AIRBUS

A318/A319/A320/A321

AeroGal
AEROLINEAS GALAPAGOS S.A.

FLIGHT CREW OPERATING MANUAL

REFERENCE: GLG A318/A319/A320/A321 For A/C: HC-CLF FCOM

ISSUE DATE: 17 OCT 17

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Issue date: 17 OCT 17

This is the FLIGHT CREW OPERATING MANUAL major event publication at issue date 17 OCT 17 for the A318/A319/A320/A321 and replacing last issue dated 05 SEP 17

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FILING INSTRUCTIONS

Please incorporate this major event revision as follow:

Localization Subsection Title	Remove	Insert Rev. Date
PLP-LESS **LIST OF EFFECTIVE SECTIONS/SUBSECTIONS**	ALL	17 OCT 17
OEB-PLP-LEOEB **LIST OF EFFECTIVE OPERATIONS ENGINEERING BULLETIN**	ALL	17 OCT 17
OEB-PLP-LEDU **LIST OF EFFECTIVE DOCUMENTARY UNITS**	ALL	17 OCT 17
OEB-50 **Modification of the AFTER START Normal Procedure**	ALL	

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PRELIMINARY PAGES

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M[1]	Localization	Subsection Title	Rev. Date
	DSC-27-30-20	**Controls and Indicators**	24 JAN 17
	DSC-28-10-10	**General**	24 JAN 17
	DSC-28-10-20	**Tanks**	22 MAR 17
	DSC-28-10-30	**Engine Feed**	22 MAR 17
	DSC-28-10-50	**APU Feed**	24 JAN 17
	DSC-28-10-60	**Fuel Recirculation System**	22 MAR 17
	DSC-28-10-70	**Refueling and Defueling**	22 MAR 17
	DSC-28-10-80	**Fuel Quantity Indication and Level Sensing**	24 JAN 17
	DSC-28-20	**Controls and Indicators**	22 MAR 17
	DSC-29-10-10	**General**	24 JAN 17
	DSC-29-10-20	**Generation**	24 JAN 17
	DSC-29-10-30	**Distribution**	24 JAN 17
	DSC-29-20	**Controls and Indicators**	24 JAN 17
	DSC-30-10-10	**Description**	24 JAN 17
	DSC-30-20-10	**Description**	24 JAN 17
	DSC-30-20-20	**Controls And Indicators**	24 JAN 17
	DSC-30-30-10	**Description**	24 JAN 17
	DSC-30-30-20	**Controls and Indicators**	24 JAN 17
	DSC-30-40-10	**Description**	24 JAN 17
	DSC-30-40-20	**Controls and Indicators**	24 JAN 17
	DSC-30-50-10	**Description**	24 JAN 17
	DSC-30-50-20	**Controls and Indicators**	24 JAN 17
	DSC-30-60-10	**Description**	19 JUN 17
	DSC-30-60-20	**Controls and Indicators**	24 JAN 17
	DSC-30-70-10	**Description**	24 JAN 17
	DSC-31-05-10	**Introduction**	24 JAN 17
	DSC-31-05-20	**Cockpit Arrangement**	24 JAN 17
	DSC-31-05-30	**Architecture**	05 SEP 17
	DSC-31-05-40	**Controls and Switching**	24 JAN 17
	DSC-31-05-50	**Reconfiguring the DMC**	24 JAN 17
	DSC-31-05-60	**Reconfiguring DUs**	24 JAN 17
	DSC-31-10	**ECAM Description**	05 SEP 17
	DSC-31-15	**Indications on E/WD**	22 MAR 17
	DSC-31-20	**Indications on SD**	24 JAN 17
	DSC-31-25-10	**General**	24 JAN 17
	DSC-31-25-20	**Example**	24 JAN 17
	DSC-31-27	**OEB Reminder**	24 JAN 17
	DSC-31-30	**ECAM Controls**	05 SEP 17
	DSC-31-40	**Indications on PFD**	05 SEP 17

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M[1]	Localization	Subsection Title	Rev. Date
	DSC-52-10-50	**Avionics Compartment Access Door**	24 JAN 17
	DSC-52-10-60	**Cockpit Door**	22 MAR 17
	DSC-52-10-80	**Escape Slides/Rafts**	24 JAN 17
	DSC-52-20	**Controls and Indicators**	24 JAN 17
	DSC-52-40-10	**Description**	22 MAR 17
	DSC-52-40-20	**Cockpit Door Locking System (CDLS)**	22 MAR 17
	DSC-52-40-30	**Cockpit Door Surveillance System (CDSS)**	19 JUN 17
	DSC-52-50	**How to**	22 MAR 17
	DSC-56-10	**General**	22 MAR 17
	DSC-56-20	**Fixed Windows**	22 MAR 17
	DSC-56-30	**Sliding Windows**	22 MAR 17
	DSC-56-40	**Description**	22 MAR 17
	DSC-70-05	**Overview**	24 JAN 17
	DSC-70-10	**System Description**	22 MAR 17
	DSC-70-20	**FADEC**	22 MAR 17
	DSC-70-30-10	**General**	22 MAR 17
	DSC-70-30-20	**Thrust Levers**	22 MAR 17
	DSC-70-30-30	**Thrust Rating Limit**	24 JAN 17
	DSC-70-30-40	**Thrust Control**	22 MAR 17
	DSC-70-40	**Fuel System (CFM56)**	22 MAR 17
	DSC-70-50	**Oil System**	24 JAN 17
	DSC-70-60	**Airbleed System (CFM56)**	22 MAR 17
	DSC-70-70	**Thrust Reverser System**	22 MAR 17
	DSC-70-80-10	**General**	22 MAR 17
	DSC-70-80-20	**Architecture**	24 JAN 17
	DSC-70-80-30	**Ignition System**	22 MAR 17
	DSC-70-80-40	**Engine Starting System**	22 MAR 17
	DSC-70-90-10	**Overhead Panel**	24 JAN 17
	DSC-70-90-20	**Pedestal**	22 MAR 17
	DSC-70-90-30	**Maintenance Panel**	24 JAN 17
	DSC-70-90-40	**Engine Display**	05 SEP 17
	DSC-70-90-50	**Memo Display**	24 JAN 17
	PRO-PLP-LETDU	**LIST OF EFFECTIVE TEMPORARY DOCUMENTARY UNITS**	12 APR 17
	PRO-ABN-ABN-00	**INTRODUCTION**	05 SEP 17
	PRO-ABN-ABN-ADV	**[ADV] ECAM ADVISORY**	05 SEP 17
	PRO-ABN-ABN-MEM	**[MEM] MEMORY ITEMS**	19 JUN 17
	PRO-ABN-ABN-QRH	**[QRH] PROCEDURES**	22 MAR 17
	PRO-ABN-ABN-RESET	**[RESET] SYSTEM RESET**	05 SEP 17
	PRO-ABN-A-ICE	**A-ICE**	22 MAR 17

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M[1]	Localization	Subsection Title	Rev. Date
	PRO-ABN-AIR	**AIR**	22 MAR 17
	PRO-ABN-APU	**APU**	22 MAR 17
	PRO-ABN-APUF	**APU FIRE**	22 MAR 17
	PRO-ABN-AUTO_FLT	**AUTO FLT**	05 SEP 17
	PRO-ABN-AVNCS	**AVIONICS SMOKE**	22 MAR 17
	PRO-ABN-BLEED	**BLEED**	22 MAR 17
	PRO-ABN-BRAKES	**BRAKES**	22 MAR 17
	PRO-ABN-CAB_PR	**CAB PR**	22 MAR 17
	PRO-ABN-CRG_SMOKE	**CARGO SMOKE**	22 MAR 17
	PRO-ABN-C_B	**C/B**	22 MAR 17
	PRO-ABN-COM	**COM**	22 MAR 17
	PRO-ABN-COND	**COND**	22 MAR 17
	PRO-ABN-CONFIG	**CONFIG**	12 APR 17
	PRO-ABN-DATALINK	**DATALINK**	22 MAR 17
	PRO-ABN-DOOR	**DOOR**	22 MAR 17
	PRO-ABN-EIS	**EIS**	22 MAR 17
	PRO-ABN-ELEC	**ELEC**	05 SEP 17
	PRO-ABN-ENG	**ENG**	05 SEP 17
	PRO-ABN-F_CTL	**F/CTL**	05 SEP 17
	PRO-ABN-FUEL	**FUEL**	22 MAR 17
	PRO-ABN-FWS	**FWS**	22 MAR 17
	PRO-ABN-HYD	**HYD**	05 SEP 17
	PRO-ABN-LG	**L/G**	05 SEP 17
	PRO-ABN-MISC	**MISC**	19 JUN 17
	PRO-ABN-NAV	**NAV**	19 JUN 17
	PRO-ABN-OVERSPEED	**OVERSPEED**	19 JUN 17
	PRO-ABN-RECORDER	**RECORDER**	22 MAR 17
	PRO-ABN-SMOKE	**SMOKE**	05 SEP 17
	PRO-ABN-SURV	**SURV**	22 MAR 17
	PRO-ABN-VENT	**VENT**	22 MAR 17
	PRO-ABN-WHEEL	**WHEEL**	22 MAR 17
	PRO-ABN-W_A_ICE	**WING A.ICE**	22 MAR 17
	PRO-ABN-90	**Detailed Cabin / Cockpit Evacuation Procedure**	05 SEP 17
	PRO-NOR-SOP-01	**General Information**	19 JUN 17
	PRO-NOR-SOP-02	**Flight Preparation**	22 MAR 17
	PRO-NOR-SOP-03	**Safety Exterior Inspection**	24 JAN 17
	PRO-NOR-SOP-04	**Preliminary Cockpit Preparation**	05 SEP 17
	PRO-NOR-SOP-05	**Exterior Walkaround**	05 SEP 17
	PRO-NOR-SOP-06	**Cockpit Preparation**	12 APR 17

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	PRO-NOR-SOP-07	**Before Pushback or Start**	19 JUN 17
	PRO-NOR-SOP-08	**Engine Start**	05 SEP 17
	PRO-NOR-SOP-09	**After Start**	22 MAR 17
	PRO-NOR-SOP-10	**Taxi**	05 SEP 17
	PRO-NOR-SOP-11	**Before Takeoff**	22 MAR 17
	PRO-NOR-SOP-12	**Takeoff**	19 JUN 17
	PRO-NOR-SOP-13	**After Takeoff**	22 MAR 17
	PRO-NOR-SOP-14	**Climb**	22 MAR 17
	PRO-NOR-SOP-15	**Cruise**	22 MAR 17
	PRO-NOR-SOP-16	**Descent Preparation**	19 JUN 17
	PRO-NOR-SOP-17	**Descent**	05 SEP 17
	PRO-NOR-SOP-18-A	**Approach General**	22 MAR 17
	PRO-NOR-SOP-18-B	**Aircraft Configuration Management**	22 MAR 17
	PRO-NOR-SOP-18-C	**Aircraft Guidance Management**	05 SEP 17
	PRO-NOR-SOP-19	**Landing**	05 SEP 17
	PRO-NOR-SOP-20	**Go-Around**	24 JAN 17
	PRO-NOR-SOP-21	**After Landing**	05 SEP 17
	PRO-NOR-SOP-22	**Parking**	05 SEP 17
	PRO-NOR-SOP-23	**Securing the Aircraft**	19 JUN 17
	PRO-NOR-SOP-90	**Standard Callouts**	22 MAR 17
	PRO-NOR-SUP-SUP	**Supplementary Procedures Menu**	22 MAR 17
	PRO-NOR-SUP-ADVWXR	**Adverse Weather**	22 MAR 17
	PRO-NOR-SUP-COM	**Communication**	22 MAR 17
	PRO-NOR-SUP-ENG	**Engines**	19 JUN 17
	PRO-NOR-SUP-FUEL	**Fuel**	05 SEP 17
	PRO-NOR-SUP-LG-LG_DN	**Flight with Landing Gear Down**	05 SEP 17
	PRO-NOR-SUP-LG-LG	**Operation with Nosewheel Steering Offset**	05 SEP 17
	PRO-NOR-SUP-MISC-D	**Pushback with Power Push Unit**	22 MAR 17
	PRO-NOR-SUP-MISC-A	**Hight Altitude Airport Operations**	22 MAR 17
	PRO-NOR-SUP-NAV	**Navigation**	22 MAR 17
	PRO-NOR-SUP-SURV	**Surveillance**	22 MAR 17
	PRO-NOR-SRP-01-05	**Introduction**	24 JAN 17
	PRO-NOR-SRP-01-10	**Cockpit Preparation**	24 JAN 17
	PRO-NOR-SRP-01-15	**Before Pushback or Start**	24 JAN 17
	PRO-NOR-SRP-01-20	**Taxi**	24 JAN 17
	PRO-NOR-SRP-01-30	**Takeoff**	24 JAN 17
	PRO-NOR-SRP-01-40	**Climb**	24 JAN 17
	PRO-NOR-SRP-01-50	**Cruise**	22 MAR 17
	PRO-NOR-SRP-01-60	**Descent**	24 JAN 17

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M[(1)]	Localization	Subsection Title	Rev. Date
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	PER-LOD-WBA-FIT-10	FUEL INDEX TABLE	22 MAR 17
	PER-OPD-GEN	GENERAL	24 JAN 17
	PER-OPD-CON-AEO	ALL ENGINES OPERATIVE	24 JAN 17
	PER-OPD-CON-OEI	ONE ENGINE INOPERATIVE	24 JAN 17
	PER-THR-GEN	GENERAL	24 JAN 17
	PER-THR-MTO	MAXIMUM TAKEOFF	24 JAN 17
	PER-THR-MGA	MAXIMUM GO AROUND	24 JAN 17
	PER-THR-FLX	FLEXIBLE TAKEOFF	24 JAN 17
	PER-THR-MCT	MAXIMUM CONTINUOUS	24 JAN 17
	PER-THR-MCL	MAXIMUM CLIMB	24 JAN 17
	PER-THR-MCR	MAXIMUM CRUISE	24 JAN 17
	PER-TOF-THR-FLX-10	DEFINITION OF FLEXIBLE TAKEOFF	24 JAN 17
	PER-TOF-THR-FLX-20	USE OF FLEXIBLE TAKEOFF	24 JAN 17
	PER-TOF-THR-FLX-30	REQUIREMENTS	05 SEP 17
	PER-TOF-THR-FLX-40	RECOMMENDATION	24 JAN 17
	PER-TOF-TOC-05	INTRODUCTION	24 JAN 17
	PER-TOF-TOC-10-10	TAKEOFF PERFORMANCE	24 JAN 17
	PER-TOF-TOC-10-20	TAKEOFF CHART DESCRIPTION	24 JAN 17
	PER-TOF-TOC-10-30	ADDITIONAL INFORMATION	24 JAN 17
	PER-TOF-TOC-12-10	DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS	24 JAN 17
	PER-TOF-TOC-12-30	EXTRAPOLATION	24 JAN 17
	PER-TOF-TOC-12-40	MAXIMUM STRUCTURAL TAKEOFF WEIGHT	24 JAN 17
	PER-TOF-TOC-12-50	SUMMARY	24 JAN 17
	PER-TOF-TOC-14-10	DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS	24 JAN 17
	PER-TOF-TOC-14-20	FLEXIBLE TAKEOFF NOT POSSIBLE	24 JAN 17
	PER-TOF-TOC-14-25	FLEXIBLE TAKEOFF POSSIBLE BUT NOT USED	24 JAN 17
	PER-TOF-TOC-14-30	SUMMARY	24 JAN 17
	PER-TOF-TOC-16-10	TAKEOFF PERFORMANCE	24 JAN 17
	PER-TOF-TOC-16-20	TAKEOFF CHART DESCRIPTION	24 JAN 17
	PER-TOF-TOC-16-30	ADDITIONAL INFORMATION	24 JAN 17
	PER-TOF-TOC-18-10	DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS	24 JAN 17
	PER-TOF-TOC-18-20	EXTRAPOLATION	24 JAN 17
	PER-TOF-TOC-18-30	MAXIMUM STRUCTURAL TAKEOFF WEIGHT	24 JAN 17
	PER-TOF-TOC-18-40	SUMMARY	24 JAN 17
	PER-TOF-TOC-20-10	DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS	24 JAN 17

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M(1)	Localization	Subsection Title	Rev. Date
	PER-TOF-TOC-20-20	**FLEXIBLE TAKEOFF NOT POSSIBLE**	24 JAN 17
	PER-TOF-TOC-20-30	**SUMMARY**	24 JAN 17
	PER-TOF-TOD-24	**QNH/BLEEDS CORRECTION**	24 JAN 17
	PER-TOF-TOD-25-10	**SPEEDS LIMITED BY VMCG/VMCA**	24 JAN 17
	PER-TOF-TOD-25-20	**V2 LIMITED BY VMU/VMCA**	24 JAN 17
	PER-TOF-CTA-10	**GENERAL**	24 JAN 17
	PER-TOF-CTA-20	**DEFINITIONS**	24 JAN 17
	PER-TOF-CTA-30	**OPERATIONAL CONDITIONS**	24 JAN 17
	PER-TOF-CTA-40-10	**TAKEOFF PERFORMANCE**	24 JAN 17
	PER-TOF-CTA-40-20	**TAKEOFF FROM A WET RUNWAY**	24 JAN 17
	PER-TOF-CTA-40-30	**TAKEOFF FROM A CONTAMINATED RUNWAY**	24 JAN 17
	PER-TOF-CTA-40-40	**EXAMPLE**	24 JAN 17
	PER-FPL-GEN-MFR	**MINIMUM RECOMMENDED FUEL REQUIREMENTS**	24 JAN 17
	PER-FPL-GEN-FPL	**FLIGHT PLAN**	24 JAN 17
	PER-FPL-FLP-QFP-10	**INTRODUCTION**	24 JAN 17
	PER-FPL-FLP-QFP-20	**CORRECTION FOR DEVIATION FROM REFERENCE LANDING WEIGHT**	24 JAN 17
	PER-FPL-FLP-QFP-30	**EXAMPLE**	05 SEP 17
	PER-FPL-FLP-QFP-40	**FLIGHT PLANNING AT A GIVEN MACH NUMBER**	24 JAN 17
	PER-FPL-FLP-QFP-50	**FLIGHT PLANNING AT LONG RANGE SPEED**	24 JAN 17
	PER-FPL-FLP-ALN-20	**ALL ENGINES OPERATIVE**	24 JAN 17
	PER-CLB-GEN	**GENERAL**	24 JAN 17
	PER-CLB-CLT	**CLIMB TABLES**	24 JAN 17
	PER-CRZ-ALT-10	**OPTIMUM AND MAXIMUM ALTITUDES**	22 MAR 17
	PER-CRZ-ALT-20	**WIND ALTITUDE TRADE FOR CONSTANT SPECIFIC RANGE**	24 JAN 17
	PER-CRZ-CRT-10	**GENERAL**	24 JAN 17
	PER-CRZ-CRT-20	**CRUISE AT M.78**	24 JAN 17
	PER-CRZ-CRT-30	**CRUISE AT LONG RANGE**	24 JAN 17
	PER-CRZ-ICQ-10	**GENERAL**	22 MAR 17
	PER-CRZ-ICQ-20	**EXAMPLE**	22 MAR 17
	PER-HLD-GEN	**GENERAL**	24 JAN 17
	PER-HLD-HLD	**HOLDING TABLES**	24 JAN 17
	PER-DES-GEN	**GENERAL**	24 JAN 17
	PER-DES-STD	**STANDARD**	24 JAN 17
	PER-DES-EMG	**EMERGENCY**	22 MAR 17
	PER-GOA-GEN	**GENERAL**	22 MAR 17
	PER-GOA-ACG-NOR	**NORMAL**	24 JAN 17
	PER-GOA-ACG-CAT	**CAT II**	24 JAN 17
	PER-LDG-GEN	**GENERAL**	19 JUN 17

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(1) Evolution code : N=New, R=Revised, E=Effectivity, M=Moved

This table gives, for each delivered aircraft, the cross reference between:

- The Manufacturing Serial Number (MSN).
- The Fleet Serial Number (FSN) of the aircraft as known by AIRBUS S.A.S.
- The registration number of the aircraft as known by AIRBUS S.A.S.
- The aircraft model.

M(1)	MSN	FSN	Registration Number	Model
	2078		HC-CLF	319-112

(1) Evolution code : N=New, R=Revised

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	J0006		20 AUG 10	FUEL SYSTEM - ADDITIONAL TREATMENT OF CENTRE TANK STRUCTURE AND INSTALLATION OF CENTRE TANK SYSTEM
	Applicable to: ALL			
	J0012		20 AUG 10	NAVIGATION LIGHTS SYSTEM - INSTALLATION OF A SECOND NAVIGATION LIGHT SYSTEM
	Applicable to: ALL			
	J0022		20 AUG 10	INSTALLATION OF A FUEL QUANTITY SELECTOR IN THE FLIGHT COMPARTMENT
	Applicable to: ALL			
	J0071		20 AUG 10	WING STRUCTURE-INTRODUCTION OF A WING TIP INCORPORATING A TIP FENCE FOR 72T MTOW A/C
	Applicable to: ALL			
	J0664		20 AUG 10	FUEL SYSTEM-TO IMPROVE LOW LEVEL WARNING
	Applicable to: ALL			
	J0689		20 AUG 10	WING-TO DELETE L/E VENTILATION SYSTEM (PICCOLO TUBE)
	Applicable to: ALL			
	J1255		20 AUG 10	FUEL - TANK LEVEL SENSING - CHANGE TO LOW PRESSURE WARNING
	Applicable to: ALL			
	J1334		20 AUG 10	LANDING GEAR-MLG-LGCIU-INTRODUCTION OF A NEW STANDARD FOR IMPROVED PROXIMITY SENSOR FAULT MONITORING FUNCTION
	Applicable to: ALL			
	J2190		20 AUG 10	FUEL - MAIN FUEL PUMPS SYSTEMS - CENTRE TANK PUMPS AUTO FEED FAULT.ADAPT PUMP CONTROL LATCH FOR FLIGHT DECK REFUEL CABABILITY
	Applicable to: ALL			
	J2257		20 AUG 10	FUEL - MANUAL MAGNETIC INDICATORS - ATTITUDE MONITOR DELETION
	Applicable to: ALL			
	K0026		20 AUG 10	LIGHTS - LOGOLIGHTS - INSTALLATION OF LOGOLIGHTS SYSTEM
	Applicable to: ALL			
	K0035		20 AUG 10	FIRE PROTECTION - FWD LOWER HOLD - INSTALLATION OF SMOKE DETECTION SYSTEM
	Applicable to: ALL			
	K0036		20 AUG 10	FIRE PROTECTION - AFT LOWER HOLD - INSTALLATION OF SMOKE DETECTION SYSTEM
	Applicable to: ALL			

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M[(1)]	MODIFICATION	Linked SB	Incorp. Date	Title
	K0037		20 AUG 10	FIRE PROTECTION - FWD AND AFT LOWER HOLD INSTALLATION OF A SINGLE SHOT FIRE EXTINGUISHING SYSTEM
	Applicable to: ALL			
	K0052		20 AUG 10	INSTALLATION OF AN AIDS
	Applicable to: ALL			
	K0064		20 AUG 10	LIGHTS - INSTALLATION OF STROBE LIGHTS SYNCHRONISED MODE
	Applicable to: ALL			
	K0070		07 APR 11	AIR CONDITIONING - VENTILATION SYSTEM FOR AFT CARGO COMPARTMENT
	Applicable to: ALL			
	K0082		20 AUG 10	WATER WASTE-INSTALL VACUUM TOILET SYSTEM
	Applicable to: ALL			
	K1014		20 AUG 10	WATER/WASTE-RELOCATION OF POT.WATER TANK FROM SECTION 18 TO SECTION 15 AND REDESIGN OF POT.WATERSYSTEM
	Applicable to: ALL			
	K1119		20 AUG 10	EQUIPMENT FURNISHINGS-C.C-REARRANGE COMPARTMENT 4 INTO TWO ZONES
	Applicable to: ALL			
	K1420		20 AUG 10	DOORS-FWD/AFT CARGO DOOR-INTRODUCTION OF LOCKING INDICATION
	Applicable to: ALL			
	K1806		20 AUG 10	AIR CONDITIONING SYSTEM POWER SUPPLY - MODIFY POWER TO FLOW CONTROL VALVE
	Applicable to: ALL			
	K2335		20 AUG 10	LAVATORY SMOKE DETECTION - IMPROVEMENT OF SMOKE DETECTION
	Applicable to: ALL			
	K2393		20 AUG 10	AIR COND.-CABIN PRESSURE CONTROL-IMPROVE CONTROLLER TO ENABLE USE OF EXTERNAL MODE
	Applicable to: ALL			
	K2938		20 AUG 10	DOORS - C.C.DOOR HYDRAULIC SYSTEM - INTRODUCE MODIFIED ELECTRICAL (MANUAL) SELECTOR VALVE -
	Applicable to: ALL			
	K2962		20 AUG 10	HYDRAULIC POWER - MAIN BLUE HYDRAULIC POWER - IMPROVE MAINTENACE STATUS OF BLUE HYDRAULIC RESERVOIR -
	Applicable to: ALL			

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M[1]	MODIFICATION	Linked SB	Incorp. Date	Title
	K3118		20 AUG 10	AUXILIARY POWER UNIT - CONTROL AND MONITORING - INTRODUCTION OF NEW ECB P/N 304817-1
	Applicable to: ALL			
	K3154		07 APR 11	FUSELAGE - REAR FUSELAGE - ADAPT STRUCTURE OF SECTION 17 TO 19 TO A319 DEFINITION
	Applicable to: ALL			
	K3279		20 AUG 10	AUXILIARY POWER UNIT - CONTROL AND MONITORING - MODIFIED WIRE HARNESSES TO NEW ECB
	Applicable to: ALL			
	K3566		07 APR 11	WATER/WASTE - ADAPT WATER/WASTE SYSTEM TO A319 DEFINITION
	Applicable to: ALL			
	K3599		20 AUG 10	AIR CONDITIONING - COCKPIT AND CABIN TEMPERATURE CONTROL - INTRODUCE IMPROVED ZONE TEMPERATURE CONTROLLER -03
	Applicable to: ALL			
	K3901		20 AUG 10	COMMUNICATIONS - CIDS - MODIFICATION OF DIRECTOR POWER SUPPLY PRINCIPLE
	Applicable to: ALL			
	K4391		07 APR 11	GENERAL - DESIGN WEIGHTS - INCREASE MAXIMUM TAKE-OFF WEIGHT (MTOW) TO 70.0T (MTOW) TO 70,0 T
	Applicable to: ALL			
	K4402		07 APR 11	LIGHTS - EMERGENCY LIGHTING - INSTALL EMERGENCY ESCAPE PATH MARKING SYSTEM , FLOOR MOUNTED -LSI-
	Applicable to: ALL			
	K4457		07 APR 11	INTRODUCTION OF NEW ALLIED SIGNAL APU GTCP 131-9 (A)
	Applicable to: ALL			
	K4574		20 AUG 10	AIR CONDITIONING-FLOW CONTROL AND INDICATING- INTRODUCE IMPROVED AIR CONDITIONING PACKAGE FOR FLOW CONTROL
	Applicable to: ALL			
	K4724		07 APR 11	OXYGEN-PASSENGER OXYGEN-INTRODUCE IMPROVED CHEMICAL OXYGEN CONTAINER SERIES 15 MIN (DRAEGER)
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	K4725		06 JUL 16	DOORS - CARGO COMPARTMENT DOOR FWD AND AFT - MODIFY CARGO DOORS
	Applicable to: ALL			
	K4726		20 AUG 10	WATER/WASTE-TOILET SYSTEM-INTRODUCE IMPROVED TOILET ASSY
	Applicable to: ALL			
	K4787		20 AUG 10	LIGHTS - INTRODUCTION OF A COMMON EPSU
	Applicable to: ALL			
	K4793		20 AUG 10	AIR CONDITIONING-AIR COOLING SYSTEM-INTRODUCE AN IMPROVED RAM OUTLET (RAO)
	Applicable to: ALL			
	K5213		20 AUG 10	AIR CONDITIONING - PACK TEMPERATURE CONTROL - INTRODUCE IMPROVED PACK TEMPERATURE CONTROLLER
	Applicable to: ALL			
	K5382		07 APR 11	OXYGEN - PASSENGER OXYGEN SYSTEM - INTRODUCE O2-CONTAINER WITH IMPROVED FUNCTION (DRAEGER, 15 MIN.)
	Applicable to: ALL			
	K5446		20 AUG 10	INDICATING/RECORDING SYSTEMS - INSTALLATION OF A COMBINED FDIU/DMU
	Applicable to: ALL			
	K5549		20 AUG 10	OXYGEN - PASSENGER OXYGEN - INTRODUCE CHEMICAL OXYGEN CONTAINER (15MIN) WITH IMPROVED ACTUATOR (VENDOR PURITAN)
	Applicable to: ALL			
	K5638		07 APR 11	EQUIPMENT/FURNISHINGS - MISCELLANEOUS EMERGENCY EQUIPMENT - INSTALL ELT CEIS A06V2 WITH CONTROL PANEL IN COCKPIT
	Applicable to: ALL			
	K5801		20 AUG 10	AIR CONDITIONING-PRESSURE CONTROL AND MONITORING- INTRODUCE MODIFIED PRESSURE CONTROLLER P/N 9022-15702-10
	Applicable to: ALL			
	K6156		20 AUG 10	AIR CONDITIONING-PACK TEMPERATURE CONTROL- INTRODUCE MODIFIED PACK TEMPERATURE CONTROLLER
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	K6936		20 AUG 10	AUXILIARY POWER UNIT (APU)-GENERAL- INCREASE OPERATION ENVELOPE TO 39800 FT. FOR GTCP36-300
	Applicable to: ALL			
	K7072		20 AUG 10	LIGHTS-EMERGENCY LIGHTING- EPSU LOAD DISTRIBUTION IMPROVEMENT
	Applicable to: ALL			
	K7755		20 AUG 10	EQUIPMENT/FURNISHINGS PAX COMPARTMENT INTRODUCE A MODIFIED INTRUSION AND PENETRATION RESISTANCE COCKPIT DOOR
	Applicable to: ALL			
	K7790		20 AUG 10	DOORS PASSENGER COMPARTMENT FIXED PARTITIONS INTERIOR DOOR-ELECTRICAL COCKPIT DOOR RELEASE SYSTEM
	Applicable to: ALL			
	P0033		07 APR 11	COMMUNICATIONS - HF1 SYSTEM PROVISION FOR HF1 SYSTEM
	Applicable to: ALL			
	P0034		07 APR 11	SINGLE HF SYSTEM
	Applicable to: ALL			
	P0040		20 AUG 10	4TH OCCUPANT SEAT
	Applicable to: ALL			
	P0091		20 AUG 10	ALTERNATIVE FLIGHT CREW OXYGEN BOTTLE (77.1CU/FT) IN COMPOSITE MATERIAL FOR FIXED SYSTEM
	Applicable to: ALL			
	P0143		20 AUG 10	COMMUNICATIONS - INSTALLATION OF A 3RD RMP
	Applicable to: ALL			
	P0147		20 AUG 10	DESIGN WEIGHT-MTOW 72T-STRUCTURAL REINFORCEMENT
	Applicable to: ALL			
	P0197	23-1365 15	07 APR 11	COMMUNICATIONS-SINGLE HF SYSTEM INSTALLATION
	Applicable to: ALL			
	P0415		20 AUG 10	COMMUNICATIONS-HOT MIKE RECORDING
	Applicable to: ALL			
	P10098	24-1120 04	20 AUG 10	ELECTRICAL POWER AC ESSENTIAL GENERATION SWITCHING INSTALL AUTO SWITCHING SYSTEM FOR AC&DC ESS BUS.
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	P10383	31-1334 04 31-1414 03	20 AUG 10	INDICATING/RECORDING SYSTEMS FLIGHT WARNING COMPUTER (FWC) INSTALL FWC STANDARD H2-F5
	Applicable to: ALL			
	P10439	22-1248 01	20 AUG 10	AUTO-FLIGHT FMGC INSTALL FMGC HNWL STD P1C12 ON CFM A/C
	Applicable to: ALL			
	P10443	27-1182 04	07 APR 11	FLIGHT CONTROL - ELAC SYSTEM - INTRODUCE ELAC "L93" SOFTWARE STANDARD
	Applicable to: ALL			
	P10686	22-1266 03	07 APR 11	AUTO-FLIGHT - FMGC INSTALL HONEYWELL PERFORMANCE DATABASE RELEASE 1A (PS4087592-901)
	Applicable to: ALL			
	P10762	22-1269 05	20 AUG 10	AUTO FLIGHT - FMGC INSTALL FMGC HWL H2C12 (RELEASE 1A) ON CFM A/C
	Applicable to: ALL			
	P11325	73-1095 02	18 MAR 15	ENGINE FUEL AND CONTROL - FADEC SYSTEM INTRODUCE ECU SOFTWARE STANDARD "5BR" ON CFM56-5B ENGINES
	Applicable to: ALL			
	P11473	22-1315 05	22 MAR 16	AUTO FLIGHT - FLIGHT MANAGEMENT SYSTEM (FMS) ACTIVE BARO RADIO SETTING FUNCTION
	Applicable to: ALL			
	P11856	22-1315 05	07 APR 11	AUTO - FLIGHT FMGC: ACTIVATE NO AP DISCONNECTION BELOW MDA/MDH UNTIL MISSED APPROACH POINT
	Applicable to: ALL			
	P1302		20 AUG 10	LANDING GEAR-POST EIS STANDARD 4 OF BSCU EQUIPMENT
	Applicable to: ALL			
	P1312		07 APR 11	LIGHTS-COCKPIT-INTEGRALLY LIGHTED PLACARD 25VU,ANTI ICE PART MODIFIED
	Applicable to: ALL			
	P1390		20 AUG 10	ELECTRICAL GENERATION-BCL'S CHANGE
	Applicable to: ALL			
	P1450		20 AUG 10	NAVIGATION - ATC MODE "S" - ACTIVATION OF SELECTIVE INTERROGATION FUNCTION
	Applicable to: ALL			
	P1485		20 AUG 10	ELECTRICAL POWER-"BAT OFF"INDICATOR LIGHT POWER SOURCE MODIFIED
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	P1631		20 AUG 10	NAVIGATION - MODIFY GPWC WARNINGS
	Applicable to: ALL			
	P1669		20 AUG 10	AIR CONDITIONING-AVIONICS VENTILATION ADD A NON RETURN VALVE AT AIR INLET
	Applicable to: ALL			
	P1752		20 AUG 10	HYDRAULICS-MODIFICATION OF ELECTRICAL ROUTING OF GREEN LEAKAGE MEASUREMENT ELECTROVALVE CONTROL
	Applicable to: ALL			
	P1850		20 AUG 10	FLIGHT CONTROLS-ELAC SYSTEM-EFCS ELAC -SOFTWARE L62
	Applicable to: ALL			
	P1872		07 APR 11	AIR CONDITIONING-INSTALLATION OF CIRCUIT BREAKER FOR REAR CARGO COMPARTMENT VALVE SUPPLY
	Applicable to: ALL			
	P1883		20 AUG 10	FLIGHT CONTROLS-FCDC L 40
	Applicable to: ALL			
	P1906		20 AUG 10	ENGINES FUEL AND CONTROL-EIU FOR CFMI POWERPLANT (SOFTWARE VERSION 11)
	Applicable to: ALL			
	P1970	23-1365 15	20 AUG 10	COMMUNICATIONS-INSTALL HF1 IN EMERGENCY CONFIG. (ETOPS)
	Applicable to: ALL			
	P2040		20 AUG 10	OXYGENE-COCKPIT-MODIFY LP VALVE
	Applicable to: ALL			
	P2196		20 AUG 10	BATCH OF MINOR IMPROVEMENTS OF SERIES A/C DESIGN (AS ZONE) FROM A/C N 268
	Applicable to: ALL			
	P2205		20 AUG 10	FIRE PROTECTION - REPLACE ENGINE/APU FIRE PANEL
	Applicable to: ALL			
	P2218		20 AUG 10	NAVIGATION - TCAS II COMPLETE PROVISIONS
	Applicable to: ALL			
	P2223		20 AUG 10	NAVIGATION - INSTALLATION OF GPWC MARK V WITH INTERFACE WITH CFDS
	Applicable to: ALL			
	P2294		20 AUG 10	ENGINE FUEL AND CONTROL - CFM 56 POWERPLANT EIU VERSION 12
	Applicable to: ALL			
	P2316		20 AUG 10	AUTOFLIGHT - ACTIVATE WINDSHEAR FUNCTION
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	P2493		20 AUG 10	COCKPIT - INSTALL A340 TYPE PILOT SEATS
	Applicable to: ALL			
	P2546		20 AUG 10	INDICATING/RECORDING SYSTEMS - INSTRUMENTS - DEFINE SDAC STANDARD FOR A321 COF A
	Applicable to: ALL			
	P2547		07 APR 11	INDICATING/RECORDING SYSTEMS - INSTRUMENTS - DEFINE DMC STANDARD FOR A321 COF A
	Applicable to: ALL			
	P2588		20 AUG 10	OXYGEN - COCKPIT - REPLACE BASIC AIR LIQUIDE PBE BY DRAEGER
	Applicable to: ALL			
	P2878		07 APR 11	INDICATING RECORDING SYSTEM - SDAC - DEFINE A PIN PROGRAM FOR REAR C.C. VENTILATION
	Applicable to: ALL			
	P2963		20 AUG 10	AIR CONDITIONING - IMPROVE CABIN PRESSURIZATION CONTROL ON 25VU -
	Applicable to: ALL			
	P3004		20 AUG 10	LIGHTS-COCKPIT LIGHTING-IMPROVE COCKPIT LIGHTING
	Applicable to: ALL			
	P3011		20 AUG 10	FMS - FMS CROSS LOAD
	Applicable to: ALL			
	P3040		07 APR 11	NAVIGATION - INSTALL 4MCU ADIRS CAPABLE OF A321 A/C FITTED WITH IAE ENGINES
	Applicable to: ALL			
	P3044		20 AUG 10	NAVIGATION -ADAPT SHELVES FOR INSTALLATION OF 4MCUADIRS -
	Applicable to: ALL			
	P3102		20 AUG 10	AUTO FLIGHT - FCU-CPIP1 STANDARD
	Applicable to: ALL			
	P3105		20 AUG 10	ENGINE FUEL AND CONTROL - CFM 56 - EIU VERSION 13
	Applicable to: ALL			
	P3112		07 APR 11	NAVIGATION - INSTALLATION OF TCAS II COLLINS SYSTEM
	Applicable to: ALL			
	P3202		20 AUG 10	AUTOFLIGHT - FCU - CPIP 2 STANDARD M10
	Applicable to: ALL			
	P3204		20 AUG 10	AUTO FLIGHT - FMGC - A320/A321 STANDARD WITH SOFTWARE OPTIONS + 400 KILOWORDS DATA

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M[1]	MODIFICATION	Linked SB	Incorp. Date	Title
				BASE OPTION + ACARS HARDWARE PROVISION (B1 CFM VERSION)
	Applicable to: ALL			
	P3365		20 AUG 10	ICE PROTECTION - ICING INDICATOR ILLUMINATION
	Applicable to: ALL			
	P3379		20 AUG 10	INDICATING/RECORDING SYSTEMS - GENERAL - DEFINE PIN PROGRAMMING FOR STD VERSIONS
	Applicable to: ALL			
	P3401		07 APR 11	AUTOFLIGHT - FCU - DELETE "EXPEDITE" FUNCTION FROM FCU
	Applicable to: ALL			
	P3420		22 MAR 16	A320/321 ENERGY MANAGEMENT FUNCTIONS - ACTIVATION BY PIN PROGRAMMING FOR IAE AND CFM ENGINES
	Applicable to: ALL			
	P3511		20 AUG 10	AUTO FLIGHT - FLIGHT AUGMENTATION - AFS COMPUTER A320/A321 FAC CFM/IAE
	Applicable to: ALL			
	P3524		20 AUG 10	ELECTRICAL GENERATION - APU GENERATOR NEW STANDARD
	Applicable to: ALL			
	P3588		20 AUG 10	LANDING GEAR - A320/A321 TWIN WHEELS BSCU STANDARD 7 (70B VERSION)
	Applicable to: ALL			
	P3594		20 AUG 10	INDICATING/RECORDING SYSTEMS - ELECTRICAL CLOCK - INSTALLATION OF A CLOCK SMITHS TYPE 2610
	Applicable to: ALL			
	P3660		20 AUG 10	FLIGHT CONTROLS - EFCS EQUIPMENT - MODIFY SEC STANDARD FOR A320 AND A321
	Applicable to: ALL			
	P3686		20 AUG 10	AUTO FLIGHT: FLIGHT AUGMENTATION COMPUTER INTRODUCE FAC POST CDN ON A320/321.
	Applicable to: ALL			
	P3694		20 OCT 11	AUTO FLIGHT-FMGC-A320/321-FG STANDARD FOR A321 CFM CAT III
	Applicable to: ALL			
	P3830		20 AUG 10	FLIGHT CONTROLS-PARTIAL LIFT DUMPING FUNCTION ACTIVATION
	Applicable to: ALL			
	P3878		20 AUG 10	FLIGHT CONTROL-ELAC SYSTEM-INSTALL ELAC 69J
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	P3955		07 APR 11	NACELLES/PYLONS-IAE/CFM-ADAPT PYLON PRIMARY STRUCTURE FOR A321 GROWTH VERSION
	Applicable to: ALL			
	P3957		06 JUL 16	ATA 2900 HYDRAULIC POWER-GENERAL INSTALL AN HYDRAULIC SHUT-OFF VALVE ON THE CFM THRUST REVERSER SYSTEM
	Applicable to: ALL			
	P3964		20 AUG 10	NAVIGATION-WEATHER RADAR SYSTEM-NEW SEXTANT ATC/TCAS CONTROL PANEL -SFE WITH FULL TIME AND ABOVE BELOW FUNCTIONS
	Applicable to: ALL			
	P3996		07 APR 11	NAVIGATION - ADIRS - INSTALLATION OF HONEYWELL ADIRS CAPABLE OF A319 A/C FITTED WITH CFM ENGINES
	Applicable to: ALL			
	P4023	35-1025 07	20 AUG 10	GENERAL - HIGH ALTITUDE CERTIFICATION UP TO 14.500 FT
	Applicable to: ALL			
	P4054		20 AUG 10	AUTOFLIGHT-FCU-INSTALL M11 STANDARD
	Applicable to: ALL			
	P4055		07 APR 11	AUTOFLIGHT-FCU-INSTALL M11 STANDARD WITH EXPEDITE FUNCTION DELETED
	Applicable to: ALL			
	P4121		20 AUG 10	EXHAUST - THRUST REVERSER CONTROL AND INDICATING -ACTIVATE ADDITIONAL THRUST REVERSER LOCK CONTROL
	Applicable to: ALL			
	P4151		20 AUG 10	INDICATING/RECORDING SYSTEMS - UP AND DOWN DATA LOADING SYSTEM - INSTALL A "PORTABLE DATA LOADER" CONNECTOR AND DISK STOWAGE.
	Applicable to: ALL			
	P4155		20 AUG 10	AUTOFLIGHT - FLIGHT MANAGEMENT AND GUIDANCE COMPUTER - ACTIVATION OF ACARS AND PRINTER INTERFACES IN F.M.S (CFM ENGINES)
	Applicable to: ALL			
	P4170		20 AUG 10	FLIGHT CONTROLS - FCDC - PROVIDE A VISUAL INDICATION FOR SIMULTANEOUS SIDE STICK ACTION
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	P4191		20 AUG 10	NAVIGATION AND COMMUNICATIONS REPLACE BFE EQUIPMENT BY SFE EQUIPMENT
	Applicable to: ALL			
	P4205		20 AUG 10	AUTOFLIGHT - FMGC - ACTIVATE PRINTER INTERFACE IN FMS (CFM AND IAE ENGINES)
	Applicable to: ALL			
	P4230		20 AUG 10	POWER PLANT-GENERAL INTRODUCTION OF CFM56-5B/P
	Applicable to: ALL			
	P4234		20 AUG 10	ICE AND RAIN PROTECTION-WINDSHIELD RAIN PROTECTION DESACTIVATION OF RAIN REPELLENT SYSTEM.
	Applicable to: ALL			
	P4271		07 APR 11	NAVIGATION - RMI - INSTALLATION OF VOR/ADF/DDRMI (SEXTANT) P/N 63543-253-2
	Applicable to: ALL			
	P4281		20 AUG 10	ENGINE FUEL AND CONTROL-CONTROLLING INTRODUCE OF A NEW ECU SOFTWARE STANDARD 5BE-1 FOR CFM56-5B SAC ENGINES
	Applicable to: ALL			
	P4287	31-1264 04	20 AUG 10	INDICATING-RECORDING SYSTEM FWC DEFINE OEB REMINDER NEW FUNCTION IN FWC
	Applicable to: ALL			
	P4319		20 AUG 10	AUTO FLIGHT/FCU DEFINE FD ENGAGEMENT IN CROSSED BARS AT GO AROUND
	Applicable to: ALL			
	P4320		20 AUG 10	AUTO FLIGHT - ACTIVATE GLOBAL SPEED PROTECTION AND FD DISENGAGEMENT UPON SPEED CONDITIONS
	Applicable to: ALL			
	P4378	00-1054 19	20 AUG 10	CERTIFICATION - GENERAL - CERTIFICATION FOR HIGH ALTITUDE AIRPORT OPERATION
	Applicable to: ALL			
	P4419		25 NOV 11	NAVIGATION - ADIRS - INSTALL HONEYWELL ADIRU 4 MCU STANDARD WITH OPTIMIZED HARDWARE P/N "AD09"
	Applicable to: ALL			
	P4425		25 NOV 11	NAVIGATION-ADIRS-INSTALL HONEYWELL ADIRU 4 MCU STANDARD, CAPABLE OF A319 IAE AIRCRAFT
	Applicable to: ALL			

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M[(1)]	MODIFICATION	Linked SB	Incorp. Date	Title
	P4495		20 AUG 10	INDICATING/RECORDING SYSTEMS- DISPLAY MANAGEMENT COMPUTER (DMC) DEFINE DMC V32 STANDARD
	Applicable to: ALL			
	P4497		20 AUG 10	DOORS-EMERGENCY ESCAPE SLIDE RELEASE AND OVERPRESSURE WARNING SYSTEMS-MODIFY CONTROL LOGIC OF THE OVERPRESSURE WARING SYSTEM
	Applicable to: ALL			
	P4502		20 AUG 10	INFORMATION SYSTEMS - ATIMS - INSTALL ATSU COMPUTER FOR PRE-FANS CONFIGURATION
	Applicable to: ALL			
	P4528		20 AUG 10	ENGINE FUEL AND CONTROL -CONTROLLING- INTRODUCE AN ECU SOFTWARE STD 5BH FOR CFM56-5B SAC ENGINES.
	Applicable to: ALL			
	P4539		20 AUG 10	AUTO FLIGHT-GENERAL/FLIGHT CONTROL UNIT- DEFINE AND INSTALL SEXTANT MODULAR FCU
	Applicable to: ALL			
	P4706		22 MAR 16	NAVIGATION - ADF - INSTALLATION OF 1 ADF QUANTUM LINE P/N 066-50014-0202
	Applicable to: ALL			
	P4766		07 APR 11	NAVIGATION - SINGLE PWS - COLLINS SINGLE PWS ACTIVATION
	Applicable to: ALL			
	P4770		20 AUG 10	NAVIGATION - WEATHER RADAR SYSTEM. INSTALL FULL PROVISION FOR THE SECOND TRANSCEIVER.
	Applicable to: ALL			
	P4789		20 AUG 10	NAVIGATION-MMR-INSTALLATION OF SEXTANT MULTICI-MODE RECEIVERS PROVIDING ILS (FM IMMUNE) AND GPS PRIMARY FUNCTION
	Applicable to: ALL			
	P4801		20 AUG 10	ELECTRICAL POWER - GENERATION SYSTEM - DEFINE AND INSTALL ON A320 FAMILY NEW ELECTRICAL GENERATION CONCEPT (WIRING/EQUIPMENT)
	Applicable to: ALL			
	P4859		22 MAR 16	NAVIGATION - ADF - INSTALL AN ADF 900 RECEIVER P/N 822-0299-020
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	P4867		22 MAR 17	NAVIGATION - EGPWS - INSTL. NEW SPECIFICATION INSTALLATION OF EGPWC (NEW SPECIFICATION)
	Applicable to: ALL			
	P4885		20 AUG 10	NAVIGATION - EGPWS - ACTIVATION OF ENHANCED FUNCTIONS OF THE EGPWS
	Applicable to: ALL			
	P4916		20 AUG 10	FLIGHT CONTROL - GENERAL - ELAC-SYSTEM - INSTALL ELAC COMPATIBLE A320/321/319 (EM2 PROGRAM)
	Applicable to: ALL			
	P4954		20 AUG 10	AUTO FLIGHT - FMGC - DEFINE AND INSTALL FMGC B546CAM0102 FOR A319 AUTOLAND CFM ENGINES (CAPABLE OF GPS/ACARS FUNCTION)
	Applicable to: ALL			
	P4977	31-1264 04	20 AUG 10	INDICATING/RECORDING SYSTEMS - FWC - PROVIDE NEW SYNTHETIC VOICE "DUAL INPUT"
	Applicable to: ALL			
	P4983		20 AUG 10	AUTO FLIGHT - FLIGHT AUGMENTATION - DEFINE FAC STANDARD B0513
	Applicable to: ALL			
	P5071		20 AUG 10	ICE AND RAIN PROTECTION-WINDSHIELD RAIN PROTECTIONREACTIVATE RAIN REPELLENT SYSTEM WITH FLUID COMPATIBLE WITH OZONE PROTECTION RULES
	Applicable to: ALL			
	P5138		20 AUG 10	FLIGHT CONTROLS-GENERAL-ELAC SYSTEM- INSTALL ELAC STANDARD L80
	Applicable to: ALL			
	P5168		20 AUG 10	NAVIGATION-MMR-INSTALLATION OF COLLINS MULTI-MODE RECEIVERS PROVIDING ILS (FM IMMUNE) AND GPS PRIMARY FUNCTION
	Applicable to: ALL			
	P5228	31-1118 20	07 APR 11	INDICATING/RECORDING SYSTEM-FWC-ACTIVATE THE HI ALT SET" RIGH MEMO FOR HIGH ALTITUDE AIRPORT OPERATION
	Applicable to: ALL			
	P5239		20 AUG 10	NAVIGATION-ATC MODE "S"-INSTALL ATC/TCAS CONTROL UNIT P/N C12240B02
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	P5241		20 AUG 10	NAVIGATION-WEATHER RADAR SYSTEMS-INSTALL COLLINS SINGLE WITH PROVISION FOR THE SECOND SYSTEM
	Applicable to: ALL			
	P5314		20 AUG 10	AUTO FLIGHT - GENERAL - MULTIPURPOSE CONTROL AND DISPLAY UNIT (MCDU) - INSTALL MCDU HONEYWELL 2ND GENERATION P/N : 4077880-980
	Applicable to: ALL			
	P5429		20 AUG 10	ENGINE FUEL AND CONTROL - GENERAL FADEC SYSTEM A320/CFM56-5B - INTRODUCE ECU SOFTWARE STANDARD 5BI
	Applicable to: ALL			
	P5451		20 AUG 10	ELECTRICAL POWER - GENERAL AC & DC MAIN DISTRIBUTION - INSTALL A/C AND DC SHEDDABLE BUSBARS
	Applicable to: ALL			
	P5459		20 AUG 10	POWER PLANT - GENERAL - ADD RELAY LOGIC FOR CONTROL PACK CLOSURE AT ENGINE START
	Applicable to: ALL			
	P5465		20 AUG 10	INDICATING/RECORDING SYSTEMS - CLOCKS - INSTALL AIR PRECISION CLOCK P/N APE5100 CAPABLE OF GPS TIME
	Applicable to: ALL			
	P5518	32-1336 01	20 AUG 10	LANDING GEAR - GENERAL - NORMAL BRAKING - INTRODUCE STD 8 BSCU TWIN VERSION
	Applicable to: ALL			
	P5567		20 AUG 10	INDICATING/RECORDING SYSTEM - DMC - DEFINE DMC V40 STANDARD
	Applicable to: ALL			
	P5583		20 AUG 10	NAVIGATION - ADIRS - REDUCED VERTICAL SEPARATION MINIMUM (RVSM) USING ADR 1 AND ADR 2 ONLY (A319/A320/A321 APPLICABLE)
	Applicable to: ALL			
	P5613		07 APR 11	NAVIGATION - TCAS - INSTALL COLLINS TCAS TTR921 WITH COLLINS ATC TPR901
	Applicable to: ALL			
	P5622		07 APR 11	AUTO FLIGHT - MCDU - INSTALL AN MCDU 2ND GENERATION HONEYWELL FMS (MCDU WITH A340 KEYBOARD)
	Applicable to: ALL			

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M[(1)]	MODIFICATION	Linked SB	Incorp. Date	Title
	P5706	31-1257 01	20 AUG 10	INDICATING/RECORDING SYSTEMS- FLIGHT WARNING COMPUTER (FWC) INSTALL FWC STD H2/E3
	Applicable to: ALL			
	P5834	34-1444 01	24 JAN 17	NAVIGATION - SENSORS - INSTALL MODIFIED SEXTANT ANGLE OF ATTACK SENSORS P/N C16291AA
	Applicable to: ALL			
	P5895		20 AUG 10	NAVIGATION-GPWS-INSTALL EGPWS P/N-206-206 & INHIBIT AUTOMATIC DEACTIVATION OF ENHANCED FUNCTIONS.
	Applicable to: ALL			
	P6044		20 AUG 10	ICE AND RAIN PROTECTION - GENERAL - WINDSHIELD RAIN PROTECTION INSTALL IMPROVED GAGE ASSY P/N 4020W35-2
	Applicable to: ALL			
	P6071		07 APR 11	INDICATING/RECORDING SYSTEMS - DMC - DISPLAY THE ALTITUDE IN METRES ON THE PRIMARY FLIGHT DISPLAY (PFD)
	Applicable to: ALL			
	P6125		25 NOV 11	NAVIGATION - ADIRU - INSTALL HNWL ADIRU 4 MCU AD11 (NEW HARD) WITH 4 TRIMS OF ANEMO CORRECTION LAWS POSSIBILITIES AND MAGVAR TABLES UPDATED
	Applicable to: ALL			
	P6146		20 AUG 10	INDICATING/RECORDING SYSTEM - FWC - INTRODUCE "F/CTL FLAP LVR NOT ZERO" RED WARNING
	Applicable to: ALL			
	P6201		20 AUG 10	GENERAL-FLIGHT ENVIRONMENTAL ENVELOPE- EXTENSION TO 12100 M
	Applicable to: ALL			
	P6251		20 AUG 10	ICE AND RAIN PROTECTION - GENERAL - WINDSHIELD RAIN PROTECTION - INSTALL NEW GAGE ASSYWITHOUT INPUT VALVE FUNCTION P/N 4020W35-3
	Applicable to: ALL			
	P6319		07 APR 11	COMMUNICATIONS - AUDIO MANAGEMENT - INSTALL TEAM DIGITAL AMU P/N 4031-SA-01
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	P6375		20 AUG 10	LANDING GEAR-PARKING/ULTIMATE EMERGENCY BRAKING -INSTALL A PRESSURE SWITCH (PARKING BRAKE SYSTEM IMPROVEMENT
	Applicable to: ALL			
	P6544		20 AUG 10	INDICATING RECORDING SYSTEM - FWC ACTIVATE SPECIFIC FWC PROCEDURE
	Applicable to: ALL			
	P6588		20 AUG 10	INFORMATION SYSTEM - ATIMS IMPROVE ATSU AIRCRAFT INTERFACE SOFTWARE TO UPDATE SERVICE PROVIDERS LIST AND MANAGEMEN
	Applicable to: ALL			
	P6589		20 AUG 10	INDICATING/RECORDING SYSTEMS - CFDIU INTRODUCE CFDIU STANDARD 9B
	Applicable to: ALL			
	P6630	00-1058 97	20 AUG 10	CERTIFICATION DOCUMENTS - GENERAL - CERTIFY AIRCRAFT FOR OPERATION ON RUNWAYS LESS THAN 45 M WIDTH
	Applicable to: ALL			
	P6687		20 AUG 10	COMMUNICATION - RADIO MANAGAMENT INTRODUCE NEW RMP STANDARD 2 P/N C12848AB02
	Applicable to: ALL			
	P6688		07 APR 11	COMMUNICATIONS - RADIO MANAGEMENT INSTALL A THIRD RADIO MANAGEMENT PANEL
	Applicable to: ALL			
	P6703	22-1079 08 22-1102 02 22-1226 04	20 AUG 10	AUTO FLIGHT - FLIGHT AUGMENTATION COMPUTER INSTALL NEW FAC SOFTWARE STANDARD P/N B397BAM0515
	Applicable to: ALL			
	P6777		07 APR 11	INFORMATION SYSTEM - ATIMS UPGRADE ATSU HARDWARE FOR NEW ARINC 429 I/O BOARD
	Applicable to: ALL			
	P6801	31-1257 01	20 AUG 10	INDICATING RECORDING SYSTEM - FWC INSTALL FWC STANDARD H2E4
	Applicable to: ALL			
	P6832		20 AUG 10	INFORMATION SYSTEMS - ATIMS - DEFINE AND INSTALL NEW SOFTWARE ATSU A/C INTERFACE UPGRADED
	Applicable to: ALL			
	P6901	27-1160 01	20 AUG 10	FLIGHT CONTROLS - ELAC SYSTEM - INTRODUCE ELAC SOFTWARE "L90" CAPABLE OF A318
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	P6954	22-1102 02 22-1226 04	20 AUG 10	AUTO FLIGHT - FLIGHT AUGMENTATION COMPUTER (FAC SYSTEM) - INTRODUCE FAC SOFTWARE "BAM0516" CAPABLE OF A318
	Applicable to: ALL			
	P6987		20 AUG 10	AUTO FLIGHT - FMGC INSTALL FMGC P/N B546CAM0103 (CFM GPS/ACARS)
	Applicable to: ALL			
	P7004	31-1286 01	07 APR 11	INDICATING/RECORDING SYSTEM - DMC - INSTALL DMC V50 STANDARD
	Applicable to: ALL			
	P7005	32-1336 01	20 AUG 10	LANDING GEAR - NORMAL BRAKING - INTRODUCE STD 9 BSCU (TWIN VERSION)
	Applicable to: ALL			
	P7125	31-1257 01	20 AUG 10	INDICATING/RECORDING SYSTEMS - FWC - INSTALL FWC STANDARD H2 F1 ON A318 PW
	Applicable to: ALL			
	P7175		20 AUG 10	ELECTRICAL POWER - GENERAL - INSTALL A COMMERCIAL SHEDDING PUSH-BUTTON SWITCH IN COCKPIT
	Applicable to: ALL			
	P7185		19 JUN 17	NAVIGATION - EGPWS INSTALL ENHANCED GPWS P/N 965-1676-001
	Applicable to: ALL			
	P7218		22 MAR 16	AUTOFLIGHT - FLIGHT MANAGEMENT AND GUIDANCE COMPUTER (FMGC) DEVELOP FMS 2ND GENERATION HONEYWELL STEP1
	Applicable to: ALL			
	P7247		20 AUG 10	FLIGHT CONTROLS - ELAC SYSTEM - INSTALL ELAC STANDARD L81
	Applicable to: ALL			
	P7268		20 AUG 10	NAVIGATION - ADIRU RESTORE RVSM 3 CIRCUITS CAPABILITIES - SERIAL SOLUTION
	Applicable to: ALL			
	P7455		20 AUG 10	ELECTRICAL POWER - GENERAL IN FLIGHT ENTERTAINMENT (IFE) POWER SUPPLY ON SHEDDABLE BUSBARS CONTROLED BY "GALY & CAB" SW
	Applicable to: ALL			
	P7519		20 AUG 10	AUTOFLIGHT - FMGC - INSTALL FMGC CFM C13042AA01 (EQUIPPED WITH FMS2 HONEYWELL)
	Applicable to: ALL			

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M[(1)]	MODIFICATION	Linked SB	Incorp. Date	Title
	P7635	27-1160 01	20 AUG 10	FLIGHT CONTROLS - ELAC SYSTEM INTRODUCE ELAC SOTWARE L82
	Applicable to: ALL			
	P7721	32-1247 02	20 AUG 10	LANDING GEAR - WHEELS AND BRAKES REMOVE THE TEMPORARY REVISIONS 5.02.00/23 AND 5.03.00/23 ON FLIGHT MANAL
	Applicable to: ALL			
	P7790		20 AUG 10	AUTO FLIGHT FLIGHT MANAGEMENT AND GUIDANCE SYSTEM ACTIVATE FMA ENHANCEMENT FUNCTION
	Applicable to: ALL			
	P7919		20 AUG 10	ENGINE FUEL AND CONTROL - FADEC SYSTEM - INTRODUCE NEW FADEC SOFTWARE "5BK" ON SAC CFM56-5B ENGINES
	Applicable to: ALL			
	P8069	73-1080 01	20 AUG 10	ENGINE FUEL AND CONTROL - FADEC SYSTEM INTRODUCE NEW ECU SOFTWARE STANDARD "5BL" FOR CFM56-5B ENGINES CAPABLE OF A318 CFM A/C
	Applicable to: ALL			
	P8232	31-1266 02	20 AUG 10	INDICATING/RECORDING SYSTEMS - FWC - INTRODUCE IAS DISCREPANCY AND DUAL PITOT MONITORING ON FWC H2F1
	Applicable to: ALL			
	P8256	22-1102 02 22-1226 04	20 AUG 10	AUTO FLIGHT FLIGHT AUGMENTATION COMPUTER INSTALL FAC STANDARD BAM0617 FOR A318 EIS
	Applicable to: ALL			
	P8274	31-1257 01	20 AUG 10	INDICATING RECORDING SYSTEM FWC INSTALL FWC STANDARD H2F2
	Applicable to: ALL			
	P8310		07 APR 11	NAVIGATION - GPWS RE-INSTALL EGPWS P/N -206-206 (ANTI-MOD 31374+26935+21391)
	Applicable to: ALL			
	P8440	32-1291 01	20 AUG 10	LANDING GEAR - WHEELS AND BRAKES INTRODUCE GOODRICH DURACARB CARBON BRAKES WITH ANTI - OXYDAN "M1"
	Applicable to: ALL			
	P8708	22-1168 01	20 AUG 10	AUTOFLIGHT - FMGC INSTALL FMS2 HONEYWELL P1C11 ON A/C FITTED WITH CFMI PPS
	Applicable to: ALL			

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M[1]	MODIFICATION	Linked SB	Incorp. Date	Title
	P9107	31-1267 03 31-1300 02	20 AUG 10	INDICATING/RECORDING SYSTEM FLIGHT WARNING COMPUTER - FWC - INSTALL FWC STANDARD H2 F3
	Applicable to: ALL			
	P9552	73-1086 00	20 AUG 10	ENGINE FUEL AND CONTROL - FADEC SYSTEM INSTALL "5BM" STANDARD ECU SOFTWARE FOR CFM 56-5B ENGINES
	Applicable to: ALL			
	22-1359 05		22 MAR 16	AUTO-FLIGHT-FLIGHT MANAGEMENT AND GUIDANCE COMPUTER (FMGC)-INSTALL FMGC HONEYWELL H2C13 ON CFM A/C
	Applicable to: ALL			
	22-1375 00		12 APR 17	AUTO FLIGHT - FLIGHT AUGMENTATION COMPUTER (FAC) - INTRODUCE FAC SOFTWARE STANDARD BAM0621 (ROPS FUNCTION).
	Applicable to: ALL			
	22-1480 03		12 APR 17	AUTO FLIGHT-FLIGHT AUGMENTATION (FAC) DEFINE STOP RUDDER INPUT WARNING FUNCTION ON AIRCRAFT
	Applicable to: ALL			
	22-1553 00		12 APR 17	AUTO FLIGHT - FLIGHT AUGMENTATION COMPUTER (FAC) - INTRODUCE FAC B624 (ROPS AND SHARKLET)
	Applicable to: ALL			
	23-1638 00		19 JUN 17	COMMUNICATIONS - ANTI HIJACK CAMERA MONITORING - INSTALL UNITS FOR A COCKPIT DOOR SURVEILLANCE SYSTEM (CDSS)
	Applicable to: ALL			
	25-1444 02		07 APR 11	EQUIPMENT/FURNISHINGS - CURTAINS AND PARTITIONS - INTRODUCE PPTC FOR COCKPIT DOOR STRIKE PROTECTION
	Applicable to: ALL			
	27-1230 01		31 JUL 14	FLIGHT CONTROLS - SPOILER AND ELEVATOR COMPUTER (SEC) - INSTALL SEC 123 HARDWARE B
	Applicable to: ALL			
	27-1238 00		06 JUL 16	FLIGHT CONTROLS - ELAC - INSTALL L97 STANDARD ON ELAC B WITHOUT DATALOADING CAPABILITY
	Applicable to: ALL			

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M(1)	MODIFICATION	Linked SB	Incorp. Date	Title
	27-1244 00		24 JAN 17	FLIGHT CONTROLS - ELEVATOR AILERON COMPUTER SYSTEM (ELAC) - INSTALL ELAC B L97+ WITHOUT DATALOADING
	Applicable to: ALL			
	31-1286 01		31 JUL 14	INDICATING/RECORDING SYSTEMS - DMC - INTRODUCE DMC EIS1 V60 STANDARD.
	Applicable to: ALL			
	31-1373 00		31 JUL 14	INDICATING/RECORDING SYSTEMS - FLIGHT WARNING COMPUTER (FWC) - INSTALL FWC STANDARD H2-F6
	Applicable to: ALL			
	33-1057 03		07 APR 11	LIGHTS - INSTRUMENT AND PANEL INTEGRAL LIGHTING - ENSURE EMERGENCY LIGHTING FOR STAND-BY INSTRUMENTS.
	Applicable to: ALL			
	34-1538 31		05 SEP 17	NAVIGATION - TCAS - INSTALL ROCKWELL COLLINS TCAS CHANGE 7.1 (-332)
	Applicable to: ALL			
	35-1077 01		09 SEP 15	OXYGEN - PASSENGER OXYGEN - REPLACE PASSENGER CHEMICAL OXYGEN CONTAINERS OF 15 MINUTES DURATION BY 22 MINUTES DURATION
	Applicable to: ALL			

(1) Evolution code : N=New, R=Revised, E=Effectivity

GENERAL INFORMATION

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AIRCRAFT CONFIGURATION SUMMARY

Applicable to: ALL

Ident.: GEN-ACS-00016449.0001001 / 26 JUN 15

For awareness and for the specified aircraft, the following table provides the flight crew with a list of optional aircraft systems and functions related to flight and aircraft operations.

Ident.: GEN-ACS-00018963.0001001 / 04 MAR 16

Item	System	Installed
Ident.: GEN-ACS-00015613.0001001 / 23 JUN 15		
ADS-B OUT	SURV	No
Ident.: GEN-ACS-00016448.0001001 / 23 JUN 15		
AP Automatic Disconnection at Minima	AUTO FLT	No
Ident.: GEN-ACS-00015927.0001001 / 26 JUN 15		
AP /FD TCAS	AUTO FLT	No
Ident.: GEN-ACS-00015892.0002001 / 19 FEB 16		
Automatic FD Bar Engagement	AUTO FLT	Yes
Ident.: GEN-ACS-00016009.0001001 / 23 JUN 15		
Backup Navigation Function of the MCDU	AUTO FLT	No
Ident.: GEN-ACS-00016014.0001001 / 23 JUN 15		
BUSS	NAV	No
Ident.: GEN-ACS-00016010.0001001 / 23 JUN 15		
CPDLC	DATALINK	No
Ident.: GEN-ACS-00015917.0001001 / 23 JUN 15		
Derated Takeoff	ENG	No
Ident.: GEN-ACS-00019728.0002001 / 06 JUN 16		
Descent Profile Optimization (DPO)	AUTO FLT	No
Ident.: GEN-ACS-00015912.0001001 / 23 JUN 15		
FLS Function in the FMS	AUTO FLT	No
Ident.: GEN-ACS-00015913.0005001 / 23 JUN 15		
FMS 2 Release 1A	AUTO FLT	Yes
Ident.: GEN-ACS-00015899.0001001 / 23 JUN 15		
GLS	AUTO FLT	No

Ident.: GEN-ACS-00015924.0002001 / 23 JUN 15

GPS	NAV	Yes

Ident.: GEN-ACS-00016553.0002001 / 23 JUN 15

GPS PRIMARY Function	NAV	Yes

Ident.: GEN-ACS-00015926.0002001 / 23 JUN 15

Metric Altitude Indications on the PFD	EIS	Yes

Ident.: GEN-ACS-00015900.0001001 / 23 JUN 15

MLS	AUTO FLT	No

Ident.: GEN-ACS-00015923.0001001 / 19 FEB 16

NAV Mode automatically Engaged (Armed) in Go-Around	AUTO FLT	No

Ident.: GEN-ACS-00016013.0002001 / 23 JUN 15

PWS	SURV	Yes

Ident.: GEN-ACS-00015920.0001001 / 23 JUN 15

QFE BARO Setting	NAV	No

Ident.: GEN-ACS-00019573.0001001 / 10 MAY 16

RAAS	SURV	No

Ident.: GEN-ACS-00015897.0001001 / 23 JUN 15

RNP AR	AUTO FLT	No

Ident.: GEN-ACS-00016008.0001001 / 23 JUN 15

ROW / ROPS	SURV	No

Ident.: GEN-ACS-00016015.0001001 / 22 MAR 17

Soft Go-Around	ENG	No

IF INSTALLED TABLE

Applicable to: ALL

Ident.: GEN-IFIT-00016590.0001001 / 23 JUN 15

The "If Installed Table" provides a list of optional systems and functions of the aircraft.
For most of the optional systems or functions associated with the "if installed" ⊲✳ symbol in the FCOM, the table indicates if the optional systems or functions are installed, or not installed.

<u>Note:</u> *Highly customized options such as cabin installations are not covered in the following table.*

Ident.: GEN-IFIT-00018965.0001001 / 22 MAR 16

Item	System	Installed

Ident.: GEN-IFIT-00015896.0002001 / 17 MAR 17
L13

4th Occupant Folding Seat 4th Occupant Fourth Occupant	EQUIPMENT	Yes

Ident.: GEN-IFIT-00016012.0002001 / 21 MAR 16
L13

4th Oxygen Mask Four	OXY	Yes

Ident.: GEN-IFIT-00018779.0002001 / 21 MAR 16

AC ESS FEED Auto Switching	ELEC	Yes

Ident.: GEN-IFIT-00016516.0001001 / 21 MAR 17
L13

ACT 1 ACT 2 ACTs ACT 1 ACT 2 ACT 1 OR 2 ACT PUMP ACT PUMP LO PR ACT XFR FAULT ACT1 ACT2 ACTs Additional center tank	FUEL	No

Ident.: GEN-IFIT-00020299.0001001 / 13 SEP 16
L13

1 ADF ADF 1 ADF 1	NAV	Yes

Ident.: GEN-IFIT-00020300.0001001 / 13 SEP 16
L13

2 ADFs 2 ADF ADF1 ADF 1 ADF 2 ADF 2 ADF s	NAV	No

Ident.: GEN-IFIT-00016641.0001001 / 23 JUN 15

ADS-B OUT	SURV	No

Ident.: GEN-IFIT-00015891.0001001 / 21 MAR 16

L13

AFT Cargo Heating AFT CRG HOT AIR temperature selector HOT AIR pb AFT CRG HEAT AFT CARGO HEAT AFT CARGO DUCT OVHT AFT Cargo heat controller Cargo Heat Cargo Temperature Regulation CRG HEAT Forward (aft) cargo heat controller HOT AIR	COND	No

Ident.: GEN-IFIT-00015901.0002001 / 21 MAR 16

L13

AFT Cargo Smoke Detector SMOKE AFT CARGO SMOKE SMOKE AFT CRG DET FAULT AFT CRG DET AFT CARGO SMOKE AFT CRG DET FAULT	FIRE	Yes

Ident.: GEN-IFIT-00015931.0002001 / 21 MAR 16

L13

AFT Cargo Ventilation Cargo Ventilation AFT ISOL VALVE AFT CRG VENT AFT CRG VENT FAULT AFT Cargo isol valves FWD (AFT) CARGO DUCT OVHT FWD (AFT) CRG HEAT FWD (AFT) CRG HEAT FAULT FWD (AFT) CRG ISOL VALVE FWD (AFT) CRG VENT FAULT FWD (AFT) CRG VENT Forward (aft) cargo isolation valves isolation valves	VENT	Yes

Ident.: GEN-IFIT-00016522.0001001 / 23 JUN 15

Aileron Anti Droop	F/CTL	No

Ident.: GEN-IFIT-00015919.0001001 / 21 MAR 16

L13

Air Conditioning System Controller (ACSC) ACSC ACSC 1 ACSC 2 Air Conditioning System Controllers	COND	No

Ident.: GEN-IFIT-00016523.0001001 / 23 JUN 15

AP / FD TCAS	AUTO FLT	No

Ident.: GEN-IFIT-00016640.0001001 / 21 MAR 16

L13

ATSAW ADS-B IN	SURV	No

Ident.: GEN-IFIT-00016524.0002001 / 23 JUN 15

Automatic FD Bar Engagement	AUTO FLT	Yes

Ident.: GEN-IFIT-00018780.0001001 / 21 MAR 16

L13

Avail Indication During Engine Start AVAIL Indication	ENG	No

Ident.: GEN-IFIT-00016681.0001001 / 21 MAR 16

L13

Backup Navigation Function of the MCDU BACK UP NAV	AUTO FLT	No

Ident.: GEN-IFIT-00016525.0002001 / 21 MAR 16

L13

BARO /RADIO Instead of MDA / MDH / DH BARO BARO /RADIO	NAV	Yes

Ident.: GEN-IFIT-00016526.0001001 / 21 MAR 16

L13

Brake Fans Brake cooling fans BRK FAN Brake Fan Brake fans 1, 2, 3 and 4 Brake fans 5, 6, 7 and 8	BRAKE	No

Ident.: GEN-IFIT-00015875.0001001 / 21 MAR 16
L13

Bulk Cargo Door Bulk Cargo Compartment Door Bulk Door	DOORS	No

Ident.: GEN-IFIT-00018781.0001001 / 21 MAR 16
L13

BUSS Backup Speed/Altitude Scale Backup Speed Scale	NAV	No

Ident.: GEN-IFIT-00021488.0002001 / 17 MAR 17
L13

Cargo ventilation system Cargo isolation valves Extraction fan	VENT	Yes

Ident.: GEN-IFIT-00016535.0001001 / 22 MAR 17
L13

Center Fuel Tank Transfer Valves Center Tank Transfer Valves L CTR TK XFR valve CTR TK XFR valve R	FUEL	No

Ident.: GEN-IFIT-00021220.0001001 / 22 MAR 17
L13

Center Fuel Tank Pumps CTR TK PUMP 1 CTR TK PUMP 2	FUEL	Yes

Ident.: GEN-IFIT-00015930.0002001 / 21 MAR 16
L13

Chemical Oxygen System 22 min Chemical Oxygen System 22 min	OXY	Yes

Ident.: GEN-IFIT-00016625.0001001 / 17 MAR 17
L13

CIDS-SDF CIDS 1 SMOKE DETECT Smoke Detection Function (SDF)	SMOKE	No

Ident.: GEN-IFIT-00015929.0001001 / 17 MAR 17
L13

Cockpit Door Deadbolt Deadbolt	EQUIPMENT	No

Ident.: GEN-IFIT-00018782.0002001 / 21 MAR 16

Cockpit Door Escape Panel	DOOR	Yes

Ident.: GEN-IFIT-00016690.0001001 / 21 MAR 16
L13

Cockpit Fixed Second Oxygen Bottle Two	OXY	No

Ident.: GEN-IFIT-00016612.0001001 / 23 JUN 15

Cockpit Foot Heater	COND	No

Ident.: GEN-IFIT-00016639.0001001 / 17 MAR 17
L13

Cockpit Foot Warmer Foot Warmer System Foot Warmer ON/OFF Control Switch	EQUIPMENT	No

Ident.: GEN-IFIT-00021875.0001001 / 25 JUL 17
L13

Cockpit Power Outlet Power Outlet	EQUIPMENT	No

Ident.: GEN-IFIT-00016614.0002001 / 21 MAR 16
L13

COMMERCIAL pb COMMERCIAL	ELEC	Yes

Ident.: GEN-IFIT-00016615.0001001 / 23 JUN 15

CVR Datalink Function	COM	No

Ident.: GEN-IFIT-00016626.0001001 / 23 JUN 15

CVR ERASE pb	COM	No

Ident.: GEN-IFIT-00016647.0001001 / 21 MAR 17
L13

DC BUS Entertainment TR Entertainment DC BUS Ent DC BUS Entertainment TR Ent TR Ent.	ELEC	No

Ident.: GEN-IFIT-00016527.0002001 / 21 MAR 16
L13

DDRMI Digital Distance and Radio Magnetic Indicator	NAV	Yes

Ident.: GEN-IFIT-00016528.0001001 / 21 MAR 16

L13

Derated Takeoff DERATE	ENG	No

Ident.: GEN-IFIT-00019730.0002001 / 06 JUN 16

L13

Descent Profile Optimization DPO	AUTO FLT	No

Ident.: GEN-IFIT-00016580.0001001 / 21 MAR 16

L13

Display of Delta ISA Delta ISA	EIS	No

Ident.: GEN-IFIT-00016529.0001001 / 23 JUN 15

Dual Ice Detection System	ICE	No

Ident.: GEN-IFIT-00016574.0002001 / 23 JUN 15

Dual Navigation Lights	LIGHTS	Yes

Ident.: GEN-IFIT-00016628.0002001 / 17 MAR 17

L13

EGPWS	SURV	Yes

Ident.: GEN-IFIT-00016530.0001001 / 23 JUN 15

Electrical Alternate Braking	L/G	No

Ident.: GEN-IFIT-00016575.0002001 / 23 JUN 15

ELT sw	COM	Yes

Ident.: GEN-IFIT-00020758.0002001 / 18 MAY 17

L13

EVAC Panel COMMAND PB (guarded) COMMAND PB Evacuation (EVAC) signalling EVAC HORN HORN SHUT OFF PB CAPT and PURS/CAPT SW	COM	Yes

Ident.: GEN-IFIT-00021713.0002001 / 03 AUG 17

Expedite	AUTO FLT	No

Ident.: GEN-IFIT-00015918.0001001 / 23 JUN 15

Extended FLEX Takeoff	ENG	No

Ident.: GEN-IFIT-00016531.0002001 / 21 MAR 16

L13

External Ice Detector Light ICE IND	ICE	Yes

Ident.: GEN-IFIT-00021527.0001001 / 17 MAR 17

FANS A+ DCDU ATC MSG pb	FANS	No

Ident.: GEN-IFIT-00021529.0001001 / 17 MAR 17

FANS B DCDU ATC MSG pb	FANS	No

Ident.: GEN-IFIT-00021530.0001001 / 17 MAR 17

FANS B+ DCDU ATC MSG pb	FANS	No

Ident.: GEN-IFIT-00015909.0001001 / 21 MAR 16

L13

Fan Speed Controller (FSC) Two Operating Speeds	VENT	No

Ident.: GEN-IFIT-00016629.0003001 / 21 MAR 16

L13

Fire Extinguishing in the AFT Cargo SMOKE FWD (AFT) CRG BTL 1(2) FAULT Forward (aft) cargo fire extinguishing	FIRE	Yes

Ident.: GEN-IFIT-00016630.0005001 / 21 MAR 16

L13

Fire Extinguishing in the FWD Cargo SMOKE FWD (AFT) CRG BTL 1(2) FAULT Forward (aft) cargo fire extinguishing	FIRE	Yes

Ident.: GEN-IFIT-00016578.0001001 / 23 JUN 15

Fixed Cabin Gaseous Oxygen System	OXY	No

Ident.: GEN-IFIT-00015898.0001001 / 21 MAR 17

L13

FLS F-G/S F-G/S BASED ON ISA F-G/S-F-LOC F-G/S-LOC F-LOC F-LOC*/F-LOC FLS 1 FLS 2 FLS function NO FLS FOR THIS APPR	AUTO FLT	No

Ident.: GEN-IFIT-00016579.0002001 / 23 JUN 15

FMS Crossload	AUTO FLT	Yes

Ident.: GEN-IFIT-00016589.0004001 / 23 JUN 15

HONEYWELL FMS 2 Release 1A H2	AUTO FLT	Yes

Ident.: GEN-IFIT-00015617.0001001 / 23 JUN 15

FTIS	FUEL	No

Ident.: GEN-IFIT-00016532.0001001 / 23 JUN 15

Fuel Leak Detection	FUEL	No

Ident.: GEN-IFIT-00016533.0001001 / 23 JUN 15

Fuel Tank Overflow Alert	FUEL	No

Ident.: GEN-IFIT-00015893.0001001 / 21 MAR 16

L13

FWD Cargo Heating Temperature Selector FWD (AFT) CARGO DUCT OVHT FWD (AFT) CRG HEAT FWD (AFT) CRG HEAT FAULT FWD CRG HEAT Cargo Heat Cargo Temperature Regulation CRG HEAT Forward (aft) cargo heat controller HOT AIR Fwd cargo heat controller	COND	No

Ident.: GEN-IFIT-00015925.0002001 / 21 MAR 16
L13

FWD Cargo Smoke Detector SMOKE FWD CARGO SMOKE FWD CARGO SMOKE SMOKE FWD CRG DET FAULT FWD CRG DET	FIRE	Yes

Ident.: GEN-IFIT-00015932.0001001 / 21 MAR 16
L13

FWD Cargo Ventilation FWD Cargo Outlet Isolation Valve Cargo Ventilation FWD ISOL Valve FWD CRG VENT FWD CARGO ISOL VALVE Forward (aft) cargo isolation valves isolation valves Fwd cargo isol valves	VENT	No

Ident.: GEN-IFIT-00016617.0001001 / 21 MAR 16
L13

Galley Bus Automatic Shedding Galley Load Automatic Shedding	ELEC	No

Ident.: GEN-IFIT-00016618.0002001 / 21 MAR 16
L13

GAPCU Ground and Auxiliary Power Control Unit	ELEC	Yes

Ident.: GEN-IFIT-00019705.0001001 / 13 MAY 16
L13

Gaseous Oxygen Generators in lavatories Gaseous Generators	OXY	No

Ident.: GEN-IFIT-00016534.0001001 / 21 MAR 16
L13

GLS GLS Autoland GLS1 GLS2	AUTO FLT	No

Ident.: GEN-IFIT-00016649.0002001 / 21 MAR 16
L13

GPS FM / GPS POS DISAGREE GPS 1(2) FAULT GPS 1 GPS 2 GPS 1+2	NAV	Yes

Ident.: GEN-IFIT-00016650.0002001 / 21 MAR 16
L13

GPS PRIMARY Function GPS PRIMARY	NAV	Yes

Ident.: GEN-IFIT-00020297.0001001 / 17 MAR 17

GSM Onboard	COM	No

Ident.: GEN-IFIT-00015911.0001001 / 21 MAR 17
L13

HF Datalink HF 1(2) DATA FAULT HF DATA LINK	COM	No

Ident.: GEN-IFIT-00020132.0002001 / 22 MAR 17
L13

HF System HF HF 1 HF 2	COM	Yes

Ident.: GEN-IFIT-00016644.0002001 / 21 MAR 16
L13

HI ALT pb Operation on High Altitude Airfields HI ALT LANDING pb-sw HI ALT LANDING pb-sw	OXY	Yes

Ident.: GEN-IFIT-00018783.0001001 / 21 MAR 16

HUD	SURV	No

Ident.: GEN-IFIT-00016651.0001001 / 23 JUN 15

IRS Alignment Based on GPS Position	NAV	No

Ident.: GEN-IFIT-00015618.0001001 / 23 JUN 15

ISIS	NAV	No

Ident.: GEN-IFIT-00020693.0001001 / 17 MAR 17
L13

ITP ATSA ITP ITP TRAFFIC LIST page IN TRAIL PROCEDURE IN TRAIL PROCEDURE page	SURV	No

Ident.: GEN-IFIT-00016594.0002001 / 23 JUN 15

LAF	F/CTL	No

Ident.: GEN-IFIT-00016596.0001001 / 21 MAR 16
L13

LAT DEV SCALE pb L/DEV deviation scale	NAV	No

Ident.: GEN-IFIT-00016600.0001001 / 23 JUN 15

LOC B/C	AUTO FLT	No

Ident.: GEN-IFIT-00016602.0002001 / 21 MAR 16
L13

Logo Light LOGO Logo Lights	LIGHTS	Yes

Ident.: GEN-IFIT-00020306.0002001 / 17 MAR 17

Man-made Obstacle Function	SURV	No

Ident.: GEN-IFIT-00016604.0002001 / 23 JUN 15

Manual Flush Control	WATER	Yes

Ident.: GEN-IFIT-00016605.0002001 / 21 MAR 16

Manual Shutoff Valves	WATER	Yes

Ident.: GEN-IFIT-00016688.0002001 / 23 JUN 15

Metric Altitude Indications on the PFD	EIS	Yes

Ident.: GEN-IFIT-00016536.0001001 / 21 MAR 16
L13

MLS MLS1 MLS2	AUTO FLT	No

Ident.: GEN-IFIT-00016603.0001001 / 23 JUN 15

NAV Mode automatically Engaged (Armed) in Go-Around	AUTO FLT	No

Ident.: GEN-IFIT-00016645.0002001 / 23 JUN 15

OEB Reminder	EIS	Yes

Ident.: GEN-IFIT-00021528.0001001 / 17 MAR 17

Optional Applications: DCL OCL D-ATIS	FANS	No

Ident.: GEN-IFIT-00016597.0002001 / 21 MAR 16

L13

1 Pair of Overwing Emergency Exit Overwing Escape Route FWD EMER EXIT	DOORS	Yes

Ident.: GEN-IFIT-00016538.0001001 / 21 MAR 16

L13

Parking Brake Monitoring PARK BRK FAULT	BRAKE	No

Ident.: GEN-IFIT-00021553.0002001 / 17 MAR 17

Predictive GPWS	SURV	Yes

Ident.: GEN-IFIT-00016608.0002001 / 22 MAR 16

L13

Printer Function in FMS PRINT FUNCTION PRINTER NOT AVAILABLE	AUTO FLT	Yes

Ident.: GEN-IFIT-00016609.0002001 / 21 MAR 16

Push to Level Off	AUTO FLT	Yes

Ident.: GEN-IFIT-00016648.0002001 / 17 MAR 17

L13

PWS Windshear DET WINDSHEAR DETECTION PRED W/S DET FAULT W/S AHEAD WINDSHEAR AHEAD Windshear PRED W/S DET predictive windshear system PWS SCAN	SURV	Yes

Ident.: GEN-IFIT-00016695.0001001 / 23 JUN 15

QAR	RECORDING	No

Ident.: GEN-IFIT-00016643.0001001 / 21 MAR 16
L13

QFE BARO Setting QFE OPTION	NAV	No

Ident.: GEN-IFIT-00016610.0001001 / 23 JUN 15

RAAS	SURV	No

Ident.: GEN-IFIT-00016539.0003001 / 21 MAR 16
L13

Rain Repellent System Rain Repellent RAIN RPLNT pb RAIN RPLNT	RAIN	Yes

Ident.: GEN-IFIT-00016737.0001001 / 23 JUN 15

RMP Load Function	COM	No

Ident.: GEN-IFIT-00016581.0001001 / 23 JUN 15

RNP pb	NAV	No

Ident.: GEN-IFIT-00016582.0001001 / 21 MAR 16
L13

ROW / ROPS ROW /ROP	SURV	No

Ident.: GEN-IFIT-00016583.0001001 / 23 JUN 15

RPCU	CAB PR	No

Ident.: GEN-IFIT-00016642.0001001 / 22 MAR 17
L13

SATCOM SATCOM DATA FAULT SATCOM FAULT Satellite Communications (SATCOM) SATCOM System	COM	No

Ident.: GEN-IFIT-00016646.0002001 / 17 MAR 17
L13

SDCU Smoke Detection Control Unit SDCU	SMOKE	Yes

Ident.: GEN-IFIT-00016584.0001001 / 23 JUN 15

Second Fire Extinguishing Bottle	FIRE	No

Ident.: GEN-IFIT-00018784.0001001 / 22 MAR 17
L13

Soft Go-Around SOFT GA Go-Around soft	ENG	No

Ident.: GEN-IFIT-00018785.0001001 / 21 MAR 16
L13

Steep Approach Capability STEEP APPR	NAV	No

Ident.: GEN-IFIT-00016586.0001001 / 23 JUN 15

T2CAS	SURV	No

Ident.: GEN-IFIT-00016587.0001001 / 23 JUN 15

T3CAS	SURV	No

Ident.: GEN-IFIT-00016588.0001001 / 21 MAR 17
L13

Tail Strike Pitch Limit Indicator Tailstrike Pitch Limit Indicator	EIS	No

Ident.: GEN-IFIT-00018786.0001001 / 21 MAR 16

Temperature Control Panel	COND	No

Ident.: GEN-IFIT-00016541.0001001 / 23 JUN 15

Thrust Bump	ENG	No

Ident.: GEN-IFIT-00016011.0001001 / 21 MAR 16
L13

TPIS TYRE LO PR	WHEEL	No

Ident.: GEN-IFIT-00017055.0001001 / 17 MAR 17

HZD switch ON Weather Hazard Prediction Function WX+T+H WX+T+HZD	SURV	No

Ident.: GEN-IFIT-00020783.0001001 / 20 DEC 16

Weight and Balance System (WBS)	EIS	No

Ident.: GEN-IFIT-00016543.0001001 / 21 MAR 16
L13

Wiper Intermittent Position Intermittent Sweep Function Intermittent Sweeping	RAIN	No

MAIN FCOM CHANGES

Ident.: GEN-00012867.0001001 / 03 AUG 17
Applicable to: ALL

The purpose of the Main FCOM Changes is to provide operators with general information about the most significant changes that are introduced in the current revision of the manual.
The main FCOM changes are available on the Airbus World portal, under the path: Content Library / Flight Operations / Manuals / Main FCOM - FCTM - MMEL Changes.

In addition, every revised Documentary Unit (DU) has a revision highlight (HL) that:
- Indicates the change(s) made to the DU
- Can be found in the associated "Preliminary Pages – Summary of Highlights" subchapter.

In addition to the Main FCOM Changes, the Modification Operational Impact (MOI) documents available on the Airbus World portal provide the operational impact linked to a MOD number.

FCOM PURPOSE

Ident.: GEN-00012627.0001001 / 17 MAR 17
Applicable to: ALL

FCOM PURPOSE

The Flight Crew Operating Manual (FCOM) is a support documentation for flight crew.

The purpose of the FCOM is to:
- Provide all necessary operating limitations, procedures, performance and system information the flight crew needs to safely and efficiently operate A320 family aircraft during normal, abnormal, and emergency situations
- Serve directly as Flight Crew Operating Manual, or as a basis for Operators to develop their own customized Airline Operations Manual, in accordance with applicable requirements
- Serve as a comprehensive reference guide during initial and refresher flight crew training.

Note: *This manual is not designed:*

- *To teach basic piloting skills*
- *To provide basic piloting techniques applicable to jet aircraft, or information, that are considered as basic airmanship for trained flight crews who are familiar with that type of aircraft and its general handling characteristics.*

The Flight Crew Operating Manual (FCOM) complements the Airplane Flight Manual (AFM).
If the FCOM data differs from the AFM data, the AFM remains the reference.
As a supplement to the FCOM , the FCTM may provide additional information that the flight crew should read in conjunction with the FCOM. For more information, *Refer to FCTM/GI FCTM Purpose*.

For any questions or comments related to this manual, the Operator's Flight Operations Management can contact the Airbus Flight Operations Support & Training Standards department.

FCOM CONTENTS

The FCOM has five sections:

- Aircraft Systems : This section is divided into ATA chapters for each aircraft system. This section includes a specific description of each system and its associated cockpit interfaces.
- Procedures : This section contains the following chapters:
  - Normal Procedures that include the SOP , the SRP, and the Supplementary Procedures
  - Abnormal and Emergency Procedures
  - Special Operations.
- Limitations : This section provides the aircraft and system limitations that the flight crew must know or refer to in operations.
- Operations Engineering Bulletins (OEB)
- Performance : This section includes the aircraft performance for each flight phase.

DOCUMENTARY UNITS

The FCOM is made of Documentary Units (DU). The DU is the smallest part of information with a technical content.
The DUs are listed on a separate "List of Effective Documentary Units" (LEDU). *Refer to the General section*.

Note: *1. DU s can be grouped into Group of DU (GDU)*
2. Temporary information may be provided via Temporary DU (TDU).

IDENTIFICATION STRIP

Below the title of the DU, the identification strip provides:

- The list of MSN the DU is applicable to
- For TDU , the reference to the DU impacted by the TDU.

LIST OF EFFECTIVE SECTIONS/SUBSECTIONS (LESS) - PAPER ONLY

Ident.: GEN-00013786.0001001 / 23 JUN 15
Applicable to: ALL

The List of Effective Sections/Subsections (LESS) summarizes all the sections and subsections contained in the FCOM . For each revision, a new LESS is issued when at least one DU of the section/subsection is changed.

The LESS consists of:
- The "M" field that may provide the following evolution code:
  - The "N" letter indicates a new section introduced by the revision
  - The "R" letter indicates a section in which the content has been revised
  - The "E" letter indicates an aircraft validity change within the section
  - The "M" letter indicates a section that have move within the FCOM
- The “Localization” field that allows localizing the section within the manual with the product structure
- The “Subsection title” field
- The “Rev. Date” field that indicated the date at which the section was changed.

LIST OF EFFECTIVE OPERATIONS ENGINEERING BULLETINS (LEOEB)

Ident.: GEN-00013787.0001001 / 17 MAR 17
Applicable to: ALL

Refer to OEB-GEN OEB Content and Management

LIST OF EFFECTIVE DOCUMENTARY UNITS (LEDU) - PAPER ONLY

Ident.: GEN-00013789.0001001 / 23 MAR 11
Applicable to: ALL

For each revision, a new List of Effective Documentary Units (LEDU) is issued at the section level. The LEDU provides information about the DU localization, applicability, identification and issue date.

The LEDU consists of:
- The "M" field that may provide the following Evolution Code:
  - The "N" letter indicates a new DU introduced by the revision
  - The "R" letter indicates a revised DU: The content of the DU is updated by the revision. A vertical line in the margin of the DU locates the modified part
  - The "E" letter indicates an aircraft validity change for the DU: The list of MSNs for which the DU is effective has been changed compared to the previous LEDU, by addition or deletion of one or several MSN
- The “Localization” field that allows localizing the DU in the manual with the product structure of the manual
- The "T" field (Temporary Information) that contains a cross if the associated DU is a TDU
- The "DU title" that provides the title of the DU
- The “DU identification” that identifies the DU with its own unique identification number or the GDU with its own unique code.
- The “DU date” that indicates when the DU has been released

- The DU criteria which lists the technical or operational criteria for which the DU and solution is applicable to.
- The “Applicable to” which provides the list of aircraft this DU and solution is applicable to
- The “Impacted by TDU” which is the identification of the TDU superseding the DU

LIST OF EFFECTIVE TEMPORARY DOCUMENTARY UNITS (LETDU) - PAPER ONLY

Ident.: GEN-00013803.0001001 / 23 JUN 15
Applicable to: ALL

The List of Effective Temporary Documentary Units (LETDU) provides a summary of the Temporary DU impacting the section.

The LETDU consists of:
- The "M" field that may provide the following Evolution Code:
  - The "N" letter indicates a new TDU introduced by the revision
  - The "R" letter indicates a revised TDU: The content of the TDU is updated by the revision. A vertical line in the margin of the TDU locates the modified part
  - The "E" letter indicates an aircraft validity change for the TDU: The list of MSNs the TDU is applicable to has been changed compared to the previous LETDU, by addition or deletion of one or several MSN
- The “Localization” field that allows localizing the TDU in the manual with the product structure of the manual
- The “TDU Title” that provides the title of the TDU
- The “TDU identification” that identifies the TDU with its identification number with its own unique code
- The “TDU date” that indicates when the TDU has been released
- The TDU criteria which lists the technical or operational criteria, the it is applicable to
- The “Applicable to” which provides the list of aircraft this TDU is applicable to
- The “Impacted DU” which is the Identification of DU superseded by the TDU
- The “Reason for issue” of the TDU

Note: *1. TDU is displayed on a yellow background*
2. within the QRH the TDU replaces the impacted DU

AIRCRAFT ALLOCATION TABLE (AAT) - PAPER ONLY

Ident.: GEN-00013804.0001001 / 23 JUN 15
Applicable to: ALL

The Aircraft Allocation Table (AAT) provides a view of the fleet covered in the FCOM . For each aircraft, the AAT provides its MSN, its registration number and the model.

LIST OF MODIFICATIONS (LOM) - PAPER ONLY

Ident.: GEN-00013805.0001001 / 23 JUN 15
Applicable to: ALL

The List of Modifications (LOM) lists the criteria (Modification Proposal (MP) or Service Bulletins (SB)) which the installation on the aircraft affects the FCOM.

Note: *Each MP has one or more associated MODs. The MP/MOD correlation is available in AirN@v / Engineering.*

The LOM also indicates:
- The title of the criteria
- The date of incorporation of the criteria in the FCOM
- The list of aircraft that have the criteria
- The "M" field that may indicate the following evolution code
  - The "E" letter indicates an aircraft validity change of the criteria. The list of aircraft to which the criteria applies has changed compared to the previous FCOM revision, by addition or deletion of one or several aircraft.
  - The "N" letter indicates new criteria added by this FCOM revision
  - The "R" letter indicates a change in the criteria title or associated SB

FCOM USE AND ORGANIZATION

Ident.: GEN-00012688.0001001 / 21 MAR 16
Applicable to: ALL

DEFINITIONS OF WARNINGS, CAUTIONS AND NOTES

The following are the official definitions of warnings, cautions and notes taken directly from the JAR25/CS-25 and applicable to Airbus flight operation documentation:

WARNING	An operating procedure, technique, etc. that may result in personal injury or loss of life if not followed.
CAUTION	An operating procedure, technique, etc. that may result in damage to equipment if not followed.
NOTE	An operating procedure, technique, etc. considered essential to emphasize. Information contained in notes may also be safety related.

INFORMATION TYPE AND LAYERS

The FCOM has technical information that may be used for:
- Flight crew operations in flight, or on ground
- Airlines operations on ground
- Training.

To take the above-noted objectives into account, the FCOM is organized in three layers as follows:
- Layer 1: "Need to know"
  Layer 1 presents information that is necessary in the cockpit.
- Layer 2: "Nice to know"
  Layer 2 presents information that is used as a reference, in order to fully understand the logic of the aircraft and pilot interfaces.
- Layer 3: Detailed information
  Layer 3 provides more detailed explanations, that are not necessarily needed in flight.

Note: For paper only, the following examples show the visual characteristics of each kind of layer

	EXAMPLE	- Text in layer 1 Layer 1 is the default layer. No symbology when not following layer 2 or layer 3 information.
L2	**EXAMPLE**	- Text in layer 2
L3	**EXAMPLE**	- Text in layer 3
L1	**EXAMPLE**	- Text in layer 1 (as this text follows a text in layer 2 or 3, symbology "L1")

OPTIONAL EQUIPMENT

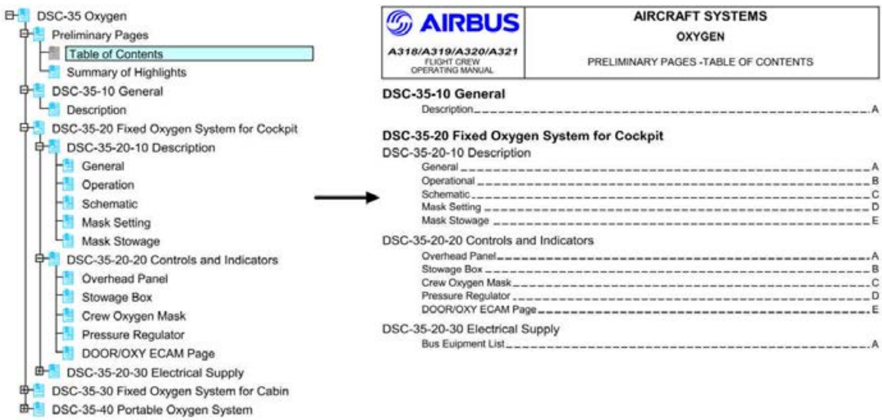
The legend ⧏ (if installed) indicates that a paragraph or an illustration is applicable only if the related optional equipment is installed.

FCOM FORMAT AND STYLE INFORMATION - PAPER ONLY

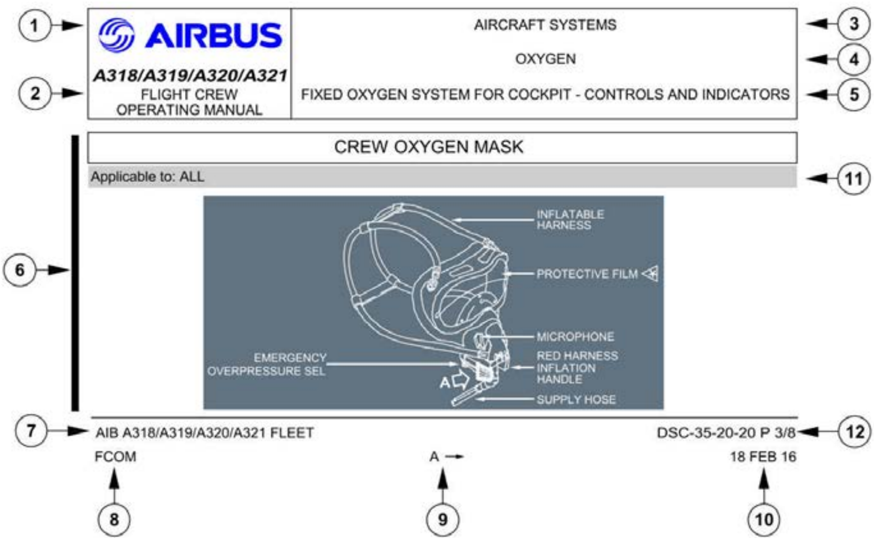
Ident.: GEN-00013793.0001001 / 21 MAR 16
Applicable to: ALL

TABLE OF CONTENTS

Each TOC entry has an alphabetical index that identifies this TOC entry within its subsection. The manual user can easily find a TOC entry content within the manual thanks to this alphabetical index and the subsection identification. Both are indicated in the TOC and both cross-refer to the paper page footer (see the TOC indexing part below).



HEADER AND FOOTER



1. Airline logo
2. Aircraft types and manual
3. Level 2 chapter (PSL level 2 : GEN, DSC, PRO, LIM, OEB, PER)
4. Level 3 chapter
5. Level 4 chapter
6. Revision mark
7. Key product (document identification and aircraft designation)
8. Key product (manual code)
9. Page index
10. Last evolution date
11. Identification strip (list of impacted aircraft)
12. PSL path

REVISION MARK

In the paper format, a vertical bar in the margin of the DU identifies the modified part. Each vertical bar has a numerical index that refers to the associated reason of the change in the Summary of Highlight.
This Summary of Highlight lists all the changes and associated reasons of the change (if necessary) that the revision has introduced.

TOC INDEXING

In the paper page footer, the TOC indexing is of the following type:

A	:	The paper page contains the whole "A" TOC entry content
A to B	:	The paper page contains the whole "A" and "B" TOC entries contents
A →	:	The "A" TOC entry content starts on this paper page and continues on the following paper page
← A	:	The "A" TOC entry content starts on a previous paper page and finishes on this paper page
← A →	:	The "A" TOC entry content starts on a previous paper page and continues on the following paper page
A to C→	:	The paper page contains the whole "A" and "B" TOC entries contents but the "C" TOC entry content starts on this paper page and continues on the following paper page

← A to C	:	The paper page contains the whole "B" and "C" TOC entries contents but the "A" TOC entry content starts on a previous paper page and finishes on this paper page
← A to C →	:	The paper page contains the whole "B" TOC entry content but the "A" TOC entry content starts on a previous paper page and finishes on this paper page and the "C" TOC entry content starts on this paper page and continues on the following paper page

Note: 1. *The indexes follow the alphabetical order: A, B, C, ..., Z, AA, AB, AC, ..., AZ, BA, BB, BC, ...*
2. *For each subsection, the index starts again from A.*
3. *When a TOC entry content continues on the following paper page, the text "Continued on the following page" is also indicated.*

FCOM REVISIONS

Ident.: GEN-00012634.0001001 / 24 OCT 14
Applicable to: ALL

FCOM REVISION

FCOM revisions are issued to add, update, or revise information. The Operator determines the revision periodicity.
When necessary, a revision may be issued in between the defined periodicity (e.g. need for urgent update).
A vertical bar appears to the left of all revised parts of the manual.

TEMPORARY INFORMATION

Some FCOM sections may need a temporary update (e.g. to explain a system behavior that will be modified by a future standard). In such cases, the applicable FCOM section is updated with a Temporary Documentary Unit (TDU).
Information contained in the TDU is highlighted in the manual and the initial content of the FCOM remains available for consultation and comparison and is highlighted (identification strip) as being impacted by the TDU.
A List of Effective Documentary Units (LEDU) is provided in the FCOM

OPERATIONS ENGINEERING BULLETINS

Operations Engineering Bulletins (OEB) are issued, when it is necessary, to rapidly transmit technical and procedural information.
The OEB chapter provides a list of all applicable OEBs.

ABBREVIATIONS

Ident.: GEN-00012598.0001001 / 05 SEP 17
Applicable to: ALL

A

Abbreviation	Term
A>B	A is greater than B
A≥B	A is greater than or equal to B
A<B	A is less than B
A≤B	A is less than or equal to B
A/BRK	Autobrake
A/C	Aircraft
A/P	Autopilot
AP	Autopilot
A/S	Airspeed
A/SKID	Anti-skid
A/THR	Auto Thrust
AA	Airworthiness Authorities
AAL	Above Aerodrome Level
AAT	Aircraft Allocation Table
AB	Abort
ABCU	Alternate Braking Control Unit
ABN	Abnormal
ABV	Above
AC	Alternating Current
ACARS	ARINC Communication Addressing and Reporting System
ACAS	Airbrone Collision Avoidance System
ACCEL	Acceleration
ACC	Active Clearance Control
ACCU	Accumulator
ACP	Audio Control Panel
ACS	Aircraft Configuration Summary
ACSC	Air Conditioning System Controller
ACT	Additional Center Tank
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADIRS	Air Data Inertial Reference System
ADIRU	Air Data Inertial Reference Unit
ADM	Air Data Module
ADR	Air Data Reference
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract

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Continued from the previous page

Abbreviation	Term
ADV	Advisory
AEVC	Avionic Equipment Ventilation Controller
AFM	Airplane Flight Manual
AFS	Auto Flight System
AGL	Above Ground Level
AIDS	Aircraft Integrated Data System
AIL	Aileron
AIME	Autonomous Integrity Monitoring Extrapolation
AIP	Attendant Indication Panel
AIU	Audio Interface Unit
ALT	Altitude
ALTN	Alternate
AMC	Acceptable Means of Compliance
AMI	Airline Modifiable Information
AMU	Audio Management Unit
ANT	Antenna
AOA	Angle of Attack
AOC	Airline Operational Control
APP	Approach
APPR	Approach
APPU	Assymetry Position Pick-off Unit
APU	Auxiliary Power Unit
AR	Authorization Required
ARINC	Aeronautical Radio Incorporated
ARN	Aircraft Registration Number
ARP	Aerospace Recommended Practice
ARPT	Airport
ASAP	As Soon As Possible
ASD	Accelerate Stop Distance
ASI	Air Speed Indicator
ASP	Audio Selector Panel
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATE	Automatic Test Equipment
ATIS	Automatic Terminal Information System
ATS	Auto Thrust System
ATSAW	Airborne Traffic Situational Awareness
ATSU	Air Traffic Service Unit
ATT	Attitude

Continued on the following page

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Abbreviation	Term
AUTO	Automatic
AVNCS	Avionics
AWY	Airway

B

Abbreviation	Term
B/C	Back Course
BARO	Barometric
BAT	Battery
BCL	Battery Charge Limiter
BCDS	Bite Centralized Data System
BCU	Backup Control Unit
BDDV	Brake Dual Distribution Valve
BITE	Built-In Test Equipment
BIU	BITE Interface Unit
BFE	Buyer Furnished Equipment
BFO	Beat Frequency Oscillator
BMC	Bleed Monitoring Computer
BNR	Binary
BRG	Bearing
BRK	Brake
BRT	Bright
BSCU	Braking Steering Control Unit
BTC	Bus Tie Contactor
BTL	Bottle
BTS	Bleed Temperature Sensor
BUS	Busbar
BUSS	Back Up Speed Scale

C

Abbreviation	Term
C/B	Circuit Breaker
CB	Circuit Breaker
C/L	Checklist
CL	Checklist
CAB	Cabin
CAPT	Captain, Capture
CAS	Calibrated Airspeed
CAT	Category
CBMS	Circuit Breaker Monitoring System

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Continued from the previous page

Abbreviation	Term
CCD	Cursor Control Device
CDL	Configuration Deviation List
CDLS	Cockpit Door Locking System
CDSS	Cockpit Door Surveillance System
CDU	Control Display Unit
CF	Cost of Fuel
CFDIU	Centralized Fault Display Interface Unit
CFDS	Centralized Fault Display System
CFP	Computerized Flight Plan
CG	Center of Gravity
CHAN	Channel
CHG	Change
CHK	Check
CI	Cost Index
CIDS	Cabin Intercommunication Data System
CIDS-SDF	Cabin Intercommunication Data System - Smoke Detection Function
CKPT	Cockpit
CIS	Commonwealth of Independent States
CLB	Climb
CLR	Clear
CLSD	Closed
CM1(2)	Crewmember 1 (left seat) or 2 (right seat)
CM1	Crewmember 1 (left seat)
CM2	Crewmember 2 (right seat)
CMPTR	Computer
CMS	Constant Mach Segment
CMS	Centralized Maintenance System
CNSU	Cabin Network Server Unit
CO	Company
CO RTE	Company Route
COND	Conditioning
CONF	Configuration
CONT	Continuous
CPC	Cabin Pressure Controller
CPCU	Cabin Pressure Controller Unit
CPDLC	Controller-Pilot Data Link Communication
CRC	Continuous Repetitive Chime
CRG	Cargo
CRS	Course
CRT	Cathode Ray Tube

Continued on the following page

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Abbreviation	Term
CRZ	Cruise
CSAS	Conditioned Service Air System
CSCU	Cargo Smoke Control Unit
CSD	Constant Speed Drive
CSM/G	Constant Speed Motor/Generator
CSTR	Constraint
CT	Cost of Time
CTL	Control
CTL PNL	Control Panel
CTR	Center
CVR	Cockpit Voice Recorder

D

Abbreviation	Term
DA	Drift Angle
DAC	Digital to Analog Converter
DAC	Double Annular Combustor
DAR	Digital AIDS Recorder
DC	Direct Current
DCDU	Datalink Control and Display Unit
DCL	Digital Cabin Logbook
DDRMI	Digital Distance and Radio Magnetic Indicator
DECEL	Deceleration
DES	Descent
DEST	Destination
DET	Detection, Detector
DEV	Deviation
DFA	Delayed Flap Approach
DFDR	Digital Flight Data Recorder
DH	Decision Height
DIR	Direction
DIR TO	Direct To
DISC	Disconnect
DISCH	Discharge
DIST	Distance
DITS	Digital Information Transfer System
DIV	Diverter
DMC	Display Management Computer
DME	Distance Measuring Equipment
DMU	Data Management Unit (Aids)

Continued on the following page

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Abbreviation	Term
DN	Down
DPO	Descent Profile Optimization
DSDL	Dedicated Serial Data Link
DTG	Distance To Go
DTO	Derated Takeoff
DU	Display Unit
DU	Documentary Unit

E

Abbreviation	Term
EWD	Engine/Warning Display
ECAM	Electronic Centralized Aircraft Monitoring
ECAS	Emergency Cockpit Alerting System
ECB	Electronic Control Box (APU)
ECM	Engine Condition Monitoring
ECON	Economic
ECP	ECAM Control Panel
ECS	Environmental Control System
ECU	Engine Control Unit
EDP	Engine-Driven Pump
EEC	Electronic Engine Computer
EFB	Electronic Flight Bag
EFCS	Electronic Flight Control System
EFIS	Electronic Flight Instruments System
EFF	Electronic Flight Folder
EFOB	Estimated Fuel On Board
EGPWS	Enhanced Ground Proximity Warning System
EGT	Exhaust Gas Temperature
EIS	Electronic Instruments System
EIU	Engine Interface Unit
ELAC	Elevator Aileron Computer
ELEC	Electrics
ELT	Emergency Locator Transmitter
ELEV	Elevator
ELV	Elevation
EMER	Emergency
EMER GEN	Emergency Generator
ENG	Engine
EO	Engine-Out
EOSID	Engine-Out Standard Instrument Departure

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Abbreviation	Term
EPE	Estimated Position Error (equal to EPU)
EPR	Engine Pressure Ratio
EPU	Emergency Power Unit
EPU	Estimated Position Uncertainty (equal to EPE)
EQPT	Equipment
EROPS	Extended Range Operation
ESS	Essential
EST	Estimated
ETA	Estimated Time of Arrival
ETE	Estimated Time Enroute
ETOPS	Extended Twin Operations
ETP	Equal Time Point
EVMU	Engine Vibration Monitoring Unit
E/WD	Engine/Warning Display
EXP	Expedite
EXT PWR	External Power
EXTN	Extension

F

Abbreviation	Term
F	Fuel
FAA	Federal Aviation Administration
FAP	Forward Attendant Panel
F/C	Flight Crew
F/O	First Officer
FO	First Officer
FAC	Flight Augmentation Computer
FADEC	Full Authority Digital Engine Control System
FAF	Final Approach Fix
FANS	Future Air Navigation System
FAP	Forward Attendant Panel
FAR	Federal Aviation Regulations
FAV	Fan Air Valve
FCDC	Flight Control Data Concentrator
FCMS	Fuel Control and Monitoring System
FCOM	Flight Crew Operating Manual
FCTM	Flight Crew Techniques Manual
FCU	Flight Control Unit
FD	Flight Director
FDGJ	Fan Drive Gear System

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Abbreviation	Term
FDIMU	Flight Data Interface and Management Unit
FDIU	Flight Data Interface Unit
FDU	Fire Detection Unit
FEP	Final End Point
FF	Fuel Flow
FG	Flight Guidance
FGC	Flight Guidance Computer
F-G/S	FLS Glide Slope
FIDS	Fault Isolation and Detection System
FL	Flight Level
FLEX	Flexible
FLHV	Fuel Lower Heating Value
F-LOC	FLS Localizer
FLP	Flap
FLS	FMS Landing System
FLSCU	Fuel Level Sensing Control Unit
FLT	Flight
F/CTL	Flight Control
FLT CTL	Flight Control
FLXTO	Flexible Takeoff
FM	Flight Management
FMA	Flight Mode Annunciator
FMGC	Flight Management and Guidance Computer
FMGS	Flight Management and Guidance System
FMS	Flight Management System
FMV	Fuel Metering Valve
FNL	Final
FOB	Fuel On Board
FOHE	Fuel Oil Heat Exchanger
FOM	Figure Of Merit
FPA	Flight Path Angle
F-PLN	Flight Plan
FPD	Flight Path Director
FPPU	Feedback Position Pick-off Unit
FPV	Flight Path Vector
FQ	Fuel Quantity
FQI	Fuel Quantity Indication
FQIC	Fuel Quantity Indication Computer
FQU	Fuel Quantity Unit
FREQ	Frequency

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Abbreviation	Term
FRT	Front
FRV	Fuel Return Valve
FTIS	Fuel Tank Inerting System
FU	Fuel Used
FWC	Flight Warning Computer
FWD	Forward
FWS	Flight Warning System

G

Abbreviation	Term
G/S	Glideslope
GA	Go-Around
GAPCU	Ground and Auxiliary Power Control Unit
GBAS	Ground Based Augmentation System
GCU	Generator Control Unit
GDU	Group of Documentary Unit
GEN	Generator
GES	Ground Earth Station
GLC	Generator Line Contactor
GLS	GBAS Landing System
GLS	GNSS Landing System
GMT	Greenwich Mean Time
GND	Ground
GND TEMP	Ground Temperature
GNSS	Global Navigation Satellite System
GPCU	Ground Power Control Unit
GPIRS	Global Positioning and Inertial Reference System
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GRND	Ground
GRP	Geographic Reference Point
GRVTY	Gravity
GS	Ground Speed
GSM	Global System for Mobile Communication
GW	Gross Weight

H

Abbreviation	Term
HC	Harness Connector
HCU	Hydraulic Control Unit

Continued on the following page

Continued from the previous page

Abbreviation	Term
HDG	Heading
HDG/S	Heading Selected
HDL	Handle
HF	High Frequency
HI	High
HLD	Hold
HM	Holding Pattern with a Manual Termination
HMU	Hydrau-Mechanical Unit
HMS	Heat Management System
HP	High Pressure
HPA	Hectopascal
HPC	High Pressure Compressor
HPSOV	High Pressure Shut-off Valve
HPT	High Pressure Turbine
HPV	High Pressure Valve
HUD	Head Up Display
HUDC	Head Up Display Computer
HYD	Hydraulic

I

Abbreviation	Term
I/O	Inputs/Outputs
I/P	Input or Intercept Profile
IAF	Initial Approach Fix
IAS	Indicated Airspeed
IATA	International Air Transport Association
ICAO	International Air Transport Organization
IDENT	Identification
IDG	Integrated Drive Generator
IFE	In Flight Entertainment
IFPC	Integrated Fuel Pump and Control
IFR	Instrument Flight Rules
IGGS	Inert Gas Generation System
IGN	Ignition
INHIB	Inhibited
ILS	Instrument Landing System
IM	Inner Marker
IMC	Instrument Meteorological Conditions
IMM	Immediate
INB	Inbound

Continued on the following page

Continued from the previous page

Abbreviation	Term
INBO	Inboard
INCREM	Increment
IND	Indicator
INIT	Initialization
INOP	Inoperative
INR	Inner
INST	Instrument
INTCPT	Intercept
INV	Inverter
IP	Intermediate Pressure
IPC	Intermediate Pressure Check valve
IPPU	Instrumentation Position Pick-off Unit
IR	Inertial Reference
IRS	Inertial Reference System
ISA	International Standard Atmosphere
ISDU	Initial System Display Unit
ISIS	Integrated Standby Instrument System
ISOL	Isolation
ISPSS	In Seat Power Supply System
ITP	In-Trail Procedure

J

Abbreviation	Term
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirements

K

Abbreviation	Term

L

Abbreviation	Term
L/G	Landing Gear
LAF	Load Alleviation Function
LAT	Lateral
LAT	Latitude
LAT REV	Lateral Revision
LAV	Lavatory
LCD	Liquid Crystal Display
LCN	Load Classification Number

Continued on the following page

Continued from the previous page

Abbreviation	Term
LDA	Landing Distance Available
	Localizer Directional Aid
L DEV	Lateral Deviation
LDG	Landing
LDS	Laptop Docking Station
LED	Light Emitting Diode
LEDU	List of Effective Documentary Units
LEOEB	List of Effective Operations Engineering Bulletins
LESS	List of Effective Section/Subsections
LF	Low Frequency
LGCIU	Landing Gear Control Interface Unit
LGPIU	Landing Gear Position Indicator Unit
LH	Left-Hand
LIM	Limitation
LIS	Localizer Inertial Smoothing
LK	Lock
LL	Latitude/Longitude
LLS	Left-Line Select key
LO	Low
LOC	Localizer
LONG	Longitude
LP	Low Pressure
LPC	Low Pressure Compressor
LPT	Low Pressure Turbine
LRRA	Low Range Radio Altimeter
LRU	Line Replaceable Unit
LS	Loudspeaker
LSK	Line Select Key
LT	Light
LTS	Load and Trim Sheet
LVL	Level
LVL/CH	Level Change
LVR	Lever
LW	Landing Weight

M

Abbreviation	Term
MABH	Minimum Approach Break-off Height
MAC	Mean Aerodynamic Chord
MAG	Magnetic

Continued on the following page

Continued from the previous page

Abbreviation	Term
MAG DEC	Magnetic Declination
MAG VAR	Magnetic Variation
MAINT	Maintenance
MAN	Manual
MAP	Missed Approach Point
MAX	Maximum
MAX CLB	Maximum Climb
MAX DES	Maximum Descent
MAX END	Maximum Endurance
MC	Master Caution
MCDU	Multipurpose Control and Display Unit
MCT	Maximum Continuous Thrust
MCU	Modular Concept Unit
MDA	Minimum Descent Altitude
MDDU	Multifunction Disk Drive Unit
MDH	Minimum Descent Height
MECH	Mechanic
MEA	Minimum En Route Altitude
MED	Medium
MEL	Minimum Equipment List
MFA	Memorized Fault Annunciator
MGB	Main Gearbox
MIN	Minimum
MKR	Marker
MLA	Maneuver Load Alleviation
MLG	Main Landing Gear
MLS	Microwave Landing System
MLW	Maximum Landing Weight
MM	Middle Marker
MMEL	Master Minimum Equipment List
MMO	Maximum Operating Mach
MMR	Multi Mode Receiver
MN	Mach number
MORA	Minimum Off Route Altitude
MP	Modification Proposal
MRIU	Maintenance and Recording Interface Unit
MSA	Minimum Safe Altitude
MSG	Message
MSL	Mean Sea Level
MSU	Mode Selector Unit

Continued on the following page

Continued from the previous page

Abbreviation	Term
MTBF	Mean Time Between Failure
MTC	Modulated Turbine Cooling
MTOW	Maximum Takeoff Weight
MZFW	Maximum Zero Fuel Weight

N

Abbreviation	Term
N/A	Not Applicable
NA	Not Applicable
N1	Low Pressure Rotor Speed (in %)
N2	High Pressure Rotor Speed (in %)
NACA	National Advisory Committee for Aeronautics
NAI	Engine Nacelle Anti-Ice
NAV	Navigation
NAVAID	Navigation Aid
NCD	Non Computed Data
ND	Navigation Display
NDB	Non Directional Beacon
NLG	Nose Landing Gear
NORM	Normal
NPA	Non Precision Approach
NW	Nosewheel
NWS	Nosewheel Steering

O

Abbreviation	Term
O/P	Output
OANS	On-board Airport Navigation System
OAT	Outside Air Temperature
OBRM	On Board Replaceable Module
OEB	Operations Engineering Bulletin
OFF/R	Off Reset
OFST	Offset
OIS	Onboard Information System
OIT	Onboard Information Terminal
OLB	OPS Library Browser
OM	Outer Marker
OP	Open
OPP	Opposite
OPS	Operations

Continued on the following page

Continued from the previous page

Abbreviation	Term
OPT	Optimum
OUTB	Outbound
OUTR	Outer
OVBD	Overboard
OVHD	Overhead
OVHT	Overheat
OVRD	Override
OVSPD	Overspeed
OXY	Oxygen

P

Abbreviation	Term
P/N	Part Number
PN	Part Number
PA	Passenger Address
P-ALT	Profile Altitude
PAX	Passenger
PAR	Precision Approach Radar
PBCS	Performance-Based Communication and Surveillance
PBE	Portable Breathing Equipment
PBN	Performance Based Navigation
P-CLB	Profile Climb
PCU	Power Control Unit
P-DES	Profile Descent
PDB	Performance Data Base
PDU	Pilot Display Unit
PED	Portable Electronic Device
PERF	Performance
PES	Passenger Entertainment System
PF	Pilot Flying
PFC	Porous Friction Course
PFD	Primary Flight Display
PHC	Probes Heat Computer
P-MACH	Profile Mach
PM	Pilot Monitoring
PNL	Panel
POB	Pressure Off Brake
POS	Position
PPOS	Present Position
PPU	Position Pick-off Unit

Continued on the following page

Continued from the previous page

Abbreviation	Term
PR	Pressure
PRED	Prediction
PRESS	Pressure, Pressurization
PROC	Procedure
PROC T	Procedure Turn
PROF	Profile
PROG	Progress
PROTEC	Protection
P-SPEED	Profile Speed
PSL	Product Structure Level
PSU	Passenger Service Unit
PT	Point
PTR	Printer
PTT	Push To Talk
PTU	Power Transfer Unit (Hydraulic)
PVI	Paravisual Indicator
PWR	Power
PWS	Predictive Windshear System

Q

Abbreviation	Term
QAR	Quick Access Recorder
QFE	Field Elevation Atmosphere Pressure
QFU	Runway Heading
QNE	Sea Level Standard Atmosphere Pressure (1013 hPa)
QNH	Sea Level Atmosphere Pressure
QRH	Quick Reference Handbook
QT	Quart (US)
QTY	Quantity

R

Abbreviation	Term
R/I	Radio/Inertial
RA	Radio Altimeter, Resolution Advisory
RAAS	Runway Awareness and Advisory System
RACC	Rotor Active Clearance Control
RAD	Radio
RAIM	Receiver Autonomous Integrity Monitoring
RAT	Ram Air Turbine
RATC	Remote ATC Box

Continued on the following page

Continued from the previous page

Abbreviation	Term
RCDR	Recorder
RCL	Recall
RCP	Required Communication Performance
RCVR	Receiver
REAC	Reactive
REC	Recommended
RED	Reduction
REG	Regulation
REL	Release
REV	Reverse
RH	Right-Hand
RLD	Required Landing Distance
RLSK	Right Line Select Key
RMI	Radio Magnetic Indicator
RMP	Radio Management Panel
RNAV	Area Navigation
RNG	Range
RNP	Required Navigation Performance
ROP	Runway Overrun Protection
ROPS	Runway Overrun Prevention System
ROW	Runway Overrun Warning
RPCU	Residual Pressure Control Unit
RPM	Revolution Per Minute
RPTG	Repeating
RQRD	Required
RSP	Required Surveillance Performance
RSV	Reserves
RSVR	Reservoir
RTA	Required Time of Arrival
RTE	Route
RTL	Rudder Travel Limit
RTO	Rejected Takeoff
RTOW	Regulatory Takeoff Weight
RUD	Rudder
RVSM	Reduced Vertical Separation Minimum
RWY	Runway

S

Abbreviation	Term
S	South
S/C	Step Climb
S/D	Step Descent
S/D	Shut Down
S/F	Slats/Flaps
S/N	Serial Number
SN	Serial Number
SAAAR	Special Aircrew and Aircraft Authorization Required
SAC	Single Annular Chamber
SAT	Static Air Temperature
SATCOM	Satellite Communication
SC	Single Chime
SCP	Software Control Panel
SD	System Display
SDAC	System Data Acquisition Concentrator
SDCU	Smoke Detection Control Unit
SDF	Smoke Detection Function, Simplified Directional Facility
SEC	Spoiler Elevator Computer
SEL	Selector
SFCC	Slat/Flap Control Computer
SFE	Seller-Furnished Equipment
SID	Standard Instrument Departure
SIM	Simulation
SLT	Slat
SOP	Standard Operating Procedure
SPD	Speed
SPD LIM	Speed Limit
SPLR	Spoiler
SRS	Speed Reference System
STAR	Standard Terminal Arrival Route
STAT	Static
STAT INV	Static Inverter
STBY	Standby
STD	Standard
STEER	Steering
STRG	Steering
STS	Status
SWTG	Switching
SYNC	Synchronize
SYS	System

T

Abbreviation	Term
T.O	Takeoff
T/O	Takeoff
TO	Takeoff
T/C	Top of Climb
T/D	Top of Descent
TA	Traffic Advisory
TAC	Taxiing Aid Camera
TACAN	Tactical Air Navigation
TACT	Tactical
TAS	True Air Speed
TAT	Total Air Temperature
TAU	Time to intercept
TAWS	Terrain Awareness and Warning System
TBC	To Be Confirmed
TBD	To Be Determined
T2CAS	Traffic and Terrain Collision Avoidance System
T3CAS	Traffic and Terrain Collision Avoidance System
TCA	Turbine Cooling Air
TCAS	Traffic Alert and Collision Avoidance System
TCC	Turbine Case Cooling
TCM	Thrust Control Malfunction
TDU	Temporary Documentary Unit
TEMP	Temperature
TFTS	Terrestrial Flight Telephon System
TGT	Target
THR	Thrust
THS	Trimmable Horizontal Stabilizer
TK	Tank
TK	Track angle
TKE	Track Angle Error
TLA	Throttle Lever Angle
TLU	Travel Limitation Unit
TMR	Timer
TOC	Table of Contents
TOD	Takeoff Distance
TOGA	Takeoff - Go-Around
TOGW	Takeoff Gross Weight
TOR	Takeoff Run
TOW	Takeoff Weight

Continued on the following page

Continued from the previous page

Abbreviation	Term
T-P	Turn Point
TPIS	Tire Pressure Indicating System
TR	Transformer Rectifier
T-R	Transmitter-Receiver
TRANS	Transition
TRK	Track
TROPO	Tropopause
TRU	Transformer Rectifier Unit
TRV	Travel
TSM	Trouble Shooting Manual
TTG	Time to Go
TVMC	Minimum Control Speed Temperature
TWY	Taxiway

U

Abbreviation	Term
UFD	Unit Fault Data
ULB	Underwater Locator Beacon
UNLK	Unlock
UP	Up, Upper
USB	Universal Serial Bus
UTC	Universal Coordinated Time

V

Abbreviation	Term
V/S	Vertical Speed
V1	Decision Speed
V2	Takeoff Safety Speed
VAPP	Approach Speed
VBV	Variable Bypass Valve
VC	Calibrated airspeed
VDEV	Vertical Deviation
VEL	Velocity
VERT	Vertical
VERT REV	Vertical Revisor
VFE	Maximum Speed for each Flap configuration
VFEN	VFE Next
VFTO	Final Takeoff Speed
VHF	Very High Frequency
VHV	Very High Voltage

Continued on the following page

Continued from the previous page

Abbreviation	Term
VIB	Vibration
VIP	Vertical Intersection Point
VLE	Maximum Landing Gear Extended Speed
VLS	Lowest Selectable Speed
VLV	Valve
VM	Maneuvering Speed
VMAX	Maximum Allowable Speed
VMC	Visual Meteorological Conditions
VMCA	Minimum Control Speed in the Air
VMCG	Minimum Control Speed on Ground
VMCL	Minimum Control Speed at Landing
VMIN	Minimum Operating Speed
VMO	Maximum Operating Speed
VMU	Minimum Unstick Speed
VOR	VHF Omnidirectional Range
VOR-D	VOR-DME
VR	Rotation Speed
VREF	Landing Reference Speed
VSC	Vacuum System Controller
VSI	Vertical Speed Indicator
VSV	Variable Stator Vane
VU	Visual Unit

W

Abbreviation	Term
W/S	Wind Shear
WAI	Wing Anti-Ice
WARN	Warning
WBm	Weight and Balance Manual
WBS	Weight and Balance System
WBS	Weight and Balance System
WD	Warning Display
WGD	Windshield Guidance Display
WHC	Window Heat Computer
WNDW	Window
WPT	Waypoint
WSHLD	Windshield
WT	Weight
WTB	Wing Tip Brake
WXR	Weather Radar

X

Abbreviation	Term
XBLD	Crossbleed
XCVR	Transceiver
XFR	Transfer
XMTR	Transmitter
XPDR	Transponder
XTK	Crosstrack Error

Y

Abbreviation	Term

Z

Abbreviation	Term
ZFCG	Zero Fuel Center of Gravity
ZFW	Zero Fuel Weight
ZFWCG	Zero Fuel Weight Center of Gravity field
Zp	Pressure Altitude

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AIRCRAFT SYSTEMS

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LIST OF EFFECTIVE TEMPORARY DOCUMENTARY UNITS

M	Localization	DU Title	DU identification	DU date

No Temporary Documentary Unit

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AIRCRAFT SYSTEMS

AIRCRAFT GENERAL

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GENERAL

Ident.: DSC-20-10-00000284.0003001 / 13 DEC 10
Applicable to: ALL

The A319 is a subsonic, medium-range, civil transport aircraft.

ENGINES

Ident.: DSC-20-10-00000285.0001001 / 13 DEC 10
Applicable to: ALL

The aircraft has two high bypass turbofan engines mounted under the wings.

COCKPIT

Ident.: DSC-20-10-00000286.0002001 / 13 DEC 10
Applicable to: ALL

The cockpit is designed for a two-member crew. It also has a place for 2 observers.

CABIN

Ident.: DSC-20-10-00000287.0007001 / 05 FEB 15
Applicable to: ALL

The passenger seating layout may vary, depending on operating requirements.

CARGO

Ident.: DSC-20-10-00000289.0001001 / 13 DEC 10
Applicable to: ALL

Two cargo compartments are under the cabin floor.

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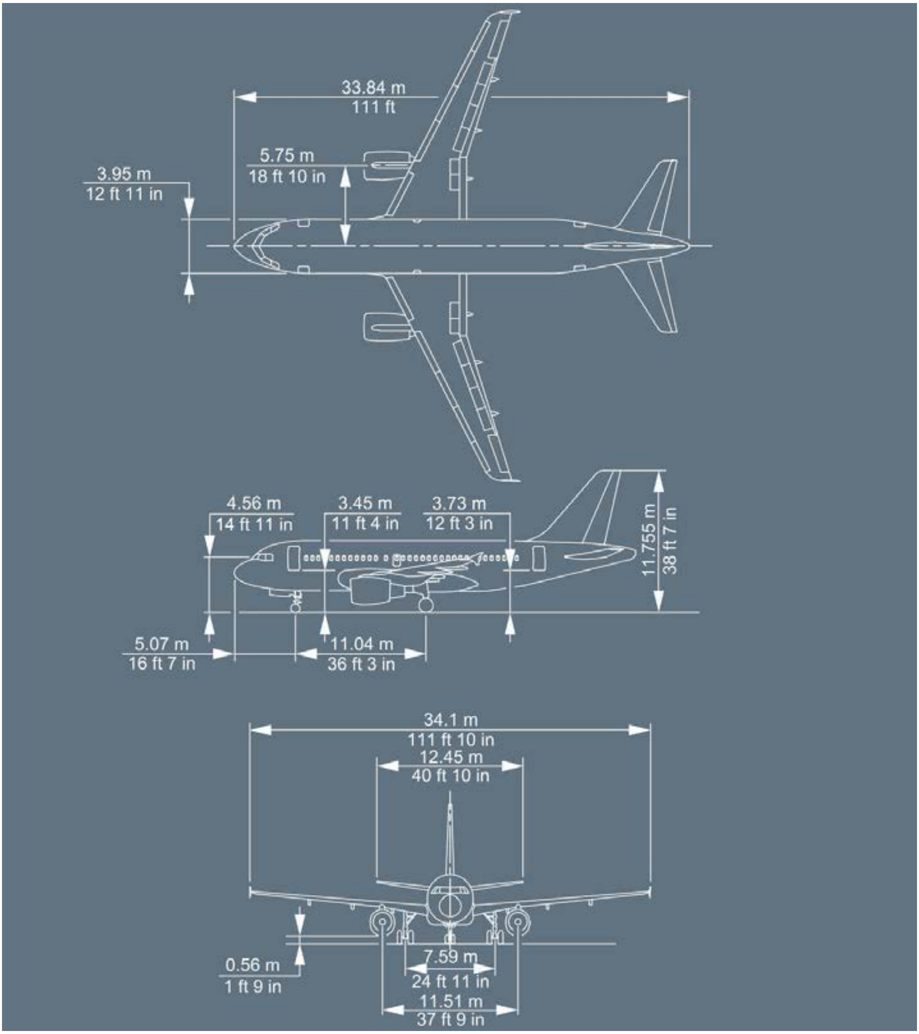
GENERAL ARRANGEMENT

Ident.: DSC-20-20-00000290.0001001 / 21 MAR 16
Applicable to: ALL

This subchapter gives the principal aircraft dimensions, location of unpressurized areas, antennas, ground service connections, and ground maneuvering characteristics.

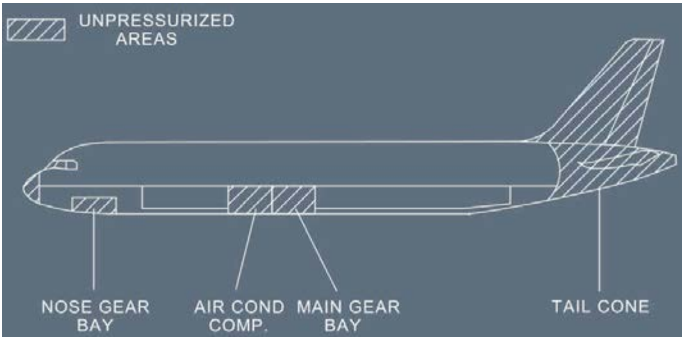
PRINCIPAL DIMENSIONS

Ident.: DSC-20-20-00000291.0002001 / 22 MAY 12
Applicable to: ALL



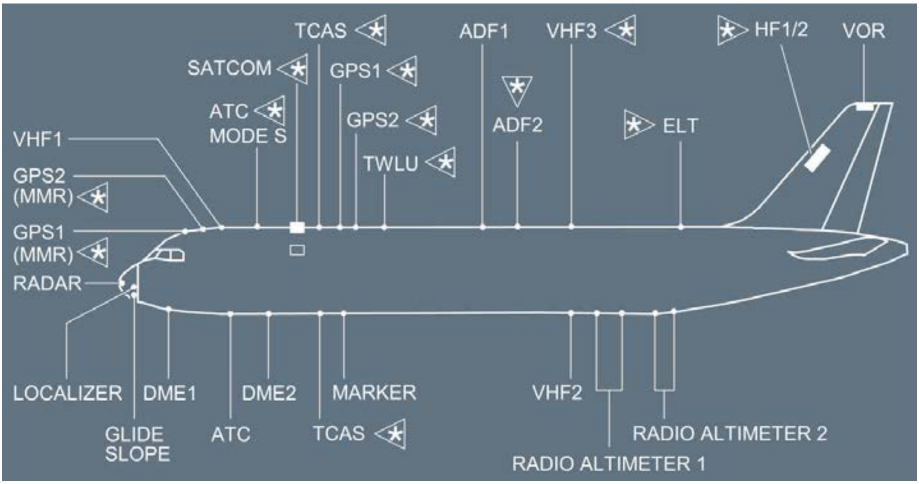
UNPRESSURIZED COMPARTMENTS

Ident.: DSC-20-20-00000292.0001001 / 21 MAR 16
Applicable to: ALL



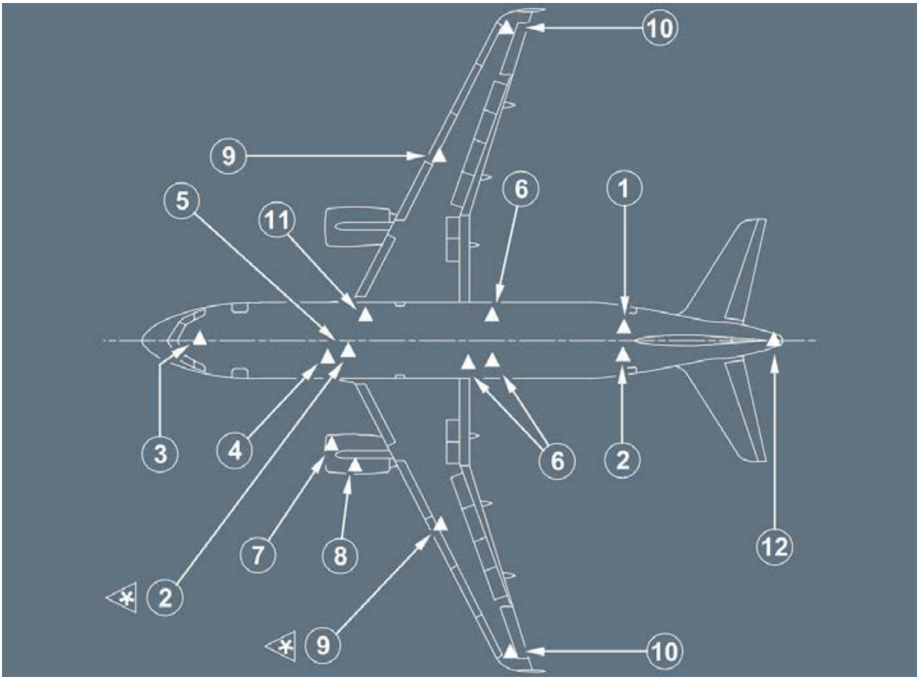
ANTENNA LOCATIONS

Ident.: DSC-20-20-00000293.0001001 / 28 JUL 14
Applicable to: ALL



GROUND SERVICE CONNECTIONS AND PANELS

Ident.: DSC-20-20-00000295.0003001 / 09 OCT 12
Applicable to: ALL



(1) Toilet servicing

(2) Water filling and/or draining

(3) Electrical ground power receptacle

(4) LP ground air supply connector

(5) HP ground air supply connector

(6) Hydraulic

(7) IDG oil filling

(8) Engine oil filling

(9) Refueling/defueling

(10) Gravity filling panels

(11) Refueling/defueling panel

(12) APU oil filling

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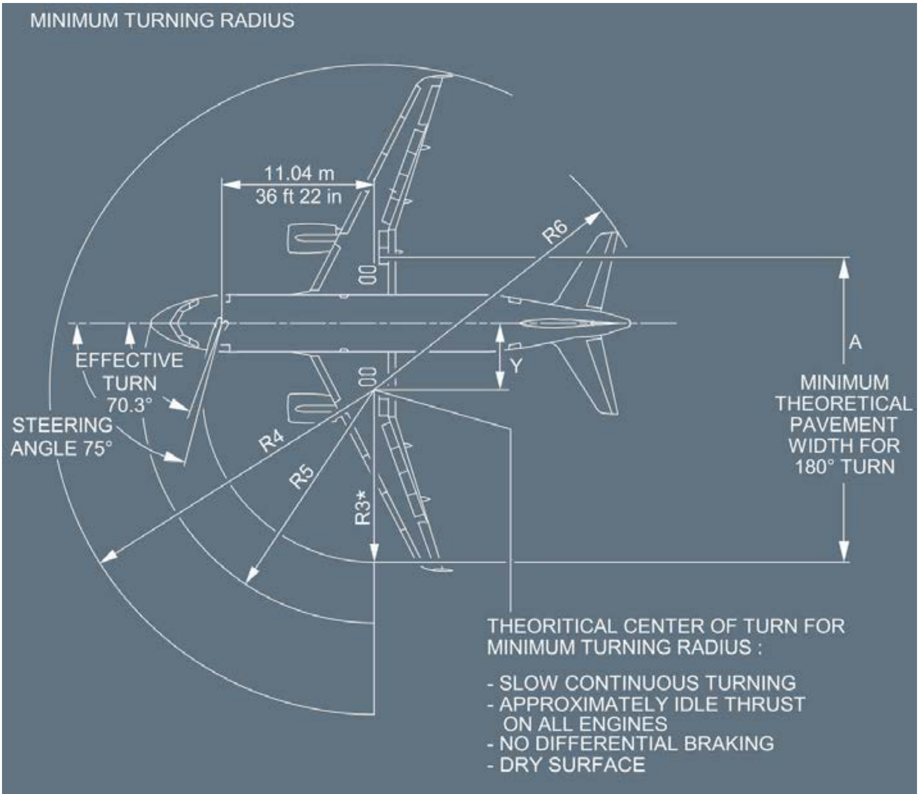
TAXIING

Ident.: DSC-20-30-00000294.0006001 / 01 JUN 17
Applicable to: ALL



	Y	A	R3	R4	R5	R6
FT	13	67	39	70	54	65
M	3.9	20.5	11.8	21.4	16.6	19.7

★ NOSE GEAR RADIUS (R3) MEASURED FROM OUTSIDE FACE OF TIRE

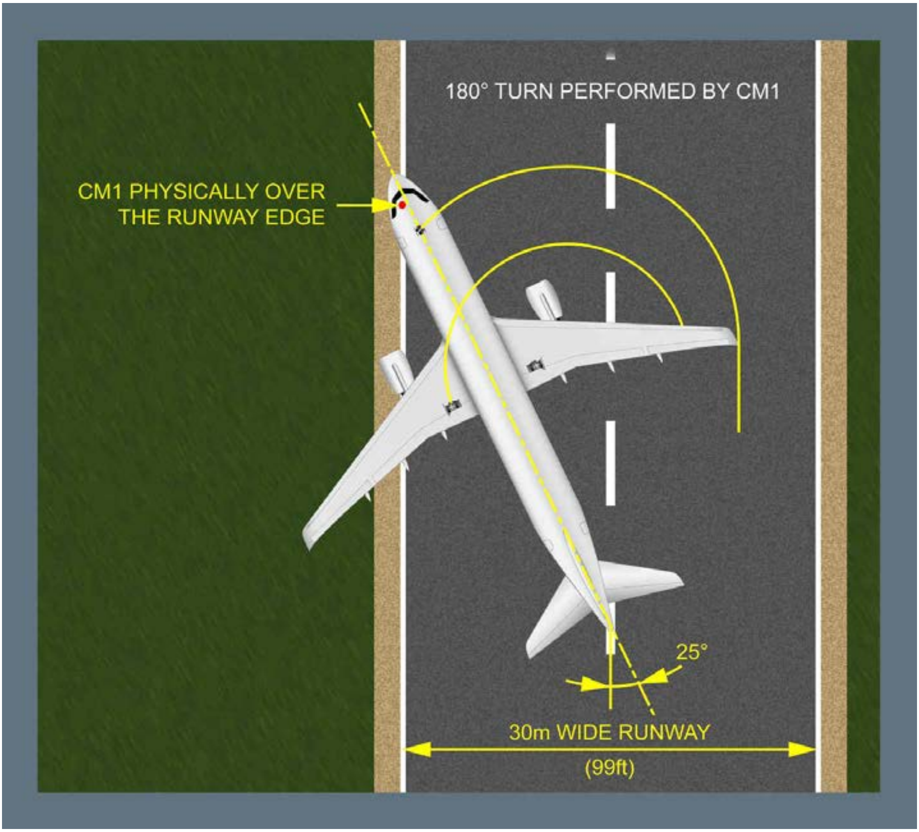
180 DEGREES TURN ON RUNWAY

Ident.: DSC-20-30-00021674.0004001 / 06 JUN 17
Applicable to: ALL

With the recommended 180 ° turn technique, on dry runway, the approximate turn width is 21 m (69 ft) without margin.

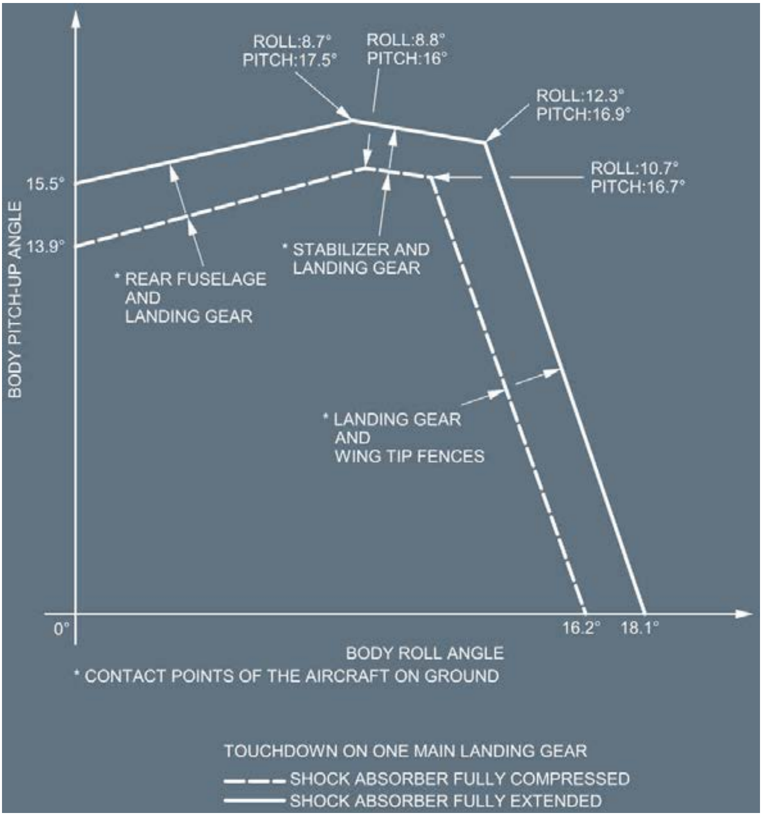
<u>Note:</u> *The flight crew should consider additional margin when the runway is wet or contaminated.*

For more information about the 180 ° Turn Technique, *Refer to FCTM/PR-NP-SOP-100 180 degrees Turn on Runway*.



GROUND CLEARANCE DIAGRAM

Ident.: DSC-20-40-00018435.0003001 / 19 JAN 16
Applicable to: ALL



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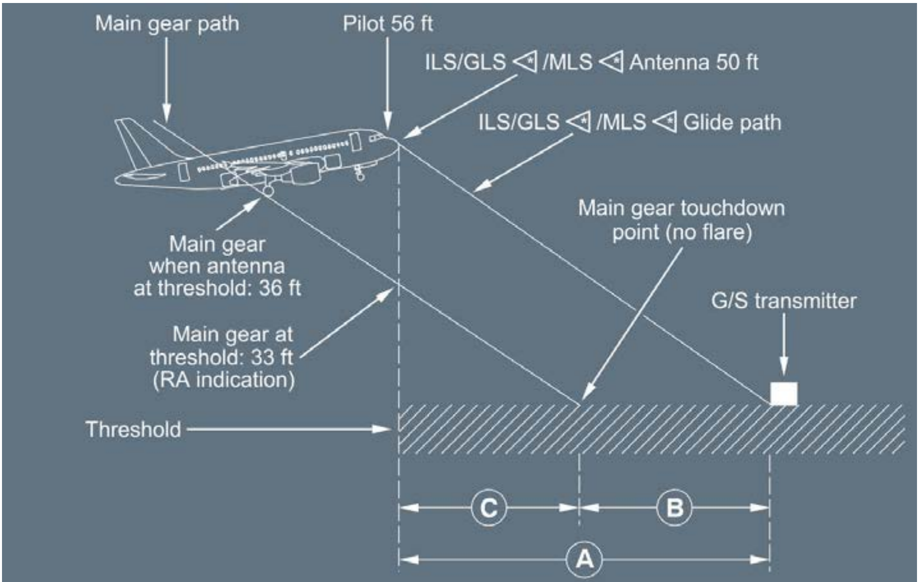
ILS/GLS ◁ /MLS ◁ FINAL APPROACH AND LANDING GEOMETRY

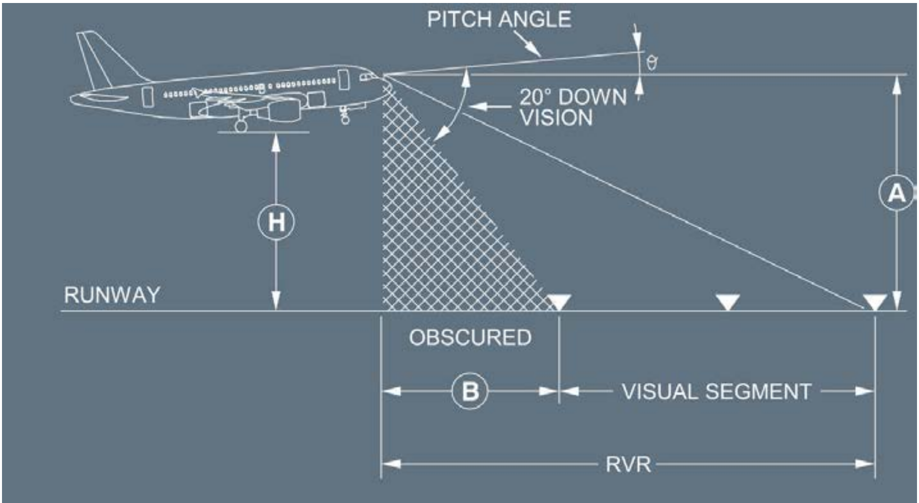
Ident.: DSC-20-50-00019878.0011001 / 22 FEB 17
Applicable to: ALL



CONDITIONS : – FLAPS FULL	PITCH ANGLE	GLIDE PATH (°)	A	B	TOUCHDOWN POINT C
– ILS ANTENNA AT 50 ft AT THRESHOLD	4°8	2°5	349 m 1145 ft	114 m 375 ft	235 m 771 ft
– NO FLARE	5°3	3°	291 m 954 ft	100 m 329 ft	191 m 625 ft

MINIMUM VISUAL GROUND SEGMENTS (FLARE PHASE)

Ident.: DSC-20-50-00019879.0011001 / 22 FEB 17
Applicable to: ALL

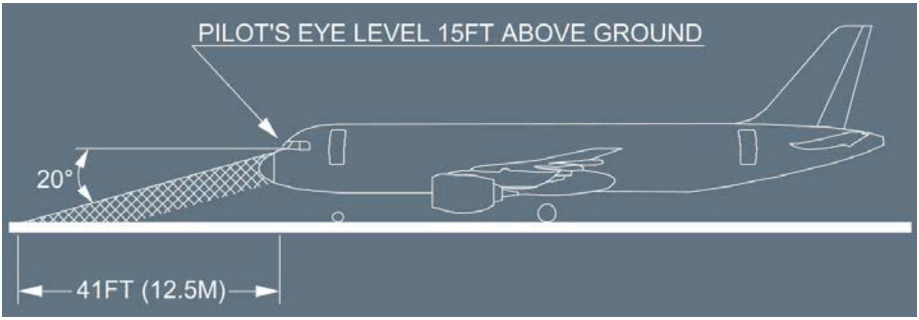


	CAT III		CAT II
H	15 ft (θ = 4.9°)	50 ft (θ = 5.3°)	100 ft (θ = 5.3°)
VISUAL SEGMENT	60 m (197 ft)		120 m (394 ft)
A	35 ft	71 ft	121 ft
OBSCURED B	40 m (131 ft)	82 m (269 ft)	140 m (460 ft)
MINIMUM RVR	100 m (328 ft)	142 m (466 ft)	260 m (854 ft)

<u>Note:</u> *This drawing illustrates that, for a CAT III landing (60 m minimum visual segment), the minimum Runway Visual Range (RVR) is 100 m at 15 ft.*

VISUAL GROUND GEOMETRY

Ident.: DSC-20-60-00010294.0001001 / 22 MAY 12
Applicable to: ALL



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AIRCRAFT SYSTEMS

AIR CONDITIONING / PRESSURIZATION / VENTILATION

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DSC-21-10 Air Conditioning

DSC-21-10-10 General

DSC-21-10-20 Main Components

DSC-21-10-30 Temperature and Flow Regulation

DSC-21-10-40 System Operation under Failure Condition

DSC-21-10-50 Controls and Indicators

Continued on the following page

Continued from the previous page

DSC-21-20 Pressurization

DSC-21-20-10 General

DSC-21-20-20 Main Components

DSC-21-20-30 System Operation

DSC-21-20-40 Controls and Indicators

DSC-21-30 Ventilation

DSC-21-30-10 General

DSC-21-30-20 Avionics Ventilation

DSC-21-30-40 Battery Ventilation

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GENERAL

Ident.: DSC-21-10-10-00017767.0001001 / 21 MAR 16
Applicable to: ALL

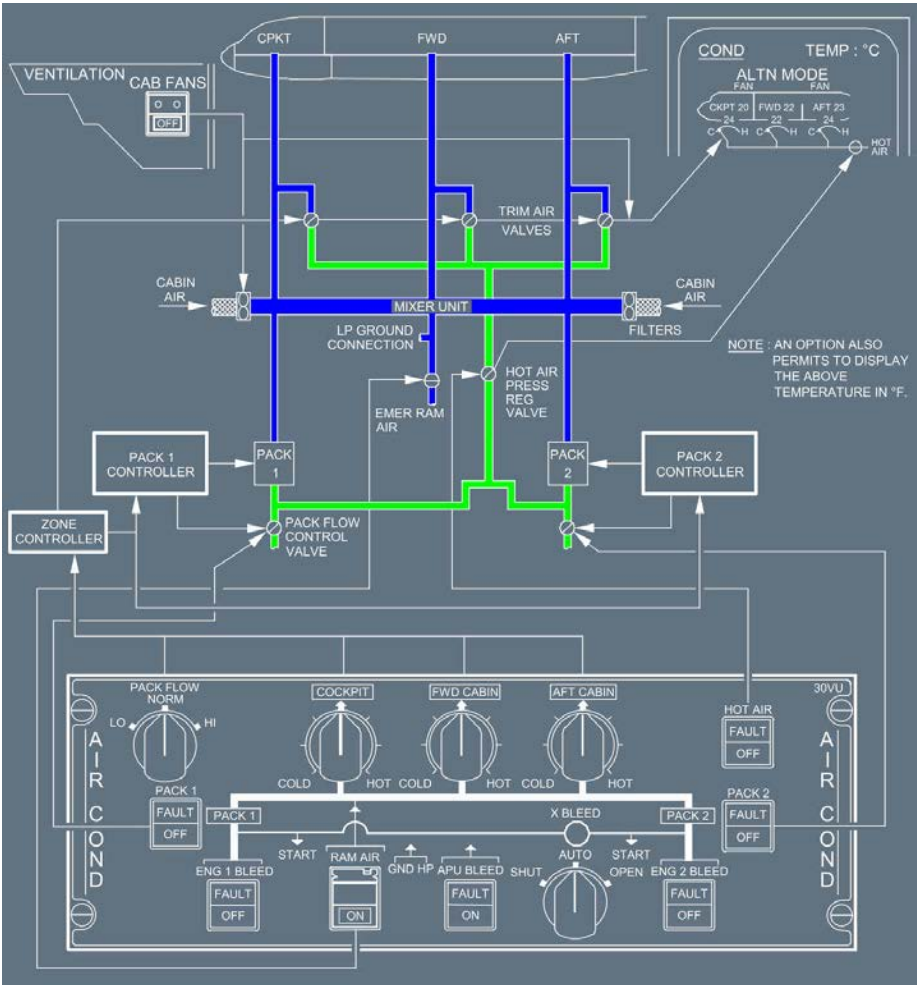
The air conditioning system is fully automatic.
It provides continuous air renewal and maintains a constant, selected temperature in the following three zones : COCKPIT, FWD CABIN, AFT CABIN. These three zones are independently controlled.

Air is supplied by the pneumatic system, via:
- Two pack flow control valves,
- Two packs,
- The mixing unit, which mixes the air that comes from the cabin and the packs.

Air is then distributed to the cockpit and the cabin.
In an emergency, a ram air inlet can provide ambient air to the mixing unit.
The temperature in the flight deck and in the cabin can be selected from the cockpit's AIR COND panel. Temperature regulation of the temperature is ensured by a zone controller and two pack controllers, or two Air Conditioning System Controller (ACSC) .
Temperature regulation is optimized via the hot air pressure regulating valve, and the trim air valves that add hot air, tapped upstream of the packs, to the air coming from the mixing unit.
A temperature control panel is also available on the Forward Attendant Panel (FAP). During cruise, the cabin crew can modify each cabin zone temperature that is selected from the cockpit, with a limited authority of ± 2.5 °C. (± 4.5 °F).
Low-pressure air is supplied to the mixing unit by a ground connection.

ARCHITECTURE

Ident.: DSC-21-10-10-00000297.0001001 / 22 MAY 12
Applicable to: ALL



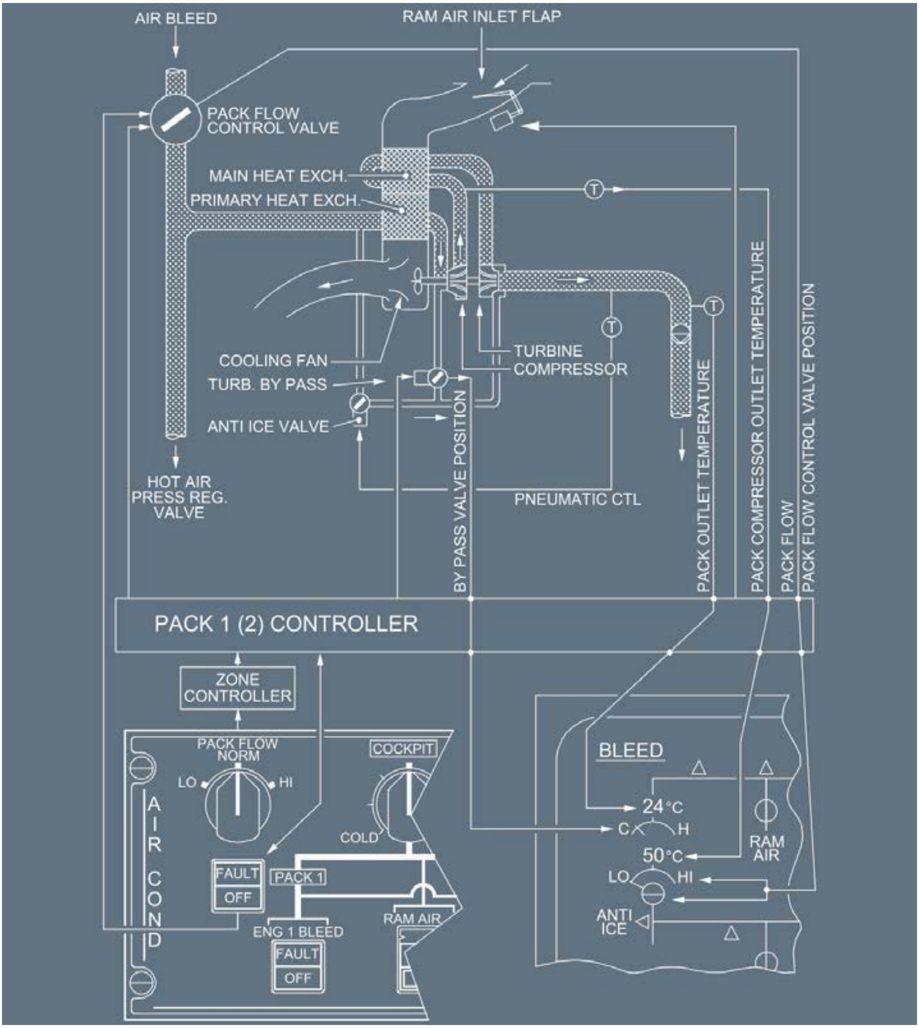
AIR CONDITIONING PACK

Ident.: DSC-21-10-20-00017768.0001001 / 21 MAR 16
Applicable to: ALL

The two packs operate automatically and independently of each other. Pack operation is controlled by signals coming from the pack controller or the Air Conditioning System Controller (ACSC) .
Warm pre-conditioned bleed air enters the cooling path via the pack flow control valve, and is ducted to the primary heat exchanger.
Then, the cooled bleed air enters the compressor section of the air-cycle machine and is compressed to a higher pressure and temperature.
It is cooled again in the main heat exchanger and enters the turbine section, where it expands and, in expanding, generates power to drive the compressor and cooling air fan.
The removal of energy during this process reduces air temperature, resulting in very low air temperature at turbine discharge.
L3 A water separator system dries the air before it enters the turbine section.

PACK SCHEMATIC (SIMPLIFIED)

Ident.: DSC-21-10-20-00000299.0003001 / 22 MAY 12
Applicable to: ALL



PACK FLOW CONTROL VALVE

Ident.: DSC-21-10-20-00017769.0001001 / 21 MAR 16
Applicable to: ALL

This valve is pneumatically-operated and electrically-controlled. It regulates the air flow in accordance with signals received from the pack controllers or the ACSC ⧼ .
In the absence of air pressure, a spring keeps the valve closed.
The valve closes automatically in case of pack overheat, engine start, or operation of the fire or ditching pushbutton. The valve is controlled from the AIR COND panel.

EMERGENCY RAM AIR

Ident.: DSC-21-10-20-00000301.0001001 / 20 DEC 16
Applicable to: ALL

An emergency ram air inlet ventilates the cockpit and cabin to remove smoke, or if both packs fail.
The emergency ram air inlet valve is controlled by the RAM AIR pushbutton on the AIR COND panel.
This pushbutton opens the ram air valve, provided that ditching is not selected.
When the RAM AIR pushbutton is ON : The outflow valve opens about 50 %, provided that it is under automatic control and ΔP is less than 1 PSI. The outflow valve does not automatically open if it is under manual control, even if ΔP is less than 1 PSI. If ΔP is greater than 1 PSI, the check valve located downstream the ram air door will not open, even if the ram air door has been selected open.
No airflow will then be supplied.

MIXER UNIT

Ident.: DSC-21-10-20-00000302.0001001 / 21 MAR 16
Applicable to: ALL

This unit mixes cold fresh air from the packs with the cabin air being recirculated through recirculation fans. The mixer unit is also connected to the emergency ram air inlet and the low pressure ground inlets.

HOT-AIR PRESSURE-REGULATING VALVE

Ident.: DSC-21-10-20-00000303.0002001 / 15 FEB 11
Applicable to: ALL

This valve regulates the pressure of hot air, tapped upstream of the packs.
It is pneumatically-operated and electrically-controlled from the HOT AIR pushbutton on the AIR COND panel. In the absence of air, a spring keeps the valve closed.

The valve closes automatically, if:
- The duct overheats, or
- The cockpit trim air valve fails, or
- Both cabin trim air valves fail.

The hot-air pressure-regulating valve remains operative, even if either the forward or aft cabin trim air valve fails.

TRIM AIR VALVES

Ident.: DSC-21-10-20-00017771.0001001 / 21 MAR 16
Applicable to: ALL

These valves are electrically-controlled by the zone controller or the ACSC ◁ . A trim air valve, associated with each zone, adjusts the temperature by adding hot air.
The cockpit trim air valve is controlled by the ACSC 1 ◁ , and the cabin trim air valves are controlled by the ACSC 2 ◁ .

GENERAL

Ident.: DSC-21-10-30-00017772.0001001 / 21 MAR 16
Applicable to: ALL

Temperature regulation is automatic and controlled by one zone controller and two pack controllers, or the ACSC ⊲ .

PACK CONTROLLER

Ident.: DSC-21-10-30-00000306.0002001 / 15 FEB 11
Applicable to: ALL

Each pack controller regulates the temperature of its associated pack, in accordance with a demand signal from the zone controller, by modulating the bypass valve and the ram air inlet flaps.
The ram air inlet flaps close during takeoff and landing to avoid ingestion of foreign matter.

Note: *During takeoff, the ram air inlet flaps close when TO power is set and the main landing gear struts are compressed.*
During landing they close as soon as the main landing gear struts are compressed, as long as speed is at or above 70 kt.
They open 20 s after the speed drops below 70 kt.

The pack controllers also regulate flow by modulating the associated pack flow control valve.

ZONE CONTROLLER

Ident.: DSC-21-10-30-00000307.0001001 / 18 MAR 11
Applicable to: ALL

PACK FLOW CONTROL

The crew can use the PACK FLOW pushbutton to adjust the pack flow for the number of passengers and for external conditions.

Whatever the crew selects, the system delivers higher flow for any of the following circumstances:
- In single-pack operation,
- When the APU is supplying bleed air.

The system delivers normal flow if the crew selects LO flow and the temperature demand cannot be satisfied.

ENGINE PRESSURE DEMAND

When the cooling demand in one zone cannot be satisfied, if the bleed pressure is too low, the zone controller sends a pressure demand signal to both Engine Interface Units (EIU) to increase the minimum idle and to raise the bleed pressure.

APU FLOW DEMAND

When the APU bleed valve is open, the zone controller signals the APU 's Electronic Control Box (ECB) to increase the APU flow output when any zone temperature demand cannot be satisfied.

TEMPERATURE REGULATION

Ident.: DSC-21-10-30-00017773.0001001 / 21 MAR 16
Applicable to: ALL

Temperature regulation is achieved by the zone controller or the ACSC .
The zone controller regulates the temperature of the two cabin zones and the cockpit. The ACSC 2 regulates the temperature of the two cabin zones, and the ACSC 1 regulates the cockpit temperature.

BASIC TEMPERATURE REGULATION

The flight crew uses the temperature selectors on the air conditioning panel to select the reference temperatures. The zone controller or the ACSC computes a temperature demand from the selected temperature and the actual temperature. The reference temperatures are then fine tuned for each cabin zone through the temperature control panel installed on the FAP.

The actual temperature is measured by sensors:
- In the cockpit, for the cockpit zone;
- In the lavatory extraction circuit and galley ventilation system, for the cabin.

A signal corresponding to the lowest demanded zone temperature goes to the pack controller or the ACSC , which then make both packs supply the required outlet temperature.

OPTIMIZED TEMPERATURE REGULATION

The zone controller or the ACSC optimizes temperature by acting on the trim air valves.
The temperature selection range is from 18 °C (64 °F) to 30 °C (86 °F).

GENERAL

Ident.: DSC-21-10-40-00000309.0001001 / 15 FEB 11
Applicable to: ALL

Each controller consists of a primary channel that is normally in control and a secondary channel that acts as a backup if the primary channel fails.

ZONE CONTROLLER

Ident.: DSC-21-10-40-00000310.0001001 / 15 FEB 11
Applicable to: ALL

PRIMARY CHANNEL FAILURE

The secondary channel operates as backup.
The flow setting function and optimized temperature regulation are not available. HOT AIR and TRIM AIR valves close.
The zones are controlled to 24 °C (76 °F) (backup regulation). Pack 1 controls the cockpit temperature. Pack 2 controls the FWD and AFT cabin temperatures.
ALTN MODE appears on the ECAM (Electronic Centralized Aircraft Monitoring) COND page.

SECONDARY CHANNEL FAILURE

This has no effect on zone temperature regulation.
Backup mode is lost.

PRIMARY AND SECONDARY CHANNEL FAILURE

Optimized and backup temperature regulation is lost.
The packs deliver a fixed temperature: 20 °C (68 °F) for pack 1, 10 °C (50 °F) for pack 2. The failure removes all information from the ECAM COND page, which then displays PACK REG.

PACK CONTROLLERS

Ident.: DSC-21-10-40-00000311.0001001 / 15 FEB 11
Applicable to: ALL

PRIMARY CHANNEL FAILURE

The secondary computer operates as a backup.
Regulation is not optimized.
Pack flow is fixed at the previous setting.

SECONDARY CHANNEL FAILURE

This failure has no effect on pack regulation. Backup mode is lost.
ECAM signals related to the corresponding pack are lost.

PRIMARY AND SECONDARY CHANNEL FAILURE

As a backup, corresponding pack outlet temperature is controlled by the anti-ice valve and is stabilized to a temperature between 5 °C (41 °F) and 30 °C (86 °F) in a maximum of 6 min.
ECAM signals, related to the corresponding pack, are lost.

AIR CONDITIONING SYSTEM CONTROLLERS

Ident.: DSC-21-10-40-00018747.0001001 / 21 MAR 16
Applicable to: ALL

ONE LANE FAILURE

No effect, as the second lane takes over.

BOTH LANES FAILURE

The related pack is lost, and the hot air pressure-regulating valve and associated trim air valves close.

AIR CYCLE MACHINE FAILURE

Ident.: DSC-21-10-40-00000312.0002001 / 15 FEB 11
Applicable to: ALL

If the Air Cycle Machine (ACM) fails (compressor/turbine seizure), the affected pack may be operated in heat exchanger cooling mode.
Warm pre-conditioned bleed air enters the cooling path via the pack valve and goes to the primary heat exchanger. Then, the main part of the cooled air goes directly downstream of ACM turbine through the bypass valve, and the rest goes through the failed ACM.
The ACM seizure reduces the pack flow.

As for normal pack operation:
- The pack controller regulates temperature, in accordance with zone controller demand, by modulating the bypass valve and the ram air inlet flap.
- The zone controller regulates the hot air flow through the hot air valves to optimize cockpit/cabin temperature regulation. Hot air flow is lower than in normal pack operation, because pack flow is reduced.

HOT AIR PRESSURE REGULATING VALVE FAILURE

Ident.: DSC-21-10-40-00000313.0001001 / 21 MAR 16
Applicable to: ALL

Failed open : No effect.

Failed closed :	Optimized regulation is lost. Trim air valves are driven to the fully closed position. Pack 1 controls the cockpit temperature to the selected value and pack 2 controls the cabin temperature (FWD and AFT) to the mean value of the selected temperatures.

TRIM AIR VALVE FAILURE

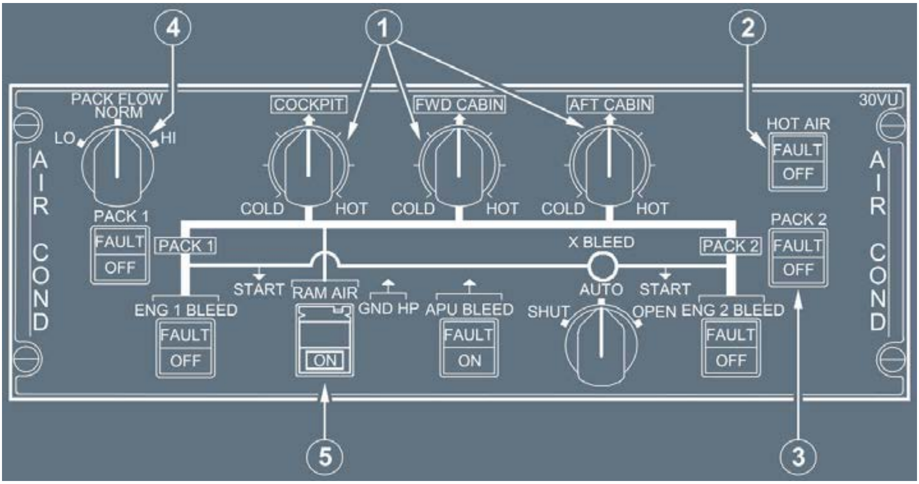
Ident.: DSC-21-10-40-00000314.0001001 / 21 MAR 16
Applicable to: ALL

Optimized temperature regulation of the corresponding zone is lost.

Intentionally left blank

CONTROLS ON OVERHEAD PANEL

Ident.: DSC-21-10-50-00000315.0002001 / 20 DEC 16
Applicable to: ALL



(1) Zone temperature selector

- 12 o'clock position: 24 °C (76 °F)
- COLD position: 18 °C (64 °F)
- HOT position: 30 °C (86 °F).

(2) HOT AIR pb

ON : The valve regulates hot air pressure.

OFF : The valve closes, and the trim air valves close.
The FAULT circuit is reset.

FAULT : The FAULT light comes on amber, along with an associated ECAM caution, when duct overheat is detected. The fault circuit detects an overheat when the duct temperature reaches 88 °C (190 °F) once.
The valve and trim air valves close automatically.
The FAULT light goes off when the temperature drops below 70 °C (158 °F), and the flight crew selects OFF.

(3) PACK pb-sw

ON : The pack flow control valve is automatically-controlled.

It opens, except in the following cases:
- Upstream pressure below minimum
- Compressor outlet overheat
- Engine start sequence:

1. If the crossbleed valve is closed, the valve located on the starting engine side immediately closes, when the MODE selector is set to IGN (or CRK)
2. It remains closed on the starting engine side (provided the crossbleed valve is closed) when:

   - The MASTER sw is set to ON (or MAN START pb is set to ON)
   - The start valve is open
   - N2 < 50 %.

   Note: *If the crossbleed valve is open at engine start, both pack flow control valves close.*

3. On ground, reopening of the valves is delayed for 30 s to avoid a supplementary pack closure cycle during second engine start.

- FIRE pb, of the engine on the related side, is pressed
- Ditching is selected.

OFF : The pack flow control valve closes.

FAULT lt : Comes on amber, and a caution appears on the ECAM, if the pack flow control valve position disagrees with the selected position, or in the case of compressor outlet overheat or pack outlet overheat.

(4) PACK FLOW selector

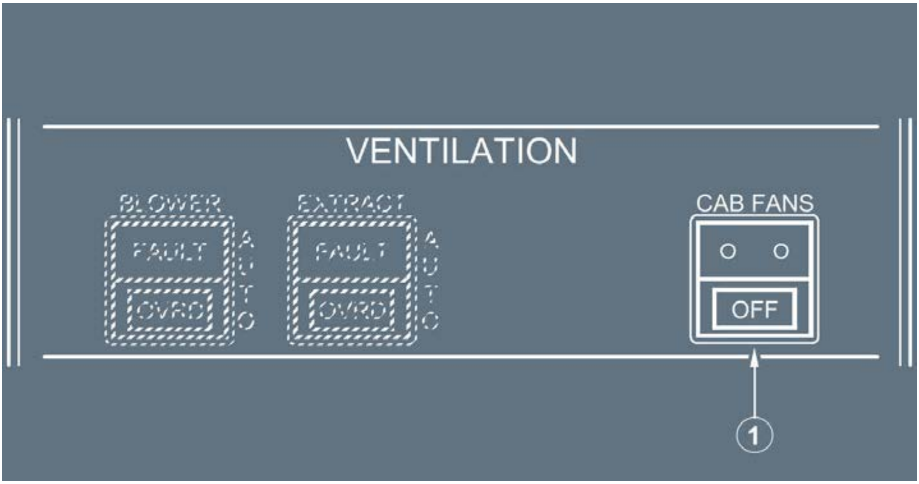
- Permits the selection of pack valve flow, according to the number of passengers and ambient conditions (smoke removal, hot or wet conditions)
  LO (80 %) – NORM (100 %) – HI (120 %)
- Manual selection is irrelevant in single pack operation, or with APU bleed supply. In these cases, HI is automatically selected
- If LO is selected, the pack flow can be automatically selected up to 100 % when the cooling demand cannot be satisfied.

(5) RAM AIR pb (guarded)

ON : The ON light comes on white.

If the DITCHING pb, on the CABIN PRESS panel, is in normal position:
- The emergency ram air inlet opens
- If $\Delta p \geq 1$ PSI: The outflow valve control remains normal. No emergency ram air flows in
- If $\Delta p < 1$ PSI: The outflow valve opens to about 50 % when under automatic control. It does not automatically open when it is under manual control. Emergency ram airflow is directly supplied to the mixer unit.

OFF: The emergency ram air inlet closes.



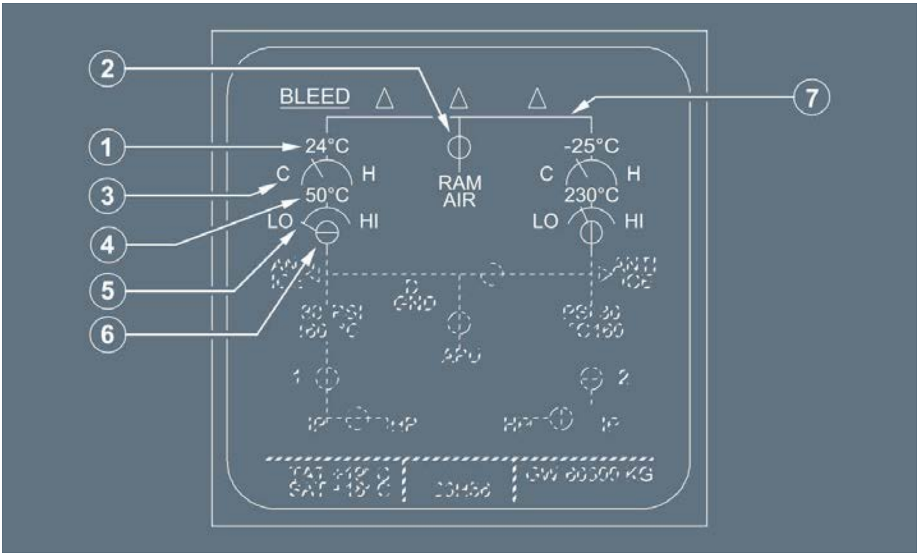
(1) CAB FAN pb

ON : The two cabin fans are on.

OFF: The two cabin fans are off.

ECAM BLEED PAGE

Ident.: DSC-21-10-50-00000316.0001001 / 21 MAR 16
Applicable to: ALL



(1) Pack outlet temperature
It appears in green. It becomes amber, if the temperature is higher than 90 °C.

(2) PACK RAM AIR inlet

Crossline: – Green	The flap is normally closed.
In transit : – Amber	The flap is partially open
Inline – : Amber	The flap is fully open on ground.
Inline – : Green	The flap is fully open in flight.

(3) Pack turbine bypass valve position
Indication is green.

C	=	Cold – Valve closed
H	=	Hot – Valve open.

(4) Pack compressor outlet temperature
It appears in green. It becomes amber, if the temperature is higher than 230 °C.

(5) Pack flow
It appears in green. It becomes amber, if the pack flow control valve is closed.

Note: *The pack flow indication can be up to 30 % below the actual flow rate.*

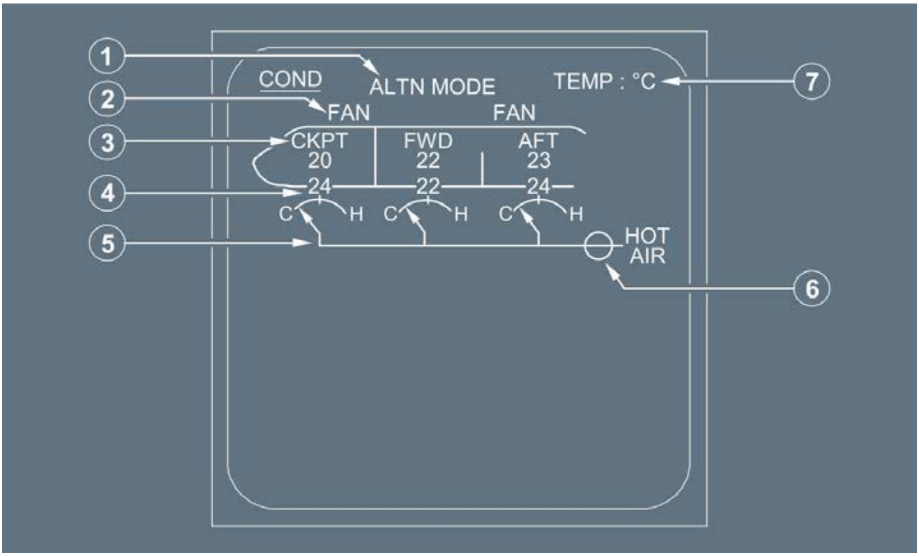
(6) Pack flow control valve

Inline - Green	:	Open.
Inline - Amber	:	Open, and disagrees with the control position.
Crossline - Green	:	Fully closed.
Crossline - Amber	:	Fully closed, and disagrees with the control position.

(7) User Indication
It appears in green. It becomes amber, in flight, when RAM AIR flap is not fully open, and both pack flow control valves are closed .

ECAM COND PAGE

Ident.: DSC-21-10-50-00000317.0001001 / 09 OCT 12
Applicable to: ALL



(1) Zone controller fault indication

ALTN MODE : Primary zone controller fault (green).

PACK REG : Zone controller fault (basic regulation by packs only) (green).

No indication : Zone controller normal operation.

(2) Cabin FAN fault indication
It appears in amber, if the recirculation fan is detected as faulty.

(3) Zone temperature indication
It is in green.

(4) Zone duct temperature
It appears in green, and becomes amber at 80 °C (176 °F).

(5) Zone trim air valve position indication
The arrow is green. It is replaced by amber crosses ("XX") if the valve fails.

C = Cold valve fully closed.

H = Hot valve fully open.

(6) Hot air pressure regulating valve

In line - Green : The valve is open.

In line - Amber : The valve is not closed; disagrees with the control position.

Crossline - Green : The valve is fully closed, and the pushbutton is at auto.

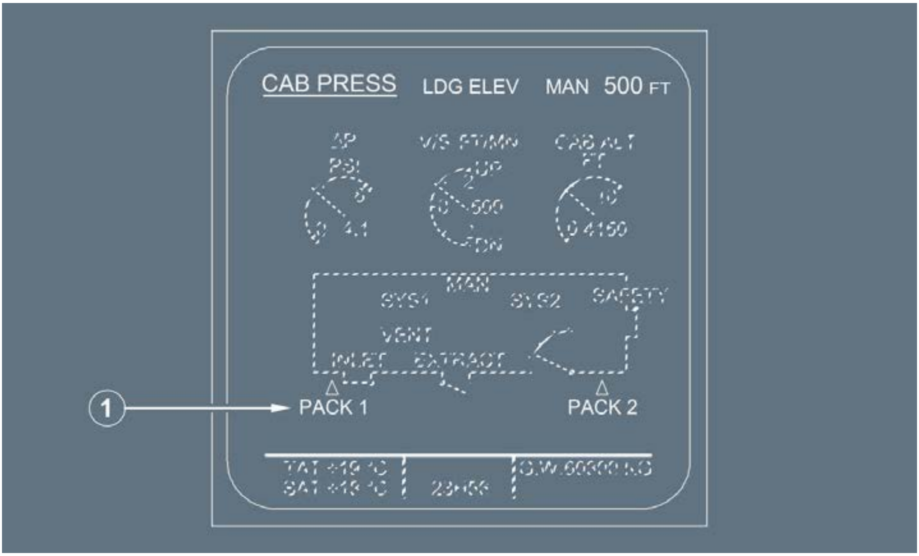
Crossline - Amber : The valve is closed, and pushbutton is OFF, or the valve disagree is closed.

(7) TEMP
Unit of measure (°C or °F) is indicated in cyan.

Note: *When the hot air valve is closed, a spurious FWD CRG HEAT message may appear in the INOP SYS list, even if the system remains operative.*

ECAM CAB PRESS PAGE

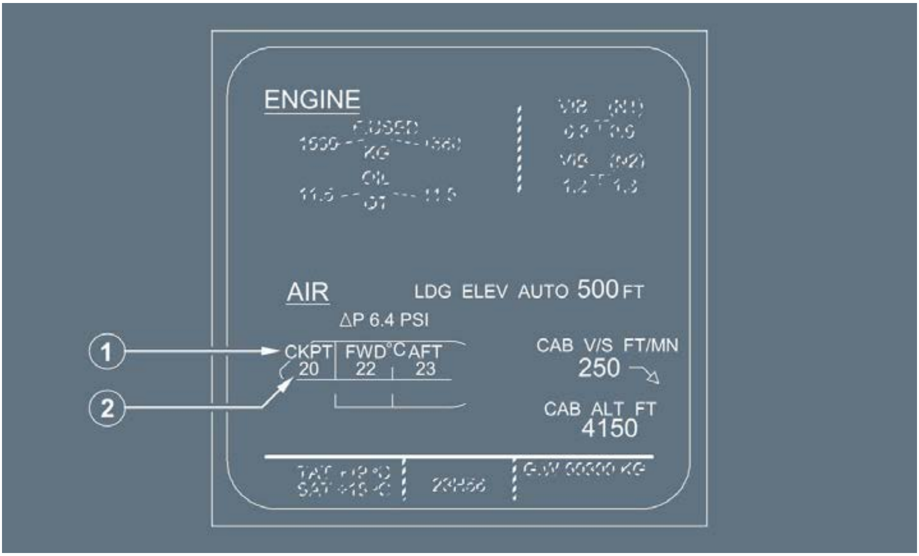
Ident.: DSC-21-10-50-00000318.0001001 / 09 OCT 12
Applicable to: ALL



(1) PACK indication
Triangle normally green, PACK 1(2) indication normally white. Both become amber when pack flow control valve is closed with associated engine running.

ECAM CRUISE PAGE

Ident.: DSC-21-10-50-00000319.0001001 / 09 OCT 12
Applicable to: ALL



(1) Zone indication
This field also displays the temperature scale in use (°C or °F).

(2) Zone temperature

MEMO DISPLAY

Ident.: DSC-21-10-50-00016760.0001001 / 21 MAR 16
Applicable to: ALL

RAM AIR ON : This memo appears in green, if the RAM AIR pb-sw is ON.

GENERAL

Ident.: DSC-21-20-10-00017903.0001001 / 21 MAR 16
Applicable to: ALL

The cabin pressurization system has four general functions:

- Ground function : Fully opens the outflow valve on ground
- Prepressurization : During takeoff, increases cabin pressure to avoid a surge in cabin pressure during rotation
- Pressurization in flight : Adjusts cabin altitude, and rate of change to provide passengers with a comfortable flight
- Depressurization : After touchdown, gradually releases residual cabin overpressure before the ground function fully opens the outflow valve.

The system consists of:

- Two Cabin Pressure Controllers (CPC)
- One Residual Pressure Control Unit (RPCU ◁)
- One outflow valve, with an actuator that incorporates three motors (two for automatic operation, one for manual operation)
- One control panel
- Two safety valves.

Any one of the three independent electric motors may power the outflow valve.
Normally, one of the two cabin pressure controllers operates the outflow valve by means of its associated automatic motor.
In case of ditching, an override switch on the control panel allows the flight crew to close the outflow valve and all valves below the flotation line.
The flight crew can set the system to operate automatically, semi-automatically, or manually.
In normal operation, cabin pressurization is fully automatic.

AUTOMATIC OPERATION

Ident.: DSC-21-20-10-00000323.0001001 / 21 MAR 16
Applicable to: ALL

The flight crew monitors the operation of the system, but does nothing to control it. Air pressure in the cabin follows external schedules that the system receives as signals from the Flight Management and Guidance System (FMGS).
When FMGS data is not available for automatic pressurization, the crew only needs to select the landing field elevation.
The pressurization system then uses the manually-selected landing field elevation for internal schedules.

MANUAL OPERATION

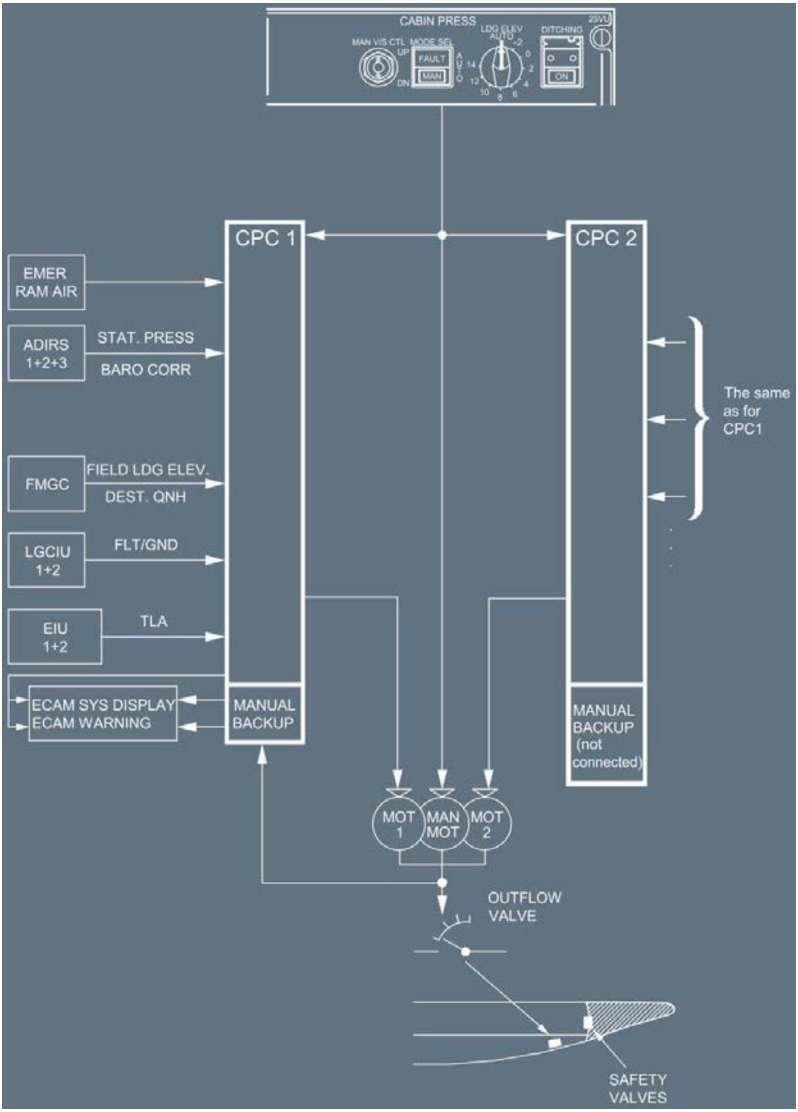
Ident.: DSC-21-20-10-00000324.0001001 / 21 MAR 16
Applicable to: ALL

In manual mode, the flight crew controls the cabin altitude via the manual motor of the outflow valves, by operating controls on the pressurization control panel.

SCHEMATICS

Ident.: DSC-21-20-10-00000325.0002001 / 21 MAR 16

Applicable to: ALL



CABIN PRESSURE CONTROLLERS

Ident.: DSC-21-20-20-00000326.0001001 / 21 MAR 16
Applicable to: ALL

Two identical, independent, digital controllers automatically control the system, by maintaining the proper cabin pressure. They receive signals from the Air Data Inertial Reference System (ADIRS), the Flight Management and Guidance Computer (FMGC), the Engine Interface Unit (EIU), and the Landing Gear Control Interface Unit (LGCIU).
When the system is in automatic or semi-automatic mode, one controller is active, the other is on standby.
The controllers also generate signals for the Electronic Centralized Aircraft Monitoring (ECAM).
For operation in manual mode, each controller has a backup section, which is powered by an independent power supply in the controller N°1 position. This section also has a pressure sensor that generates the cabin altitude and pressure signal for the ECAM , when MAN mode is selected.
The controllers communicate with each other via a cross-channel link.

OUTFLOW VALVE

Ident.: DSC-21-20-20-00000327.0001001 / 21 MAR 16
Applicable to: ALL

The outflow valve is on the right-hand side of fuselage, behind the aft cargo compartment and below the flotation line.
The outflow valve assembly consists of a flush, skin-mounted, rectangular frame, carrying inward and outward opening flaps linked to the actuator. The actuator contains the drives of the two automatic motors and the manual motor. Either of two automatic motors operates the valve in automatic mode, and the manual motor operates it in manual mode.
In automatic mode, the operating controller signals the position of the valve to the ECAM.
In manual mode, the backup section of the N° 1 controller signals the position of the valve to the ECAM.

<u>Note:</u> *When the RAM AIR pushbutton is ON, and Δp is below 1 PSI, the system drives the outflow valve about 50 % open if it is under automatic control. If the system is under manual control, the outflow valve does not automatically open, even if Δp is below 1 PSI.*

SAFETY VALVES

Ident.: DSC-21-20-20-00000328.0001001 / 21 MAR 16
Applicable to: ALL

Two independent pneumatic safety valves prevent cabin pressure from going too high (8.6 PSI above ambient) or too low (1 PSI below ambient).
They are located on the rear pressure bulkhead, above the flotation line.

RESIDUAL PRESSURE CONTROL UNIT (RPCU ⩤)

Ident.: DSC-21-20-20-00017788.0001001 / 21 MAR 16
Applicable to: ALL

The RPCU automatically depressurizes the aircraft in case of abnormal residual pressure on ground.
It automatically opens the outflow valve, when:
- The outflow valve is not fully open, and
- Both CPCs are failed, or manual mode is selected, and
- The aircraft is on ground, and
- All engines are shutdown, or all ADIRS indicate an airspeed below 100 kt.

AUTOMATIC PRESSURE CONTROL MODE

Ident.: DSC-21-20-30-00000329.0001001 / 14 NOV 11
Applicable to: ALL

GENERAL

- Two identical, independent, automatic systems (each consisting of a controller and its associated motors) control cabin pressure.
  Either system controls the single outflow valve.
  Only one controller operates at a time.

  An automatic transfer occurs:
  - 70 s after each landing.
  - If the operating system fails.
- The controller automatically controls the cabin pressure. It limits the cabin pressure to 8 000 ft maximum and optimizes it during climb and descent phases.
- The controller normally uses the landing elevation and the QNH from the FMGC , and the pressure altitude from ADIRS.
  If FMGC data are not available, the controller uses the captain BARO Reference from the ADIRS and the LDG ELEV selection.
- Pressurization is assumed through the following modes:

GROUND (GN)

Before takeoff, and 55 s after landing, the outflow valve fully opens to ensure that there is no residual cabin pressure. At touchdown, any remaining cabin pressure is released at a cabin vertical speed of 500 ft/min.

TAKEOFF (TO)

To avoid a pressure surge at rotation, the controller pre-pressurizes the aircraft at a rate of 400 ft/min, until the ΔP reaches 0.1 PSI. At liftoff, the controller initiates the climb phase.

CLIMB (CL)

During climb, the cabin altitude varies according to a fixed pre-programmed law that takes into account the aircraft's actual rate of climb.

CRUISE (CR)

During cruise, the controller maintains cabin altitude at the level-off value, or at the landing field elevation, whichever is higher.

DESCENT (DE)

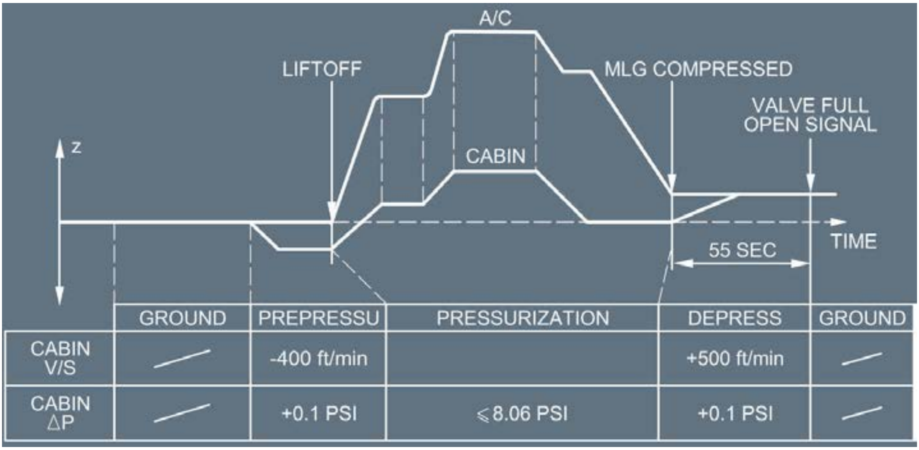
During descent, the controller maintains a cabin rate of descent, such that the cabin pressure is equal to the landing field pressure +0.1 PSI, shortly before landing.
The maximum descent rate is 750 ft/min.

ABORT (AB)

If the aircraft does not climb after takeoff, the abort mode prevents the cabin altitude from climbing.
Cabin pressure is set back to the takeoff altitude +0.1 PSI.

PRESSURIZATION FLIGHT PROFILE

Ident.: DSC-21-20-30-00000331.0001001 / 08 SEP 15
Applicable to: ALL



MANUAL PRESSURE CONTROL MODE

Ident.: DSC-21-20-30-00000332.0001001 / 21 MAR 16
Applicable to: ALL

If both automatic systems fail, the flight crew may use the CABIN PRESS control panel to take over manual control of cabin pressurization.
- Release the MODE SEL pushbutton to select MAN, and
- Push the MAN V/S CTL switch UP or DN to increase or decrease cabin altitude.

The first of these actions cuts off power to the AUTO motors, and enables the MAN motor to control the outflow valve.

Note: 1. *Due to the slow operation of the outflow valves in manual mode, and the limited resolution of the outflow valves' position on the ECAM , the visual ECAM indication of a change in the outflow valves' position can take up to 5 s.*
2. *As the pressurization system is manually-controlled, the outflow valve does not open automatically at touchdown.*

DITCHING

Ident.: DSC-21-20-30-00017789.0001001 / 21 MAR 16
Applicable to: ALL

To prepare for ditching, the flight crew must press the DITCHING pb on the CABIN PRESS control panel to close the outflow valve, the emergency ram air inlet, the avionics ventilation inlet and extract valves, the pack flow control valves, and the FWD cargo outlet isolation valve ⊲ .

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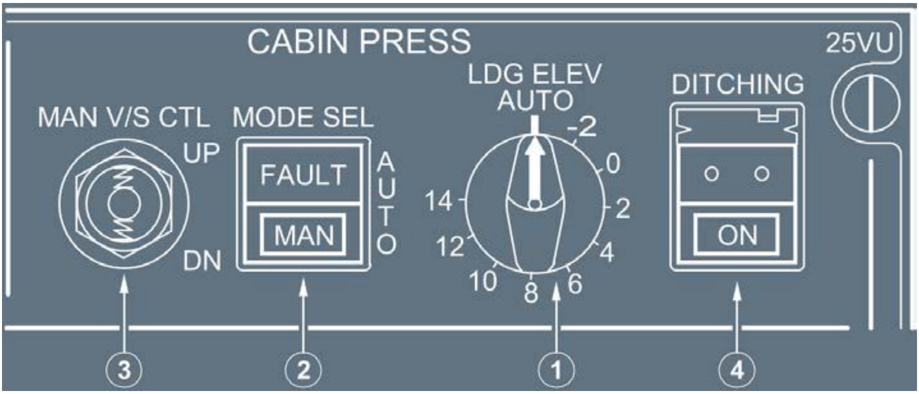
OVERHEAD PANEL

Ident.: DSC-21-20-40-00000334.0003001 / 07 MAY 13
Applicable to: ALL



(1) LDG ELEV knob

AUTO : The pressurization system uses the FMGS data to construct an optimized pressure schedule.
To exit the AUTO position, pull out and turn the selector.

Other positions : The pressurization schedule does not use the landing elevation from the FMGS, but instead uses the landing elevation selected with this knob (from -2 000 to +14 000 ft) as its reference.

Note: *The LDG ELEV knob scale is only given as an indication; refer to the ECAM information for accurate adjustment.*

(2) MODE SEL pb

AUTO : Automatic mode is operating. One of the two systems controls the outflow valve.

MAN : This legend appears in white, and FAULT does not come on. The flight crew then uses the MAN V/S CTL selector to control the outflow valve.

Note: *Switching the MODE SEL pb to MAN, for at least 10 s, then returning it to AUTO will select the other system.*

FAULT lt : This legend appears in amber and the ECAM caution light comes on only when both automatic systems are faulty.

Note: The pilot may notice a variation in the CAB ALT indication on the ECAM PRESS page, when the system switches from the cabin pressure control AUTO mode to MAN mode, due to the reduced resolution of the backup pressure sensor.

(3) MAN V/S CTL toggle switch

The switch, springloaded to neutral controls the outflow valve position through operation of the MAN motor, when the MODE SEL pb is in the MAN position.

UP : The valve moves towards the open position.

DN : The valve moves towards the closed position.

Note: To target precise cabin vertical speed rate, only short inputs should be applied on the toggle switch.

(4) DITCHING guarded pushbutton

Normal : The system functions normally.

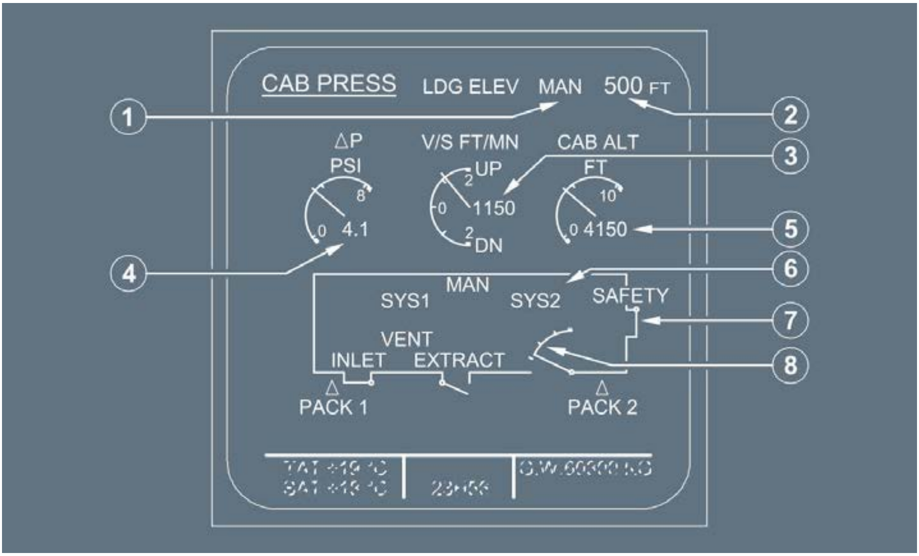
ON : The operating system sends a “close” signal to the outflow valve, emergency ram air inlet, avionics ventilation inlet and extract valves, pack flow control valves.

Note: The outflow valve will not close automatically, if it is under manual control.

CAUTION	If the ditching pb is set to ON, with the low pressure ground cart connected and all doors closed, a differential pressure will build up.

ECAM CAB PRESS PAGE

Ident.: DSC-21-20-40-00000335.0001001 / 21 MAR 16
Applicable to: ALL



(1) LDG ELEV AUTO/MAN

- LDG ELEV AUTO: appears in green when the LDG ELEV selector is in AUTO.
- LDG ELEV MAN: appears in green when the LDG ELEV selector is not in AUTO.

Neither appears when the MODE SEL pushbutton switch is in MAN.

(2) Landing elevation
The landing elevation selected either automatically by the FMGS or manually by the pilot appears in green (but not when the MODE SEL pushbutton switch is in MAN).

(3) V/S FT/MIN (cabin vertical speed)
The analog and digital presentations appear in green when V/S is in the normal range.
They appear in amber when V/S ≥ 2 000 ft/min.
The digital presentation pulses when V/S > 1 800 ft/min (resets at 1 600 ft/min).

(4) ΔP PSI (cabin differential pressure)
The analog and digital presentations appear in green when ΔP is in the normal range.
They appear in amber when ΔP ≤ –0.4 PSI or ≥ 8.5 PSI.

The digital presentation pulses if Δp > 1.5 PSI (resets at 1 PSI) during flight phase 7. (*Refer to DSC-31-15 Flight Phases*).

(5) CAB ALT FT (cabin altitude)
The analog and digital presentations appear in green, in normal range.
They appear in red if the cabin altitude goes above 9 550 ft.
The digital presentation pulses if the cabin altitude is at or above 8 800 ft (resets at 8 600 ft).

(6) Active system indication (SYS 1 or SYS 2 or MAN)
SYS 1 or SYS 2 appears in green when active and in amber when faulty. When either system is inactive, its title does not appear.
MAN appears in green when the MODE SEL switch is in MAN.

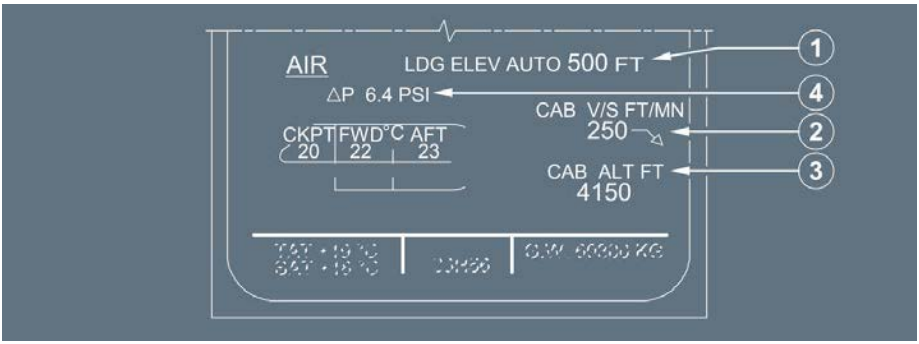
(7) Safety valve position
SAFETY appears in white and the diagram in green when both safety valves are fully closed.
SAFETY and the diagram appear in amber when either valve is not closed.

Note: *The safety valve opens when the cabin differential pressure is between 8.2 and 8.9 PSI. The range is due to the reduced accuracy of ΔP measurements (in MAN mode), combined with the decrease in cabin differential pressure that occurs immediately after the safety valves open.*

(8) Outflow valve position
The diagram is green when the valve is operating normally.
The diagram becomes amber when the valve opens more than 95 % during flight.

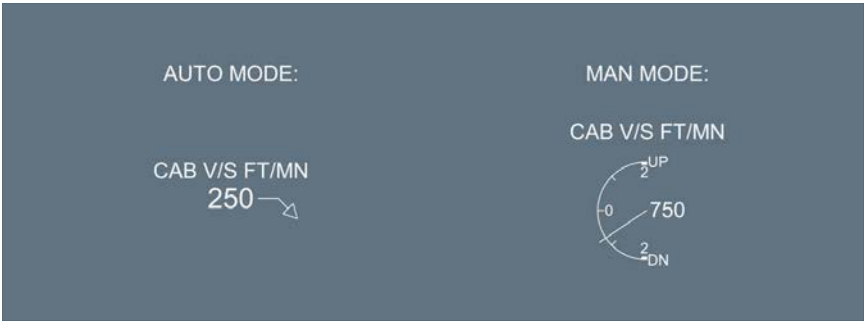
ECAM CRUISE PAGE

Ident.: DSC-21-20-40-00000336.0001001 / 09 OCT 12
Applicable to: ALL



(1) <u>LDG ELEV AUTO/MAN</u>
Identifical to the CAB PRESS page.

(2) <u>CAB V/S FT/MIN (cabin vertical speed)</u>
Green, in normal range.
Amber, when out of normal range : V/S ≥ 2 000 ft/min
Pulses, when the V/S > 1 800 ft/min (resets at 1 600 ft/min).

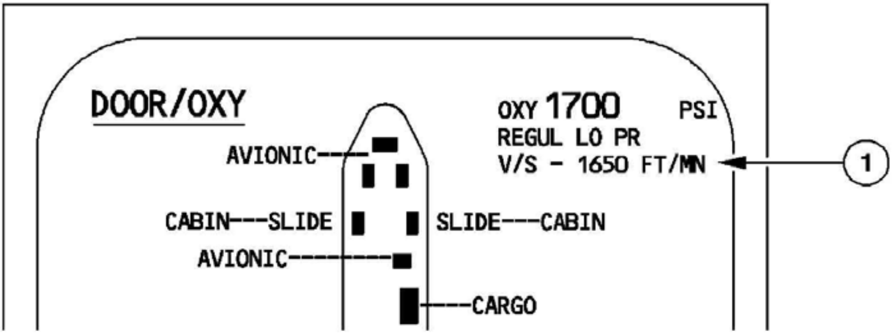


(3) <u>CAB ALT FT (cabin altitude)</u>
Green, in normal range.
Red, for excessive cabin altitude : ≥ 9 550 ft.
Pulses for cabin altitude at, or above, 8 800 ft (resets at 8 600 ft).

(4) <u>ΔP indication</u>
It is normally green.
It becomes amber, when out of normal range Δp ≤ -0.4 PSI or ≥ 8.5 PSI.

ECAM DOOR/OXY PAGE

Ident.: DSC-21-20-40-00000337.0001001 / 21 MAR 16
Applicable to: ALL



(1) V/S (cabin vertical speed)

This number only appears during flight phases 5, 6 and 7. (*Refer to DSC-31-15 Flight Phases* for flight phase definitions).
- It is normally green.
- It becomes amber, when the V/S is greater than 2 000 ft/min, or less than -2 000 ft/min.

MEMO DISPLAY

Ident.: DSC-21-20-40-00016761.0001001 / 21 MAR 16
Applicable to: ALL

MAN LDG ELEV : This memo appears in green, if the LDG ELEV knob is not in the AUTO position.

GENERAL

Ident.: DSC-21-30-10-00017790.0001001 / 21 MAR 16
Applicable to: ALL

The ventilation system includes ventilation for:
- The avionics, controlled by the Avionics Equipment Ventilation Controller (AEVC),
- The batteries,
- The lavatories and galleys.

Note: *For more information about cargo ventilation , Refer to DSC-21-40-10 General.*

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GENERAL

Ident.: DSC-21-30-20-00000341.0001001 / 24 FEB 11
Applicable to: ALL

The avionics ventilation system is fully automatic.
It cools the electrical and electronic components in the avionics compartment and on the flight deck, including the instrument and circuit breaker panels. It uses two electric fans to force the circulation of cooling air.
Whatever the configuration of the avionics ventilation system is, a part of the avionics ventilation air is sucked from the cockpit through the different cockpit panels.

MAIN COMPONENTS

Ident.: DSC-21-30-20-00017791.0001001 / 21 MAR 16
Applicable to: ALL

FANS

Two electric fans continuously circulate air around the avionics equipment, when the aircraft is electrically supplied.
The Fan Speed Controller (FSC) controls the avionics ventilation fan speed as a function of temperature::

1. High speed when the ventilation air temperature is above +40 °C (104 °F)
2. Low speed when the ventilation air temperature is below +35 °C (95 °F)

SKIN AIR INLET AND OUTLET VALVES

These valves admit air from outside the aircraft and evacuate hot air from the avionics equipment.

SKIN EXCHANGE INLET AND OUTLET BYPASS VALVES

These valves enable air to circulate between the avionics bay and the space under the cargo compartment floor.

AIR CONDITIONING INLET VALVE

This valve opens to enable the air conditioning circuit to supply fresh air to the avionics bay.

SKIN EXCHANGE ISOLATION VALVE

This valve connects or isolates the skin heat exchanger.

AVIONICS EQUIPMENT VENTILATION CONTROLLER (AEVC)

The AEVC controls the operation of all fans and valves in the avionics ventilation system.

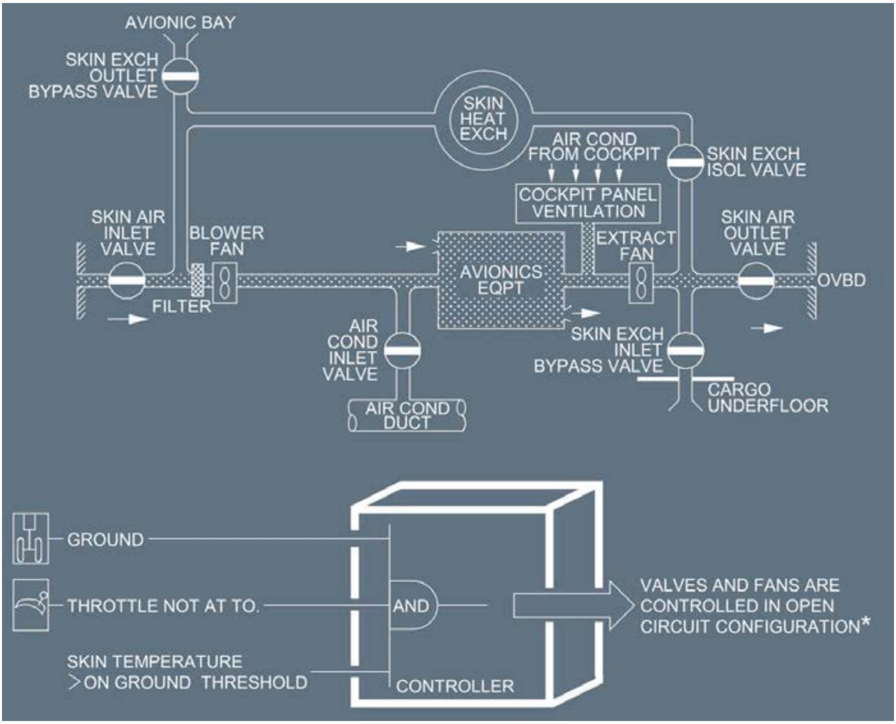
NORMAL OPERATION, OPEN-CIRCUIT CONFIGURATION

Ident.: DSC-21-30-20-00000343.0001001 / 16 APR 14
Applicable to: ALL

GROUND OPERATIONS

The open-circuit configuration operates when skin temperature is above the on-ground threshold.

On-ground threshold = +12 °C (53 °F), temperature increasing, or
+9 °C (48 °F), temperature decreasing.



(*)

<u>Note:</u> *In some cases, the opening of the skin air valves can be delayed even if the skin temperature is above the on-ground thresholds: This is to avoid condensation phenomenon when the temperature inside the avionic compartment is too cold.*

NORMAL OPERATION, CLOSE-CIRCUIT CONFIGURATION

Ident.: DSC-21-30-20-00000345.0001001 / 09 OCT 12
Applicable to: ALL

FLIGHT OPERATIONS

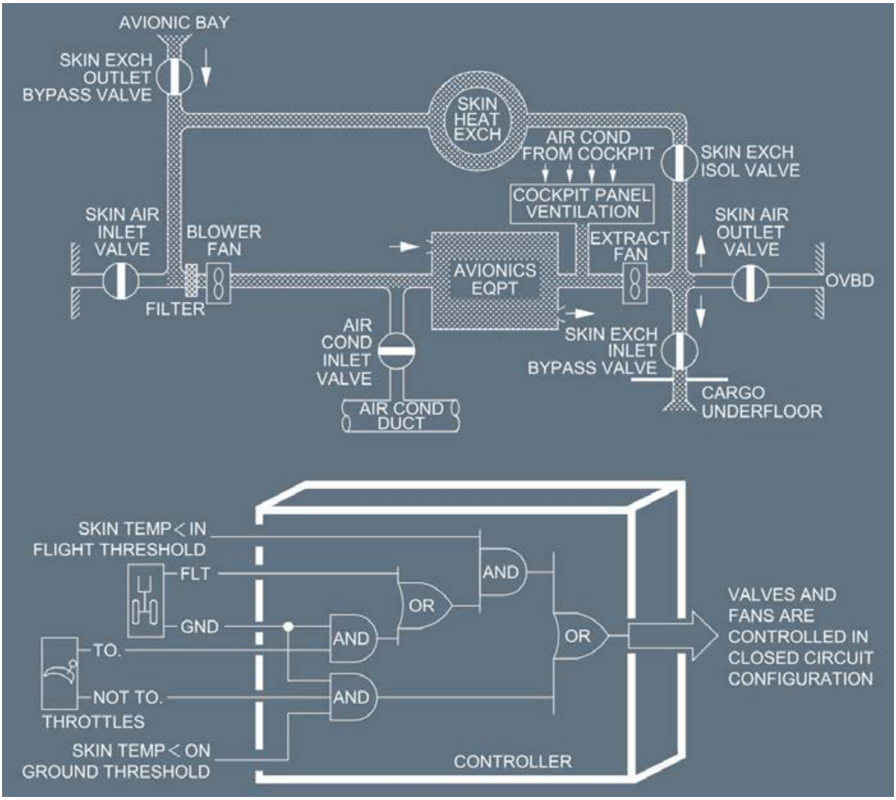
The close-circuit configuration operates when skin temperature is beneath the in-flight threshold.

In flight threshold = +35 °C (95 °F), temperature increasing, or
+32 °C (90 °F), temperature decreasing.

GROUND OPERATIONS

The close-circuit configuration operates when skin temperature is beneath the on-ground threshold.

On ground threshold = +12 °C (53 °F), temperature increasing, or
+9 °C (48 °F), temperature decreasing.



NORMAL OPERATION, INTERMEDIATE CONFIGURATION

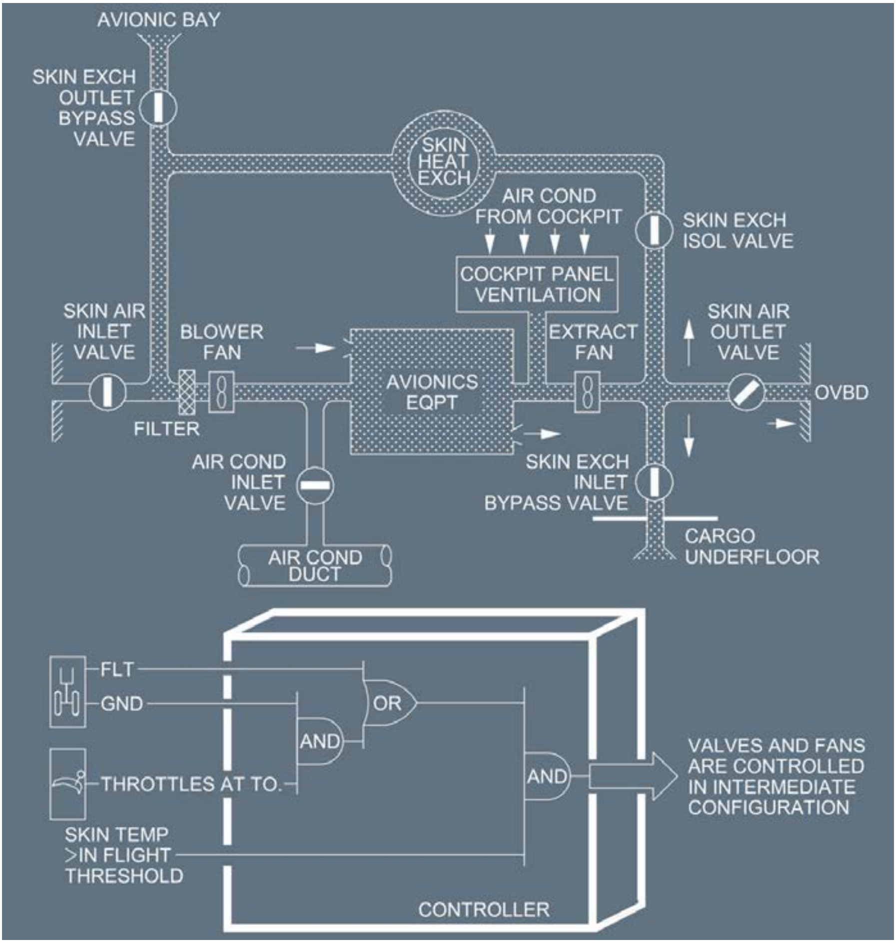
Ident.: DSC-21-30-20-00000344.0001001 / 09 OCT 12
Applicable to: ALL

FLIGHT OPERATIONS

The intermediate configuration operates when skin temperature is above the in-flight threshold.

In flight threshold = +35 °C (95 °F), temperature increasing, or
+32 °C (90 °F), temperature decreasing.

Note: *The measuring range of the skin temperature sensed is between -50 °C and 80 °C. Outside of this range, the AEVC sets the avionics ventilation configuration to the intermediate configuration (partially open) until the temperature is within the operation range again.*



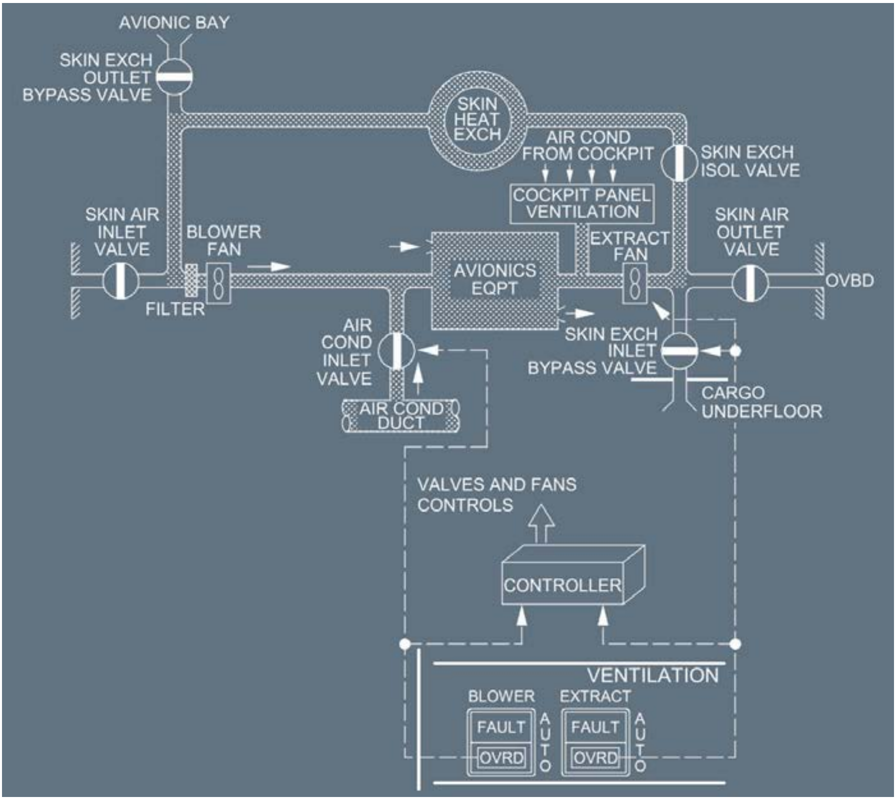
ABNORMAL OPERATION

Applicable to: ALL

Ident.: DSC-21-30-20-A-00000346.0001001 / 20 JAN 15

BLOWER FAULT OR EXTRACT FAULT ALERT

When the BLOWER or the EXTRACT pushbutton switch is set at the OVRD (override) position, the system is in closed-circuit configuration and adds air from the air conditioning system to the ventilation air.

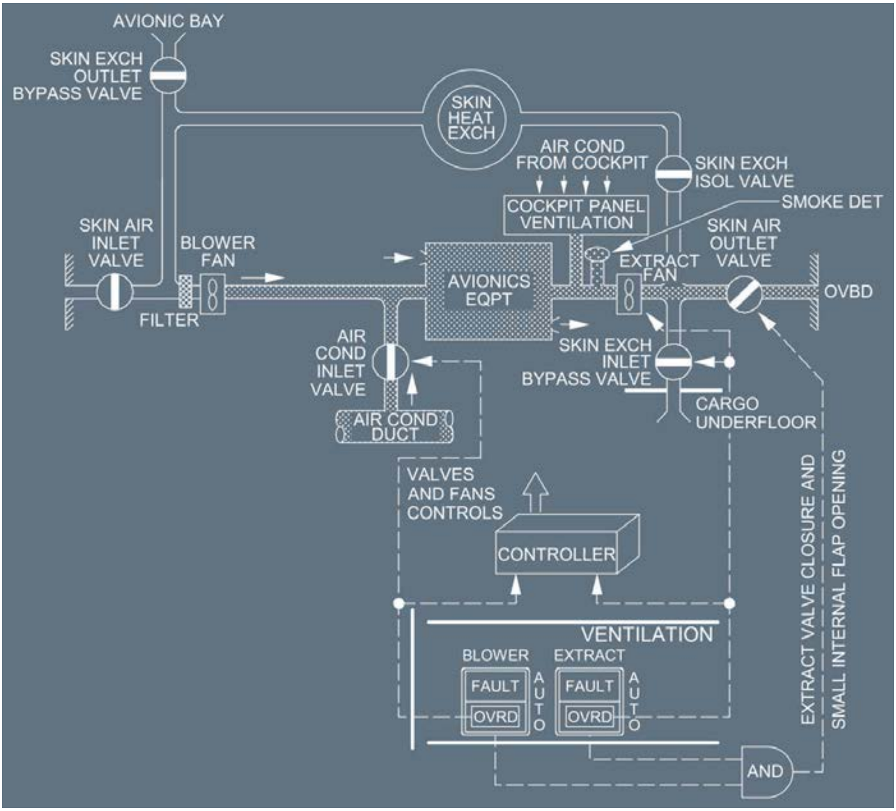


When the BLOWER pushbutton switch is set at OVRD, the blower fan is stopped and the extract fan continues to run.
When the EXTRACT pushbutton switch is set at OVRD, the extract fan is controlled directly from the pushbutton. Both fans continue to run.

Ident.: DSC-21-30-20-A-00000347.0001001 / 09 OCT 12

SMOKE CONFIGURATION

When the smoke detector detects smoke in the avionics ventilation air the BLOWER and the EXTRACT FAULT lights come on.
When both the BLOWER and the EXTRACT pushbuttons are set to the OVRD position, the air conditioning system supplies cooling air, which is then exhausted overboard. The blower fan stops.



Ident.: DSC-21-30-20-A-00000348.0001001 / 21 MAR 16

CONTROLLER FAILURE

The system goes to the same configuration as above, except that the skin exchange isolation valve stays open.

The inlet valve and the skin exchange inlet bypass valve remain in the position they were in before the failure occurred.
The extract fan keeps running.

BATTERY VENTILATION

Ident.: DSC-21-30-40-00000350.0001001 / 21 MAR 16
Applicable to: ALL

A venturi in the skin of the aircraft draws air from the space around the batteries and vents it overboard. The resulting airflow ventilates the batteries.

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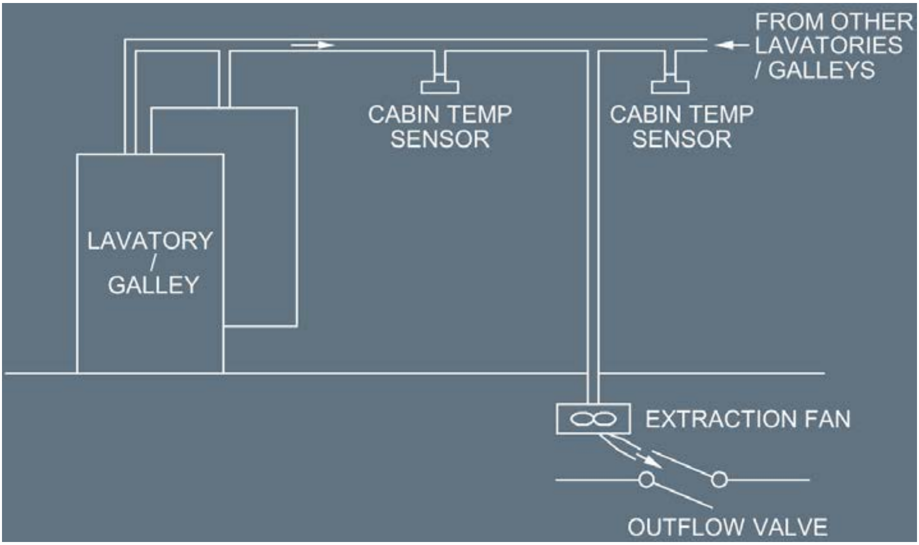
LAVATORY AND GALLEY

Ident.: DSC-21-30-50-00000351.0001001 / 09 OCT 12
Applicable to: ALL

An extraction fan draws ambient cabin air through the lavatories and galleys and exhausts it near the outflow valve.
The extraction fan runs continually when electric power is available.



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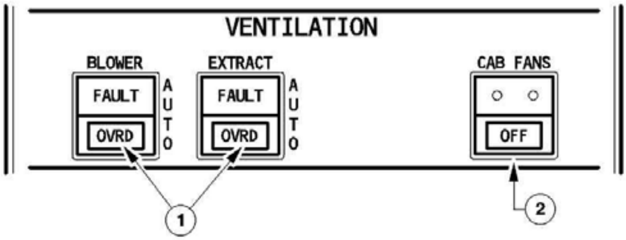
OVERHEAD PANEL

Ident.: DSC-21-30-60-00000352.0001001 / 24 FEB 11
Applicable to: ALL



(1) BLOWER pb-sw and EXTRACT pb-sw

AUTO: : When both pushbutton switches are on AUTO:
- On the ground before the application of TO power, the ventilation system is in open circuit configuration (closed configuration when the skin temperature is below the ground threshold).
- On the ground after the application of TO power, and in flight, the ventilation system is in closed circuit configuration.

OVRD: : When either pushbutton switch is on OVRD:
- The system goes to closed circuit configuration.
- Air from the air conditioning system is added to ventilation air. (The blower fan stops if the BLOWER pushbutton switch is in the OVRD position).

When both pushbutton switches are on OVRD:
- Air flows from the air conditioning system and then overboard.
- The extract fan continues to run.

FAULT lt: : Lights up amber (and ECAM activates)

in the blower switch, if :
- blowing pressure is low (See *)
- duct overheats (See *)
- computer power supply fails
- smoke warning is activated

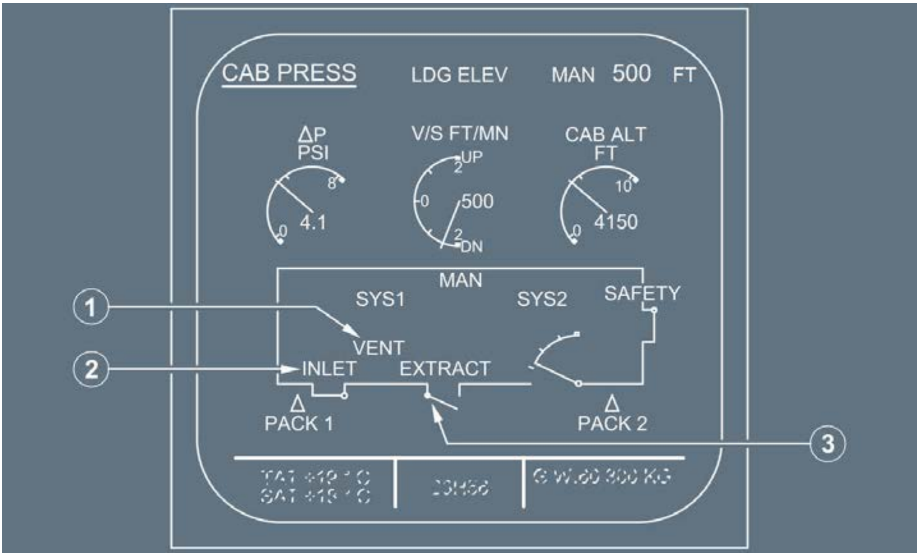
in the extract switch, if :
- extract pressure is low (See *)
- computer power supply fails
- smoke warning is activated.

* If the warning occurs on the ground when the engines are stopped, the external horn sounds.

(2) *Refer to DSC-21-10-50 Controls on Overhead Panel*

ECAM CAB PRESS PAGE

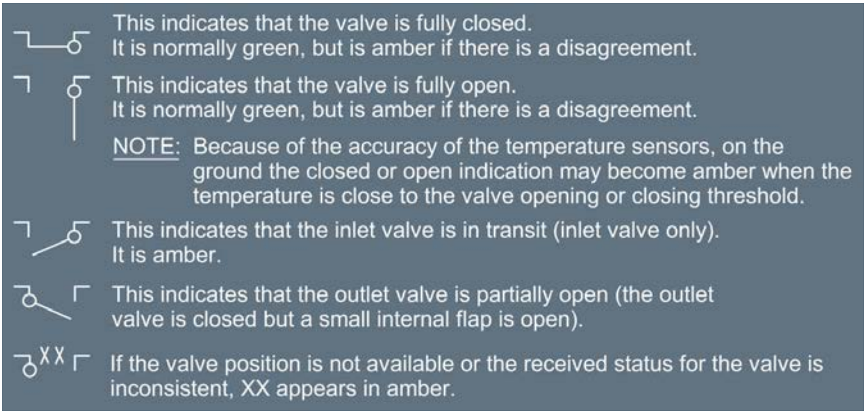
Ident.: DSC-21-30-60-00000353.0001001 / 03 APR 13
Applicable to: ALL



(1) VENT
This normally appears in white. It becomes amber, if there is a BLOWER FAULT, EXTRACT FAULT, or AVNCS SYS FAULT.

(2) INLET and EXTRACT Indications
Normally white. The corresponding indication becomes amber, in case of a BLOWER FAULT or EXTRACT FAULT.

(3) INLET and EXTRACT Valve Diagrams



This indicates that the valve is fully closed.
It is normally green, but is amber if there is a disagreement.

This indicates that the valve is fully open.
It is normally green, but is amber if there is a disagreement.

NOTE: Because of the accuracy of the temperature sensors, on the ground the closed or open indication may become amber when the temperature is close to the valve opening or closing threshold.

This indicates that the inlet valve is in transit (inlet valve only).
It is amber.

This indicates that the outlet valve is partially open (the outlet valve is closed but a small internal flap is open).

If the valve position is not available or the received status for the valve is inconsistent, XX appears in amber.

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GENERAL

Ident.: DSC-21-40-10-00017795.0001001 / 21 MAR 16
Applicable to: ALL

CARGO VENTILATION

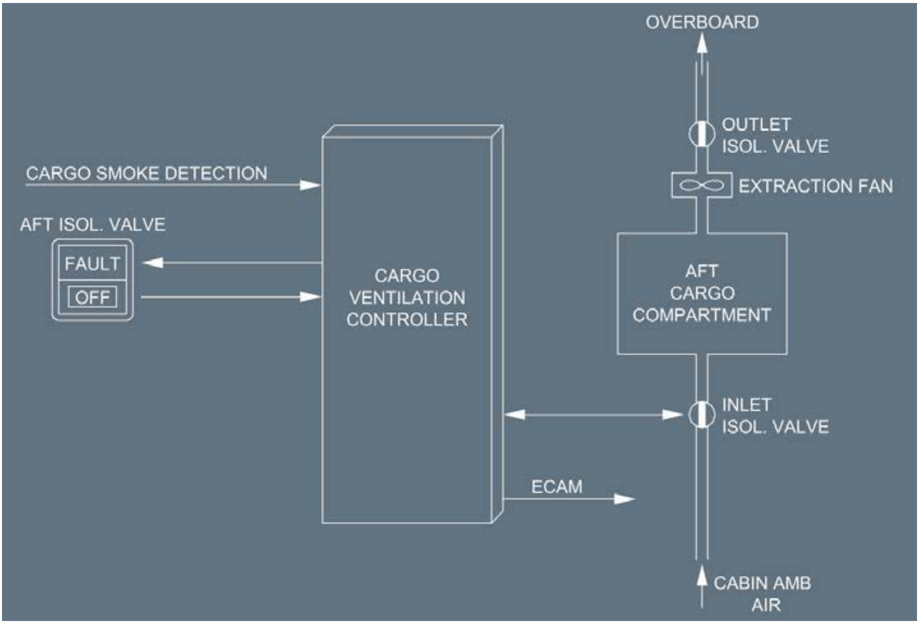
An extraction fan draws air from forward cargo compartment or aft cargo compartment, and exhausts it overboard. Air from the cabin replaces the exhausted air, thus ventilating the cargo compartments.

CARGO TEMPERATURE REGULATION

The system can mix hot bleed air with the air coming from the cabin, therefore giving the flight crew control of the temperature in the forward or aft cargo compartment.

SCHEMATIC

Ident.: DSC-21-40-10-00000357.0002001 / 22 MAY 12
Applicable to: ALL



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FWD CARGO VENTILATION

Ident.: DSC-21-40-20-00017796.0001001 / 21 MAR 16
Applicable to: ALL

Air from the cabin goes via the inlet isolation valve to the forward cargo compartment, driven either by an extraction fan or by differential pressure in flight. A skin-mounted venturi discharges the air overboard via the outlet isolation valve. The cargo ventilation controller controls the operation of the inlet and outlet isolation valves and the extraction fan.

The ventilation system operates in two modes:
- On the ground or when $\Delta P \leq 1$ PSI in flight, the controller opens the isolation valves, then starts the extraction fan
- In flight when $\Delta P > 1$ PSI, the controller stops the fan, and differential pressure maintains the ventilation.

The controller closes the isolation valves and stops the extraction fan when:
- The flight crew sets the FWD ISOL VALVE pb-sw to OFF, or
- The forward cargo smoke detection unit detects smoke.

The outlet valve closes and the extraction fan stops when the flight crew sets the DITCHING pb-sw to ON.

AFT CARGO VENTILATION

Ident.: DSC-21-40-20-00017797.0001001 / 21 MAR 16
Applicable to: ALL

Air from the cabin goes via the inlet isolation valve to the aft cargo compartment, driven by an extraction fan. Air is controlled by the outlet isolation valve and then goes outboard through the outflow valve.
The cargo ventilation controller controls the operation of the inlet and outlet isolation valves and the extraction fan.
When the isolation valves are fully open, the extraction fan operates continuously when the aircraft is on the ground and during flight.

The controller closes the isolation valves and stops the extraction fan when:
- The flight crew sets the AFT ISOL VALVE pb-sw to OFF, or
- The aft cargo smoke detection unit detects smoke.

AFT CARGO HEATING

Ident.: DSC-21-40-20-00017798.0001001 / 21 MAR 16
Applicable to: ALL

The ventilation system for the aft cargo compartment uses hot engine bleed air (upstream of the packs), mixing it with the ambient cabin air that flows through the cargo compartment.
The cargo regulating valve regulates the pressure of this hot air supply, and the trim air valve, which is modulated electrically by the controller, controls the flow.
The cargo pressure regulating valve is pneumatically operated and electrically controlled from the HOT AIR pb on the CARGO HEAT panel.
The hot air is controlled by the cargo trim air valve which is modulated electrically by the controller.
The hot air is then mixed with air from the cabin and supplied to the cargo compartment through the ventilation inlet isolation valve.
According to the temperature selector demand, the controller regulates the amount of hot air added by the trim air valve, until the desired temperature is reached.
If the inlet temperature exceeds 70 °C, the controller closes the trim air valve.
If the inlet temperature exceeds 88 °C, the controller interprets this as a duct overheat and closes the pressure regulating valve. This valve then remains closed until the flight crew resets the system by pressing the HOT AIR pb — which it cannot do until the temperature drops below 70 °C.

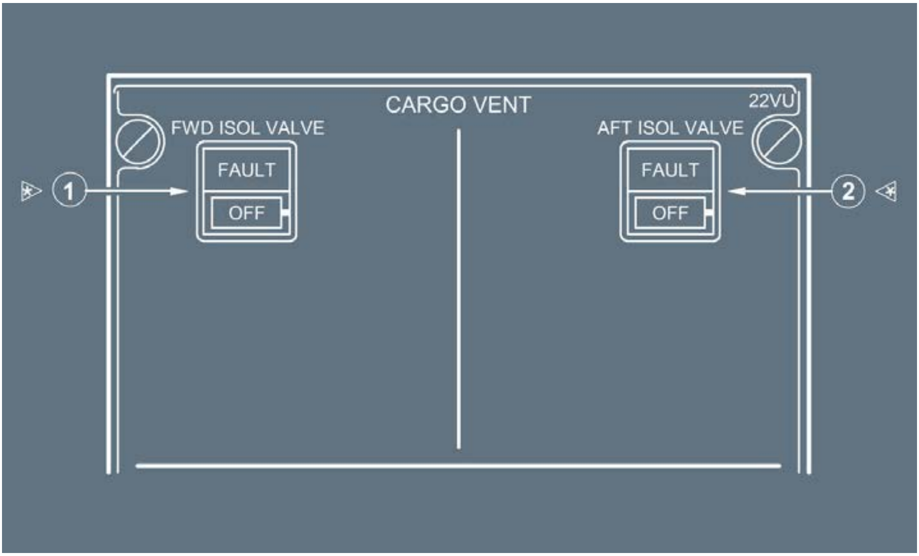
FWD CARGO HEATING

Ident.: DSC-21-40-20-00017799.0001001 / 21 MAR 16
Applicable to: ALL

The ventilation system for the forward cargo compartment uses hot engine bleed air, which is also used for cockpit and cabin temperature control, mixing it with the ambient cabin air that flows through the cargo compartment.
The cockpit and cabin hot air pressure regulating valve regulates the pressure of this hot air supply, and the cargo trim air valve, which is modulated electrically by the controller, controls the flow.
The hot air mixes with air from the cabin as it supplied to the cargo compartment through the ventilation inlet isolation valve.
The controller regulates the amount of hot air added by the trim air valve to get the desired temperature, per the temperature selector.
If the inlet temperature exceeds 70 °C, the controller closes the trim air valve. If the inlet temperature reaches 88 °C, the controller interprets this as a duct overhead and closes the pressure regulating valve. This valve then remains closed until the flight crew resets the system by pressing the HOT AIR pb - which it cannot do until the temperature drops below 70 °C.

OVERHEAD PANEL

Ident.: DSC-21-40-30-00017800.0001001 / 20 MAR 17
Applicable to: ALL



(1) FWD ISOL VALVE pb-sw
The switch controls the forward isolation valves and the extraction fan.

Auto : The inlet and outlet isolation valves open, extraction fan runs if there is no smoke detected in the fwd cargo bay.

OFF : The inlet and outlet isolation valves and the trim air valve close, the extraction fan stops.

FAULT lt : The light, associated with the ECAM caution, comes on amber when either inlet or outlet valve is not in the selected position.

(2) AFT ISOL VALVE pb-sw
The switch controls the isolation valves and the extraction fan.

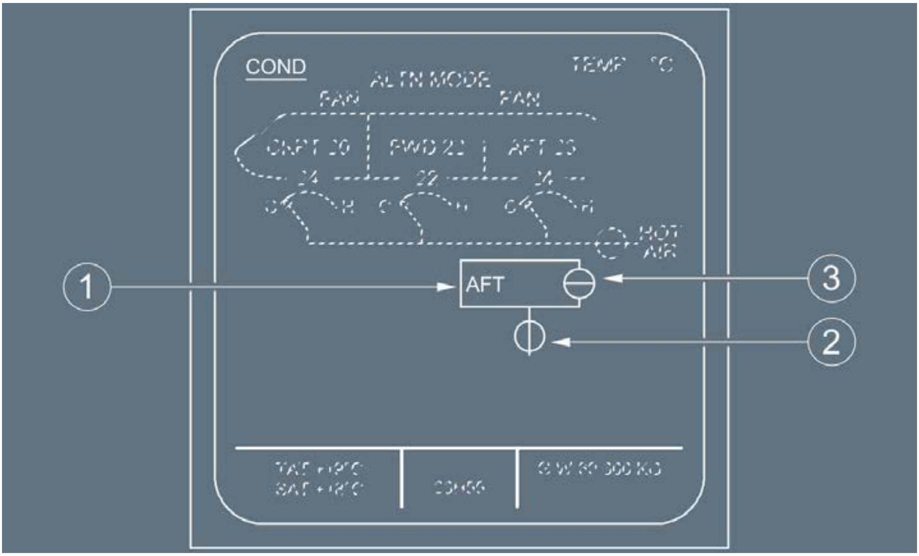
Auto : The inlet and outlet isolation valves open, extraction fan runs if there is no smoke detected in the aft cargo bay.

OFF : The inlet and outlet isolation valves and the trim air valve close, the extraction fan stops.

FAULT lt : The light, associated with the ECAM caution, comes on amber when either inlet or outlet valve is not in the selected position.

ECAM COND PAGE

Ident.: DSC-21-40-35-00006005.0002001 / 22 MAY 12
Applicable to: ALL



(1) Zone indication
It is white.

(2) Inlet isolation valve

In line – Green	:	Valve is open.
Crossline – Amber	:	Valve is closed.

(3) Outlet isolation valve

Crossline – Green	:	Valve is open.
In line – Amber	:	Valve is closed.

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AIRCRAFT SYSTEMS

AUTO FLIGHT - GENERAL

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Continued on the following page

Continued from the previous page

FMGC STANDARD

Ident.: DSC-22_10-10-00014871.0012001 / 24 JUL 13
Applicable to: ALL

The aircraft is equipped with FMS 2 HONEYWELL Release 1A H2 and FG C13.

PREAMBLE

Ident.: DSC-22_10-10-00010067.0001001 / 17 AUG 10
Applicable to: ALL

This section gives a general description of the Auto Flight System and its functions:
- Architecture
- Function description
- Basic principle of systems:
  - Reversion
  - Protection
  - Managed and selected guidance modes.
- Mode information
- Display characteristics
- Operational principles
- Flight crew interface (MCDU pages)
- Degraded modes of operations.

DESCRIPTION

Ident.: DSC-22_10-10-00010068.0001001 / 17 AUG 10
Applicable to: ALL

The Flight Management Guidance System (FMGS) contains the following units:
- Two Flight Management Guidance Computers (FMGC)
- Two Multipurpose Control and Display Units (MCDU) (third MCDU optional)
- One Flight Control Unit (FCU)
- Two Flight Augmentation Computers (FAC).

GENERAL PHILOSOPHY

Ident.: DSC-22_10-10-00010069.0001001 / 17 AUG 10
Applicable to: ALL

The Flight Management and Guidance System (FMGS) provides predictions of flight time, mileage, speed, economy profiles and altitude.
It reduces cockpit workload, improves efficiency, and eliminates many routine operations generally performed by the flight crew.

The Flight Management Guidance System (FMGS) operates as follows:
- During cockpit preparation the flight crew uses the Multipurpose Control and Display Unit (MCDU) to insert a preplanned route from origin to destination. This route includes SID , EN ROUTE, WAYPOINTS, STAR , APPROACH, MISSED APPR , and ALTN route as available from the navigation database.
- Subsequently the system defines a vertical profile and a speed profile, taking into account ATC requirements and performance criteria.

Either FMGC performs all operations, if one FMGC fails.
The FMGS computes the aircraft position continually, using stored aircraft performance data and navigation data. Therefore it can steer the aircraft along a preplanned route and vertical and speed profiles. This type of guidance is said to be “managed”.
If the flight crew wants to modify any flight parameter (SPD , V/S , HDG , etc.) temporarily, they may do so by using the various Flight Control Unit (FCU) selectors. The FMGS then guides the aircraft to the target value of this parameter that they have selected. This type of guidance is said to be “selected”.

The two available types of guidance, then, are:
- Managed guidance guides the aircraft along the preplanned route and the vertical and speed/Mach profile. (The FMGS computes the target values of the various flight parameters).
- Selected guidance guides the aircraft to the target values of the various flight parameters the flight crew selects by using the FCU selectors.

Selected guidance always has priority over managed guidance.

FLIGHT MANAGEMENT GUIDANCE COMPUTER (FMGC)

Ident.: DSC-22_10-10-00010073.0002001 / 17 AUG 10
Applicable to: ALL

Each FMGC is divided into two main parts:
- The Flight Management (FM) part controls the following functions:
  - Navigation and management of navigation radios
  - Management of flight planning
  - Prediction and optimization of performance
  - Display management.
- The Flight Guidance (FG) part performs the following functions:
  - Autopilot (AP) command
  - Flight Director (FD) command
  - Autothrust (A/THR) command.

Each FMGC has its own set of databases. The individual databases can be independently loaded into their respective FMGC , or independently copied from one FMGC to the other.

Each FMGC contains these main databases:

1. The Navigation database (2.8 Mbytes) contains standard navigation data: Navaids, waypoints, airways, enroute information, holding patterns, airports, runways, procedures (SID s, STARs, etc.), company routes, alternates.
   The airline updates this part every 28 days, and is responsible for defining, acquiring, updating, loading, and using this data. The updating operation takes 20 min to complete or 5 min if cross loaded from the opposite FMGC.
2. The Airline Modifiable Information (AMI), also described as the FM Airline Configuration file, contains:
   - Airline policy values: THR RED altitude, ACC altitude, EO ACC altitude, PERF factor, IDLE factor.
   - Fuel policy values: Fuel for taxi, % of route reserve, maximum and minimum values of route reserve, etc.
   - AOC functions customization.
3. The Aircraft Performance database includes the Engine model, Aerodynamical model, and Performance model. The airline cannot modify this database.
4. The Magnetic Variation database.
5. Each FMGC contains elements stored by the flight crew that enable them to create 20 waypoints, 10 runways, 20 navaids, and 5 routes.

MULTIPURPOSE CONTROL AND DISPLAY UNIT (MCDU)

Ident.: DSC-22_10-10-00010074.0001001 / 17 AUG 10
Applicable to: ALL

Two MCDU s are installed on the pedestal for flight crew loading and display of data. The use of the MCDU allows the flight crew to interface with the FMGC by selection of a flight plan for lateral and vertical trajectories and speed profiles. The flight crew may also modify selected navigation or performance data and specific functions of Flight Management (revised flight plan, engine-out, secondary flight plan, etc.). Additional data from peripherals (Centralized Fault Display System (CFDS), ARINC Communication Addressing and Reporting System (ACARS), Air Traffic Service Unit (ATSU)...) can also be displayed. Data that is entered into the MCDU that is illogical or beyond the aircraft capabilities will either be disregarded or will generate an advisory message.

FLIGHT CONTROL UNIT (FCU)

Ident.: DSC-22_10-10-00010075.0001001 / 17 AUG 10
Applicable to: ALL

The FCU located on the glareshield, is the short-term interface between the flight crew and the FMGC . It is used to select any flight parameters or modify those selected in the MCDU. The autopilots and autothrust functions may be engaged or disengaged. Different guidance modes can be selected to change various targets (speed, heading, track, altitude, flight path angle, vertical speed).

FLIGHT AUGMENTATION COMPUTER (FAC)

Ident.: DSC-22_10-10-00010076.0001001 / 17 AUG 10
Applicable to: ALL

The FAC controls rudder, rudder trim and yaw damper inputs. It computes data for the flight envelope and speed functions. The FAC also provides warning for low-energy and windshear detection if these functions are installed.

OTHER FLIGHT CREW INTERFACES

Applicable to: ALL

Ident.: DSC-22_10-10-A-00010077.0001001 / 23 JUN 15

THRUST LEVERS

The thrust levers are the main interface between the Flight Management Guidance Computer (FMGC), the Full Authority Digital Engine Control System (FADEC), and the flight crew.

The thrust levers:
- Arm the autothrust at takeoff, when FLX or TOGA is selected
- Limit the maximum thrust by their position when autothrust is active
- Disconnect the autothrust system when the flight crew sets them to IDLE
- Command the thrust manually when autothrust is not active
- Engage the common modes (takeoff or go-around) when TOGA (or FLX for takeoff) is set
- Set the autothrust to the active mode when they are between IDLE and CL detent (MCT in engine out).

Ident.: DSC-22_10-10-A-00010078.0001001 / 17 AUG 10

ELECTRONIC FLIGHT INSTRUMENTS (EFIS)

Two Primary Flight Displays (PFD) and Navigation Displays (ND) provide the flight crew with full-time flight guidance, navigation and system advisory information for all flight phases. An EFIS control panel is located at each end of the glareshield and is used to control both Primary and Navigation Displays. This panel includes controls to select various modes within the PFD . A selector allows the barometric altimeter setting to be displayed on the PFD . Various distance ranges can be selected on the ND , and two switches allow either the left or right VOR /ADF bearing pointers to be displayed on the ND.

Ident.: DSC-22_10-10-A-00010079.0001001 / 17 AUG 10

PRIMARY FLIGHT DISPLAYS

The PFDs combine several conventional flight instrument indications on one color display panel, for centralized reference of flight data.

This centralized color display includes:
- Flight Director attitude guidance targets
- Armed and engaged modes
- Navigation and instrument approach information
- Altimeter setting
- Barometric altitude
- System messages.

Ident.: DSC-22_10-10-A-00010080.0002001 / 17 AUG 10

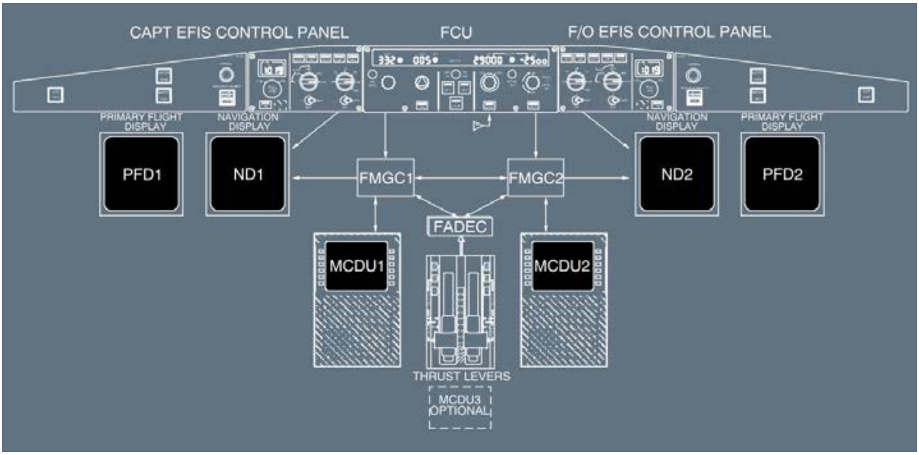
NAVIGATION DISPLAYS

Five different color navigation compass displays can be selected:
- ARC (map mode)
- ROSE NAV (map mode)
- ROSE VOR
- ROSE LS
- PLAN.

Information displayed on these modes uses the aircraft's position as a reference point for the flight plan navigation data (lateral and vertical information).

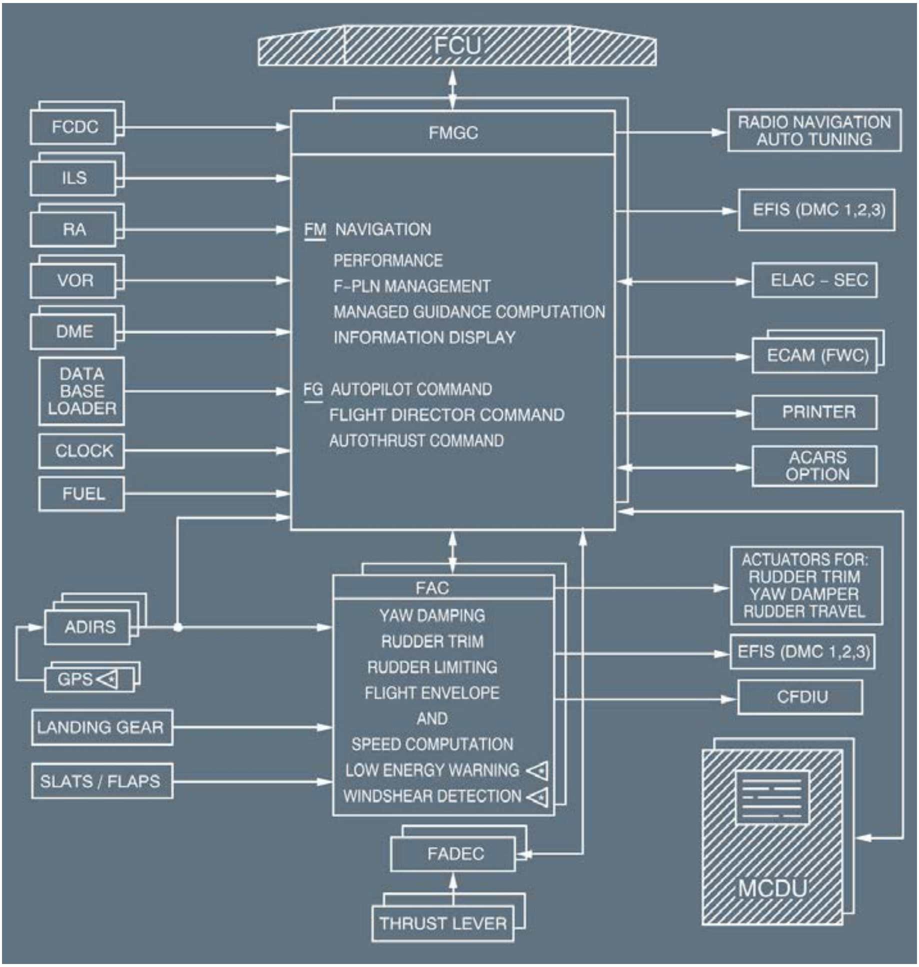
FLIGHT CREW INTERFACE WITH FMGC

Ident.: DSC-22_10-10-00010082.0002001 / 14 MAY 12
Applicable to: ALL



SYSTEM INTERFACE DIAGRAM

Ident.: DSC-22_10-20-00010084.0001001 / 01 OCT 12
Applicable to: ALL



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GENERAL

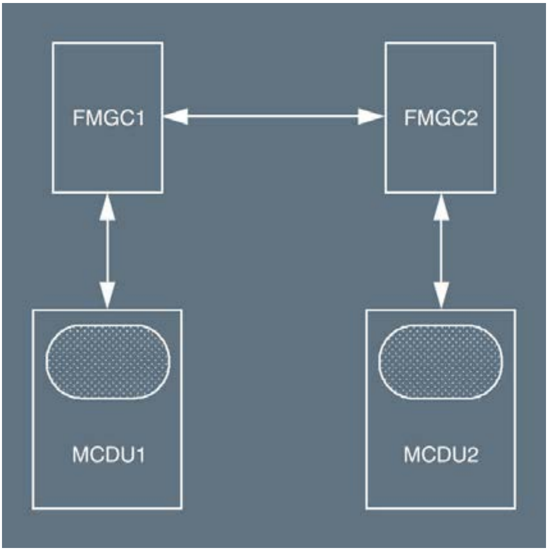
Ident.: DSC-22_10-30-00010085.0001001 / 17 AUG 10
Applicable to: ALL

The FMGS has three modes of operation:
- Dual mode (the normal mode)
- Independent mode. Each FMGC being controlled by its associated MCDU
- Single mode (using one FMGC only).

DUAL MODE

Ident.: DSC-22_10-30-00010086.0001001 / 01 OCT 12
Applicable to: ALL

This is the normal mode. The two FMGCs are synchronized: each performs its own computations and exchanges data with the other through a crosstalk bus.
One FMGC is the master, the other the slave, so that some data in the slave FMGC comes from the master.
All data inserted into any MCDU is transferred to both FMGCs and to all peripherals.

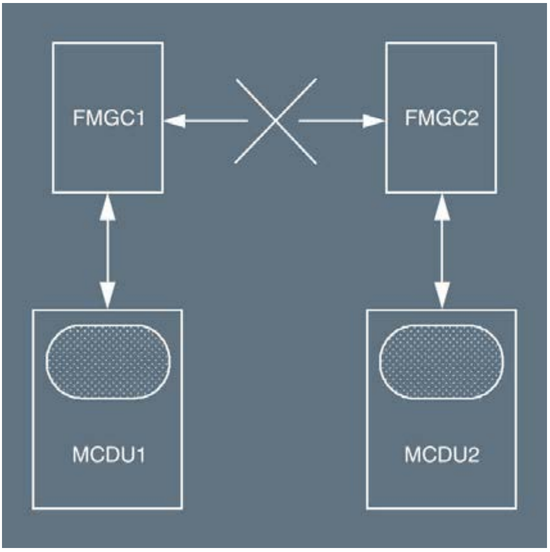


MASTER FMGC LOGIC

- If one autopilot (AP) is engaged, the related FMGC is master:
  - It uses the onside FD for guidance
  - It controls the A/THR
  - It controls the FMA 1 and 2.
- If two AP s are engaged, FMGC1 is master.
- If no AP is engaged, and
  - The FD1 pb is on, then FMGC1 is master
  - The FD1 pb is off, and FD2 pb on then FMGC2 is master.
- If no AP /FD is engaged, A/THR is controlled by FMGC1.

INDEPENDENT MODE

Ident.: DSC-22_10-30-00010087.0001001 / 01 OCT 12
Applicable to: ALL



The system automatically selects this degraded mode under specific abnormal conditions (e.g. different database validity on both FMGCs).
Both FMGCs work independently and are linked only to peripherals on their own sides of the flight deck (“onside” peripherals).
When this occurs, the “INDEPENDENT OPERATION” message is displayed on both MCDU scratchpads.

Each MCDU transmits data it receives from its onside FMGC . It affects only the onside EFIS (Electronic Flight Instrument System) and RMP (Radio Management Panel).
On the POS MONITOR page (and GPS MONITOR page), FMGS position (and GPS position) from the opposite FMGC is not displayed.
On the RAD NAV page (and PROG page, if the FMGS GPS is not installed), navaids tuned on the opposite MCDU are not displayed. Corresponding fields are blank.

PROCEDURES ON GROUND

- **If each FMGC is loaded with a different database,** the FMGS will only operate in independent mode.

  CHECK the database number and validity.

  CROSSLOAD the database to restore the dual operation.

  Crossload function is available on ground only (in preflight or done phase), when an independent operation is detected.

PROCEDURES IN FLIGHT

DO NOT SWITCH the navigation databases.
MAKE the same entries on both MCDU s to have both AP /FDs similar orders.

Both FG s being valid, 2 AP s may be engaged for CAT II or CAT III operations.

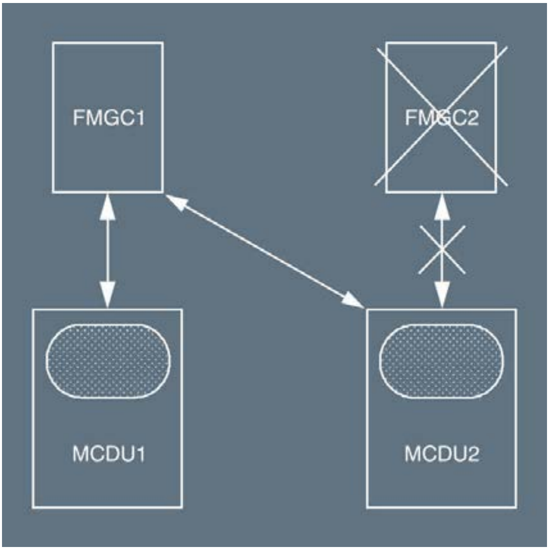
- **In the event of a go-around and when the second AP is disconnected:**

  ENSURE that the FMGC in command has correct flight plan orders and an updated nav database.

  Airbus does not recommend pulling one FMGC circuit breaker to force the system to operate in SINGLE mode.

SINGLE MODE

Ident.: DSC-22_10-30-00010088.0001001 / 01 OCT 12
Applicable to: ALL



The system automatically selects this degraded mode when one FMGC fails.
When this occurs, the failed FMGC displays "OPP FMGC IN PROCESS" in white on the MCDU scratchpad.
The corresponding ND displays the "SELECT OFFSIDE RNG/MODE" amber message.
Both POS MONITOR pages display the same position (operative FMGC position).
Both FD s are driven by the same FMGC . Any entry on either MCDU is sent to the operative FMGC.

PROCEDURES

- **If a transient failure triggers a single mode of operation:**

  DO NOT USE the MCDU(s) until the PLEASE WAIT message is suppressed.

  SET both NDs on the same range and mode to display the same information from the operative FMGC.

  When convenient, RESET the failed FMGC. (*Refer to DSC-22_20-90-10 Manual FMGC Reset - General*).

GENERAL

Ident.: DSC-22_10-40-05-00010083.0001001 / 17 AUG 10
Applicable to: ALL

The flight management system displays navigation, performance and guidance information on the:
- Multipurpose Control and Display Unit (MCDU)
- Navigation Display (ND) of the Electronic Flight Instrument System (EFIS)
- Primary Flight Display (PFD) of the EFIS.

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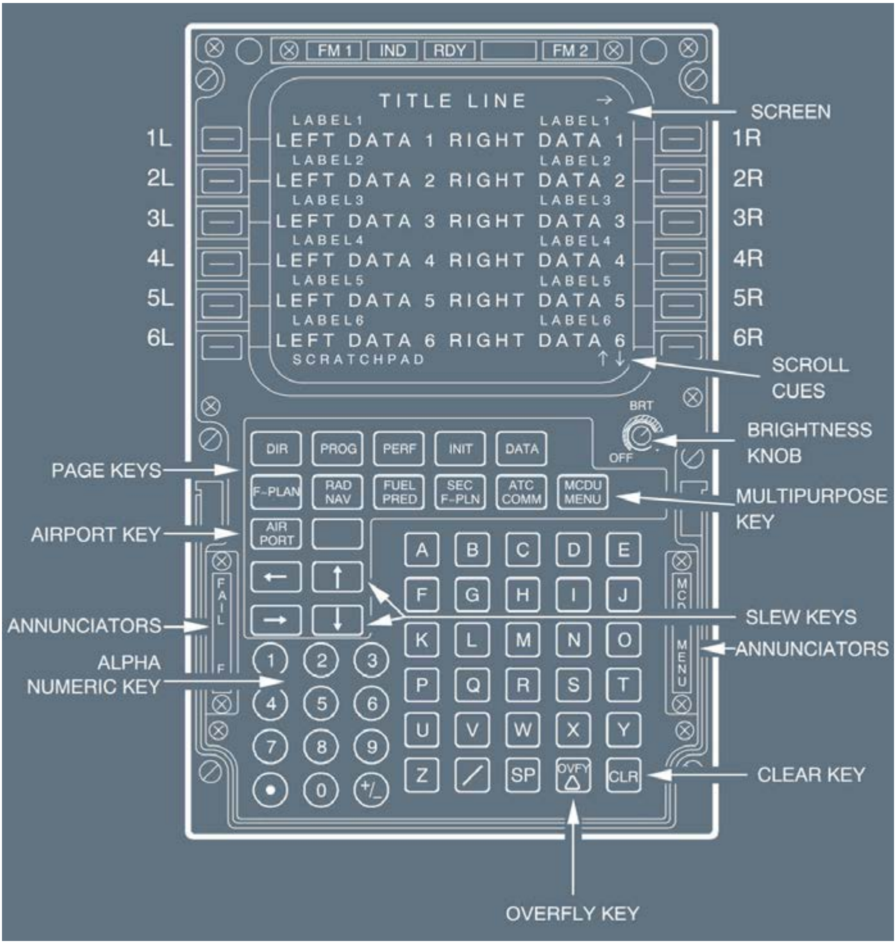
MCDU

Applicable to: ALL

Ident.: DSC-22_10-40-10-A-00010090.0008001 / 14 MAY 12

MCDU INTERFACE



Ident.: DSC-22_10-40-10-A-00010091.0001001 / 17 AUG 10

GENERAL

The Multipurpose Control and Display Unit (MCDU) is a cathode ray tube that generates 14 lines of 24 characters each, including:
- A title line that gives the name of the current page in large letters
- Six label lines, each of which names the data displayed just below it (on the data field line)
- Six data field lines that display computed data or data inserted by the flight crew
- The scratchpad line that displays:
  - Specific messages
  - Information the flight crew has entered by means of the number and letter keys and which can then be moved to one of the data fields.

Ident.: DSC-22_10-40-10-A-00010092.0001001 / 17 AUG 10

LINE SELECT KEYS

There is a column of Line Select Keys (LSKs) on each side of the screen.

The flight crew uses these keys to:
- Move a parameter they have entered in the scratchpad to the appropriate line on the main screen
- Call up a specific function page indicated by a prompt displayed on the adjacent line
- Call up lateral or vertical revision pages from the flight plan page.

Ident.: DSC-22_10-40-10-A-00010093.0002001 / 17 AUG 10

KEYBOARD

The keyboard includes:

- Function and Page keys — Call up functions and pages the flight crew uses for flight management functions and computations.

↑ ↓ (or SLEW) keys	Move a page up or down to display portions that are off the screen.
← → keys	Moves to the next page of a multi-page element. An arrow in the top right corner indicates that another page is available.
AIRPORT key	Calls up the flight plan page that contains the next airport along the current flight plan. Successive pushes on the key show the alternate airport, the origin airport (before takeoff), and the next airport again.

- Number and letter keys allow the flight crew to insert data in the scratchpad so that they can use a line select key to enter it in the main display.
- Three keys have special functions:

CLR (clear) key	Erases material (messages or inserted data) from the scratchpad or from certain areas of displayed pages.
OVFY (overfly) key	Allows the aircraft to overfly a selected waypoint.
SP (space) key	Allows to insert a space in specific message.

Ident.: DSC-22_10-40-10-A-00010094.0002001 / 17 AUG 10

ANNUNCIATORS (ON THE SIDE OF THE KEYBOARD)

FAIL (amber)	Indicates that the Multipurpose Control and Display Unit (MCDU) has failed.
MCDU MENU (white)	Indicates that the flight crew should call up a peripheral linked to the MCDU (such as ACARS , ATSU or CFDS).
FM (white)	Comes on while the flight crew is using the MCDU to display peripherals. This light tells the flight crew that the FMGC has an important message to deliver. The flight crew accesses the message by pressing the MCDU MENU key and the line select key adjacent to the FMGC prompt.

Ident.: DSC-22_10-40-10-A-00010757.0001001 / 17 AUG 10

ANNUNCIATORS (ON THE TOP OF THE KEYBOARD)

FM 1 and FM 2 (amber)	The onside FM is failed
IND (amber)	The onside FM detects an independent mode of operation while both FM are healthy.
RDY (green)	MCDU has passed its power up test after its BRT knob was turned to OFF.

Ident.: DSC-22_10-40-10-A-00010095.0001001 / 17 AUG 10

BRT knob

Controls the light intensity of the entire MCDU.

Ident.: DSC-22_10-40-10-A-00010097.0001001 / 17 AUG 10

DATA ENTRY

The flight crew enters data by typing it into the scratchpad on the MCDU . Next, pressing the line select key (LSK) will load the data from the scratchpad into the desired field. An error message displays if the data is out of range or not formatted correctly. To correct data, the flight crew may clear the message with the clear (CLR) key and then retype the message into the scratchpad. Pressing the CLR key when the scratchpad is empty displays “CLR”. To clear data from a field, select CLR from the scratchpad to the data field to be cleared.

Ident.: DSC-22_10-40-10-A-00010098.0001001 / 17 AUG 10

MCDU ENTRY FORMAT

The flight crew enters information into the MCDU at the bottom line of the scratchpad. When data has lead zeros, they may be omitted if desired. For example a three-digit wind direction of 060 may be typed as 60. The display will still show 060. To enter an altitude below 1 000 ft, the lead zero must be added as 0400 for 400 ft. This differentiates the altitude from a flight level.
To enter a double data entry such a speed/altitude, the separating slash must be used. If entering only the first part of a double entry, omit the slash. To enter only the second part of a double entry, a leading slash must be used i.e. /0400.

Ident.: DSC-22_10-40-10-A-00010099.0001001 / 17 AUG 10

MESSAGES

The scratchpad displays various messages for flight crew information. Theses messages are prioritized by importance to the flight crew as either amber or white.

Amber messages are:
- Navigation messages
- Data entry messages
- EFIS repeat messages.

Amber messages are categorized into two types:
- Type 1 message that is a direct result of a flight crew action. Type 1 messages are displayed immediately in the scratchpad ahead of other messages.
- Type 2 messages inform the flight crew of a given situation or request a specific action. Stored in “last in”, “first out” message queue that holds maximum of 5 messages.
  Type 2 messages are displayed in the scratchpad only if there are no Type 1 messages or other data and will remain until all the messages have been viewed and cleared with the CLR key.

White messages are advisory only.

Ident.: DSC-22_10-40-10-A-00010101.0001001 / 17 AUG 10

CHARACTERS

Small and large fonts are displayed according to the following rules:
- The title line and the scratchpad are displayed in large font
- Datafields are usually displayed in large font
- Label lines are displayed in small font
- Flight crew entries and modifiable data are displayed in large font
- Defaulted/computed and non modifiable data are displayed in small font.

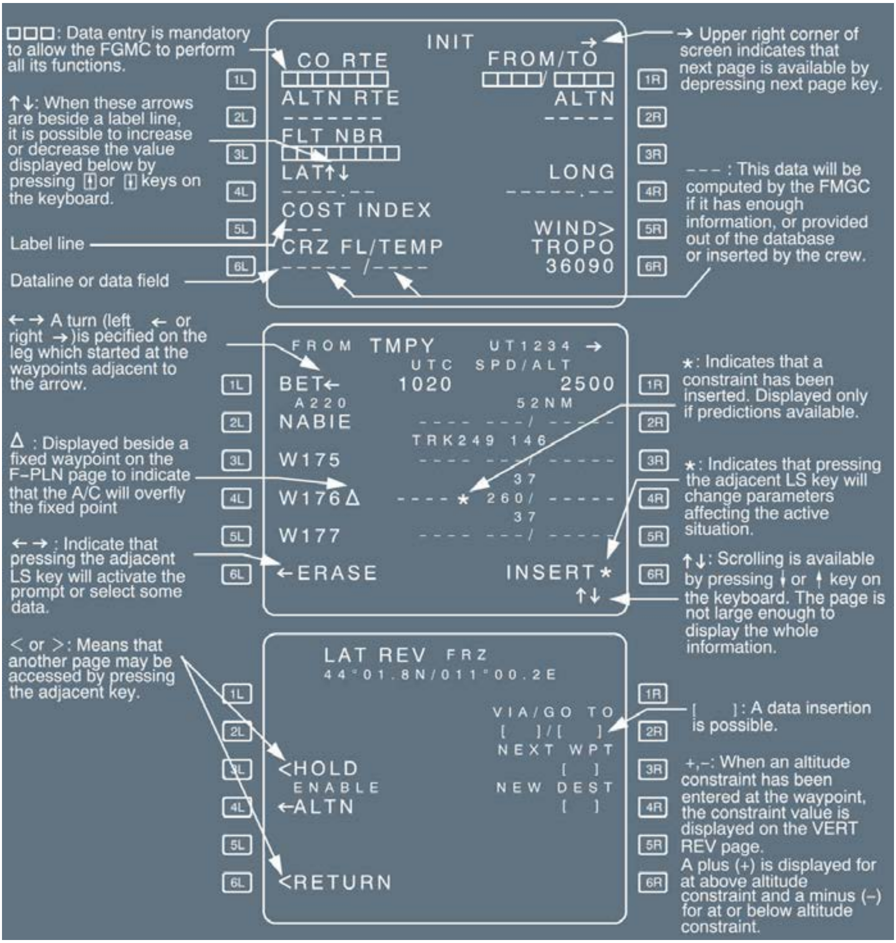
Ident.: DSC-22_10-40-10-A-00010102.0001001 / 17 AUG 10

COLORS

DATA	MCDU COLOR
TITLES, COMMENTS, <, >, ↑ ↓, ← →, DASHES, MINOR MESSAGES	WHITE
- MODIFIABLE DATA - SELECTABLE DATA - BRACKETS	BLUE
- NON MODIFIABLE DATA - ACTIVE DATA	GREEN
- MANDATORY DATA (BOXES) - FLIGHT CREW ACTION REQUIRED - IMPORTANT MESSAGES - MISSED CONSTRAINT	AMBER
- CONSTRAINTS - MAX ALTITUDE	MAGENTA
PRIMARY F-PLN	GREEN WAYPOINTS, WHITE LEGS
TEMPORARY F-PLN	YELLOW WAYPOINTS, WHITE LEGS
SECONDARY F-PLN	WHITE WAYPOINTS AND LEGS
MISSED APPROACH (not active)	BLUE WAYPOINTS, WHITE LEGS
ALTERNATE F-PLN (not active)	BLUE WAYPOINTS, WHITE LEGS
OFFSET	GREEN WAYPOINTS, WHITE LEGS, OFST DISPLAYED IN THE TITLE OF THE F-PLN PAGE
TUNED NAVAID	BLUE
"TO" WAYPOINT AND DESTINATION	WHITE

Ident.: DSC-22_10-40-10-A-00010103.0001001 / 14 MAY 12

SCREEN PROMPTS



Ident.: DSC-22_10-40-10-A-00010104.0002001 / 23 JUN 15

MCDU FUNCTION KEYS

The function keys on the Multipurpose Control and Display Units allow the flight crew to call up MCDU pages quickly.

The following is a summary of the purpose of each key:

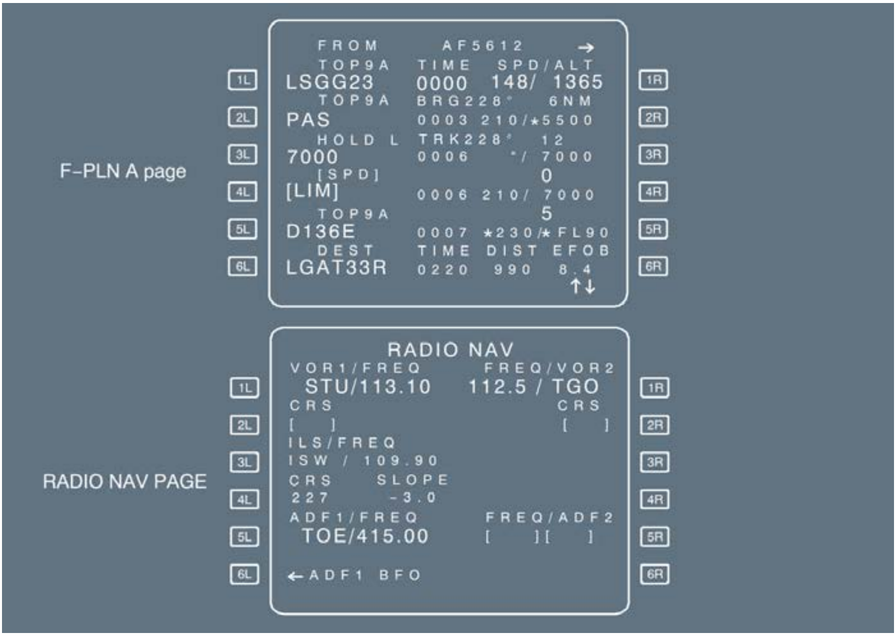
DIR	Calls up the DIR TO page, and enables the flight crew to proceed directly from the present position to any waypoint, entered manually or selected in the active flight plan.
PROG	Calls up the progress page corresponding to the phase of the active flight plan that is in progress. This page displays navigation information and active data such as the optimum and maximum recommended cruise flight levels. It enables the flight crew to update the FMGS position and to obtain a bearing and distance to any location.
PERF	Calls up the performance pages, that display the optimum speed or Mach number for each phase. The flight crew can amend these pages. The first page to be displayed is the one corresponding to the current flight phase (except for preflight and done phases). The flight crew can then use the appropriate 6L or 6R LSK to call up pages corresponding to future flight phases.
INIT	Calls up the flight plan initialization A page, which also gives the flight crew access to the B page. The flight crew uses the INIT pages to initialize Flight Management for the flight. The flight crew uses the INIT A page primarily to insert his flight plan and to align the inertial reference system. The flight crew uses the INIT B page to insert aircraft weight, fuel on board, CG and various fuel requirements. The FMGS uses this data to compute predictions and fuel planning parameters. The flight crew has access to the INIT A page only in the preflight phase. INIT B page (not accessible after engine start) is called up by pressing the "NEXT PAGE" key.
DATA	Calls up the data index page. This gives the flight crew access to various reference pages that show aircraft position, aircraft status, runways, waypoints, navaids, routes, and data stored by the flight crew.
F-PLN	Calls up the flight plan A and B pages, which contain a leg-by-leg description of the active primary flight plan. The flight crew can use the slewing keys to review the entire active flight plan. They can make all lateral and vertical revisions to the flight plan through these pages, using the left LSKs for lateral revision and the right keys for vertical revision.
RAD NAV	Calls up the radio navigation page. This page displays the Radio Navaids tuned automatically or manually through the FMGC.

FUEL PRED	Calls up the fuel prediction page. Once the engines are started, this page displays the fuel predicted to be remaining at the destination and the alternate, as well as fuel management data.
SEC F-PLN	Calls up the index page for the secondary flight plan. The flight crew can use this page to call up the secondary flight plan and all the functions related to it (copying, deleting, reviewing, activating, and the INIT and PERF pages).
ATC COMM	Calls up the ATC applications (not activated).
MCDU MENU	Calls up the MCDU MENU page, which displays the subsystems currently addressed via the MCDU. The key next to the name of a subsystem enables the flight crew to select that subsystem. When the MCDU MENU annunciator lights up, the flight crew should press the MCDU MENU key. The menu will have [REQ] displayed next to the name of the subsystem that requires attention.

Ident.: DSC-22_10-40-10-A-00010107.0005001 / 01 OCT 12

MCDU DISPLAY

The MCDUs display:
- Position and accuracy information
- Tuned navaids
- Lateral and vertical flight plans (waypoints, pseudo waypoints, constraints)
- Predictions (SPD , TIME, ALT, WIND)
- Fuel predictions and fuel management information (estimated fuel on board, extra fuel)
- Performance data.


F-PLN A page
FROM AF5612 →
TOP9A TIME SPD/ALT
LSGG23 0000 148/ 1365
TOP9A BRG228° 6NM
PAS 0003 210/*5500
HOLD L TRK228° 12
7000 0006 °/ 7000
[SPD] 0
[LIM] 0006 210/ 7000
TOP9A 5
D136E 0007 *230/*FL90
DEST TIME DIST EFOB
LGAT33R 0220 990 8.4
RADIO NAV PAGE
RADIO NAV
VOR1/FREQ FREQ/VOR2
STU/113.10 112.5 / TGO
CRS CRS
[ ] [ ]
ILS/FREQ
ISW / 109.90
CRS SLOPE
227 -3.0
ADF1/FREQ FREQ/ADF2
TOE/415.00 [ ][ ]
←ADF1 BFO

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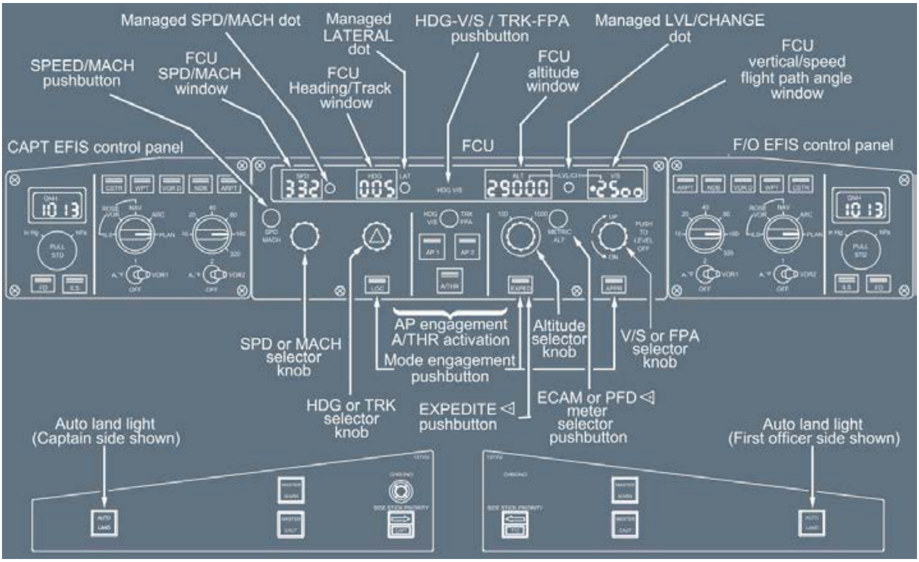
FCU

Ident.: DSC-22_10-40-20-00010112.0003001 / 03 AUG 17
Applicable to: ALL

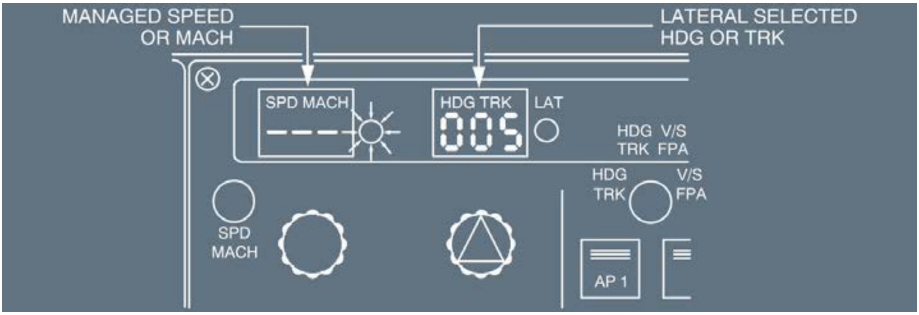
The Flight Control Unit (FCU) is located on the glareshield and is constituted of three control panels: One for the automatic flight controls and two for the Electronic Flight Instrument System (EFIS). The FCU has two channels, each of which can independently command the central control panel. If one channel fails, the other channel can control all the functions.



FCU PHILOSOPHY

Ident.: DSC-22_10-40-20-00010113.0002001 / 14 MAY 12
Applicable to: ALL

The flight crew can use two types of guidance to control the aircraft in auto flight. One type is managed by the Flight Management Guidance System (FMGS). The other uses target quantities which are manually entered by the flight crew.
When the aircraft uses target quantities from the FMGS (managed guidance), the FCU windows display dashes and the white dots next to those windows light up. When the aircraft uses target quantities, entered by the flight crew (selected guidance), the windows display the selected numbers and the white dots do not light up.



Note: The altitude window always displays an altitude selected by the flight crew (never dashes).

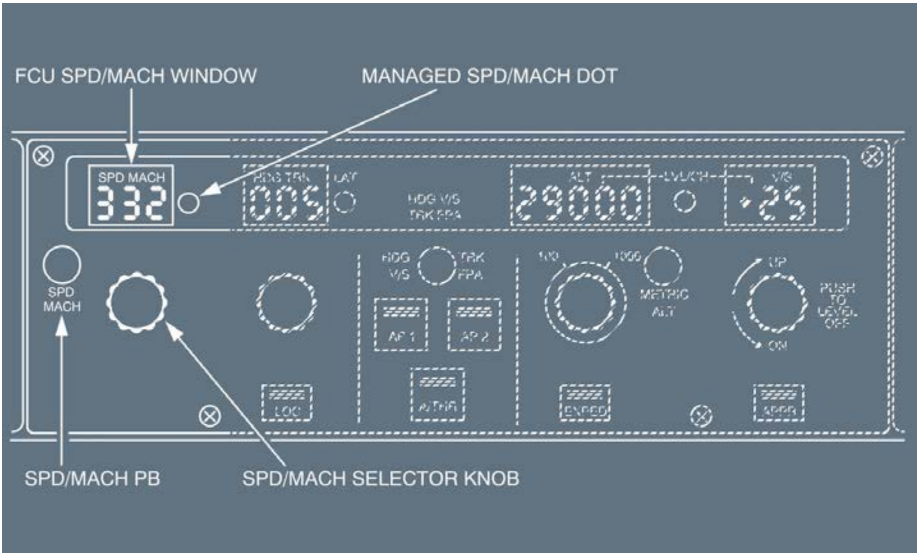
The FCU has four knobs:
- SPD-MACH
- HDG -TRK
- ALT
- V/S -FPA.

The knobs can be rotated, pushed in, and pulled out:
- In order to arm or engage managed guidance for a given mode, the flight crew pushes in the associated knob. If, for example, they push in the HDG knob, they engage or arms the NAV mode.
- In order to engage a selected guidance mode, the flight crew turns the knob to set the desired value, then pulls the knob out to engage the mode with a target value equal to the selected value.

Note: In managed guidance (lateral, vertical guidance or managed speed), the corresponding window is dashed. Turning a knob without pulling it, displays a value that is the sum of the current target and the turn action value. The display remains 45 s on the HDG /TRK and V/S windows and 10 s on the SPD/MACH window before the dashes reappear. This rule does not apply to the ALT knob/window.

SPEED/MACH CONTROL AREA

Ident.: DSC-22_10-40-20-00010114.0002001 / 14 MAY 12
Applicable to: ALL



SPD/MACH knob

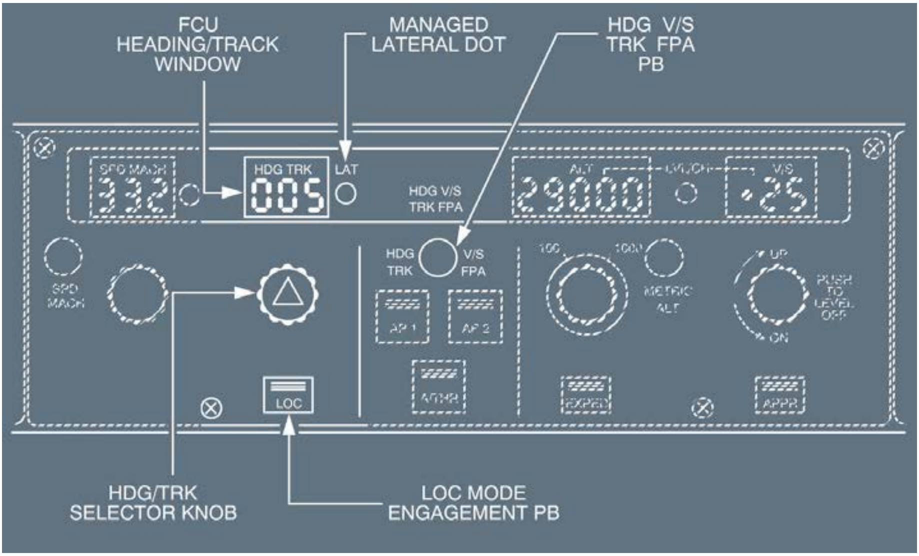
Display range: between 100 and 399 kt for speed, between 0.10 and 0.99 for Mach number.
One rotation of the knob corresponds to approximately 32 kt or M 0.32.

SPD/MACH pb

Pushing this pushbutton changes the SPD target to the corresponding MACH target and vice versa.

LATERAL CONTROL AREA

Ident.: DSC-22_10-40-20-00010115.0007001 / 14 MAY 12
Applicable to: ALL



HDG/TRK knob

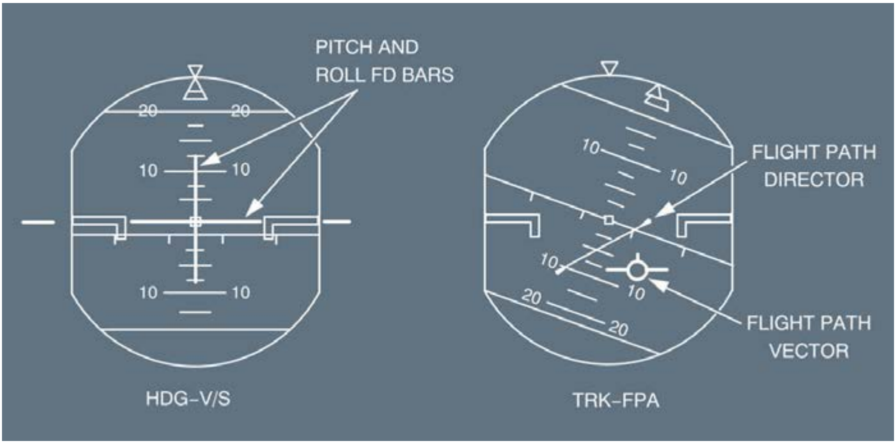
Display range: between 0 ° and 359 °.
One rotation of the knob corresponds to 32 ° (1 ° per click).

LOC pb

Pushing this pushbutton arms, engages, or disengages the LOC mode.

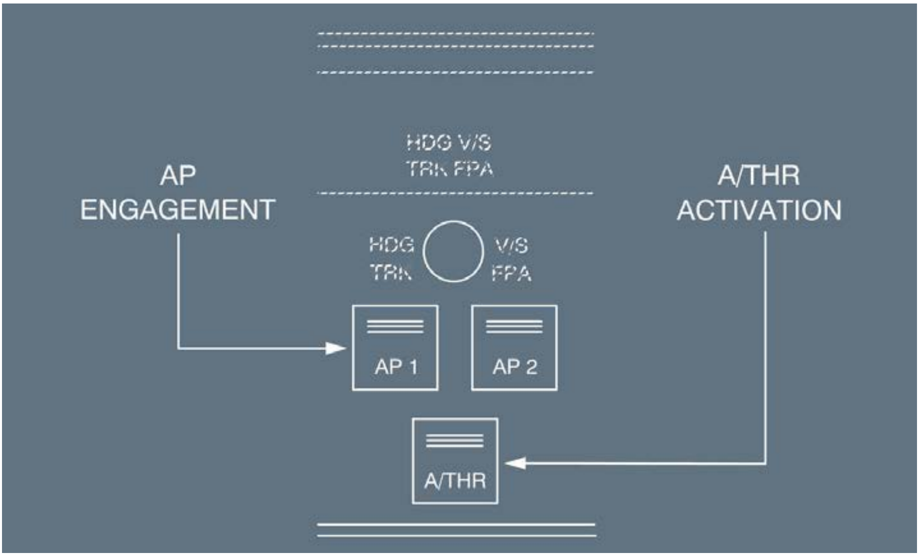
HDG V/S – TRK FPA pb

The flight crew uses this pushbutton to select HDG (associated with V/S) or TRK (associated with FPA). Pushing it:
- Displays the Flight Path Vector (FPV) on the Primary Flight Display (PFD) or deletes it.
- On the PFD , changes the FD crossbar display (with the aircraft attitude as its reference) to the aircraft Flight Path Director (with the flight path vector as its reference) and vice versa.
- Changes heading reference into track reference in the HDG /TRK window and vice versa.
- Changes vertical speed reference target into flight path angle reference target in the V/S -FPA window and vice versa.



AP-A/THR CONTROL AREA

Ident.: DSC-22_10-40-20-00010116.0001001 / 14 MAY 12
Applicable to: ALL



AP1 pb AND AP2 pb

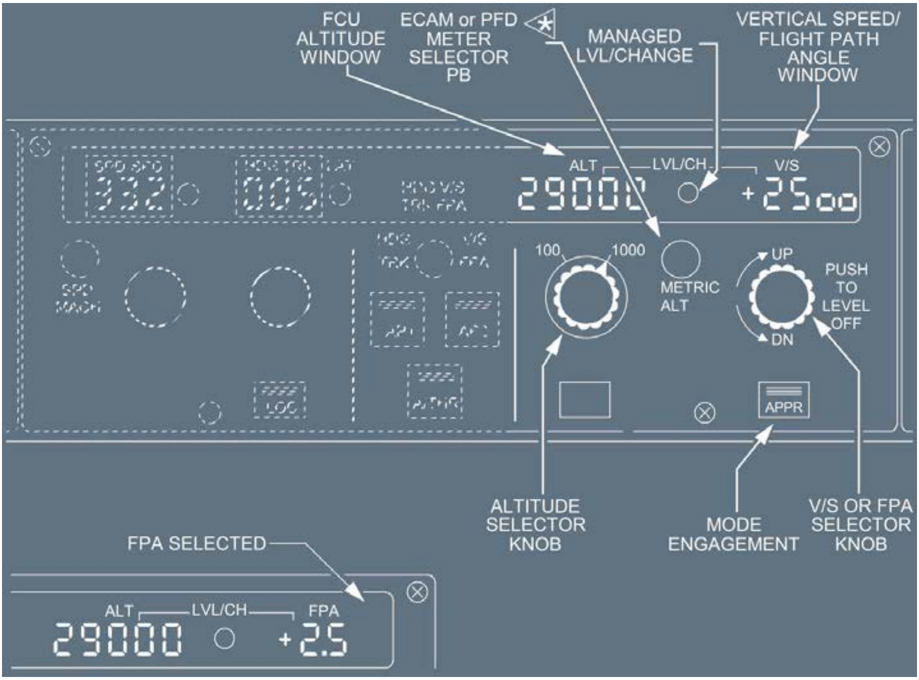
The flight crew uses these pushbuttons to engage or disengage the autopilots. The buttons illuminate green when the autopilot is engaged.

A/THR pb

The flight crew uses this pushbutton to arm, activate, or disconnect the autothrust (A/THR). This button illuminates green if the A/THR is armed or active.

VERTICAL CONTROL AREA

Ident.: DSC-22_10-40-20-00010117.0012001 / 22 MAY 12
Applicable to: ALL



The FCU altitude window always displays a target value selected by the flight crew. It never displays dashes.

Altitude knob (INNER AND OUTER)

Display range: 100 to 49 000 ft
- The outer knob has two positions: 100 and 1000
- The inner knob sets the altitude in the FCU window in increments of 100 or 1 000 ft, depending upon the position of the outer knob.

METRIC ALT pb

This pushbutton is used to display the FCU altitude target in meters on the ECAM , or the current altitude and FCU /FM altitude target in meters on the PFD .

V/S or FPA knob

Range (V/S) : –6 000 to +6 000 ft/min
2 clicks = 100 ft/min
If the flight crew turns the knob slowly, each click equals 100 ft/min.

Range (FPA) : –9.9 ° to +9.9 °
1 click = 0.1 °

The flight crew turns this knob to set the value of the vertical speed (V/S) or flight path angle (FPA) to be displayed in the V/S or FPA window (They choose which, V/S or FPA, is to be displayed by pushing the HDG V/S - TRK FPA pb).

One rotation of the knob corresponds to 32 clicks. One complete rotation sets:
FPA = 3.2 °
V/S = 1 600 ft/min

When the flight crew pushes in the V/S or FPA knob, the system commands an immediate level-off by engaging the V/S or FPA mode with a target of zero. The flight mode annunciator (FMA) then displays "V/S = 0" in green when V/S or FPA is nulled. If the flight crew now turns the knob to put in a new setting for V/S or FPA, the aircraft changes flight path accordingly.

APPR pb

This pushbutton arms, disarms, engages, or disengages the approach modes:
- LOC and G/S modes, if an ILS approach is selected in the active F-PLN.
- APP NAV -FINAL modes, if a non precision approach is selected in the active F-PLN.

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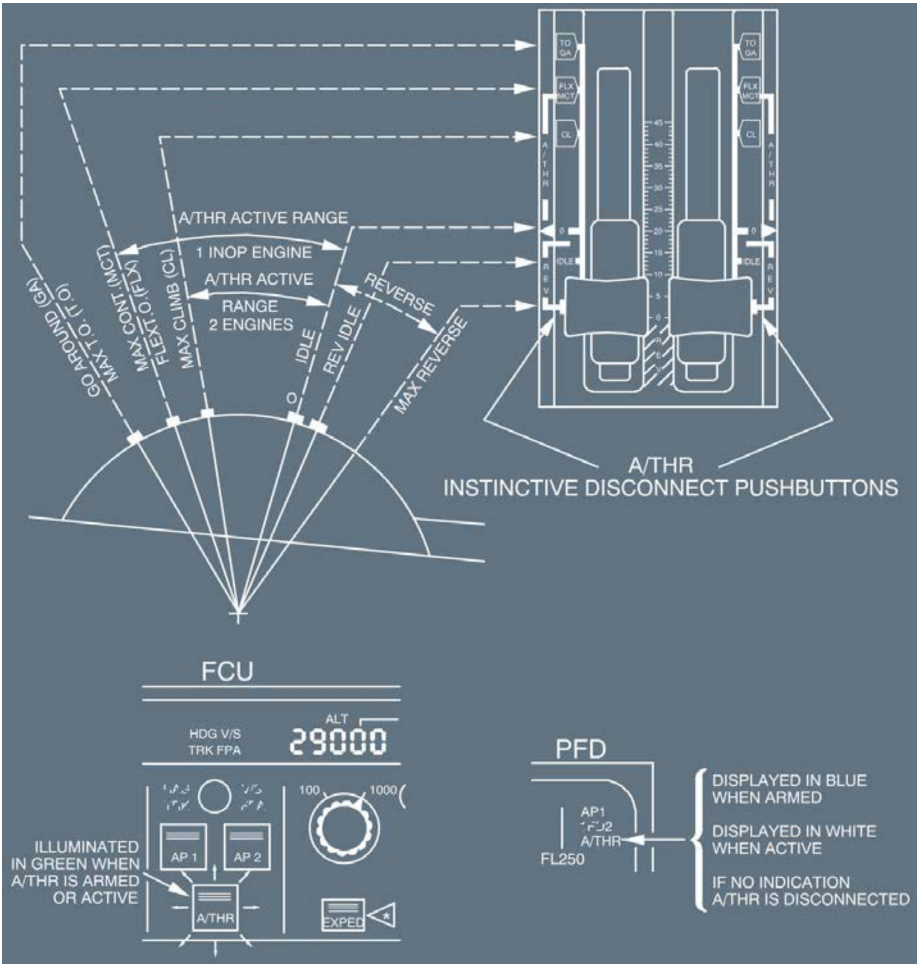
THRUST LEVERS

Ident.: DSC-22_10-40-30-00010119.0001001 / 14 MAY 12
Applicable to: ALL



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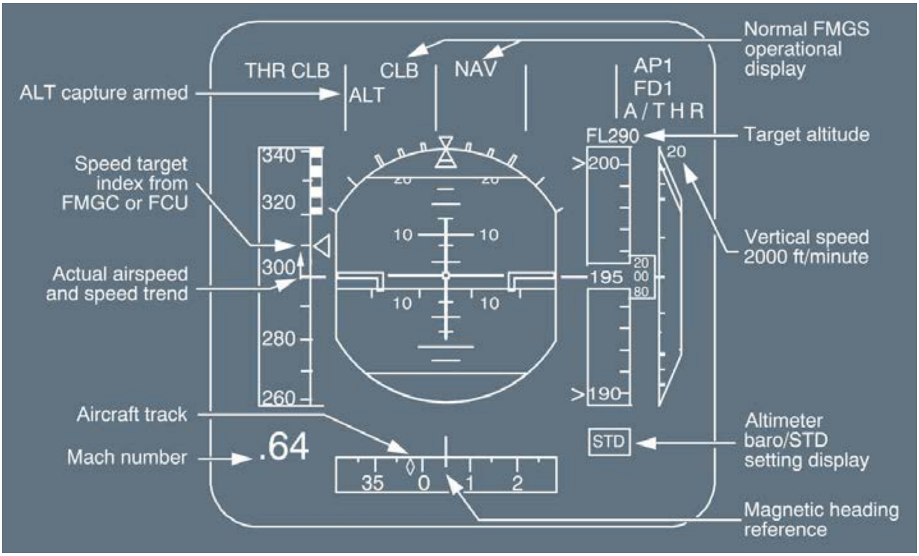
PFD

Ident.: DSC-22_10-40-40-00010677.0001001 / 17 AUG 10
Applicable to: ALL

The Flight Management and Guidance System generates the following information to the EFIS Primary Flight Display:
- Armed and engaged modes on the Flight Mode Annunciator (FMA)
- FMGS guidance targets (SPD , ALT , HDG)
- Vertical deviation from descent profile
- Messages
- Navigation information.

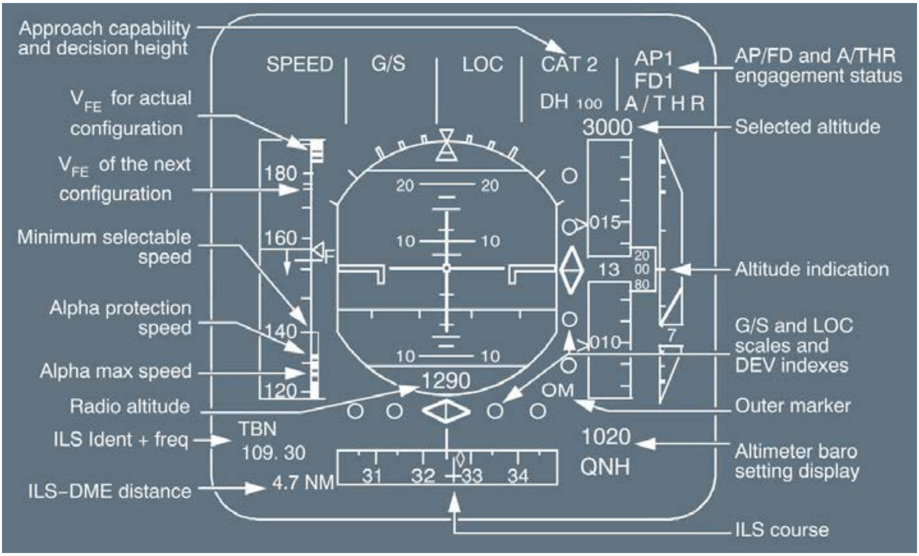
CLIMB PHASE

Ident.: DSC-22_10-40-40-00010121.0002001 / 14 MAY 12
Applicable to: ALL



APPROACH PHASE

Ident.: DSC-22_10-40-40-00010122.0002001 / 14 MAY 12
Applicable to: ALL



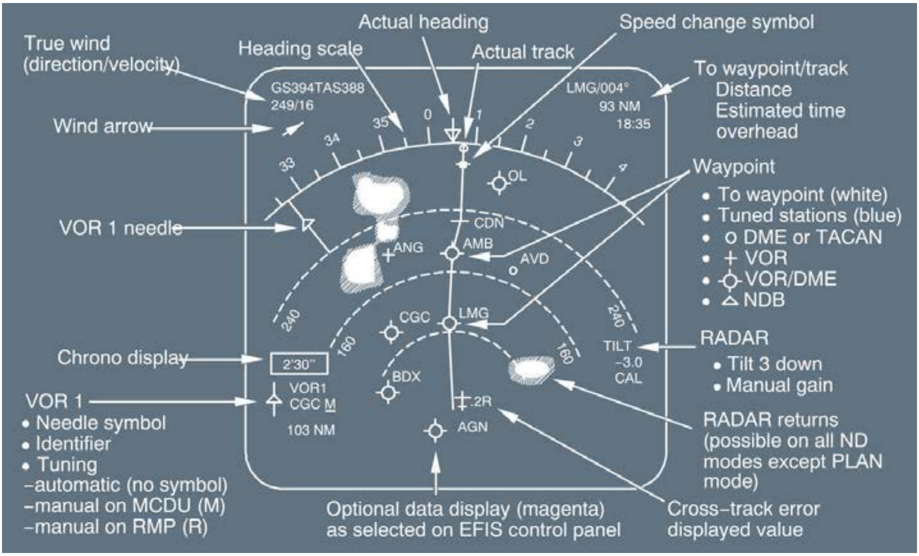
ND

Ident.: DSC-22_10-40-50-00010123.0001001 / 17 AUG 10
Applicable to: ALL

The FMGS generates the following information, displayed on the EFIS Navigation Displays:
- Flight plan (active secondary, temporary, dashed)
- Aircraft position and lateral deviation from the flight plan
- Pseudo-waypoints along the flight plan
- Raw data from tuned Navaids and type of selected approach
- Various display options (waypoints, Navaids, NDBs, airports, constraints)
- Wind information and various messages.

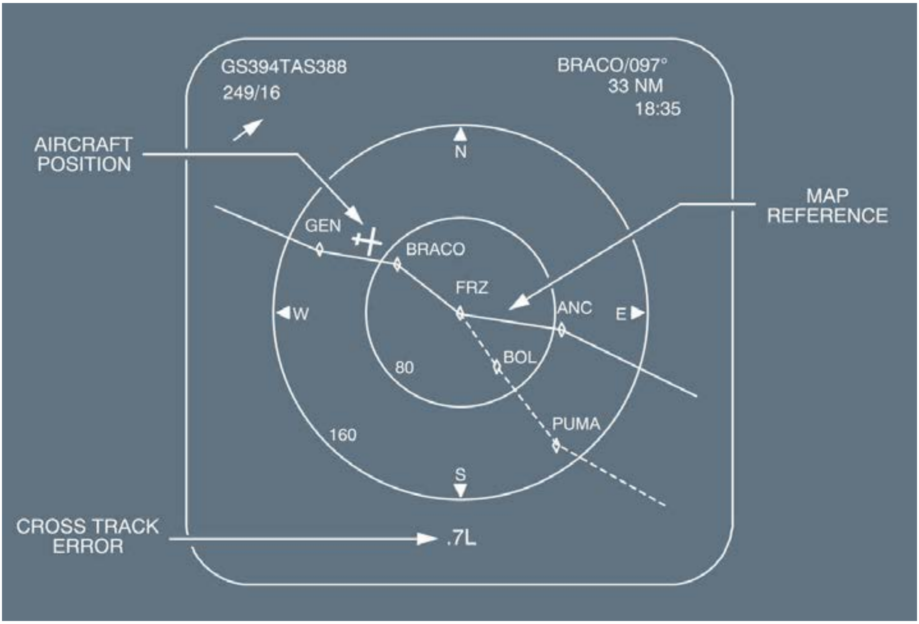
ARC MODE

Ident.: DSC-22_10-40-50-00010124.0001001 / 14 MAY 12
Applicable to: ALL



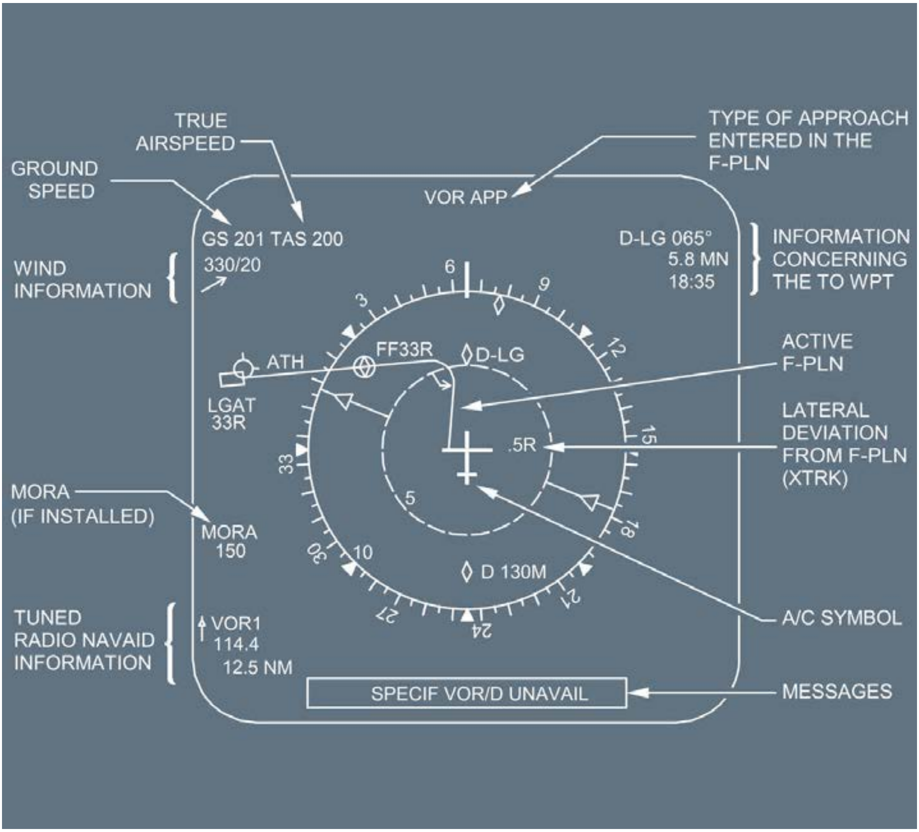
PLAN MODE

Ident.: DSC-22_10-40-50-00010125.0001001 / 01 OCT 12
Applicable to: ALL



ROSE MODES

Ident.: DSC-22_10-40-50-00010126.0022001 / 09 MAR 15
Applicable to: ALL



FLIGHT PLAN DISPLAY COLORS

Ident.: DSC-22_10-40-50-00010127.0002001 / 17 AUG 10
Applicable to: ALL

F-PLN	Color
Primary Flight Plan	- Managed mode: Steady green - Selected mode: Dashed green
Track line	Steady green
Alternate flight plan	Dashed blue
Missed approach	Steady blue
Offset flight plan	Steady green (Original flight plan: Dashed green)
Temporary flight plan	Dashed yellow
Engine-out SID (not inserted)	Steady yellow
Secondary flight plan	Steady dimmed white
Abeam/Radial	Dashed blue

GENERAL

Ident.: DSC-22_10-50-10-00020369.0001001 / 17 MAR 17
Applicable to: ALL

This chapter shows the speed symbols and definitions.
The source of the computation is also given, when applicable.

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CHARACTERISTIC SPEEDS

Ident.: DSC-22_10-50-20-00020370.0008001 / 17 MAR 17
Applicable to: ALL

The characteristic speeds displayed on the PFD are computed by the Flight Augmentation Computer (FAC), according to aerodynamic data.
VLS (of normal landing configuration: CONF 3 or FULL), F, S and Green Dot speeds are also displayed on the MCDU TAKEOFF and/or APPR pages.
The speeds displayed by the MCDU are computed by the FMS , based on the aircraft gross weight (which is computed according to the entered ZFW and the FOB), or the predicted gross weight (for approach or go-around).

VS : Stalling speed.
Not displayed.
For a conventional aircraft, the reference stall speed, VSmin, is based on a load factor that is less than 1 g. This gives a stall speed that is lower than the stall speed at 1 g. All operating speeds are expressed as functions of this speed (for example, VREF = 1.3 VSmin).
Because aircraft of the A320 family have a low-speed protection feature (alpha limit) that the flight crew cannot override, Airworthiness Authorities have reconsidered the definition of stall speed for these aircraft.
All the operating speeds must be referenced to a speed that can be demonstrated by flight tests. This speed is designated VS1g.

Airworthiness Authorities have agreed that a factor of 0.94 represents the relationship between VS1g for aircraft of the A320 family and VSmin for conventional aircraft types. As a result, Authorities allow aircraft of the A320 family to use the following factors :
V2 = 1.2 × 0.94 VS1g = 1.13 VS1g
VREF = 1.3 × 0.94 VS1g = 1.23 VS1g

These speeds are identical to those that the conventional 94 % rule would have defined for these aircraft. The A318, A319, A320 and A321 have exactly the same maneuver margin that a conventional aircraft would have at its reference speeds.
The FCOM uses VS for VS1g.

VLS : Lowest Selectable Speed.
Represented by the top of an amber strip along the airspeed scale on the PFD.
Computed by the FAC, based on aerodynamic data, and corresponds to 1.13 VS during takeoff, or following a touch and go.
Becomes 1.23 VS, after retraction of one step of flaps.
Becomes 1.28 VS, when in clean configuration.

Note: *If in CONF 0 VLS were 1.23 VS (instead of 1.28 VS), the alpha protection strip would hit the VLS strip on the PFD.*

Above 20 000 ft, VLS is corrected for Mach effect to maintain a buffet margin of 0.2 g.
In addition, VLS increases when the speedbrakes are extended.

F : Minimum speed at which the flaps may be retracted at takeoff.
In approach, used as a target speed when the aircraft is in CONF 2 or CONF 3.
Represented by “F” on the PFD speed scale. Equal to about 1.26 VS of CONF 1 + F.

S : Minimum speed at which the slats may be retracted at takeoff.
In approach, used as a target speed when the aircraft is in CONF 1.
Represented by “S” on the PFD airspeed scale.
Equal to about 1.23 VS of clean configuration.

O : Green dot speed.
Engine-out operating speed in clean configuration.
(Best lift-to-drag ratio speed).
Also corresponds to the final takeoff speed.
Represented by a green dot on the PFD scale.
Below 20 000 ft equal to 2 × weight (tons) +85
Above 20 000 ft, add 1 kt per 1 000 ft

LIMIT SPEEDS

Ident.: DSC-22_10-50-30-00020383.0001001 / 17 MAR 17
Applicable to: ALL

VA	:	Maximum design maneuvering speed. This corresponds to the maximum structural speed permitted for full control deflection, if alternate or direct law is active.
VMCG	:	Minimum speed, on the ground during takeoff, at which the aircraft can be controlled by only using the primary flight controls, after a sudden failure of the critical engine, the other engine remaining at takeoff thrust.
VMCA	:	Minimum control speed in flight at which the aircraft can be controlled with a maximum bank of 5 °, if one engine fails, the other engine remaining at takeoff thrust (takeoff flap setting, gear retracted).
VMCL	:	Minimum control speed in flight, at which the aircraft can be controlled with a maximum bank of 5 °, if one engine fails, the other engine remaining at takeoff thrust (approach flap setting).
VFE	:	Maximum speed for each flap configuration.
VLE	:	Maximum speed with landing gear extended.
VLO	:	Maximum speed for landing gear operation.
VMO	:	Maximum speed.
VFE NEXT	:	Maximum speed for the next (further extended) flap lever position.

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PROTECTION SPEEDS

Ident.: DSC-22_10-50-40-00020382.0001001 / 17 MAR 17
Applicable to: ALL

Vα PROT, Vα MAX and VSW are computed by the FAC , based on aerodynamic data. They are only used for display on the PFD , and not for flight control protection (the activation of the protections is computed by the ELAC).

Vα PROT	:	Angle of attack protection speed. Corresponds to the angle of attack at which the angle of attack protection becomes active. Represented by the top of a black and amber strip along the PFD speed scale, in normal law.
Vα MAX	:	Maximum angle of attack speed. Corresponds to the maximum angle of attack that may be reached in pitch normal law. Represented by the top of a red strip along the PFD speed scale, in normal law.
VSW	:	Stall warning speed. Represented by a red and black strip along the speed scale when the flight control normal law is inoperative.
VMAX	:	Represented by the bottom of a red and black strip along the speed scale. Determined by the FAC according to the aircraft configuration. Is equal to VMO (or speed corresponding to MMO), VLE or VFE.

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OTHER SPEEDS

Ident.: DSC-22_10-50-50-00020384.0002001 / 17 MAR 17
Applicable to: ALL

V1	:	The highest speed, during takeoff, at which the flight crew has a choice between continuing the takeoff or stopping the aircraft. Represented by “1” on the airspeed scale (or the V1 value when it is off the airspeed scale). Inserted manually through the MCDU by the flight crew. Displayed on the MCDU TAKEOFF page.
VR	:	The speed at which the pilot rotates in order to reach V2 at an altitude of 35 ft at the latest after an engine failure. Inserted manually through the MCDU by the flight crew. Displayed on the MCDU TAKEOFF page.
V2	:	Takeoff safety speed that the aircraft attains at the latest at an altitude of 35 ft with one engine failed, and maintains during the second segment of the takeoff. Represented by the SPEED SELECT symbol on the speed scale. Minimum value equal to 1.13 VS for the corresponding configuration. Inserted manually through the MCDU by the flight crew. Displayed on the MCDU TAKEOFF page.
VREF	:	Reference speed used for normal final approach. Equal to 1.23 × VS of CONF FULL. Displayed on the MCDU APPR page, if landing is planned in CONF FULL (VLS CONF FULL).
VAPP	:	Final approach speed. Displayed on MCDU APPR page. Calculated by the FMGCs. Represents : VAPP = VLS + wind correction. The wind correction is limited to a minimum of 5 kt and a maximum of 15 kt. The flight crew may modify VAPP through the MCDU. - During autoland or when A/THR is on or in case of ice accretion or gusty crosswing greater than 20 kt, VAPP must not be lower than VLS +5 kt. - For landing in configuration 3 with ice accretion VAPP must not be lower than VLS +10 kt.

SPEED TARGET	:	Represented by a magenta triangle. Calculated by the FMGCs Gives efficient speed guidance in approach during various windy conditions. Represents : SPEED TARGET = GS mini + actual headwind (measured by ADIRS) GS mini = VAPP – TOWER WIND (headwind component along runway axis calculated by FMGC from tower wind entered on MCDU).

AIRCRAFT SYSTEMS

AUTO FLIGHT - FLIGHT MANAGEMENT

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DSC-22_20-40 Performance

DSC-22_20-40-10 Optimization

DSC-22_20-40-20 Cost Index

DSC-22_20-40-30 Predictions

DSC-22_20-50 Controls and Indicators

DSC-22_20-50-10 MCDU - Page Description

DSC-22_20-50-10-25 FMS2 Honeywell

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DSC-22_20-80 Print Functions

DSC-22_20-90 Abnormal Operations

DSC-22_20-90-10 FMGC Reset

DSC-22_20-90-20 "CHECK GW" or "CHECK WEIGHT" Message

DSC-22_20-100 Temporary Abnormal Behaviors

DSC-22_20-100-20 FMS2 HONEYWELL Temporary Abnormal Behaviors

DSC-22_20-100-40 All FMS Temporary Abnormal Behaviors

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GENERAL

Ident.: DSC-22_20-10-00010128.0001001 / 17 AUG 10
Applicable to: ALL

The flight management and guidance system (FMGS) performs navigation functions and lateral and vertical flight planning functions. It also computes performance parameters and guides the aircraft along a preplanned route.

The Flight Management (FM) part controls the following functions:
- Navigation
- Management of flight planning
- Prediction and optimization of performance
- Management of navigation radios
- Management of displays

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NAVIGATION

Ident.: DSC-22_20-20-05-00010129.0001001 / 17 AUG 10
Applicable to: ALL

Essential navigation functions are:
- Computation of position
- Evaluation of position accuracy
- Radio navigation tuning
- Alignment of Inertial Reference System.

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GENERAL

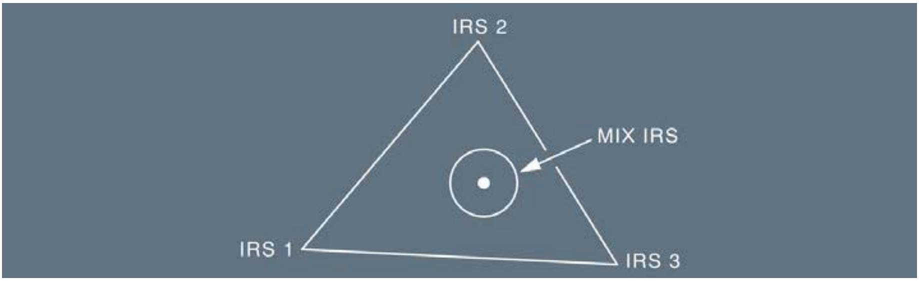
Ident.: DSC-22_20-20-10-00010130.0002001 / 16 MAR 11
Applicable to: ALL

Each FMGC computes its own aircraft position (called the "FM position") from a MIX IRS position and a computed radio position, or a GPS position.
The FMGS selects the most accurate position, considering the estimated accuracy and integrity of each positioning equipment.
GPS /INERTIAL is the basic navigation mode, provided GPS data is valid and successfully tested. Otherwise, navaids plus inertial or inertial only are used. (*Refer to DSC-22_20-20-10 Navigation Modes*).

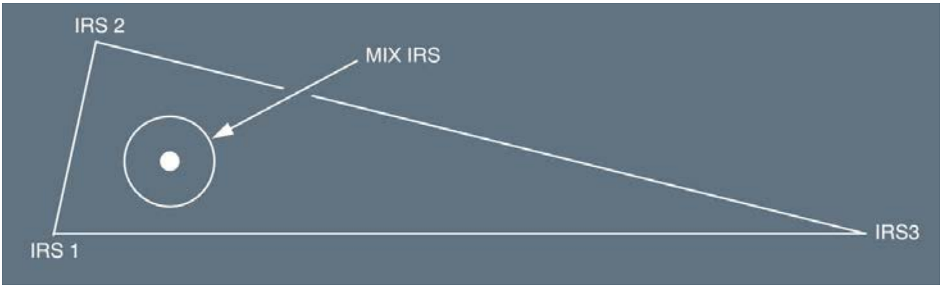
MIX IRS POSITION

Ident.: DSC-22_20-20-10-00010131.0002001 / 01 OCT 12
Applicable to: ALL

Each FMGC receives a position from each of the three IRS s, and computes a mean-weighted average called the “MIX IRS” position:



- If one of the IRS s drifts abnormally, the MIX IRS position uses an algorithm that decreases the influence of the drifting IRS within the MIX IRS position.



- If one of the IRS s fails, each FMGC uses only one IRS (onside IRS or IRS 3). Each IRS position and inertial speed are continuously tested. If the test fails, the corresponding IRS is rejected.
- When the "CHECK IRS (1, 2 or 3)/FM POSITION" message appears on the MCDU.

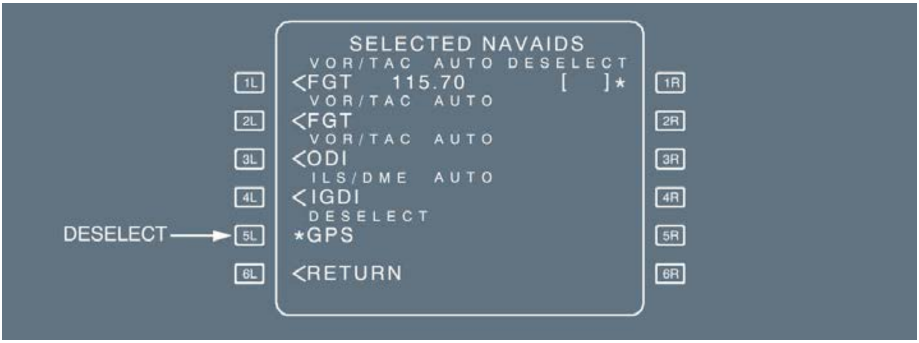
GPS POSITION

Ident.: DSC-22_20-20-10-00010132.0002001 / 23 JUN 15
Applicable to: ALL

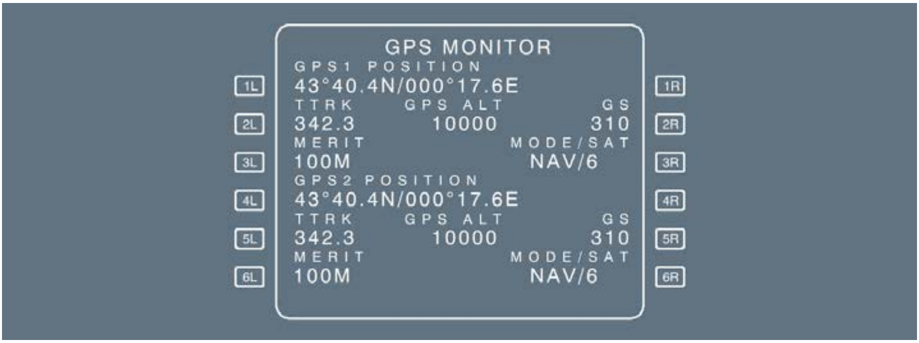
Each IRS computes a mixed IRS /GPS position called the GPIRS position. For this, each IRS can independently select their GPS source in order to maximize the availability of GPS data.
Of the three GPIRS positions that each FMGC receives, the FMS selects one GPIRS position based on a figure of merit and priority.

The FMS uses the following hierarchy to perform the selection:
- Onside GPIRS position
- GPIRS 3
- Opposite GPIRS position.

If the GPIRS data does not comply with an integrity criterion that is based on a Horizontal Integrity Limit (HIL) and on the automatic detection of failed satellites, the FMS rejects the GPS mode and uses the radio position update.
The flight crew can deselect/select the GPS position on the SELECTED NAVAIDS page, if necessary.



Information about the GPS position is displayed on the GPS MONITOR page.



Note: *In nominal case, ADIRU 1 selects GPS 1 and ADIRU 2 selects GPS 2. The GPS selection by ADIRU 3 depends on the position of the ATT HDG selector switch. If one of the GPS source is rejected by the ADIRU s, all ADIRU s will select the same GPS source. As a result, the data of the GPS that is not selected is dashed on the GPS MONITOR page. The "GPS PRIMARY LOST" message may not be displayed.*

RADIO POSITION

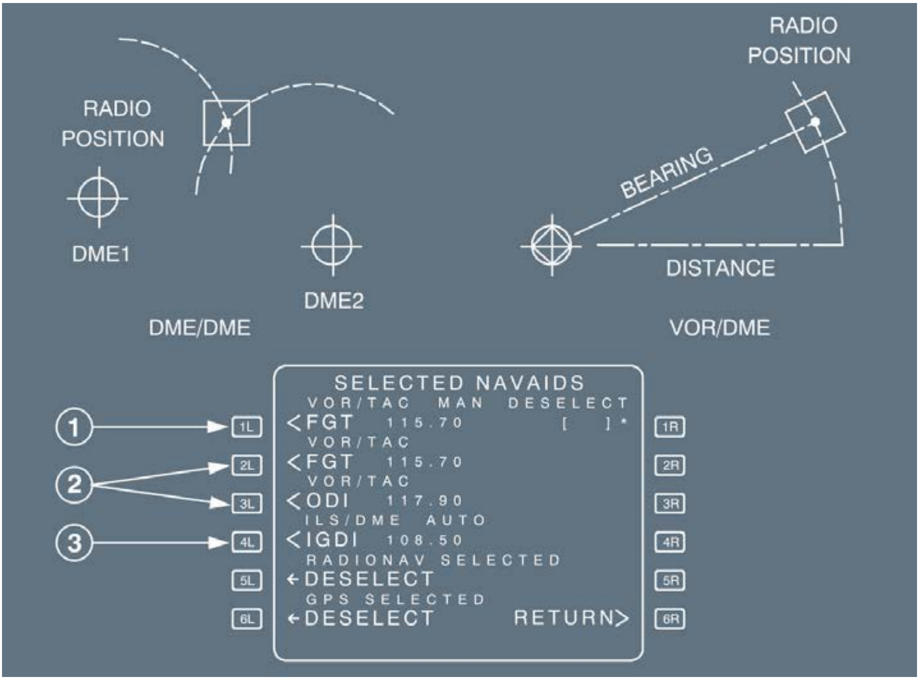
Ident.: DSC-22_20-20-10-00010669.0020001 / 01 OCT 12
Applicable to: ALL

Each FMGC uses onside navaids to compute its own radio position. These navaids are displayed on the SELECTED NAVAIDS page.

The available navaids are:
- DME /DME
- VOR /DME

- LOC
- DME /DME -LOC
- VOR /DME -LOC.

It uses LOC to update the lateral position, using LOC beam during ILS approach.
LOC is also used for quick update, when in GPS /IRS mode.
If one or more navaids fail, each FMGC can use offside navaids to compute the VOR /DME , or the DME /DME radio position.
The radio navaid selection is displayed on the DATA “SELECTED NAVAIDS” page.



(1) VOR /DME selection (auto or manual) for display (onside VOR).

(2) DME s automatic selection for DME /DME onside radio position.

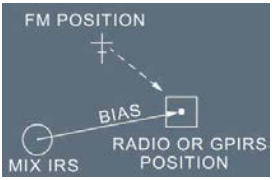
(3) ILS selection (auto or manual) for LOC update computation.

FM POSITION

Ident.: DSC-22_20-20-10-00010135.0017001 / 17 AUG 10
Applicable to: ALL

At flight initialization, each FMGC displays an FM position that is a MIX IRS /GPS position (GPIRS):
- At takeoff, when the FM position is updated to the runway threshold position as stored in the database, possibly corrected by the takeoff shift entered on PERF TO page.
- In flight, the FM position approaches the radio position or the GPS position at a rate depending upon the aircraft altitude.

  Note: The FM position update at takeoff is inhibited when GPS PRIMARY is active.



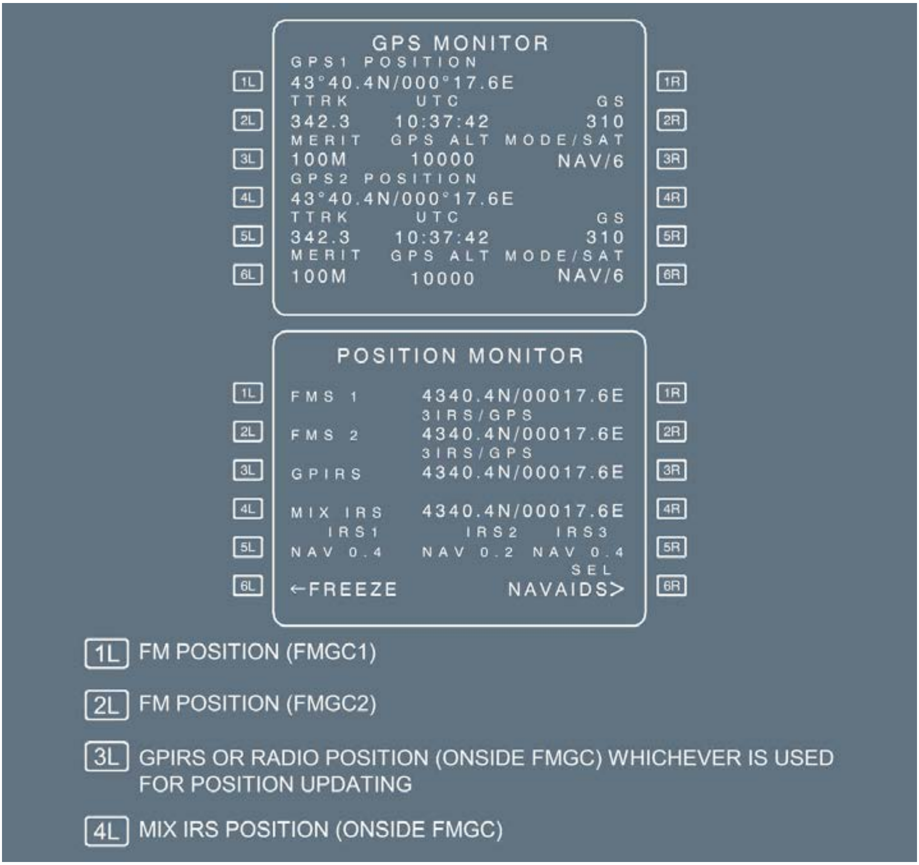
BIAS

Each FMGC computes a vector from its MIX IRS position to the radio position or GPIRS position. This vector is called the “bias”.
Each FMGC updates its bias continuously as long as a radio position or a GPIRS position is available.
If an FMGC loses its radio/GPIRS position, it memorizes the bias and uses it to compute the FM position, which equals the MIX IRS position plus the bias. Until the radio or the GPIRS position is restored, the bias does not change.
The flight crew can update the FM position manually. This also updates the bias.

POSITION MONITOR

Ident.: DSC-22_20-20-10-00010136.0016001 / 07 MAY 13
Applicable to: ALL

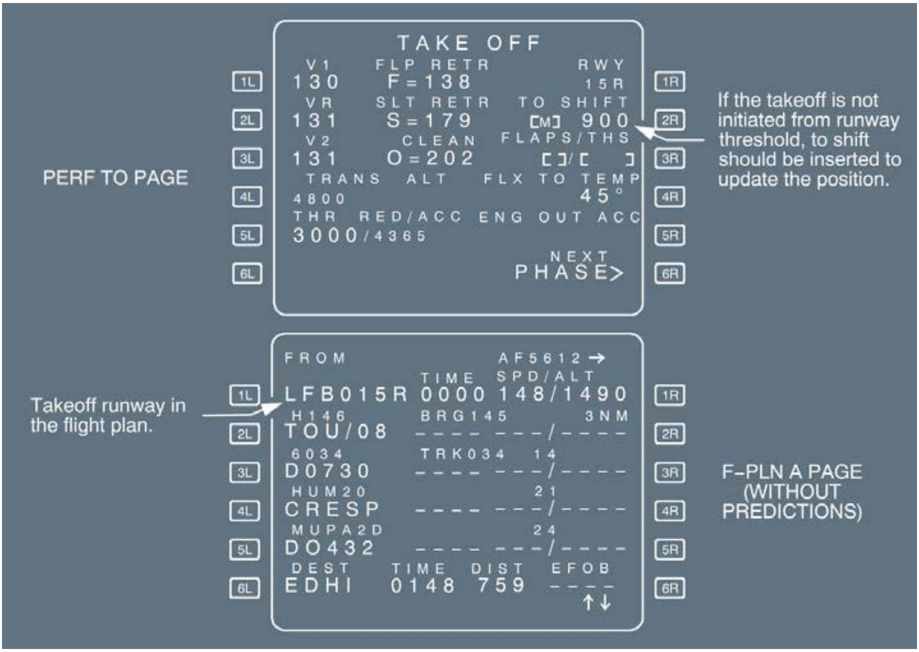
The flight crew may check the position computation using the GPS MONITOR or POSITION MONITOR page.



TAKEOFF UPDATE

Ident.: DSC-22_20-20-10-00010137.0017001 / 04 AUG 16
Applicable to: ALL

A takeoff update requires that the takeoff runway be part of the flight plan. This provides the most accurate position update.
If the takeoff run starts at an intersection, enter a takeoff shift on the PERF TO page to refine the takeoff update.
An accurate takeoff update ensures a precise aircraft position during departure.



NAVIGATION MODES

Ident.: DSC-22_20-20-10-00010138.0001001 / 19 JUL 11
Applicable to: ALL

The FMGS updates the FM position via the use of radio navaids or GPS , if available. It can use four different FM navigation modes to make this update.

The decreasing order of priority is:
- IRS -GPS
- IRS -DME /DME
- IRS -VOR /DME
- IRS only.

During ILS approaches, the system performs a temporary lateral update, via one of the following modes:
- IRS -GPS /LOC
- IRS -DME /DME -LOC

- IRS -VOR /DME -LOC
- IRS -LOC.

GENERAL

Ident.: DSC-22_20-20-20-00010448.0023001 / 27 MAY 13
Applicable to: ALL

The FMGS continuously computes an Estimated Position Uncertainty (EPU).
It is an estimate of how much the FM position diverged, and it is a function of the navigation mode that the system uses.

CURRENT NAV MODE	EPU (RATE or THRESHOLD)	REMARK
IRS /GPS	$\sqrt{(FOM^2 + 100^2)}$ (in meters).	FOM = Figure of Merit of GPS. If above 0.28 NM, the FMS rejects the GPS position.
IRS /DME /DME	Moves toward 0.28 NM.	EPU decreases from initial value to 0.28 NM.
IRS /VOR /DME	0.1 NM + 0.05 X DME DIST. Minimum : 0.28 NM.	Dependent on the distance between the aircraft and the VOR /DME.
IRS ONLY	+8 nm/h for the first 30 min. 0 nm/h for the following 60 min. +4 nm/h for the following 30 min. 0 nm/h for the following 60 min. +2 nm/h after.	EPU increases continuously.

Note: After an IRS alignment or at takeoff, the EPU is set to 0.2 NM.

ESTIMATED POSITION UNCERTAINTY

Ident.: DSC-22_20-20-20-00010499.0076001 / 01 OCT 12
Applicable to: ALL

The FMS displays the EPU to the flight crew and compares it with the Required Navigation Performance (RNP):
- If the EPU does not exceed the RNP, accuracy is HIGH
- If the EPU exceeds the RNP, accuracy is LOW.

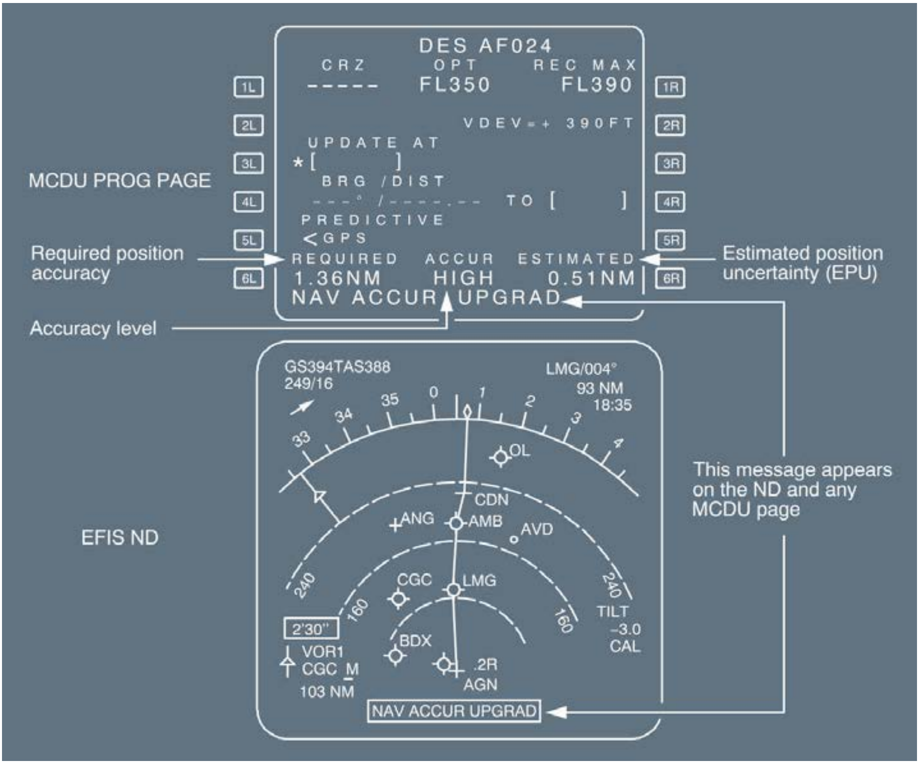
The RNP is displayed in the REQUIRED field of the PROG page. The displayed RNP is (in a decreasing order of priority):
- The value that the flight crew entered
- The navigation database procedure value
- The system's default value.

When a flight crew enters an RNP that is higher than the published value, one of the following messages is displayed : "PROCEDURE RNP IS XX.XX", or "AREA RNP IS XX.XX". When this occurs, the flight crew should verify the RNP value that was manually entered in the REQUIRED field of the PROG page, and clear or modify it if necessary.

The "AREA RNP IS XX.XX" message is also displayed at the change of flight area if the new RNP (default value) is smaller than the displayed RNP (manually entered).

DEFAULT AREA RNP VALUES	
EN ROUTE	2.0 NM
TERMINAL	1.0 NM
APPROACH	GPS 0.3 NM OTHER CASES 0.5 NM

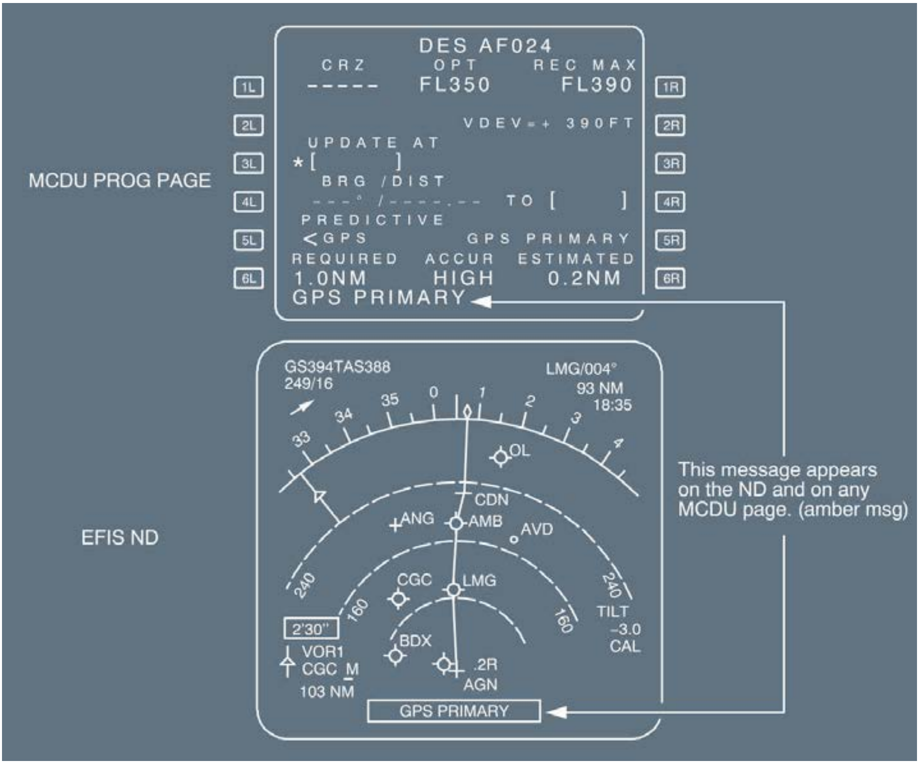
When one FMGC changes the NAV accuracy from LOW to HIGH (or HIGH to LOW), the MCDU and the ND display the "NAV ACCUR UPGRAD" (or DOWNGRAD) message.
These messages are inhibited when the navigation mode is IRS /GPS.



When in IRS /GPS mode, the GPS PRIMARY status combines two different criteria:
- The accuracy criterion previously described (HIGH/LOW accuracy)
- An integrity criterion: This is the capability to detect a failure and provide appropriate warning of it. This criterion indicates the confidence that the flight crew can have in the FMS position.

If the GPS PRIMARY status complies with both criteria, "GPS PRIMARY" is displayed on the MCDU (PROG page, [5R] field and scratchpad) and temporarily on the ND.
If the GPS PRIMARY status no longer complies with one of these criteria (Navigation downgraded or integrity lost), the GPS PRIMARY status is lost and the MCDU and the ND display the "GPS PRIMARY LOST" message. It is possible to clear the scratchpad message on the MCDU , but not on the ND.

CAUTION	"HIGH" or "LOW" on the PROG page indicates the FM position accuracy, based on estimated uncertainty. When GPS PRIMARY mode is lost, the flight crew must periodically check this position accuracy. In GPS PRIMARY mode, the position accuracy is always at HIGH.



When the GPS is manually deselected, the "GPS IS DESELECTED" message is displayed on the MCDU , 80 NM before the T/D or at approach phase transition.

FM/GPS POSITION DISAGREEMENT

Ident.: DSC-22_20-20-20-00010500.0011001 / 17 AUG 10
Applicable to: ALL

When the GPS PRIMARY function is active, and either of the FM positions deviate from the GPS positions 1 or 2 by more than:
- A longitude threshold that depends on the latitude:
  - 0.5' for latitudes below 55°
  - 0.9' for latitudes at or above 55°, and below 70°.
- A latitude threshold of 0.5', regardless of the latitude,

then, the lower ECAM displays the NAV FM /GPS POS DISAGREE amber caution. The master caution light comes on and the single chime sounds.
This amber caution is inhibited during the takeoff phase.
Above 70° of latitude, a longitude difference does not trigger the alarm.

PREDICTIVE GPS PAGE

Ident.: DSC-22_20-20-20-00010501.0001001 / 16 MAR 11
Applicable to: ALL

The predictive GPS page is only operative with the Honeywell ADIRS equipment. All fields are blank with Litton ADIRS equipment.
The predictive GPS function predicts the availability of the GPS within ± 15 min of ETA at destination, or at any waypoint entered by the flight crew.

Predictions are displayed on the predictive GPS page at time intervals of 5 min (+15 and –15 min of ETA).
To access this page, press the 5L key of the PROG page. This page also enables the deselection of up to 4 satellites at a time.

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GENERAL

Ident.: DSC-22_20-20-30-00010478.0001001 / 17 AUG 10
Applicable to: ALL

Radio navaids are tuned for two different purposes: Display and computation.

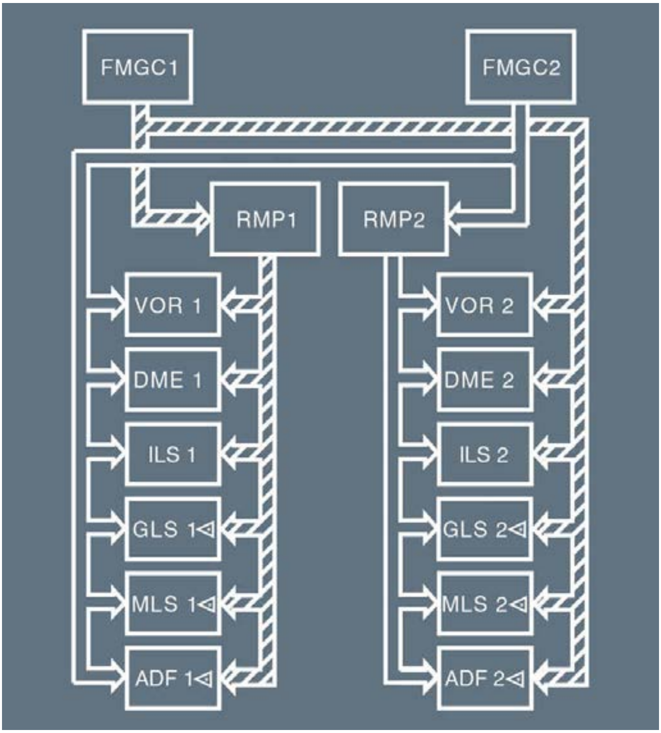
It is possible to perform tuning for display in three different ways:
- Automatic tuning via FMGC software
- Manual tuning via the MCDU RAD NAV page
- Manual tuning via the Radio Management Panel (RMP) if both FMGC s or both MCDUs fail.

The FMGS automatically tunes the radio navaids for computation of the radio position.

<u>Note:</u> *The manual selection of a VOR or VOR /DME may prevent the FMGS from automatically tuning a VOR /DME to compute position. In this case, the related MCDU displays "TUNE BBB FFF.FF" (BBB = ident, FFF.FF = frequency).*

ARCHITECTURE

Ident.: DSC-22_20-20-30-00010479.0001001 / 31 AUG 17
Applicable to: ALL



- In dual mode and independent mode, each FMGC simultaneously tunes the navaids on its own side (one VOR , one DME , one ILS , one GLS , one MLS and one ADF). In these modes, the flight crew can also manually tune the VOR (and associated DME), ILS, GLS , MLS and ADF .
- In single mode, the valid FMGC tunes navaids on both sides. The flight crew can also use the RAD NAV page to manually tune both VOR s, both ADFs , and the ILS / GLS / MLS .

Manual tuning has priority over automatic tuning.

<u>Note:</u> *If one receiver fails, both FMGCs use the operative radio receiver to compute the position of the aircraft.*

VOR

Ident.: DSC-22_20-20-30-00010480.0001001 / 17 AUG 10
Applicable to: ALL

Each FMGC may tune only one VOR (manually or automatically).

Automatic tuning complies with the following priorities for tuning the VOR:
1. The specified navaid for the approach
2. The navaid that the flight crew should use to compute the current radio position
3. For display purposes:
   - A navaid specified for the active flight leg
   - The “TO” waypoint (TO WPT), if it is a navaid
   - The “FROM” waypoint (FROM WPT), if it is a navaid
   - A waypoint farther along the flight path, if it is a navaid
   - The navaid closest to the current position of the aircraft.

The scratchpad displays “SPECIFIC VOR-D UNAVAIL”, if the VOR or the VOR /DME that the flight crew requires for tuning is deselected.

DME

Ident.: DSC-22_20-20-30-00010481.0002001 / 17 AUG 10
Applicable to: ALL

Each FMGC automatically uses its four DME frequencies as follows:
- One DME frequency for display. It is possible to tune it manually or automatically. This DME frequency is also used for VOR /DME position computation.
- Two DME frequencies in DME /DME mode for calculating the radio position of the aircraft. The FMGC automatically tunes these as a function of their best accuracy. The flight crew does not receive any indication that this process is happening.
- One DME frequency is connected to the ILS /DME.

ADF

Ident.: DSC-22_20-20-30-00010482.0001001 / 17 AUG 10
Applicable to: ALL

The FMGC automatically tunes one ADF , when the flight plan specifies a Non Directional Beacon (NDB) approach and a fix in the approach is the “TO” waypoint.
The scratchpad displays “SPECIFIC NDB UNAVAIL”, if the NDB that the flight crew requires for autotuning is deselected.

ILS

Ident.: DSC-22_20-20-30-00010483.0001001 / 17 AUG 10
Applicable to: ALL

Each FMGC automatically tunes one ILS frequency:
- In the PREFLIGHT or TAKEOFF phase, when the takeoff runway has an associated ILS.
- In the CLIMB, CRUISE, DESCENT, APPROACH, or GO-AROUND phase, when the type of approach in the flight plan is ILS.

The scratchpad displays “RWY /ILS MISMATCH” when the flight crew manually tunes the ILS and the entered frequency does not agree with the ILS or the LOC IDENT /FREQ that the flight crew requests for automatic tuning. The FMGS logic does not enable the flight crew to modify the course of an ILS when its frequency is identical to the ILS selected in the F-PLN.

SELECTION OF NAVAIDS ON MCDU PAGES

Ident.: DSC-22_20-20-30-00010485.0032001 / 31 AUG 17
Applicable to: ALL

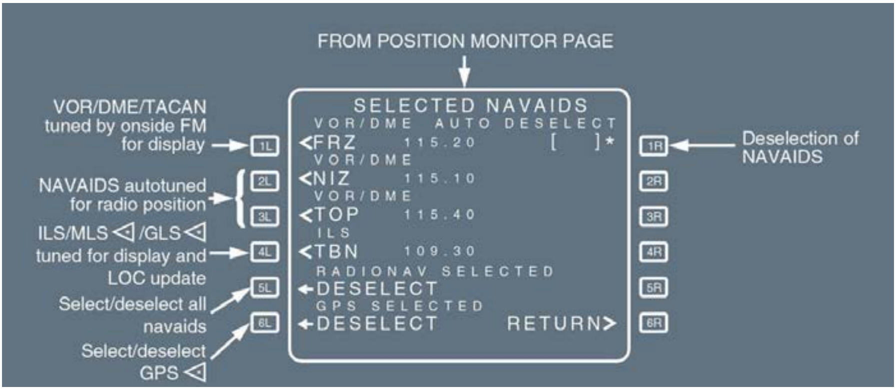
The MCDU displays the navaids tuned by the FMGC on two pages:
- RADIO NAV Page
- SELECTED NAVAIDS Page.

RADIO NAV PAGE

This page shows which navaids have been tuned automatically or manually for display purposes.

SELECTED NAVAIDS PAGE

This page lists the navaids tuned by the onside FMGC. No navaids can be modified on this page. The flight crew may deselect navaids and or GPS for the whole flight.

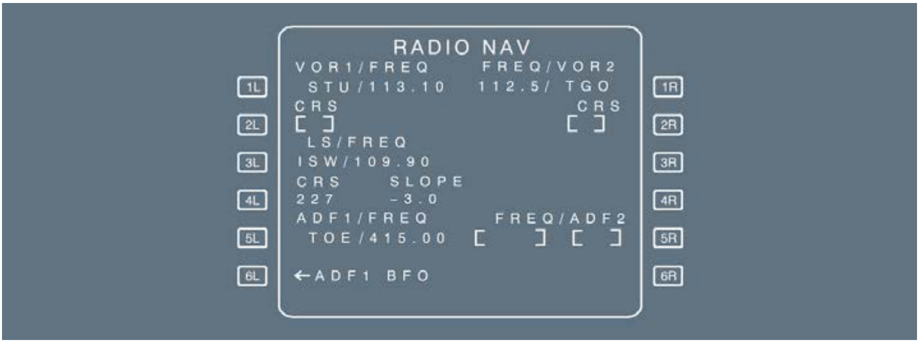


MANUAL TUNING

Ident.: DSC-22_20-20-30-00010486.0002001 / 01 MAR 17
Applicable to: ALL

INSERT the identifier on the RADIO NAV page.

Preferably use the identifier.



<u>Note:</u> *The RAD NAV page may differ according to option installed (ADF 1, ADF2, xLS).*

- **If the MCDU displays “NOT IN DATA BASE”:**

  INSERT the frequency.

  DISREGARD the ident that appears in small font on the MCDU.

  When a frequency is entered in the VOR field, the FMGC automatically associates to the tuned frequency the closest navaid identifier with the same frequency, and displays it on the RAD NAV page. This identifier may not correspond to the tuned navaid.

If the closest navaid, found in the database, is of a different type (e.g. VOR instead of VOR /DME), the flight crew will obtain a partial tuning (e.g. VOR indication instead of VOR /DME indication).

ENTER the course.

If the flight crew intends to manually tune an ILS that is not in the Navigation Database or to manually tune an ILS by its frequency (ident not entered), and if they do not enter the course, the flight crew will not be able to arm approach modes.

NAVAID IDENTIFICATION

Ident.: DSC-22_20-20-30-00010487.0001001 / 31 AUG 17
Applicable to: ALL

CHECK the xLS (ILS or GLS or MLS) identifier decoded on the PFD , and the VOR or ADF on the ND.

When the navaid identifier is decoded in agreement with that published, no audio check is necessary.
When the decoding is different from the published one, check the audio. Due to morse coding inaccuracy, wrong decoding may sometimes occur.
For GLS , the audio signal may be inaudible. However, the GLS identifier displayed on ND and PFD is raw data. Consequently, for GLS , no audio check is necessary.

Note: *When a DME or a TACAN only is selected using either its identifier or its frequency, the NDs do not display the decoded indication.*

ALIGNMENT OF INERTIAL REFERENCE SYSTEM

Ident.: DSC-22_20-20-40-00010143.0002001 / 01 OCT 12
Applicable to: ALL

The FMGS uses the reference point coordinates of the departure airport to align the IRS.
It calls these up from the database automatically after the flight crew has entered a company route or an origin-destination city pair and pressed the ALIGN IRS key on the MCDU. The flight crew can adjust these coordinates manually to the gate position. A normal alignment takes 10 min, a fast alignment 30 s.
Fast alignment is used to refine a position when time is limited.

<u>Note:</u> *If "ALIGN" flashes on the ADIRS overhead CDU during the alignment process, it indicates one of the following:*
- *It has detected excessive motion. (It automatically restarts the alignment)*
- *It has detected a disagreement between the position the MCDU has sent to the IRS , and the last memorized IRS position. The flight crew must enter new coordinates in the MCDU , and realign the IRS*
- *It has detected a disagreement between the latitude the MCDU has sent to the IRS , and the latitude the IRS has computed during the alignment*
- *The IRS has not received a position from the MCDU or the ADIRS overhead CDU.*

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GENERAL

Ident.: DSC-22_20-20-50-00010410.0001001 / 09 MAR 15
Applicable to: ALL

Overall navigation performance is mainly based on two elements:
- The accuracy of the aircraft position calculation
- The validity of the flight path definition, as extracted from the navigation database.

The level of validation depends on the type of operations. For example, JAA TGL 10 requires that, for Precision RNAV in terminal area, providers and operators implement a quality assurance program for the navigation database, which may include a navigation database validation process. The highest level of validation is required for RNAV approach, with lateral and vertical navigation.
The navigation databases are revised every 28 days (AIRAC cycle). Flights should be conducted with a navigation database that is within its cycle. This should be checked on the AIRCRAFT STATUS MCDU page.

OPERATIONS WITH AN OUTDATED NAVIGATION DATABASE

Ident.: DSC-22_20-20-50-00010411.0001001 / 13 DEC 12
Applicable to: ALL

Airbus recommends flying with an updated navigation database. However, in exceptional circumstances, and for a limited period of time, an aircraft can continue to operate beyond the end date of the database cycle, provided it is approved by the national authorities.

The following precautions need to be considered:
- Prior to flight, identify recent changes on the intended route, with the navigation charts and manuals. Some “strategic” new waypoints, not in the navigation database, may be worth entering as DEFINED WAYPOINT on MCDU.

  Note: *Flying with an outdated database, in an airspace that was recently restructured with numerous new waypoints, should be avoided.*

- Check SID , STAR, and approach procedures of departure, destination and required alternates for recent changes.
  Do not attempt to modify or manually construct terminal instrument procedures or approaches.
- Fly terminal instrument procedures and approaches with managed guidance, that are in the navigation database and that have been checked for accuracy. Otherwise, fly the procedure, or the approach, in selected guidance with conventional radio navaid raw data.

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FLIGHT PLANNING

Ident.: DSC-22_20-30-05-00010492.0002001 / 17 AUG 10
Applicable to: ALL

The flight crew uses the MCDU to insert flight plans into the FMGS:
- A lateral flight plan that defines the intended horizontal flight path
- A vertical flight plan that defines the intended speed and altitude profile for the aircraft to follow while flying the lateral flight plan.

Note: *The flight planning function is available for both the primary and secondary flight plans.*

The FMGS can contain two different flight plans:
- The ACTIVE flight plan, which is the basis for:
  - Lateral and vertical guidance
  - MCDU and ND display
  - Radio navigation autotuning
  - Performance predictions
  - Fuel planning.
- The SECONDARY flight plan which the flight crew may use:
  - When an alternate takeoff runway is probable
  - To plan a diversion
  - To prepare the next flight
  - To compare predictions or evaluations.

Each flight plan is composed of the same elements:
- The primary flight plan, from origin to destination and missed approach
- The alternate flight plan, from destination to alternate destination.

The flight crew enters the flight plan in either of two ways:
- Automatically by selecting a company route. Such a selection will call all the elements of the route out of the database.
- Manually by selecting an ORIGIN/DEST pair, and then selecting all successive waypoints, procedures, and vertical constraints on the MCDU.

The flight crew may then modify the flight plan on the ground or in flight, by making lateral and vertical revisions.

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General

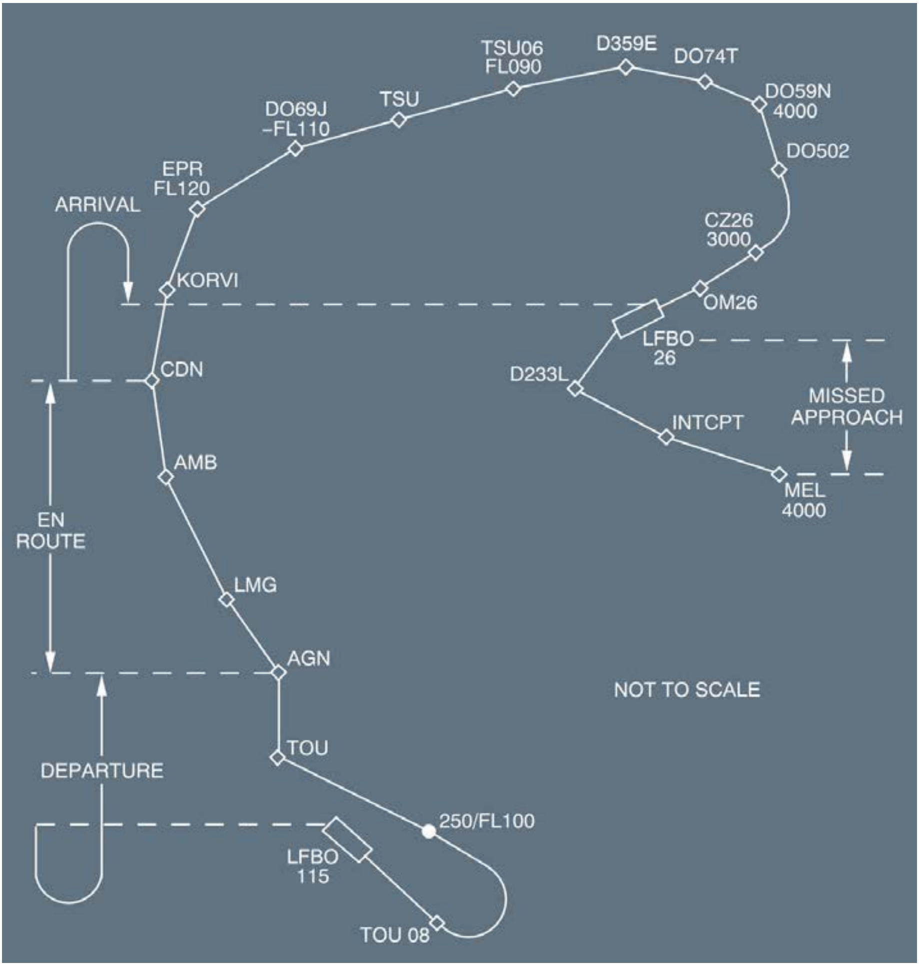
GENERAL

Ident.: DSC-22_20-30-10-05-00011075.0002001 / 23 JUN 15
Applicable to: ALL

To insert the lateral flight plan, the flight crew can use either a company route number or an ICAO four-letter city pair.

The lateral flight plan includes the following elements:
- Departure
  - Takeoff runway
  - SID
  - En route transition.
- En route
  - En route waypoints and airways.
- Arrival
  - En route transition
  - STARs/VIAs
  - Landing runway with selected approach
  - Missed approach.
- Alternate flight plan.

These elements are defined by waypoints and legs between the waypoints.



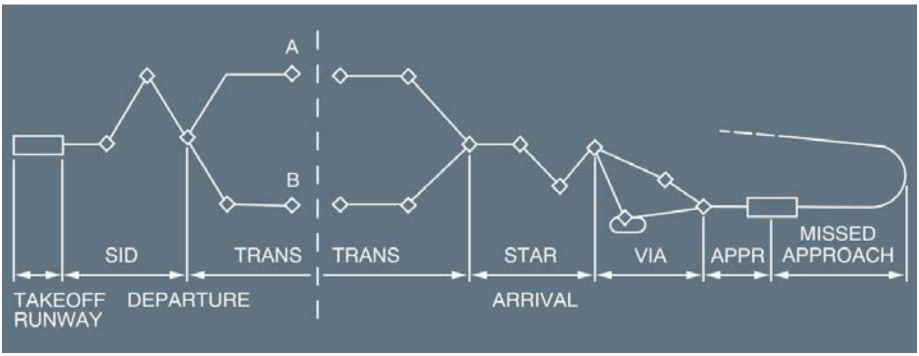
The FMGC automatically strings the legs in sequence.
The flight plan has a discontinuity if any two waypoints do not have a leg defined between them.
The computer assumes that the aircraft will fly a direct leg between the two waypoints that define the discontinuity.

Note: 1. *When the aircraft overflies a flight plan discontinuity, the NAV mode automatically reverts to the HDG (TRK) mode.*
2. *In HDG /TRK mode, a waypoint is sequenced when it passes behind the aircraft, and the aircraft is less than 7 NM from it, and also when the difference between the track of the aircraft and the track of the leg is less than 90 °.*
If the aircraft is flying a discontinuity towards a waypoint, this waypoint is sequenced when the aircraft is less than 5 NM from it.
The same conditions apply in NAV mode, except that no distance to the waypoint is taken into account.

The FMGS automatically strings additional types of legs, when departure or arrival procedures (SID - STAR - TRANS) are defined.

Those strings correspond to specific patterns that are heading or track referenced and are defined in the database, such as:
- DME arc leg
- Holding pattern to a fix, or reverse turn
- Course-to-fix leg
- Radius-to-fix leg
- Heading leg
- MANUAL leg.

The flight crew cannot create these types of legs: They are part of the stored departure/arrival procedures they have selected.
The flight crew can only create direct legs between manually defined geographic points (navaids, airports, waypoints).



Note: *The departure and arrival procedures are defined in the database to minimize the amount of memory required.*

They are divided, as follows:
- *DEPARTURE = SID + EN ROUTE TRANSITION*
- *ARRIVAL = APPR VIA + STAR + EN ROUTE TRANSITION*

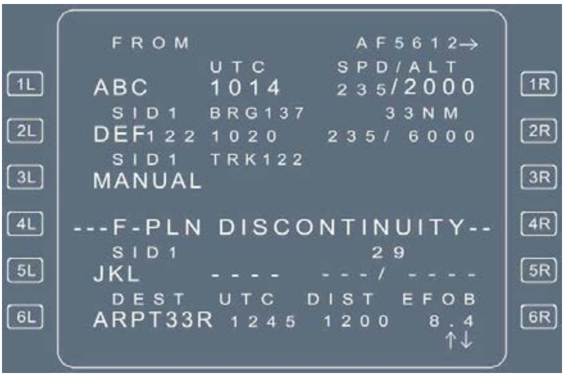
The SID is the central common part of the departure procedure, as the STAR is of the arrival procedure. Enroute transitions (TRANS) are the various possible trajectories defined between the last SID point and the first enroute waypoints, and between the last enroute waypoint and the first fix of the STAR . "APPR VIAs" are the possible trajectories, defined between the last STAR point and the first point of the approach.

MANUAL LEGS

Ident.: DSC-22_20-30-10-05-00010629.0001001 / 17 AUG 10
Applicable to: ALL

A MANUAL leg stays on a constant TRK or HDG and has no termination point. The flight crew cannot insert it into a flight plan manually: it is part of a given procedure such as a SID or a STAR. When the aircraft is flying a MANUAL leg, the NAV mode remains engaged and predictions assume that the aircraft will fly a direct leg from its present position to the next waypoint (DIR TO). When the aircraft is cleared to fly to the next waypoint of the flight plan, the flight crew performs a DIR TO.

Note: *1. In NAV mode, a MANUAL leg is sequenced only by performing a DIR TO.*
2. The use of the descent mode (DES) on a MANUAL leg is not recommended.

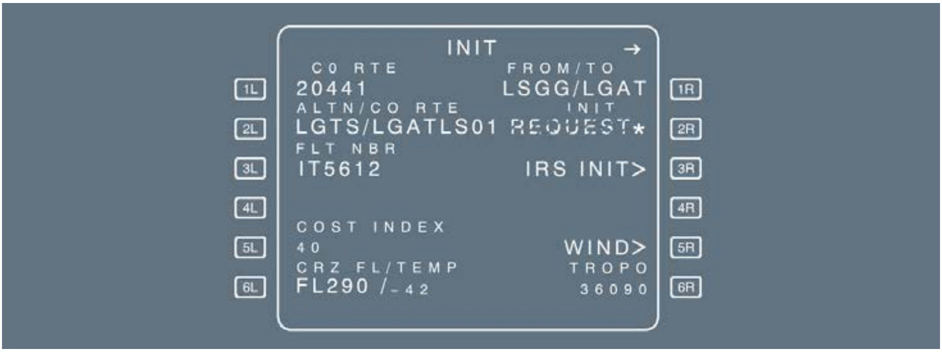


FLIGHT PLAN CONSTRUCTION

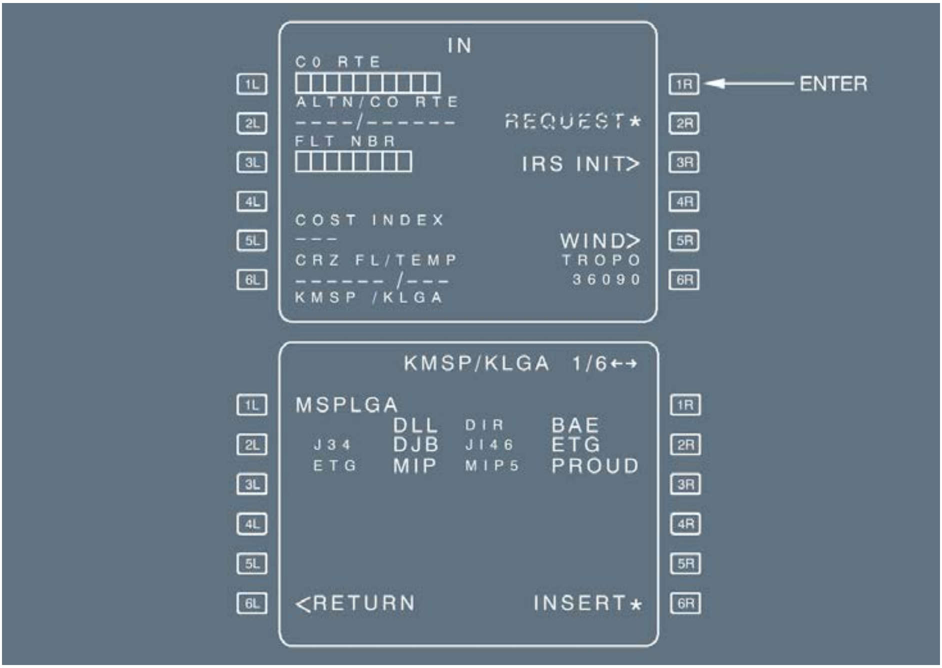
Ident.: DSC-22_20-30-10-05-00011076.0032001 / 01 OCT 12
Applicable to: ALL

There are three ways of defining the route:

1. A company route, that is in the database, and is known by the flight crew.
   The flight crew enters the name of the CO RTE into the [1L] field of the INIT A page. This action enters all the elements of the flight plan. The database usually includes an alternate route associated with the destination.



2. A company route, that is in the database, but the flight crew does not know it is there.
   The flight crew enters a city pair in the [1R] field. The ROUTE SELECTION page automatically appears and enables the flight crew to review all stored routes between the two cities before selecting one of them.



3. There is no company route between the two cities.
   The flight crew enters the city pair in the [1R] field. The ROUTE SELECTION page appears and displays “NONE”.
   The flight crew has to manually construct the entire flight plan.
   For procedure, *Refer to PRO-NOR-SRP-01-10 Flight Plan Initialization - General*.

FLIGHT PLAN CAPACITY

Ident.: DSC-22_20-30-10-05-00010631.0002001 / 17 AUG 10
Applicable to: ALL

In terms of flight plan capacity, the FMS takes into account 3 flight plans:
- The active flight plan
- The secondary flight plan
- The temporary flight plan.

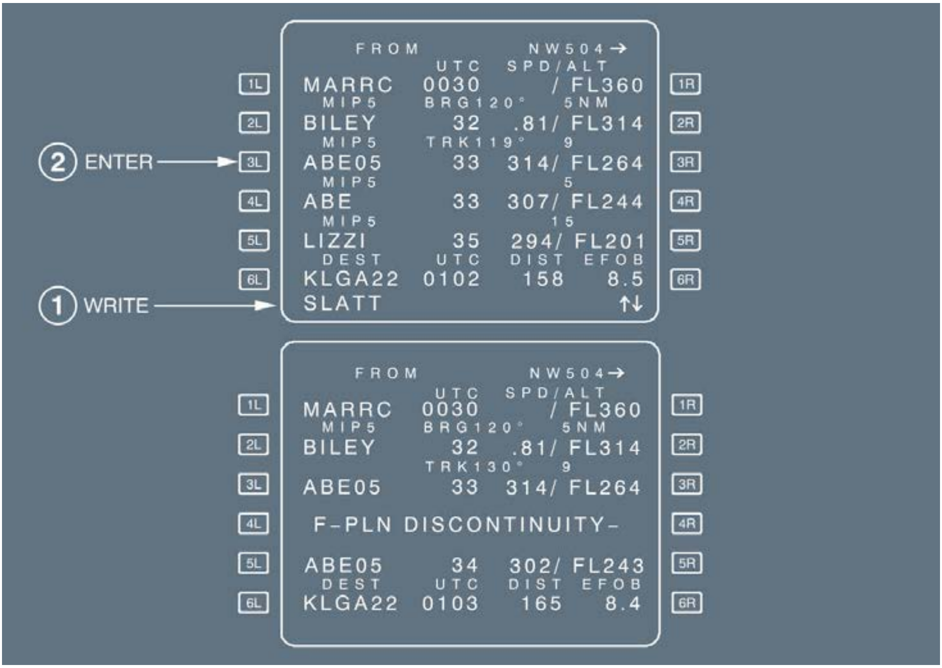
Each flight plan can contain up to 200 legs. If a flight plan contains 200 legs, and if the flight crew attempts to perform a lateral revision that increases the number of legs of this flight plan, the FMS rejects the revision and the MCDU displays the “F-PLN FULL” message. For the active and secondary flight plans, the primary parts must contain less than 135 legs, and the alternate parts must contain lesgs than 65 legs.

LATERAL REVISIONS

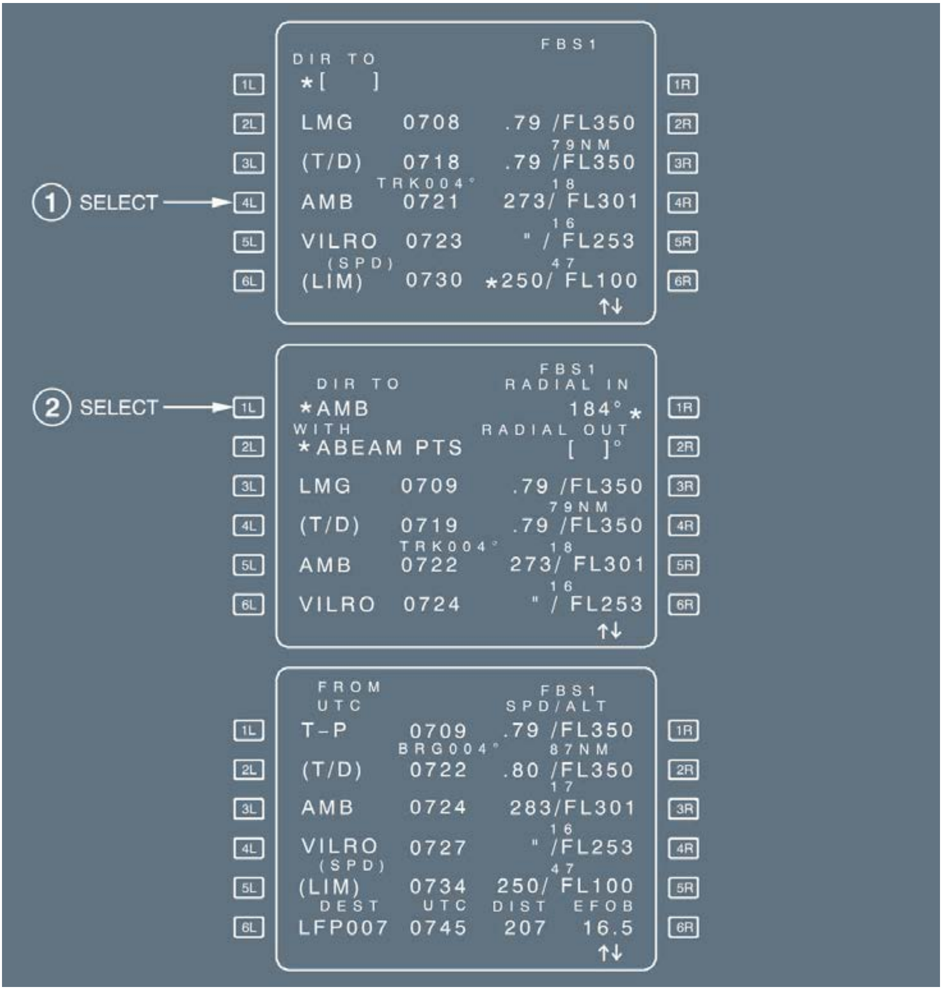
Ident.: DSC-22_20-30-10-05-00010632.0002001 / 07 APR 17
Applicable to: ALL

The flight crew can revise the lateral flight plan following two types of revisions:

1. Lateral revisions that have an immediate effect on the active flight plan:
   - The flight crew inserts a new waypoint directly on the F-PLN page, deletes, or changes a waypoint from it:



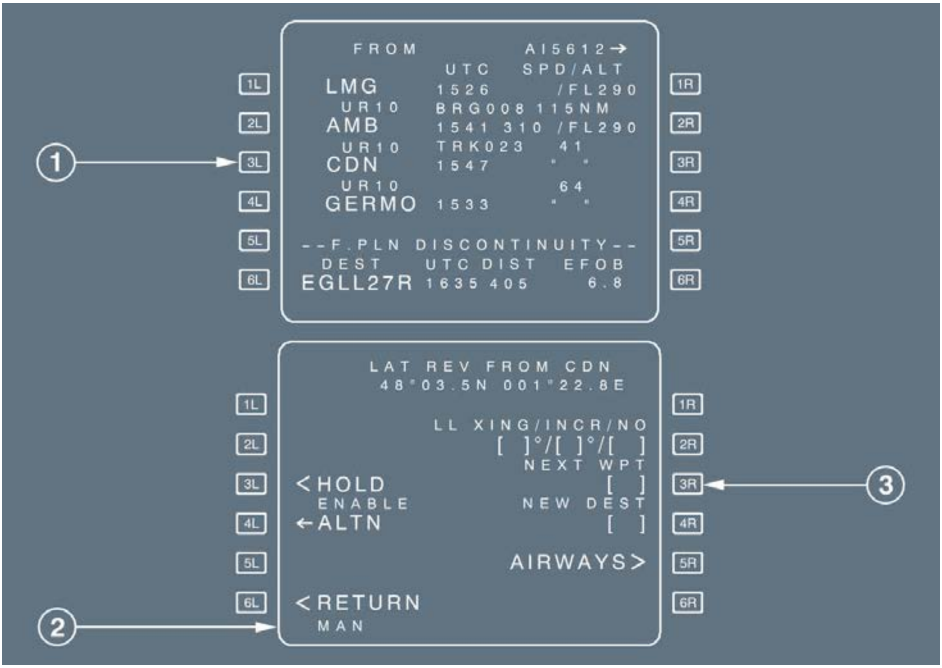
     When the flight crew enters a new waypoint, which does not exist in the flight plan, the following waypoint moves down the flight plan, with a discontinuity shown after the new waypoint.
   - The flight crew adds a direct leg (DIR TO) from his present position to a selected waypoint:
     The flight crew can change the “TO” waypoint of the active leg. The DIR TO function gives access to DIR TO , DIR TO ABEAM, or DIR TO/INTERCEPT. The active leg then goes from the present position (T/P) to the waypoint selected or inserted as the new “TO” waypoint.



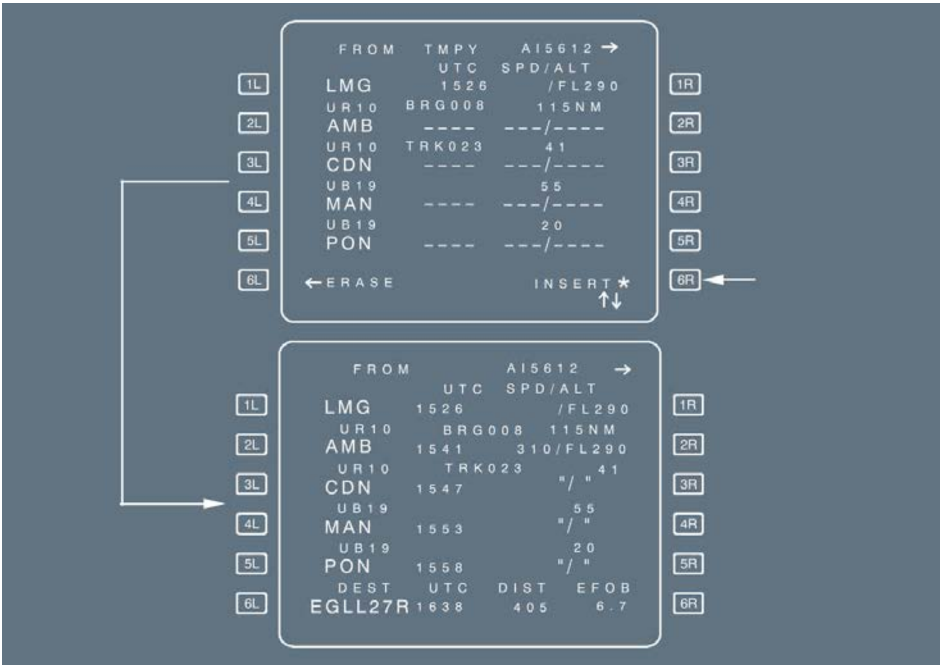
2. Lateral revisions that lead to a temporary flight plan (TMPY) before they take effect:
The flight crew creates a temporary flight plan, then inserts it as a revision to the active flight plan. The flight crew does this when selecting, deleting, or modifying several waypoints of an airway or procedure at once (SID , STAR , HOLD, TAKEOFF or LANDING RWY). This modification is made on specific “LAT REV” pages from the flight plan page.

Possible revisions are:
- Insert or modify the departure procedure
- Insert or modify the arrival procedure
- Insert a waypoint
- Change the destination
- Insert an airway
- Insert an offset
- Insert a holding pattern
- Select or enable an alternate flight plan
- Fix information.

The purpose of the temporary flight plan is to allow the flight crew to check a revision on the MCDU and on the ND before inserting the changes into the active flight plan. It is a copy of the active flight plan that has been changed according to the flight crew revision. While it is displayed, the aircraft will continue to follow the original active flight plan.
No predictions are computed or displayed on the pages of the temporary flight plan.



A temporary flight plan is displayed for a check and/or new modification. Inserting the temporary revision will modify the active flight plan.



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FMS2 HONEYWELL

GENERAL

Ident.: DSC-22_20-30-10-15-00005067.0001001 / 09 FEB 11
Applicable to: ALL

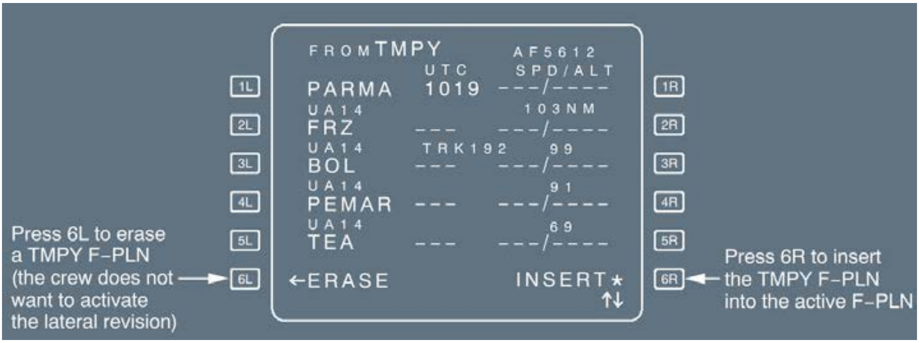
The lateral revision function allows the pilot to create or modify the following parts of the flight plan:
- Airway
- Waypoint
- New destination
- Holding pattern
- Offset
- Alternate
- Fix information
  Each time the pilot activates one of the above-listed revisions, he accesses a temporary flight plan that enables the modification to be checked before inserting it in the active flight plan. The crew selects these functions by pressing the left keys on F-PLN A or B.
- Direct to and overfly functions are accessed via the MCDU keys. No temporary flight plan is created with these functions.
- “Update at” capability is a specific function that manually updates the FM position. It does not .use a temporary flight plan, but the pilot must confirm its insertion before it is activated.

TEMPORARY F-PLN (TMPY)

Ident.: DSC-22_20-30-10-15-00000460.0001001 / 01 OCT 12
Applicable to: ALL

When a pilot makes a lateral revision to the F-PLN , the FMGS creates a temporary flight plan. This is a copy of the active F-PLN, but is corrected by the lateral revision in progress.
The aircraft continues to follow the active F-PLN, until the temporary revision is inserted.
The revision appears in yellow font on both MCDU s and NDs.

- Lateral and vertical revisions cannot be made to a temporary F-PLN.
- Only one temporary F-PLN may be accessed at a time.
- The “DIRECT TO” function, when used, erases a temporary F-PLN.
- When a DIR TO is in process, a temporary revision cannot be displayed on the other MCDU.
- A TMPY F-PLN changes the title of the flight plan pages. (TMPY appears in all titles).
- No predictions are computed for a temporary flight plan (dashes are displayed).



Temporary data is displayed in yellow (ND and MCDU). Once inserted, it becomes active and is displayed in green.

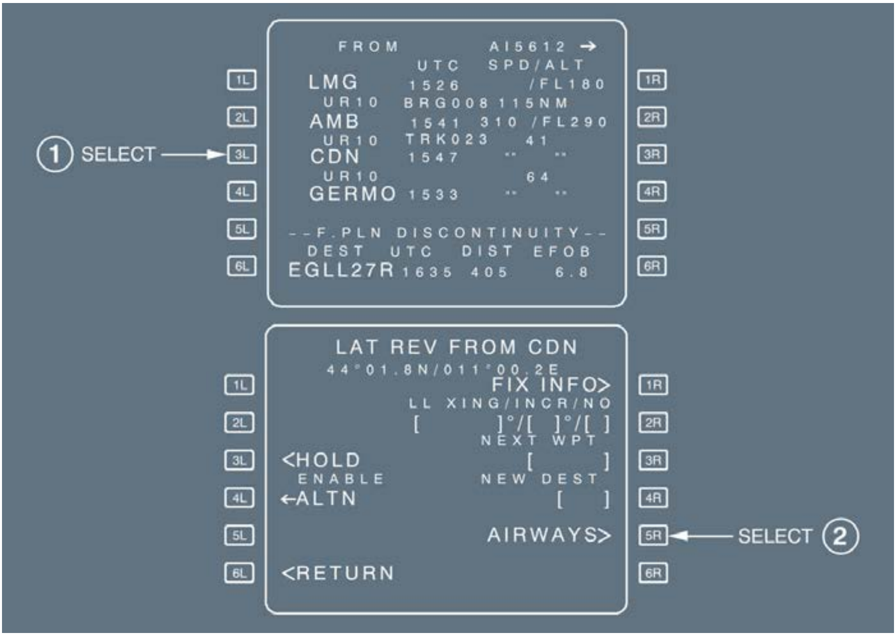
INSERTING AN AIRWAY WITH "VIA"

Applicable to: ALL

Ident.: DSC-22_20-30-10-15-E-00012828.0001001 / 14 MAY 12

GENERAL

In the active flight plan, the pilot can insert up to 5 successive airway segments, going from a revised waypoint or ending at a given waypoint of the flight plan.

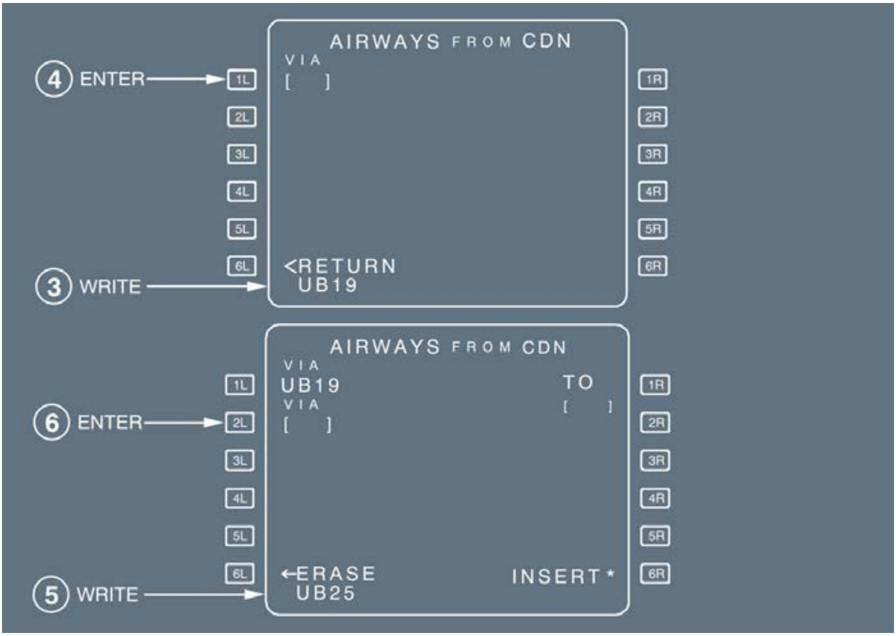


SELECT the revised waypoint (here CDN).
PRESS [5R] to select the airways function.

Ident.: DSC-22_20-30-10-15-E-00012829.0001001 / 14 MAY 12

THE PILOT WISHES TO INSERT SUCCESSIVE AIRWAY SEGMENTS FROM A WAYPOINT

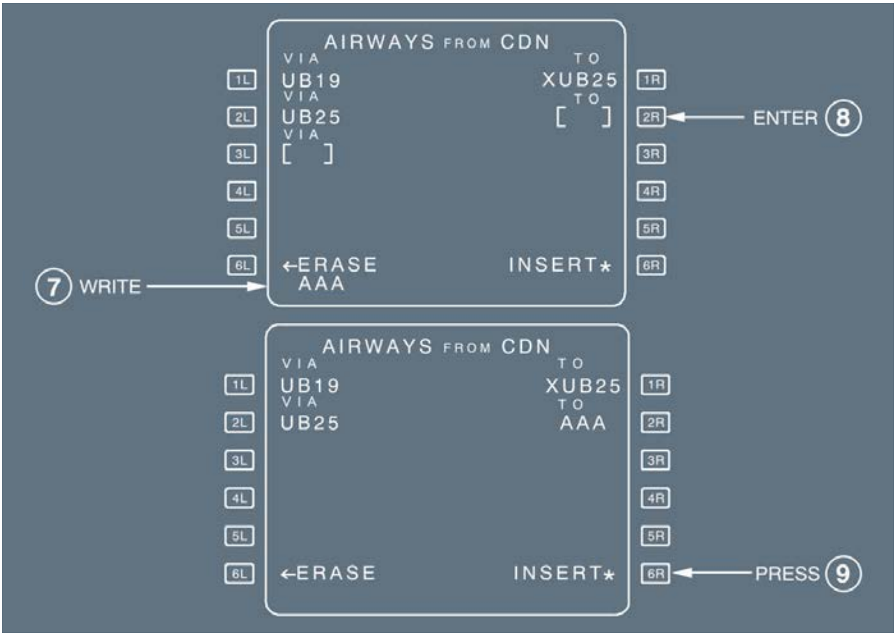
e.g. from CDN - Airways UB19 – Airways UB25 – Ending point AAA.



WRITE the first airway in the scratchpad (here UB19).
PRESS [1L] to insert it into the VIA field.
WRITE the second airway in the scratchpad (here UB25).
PRESS [2L] to insert it into the VIA field.

The system automatically determines the first downpath intersection point between the 2 airways.
- If the airways have a common waypoint, the system selects it as the ending point of the first VIA.
- If they have no common waypoint, but have a single intersection, the system creates this intersection as an FM -computed point and displays X followed by the airway IDENT (here XUB25).
- If they have no common waypoint or intersection, the system displays NO INTERSECTION FOUND in the scratchpad.

Once the pilot has entered the required airways (up to 5), he must enter the ending point of the last selected airways:

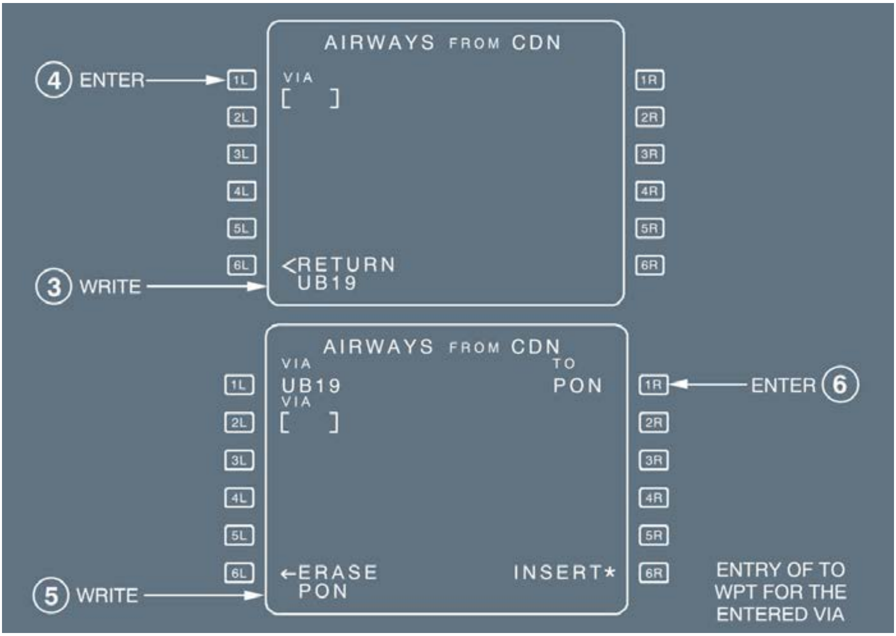


WRITE the ending waypoint in the scratchpad (here AAA).
PRESS [2R] to insert the ending waypoint into the TO field.

<u>Note:</u> *If two waypoints with the same IDENT belong to the same airway, the DUPLICATE NAMES page will not be called up, and the system selects the first one in the database.*

Ident.: DSC-22_20-30-10-15-E-00012830.0001001 / 01 OCT 12

THE PILOT WISHES TO INSERT ONE AIRWAY SEGMENT TO AN ENDING WAYPOINT



WRITE the airway IDENT in the scratchpad (here UB19).
PRESS [1L] to insert it into the VIA field.
WRITE the ending waypoint in the scratchpad (here PON).
PRESS [1R] to insert it into the TO field.

Note:
- *If the revise waypoint, or the ending waypoint, does not belong to the entered airway, the system displays AWY /WPT MISMATCH in the scratchpad.*
- *If two waypoints with the same IDENT belong to the same airway, the DUPLICATE NAMES page will not be called up and the system selects the first one in the database.*

Ident.: DSC-22_20-30-10-15-E-00012831.0001001 / 09 FEB 11

FLIGHT PLAN INSERTION

The flight crew either inserts the flight plan directly from the AIRWAYS page, or from the TMPY F-PLN page. In both cases:

PRESS [6R] to insert the temporary flight plan. Clear flight plan discontinuity, as needed.

INSERTING A WAYPOINT

Applicable to: ALL

Ident.: DSC-22_20-30-10-15-F-00012832.0001001 / 09 FEB 11

GENERAL

Waypoints can be inserted in two ways:
- Directly into the flight plan. All modifications go directly into the active flight plan. No temporary flight plan is created.
- By means of a lateral revision at the “NEXT WAYPOINT”, a process that creates a temporary flight plan.

The second method enables the temporary flight plan to be checked before it is inserted.

Ident.: DSC-22_20-30-10-15-F-00012833.0001001 / 09 FEB 11

WAYPOINT IDENTIFICATION

The pilot can identify a waypoint by:
- Its identifier (if it is in the navigation database).
- A Latitude/Longitude (LL).
- A Place/Bearing/Distance (PBD). The waypoint is defined by its bearing and distance from a place.
- A Place-Bearing/Place-Bearing (PBX). The waypoint is defined by the interception of 2 radials from 2 places.
- A Place/Distance (PD). The waypoint is defined by a distance from a place, along the F-PLN.

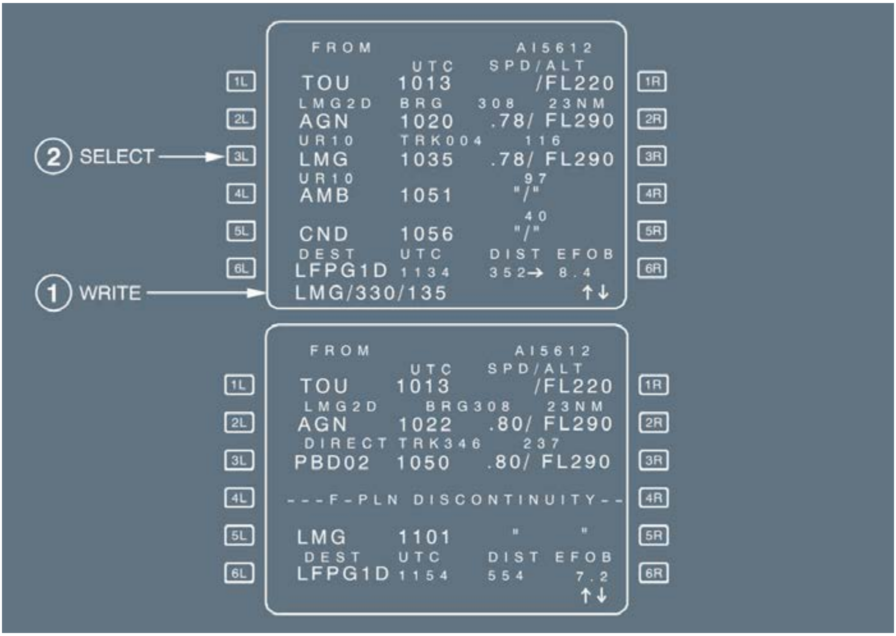
Note: *If a slash or a dash is not entered properly, the MCDU displays a “FORMAT ERROR” message.*

When the Flight Management Guidance System receives a waypoint that is not in the database, it identifies it as LLxx or PBD xx or PBX xx or PD xx (xx is a two-digit number between 01 and 20) and stores it in the stored waypoints file of the database.

Note: *When NAV mode is engaged, the crew cannot modify the “TO ” waypoint (active leg) using the waypoint insertion function. If the crew wants to modify it, the DIR TO function will be used.*

Ident.: DSC-22_20-30-10-15-F-00012834.0001001 / 14 MAY 12

WAYPOINT INSERTED DIRECTLY IN THE FLIGHT PLAN



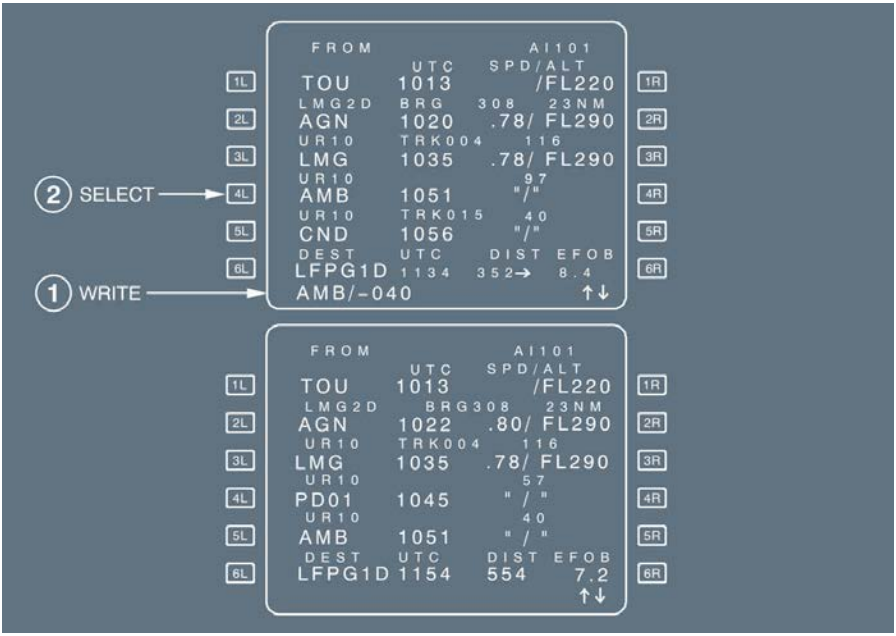
WRITE the waypoint identifier or LAT /LONG, Place/Bearing/Distance or Place-Bearing/Place-Bearing into the scratchpad. (Example: Place: LMG, Bearing: 330 °, Distance: 135 NM).
PRESS the appropriate key to enter the waypoint into the flight plan. The rule is that the new waypoint appears next to the pressed key, and the previous waypoint moves down the flight plan path.

This operation creates a discontinuity between the new waypoint and the previous one.
The new flight plan will have to be cleared of the discontinuity and some waypoints erased.

Ident.: DSC-22_20-30-10-15-F-00012835.0001001 / 01 OCT 12

ALONG TRACK WAYPOINT INSERTION

On the F-PLN or STEP ALTS page, the pilot can enter an along track waypoint, defined as a place/distance waypoint.



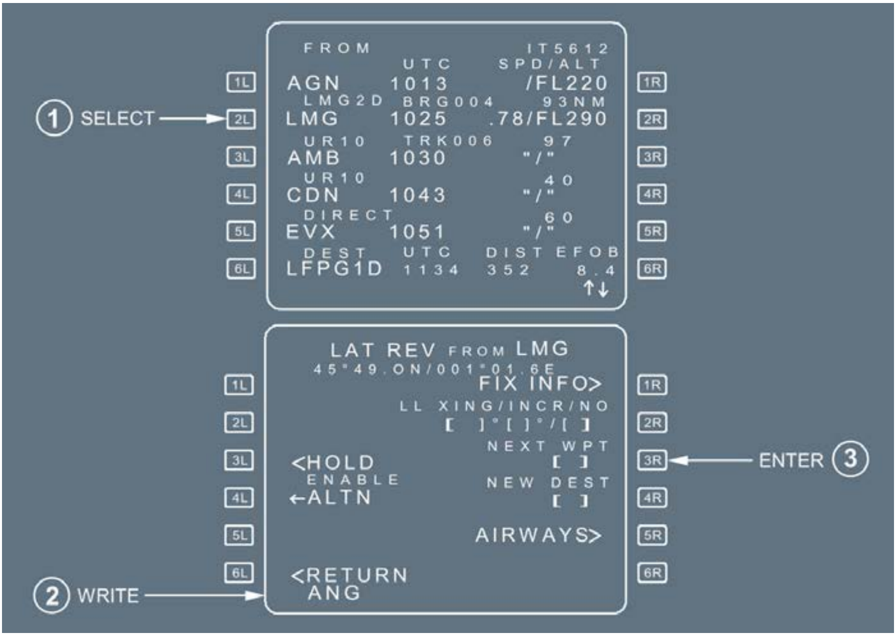
WRITE the waypoint identifier and distance from this place.

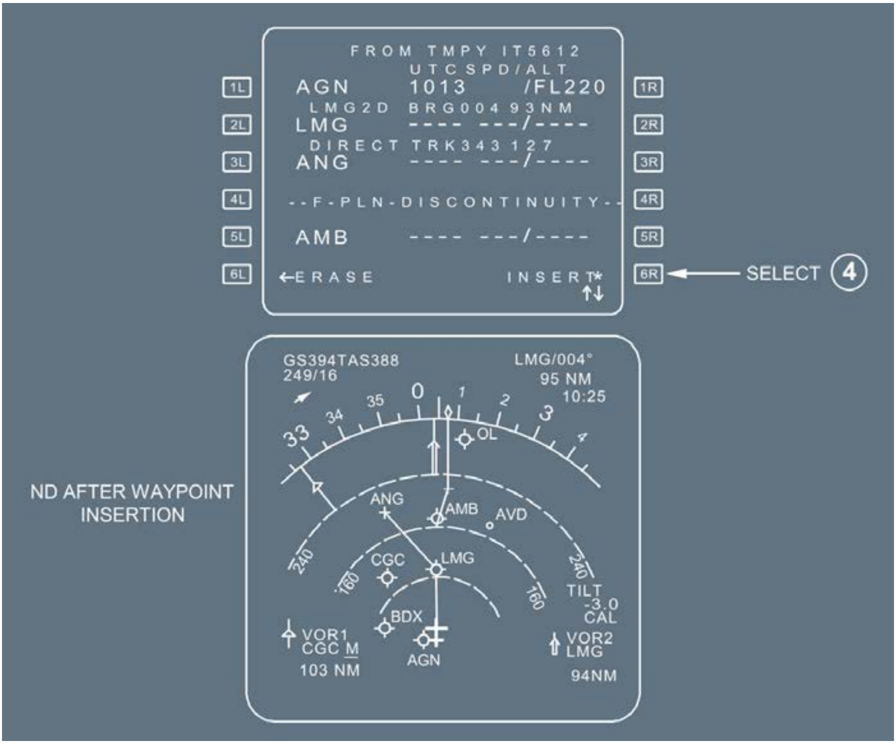
According to the sign of the distance, the crew may define an along track waypoint before or after the revised place. (Example: AMB/-040).

PRESS the appropriate key adjacent to the place identifier. The system automatically positions the waypoint in the flight plan.

This operation does not create any discontinuity.
The system does not accept an along track waypoint entered at the FROM waypoint.

WAYPOINT INSERTED THROUGH THE USE OF “NEXT WAYPOINT”



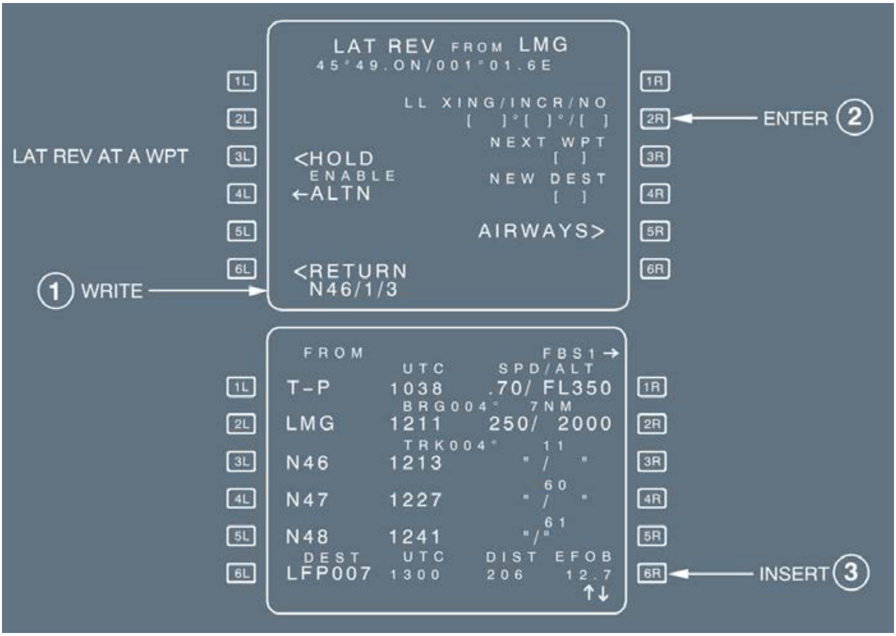


SELECT the lateral revision (LAT REV) function at an appropriate waypoint.
WRITE the waypoint identifier, or LAT /LONG, or Place/Bearing/Distance, or Place-Bearing / Place-Bearing into the scratchpad.
ENTER it in the brackets under NEXT WPT (next waypoint).
INSERT the temporary flight plan by pressing the [6R] key.
CLEAR the F-PLN discontinuity, as appropriate.

Ident.: DSC-22_20-30-10-15-F-00012837.0001001 / 14 MAY 12

LATITUDE/LONGITUDE CROSSING WAYPOINT INSERTION

This function allows the insertion of one or several points along the flight-plan beyond the revised waypoint, at fixed latitude or longitude intervals (INCR) from a specified latitude or longitude. These waypoints are not considered as part of the pilot-defined elements. The system deletes them when sequenced.



WRITE the latitude (NXX, XXN, SXX or XXS), the required increment in degrees between the successive waypoints, and the number of required waypoints.

(Example: The pilot wants to obtain 3 points, every degree from latitude N46: He enters N46/1/3).

PRESS [2R] to insert it into the LL XING/INCR/NO field.
PRESS [6R] to insert the new waypoints in the flight plan without discontinuity.

The system does not store these waypoints in the database.

FIX INFO

Applicable to: ALL

Ident.: DSC-22_20-30-10-15-G-00012838.0008001 / 09 FEB 11

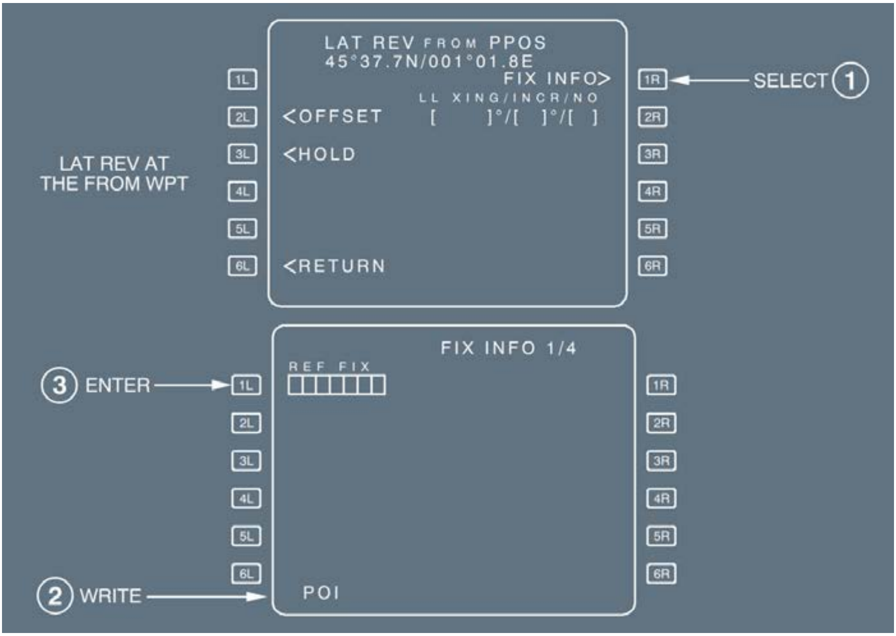
GENERAL

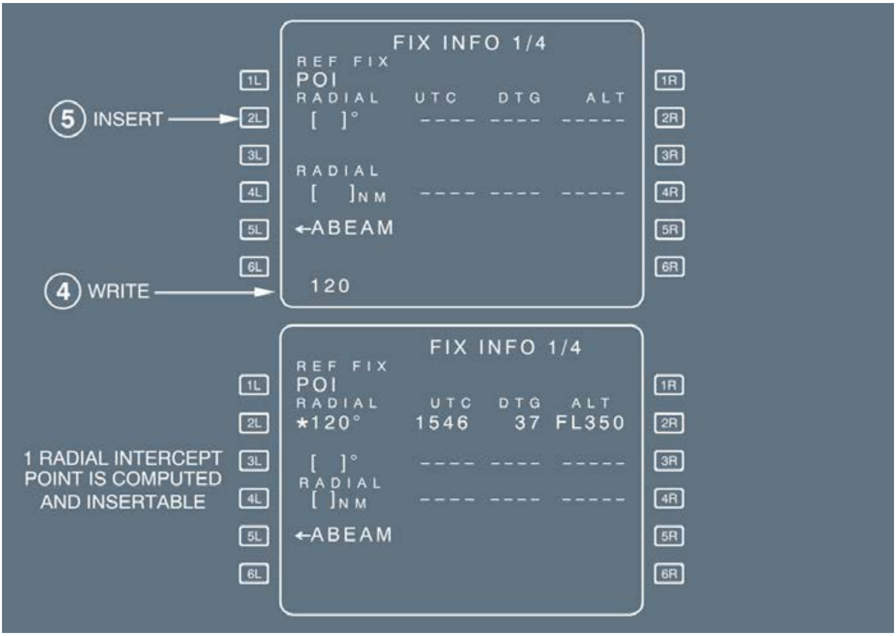
When using the FIX INFO function, the flight crew defines waypoint intersections of the flight plan with radials, circle or abeam associated to a fix.
When the flight crew inserts the intersection points, the system automatically identifies these points, but does not store them in the navigation database.

Ident.: DSC-22_20-30-10-15-G-00012839.0008001 / 01 OCT 12

INSERTING A RADIAL INTERCEPT WAYPOINT

The flight crew accesses the radial intercept function from the lateral revision page at the origin or “from” waypoint.


LAT REV FROM PPOS
45°37.7N/001°01.8E
FIX INFO>
LL XING/INCR/NO
<OFFSET [ ]°/[ ]°/[ ]
<HOLD
<RETURN
SELECT 1
LAT REV AT
THE FROM WPT
FIX INFO 1/4
REF FIX
3 ENTER
2 WRITE
POI



WRITE the reference fix identifier into the scratchpad (here POI), and ENTER it [1L].

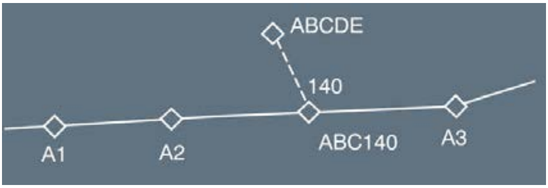
It may be any database or pilot-defined fix.

WRITE the radial into the scratchpad (here 120 °) and ENTER it [2L].

The defined radial appears as a blue dashed line on the ND.
If the radial line intersects the active flight plan, the system computes the time, distance to go, and the altitude at the intersection point.
Up to two radials can be entered.

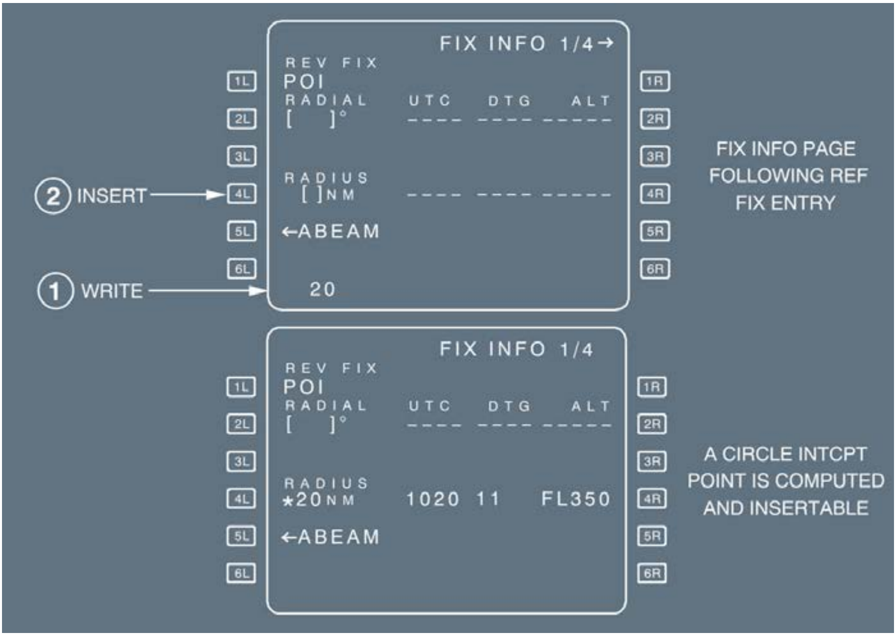
SELECT the required radial to insert the associated waypoint into the flight plan (if needed):

The system automatically assigns its IDENT as the three first characters of the reference fix IDENT , followed by the radial. (Example: ABC 140). The blue dashed line disappears from the ND.



Ident.: DSC-22_20-30-10-15-G-00012840.0001001 / 01 OCT 12

INSERTING A CIRCLE INTERCEPT WAYPOINT

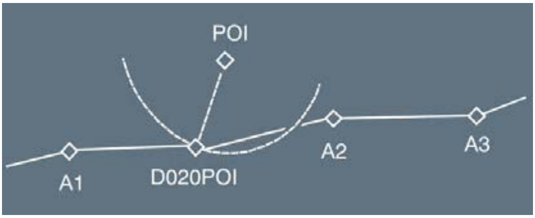


WRITE the reference fix identifier into the scratchpad (here POI), and ENTER it [1L].
WRITE the circle radius in the scratchpad (here 20 NM), and ENTER it [4L]:

The defined circle appears as a blue dashed circle on the ND. If the circle intersects the active flight plan, the system computes the time, along path distance to go and altitude at the first intersection point from the current aircraft position.

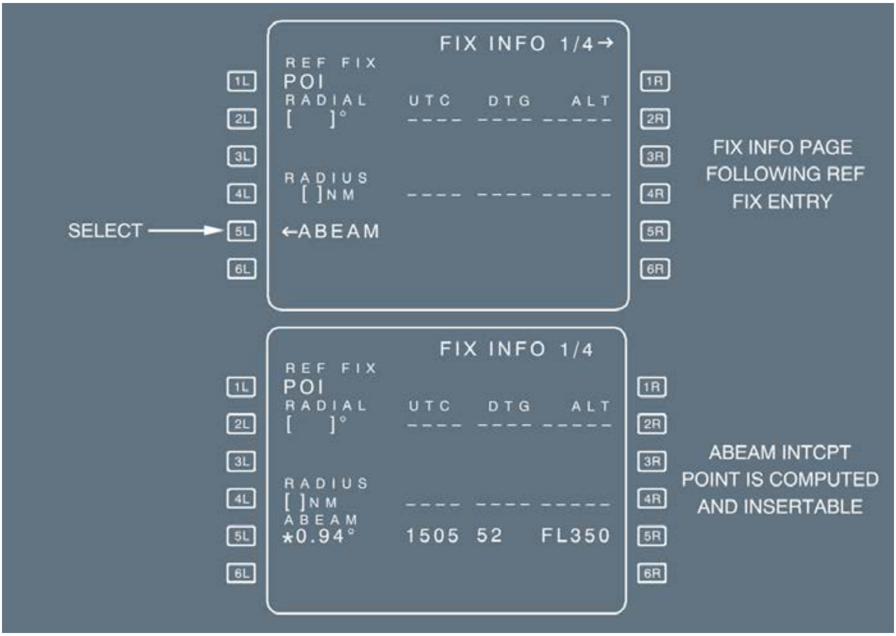
SELECT the required radius to insert the associated waypoint into the flight plan (if needed).

The system automatically assigns its IDENT as a D, followed by the radius, and followed by the three first characters of the reference fix IDENT (example D020 POI). The blue dashed circle disappears from the ND.



Ident.: DSC-22_20-30-10-15-G-00012841.0008001 / 01 OCT 12

INSERTING AN ABEAM INTERCEPT WAYPOINT



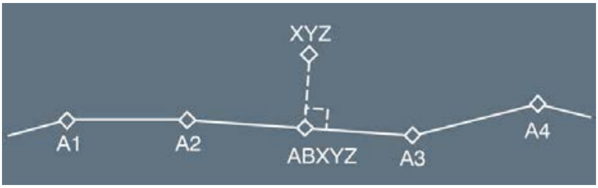
WRITE the reference fix identifier into the scratchpad (here POI), and ENTER it [1L]

SELECT the ABEAM prompt [5L]:

A blue dashed line from the reference fix and perpendicular to the flight plan appears on the ND. The system computes the radial, time, distance to go, altitude and predictions related to the waypoint abeam the reference fix.

SELECT [5L] to insert the abeam intercept waypoint into the flight plan (if needed):

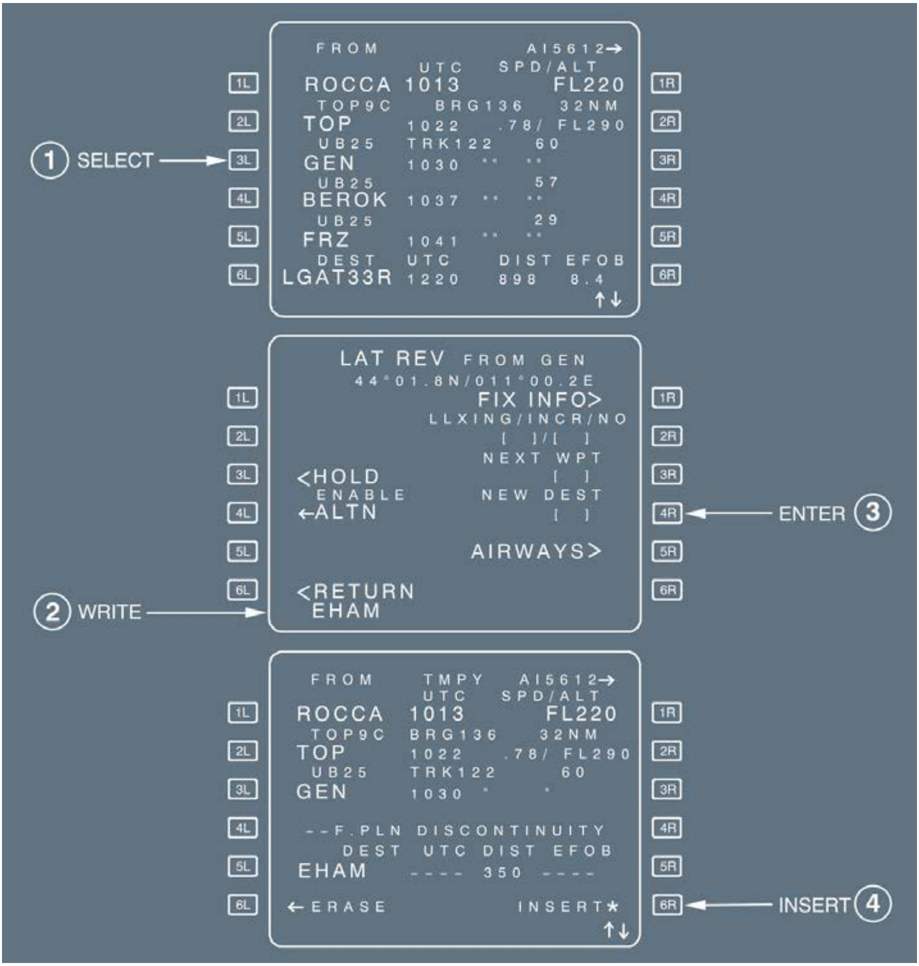
The system automatically assigns its identifier as AB, followed by the first five characters of the reference fix identifier (Example ABXYZ). The blue dashed line disappears from the ND.



INSERTING A NEW DESTINATION

Ident.: DSC-22_20-30-10-15-00000471.0001001 / 14 MAY 12
Applicable to: ALL

The pilot may define a new destination and insert it via the lateral revision page. The pilot may then call up the new destination from any waypoint along the flight plan, except the FROM waypoint, the destination, and the missed-approach waypoint. When the new destination has been inserted, a flight plan discontinuity appears between the revision waypoint and the new destination. All waypoints beyond the revision waypoint (including the previous destination and associated missed approach) are deleted.



SELECT the lateral revision function at an appropriate waypoint.
WRITE the new destination in the scratchpad.
Enter it in the brackets under “NEW DEST”.
INSERT the temporary flight plan ([6R] key), and complete the flight plan to the new destination.

HOLDING PATTERN

Applicable to: ALL

Ident.: DSC-22_20-30-10-15-A-00007222.0001001 / 09 FEB 11

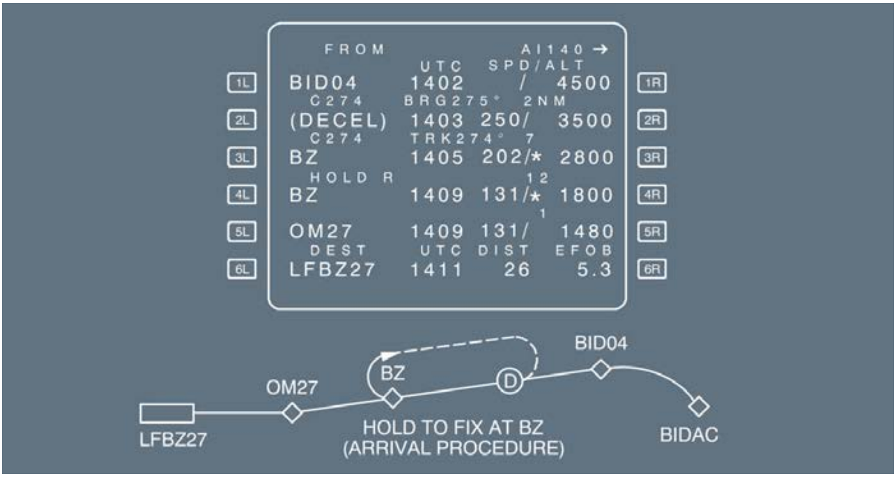
GENERAL

This section describes holding patterns, associated guidance and flight crew procedures.
The Flight Management and Guidance Computer (FMGC) has three types of holding patterns that the pilot can use in a flight plan.

Ident.: DSC-22_20-30-10-15-A-00007163.0001001 / 01 OCT 12

HOLD TO FIX (HF)

The holding pattern is always part of an arrival or departure procedure. The aircraft flies it once and then automatically exits the holding pattern at the fix. The predicted speed in the holding pattern is the lowest of the ICAO speed limit, max endurance speed, or any speed constraint.
Guidance to the fix in the holding pattern is similar to that on any leg of a flight plan. The HF patterns are part of the navigation database and cannot be created by the crew.

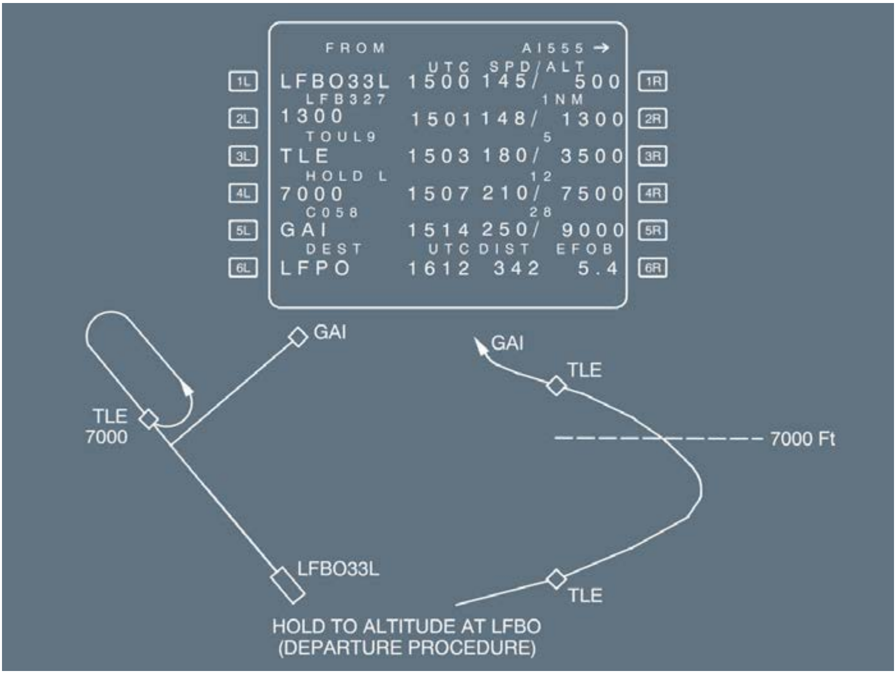


Ident.: DSC-22_20-30-10-15-A-00007182.0001001 / 01 OCT 12

HOLD TO ALTITUDE (HA)

The aircraft flies the hold until it reaches the specified altitude. Then, it automatically exits the hold at the fix.
The predicted speed for the holding pattern is the lowest of the ICAO speed limits, the max endurance speed, or any speed constraint.

The size of the holding pattern is a function of the predicted speed.
Guidance in a hold to altitude (HA) is similar to that for any leg of a flight plan.
The HAs are in the navigation database, as part of the arrival or departure procedures, and cannot be created by the crew.

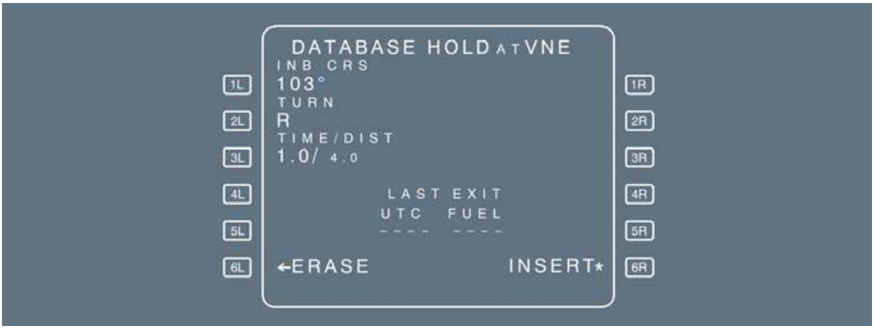


Ident.: DSC-22_20-30-10-15-A-00007206.0013001 / 01 OCT 12

HOLD WITH MANUAL TERMINATION (HM)

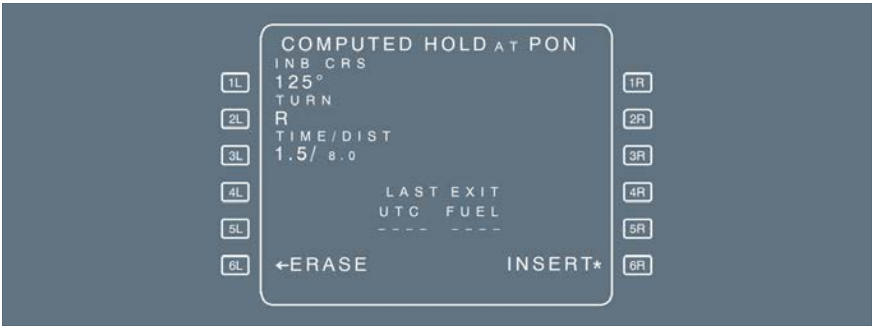
This type of holding pattern may be part of an arrival procedure, or the pilot may enter it at the present position or at any flight plan waypoint.
The pilot will use this type of holding pattern to comply with a defined procedure or a clearance limit, or to meet an operational need (such as losing altitude, holding for weather improvement, or absorbing an ATC delay).
This type of holding pattern is exited according to the pilot's decision, not automatically.
There are 3 types of HM.
All are modifiable.

DATABASE HOLD



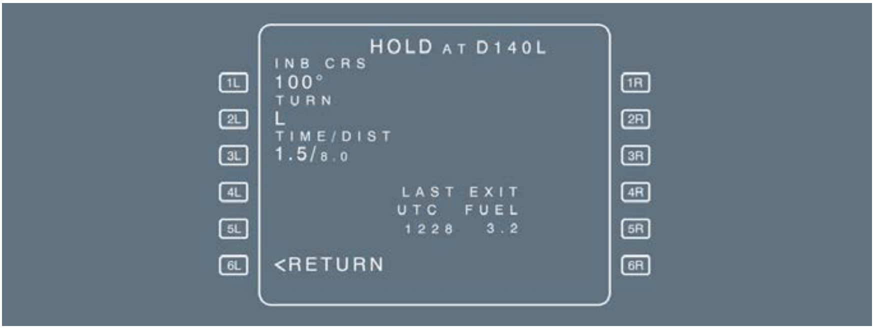
If the holding pattern is part of the database, it is named DATABASE HOLD and all its associated data (inbound course, turn direction, time/distance) are defined in the database. The flight crew can modify this data.

COMPUTED HOLD AT...



If the holding pattern is not in the database, the FMGC designs a holding pattern and proposes it to the pilot. The associated data consists of default values that the pilot can modify.

HOLD AT...

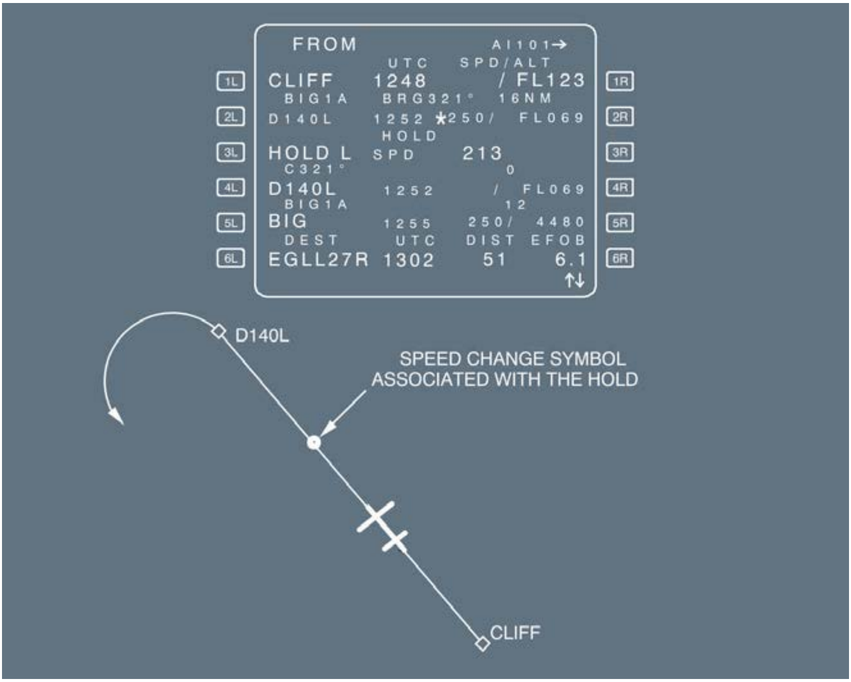


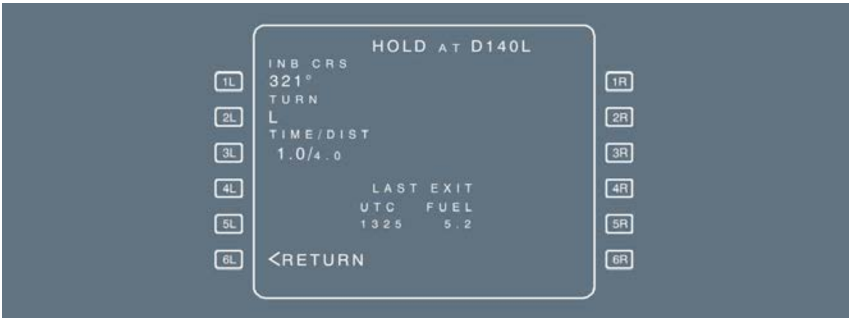
If the pilot inserts into the active flight plan a holding pattern that is manually-corrected from a hold defined by the FMGS, the screen displays a “HOLD AT...” page. The 2R field displays REVERT TO DATABASE or REVERT TO COMPUTED to restore the database data, if necessary.

PREDICTIONS AND GUIDANCE ASSOCIATED WITH A HM HOLDING PATTERN (HOLD WITH MANUAL TERMINATION)

Before deceleration

If an altitude constraint is defined at the hold entry fix, then the FMS duplicates this constraint on the hold exit.
However, different constraints may be inserted at entry and exit fixes.
Although the hold is inserted into the flight plan, the FMGS does not take it into account for predictions until the aircraft enters the hold.
However, if the hold is not deleted by the crew, the FMGS schedules a deceleration point and displays it on the ND.





The FMGS predicts the estimated time and amount of fuel remaining at which the aircraft must exit holding, so as to comply with the fuel policy specified on the fuel prediction page.
When the aircraft enters the holding pattern, the FMGS revises all predictions and assumes the aircraft will fly one turn of the holding pattern.
All predictions are revised for one more holding circuit at holding fix overfly.

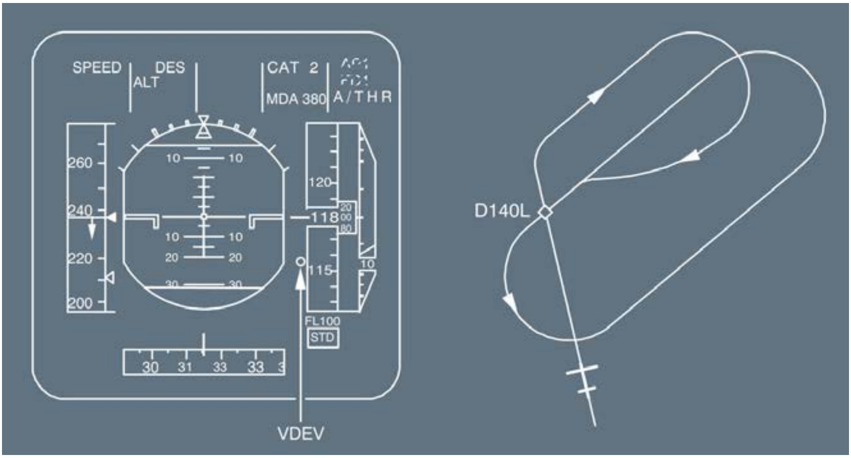
Upon reaching the speed change pseudo waypoint

The FMGS either causes the aircraft to decelerate to the hold speed (if managed speed is active and NAV mode engaged), or displays “SET HOLD SPD” (set hold speed) on the MCDU and primary flight display, if the flight crew had selected a speed target.

The default hold speed is the lowest of the:
- Maximum endurance speed
- ICAO limit holding speed
- Speed constraint (if any).

When no specific speed limit applies, the default hold speed is approximately equal to:
- Green Dot speed on the A318, A319, A320 (CFM) and A321
- Green Dot + 20 kt for altitude lower than 20 000 ft, on the A320 (IAE).
- Green Dot + 5 kt for altitude bigger than 20 000 ft, on the A320 (IAE).

The flight plan predictions for time and fuel do not yet consider that the hold will be flown, however, the navigation display shows the hold entry and holding pattern trajectory.



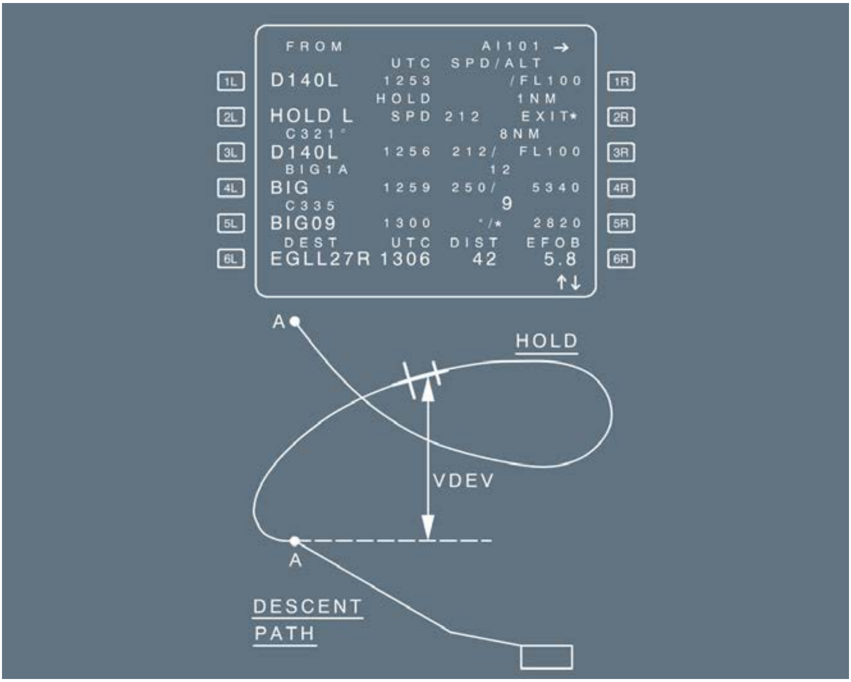
Deceleration receives priority, so that when the aircraft is in descent with the descent mode engaged, it will deviate above the descent path to decelerate. (VDEV becomes positive on the progress page).
The flight plan page displays an immediate exit prompt.
If the flight crew presses the key next to “IMM EXIT” before arriving at the holding fix, the aircraft will not enter the holding pattern, but will resume its phase-related managed-speed profile.

<u>After reaching the hold entry fix</u>

The aircraft enters the hold. The MCDU HOLD page displays the associated holding data:
- The inbound course (INB CRS)
- The TURN direction (L or R)
- The TIME/DIST
- The LAST EXIT time and the associated fuel to reach the alternate airport with no extra fuel.

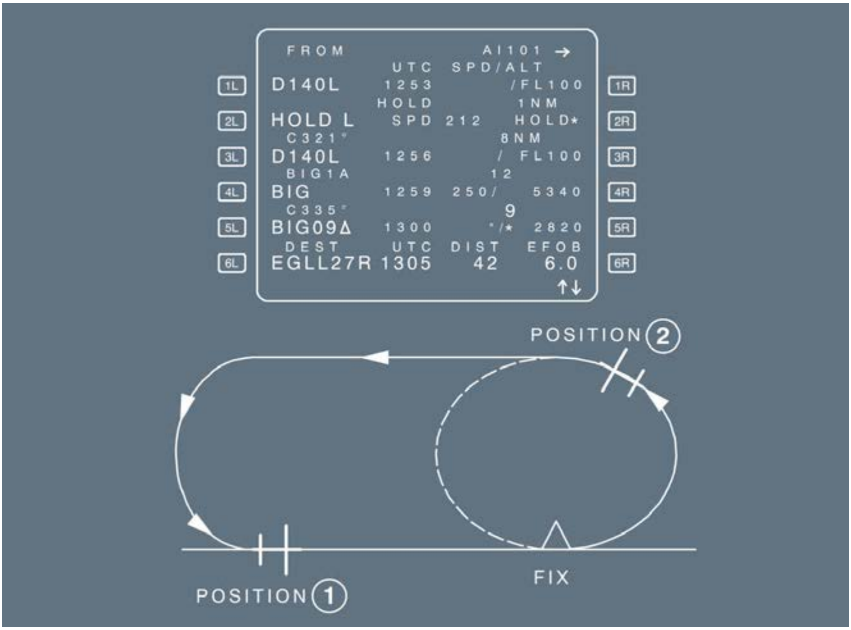
The FMS assumes that the aircraft will fly one turn of the holding pattern, and revises the predictions accordingly.
When the holding pattern is defined by a leg time (and not a leg distance), the system revises the size of the hold as a function of the target speed.

- If managed speed is active, the system uses the predicted holding speed to calculate the size of the holding pattern.
- If the selected speed is active, the system uses the target speed selected by the flight crew at the entry fix sequencing to calculate the size of the holding pattern.
- The VDEV displayed on the primary flight display and the PROG page when the aircraft is flying in the HM (hold pattern with manual termination) is the difference between the aircraft's current altitude and the altitude at which it should be when it reaches the hold exit fix in order to be correctly positioned on the descent path.



With IMM EXIT pressed (aircraft in the holding pattern)

The predictions and guidance assume that the aircraft is immediately returning to the hold fix. Sequencing the hold fix, the aircraft exits the holding pattern and resumes its navigation. The flight plan page displays “RESUME HOLD*” instead of “IMM EXIT*”.



HOLD EXIT PROCEDURE

Position (1) If “IMM EXIT” pressed, the aircraft will exit at the next fix overfly.
Position (2) If “IMM EXIT” pressed, the aircraft will make an immediate turn to the fix where the hold will be exited.

- **If managed speed is active:**

  The computer sets the target speed to the applicable speed of the current phase (for example, speed constraint, ECON speed, or speed limit).
  The computer then bases its predictions on the assumption that the flight will continue on the descent path, if the aircraft is in descent.

- **If DES mode is engaged:**

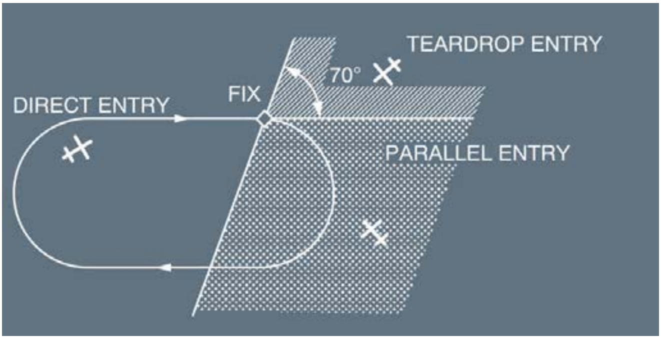
  The following applies:
  - The holding pattern is never included in the descent path computation.
  - The flight crew cannot enter altitude and speed constraints at the hold exit fix. (This is only allowed at the hold entry fix).
  - The vertical guidance in the HM , during the descent phase, calls for a constant -1 000 ft/min. But the computer considers altitude constraints that will take effect farther down the flight path as it calculates vertical guidance and predictions. The system will not allow the aircraft to descend below the next altitude constraint, neither the FCU selected altitude. If the aircraft reaches the next altitude constraint, it will level off and the altitude constraint mode will engage.

<u>With RESUME HOLD pressed</u>

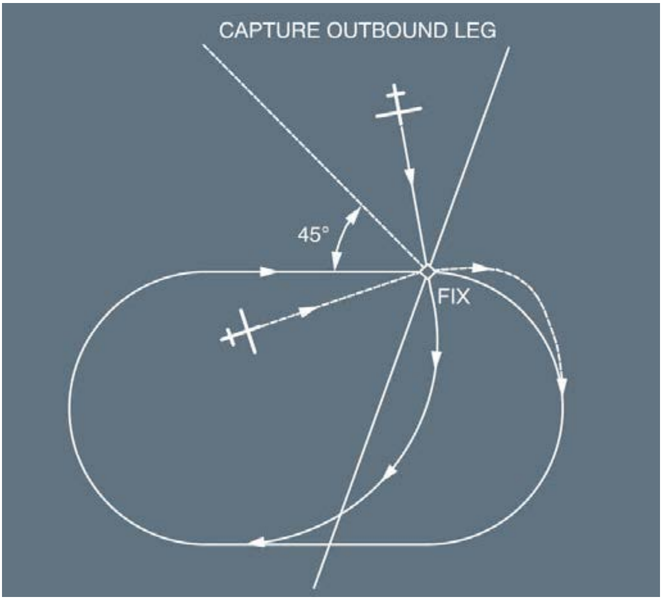
If the flight crew presses the key next to “RESUME HOLD”, the aircraft remains in the holding pattern, and “IMM EXIT” is displayed again.
After that, each time the aircraft flies over the holding fix, the system updates the predictions for one more holding circuit.

HOLDING PATTERN ENTRIES

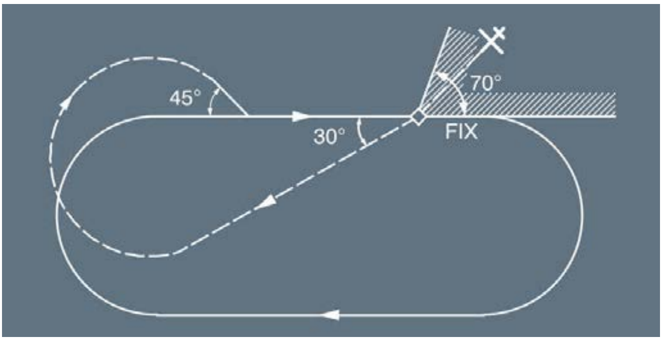
The FMGS offers three types of entry into holding patterns:
1. Direct entry
2. Teardrop entry
3. Parallel entry



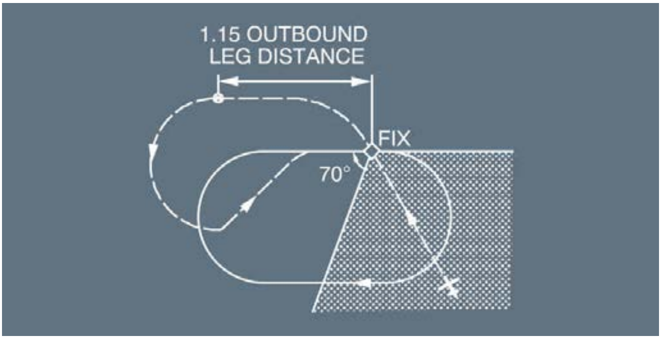
1. The direct entry



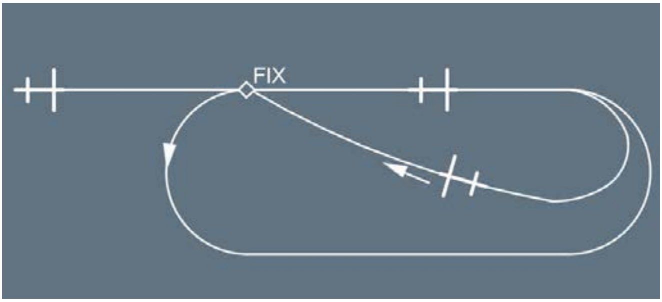
2. The teardrop entry



3. The parallel entry



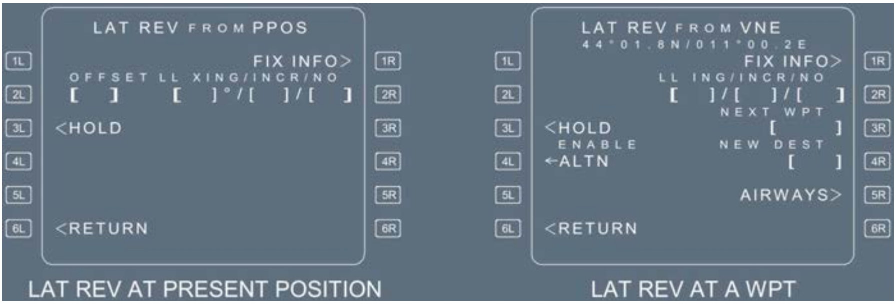
Note: *If the leg the aircraft is flying toward the holding fix is on a "limit" between a teardrop entry and a parallel entry, the FMGC may compute and display either of the two entries. The pilot should keep this in mind and should not assume that the FMGC is malfunctioning.*
If the flight plan leg toward the hold entry fix is on a course that is the reciprocal of the inbound course of the holding pattern, the aircraft will fly a parallel entry.



Ident.: DSC-22_20-30-10-15-A-00007220.0001001 / 09 FEB 11

PROCEDURE TO INSERT A HOLD (HOLD WITH MANUAL TERMINATION)

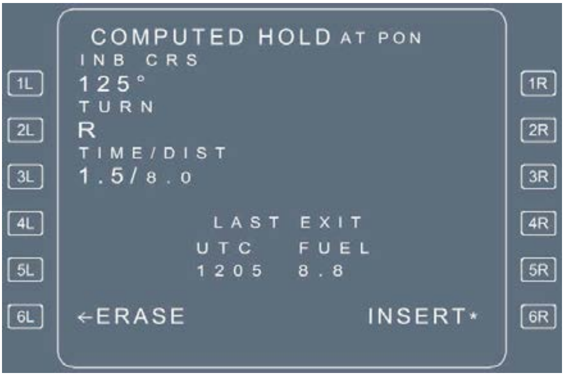
The HOLD prompt allows the flight crew to enter a hold with manual termination (HM), at the revised waypoint or at the present position.
The flight crew accesses the HOLD page from a lateral revision at the present position (PPOS) or at a waypoint.



SELECT lateral revision at present position (PPOS), or an applicable waypoint.
PRESS the HOLD prompt [3L].

A TMPY F-PLN is created and if applicable, the database hold is proposed.
If no database hold is available, the computed hold is proposed.

CHECK and (if necessary) MODIFY the HOLD data.
CHECK the temporary flight plan and INSERT it, if appropriate.



Ident.: DSC-22_20-30-10-15-A-00007219.0001001 / 09 FEB 11

PROCEDURE TO DELETE A HOLD (HOLD WITH MANUAL TERMINATION)

CLEAR the HOLD directly in the flight plan, as can be done for a normal waypoint.

OFFSET

Applicable to: ALL

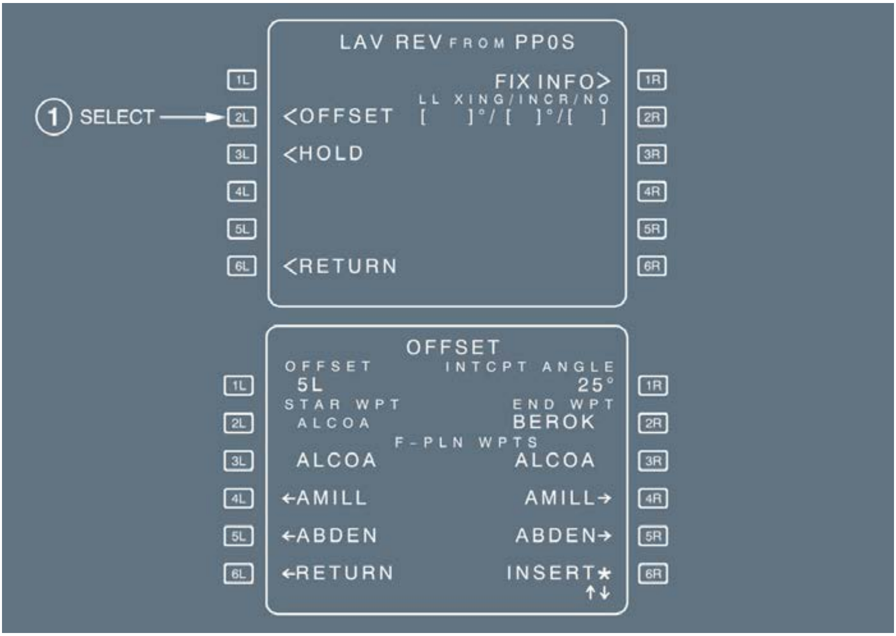
Ident.: DSC-22_20-30-10-15-B-00007230.0009001 / 14 MAY 12

GENERAL

Offset allows the flight crew to define on offset of the active flight plan. The offset can be immediate or deferred to start on a downstream leg. The offset will end by default or at a pre-planned end waypoint. Additionally, the flight crew can specify the intercept angle used for the transitions to and from the offset path.
In most cases, the pilot will use it enroute because of an ATC clearance, or to avoid bad weather expected along the flight plan route.
This page is accessed from LAT REV page at the FROM waypoint or at any waypoint downpath the flight plan, except the destination airport.
After inserting the offset in the flight plan, the flight plan page shows OFST in its title, left or right arrows are displayed on every label line between the start and end waypoints of the offset, and the navigation display shows the offset flight plan with a solid green line and the original flight plan with a dashed green line.

The offset is cleared:
- Automatically (holding pattern, approach), or
- Manually with the clear (CLR) key, or by entering “o” in the offset value field [1L] or by using the delete prompt in the OFFSET page.

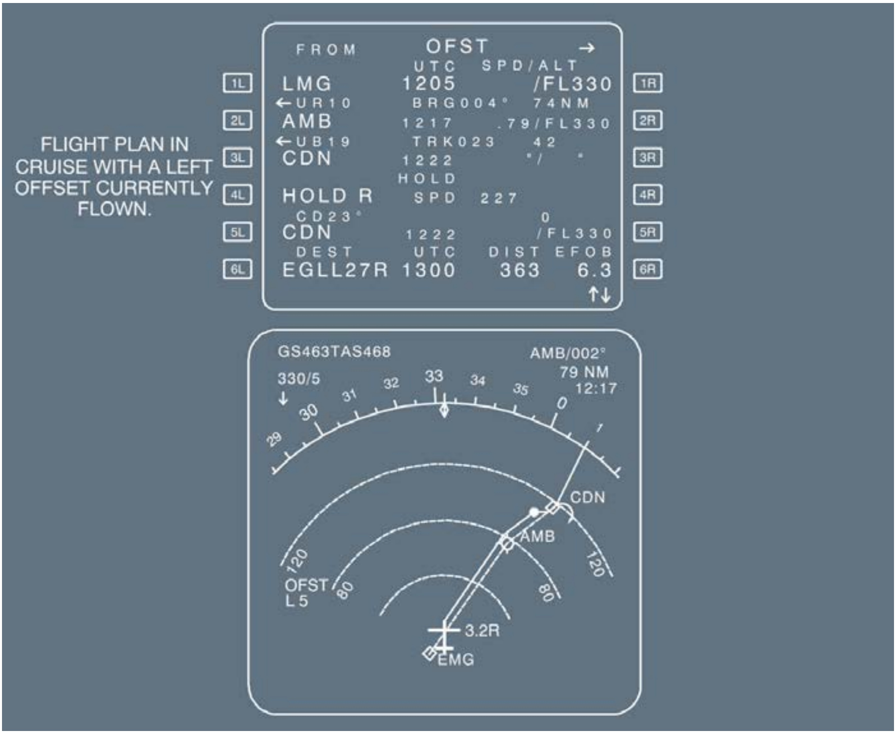
<u>Note:</u> *If the pilot enters an OFFSET when the aircraft is too close to the TO waypoint, the FMGS may refuse to accept it, in which case the MCDU displays the “ENTRY OUT OF RANGE” message.*



Ident.: DSC-22_20-30-10-15-B-00007207.0010001 / 01 OCT 12

INSERTING AN OFFSET

SELECT LAT REV page at a waypoint.
SELECT OFFSET function by pressing [2L].
WRITE the required offset value and direction (for example, L5 or 5L), and enter it into [1L] field.
CHECK or INSERT the START WPT from the list in [3L] - [5L] fields or manually enter it.
CHECK or ENTER the INTCP ANGLE in [1R] field.
CHECK OR INSERT the END WPT from the list in [3R] - [5R] fields or manually enter it.
PRESS INSERT in [6R] field to activate the OFFSET.

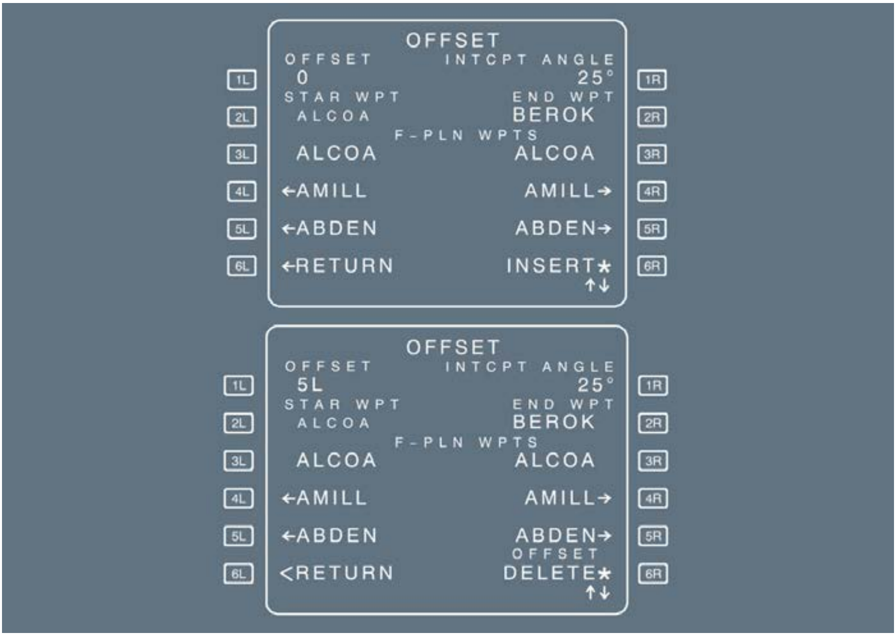


Ident.: DSC-22_20-30-10-15-B-00007218.0009001 / 14 MAY 12

MANUAL CANCELLATION OF AN OFFSET

There are two standard methods for cancelling an offset:
1. SELECT DIR TO a waypoint (the next waypoint, for example).
2. SELECT a Lateral Revision (LAT REV) at FROM WPT.

CLEAR the OFFSET field or enter “0” in the OFFSET value field [1L], and press INSERT* in [6R] to activate the temporary flight plan (cancelling OFFSET), or
PRESS the OFFSET DELETE prompt [6R] to activate the temporary flight plan (cancelling OFFSET).



ALTERNATE FUNCTION

Applicable to: ALL

Ident.: DSC-22_20-30-10-15-C-00007240.0001001 / 09 FEB 11

GENERAL

The ALTERNATE FUNCTION performs two actions:
- It reviews and defines alternate airports and inserts them into the flight plan.
- It allows a diversion to be activated through the ENABLE ALTN command.

Ident.: DSC-22_20-30-10-15-C-00007217.0009001 / 23 JUN 15

REVIEW AND SELECTION OF ALTERNATE AIRPORT

Several alternate airfields may be stored in the database and assigned to a destination. When the pilot selects a company route (CO RTE) (or a city pair), the computer strings the preferred alternate into the active flight plan.
The pilot may review the alternate airports on the ALTN page and, if the one selected is not suitable because of weather or fuel considerations, another alternate may be strung into the active flight plan.

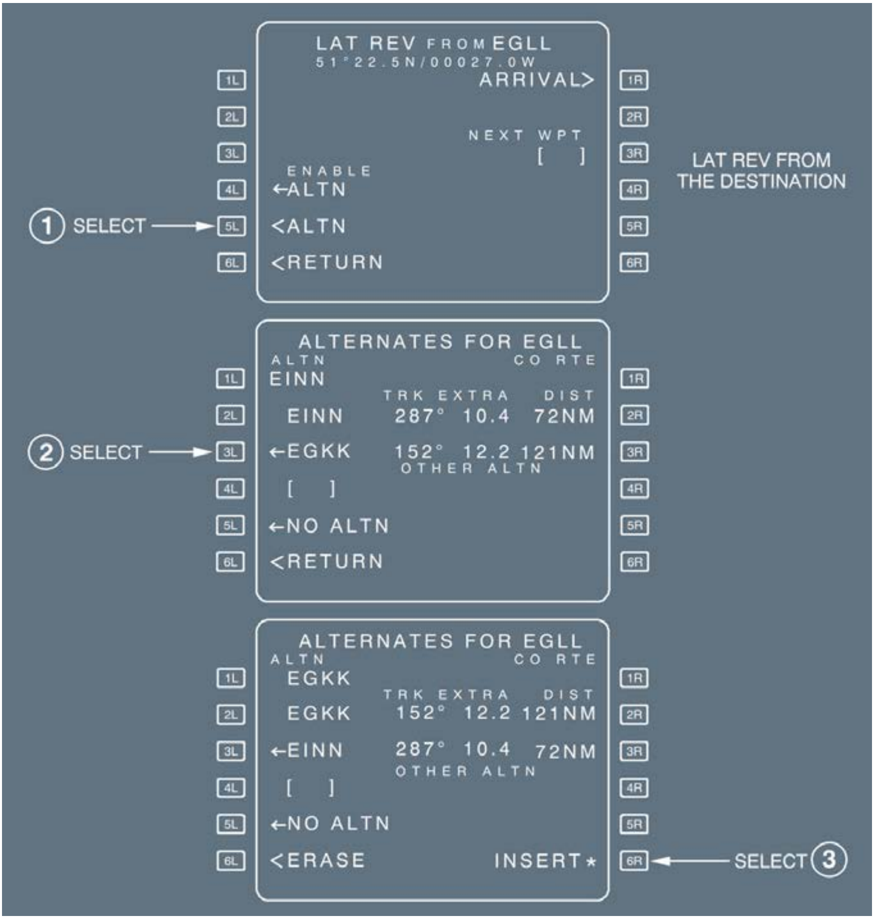
The pilot may define an additional alternate airport into the list, if necessary.
The ALTERNATE page shows the track and distance (airway or direct) between destination and alternate, as well as fuel management data (EXTRA fuel, assuming the associated airfield is the alternate airport). This data will help the pilot change the preferred alternate, if necessary.
Access the ALTERNATE page through the ALTN prompt on the LAT REV page at destination.
Alternate airfields are attached to the destination.

ENTERING NEW ALTERNATE INTO THE F-PLN

If the preferred alternate is unsuitable, proceed as follows:

SELECT F-PLN key on MCDU.
SELECT LAT REV at destination.
SELECT ALTN [5L].
SELECT an AIRFIELD IDENTIFIER.
INSERT the temporary flight plan.

Note: *If weather and destination airfield conditions permit, you may select “NO ALTN”. Fuel predictions will be computed without alternate fuel.*



SELECTION OF ANOTHER ALTERNATE

Fuel management information for flight to another alternate airfield may be obtained by selecting the OTHER ALTN field.

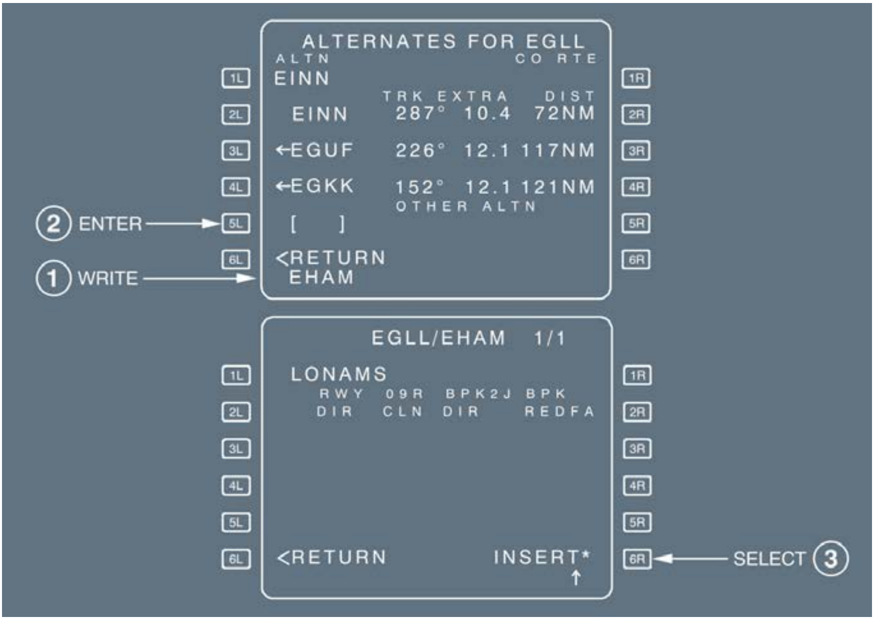
SELECT LAT REV at DESTINATION.
SELECT ALTN [5L].

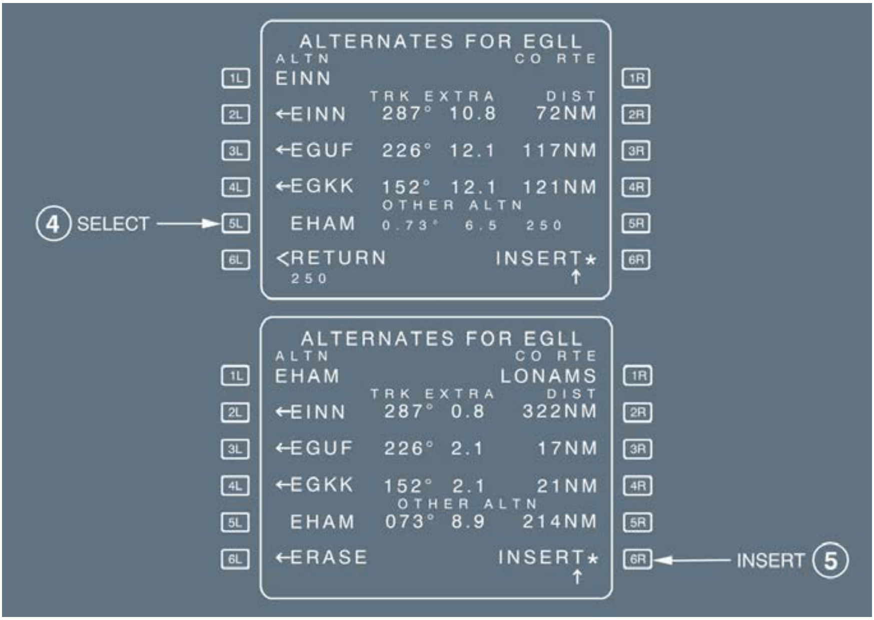
ENTER the airfield identifier in the brackets.

- *If the airfield is not in the database, the NEW RUNWAY page automatically appears.*
- *If the airfield is in the database and there is a company route (CO RTE) to it, the ROUTE SELECTION page automatically appears.*

SELECT the route, as appropriate, or RETURN to the ALTN page.
ENTER the distance in the brackets (if required). XTRA fuel and track (TRK) will appear.
SELECT the other alternate (OTHER ALTN) as a primary alternate if convenient. (EXTRA fuel and DIST revert to AIRWAY distance).
INSERT it, if you want to have it as a primary alternate.

Note:
- *The pilot can always overwrite the "OTHER ALTN ". The new "OTHER ALTN" then replaces the previous one, which is lost.*
- *The pilot can select OTHER ALTN as a primary alternate (active flight plan), to replace any alternate on the initial list.*
- *If the pilot selects the other alternate as a primary alternate, and overwrites the OTHER ALTN field by entering a new airport, the first one will remain a primary alternate and the system will memorize a second OTHER ALTN.*





The pilot may enter a distance in the OTHER ALTN field. The system will compute the extra fuel and the track for this distance.

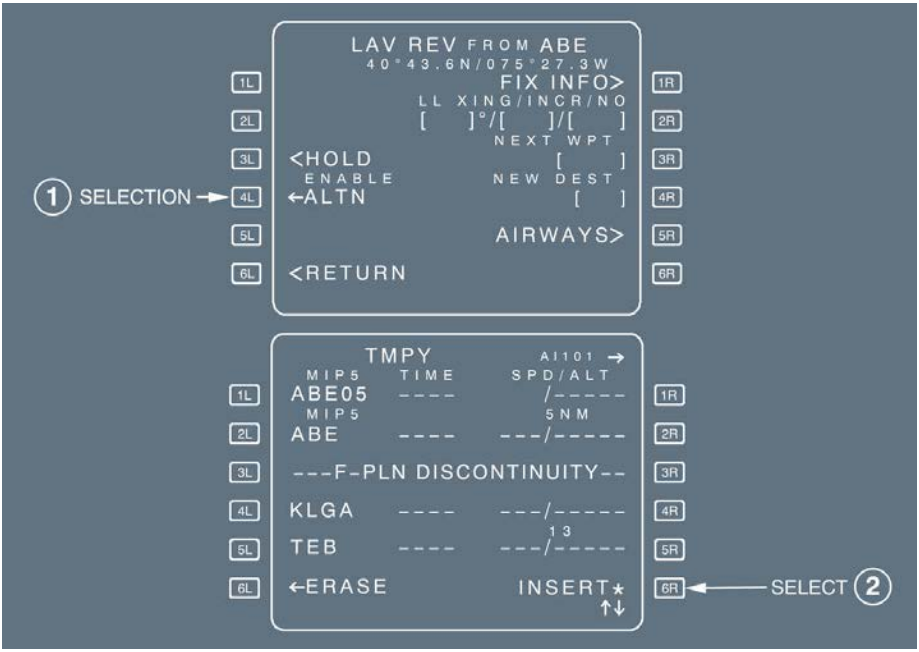
PREDICTED DATA FOR ALTERNATE

Data predictions are based on:
- Aircraft weight being equal to landing weight at primary destination.
- Flight at FL 100 if the alternate F-PLN length is less than 100 NM , at FL 220 if the alternate F-PLN length is comprised between 100 and 200 NM , or else at FL 310.
- Cost index 0.
- Constant wind (as entered in the alternate field of the DES WIND page).
- Constant delta ISA (equal to delta ISA at primary destination).
- The along flight path distance from the destination to the alternate airport. If the flight crew enters an ALTN fuel value, this value is the one taken into account.

ENABLE ALTN

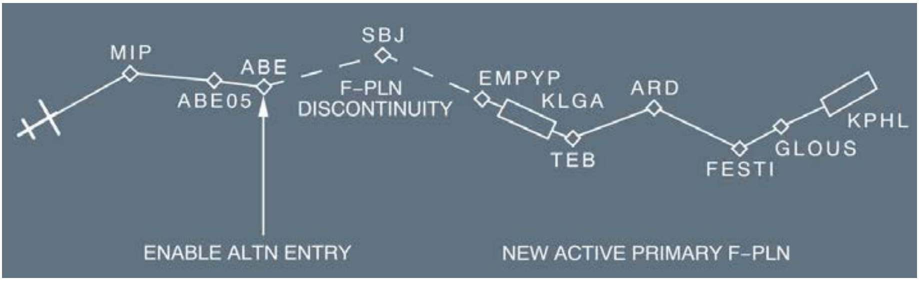
Ident.: DSC-22_20-30-10-15-00000467.0009001 / 01 OCT 12
Applicable to: ALL

This enables the pilot to initiate a diversion by entering the alternate flight plan just after the revision waypoint (with a discontinuity).
The pilot may have to adjust the resulting flight plan (use “direct to”, or add or suppress waypoints), depending on the circumstances.



TO ACTIVATE THE PRIMARY ALTN:

SELECT a LAT REV at the “TO” waypoint (or at another suitable waypoint).
PRESS the ENABLE ALTN key.
INSERT the temporary flight plan.
ENTER an appropriate waypoint in DIRECT TO and adjust the flight plan.
ADJUST the cost index on the PERF page and the defaulted cruise flight level (CRZ FL) on the PROG page, as required.



When ENABLE ALT is pressed at ABE, a flight plan discontinuity is created from ABE down to destination and the alternate route is linked to the active flight plan.

DIR KEY (DIRECT-TO-FUNCTION)

Applicable to: ALL

Ident.: DSC-22_20-30-10-15-D-00007243.0001001 / 09 FEB 11

GENERAL

The pilot uses the "Direct To" function to define a direct leg from the present position to any waypoint on the active flight plan or to any waypoint.
The designated waypoint may be entered by its identifier (if it is stored in the database) or by a latitude/longitude, place/bearing/distance, or a place-bearing/place-bearing.

Note: *If the autopilot or flight director is in the heading/track or localizer mode, the "DIR TO " function engages the NAV mode.*

Three functions are available through the DIR TO key:
- The DIR TO defines a direct leg from the present position to a specified waypoint.
  NAV mode engages simultaneously to the DIR TO selection.
  When the pilot uses DIR TO , the present position (PPOS) becomes the "FROM" waypoint and the active flight plan shows it as the T-P (turn point).
- The DIR TO /ABEAM function, defines the abeam waypoints along the direct leg. These waypoints are the projection on the direct leg of the initial F-PLN waypoints located between the aircraft position and the specified waypoint.
  NAV mode engages simultaneously to the DIR TO/ABEAM selection.
- The DIR TO /INTCPT function allows the definition of a specified RADIAL INBOUND or OUTBOUND at an inserted waypoint. The current aircraft track is used to compute the INTCPT point with the specified radial.
  NAV mode is armed simultaneously to the DIR TO /INTCPT selection.

The ND displays the DIR TO leg as a temporary flight plan leg between current aircraft position and specified waypoint. In case of a DIR TO /INTCPT, the leg is not displayed when the angle between the current aircraft track and the intercept radial exceeds 160 °.

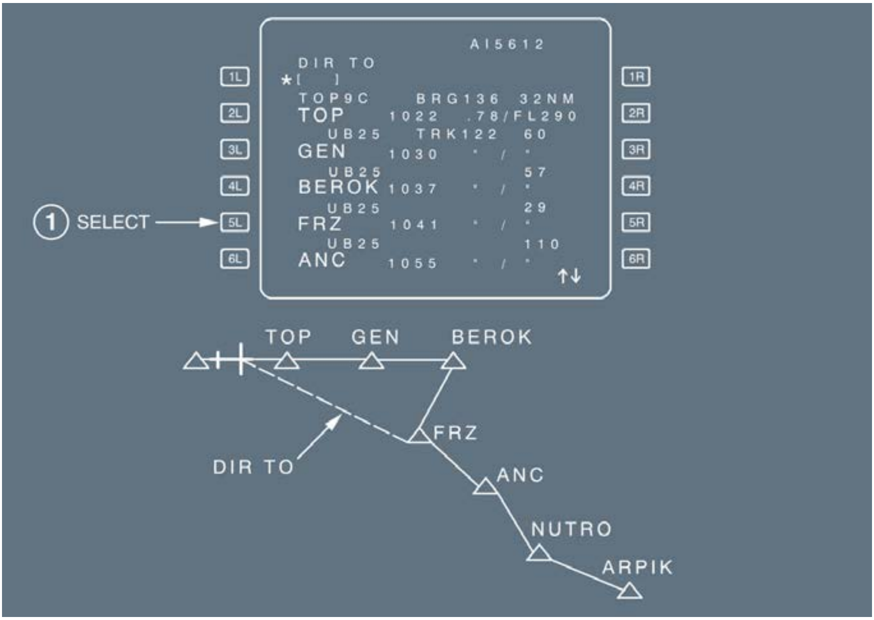
Ident.: DSC-22_20-30-10-15-D-00007216.0001001 / 14 MAY 12

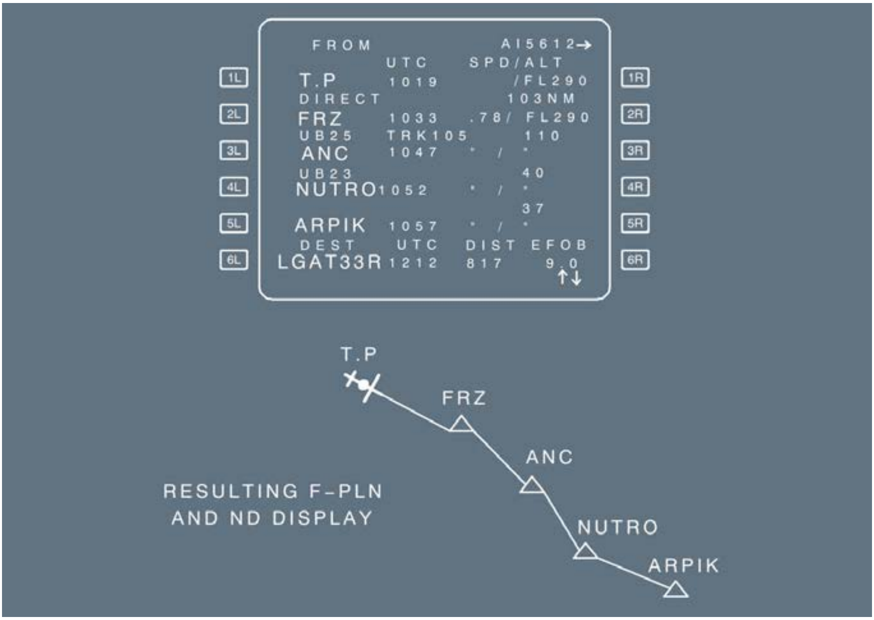
PROCEDURE FOR DIR TO WAYPOINT

CASE 1. THE “TO” WAYPOINT IS IN THE FLIGHT PLAN

Example : DIR TO FRZ

PRESS the DIR key on the MCDU.
PRESS the line select key next to “FRZ”.

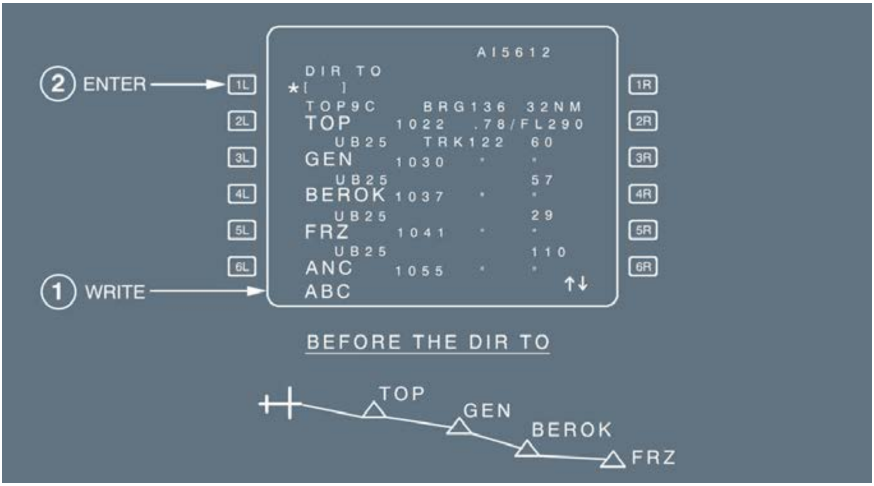


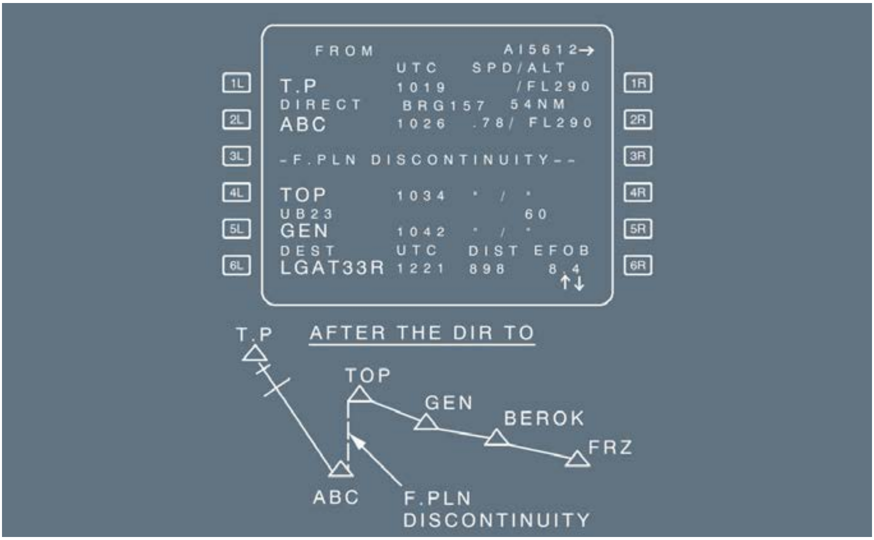


CASE 2. THE “TO” WAYPOINT DOES NOT BELONG TO THE FLIGHT PLAN

Example : Direct to ABC (ABC being an ident, LL or PBD or PBX (Place/Bearing-Place/Bearing)

PRESS the DIR key.
WRITE the waypoint identifier (e.g. ABC) into the scratchpad.
PRESS [1 L] to enter “ABC” in the “DIR TO” field.



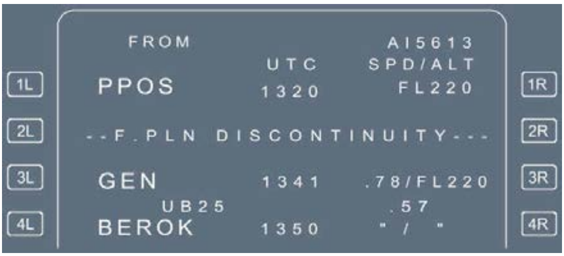


Clear the discontinuity and the waypoints that are not included in the new flight plan.

PARTICULAR CASES FOR USE OF DIR TO

- If the pilot is flying a manual leg (part of a SID or STAR), the flight plan page displays “F-PLN DISCONTINUITY”, preceded by “MANUAL” (see below).
  These legs are specific heading or track legs flown with no defined end waypoint.

- When the pilot encounters a flight plan discontinuity, or if a major reset occurs, the flight plan page displays “PPOS - F-PLAN DISCONTINUITY”, and the pilot looses managed guidance in both the lateral and vertical plans.
  The autopilot or flight director reverts to the basic HDG V/S (or TRK FPA) modes. Predictions remain available and are based on the assumption that the aircraft will fly a direct leg from its present position to the next waypoint.



- **In both of these cases, the only way to get back to a standard flight plan is to perform a “ DIR TO ” to a designated waypoint.**
- Following a DIR TO , the message “MAP PARTLY DISPLAYED” may appear on the NDs, if the new flight plan includes a very long leg (*Refer to DSC-31-45 Flags and Messages Displayed on ND*). When this message comes up, enter an intermediate waypoint to shorten the leg.

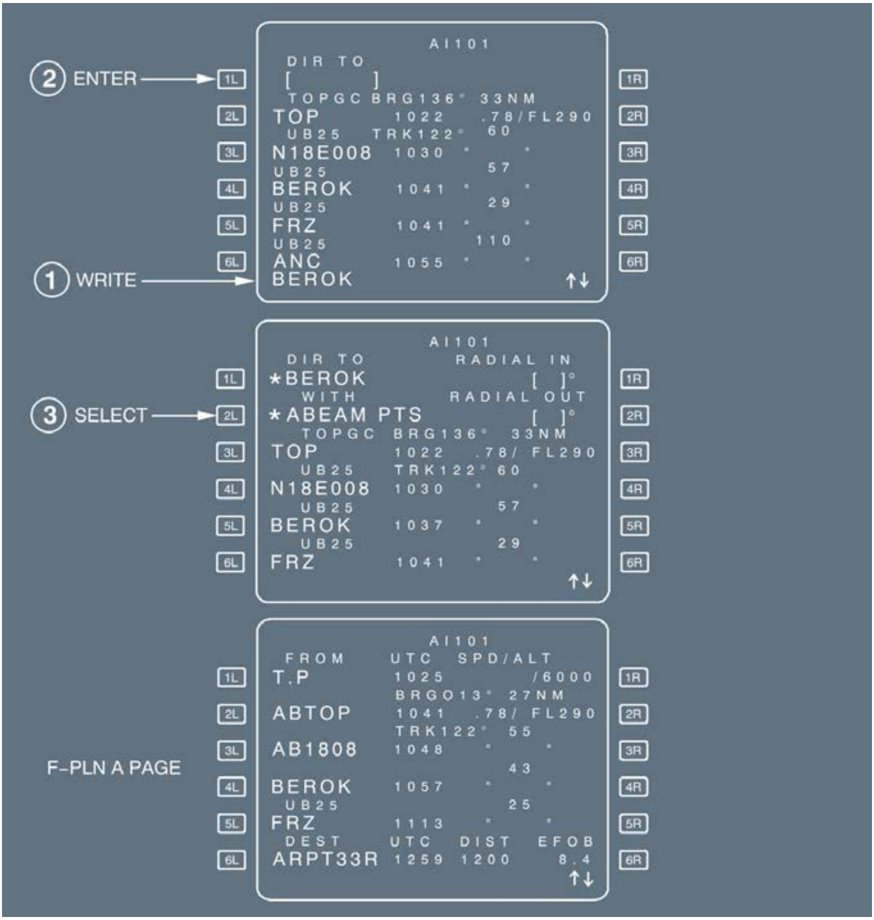
<u>*Note:*</u> *During cruise, the DIR TO function is not available as long as uplink wind data, received through ACARS , is not inserted or cancelled on the CRUISE WIND page.*

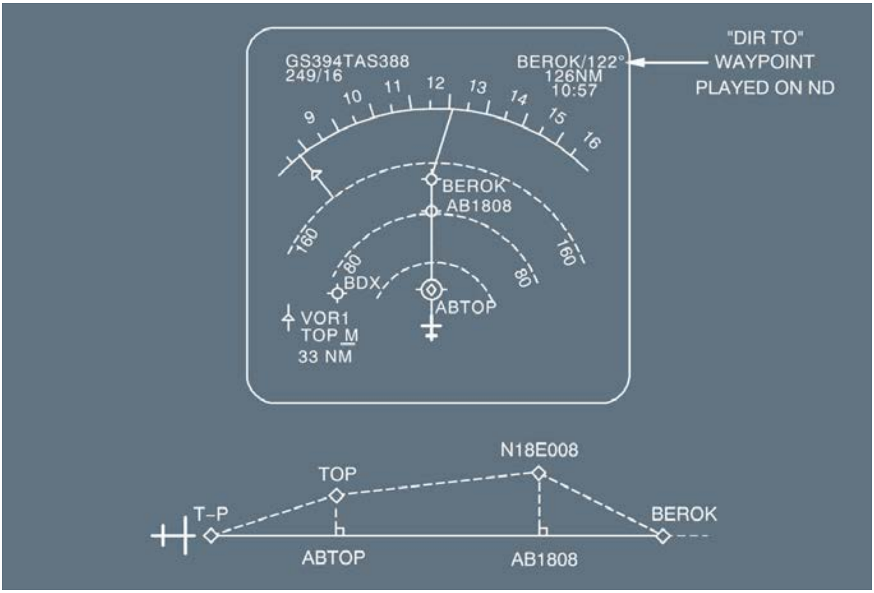
Ident.: DSC-22_20-30-10-15-D-00007208.0009001 / 22 OCT 13

PROCEDURE FOR DIR TO/ABEAM

Example : DIR TO/ABEAM BEROK

PRESS the DIR on the MCDU.
WRITE the waypoint identifier into the scratchpad (Example : BEROK).
PRESS [1 L] to enter the waypoint in the DIR TO field.
SELECT the ABEAM PTS function.
The display reverts to F-PLN A page.





Note: 1. *If, between two waypoints projected on the direct leg, there was a discontinuity in the original flight plan, this discontinuity disappears between the corresponding abeam points on the direct leg.*
2. *. Abeam waypoints computed from latitude/longitude-type waypoints are renamed by the system as "AB XXXXX", where "xxxxx" is an abbreviation in 5 characters, of the latitude and longitude of the initial waypoints.*

Ident.: DSC-22_20-30-10-15-D-00007221.0001001 / 14 MAY 12

PROCEDURE FOR DIR TO/INTERCEPT

PRESS the DIR key.
WRITE the waypoint identifier into the scratchpad.
PRESS [1L] to enter the waypoint in the DIR TO field.

In the [1R] and [2R] fields, the MCDU displays the functions radial inbound and radial outbound from the waypoint.
If the waypoint belongs to the flight plan, the system displays the flight plan track as the default inbound radial. The crew can modify it.

WRITE the required in or out radial into the scratchpad.
PRESS [1R] or [2R] to enter the radial in the required field.

The ND displays the entered radial as an amber dotted line : The pilot can still modify it.

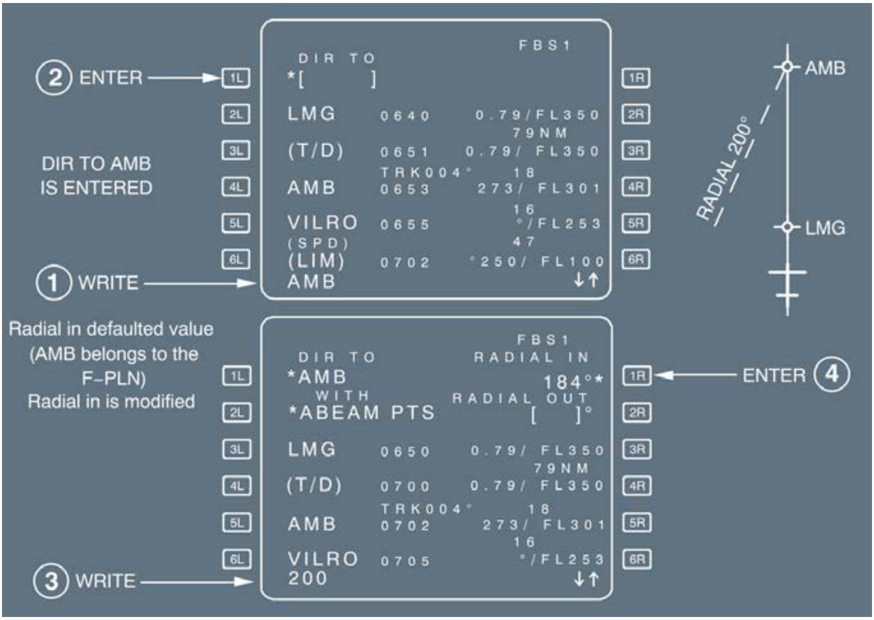
PRESS [1R] or [2R] to confirm the DIR TO/INTERCEPT selection.

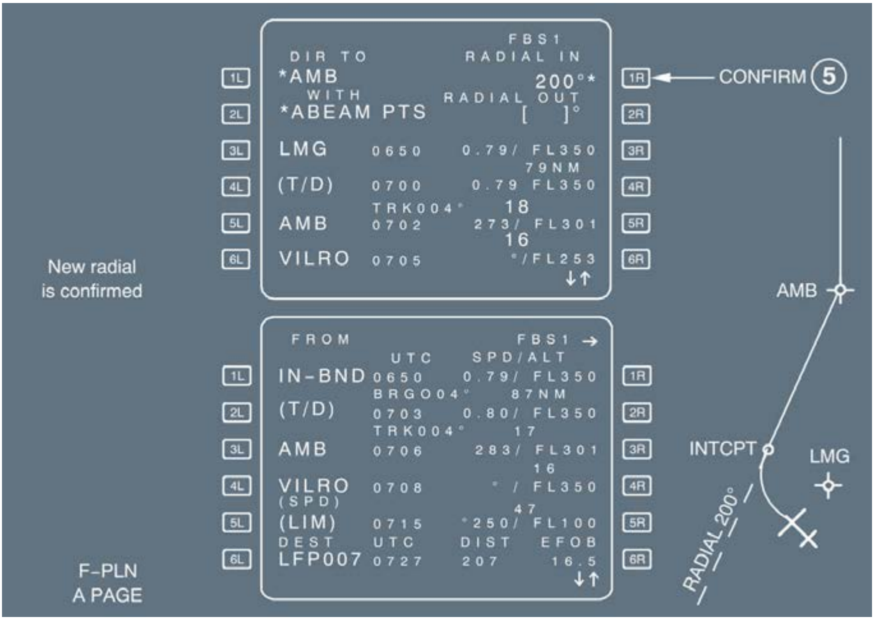
The display reverts to the F-PLN A page, the system arms the NAV mode, and engages the HDG mode. The FROM waypoint is the aircraft position at the time of the DIR TO /INTERCEPT selection. The MCDU indicates it as INBND or OUTBND.

Note: 1. *If the waypoint does not belong to the flight plan, the system strings the DIR TO/INTERCEPT leg to this waypoint, and inserts a discontinuity following the waypoint.*
2. *A DIR TO/INTERCEPT cancels any active offset.*
3. *If the current AP /FD lateral mode is HDG or TRK , NAV becomes armed. If the NAV mode was engaged, NAV becomes armed. FCU HDG or TRK must be used to guide the aircraft. The ND displays an intercept point, if the intercept angle is less than 120 °. The system constantly updates it to reflect the current aircraft track and position with respect to the intercept radial. The NAV mode engages when reaching the intercept point.*

EXAMPLE: RADIAL INBND

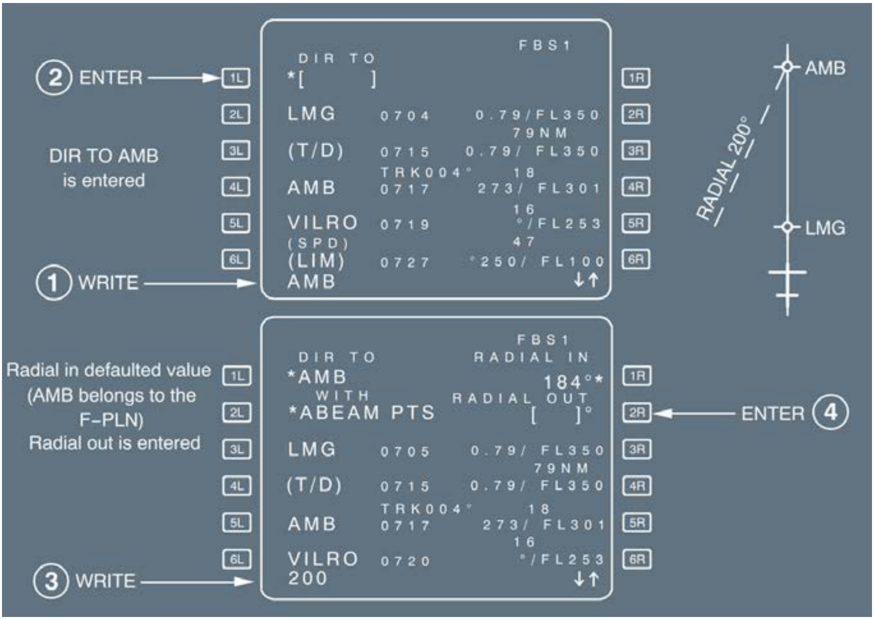
DIR TO AMB - RADIAL 200 ° INBOUND

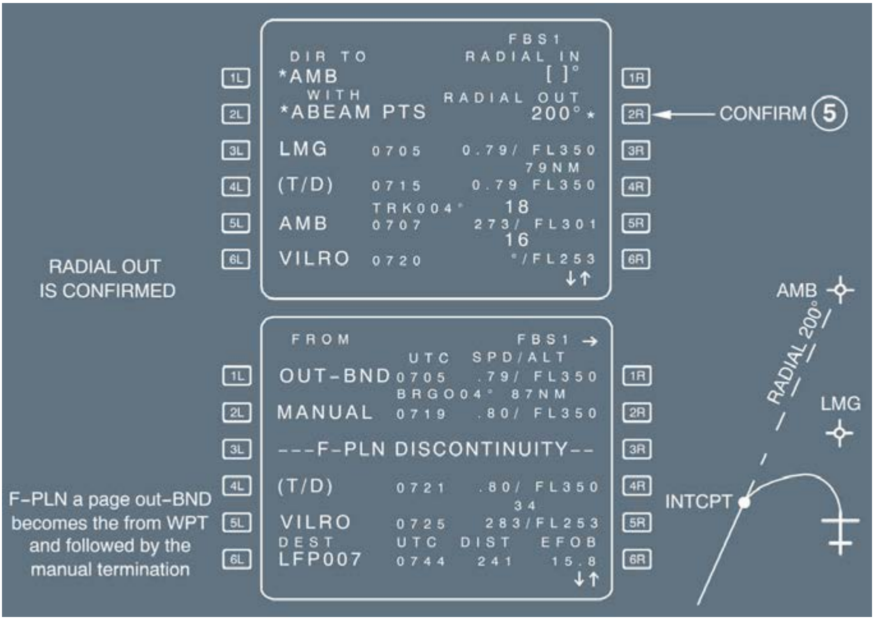




EXAMPLE: RADIAL OUTBND

DIR TO AMB - RADIAL 200 ° OUTBOUND


2 ENTER
DIR TO AMB
is entered
1 WRITE
DIR TO
FBS1
*[ ]
LMG 0704 0.79/FL350
79NM
(T/D) 0715 0.79/ FL350
TRK004° 18
AMB 0717 273/ FL301
16
VILRO 0719 °/FL253
(SPD) 47
(LIM) 0727 °250/ FL100
AMB
AMB
RADIAL 200°
LMG
Radial in defaulted value
(AMB belongs to the
F-PLN)
Radial out is entered
3 WRITE
DIR TO
FBS1
RADIAL IN
AMB 184°
WITH
RADIAL OUT
*ABEAM PTS [ ]°
LMG 0705 0.79/ FL350
79NM
(T/D) 0715 0.79/ FL350
TRK004° 18
AMB 0717 273/ FL301
16
VILRO 0720 °/FL253
200
ENTER 4



OVFY (OVERFLY) KEY

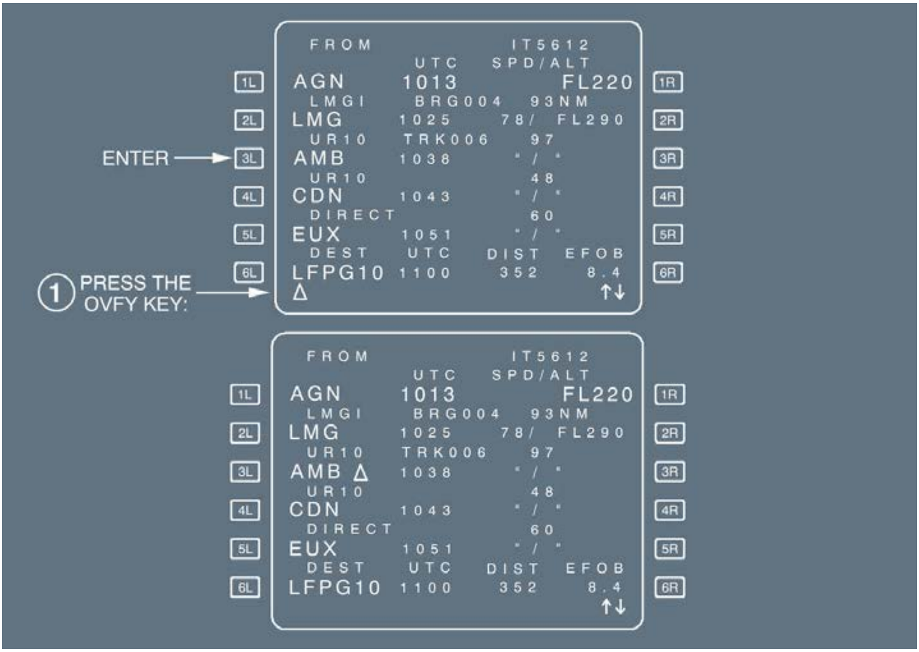
Ident.: DSC-22_20-30-10-15-00000469.0001001 / 01 OCT 12
Applicable to: ALL

The overfly key programs the Flight Management Guidance Computer to fly over a specific waypoint or NAVAID. To use it:

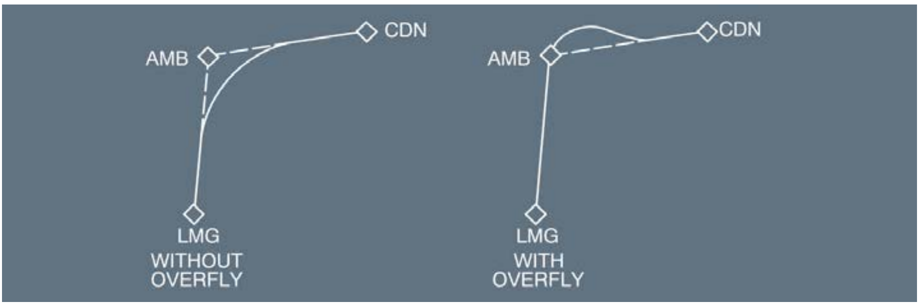
PRESS the “OVFY” key.

A “∆” appears in the scratchpad.

INSERT it by pressing the key adjacent to the waypoint to be overflown. [3L] in this example.



The pilot cannot cancel the overfly program. If you do not want to fly over the point you have entered, use DIR TO (direct to) the next waypoint or engage the heading mode, whichever is more suitable.

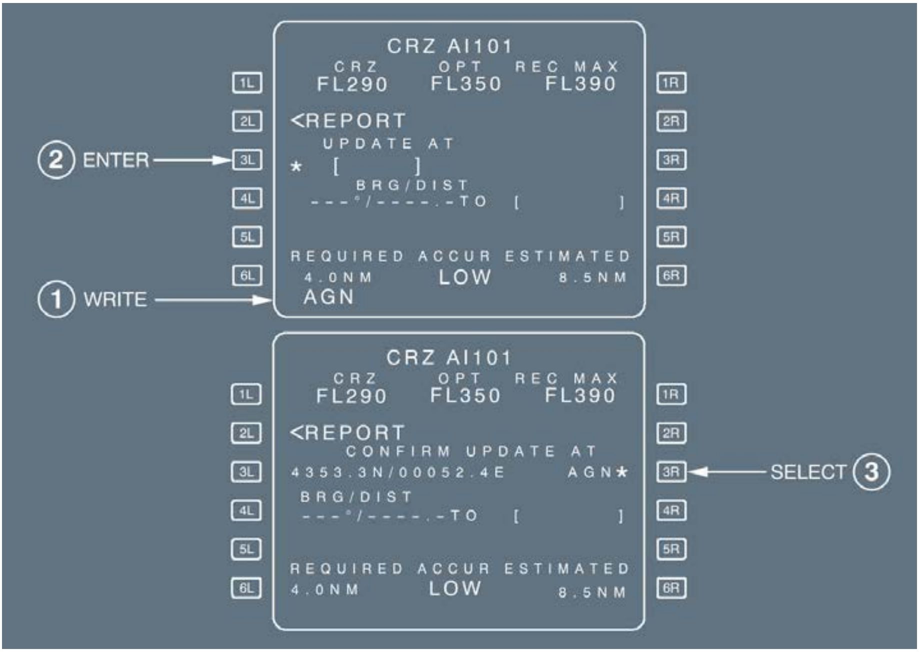


The overfly function allows you to fly over a specific waypoint, and return the aircraft to the great circle track.

"UPDATE AT"

Ident.: DSC-22_20-30-10-15-00000470.0001001 / 01 OCT 12
Applicable to: ALL

To manually change the position computed by the FMGC (FM position and bias), the pilot uses "UPDATE AT" on the progress page.
Use this facility with extreme caution: It is apt to be inaccurate, because it relies on the pilot's estimation of when a designated position has been reached.



WRITE the ident for the NAVAID (or waypoint or airport), or the coordinates, or the PBD or PBX (Place/Bearing-Place/Bearing) at which the update is intended.
PRESS [3L] to enter the ident in the "UPDATE AT" field. The coordinates of the point, along with its identifier (or "ENTRY", if the identifier is not in the database), appear in that field.
PRESS [3R] to activate the update, when you estimate that you are at the position.

Note: *The system reinitializes the Estimated Position Error computation when a position update is performed. This may lead to the appearance of a "NAV ACCUR DOWNGRAD" or "NAV ACCUR UPGRAD" message.*

If the “UPDATE AT” does not properly take effect, it corrupts the FM position.

- In an area with good radio NAVAID coverage:
  - If the update error is small, subsequent radio position updating will correct the FM position.
  - If the update error is large, the system will reject any radio updating because its internal “reasonableness test” will reject the various NAVAID s. Thus, the FM position will only be the MIX IRS position corrected by the position bias, determined at the time of the update, and the error will be maintained.
- In an area without proper NAVAID coverage, radio position updating will not be available and the FM position, if incorrect, will remain incorrect until a new manual update is performed.
- Therefore, the pilot should only use “UPDATE AT” in case of a major position problem, such as:
  - On the ground, no flight plan appears on the navigation display and ARC/ROSE NAV mode is selected.
  - A “CHECK IRS /FM POSITION” message appears on the MCDU.
  - A “FM /IR POSITION DISAGREE” message appears on the ECAM.

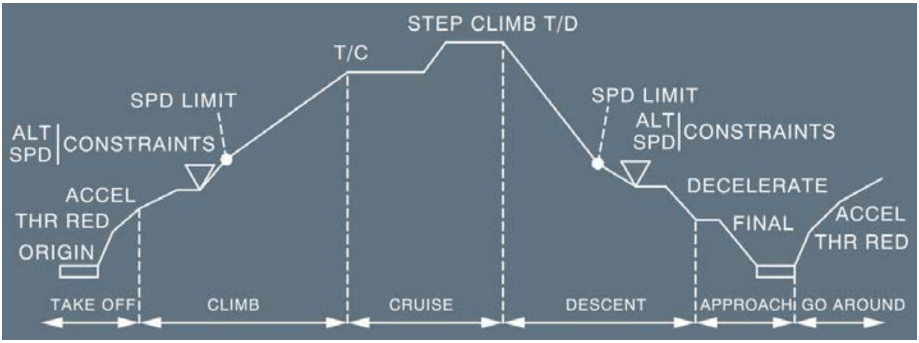
When GPS PRIMARY is operative, the FM position will always converge towards the GPS position at a rate depending on the aircraft altitude. Therefore, when GPS PRIMARY is operative, an inaccurate “update at” will have a temporary effect on the FM position.

General

GENERAL

Ident.: DSC-22_20-30-20-05-00010939.0001001 / 01 OCT 12
Applicable to: ALL

The vertical flight plan is divided into the following flight phases:
Preflight - Takeoff - Climb - Cruise - Descent - Approach - Go-Around - Done.
All but “Preflight” and “Done” phases are associated with speed and altitude profiles.



Each phase has an assigned profile of target speeds. For each phase the FMGS computes an optimum (ECON) speed as a function of the strategic parameters (CI , CRZ FL , ZFW , ZFWCG, block FUEL) and performance criteria.
ECON speed is the basis of the managed speed profile.

The ECON speed can be modified by:
- Presetting a speed or Mach number on the MCDU (PERF page) for the next phase
- Selecting on the FCU a speed or a Mach number for the active phase
- Inserting speed constraints or speed limits on the MCDU vertical revision (VERT REV) page.

The vertical flight plan includes vertical constraints (altitude, speed, time) that may be stored in the data base or entered manually by the flight crew through vertical revision pages.
The flight crew may also define step climbs or step descents for cruise purposes. If the flight crew plans to climb to a higher flight level or descend to a lower level, they can use a vertical revision at any waypoint to insert the new level.
When all the vertical data has been defined, the FMGC computes the vertical profile and the managed speed/Mach profile from takeoff to landing.

VERTICAL FLIGHT PLANNING

Ident.: DSC-22_20-30-20-05-00011065.0002001 / 17 AUG 10
Applicable to: ALL

DATA ENTRY

The vertical flight plan provides the FMGS with all the data required to calculate performance and predictions. This data is either entered by the flight crew or calculated by the FMS.

There are three categories of data:

- Strategic data, that applies to the overall flight profile:
  - Cost Index (CI)
  - Cruise Flight Level (CRZ FL) and STEP ALTS if any
  - Zero-Fuel Weight (ZFW)
  - Zero-Fuel Weight Center of Gravity (ZFWCG)
  - Block Fuel.
- Weather data:
  - Winds (for climb, cruise, descent, approach)
  - Sea level atmospheric pressure (QNH) at destination
  - Surface temperature (TEMP) at destination
  - Temperature in cruise phase
  - The Tropopause altitude (TROPO).
- Tactical data for the flight phases:
  - Phase switching conditions:
    - Setting of the thrust levers to TOGA or FLEX positions
    - Reaching acceleration altitude (ACCEL ALT)
    - Entering cruise (T/C)
    - Initiation of descent (T/D)
    - Passing a deceleration pseudo waypoint (DECEL PSEUDO WPT)
    - Touchdown.
  - Speed profile:
    - V2
    - Economy climb speed or Mach (ECON CLB SPD/MACH)
    - Preselected speed or Mach (SPD/MACH PRESELECTION)
    - Economy cruise Mach (ECON CRZ MACH)
    - Constant Mach
    - Economy descent Mach or speed (ECON DES MACH/SPD)
    - Approach speed (VAPP).
  - Vertical limitations:
    - Speed limits (SPD LIMIT)
    - Speed and altitude constraints (SPD AND ALT CSTR)
    - Time constraints or Required Time of Arrival (RTA).

In addition to the data entered by the flight crew, the FMS uses some real flight data parameters (CRZ SAT, actual wind) to improve the accuracy of the computed predictions.

FLIGHT PHASES

Ident.: DSC-22_20-30-20-05-00011024.0007001 / 22 MAR 16
Applicable to: ALL

The vertical flight plan is divided into flight phases. For each phase, the FMGS computes the optimum speed or Mach Profile. These flight phases are:
Preflight - Takeoff - Climb - Cruise - Descent - Approach - Go-Around - Done.

FLIGHT PHASES	OPTIMUM SPEED PROFILE	SWITCHING CONDITIONS TO NEXT PHASE
PREFLIGHT	/	SRS takeoff mode engaged and N1 > 85 %(EPR ≥ 1.25) or Ground Speed >90 kt
TAKEOFF	V2 (V2 + 10)	At acceleration altitude or by engagement of another vertical mode.
CLIMB	ECON CLB SPD / MACH	Reaching cruise FL
CRUISE	ECON CRZ MACH	No step descent, and distance to destination < 200 NM, or all engines operative and selected altitude below Max [FL 200, highest DES ALT CSTR]
DESCENT	ECON DES MACH / SPD	- Overflying (DECEL) pseudo waypoint with NAV (or LOC */LOC) mode engaged and altitude <9 500 ft AGL - Manual activation of the approach phase.
APPROACH	VAPP (GS Min)	1. To Go-Around: When thrust levers at TOGA detent, or 2. To Done: 30 s after landing, or 3. To Climb: When inserting a new CRZ FL.
GO-AROUND	VAPP or current SPD, whichever is greater. Green Dot at ACC ALT	1. To Approach: Manual activation of the approach phase, or 2. To Climb: Above acceleration altitude, modification of the destination airport by: - Selection of the ALTN, or - Insertion of a NEW DEST, or - Insertion of a SEC F-PLN with a destination airport different from the destination airport of the active F-PLN.
DONE	/	To preflight: When INIT or PERF key depressed.

Note: *During the preflight phase, the flight crew inserts the flight plan, which includes all data needed for the flight.*
During the Done phase, the FMGC erases the data entered for the flight. If the descent or the approach phase is inadvertently activated (manual approach phase activation, for example), the flight crew may reselect a CRZ FL on the PROG page to reactivate the CRZ phase.

VERTICAL REVISION

Ident.: DSC-22_20-30-20-05-00011025.0002001 / 17 AUG 10
Applicable to: ALL

The flight crew uses vertical revisions to enter or modify:
- The speed limit in the climb and descent phases
- An altitude or speed constraint at the revised waypoint
- A step climb or a step descent
- New wind data
- A time constraint.

The vertical revision page is accessed by pressing a right hand select key of the flight plan page.

VERT REV AT CRUISE WPT

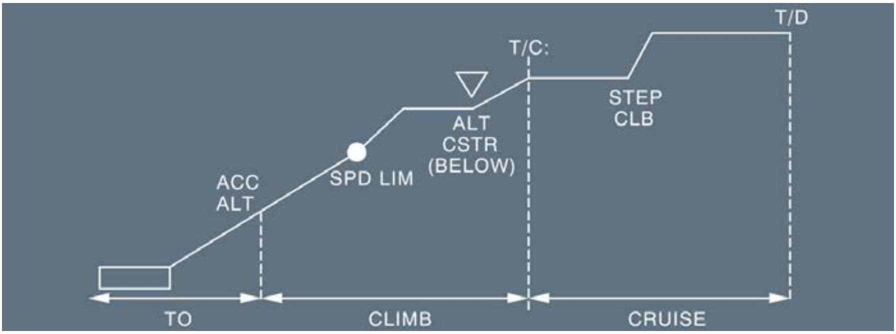
VERTICAL CONSTRAINTS (SPEED, ALTITUDE, TIME)

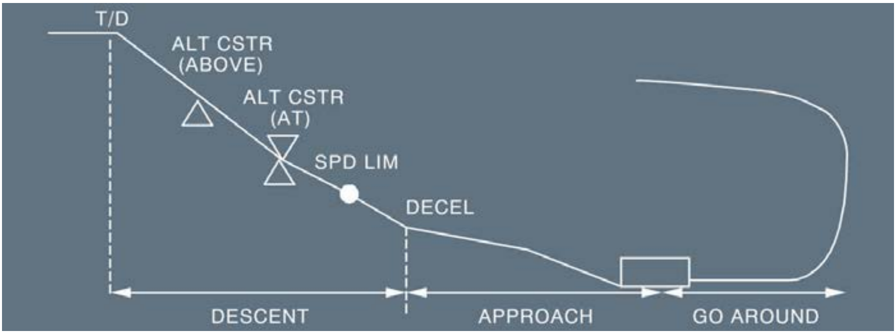
Ident.: DSC-22_20-30-20-05-00012689.0005001 / 18 FEB 15
Applicable to: ALL

The flight crew enters speed, altitude and time constraint, either to comply with ATC requests and specified procedures, or at the discretion of the flight crew, in response to operational variables.

SPEED LIMIT

A speed limit is associated with altitude as a maximum speed below a specified altitude (only one in climb and one in descent).





ALTITUDE CONSTRAINT

Altitude constraints may be attached to specific waypoints in the climb, descent, or approach phases.
To meet the altitude constraint, the aircraft must fly over the waypoint at an altitude equal, above or below the altitude constraint as specified by the flight crew or the database.

Note: *The database may contain an altitude constraint window (two altitudes between which the aircraft must fly passing over a given waypoint), but the flight crew cannot enter such a constraint manually.*

An altitude constraint is considered as missed if the system predicts more than 250 ft of difference between the constraint value and the predicted aircraft altitude.
Altitude constraints are observed in CLB or DES or APP NAV-FINAL modes.

The FMS automatically deletes from the F-PLN:
- The altitude constraints ("AT", "AT OR ABOVE", or "AT OR BELOW") with values greater than the CRZ FL
- The altitude constraint windows with the upper constraint greater than the CRZ FL.

The MCDU and the ND no longer display the deleted altitude constraints. These altitude constraints are no longer used for the computation of the FMS climb and descent profile.
In that case, the scratchpad of the MCDU displays the "CSTR DEL ABOVE CRZ FL" message.
The FMS does not delete the altitude constraints at the CRZ FL . The FMS computes the T/D , in order to respect these altitude constraints. However these altitude constraints are not used for guidance. If the flight crew initiates the descent before reaching the T/D , the aircraft descents below the altitude constraints, and the altitude constraints are missed (amber on the MCDU and on the ND).

SPEED CONSTRAINT

Speed constraints may be attached to specific waypoints in the climb, descent or approach phases. To meet the speed constraint, the aircraft must fly over the waypoint with a speed equal or less than the speed constraint.
A speed constraint is considered as missed if the system predicts an aircraft speed 10 kt greater than the speed constraint.
Speed constraints are observed when NAV mode is engaged and speed target is managed. Otherwise speed constraints are disregarded.

TIME CONSTRAINT

Time constraint may be attached to any waypoint except the "from" waypoint.

Note: *No constraint can be associated with go-around waypoints.*

Intentionally left blank

FMS2 Honeywell

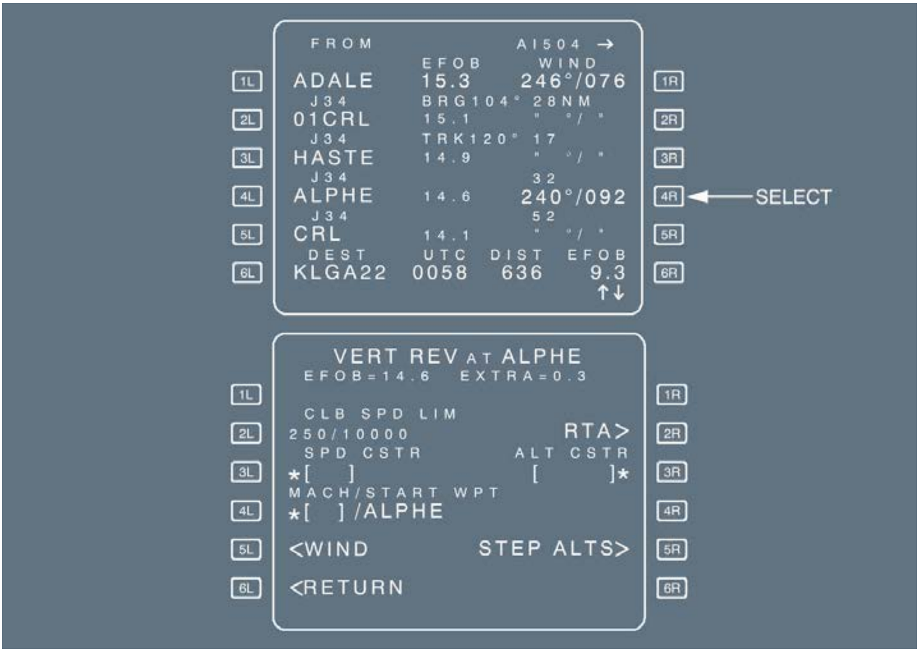
GENERAL

Ident.: DSC-22_20-30-20-25-00009323.0008001 / 14 MAY 12
Applicable to: ALL

The vertical revision function allows the pilot to modify the following parts of the flight plan:

- Speed limit
- Speed and altitude constraints
- Time constraints
- Wind
- Step climb or step descent
- Constant Mach Segment

The pilot selects these functions by pressing the right key on flight plan A or B.



Note: *This vertical functions section only describes the following three functions: Wind and time constraints, and Constant Mach Segment.*
For other vertical revision functions: Refer to the Systems Related Procedures section.

REQUIRED TIME OF ARRIVAL (RTA)

Applicable to: ALL

Ident.: DSC-22_20-30-20-25-A-00009324.0001001 / 24 JAN 11

GENERAL

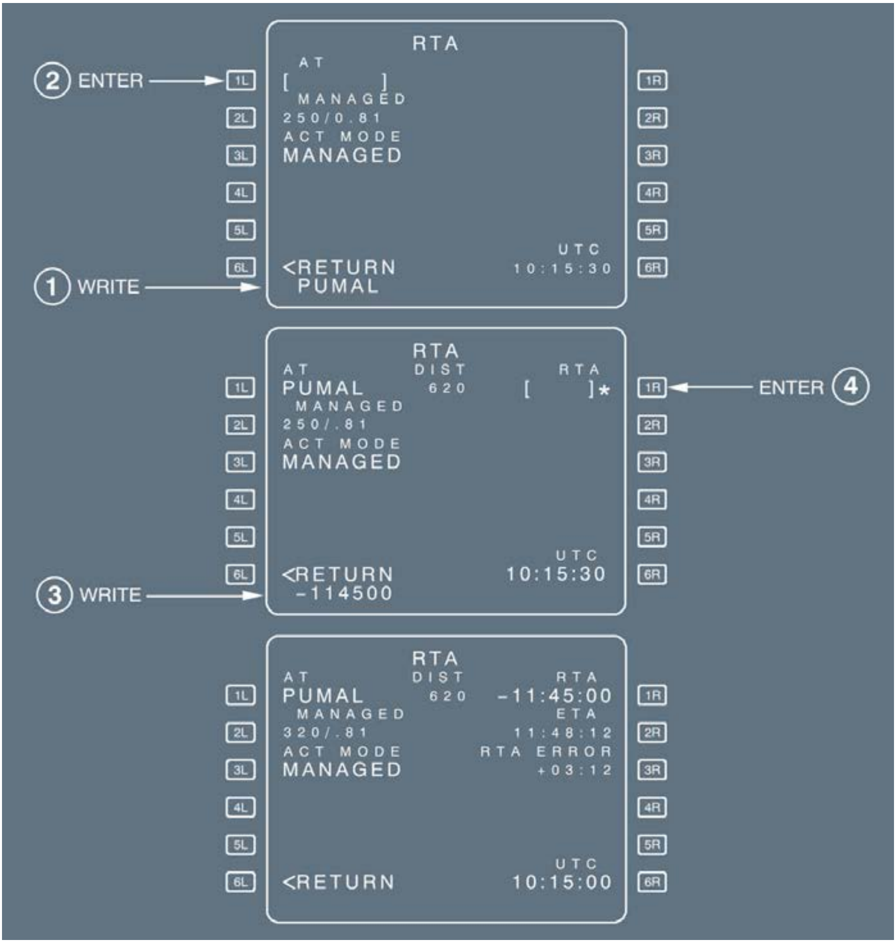
A Required Time of Arrival (RTA) is a time requirement to be met over a specified waypoint of the lateral flight plan, including destination but excluding the origin and FROM waypoints. When the predictions are available, the time constraint value is replaced by the predicted time at the related waypoint, highlighted by a star (*):
- If the RTA is predicted as matched, the star (*) is in magenta.
- If the RTA is predicted as missed, the star (*) is in amber.

No specific symbol is provided on the ND.
A time constraint is cleared in the same way as any other constraints. If a time constraint is automatically deleted. The MCDU displays an “RTA DELETED” message.

Ident.: DSC-22_20-30-20-25-A-00000489.0008001 / 14 MAY 12

ENTERING A REQUIRED TIME OF ARRIVAL

SELECT the F-PLN key on the MCDU.
SELECT a VERT REV at the revised waypoint.
SELECT the RTA prompt (2R).
CHECK, ENTER or MODIFY the identifier of the waypoint at which the time constraint is to be defined in the [1L] field.



WRITE the required time of arrival.

The format is +/- HHMMSS (entry of seconds is not mandatory).

ENTER it in the 1R field.

CHECK the 2R and 3R fields to determine whether the entered constraint can be met.

WIND - TEMPERATURE - QNH

Applicable to: ALL

Ident.: DSC-22_20-30-20-25-B-00000490.0001001 / 24 JAN 11

GENERAL

In order to receive the best predictions, the pilot must enter wind and temperature values for the different phases and for the various waypoints of the cruise phase.
The system uses the temperature value at a given altitude, associated with the tropopause entered on the INIT A page, to optimize the temperature profile.

Ident.: DSC-22_20-30-20-25-B-00009327.0001001 / 24 JAN 11

ENTERING THE TRIP WIND AND TEMPERATURE DURING F-PLN INITIALIZATION

The trip wind is a mean wind component for the entire flight from origin to destination. The pilot can enter it on the INIT B page prior to engine start. It is usually defined by the airline's flight operations on the computerized flight plan.
The FMGS does not consider the trip wind for alternate predictions.
The trip wind is used as long as no winds are entered in the CLB , CRZ , and DES WIND pages. When the pilot enters a CLB , CRZ or DES WIND, the FMGS disregards the trip wind.

PRESS the INIT key.
INSERT the temperature at cruise FL.
On the INIT B page, INSERT the TRIP WIND.

The trip wind is defined as a headwind component (HDXX, XXHD or –XX), or as a tailwind (TLXX, XXTL or +XX).
The FMGS uses the trip wind to compute preliminary performance, time and fuel predictions.

CHECK the predictions on the F-PLN B page.

Ident.: DSC-22_20-30-20-25-B-00009328.0008001 / 01 OCT 12

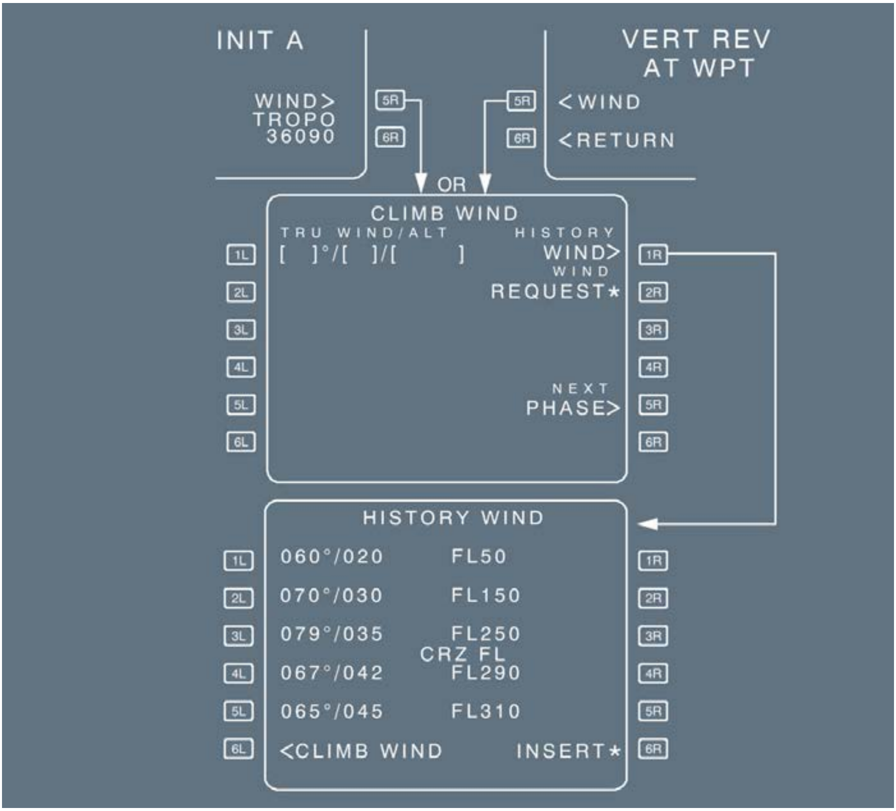
ENTERING THE WIND AND TEMPERATURE DURING F-PLN INITIALIZATION

When completing the INIT A page, and once the wind and cruise FL temperature forecasts are available, the pilot may enter them, if significantly different, by pressing the wind prompt.
The pilot will access the different wind pages by using the NEXT PHASE and PREV PHASE prompts. He will slew the CRZ WIND page to access the various cruise wind waypoints.

The pilot will enter wind data as follows:
- For climb phase: By inserting either the HISTORY WIND data (as recorded during the last descent), or by inserting winds (at up to 5 altitudes) on the CLIMB WIND page.
- For cruise phase: By inserting winds (at up to 4 FL) at various CRZ waypoints on the CRZ WIND pages. The 4 levels are the same for all the cruise waypoints. The pilot may enter the temperature of each waypoint and at destination on this page.
- For descent phase: By inserting winds (at up to 5 FL /altitudes) on the DES WIND page.
- For the ALTN F-PLN , an average wind may be entered on the DES WIND page for alternate cruise flight level.

Note: *Wind can be automatically received (and inserted) through the ACARS system (Refer to DSC-22_20-70 Wind Data - Request for Wind Data).*

Once a CLIMB, CRZ, or DESCENT WIND is entered, the system ignores the TRIP WIND.
Once temperature and winds are inserted, the FMGS computes the ISA profile, and the F-PLN B page displays the forescast wind profile (by linear interpolation and propagation).



WIND ENTRY RULES

When a wind entry is performed from an empty field, direction/velocity/altitude (or flight level) must be entered simultaneously. One entry in each bracket.
Overwriting a wind cancels the previous one.
Entered wind data can be cleared: The field reverts to brackets.
Propagated wind cannot be cleared.
Entering a new altitude, over an existing altitude, replaces that existing altitude at all cruise waypoints. Any winds entered at the overwritten altitude are lost at all cruise waypoints.

ENTERING THE HISTORY WIND (F-PLN INITIALIZATION)

The pilot may insert the history wind, but cannot modify this page.

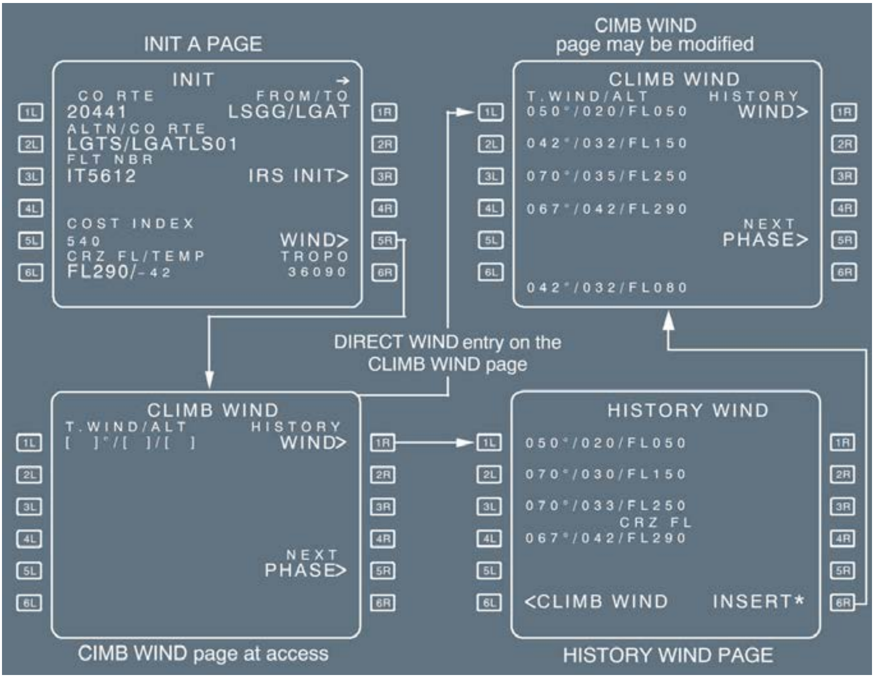
If convenient, PRESS the (6R) prompt to insert. After insertion, the [6R] prompt is suppressed, but the page still displays the wind values for information.

ENTERING THE CLIMB WIND (F-PLN INITIALIZATION)

If history winds are not convenient:

SELECT CLIMB WIND page from INIT A page or VERT REV page.
WRITE new winds into the scratchpad and ENTER.

Winds entered on the CLIMB, CRZ, and DESCENT WIND pages are always true north referenced.
Tower wind, entered on PERF APPR page is magnetic-referenced.
The pilot can enter "GRND" in the altitude field for wind at destination.
CLIMB WIND cannot be modified when the climb phase is active.
At climb phase transition, wind data switches from blue to green, and any attempted modification will trigger the "NOT ALLOWED" message.
The system extrapolates the highest wind entry to all higher levels.
The system interpolates winds between 2 entered levels.



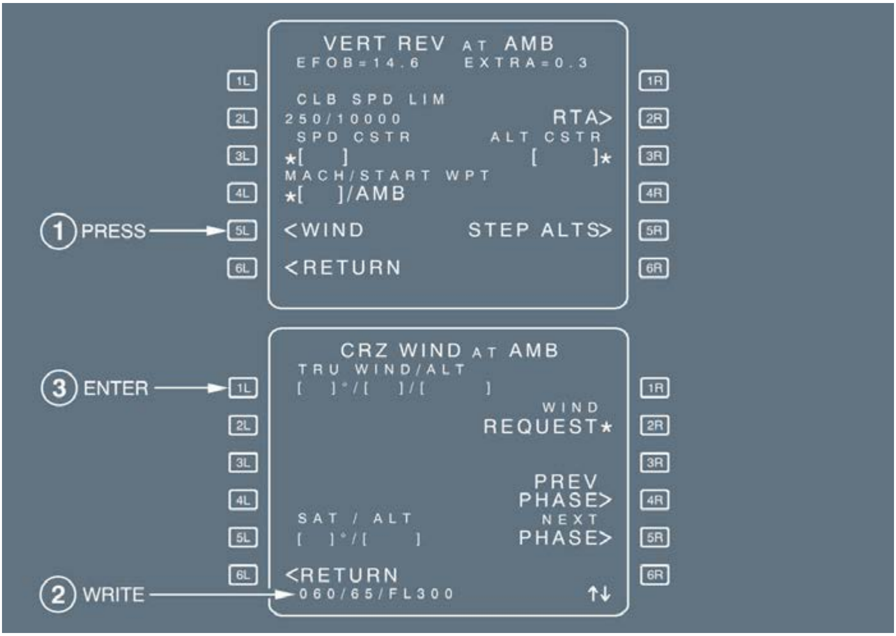
Ident.: DSC-22_20-30-20-25-B-00009329.0001001 / 14 MAY 12

ENTERING THE CRUISE WINDS AND TEMPERATURES

At flight plan initialization, the CRZ WIND page displays all cruise waypoints with empty brackets. In flight, only downpath waypoints are displayed.

SELECT VERT REV at WPT.
PRESS the WIND prompt.
SELECT NEXT PHASE.
SLEW until relevant waypoint is displayed.
WRITE and ENTER the new temperature into the scratchpad.
WRITE and ENTER the new wind data into the scratchpad.

WIND and temperature may be entered through the ACARS pages. (Refer to DSC-22_20-70 Wind Data - Procedure to Insert Wind Data).



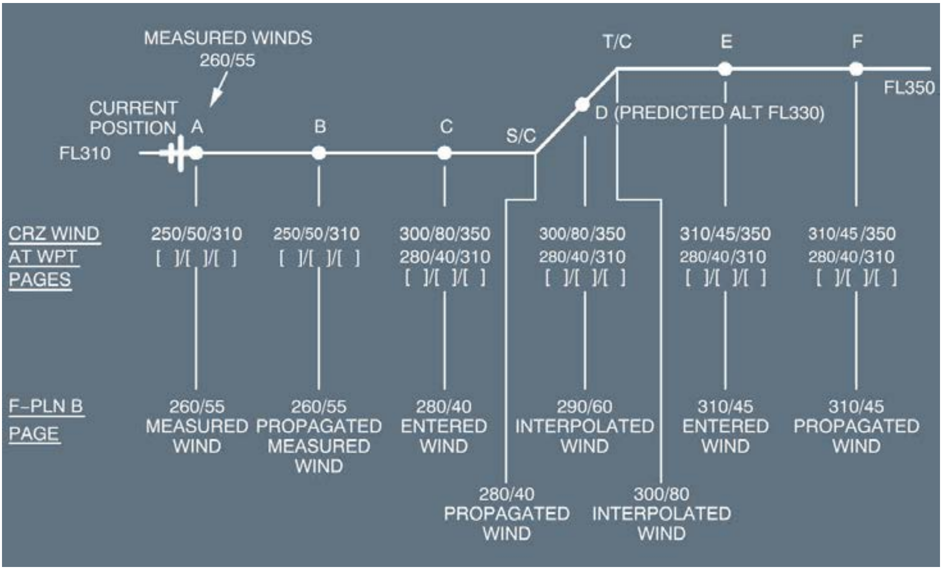
The crew will modify the entered winds and temperatures in flight, if a significant difference is expected (greater than 30 kt or 30 ° for the wind data and greater than 5 °C for the temperature). The system propagates the pilot's (or ACARS) wind and temperature entries downpath, until a waypoint for which a different temperature or wind has been entered (for the same flight level), or until the last cruise waypoint.

The forecast winds at a waypoint are determined as follows:
- If the predicted altitude at the waypoint matches an altitude defined in the CRZ WIND page, the forecast wind, is the corresponding entered or propagated wind, displayed at that waypoint on the CRZ WIND page.
- If the predicted altitude lies between two altitudes entered on the CRZ WIND page, the wind direction and velocity are linearly interpolated.
- If the predicted altitude is above or below the set of cruise altitudes, the forecast wind is a constant value extrapolated from the entered or propagated wind at the highest (or lowest) altitude displayed on the CRZ WIND page for that point.

Once in flight, the FMGS considers the actual measured wind up to 200 NM ahead of the aircraft to permanently update the wind profile. This updated wind profile is used to compute the predictions and the performance data, but is not displayed to the crew.

The CRZ WIND pages display the propagated values in small blue font, and the pilot (or ACARS) entries in large blue font.

Note: *The CRZ WIND page displays ACARS or crew-entered or propagated data. It never displays computed data (F-PLN B page only).*
Example:



Ident.: DSC-22_20-30-20-25-B-00009330.0001001 / 24 JAN 11

EFFECT OF WIND ENTRIES ON OPTIMUM FLIGHT LEVEL

The OPT FL computation considers the wind entries made at different altitudes (normally at the different CRZ FL).
When flying the subsequent CRZ FL , the OPT FL proposed by the PROG page may be affected by the wind entries made at the previous CRZ FL; these winds are automatically propagated and may be significantly different from the actual winds.
We recommend the following procedure: If the propagated winds at the lower altitudes are significantly different from the actual winds, enter the wind at these altitudes, or if not available, the wind measured at the current CRZ FL.

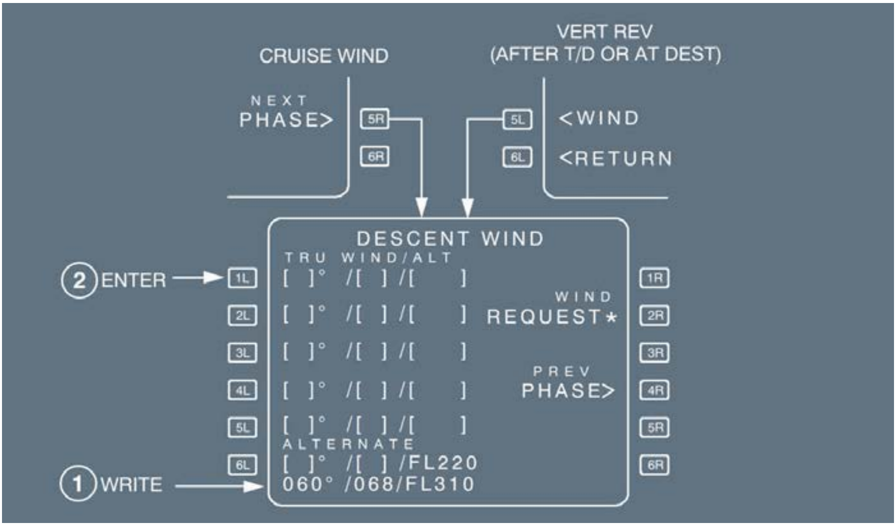
Ident.: DSC-22_20-30-20-25-B-00009331.0001001 / 14 MAY 12

ENTERING THE DESCENT WINDS

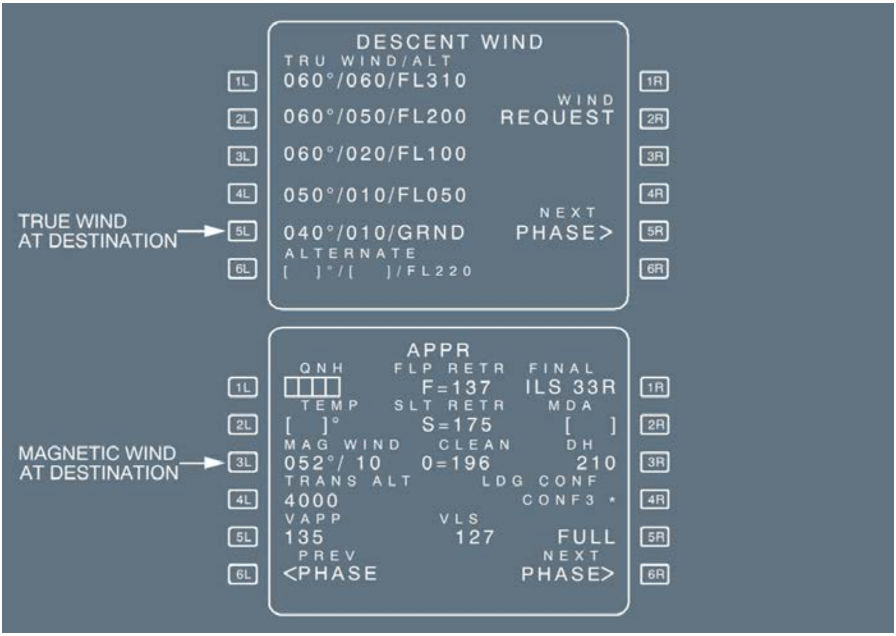
The pilot will enter as many as one wind at 5 different FL or altitudes. This wind data will be used for descent profile and prediction computation.

From the vertical revision page, or from the CRZ WIND page:

PRESS the WIND prompt.
SELECT the DESCENT WIND page.
ENTER up to 5 different "wind/altitude".



A wind is written as true direction/velocity/flight level or altitude in feet.
If the crew enters "GRND" in the altitude field, the system uses the associated wind as wind at destination.
The descent profile is corrected, as well as the tower wind entered in the PERF APPR page.



When the winds have been entered, the F-PLN B page displays the forecasted wind profile at all descent waypoints, using values it has interpolated from manual entries. Descent winds are not modifiable when the descent, approach, or go-around phase is active. At descent phase transition, wind data switches from blue to green, and any attempted modification will trigger the “NOT ALLOWED” message.

Ident.: DSC-22_20-30-20-25-B-00009332.0001001 / 24 JAN 11

ENTERING THE ALTERNATE WIND

Alternate wind is entered on the DESCENT WIND page.

The alternate cruise (ALTN CRZ) level defaults to:
- FL 220 if the length of the ALTN F-PLN is less than 200 NM.
- FL 310 if the length of the ALTN F-PLN is greater than 200 NM.

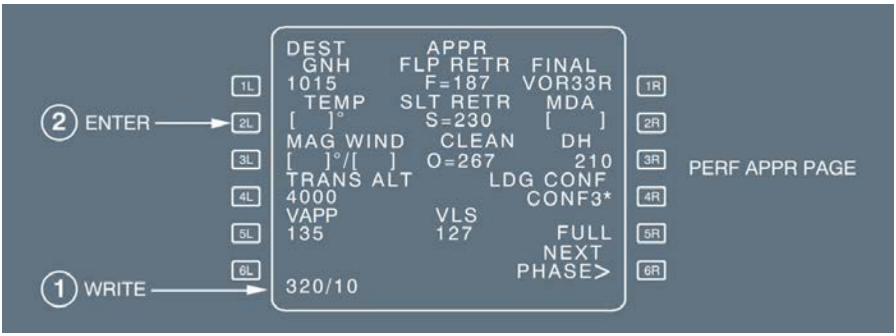
If an alternate wind is not defined, the predictions are computed with a wind defaulted to zero. Alternate wind can be modified at any time.

The alternate wind profile is as follows:
- ALTN CLB wind : Mean wind between ALTN CRZ wind (as entered on the DESCENT WIND page), and the wind at primary DEST (as entered on the PERF APPR page).
- ALTN CRZ wind : If no ALTN WIND has been entered on the DESCENT WIND page, the WIND at primary DEST (as entered on the PERF APPR page) is considered.
  In case no entry is made, zero wind is assumed.
- ALTN DES wind : Mean wind between ALTN CRZ WIND and wind at FL 100.
  Wind at FL 100 = Interpolation between wind at ALTN CRZ FL and zero at ALTN DEST.

Ident.: DSC-22_20-30-20-25-B-00009333.0001001 / 14 MAY 12

ENTERING THE APPROACH WIND TEMPERATURE AND QNH

The wind at destination is entered in the 3L field of the PERF APPR page.
It is copied in true reference into the DESCENT WIND page at ground level (GRND), and F-PLN B page at destination. A ground entry on the DESCENT WIND page is, in the same way, automatically copied to F-PLN B page and the PERF APPR page.
This wind is modifiable in descent, approach, and go-around phases.



SELECT the PERF key on the MCDU.
PRESS NEXT PHASE (6R).
WRITE QNH and temperature, and enter them.
WRITE the surface wind in the scratchpad, and enter it.

<u>*Note:*</u> *At each wind entry, the descent profile is recomputed. Therefore, it is recommended to enter all winds, temperature, and QNH at the same time in order to minimize recomputation time.*

CONSTANT MACH SEGMENT

Applicable to: ALL

Ident.: DSC-22_20-30-20-25-C-00009334.0001001 / 14 MAY 12

GENERAL

The pilot can enter the start and end points of a constant Mach segment, and its associated Mach number, from the VERT REV page.
Only one constant Mach segment may be defined in the active flight plan, and only one in the secondary flight plan. No constant Mach segment can be defined in the alternate flight plan.

Ident.: DSC-22_20-30-20-25-C-00000491.0008001 / 01 OCT 12

ENTERING A CONSTANT MACH SEGMENT

SELECT the F-PLN key on the MCDU.
SELECT VERT REV at a waypoint.

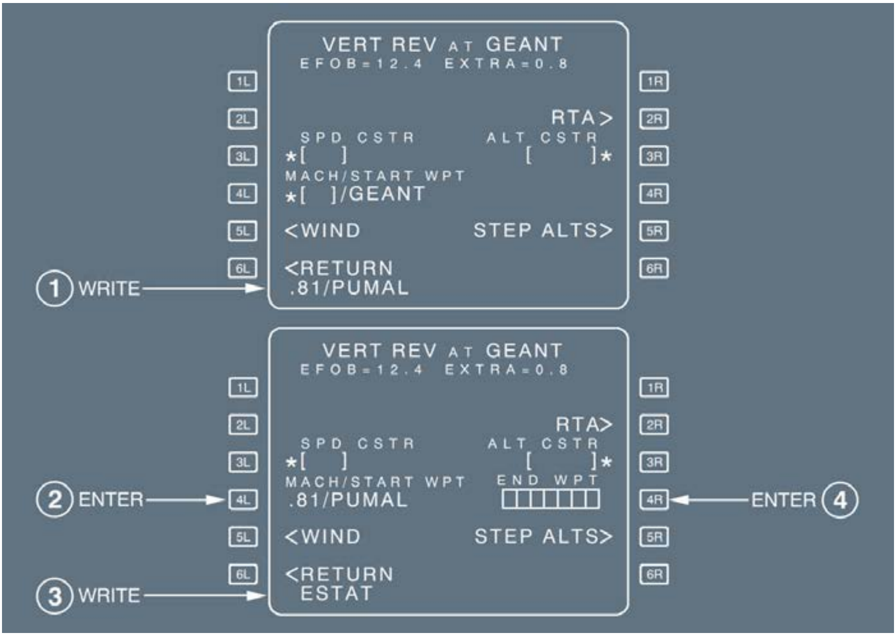
(Except the destination and alternate flight plan waypoint).

WRITE the Mach/start waypoint pair.

It is possible to enter only the Mach or the waypoint. But, for the first entry, a Mach entry is mandatory.
The waypoint must be located in front of the aircraft and must be part of the cruise.

ENTER it in the 4L field

The END WPT prompt appears in the 4R field.



WRITE the end waypoint.

The end waypoint must be part of the cruise.

ENTER it in the 4R field.

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GENERAL

Ident.: DSC-22_20-40-10-00011077.0001001 / 17 AUG 10
Applicable to: ALL

The performance function:
- Optimizes a flight plan
- Computes predictions.

OPTIMIZATION

Ident.: DSC-22_20-40-10-00011084.0029001 / 23 JUN 15
Applicable to: ALL

The FMGC minimizes cost by optimizing the following items:
- Takeoff, approach, and go-around speeds (F , S , Green Dot, VAPP)
- Target speed for CLB , CRZ and DES phases (ECON SPD/MACH)
- Flight Level (for flight crew's information)
- Descent profile from CRZ FL down to the destination airport.

These items depend on the data the flight crew inserts during lateral and vertical flight planning and revision procedures.
Most are displayed on the PERF pages associated with the appropriate flight phases.

WIND PROFILE

To obtain the best predictions, the flight crew must enter the wind for the various flight phases and specifically for waypoints in cruise.

■ **ON GROUND:**
During flight planning initialization, enter the winds for the climb and cruise phases using the HISTORY WIND and WIND pages. Enter, manually or with ACARS , different wind values in the climb and cruise phases. The system will compute a wind for all waypoints of the F-PLN using linear interpolation between manual/ACARS entries.
The wind profile will be displayed on the F-PLN B page, and is called forecast wind profile.
Flight crew or ACARS entries are displayed in large font, and system-computed winds in small font.

■ **IN FLIGHT:**
The system updates the predictions and the current ECON speed, using the measured wind at the present position. It combines actual wind and forecast winds to compute the wind ahead of the aircraft, but this is totally transparent to the flight crew.
During cruise, the flight crew will enter the descent winds and the approach wind. The system will update the final predictions, compute the optimum descent profile and compute the optimum speed in descent and approach.

The forecast wind profile will be used to compute fuel and time predictions, as well as ECON speed/Mach targets.

OPTIMUM TAKEOFF, APPROACH AND GO-AROUND SPEEDS

The FMGC computes takeoff speeds (F , S, Green Dot) during the preflight and takeoff phases, using the performance model in the database and the takeoff weight.
The flight crew has to insert V1 , VR , and V2 in the PERF TO page manually.
The FMGC uses the performance model and either the predicted landing weight or the current gross weight at transition to the approach phase to compute approach speeds (VLS , VAPP , F , S, Green Dot).
On the PERF APPR page, the selected LDG CONF determines the applicable VLS and VAPP , the latter being updated by the WIND correction that the flight crew enters on the same page. The FMGC uses the performance model and gross weight to compute go-around speeds (F , S, Green Dot).

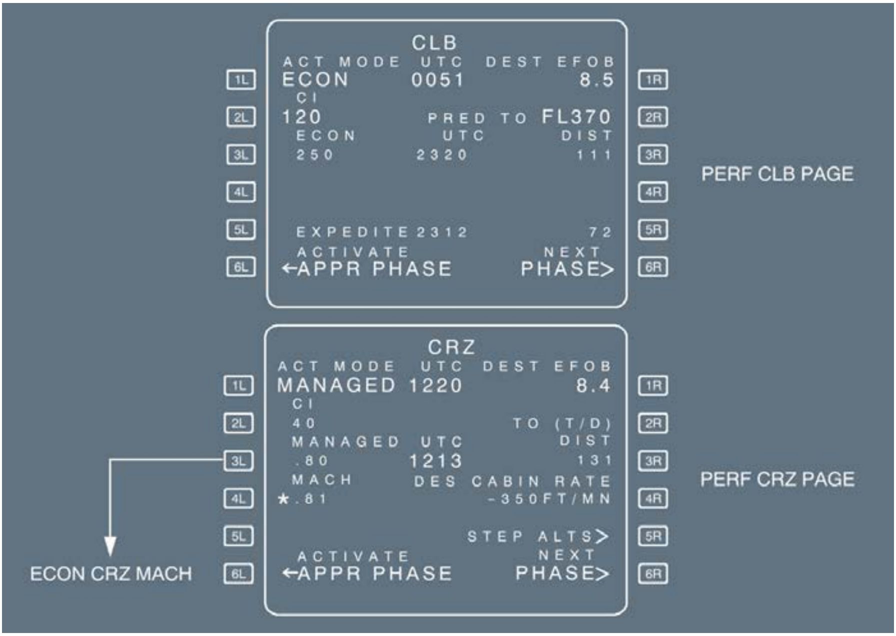
OPTIMUM TARGET SPEED FOR CLIMB, CRUISE AND DESCENT (ECON SPD/MACH)

The FMGS computes the optimum target speed (ECON SPD/MACH) as a function of:
- Cost index (CI)
- Cruise flight level (CRZ FL)
- Gross weight (GW)
- Wind and temperature models
- Performance factor.

The computer processes the ECON SPDs for the climb and descent phases before the initiation of the flight phase, and freezes the values once the flight phase becomes active.
When there is no time or speed constraint/limit, ECON SPEED is the optimum speed for the selected cost index. It refers to fuel and time cost and not directly to fuel saving.
The FM calculates ECON CLB , ECON DES and the associated top of climb and top of descent as a function of cost index, cruise FL, and meteo data.

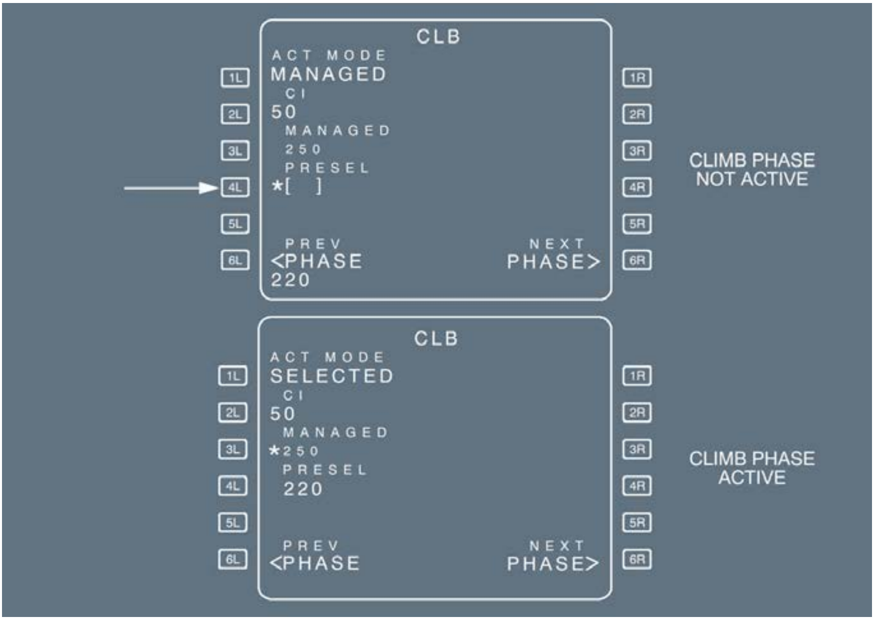
The computer continually updates ECON CRUISE MACH (SPD), taking into account current weather conditions and modifications to the flight plan.

<u>Note:</u> *If the cruise FL is below FL 250, ECON CRUISE SPEED is computed. If the cruise FL is above FL 250, ECON CRUISE MACH is computed.*



PRESET TARGET SPEED FOR CLB PHASE

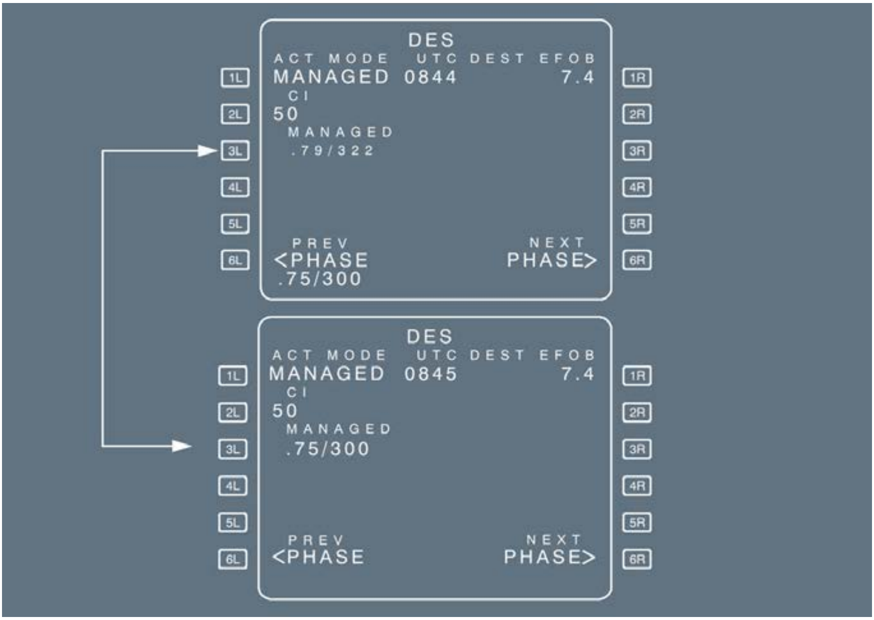
The flight crew can preselect the climb speed before the CLB phase begins, by inserting a speed in the PRESEL field:



The active mode field changes from MANAGED to SELECTED, and the FM will use the entered speed for climb predictions computation.
The flight crew can revert to managed mode by pressing the 3L key.

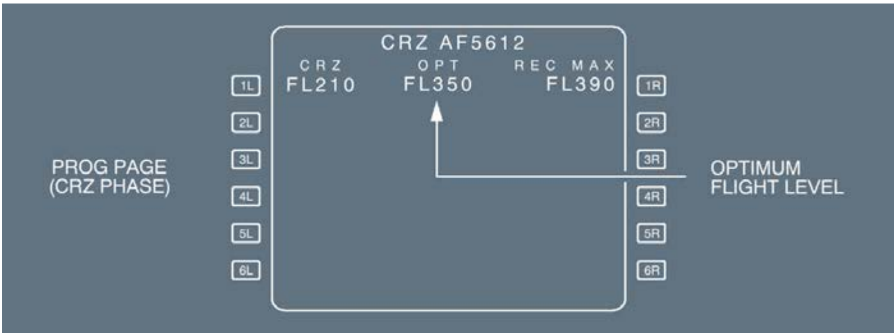
PRESET TARGET SPEED/MACH FOR DES PHASE

The flight crew can change the speed and/or Mach displayed in the MANAGED field by inserting a speed and/or Mach in the MANAGED field.
Although the entered speed is chosen by the flight crew, the FMGS uses it to compute the descent flight path and top of descent. It is therefore part of the managed descent profile.



The flight crew can revert to the optimum speed/Mach by clearing the 3L field.

OPTIMUM FLIGHT LEVEL

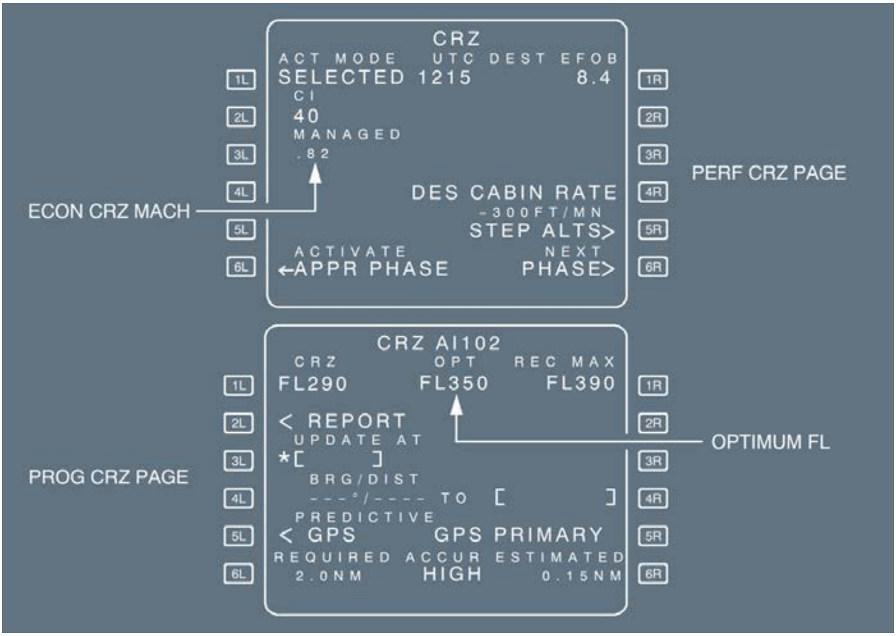


The optimum flight level (OPT FL) indicates the most economic flight level for a given cost index, weight, weather data. It is continuously updated in flight. It requires a 5 min minimum cruise time, at a minimum cruise flight level of FL 100.

The OPT FL is a compromise between fuel and time saving. As a result, the flight crew may observe jumps in OPT FL due to GW , ISA , or wind changes. The computation of the OPT FL considers the wind entries made at the different altitudes (normally at the different CRZ FL). When flying the subsequent CRZ FL , the OPT FL proposed by the PROG page may be affected by the wind entries made at the previous CRZ FL; these winds are automatically propagated and may be significantly different from the actual winds.

Note: *For simplification purposes, the FCOM /QRH gives the OPT FL at a given Mach number. It does not consider the cost index, therefore the FMGS and the FCOM /QRH values are different.*

FM displays OPT FL on the PROG page. The PROG page displays dashes for this quantity when the system detects an engine-out condition.



OPTIMUM DESCENT PATH

The vertical flight path is computed to minimize fuel consumption, while satisfying the various altitude constraints of the F-PLN and the descent speed profile, in order to reach VAPP at 1 000 ft.

The computer calculates the descent profile before the descent phase is initiated, taking into account:

- All lateral and vertical flight plan data
- The descent and approach winds, as inserted into the DESCENT WIND page and PERF APPR page, and the required maximum cabin rate of descent.

During descent, the descent profile is updated only if the flight plan is modified, or if data for the APPR phase (WIND, VAPP , or LDG CONF) are changed.

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COST INDEX (CI)

Ident.: DSC-22_20-40-20-00011041.0001001 / 17 AUG 10
Applicable to: ALL

The cost index is a fundamental input for the ECON SPEED or ECON MACH computation. ECON SPEED and ECON MACH reduce the total flight cost in terms of flight time and fuel consumption (and not only in terms of fuel saving).
CI is the ratio of flight time cost (CT) to fuel cost (CF).
CI = CT /CF (kg/min or 100 lb/h).
CI = 0 corresponds to minimum fuel consumption (Max Range).
CI = 999 corresponds to minimum time.
CI = Long Range Cruise (*Refer to PRO-NOR-SRP-01-50 Preparation for Descent and Approach - Cost Index for Long-Range Cruise*).

Note: *The airline's operations department usually defines the cost index, to optimize each company route. The flight crew does not ordinarily modify the cost index during a flight.*

Intentionally left blank

GENERAL

Ident.: DSC-22_20-40-30-00011080.0002001 / 17 AUG 10
Applicable to: ALL

The FMGC computes predictions for the primary and secondary flight plans and displays them on the Multipurpose Control and Display Units (MCDU s), and on the navigation display (ND) of the Electronic Flight Instrument System (EFIS).
The computations use the current state of the aircraft (GW , CG, position, altitude, speed, engaged mode of the autopilot or flight director, time, wind, temperature) for the active flight plan.
The computations use data entered by the flight crew for the secondary flight plan when it is not a copy of the active flight plan. When the secondary flight plan is a copy of the active flight plan, it uses the same data.

PREDICTIONS FOR THE PRIMARY FLIGHT PLAN

Ident.: DSC-22_20-40-30-00011085.0001001 / 17 AUG 10
Applicable to: ALL

The predictions displayed on the MCDU assume that the FMGS will guide the aircraft along the preplanned lateral and vertical flight plans.
The predictions displayed on the ND assume that the aircraft will continue to operate in the modes (selected or managed) that are currently active.
As long as the aircraft is flying the flight plan under managed guidance, the predictions on the MCDU will match those on the ND.

If the flight crew does not fly the flight plan, the MCDU predictions assume that:
- The flight crew will fly back towards the flight-planned route
- The flight crew will immediately resume flying the FMGC managed modes.

If the flight crew does not fly the managed speed profile, the MCDU predictions assume that they will maintain the selected speed until they reach:
- In the climb or descent phase, the next speed limit or speed constraint if any, or next phase
- In cruise, the top of descent.

Then, the predictions assume that the flight crew will revert to managed speed.

COMPUTATION OF PREDICTIONS

Ident.: DSC-22_20-40-30-00011086.0001001 / 17 AUG 10
Applicable to: ALL

The system calculates various predictions for the active flight plan and updates them continually during flight as functions of:
- Revisions to the lateral and vertical flight plans
- Cost index

- Current winds and temperature
- Present position versus lateral and vertical flight plans
- Current guidance modes
- Speed control (managed/selected).

The MCDU and the ND show these predictions, each of which is based on specific assumptions.

Note: *During computation, prediction fields on the MCDU pages display dashes.*

PREDICTIONS DISPLAYED ON THE NAVIGATION DISPLAY

Ident.: DSC-22_20-40-30-00011090.0002001 / 17 AUG 10
Applicable to: ALL

These predictions consist of symbols positioned along the lateral flight plan (NAV mode engaged) or the track line (NAV mode not engaged). These symbols (named as pseudo waypoints) and their meanings are:

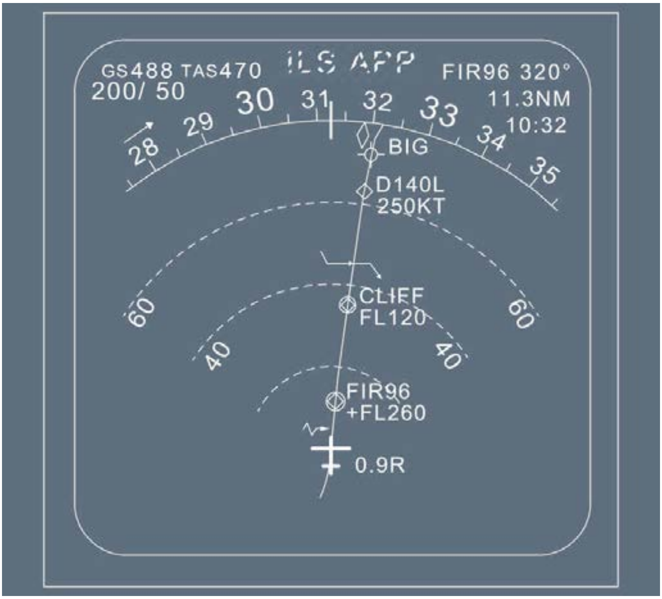
Pseudo waypoint	Definition
 	Level symbol at the position (top of climb or level-off) where the aircraft will reach: - The FCU selected altitude (blue) or - The constrained altitude, if it is more restrictive than the FCU altitude and if appropriate modes are engaged (magenta).
	Top of descent or continue descent symbol: - Top of descent (always white) - Continue descent symbol (white if DES is not armed, blue if it is).
	Start of CLIMB symbol: - White if CLB is not armed - Blue if CLB is armed.
	Intercept point symbol: The point where the aircraft is predicted to intercept the descent path, if there is any vertical deviation when the aircraft is in DES mode (white if DES is not engaged, blue if it is).
•	Speed change symbol: The point at which the aircraft will initiate an automatic ACCEL or DECEL from current speed to a new computed speed if it encounters a SPD LIM , SPD CSTR , or HOLDING SPD (magenta).
	Decelerate point symbol: - Indicates the point at which the aircraft is predicted to decelerate for approach (and thus switch to the approach phase) - Magenta, if in managed speed and NAV or approach mode is engaged - White, if in selected speed or HDG /TRK mode - Automatic deceleration only occurs when displayed in magenta.

Continued on the following page

Continued from the previous page

Pseudo waypoint	Definition
	ALT CSTR symbol set around the constrained waypoint: - Magenta, when the ALT CSTR is predicted to be met - Amber, when the ALT CSTR is predicted to be missed - White, when the ALT CSTR is not taken into account by the FMGS , and the NAV mode is engaged.
 (10 45)  (ETP)	Time marker and equitime point symbols appear in green to indicate where the aircraft reaches the time marker or equitime point.
	Energy circle symbol (green arc) centered on the aircraft position and oriented to the current track line. Represents the Required Distance to Land. Only displayed if the lateral guidance mode is heading or track, and the current FMS flight phase is in cruise, descent or approach, and the aircraft is within 180 NM of the destination.
Crosstrack error XX.XR or XX.XL (X is a number)	The crosstrack error displays the lateral deviation between the aircraft position and the track of the F-PLN active leg. The value is limited to 99.9 NM left or right.
INTCPT	Intercept waypoint is displayed on the ND at the point at which the present track intercepts the F-PLN.

The predicted time of arrival at the TO WPT is located in the upper right-hand corner of the ND . It assumes direct distance from the aircraft position to the TO WPT and assumes current ground speed will be constant.



As a general rule, the ND indicates what the aircraft will fly, with the current active FG modes.

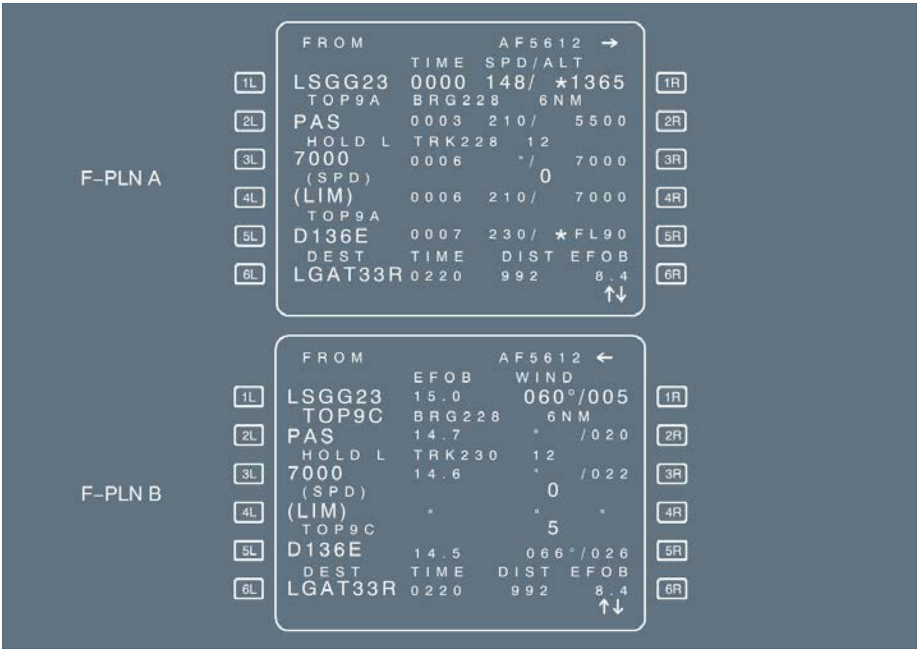
For example:
- The continuous green line on the ND represents the track the aircraft is currently flying:
  - If HDG /TRK is engaged, the track line is green and the flight plan is dashed
  - If NAV mode is engaged, the green line is the flight plan.
- If the speed target is manually selected, the speed-change symbol is no longer displayed because it will not be taken into account.
- When the aircraft is not following the vertical flight plan (OP CLB , OP DES , V/S) but the NAV mode is engaged, the system disregards any altitude constraints and puts white circles around the waypoints that have these constraints and positions level symbols accordingly.
- Pseudo waypoints are adjusted each time predictions are updated.

PREDICTIONS DISPLAYED ON THE MCDU

Ident.: DSC-22_20-40-30-00011093.0001001 / 14 MAY 12
Applicable to: ALL

The predictions displayed on the MCDU assume that AP (or FD order) is controlling the aircraft and flying it along the preplanned lateral and vertical flight plan.

Therefore:
- If the aircraft is guided along the flight plan (managed guidance), the MCDU predictions correspond exactly to what the aircraft is doing
- If the aircraft is not guided along the flight plan (selected guidance), the MCDU predictions assume that it will return immediately to the flight plan, intercepting at a predetermined angle, and will then proceed under managed guidance
- If the aircraft does not fly the managed speed profile (ECON , SPD CSTR ...), the MCDU predictions assume that it will remain at the present selected speed/Mach until it reaches the next SPD CSTR or SPD LIM or enters the next flight phase.



<u>Note:</u> *For secondary flight plan predictions, Refer to DSC-22_20-60-50 Secondary Flight Plan.*

TYPE OF PREDICTIONS

Ident.: DSC-22_20-40-30-00011113.0002001 / 18 MAR 11
Applicable to: ALL

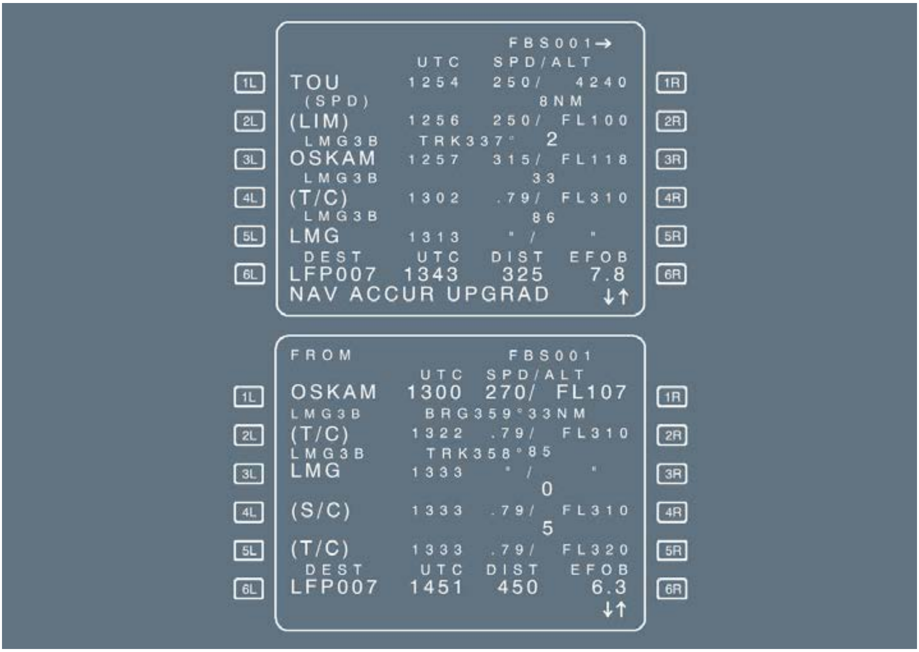
	MCDU PAGE
Pseudo waypoints: T/C , T/D , S/C , S/D , I/P , SPD LIM , DECEL	F-PLN A and B
TIME/SPD /ALT at each WPT and pseudo-WPT	F-PLN A
ETA /DIST TO DEST along F-PLN /EFOB at destination	F-PLN A and B
EFOB /T-WIND at each WPT and pseudo-WPT	F-PLN B
Constraint symbol * at each constrained WPT (TIME/SPD /ALT)	F-PLN A and B
Altitude error in case of missed ALT constraint	VERT REV
EFOB /EXTRA FUEL at each WPT	VERT REV
TIME/EFOB at destination	FUEL PRED /PERF CLB /CRZ /DES
TIME/DIST to a selected altitude	PERF CLB or DES
Fuel prediction prior engine start	INIT B
REC MAX FL	PROG
TIME/EFOB at Alternate	FUEL PRED
XTRA FUEL for various Alternates	ALTN
VDEV vertical deviation from vertical flight path	PROG

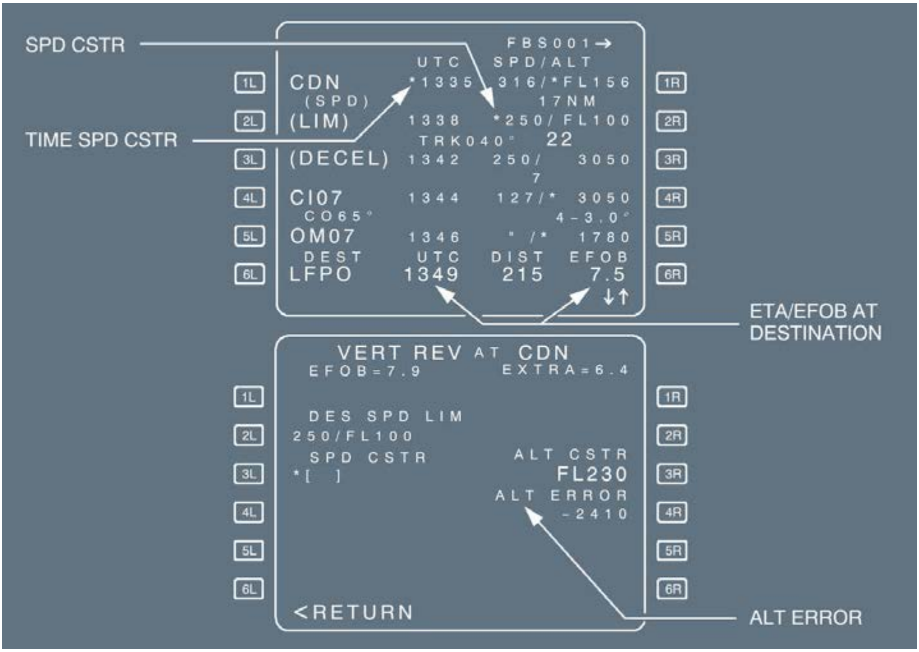
EXAMPLES OF MCDU PREDICTIONS

Ident.: DSC-22_20-40-30-00011120.0001001 / 14 MAY 12
Applicable to: ALL

The following MCDU pages display some of the prediction types.

- Pseudo-waypoints:
  Top of Climb (T/C), Top-of-Descent (T/D), Start of Climb (S/C) or Start of Descent (S/D) for Step Climb/Descent, Speed Limit (SPD LIM), deceleration to approach phase (DECEL)
- Time, speed, and altitude predictions:
  TIME/SPD /ALT for all waypoints and pseudo-waypoints.

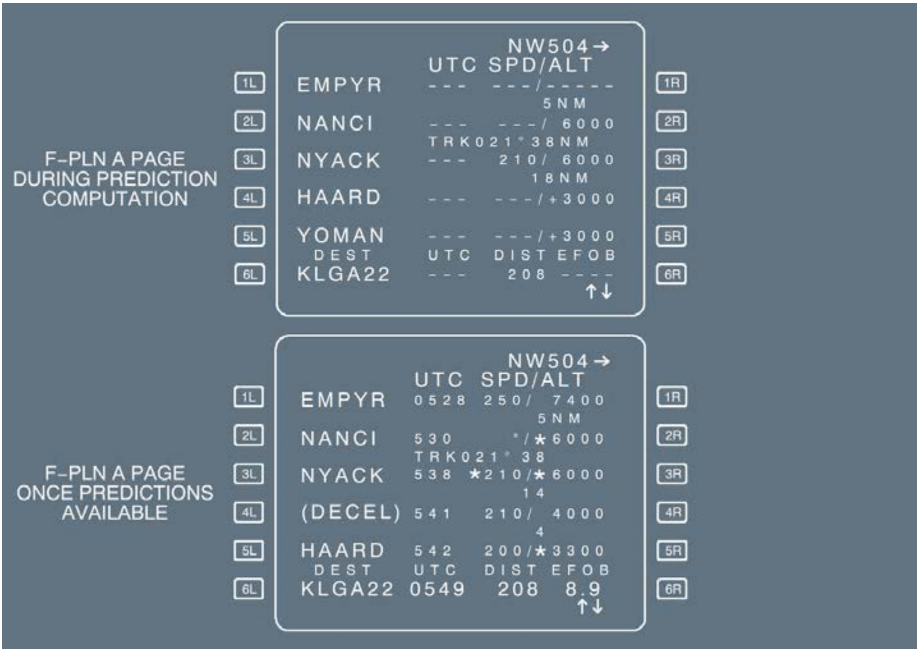

FBS001→
UTC SPD/ALT
TOU 1254 250/ 4240
(SPD) 8NM
(LIM) 1256 250/ FL100
LMG3B TRK337° 2
OSKAM 1257 315/ FL118
LMG3B 33
(T/C) 1302 .79/ FL310
LMG3B 86
LMG 1313 " / "
DEST UTC DIST EFOB
LFP007 1343 325 7.8
NAV ACCUR UPGRAD ↓↑
1L 2L 3L 4L 5L 6L
1R 2R 3R 4R 5R 6R
FROM FBS001
UTC SPD/ALT
OSKAM 1300 270/ FL107
LMG3B BRG359°33NM
(T/C) 1322 .79/ FL310
LMG3B TRK358°85
LMG 1333 " / "
0
(S/C) 1333 .79/ FL310
5
(T/C) 1333 .79/ FL320
DEST UTC DIST EFOB
LFP007 1451 450 6.3
↓↑



CONSTRAINT SYMBOLS (STAR)

Ident.: DSC-22_20-40-30-00011150.0001001 / 14 MAY 12
Applicable to: ALL

When a time speed or an altitude constraint is part of the vertical flight plan, it appears on the F-PLN A page only at the time of insertion, or when predictions are not yet available.
Once available, the time speed and altitude predictions are displayed for all F-PLN waypoints: when a speed or an altitude constraint is at a waypoint, a star symbol appears adjacent to the speed or altitude prediction. If the star is magenta, the constraint is predicted to be matched. If the star is amber, the constraint is predicted to be missed.



<u>Note:</u> *If an altitude constraint is predicted as missed, the system tells you what will be the error at the specific waypoint.*

VERTICAL DEVIATION

Ident.: DSC-22_20-40-30-00011139.0001001 / 29 SEP 15
Applicable to: ALL

During descent, the system indicates to the flight crew the vertical deviation from the computed descent profile (PFD and MCDU) and predicts where the flight crew can rejoin it.
VDEV on the PFD and PROG page, predictions on the MCDU F-PLN page, symbols on the ND, enable assessment to the vertical position versus the computed flight profile.

OPERATION RULES CONCERNING PREDICTIONS

Ident.: DSC-22_20-40-30-00011140.0001001 / 17 AUG 10
Applicable to: ALL

The flight crew must properly update the flight plan data during the flight, in order to obtain accurate and meaningful predictions.

The flight crew should rely on the ND for short-term predictions. It indicates what the aircraft will do under the currently engaged modes (selected or managed).
The flight crew should rely on the MCDU for long-term predictions, when managed guidance is active or about to be reengaged.

OTHER COMPUTATIONS

Applicable to: ALL

Ident.: DSC-22_20-40-30-A-00011141.0002001 / 17 AUG 10

ENGINE-OUT CASE

The FMGS computes an engine-out target speed for each flight phase. It computes an engine-out maximum altitude at long-range cruise speed, and displays it on the PROG page.
The new speed target becomes Green Dot in climb, and EO CRZ SPD in cruise.
The system computes the flight plan predictions down to the primary destination. If the aircraft is above EO MAX ALT , the predictions are computed, assuming that a drift down descent will immediately be performed to reach EO MAX ALT.

Ident.: DSC-22_20-40-30-A-00011142.0001001 / 17 AUG 10

RECOMMENDED MAXIMUM ALTITUDE (REC MAX)

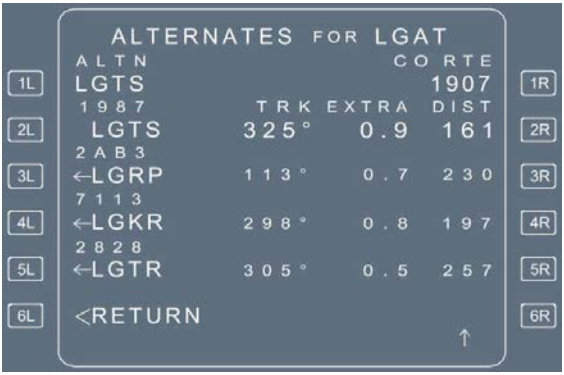
The recommended maximum altitude is the lowest of the maximum altitude that:
- The aircraft can reach with a 0.3 g buffet margin
- The aircraft can fly in level flight at MAX CRZ rating
- The aircraft can maintain a V/S of 300 ft/min at MAX CLB thrust
- The aircraft can fly at a speed higher than Green Dot and lower than VMO /MMO
- The aircraft is certified at.

The REC MAX altitude is displayed on the PROG page.
Anti-ice is not taken into account for this computation. Refer to QRH graphs if icing conditions are expected.
A maximum altitude using a 0.2 g buffet margin is also computed. It is not displayed, but the system uses it to limit CRZ ALT entry.

Ident.: DSC-22_20-40-30-A-00011250.0001001 / 17 AUG 10

PREDICTIONS FOR ALTERNATES

Predictions for alternates are displayed on the ALTERNATES page.



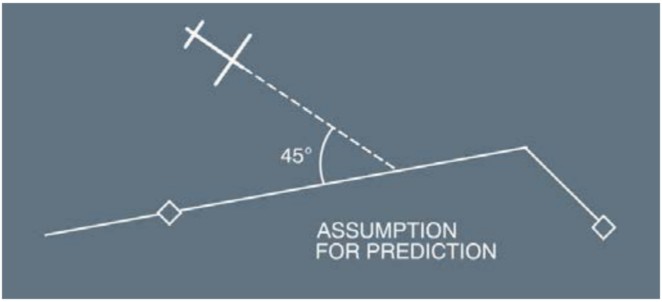
They are based on:
- A default cruise FL equal to 220, if the airway distance is less than 200 NM. Otherwise, it is FL 310
- Simplified wind/temperature models, based on flight crew entries:
  - ALT CRZ wind, as entered on the FUEL PRED page
  - CRZ temperature interpolated from the temperature model for the primary flight plan.
- Airway distance, or direct distance, as provided by the database (manual entry, if not in the database)
- Cost index = 0 (minimum fuel)
- Initial aircraft weight equal to landing weight at primary destination.

Note: *1. No step can be inserted in an alternate flight plan*
2. No predictions are displayed for the selected alternate on flight plan pages. However, the flight crew can read ALTN trip fuel and time on the INIT B page before engine start, and estimated time and estimated fuel on board at alternate on the FUEL PRED page after engine start.

RETURN-TO-TRAJECTORY ASSUMPTIONS

Ident.: DSC-22_20-40-30-00011148.0001001 / 19 DEC 12
Applicable to: ALL

If the aircraft is not on the lateral flight plan, predictions assume an immediate return to the active lateral leg with a 45 ° convergence angle, or that it will fly directly to the “TO” waypoint, when the required convergence angle is greater than 45 °.



ENERGY CIRCLE

Ident.: DSC-22_20-40-30-00011144.0001001 / 17 AUG 10
Applicable to: ALL

The energy circle is a green arc, centered on the aircraft's position and oriented towards the current track line. It is displayed on the ND s during descent, when HDG or TRK mode is selected. It represents the required distance to land from the aircraft's position down to airport elevation at VAPP speed, considering all speed constraints on the vertical profile.

INTRODUCTION TO PERF AND IDLE FACTORS

Ident.: DSC-22_20-40-30-00014856.0001001 / 31 JAN 13
Applicable to: ALL

The FMGS contains a performance database to compute the predictions and the performance data. This performance database has a model of several aircraft configurations (aircraft type/engine model) to tune the performance and the FMGS predictions. For some aircraft configurations, the model can differ from the real aircraft performance. In these cases, the FMGS has to correct the computation of the performance and the predictions. This is the aim of PERF and IDLE factors.
With time, the real aircraft drag and engine performance can deviate from the nominal model.
The airline Flight Operations should periodically revise the value of these factors to adapt FMGS predictions to actual aircraft performance.

Note: *The IDLE factor is not available on aircraft with FMS1 Honeywell Legacy.*

PERF FACTOR

Applicable to: ALL

Ident.: DSC-22_20-40-30-B-00011145.0001001 / 30 JAN 13

GENERAL

The FMGS uses the PERF factor to correct the predicted fuel flow that is used for the computation of the fuel predictions.

The PERF factor modifies the predicted fuel flow, according to the following formula:

$$FFpred = FFmodel \times (1 + \frac{PERF\ FACTOR}{100})$$

FF pred is the FF used for prediction.
FF model is the FF from the aero-engine model.

This correction is applied throughout the entire flight, and modifies the performance predictions and the ECON speed or Mach.
For example: Entering a PERF factor of +1.5 means that Flight Operations have evaluated the aircraft fuel deviation as 1.5 %, compared to the basic performance model (0.0).

PERF FACTOR VALUES

The PERF factors to be used on FMS2, depending on engine type, are:

- For CFM 56-5B engines only:
  Depending on the engine type: CFM 56–5B SAC (Single Annular Chamber) or DAC (Double Annular Chambers), or non/P (without the new LP and HP blade compressor), a positive performance factor has to be entered on the MCDU STATUS page to increase the FMGS' predicted fuel consumption and match the actual fuel burnt.

		NON/P		/P or /3	
		SAC	DAC	SAC	DAC
A321-111	CFM56-5B1	2	2	0	1
A321-112	CFM56-5B2	2	2	0	1
A321-211	CFM56-5B3	2	2	0	1
A321-212	CFM56-5B1	2	2	0	1
A321-213	CFM56-5B2	2	2	0	1
A321-214	CFM56-5B4	-	-	1	-
A320-214	CFM56-5B4	3	3	0	1
A320-215	CFM56-5B5	-	-	0	-
A320-216	CFM56-5B6	-	-	0	-
A319-111	CFM56-5B5	4.5	4.5	0	1
A319-112	CFM56-5B6	4.5	4.5	0	1
A319-115	CFM56-5B7	4.5	4.5	0	1
A318-111	CFM56-5B8	-	-	0	-
A318-112	CFM56-5B9	-	-	0	-

- For other engines:
  - A318 “PW": 0.0 %
  - A319/A320 “CFM” Family fitted with CFM 56-5A engines: 0.0 %
  - A319/A320/A321 “IAE” Family: 0.0 %
  - A320 “PW” Family: 0.0 %
  - A320 “CFM LEAP” Family: 0.0 %

All these numbers assume that:

- The aircraft is brand-new
- Anti-ice is OFF
- The air conditioning is on NORMAL for “IAE” engines and on LOW for “CFM” engines
- The conservative Fuel Lower Heating Value (FLHV) is 18400 btu/lb.

When an aircraft ages, fuel consumption degradation will be measured to determine the so-called “monitored fuel factor”. This factor corresponds to the deviation of the aircraft’s actual fuel consumption from the nominal model. Generally, the FLHV that is used during fuel factor monitoring is higher than the FMS value.
In order not to penalize FMS predictions, it is necessary to correct the “monitored fuel factor”.
For example, add -1 % to the “monitored fuel factor”, when an FLHV of 18590 btu/lb is used.
Once this factor is established by the airline, it should be arithmetically added to the above-noted performance factor.

Note: *1. At delivery, ENTER the PERF factor (given in the table above) directly in the MCDU (no correction factor is needed).*
2. When replacing an FMS 1 Legacy by an FMS 2, on any given aircraft model, the performance model that is stored in the FMS 2 may be different from the one that was previously stored in the FMS1 Legacy.
As a result, DISREGARD the PERF factor previously entered in the MCDU.
ADD the “monitored fuel factor” (when available) to the PERF factor (given above), and ENTER the resulting factor in the MCDU.

IDLE FACTOR

Applicable to: ALL

Ident.: DSC-22_20-40-30-D-00014861.0001001 / 29 SEP 15

GENERAL

The FMGS uses the IDLE factor to adjust the computation of the vertical profile during the descent phase (IDLE segment).

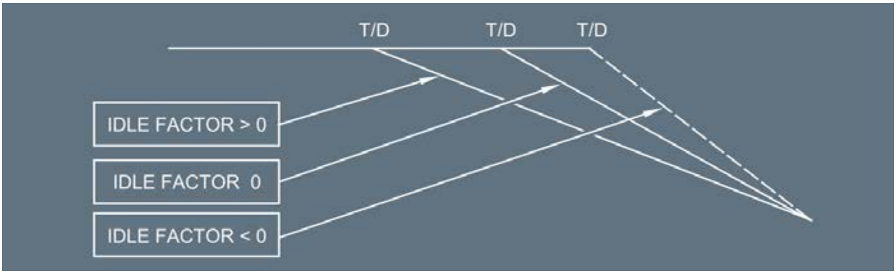
The FMGS computes the vertical profile and the predictions from the Top of Descent (T/D) to the first altitude constraint with the following assumptions:
- The aircraft has a given thrust
- The aircraft has a given speed (within the speed target range).

The IDLE Factor adjusts the value of the given thrust by an addition of a delta (DELTA) thrust to IDLE thrust. With this additional thrust, the IDLE Factor gives flexibility to maintain the aircraft on the computed vertical profile in case of external perturbations such as windy conditions (previously entered by the flight crew in WIND pages).
Depending on the IDLE factor value, the FMGS modifies the position of the T/D and computes a vertical profile in function of the given thrust (IDLE + DELTA).

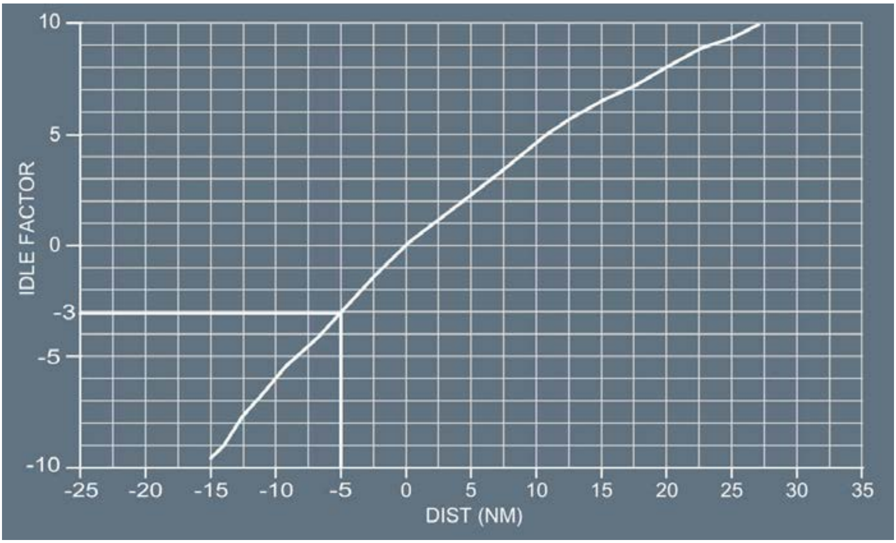
Therefore, the IDLE factor has a direct impact on:
- The computation of vertical profile
- The capability of the aircraft to maintain the vertical profile.

IMPACT ON VERTICAL PROFILE

- If the IDLE factor is positive, the vertical profile is less steep than with IDLE factor 0. The descent phase starts earlier.
- If the IDLE factor is negative, the descent path is steeper than with IDLE factor 0. The descent phase start later.



The following graph provides an example (average values) of the IDLE factor's effect on descent length:

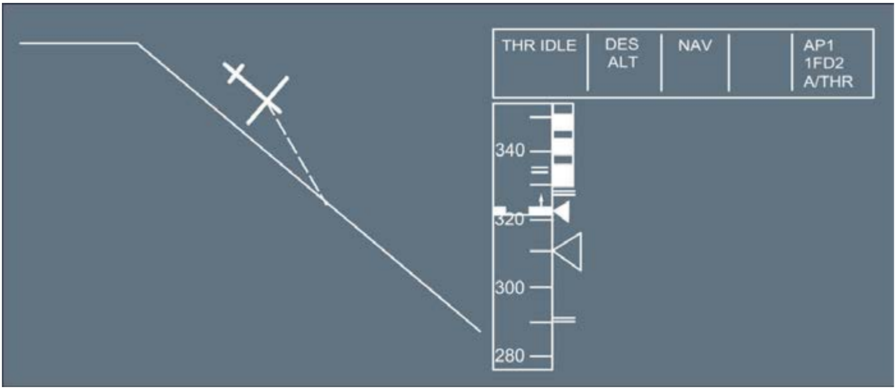


Example: An IDLE factor of -3 decreases the computed descent length by 5 NM.

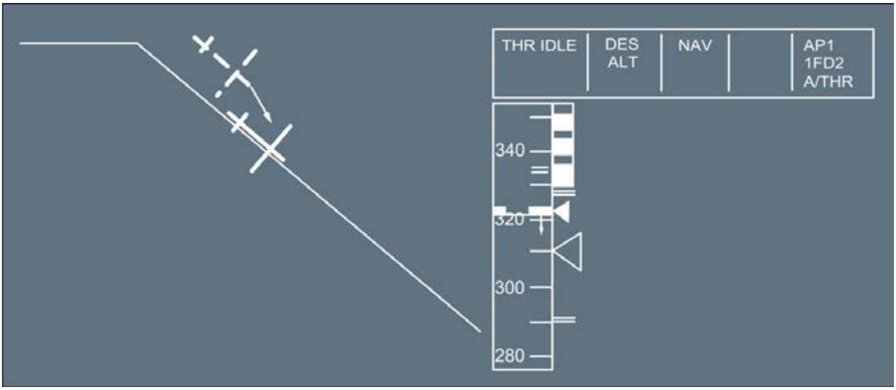
Ident.: DSC-22_20-40-30-D-00014863.0001001 / 30 JAN 13

IMPACT ON GUIDANCE

In DES mode, the FMGS maintains the aircraft on the vertical profile and keeps the IAS within the speed target range.
If the aircraft deviates above the profile, the IAS will increase to return to the vertical profile.



When the aircraft returns to the descent profile, the IAS will decrease to the target speed.



Ident.: DSC-22_20-40-30-D-00014864.0001001 / 30 JAN 13

IDLE FACTOR AT DELIVERY

The IDLE factor to be used at delivery is 0 %.

PROCEDURE TO MODIFY THE PERF AND IDLE FACTORS

Ident.: DSC-22_20-40-30-00014857.0001001 / 30 JAN 13
Applicable to: ALL

PROCEDURE TO MODIFY THE PERF AND IDLE FACTORS (ON GROUND ONLY)

- PRESS the MCDU DATA key and then the A/C STATUS prompt in order to access the A/C STATUS page
- For aircraft with FMS2 Honeywell or Thales:
  - ENTER the change code in the CHG CODE field.
    The default value for this code is “ARM” but it is possible to modify it on airline request.
    The applicable code is then coded in the Airline Modifiable Information (AMI).
    When a valid change code is entered, the IDLE and PERF factors are displayed in blue.
  - ENTER the new IDLE and PERF factors in the MCDU scratchpad separated by a "/".
    For example: "-2/+1"
  - PRESS the corresponding key to insert the new IDLE and PERF factors.

  The new IDLE and PERF factors are displayed in large blue font.

  Note: *Only authorized personnel should take the responsibility to update the IDLE and PERF factor values.*

- For aircraft with FMS1 Honeywell Legacy:
  - ENTER the new PERF factor in the MCDU scratchpad.
  - PRESS the corresponding key to insert the new PERF factor.

  The new PERF factor is displayed in large blue font.

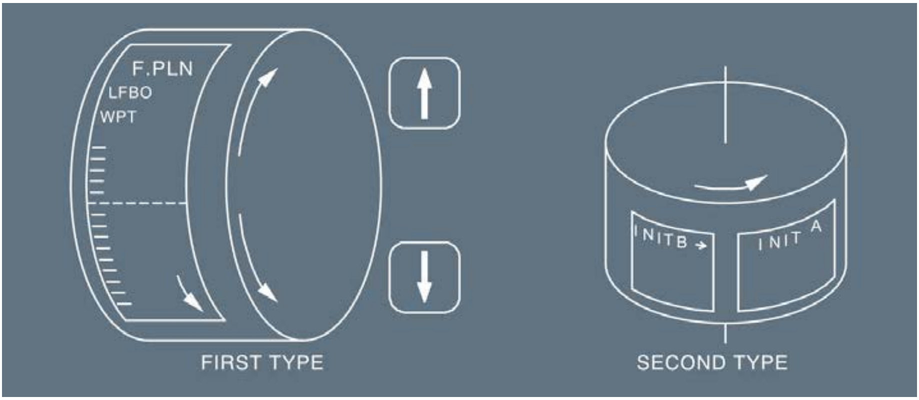
  Note: *1. Only authorized personnel should take the responsibility to update the PERF factor value.*
  2. The IDLE Factor is not available on aircraft with FMS1 Honeywell Legacy.

FMS2 Honeywell

GENERAL

Ident.: DSC-22_20-50-10-25-00000556.0001001 / 01 OCT 12
Applicable to: ALL

The Flight Management and Guidance System (FMGS) displays information on various “pages”. When a page cannot display all of the assigned information, it cues the pilot to call up additional information. There are three types of pages, and each type has its particular way of cuing the pilot to call up additional information.



FIRST TYPE

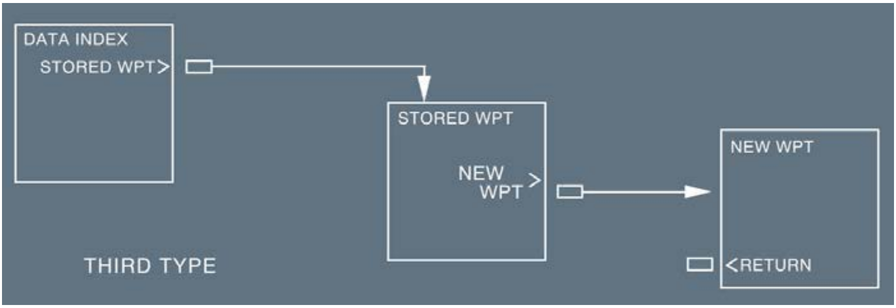
When this page cannot simultaneously display all the information on the screen (more information than the six pairs of lines can hold), the pilot can scroll the page up or down.
In this case, the screen displays a ↑ ↓ symbol in the bottom righthand corner (F-PLN pages, secondary F-PLN page, departure/arrival pages,...).

SECOND TYPE

When the information is on successive pages, the pilot presses the “NEXT PAGE” key to sequentially call up these pages.
In this case, an arrow is displayed in the top righthand corner of the screen (INIT pages).

THIRD TYPE

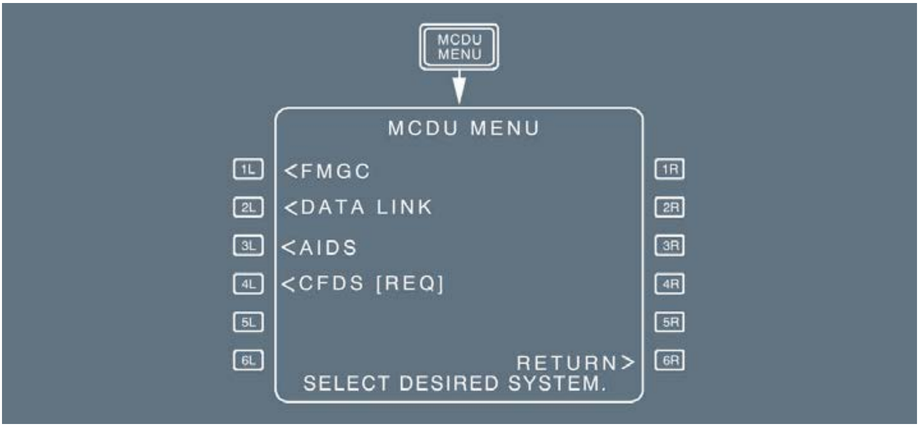
When different types of information are on successive pages, the pilot calls up these pages by pressing the key adjacent to the prompts >, < or *.



MCDU MENU PAGE

Ident.: DSC-22_20-50-10-25-00000557.0001001 / 14 MAY 12
Applicable to: ALL

This page lists the various systems which the pilot can access via the MCDU.



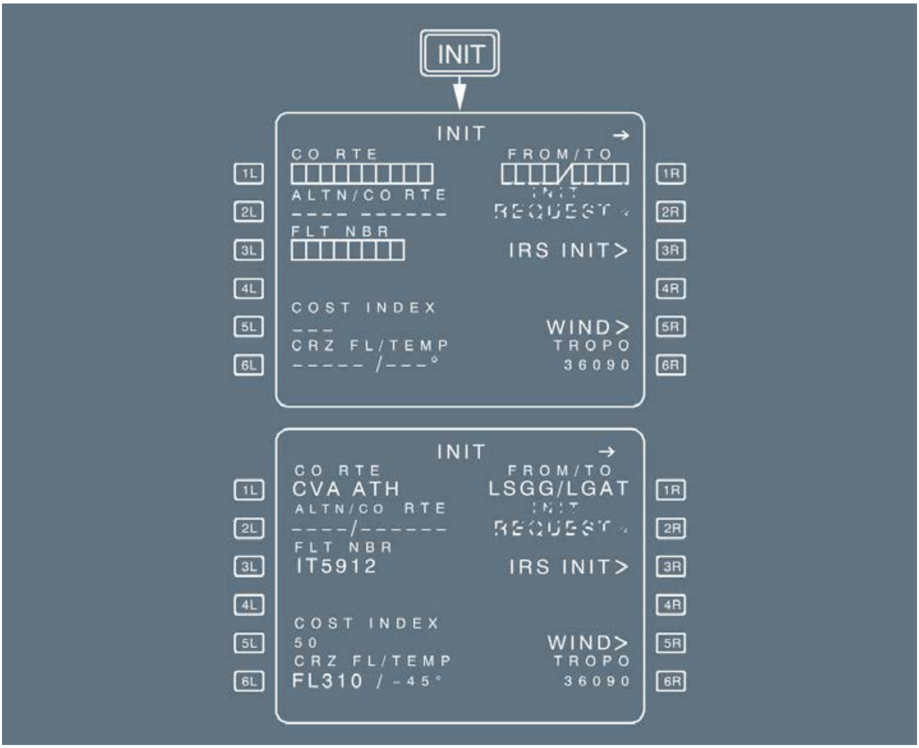
The pilot selects a system by pressing the key adjacent to the name of that system. The name of the selected system is displayed in green, all others in white.
If the MCDU cannot establish communication with the selected system, it displays “OUT”.
When a system calls for the pilot's attention, the MCDU displays “REQ” next to the system's name, and the “MCDU MENU” annunciator lights up.
When the pilot presses the key next to the name of the system requiring attention, the “MCDU MENU” annunciator light goes out.

INIT A PAGE

Ident.: DSC-22_20-50-10-25-00000558.0009001 / 14 MAY 12
Applicable to: ALL

The flight crew uses the INIT A page to initialize the flight plan and align the inertial reference system.

- The flight crew accesses to this page by pressing the INIT key on the MCDU . The INIT A page can be accessed on ground or in flight.
- The flight crew may also call up this page by:
  - Pressing the “NEXT PAGE” key on the MCDU console, while on the INIT B page, or
  - Pressing the key next to “RETURN” or “INSERT” on the route selection page, or
  - Pressing the key next to “INSERT” on the wind page.
- When in the done phase, the pilot may press the INIT key to switch to the next preflight phase.



[1L] CO RTE	If the flight crew enters a company route number, the screen displays all data associated with that route (8 or 10 characters, depending on the pin program). Inserting the CO RTE into the RTE selection page also enters the CO RTE number in this field.
[2L] ALTN/CO RTE (blue)	This field is dashed, until a primary destination is entered in the 1R field. If a preferred alternate is associated with the primary destination, it is displayed in this field with the company route identification. The crew may manually enter an alternate and company route. If preferred alternate is not associated with the primary destination, NONE is displayed in this field. When the alternate route and the primary destination do not match, the MCDU scratchpad displays “DEST /ALTN MISMATCH”. If the primary destination is changed, this field is modified accordingly.
[3L] FLIGHT NUMBER	The flight number automatically appears in this field, if it is stored with the company route. The flight crew may modify it, or enter a new number here.
[5L] COST INDEX	This is usually stored in the database along with the company route. The flight crew may modify it, or enter a new value here. It defaults to the last entered value, if a value is not stored in the database.
[6L] CRZ FL/TEMP (cruise flight level and temperature)	The cruise flight level is usually stored in the database along with the company route. If not, it has to be entered manually. If no cruise flight level is entered, the system will not furnish predictions, while the aircraft is on the ground. The flight crew has to enter the temperature at cruise flight level in order to refine the predictions. Otherwise, these are computed for ISA conditions. (If no sign is entered, the system uses a plus).
[1R] FROM/TO	This field allows the pilot to enter a city pair (ICAO codes for city of origin and destination). This entry automatically deletes any previously entered company route and calls up the route selection page. If one airfield of the pair is not in the database, the display changes to the NEW RWY page.

[2R] INIT REQUEST	This prompt is displayed if the pilot did not enter an active flight plan or entered a flight number or a company route that is not in the aircraft database. Selecting this prompt sends the ground a request for active flight plan initialization (downlink message). When the star is not displayed, a downlink message cannot be sent. The uplink flight plan is automatically inserted in the active flight plan, prior to engine start, provided an active flight plan does not exist. After engine start, the uplink flight plan is sent to the secondary flight plan and manually inserted or rejected. (*Refer to DSC-22_20-70 Flight Plan Initialization Through ACARS*).
[3R] IRS INIT	The flight crew presses this key to access the IRS INIT page.
[5R] WIND	The pilot presses this key in order to gain access to the climb wind page, unless a temporary flight plan exists. In this case, the scratchpad displays TEMPORARY F-PLN EXISTS.
[6R] TROPO	The default tropopause altitude is 36 090 ft. The pilot can use this field to modify it (60 000 ft maximum).

ROUTE SELECTION PAGE

Ident.: DSC-22_20-50-10-25-00000559.0001001 / 17 MAR 11
Applicable to: ALL

This page displays all the company routes, stored in the database, that are associated with the inserted city pair. They can be called up manually, or displayed automatically.

- Manually : The pilot presses the FROM/TO or ALTN key on the INIT A page when a city pair is displayed.
- Automatically : The system displays it, when the pilot enters a city pair, or defines an alternate on the INIT A page of the active or secondary flight plan.

TITLE	Idents for the city pair inserted on the INIT A page. (The numbers in the upper righthand corner are the total number of company routes from this city pair stored in the database).
[1L]	This field shows the name of the company route. NONE appears, if there is no company route for this city pair.
Line 2 to Line 5	These fields display the various elements of the company route: Waypoints in large green font, and airways in small white font.
[6L] RETURN	The pilot presses this key to return to the INIT A page.
[6R] INSERT	The pilot presses this key to insert the displayed company route in the flight plan, and return to the INIT A page.

Note: The pilot can slew the display to show the rest of the route, if one page does not show it all, or to display other company routes for this city pair.

IRS INIT PAGE

Ident.: DSC-22_20-50-10-25-00013511.0051001 / 14 MAY 12
Applicable to: ALL

The flight crew uses the IRS INIT page to align the inertial reference system. The crew accesses this page, by pressing the IRS INIT key on the INIT A page.

Line 1 LAT-REFERENCE-LONG	This line provides the latitude and longitude of the FM reference position. This reference is extracted from the navigation database. The flight crew can modify this reference. Only when the FM reference position matches the origin airport position, the airport identifier is displayed in green. Otherwise, there are dashes at the place of the airport identifier. Latitude and longitude of the FM reference position are displayed in blue. The flight crew can modify the latitude and longitude values using the scroll keys.
Line 2 LAT-GPS POSITION-LONG	This line displays the GPS position latitude and longitude.
Line 3 to 5	These lines display the IRS 1-2-3 alignment state, source and latitude/longitude. The alignment status can be ALIGNING ON XXX, or ALIGNED ON XXX or IN ATT . XXX is the alignment source and can be GPS or CDU or REF. It is displayed in white font. The latitude and longitude values are displayed in green.
[6L] RETURN	This prompt enables the flight crew to return to the INIT A page.
[6R]	If a reference is available, field displays ALIGN ON REF → in blue which is replaced by CONFIRM ALIGN* in amber when 6R prompt is pressed. Pressing again the 6R prompt enables the transmission of the FM reference position displayed in line 1.

WIND PAGES

Ident.: DSC-22_20-50-10-25-00000560.0009001 / 17 MAR 11
Applicable to: ALL

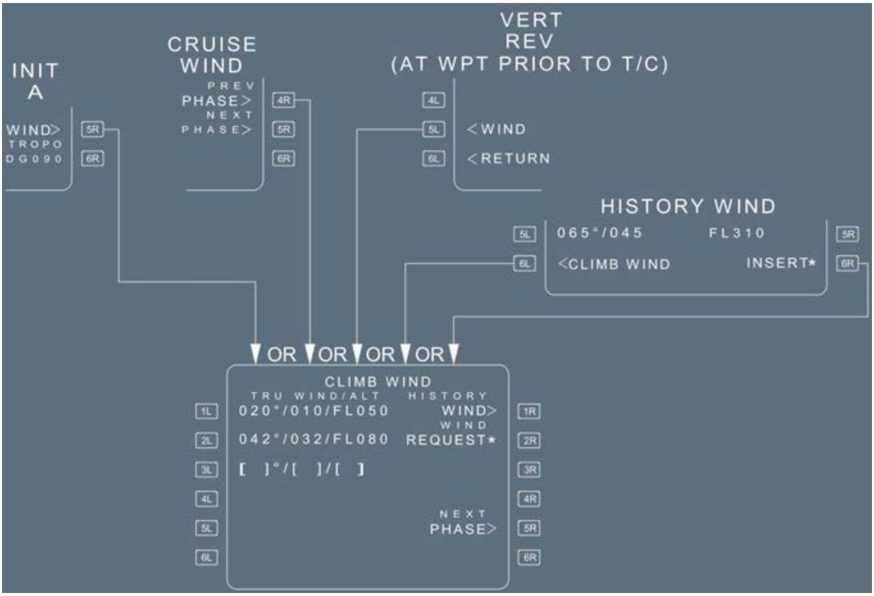
Winds in climb, cruise, descent and approach are necessary to provide the pilot with reliable predictions and performance. Wind pages enable the pilot to enter and/or review the winds propagated by the FMGS or sent by ACARS for the various flight phases.

Note: On WIND pages, wind direction is always true-referenced.

CLIMB WIND PAGE

This page enables the pilot to enter and/or review predicted wind vectors (direction and velocity) at up to 5 different levels.

THE CLIMB WIND PAGE IS ACCESSED FROM:



TITLE	CLIMB WIND in large white font.

[1L] to [5L] TRU WIND/ALT	This field displays the winds, entered at various climb altitudes : In blue before climb phase activation, and in green after climb phase activation. This field may also display history winds or uplink winds. Large blue brackets are displayed before any wind entry. Pilot-entered and uplinked winds are displayed in large font. History wind data is displayed in small font. Upon sequencing the top of climb, the climb winds are deleted. *Note:* *Climb winds are not deleted, when the origin airport is changed.*
[1R] HISTORY WIND	Displayed in preflight phase only. This key calls up the history wind page. This page is not modifiable (small green font), but can be inserted into the CLIMB WIND page by using the 6R key and modified accordingly.
[2R] WIND REQUEST	Pressing this key sends a request for ACARS winds. (*Refer to DSC-22_20-70 Wind Data - Request for Wind Data*).
[5R] NEXT PHASE	Pressing this key calls up the CRUISE WIND page, or the DESCENT WIND page, if no cruise waypoint exists.

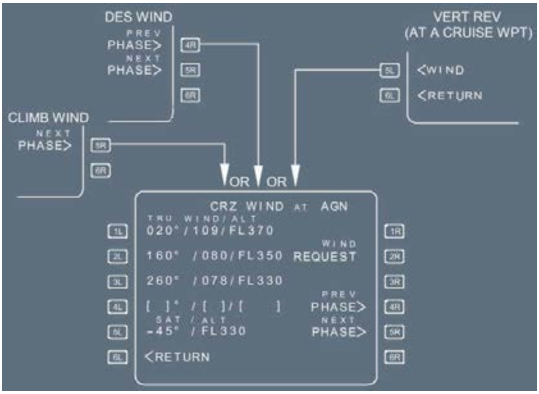
HISTORY WIND PAGE

[6L] CLIMB WIND	This key reverts the display to the CLIMB WIND page.
[6R] INSERT	This key inserts the history wind values into the CLIMB WIND page.

CRZ WIND PAGE

This page displays the wind direction and velocity for each cruise waypoint.

The cruise wind page enables the definition of a temperature at a given altitude, and is accessed as follows:



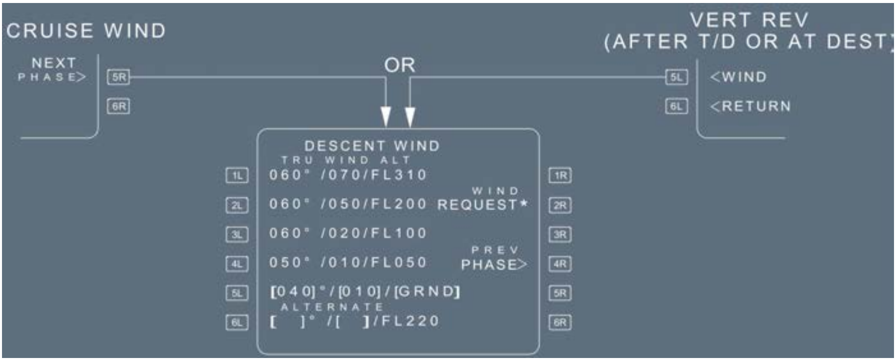
TITLE	CRZ WIND AT in large white font.
[1L] to [4L] TRU WIND/ALT	These fields display the entered wind at various altitudes in blue. The entered winds are propagated at the same altitude to the downpath cruise waypoints, if no other winds are entered. The propagated wind direction and velocity are displayed in small fonts. Both uplinked winds and pilot-entered winds are displayed in large blue font. Wind data is modifiable during cruise.
[5L] SAT/ALT	This field allows the pilot to enter a temperature at a given flight level, or to display a propagated value. The crew must enter both temperature and altitude at the first entry. They can then independently modify the temperature, or the altitude.
[2R] WIND REQUEST	Pressing this key sends a request for ACARS winds. (*Refer to DSC-22_20-70 Wind Data - Request for Wind Data*)
[4R] PREV PHASE	This prompt is displayed in Preflight, Takeoff, Climb and Done phases. Pressing this prompt calls up the CLIMB WIND page.
[5R] NEXT PHASE	Pressing this prompt calls up the DES WIND page.

Any new entry performed on the CRZ WIND page is immediately inserted into the corresponding flight plan. Predictions are dashed on the F-PLN pages during the recomputation time. CRZ WIND page automatically reverts to F-PLN page, if a temporary flight plan is created or the secondary flight plan is activated.

DESCENT WIND PAGE

This page enables the pilot to define and display the winds used for computing the descent profile.

The pilot calls it up by selecting NEXT PHASE on the CRUISE WIND page, or the WIND prompt on the VERT REV page.



[1L] to [5L]	This displays inserted winds or uplinked winds, in large blue fonts, prior to activating the descent phase (modifiable values), and in green after descent phase activation (not modifiable values). An entry of “GRND ” in the “ALT ” field is seen as the wind at ground level. This wind is copied on the PERF APPR page (and corrected for the magnetic variation). A clear action on one key reverts the line to blue brackets.
[6L] ALTERNATE	This field is only displayed when an alternate is defined. The pilot-entered value or uplinked value is displayed in large blue font. It is always modifiable by the pilot.
[2R] WIND REQUEST*	Pressing this key sends a request for ACARS winds. (*Refer to DSC-22_20-70 Wind Data - Request for Wind Data*).
[4R] PREV PHASE	Pressing this key calls up the CRUISE WIND page. The field is erased after the top of descent has sequenced.

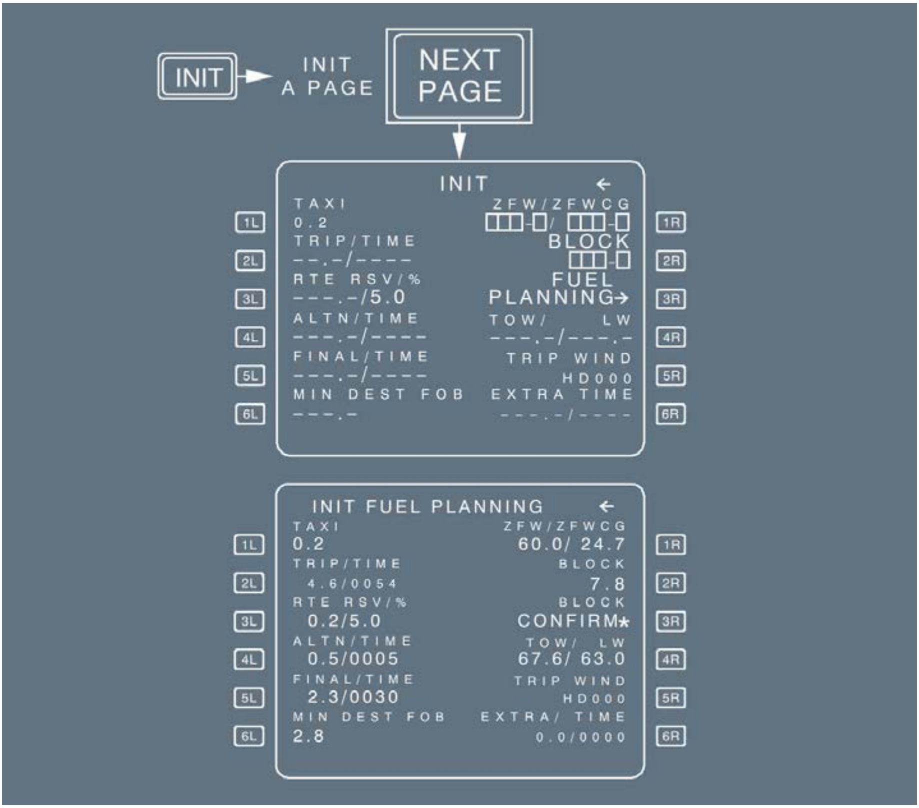
Note: Descent winds and alternate wind are deleted, if the destination airport is changed.

INIT B PAGE

Ident.: DSC-22_20-50-10-25-00000561.0009001 / 14 MAY 12
Applicable to: ALL

The pilot uses this page to initialize the gross weight and center of gravity, before starting the engines.
The pilot can call it up from the INIT A page during preflight phase prior to engine start, by pressing the NEXT PAGE key on the MCDU console, as long as engines have not been started.

This page automatically reverts to the FUEL PRED page after the first engine is started.
The FMGC will stop using the pilot-entered block fuel and will compute its predictions based on the FOB indicated by the FQI computer (or the FAC as a back up) from that moment on.



[1L] TAXI	This is the taxi fuel, which defaults to a preset value, (usually 200 kg or 400 lb in the AMI file). The crew can change the value through this field.
[2L] TRIP/TIME (green)	This field displays trip fuel and time when predictions become available. The pilot cannot modify this data.
[3L] RTE RSV/% (blue)	This field displays the contingency fuel for the route and the corresponding percentage of trip fuel. It may be equal to 0.0, if such is the policy of the operator. The flight crew can either enter a fuel quantity, or a percentage.

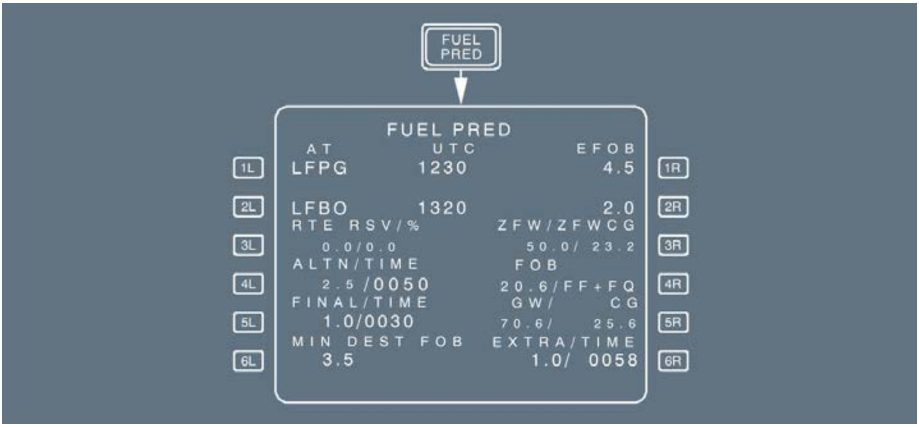
[4L] ALTN/TIME (blue/green)	Displays alternate trip fuel and time, assuming that the Cost Index = 0 and that the aircraft flies at the default cruise flight level. (*Refer to DSC-22_20-30-10-15 Alternate Function - Review and Selection of Alternate Airport*). The flight crew can modify the alternate fuel as required. In this case, alternate time will be dashed.
[5L] FINAL/TIME (blue)	Displays the final reserve fuel and time calculated at the alternate airport (or destination airport, if selected in the “airline fuel policy” section of the AMI). Before any crew entry, the FINAL field is dashed and FINAL TIME field is defaulted to the value specified in the AMI file (typically 30 min). The flight crew may enter a final fuel or time, and the system will compute associated holding time/fuel available. The system assumes a holding pattern at 1 500 ft AGL , with the aircraft in CONF 1 at maximum endurance speed (racetrack pattern, altitude and selected airport can be modified through the “airline fuel policy” section of the AMI).
[6L] MIN DEST FOB (blue)	Displays the expected minimum fuel at destination. It is equal by default to the ALTN + FINAL fuel. This field can be modified directly by the flight crew, and is also impacted by the modification of ALTN and/or FINAL fuel. <u>Note:</u> *If pilot entry of MIN DEST FOB is lower than ALTN + FINAL fuel, the message “CHECK MIN DEST FOB” is triggered on the MCDU.*
[1R] ZFW/ZFWCG (blue)	Displays the Zero Fuel Weight (ZFW) and Zero Fuel Weight CG (ZFWCG). The flight crew must enter the ZFW /ZFWCG values (as appropriate) to obtain a speed profile and predictions. <u>Note:</u> *If the flight crew enters a ZFW value that exceeds the acceptable range (as defined in the OPC or in the performance database), the “ENTRY OUT OF RANGE” message appears and the value is rejected.*
[2R] BLOCK	The block fuel in this field is a mandatory entry. When the flight crew enters a block fuel, the page title changes to INIT FUEL PREDICTION.

[3R] FUEL PLANNING (amber)	Initiates an FMGC block fuel computation using current hypothesis and extra = 0. When the pilot selects this function, FUEL PLANNING becomes green, and the BLOCK field is dashed during FMGC computation. The title of the page changes to INIT FUEL PLANNING, and BLOCK CONFIRM* replaces the FUEL PLANNING prompt, when the block fuel is computed by the FMGC. If the pilot modifies the parameters used to compute prediction before confirmation, the computation automatically restarts and FUEL PLANNING is displayed in green.
[4R] TOW/LW (green)	Displays the computed Takeoff Weight (TOW) and Landing Weight (LW) at the primary destination. This cannot be modified.
[5R] TRIP WIND (blue)	This field allows the entry of a mean wind component for the trip from the origin to the destination. Upon entry of a CO RTE or FROM/TO pair, this field defaults to HD 000 in small font. An entry preceeded by –, H, HD is considered to be headwind, +, T, TL to be tailwind. The entered speed is displayed in large blue font. When the flight crew inserts a wind on the CLIMB, CRUISE or DESCENT WIND page, or on the PERF APP page, the system no longer considers the trip wind, and the corresponding field is dashed.
[6R] EXTRA/TIME (green)	Displays the amount of extra fuel, and the resulting time available for holding over the primary destination. EXTRA FUEL = BLOCK – (TAXI + TRIP + RSV + MIN DEST FOB). The field displays its information in small font, and it cannot be modified by the flight crew.

FUEL PREDICTION PAGE

Ident.: DSC-22_20-50-10-25-00000562.0009001 / 14 MAY 12
Applicable to: ALL

The pilot presses the FUEL PRED key on the MCDU console to display fuel prediction information at destination and alternate, as well as fuel management data after the engines are started.



[1L] - [1R] AT-UTC/TIME-EFOB (green)	Display time and fuel predictions to the primary destination. TIME is displayed before takeoff. UTC predictions are displayed after takeoff. If the flight crew has entered an Estimated Takeoff Time (ETT), the UTC is displayed. The EFOB at destination will turn to amber, if it becomes less than the MIN DEST FOB value.
[2L] - [2R] AT-UTC/TIME-EFOB (green)	These lines display time and fuel predictions to the alternate airport. (*Refer to DSC-22_20-30-10-15 Alternate Function - General*).
[3L] RTE RSV% (blue)	Before departure, this field displays the route reserve fuel and the corresponding percentage of trip fuel. It may be equal to 0.0, if such is the policy of the operator. The crew can either enter a fuel quantity or a percentage. After takeoff, it becomes green 0.0/0.0, and the corresponding fuel is added to the EXTRA fuel.
[4L] ALTN/TIME (blue/green)	Displays alternate trip fuel and time, assuming that the Cost Index = 0 and that the aircraft flies at the default cruise flight level. (*Refer to DSC-22_20-30-10-15 Alternate Function - Review and Selection of Alternate Airport*). The flight crew can modify the alternate fuel as required. In this case, alternate time will be dashed.

[5L] FINAL/TIME (blue)	Displays the final reserve fuel and time calculated at the alternate airport (or destination airport, if selected in the “airline fuel policy” section of the AMI). The flight crew may enter a final fuel or time, and the system will compute associated holding time/fuel available. The system assumes a holding pattern at 1 500 ft AGL , with the aircraft in CONF 1 at maximum endurance speed (racetrack pattern, altitude and selected airport can be modified through the “airline fuel policy” section of the AMI).
[6L] MIN DEST FOB (blue)	Displays the expected Minimum Fuel at Destination. It is equal to the FINAL + ALTN fuel. The field can be modified directly by the flight crew, and is also impacted by the modification of the ALTN and/or the FINAL fuel.
[3R] ZFW/ZFWCG (blue)	Displays the Zero Fuel Weight (ZFW) and Zero Fuel Weight Center of Gravity (ZFWCG) values, as entered before engine start on the INIT B page. The flight crew can re-enter or modify these values after engine start on the FUEL PRED page. If at engine start, no ZFW or ZFWCG values have been entered, amber boxes are displayed in the corresponding field. The flight crew must enter the ZFW /ZFWCG values to obtain a speed profile and predictions.
[4R] FOB (blue)	Displays the Fuel On Board (FOB) calculated by the FMGS and the following fuel sensors: - Fuel flow and fuel quantity sensors (/FF+FQ) - Fuel flow sensors only (/FF). - Fuel quantity sensors only (/FQ). The flight crew can modify the FOB value in flight, or modify the sensors used by entering “/FF ”, “/FQ” or “/FF+FQ”, as required.
[5R] GW/CG (green)	The FMS continuously updates the GrossWeight (GW) and Center of Gravity (CG) during the flight. The field displays dashes, as long as the system is not calculating the Fuel On Board, or the ZFW has not been entered by the flight crew. The field cannot be modified.
[6R] EXTRA/TIME (green)	Displays the amount of extra fuel, and the resulting time available for holding over the primary destination. EXTRA FUEL = FOB – (TAXI + TRIP + RSV + MIN DEST FOB). This field displays its information in small green font, and it cannot be modified by the flight crew.

Note: All fields are dashed before engines are started.

FLIGHT PLAN PAGES

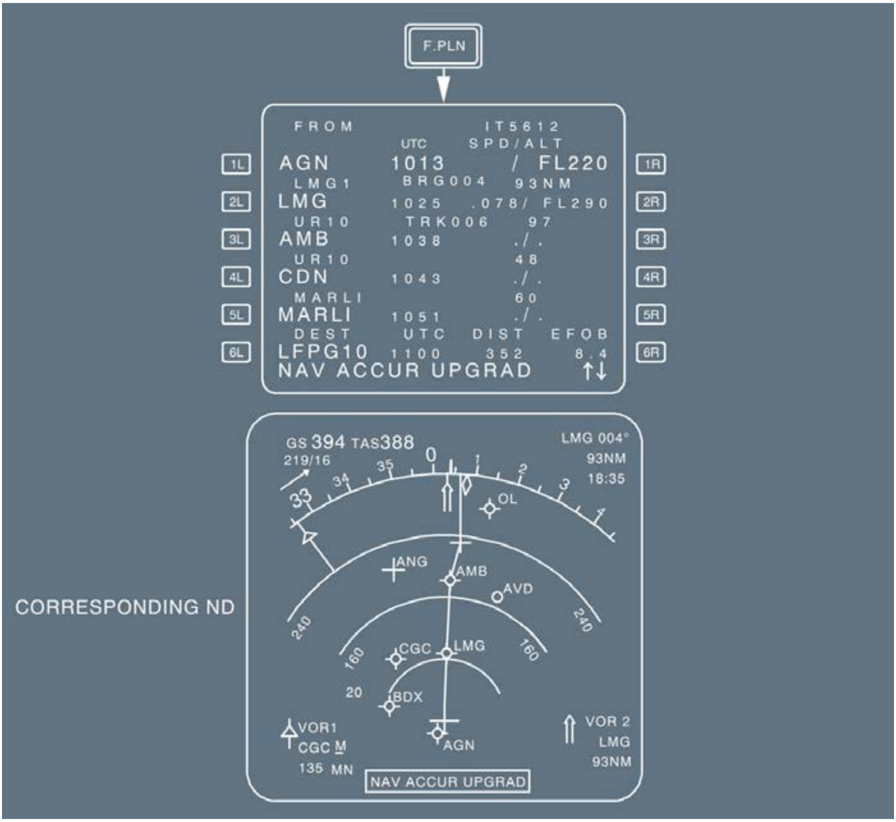
Ident.: DSC-22_20-50-10-25-00000563.0009001 / 23 JUN 15
Applicable to: ALL

These pages display all waypoints of the active and alternate flight plans, along with associated predictions.

The pilot can make all revisions to the lateral and vertical flight plans from these pages:
- He presses the left key to revise the lateral flight plan, and the right key to revise the vertical flight plan.
- He presses the F-PLN key on the MCDU console to access the page A of the active flight plan.

FLIGHT PLAN A PAGE

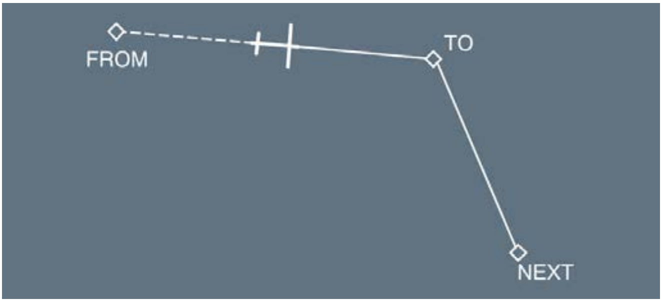
Page A displays time, speed, and altitude predictions for each waypoint of the active flight plan.



TITLE	FLIGHT NUMBER (blank, if no flight number has been entered). This line may display: TMPY in yellow if a temporary flight plan exists; OFST in white, if a lateral offset is flown; or, OFST in yellow, if a lateral offset revision is pending.
Line 1 to Line 5 WPT, UTC, SPD, ALT	These lines display consecutive waypoints along with associated predictions of time, speed or Mach and altitude for each. TIME is displayed before takeoff, and UTC after takeoff. After the pilot enters an estimated takeoff time (ETT), UTC is displayed. The time and flight level display at the FROM waypoint (first line of the flight plan) are values that the system memorized at waypoint sequencing.

[1R] SPD/ALT	The field dedicated to SPEED or MACH is blank at the FROM waypoint, except at the departure airport. (V1 associated with runway elevation, is displayed). *Note:* *When the HOLD marker is slewed, the HOLD SPD Label will overwrite the TIME/UTC title.*
Line 6, DEST UTC/TIME DIST, EFOB	DIST is the distance to destination along the displayed flight plan. EFOB is the estimated fuel on board at destination. The EFOB at destination will turn to amber, if it becomes less than the MIN DEST FOB value. The sixth line is permanent and is displayed in white font once predictions are available, except when a TMPY F-PLN is displayed or in some cases when an ALT CSTR is entered ("*CLB or DES*" prompt appears).

Note: *The predicted altitude at a waypoint is related to the QNH below the transition altitude, and is given as a flight level above the transition altitude.*



The generic flight plan page displays the FROM waypoint (last waypoint to be overflown) on the first line, and the TO waypoint (in white) on the second line. The FROM/TO flight plan leg is called the active leg.
The flight crew can use the scroll keys to review all flight plan legs down to the last point of the alternate flight plan. The AIRPORT key serves as a fast slew key. The pilot can press it to call up the next airport (DEST , ALTN, ORIGIN) to be displayed on the flight plan page.
In order to return to the beginning of the flight plan page, the pilot presses the F-PLN key on the MCDU console.
The display shows the name of the leg between two waypoints, and the distance between them on a line between the lines that identify them. During an approach, this in-between line also defines the angle of the final descent path. For example, "2-3 °" indicates that the leg is two nautical miles long, and the flight path angle is -3 °.

The display shows the bearing between FROM and TO waypoints as the bearing from the aircraft position to the TO waypoint. It shows track (TRK) between the waypoints shown in lines 2 and 3. This is the outbound track of the next leg.
If the database contains a published missed approach procedure, or if someone has inserted one manually, the display shows it in blue after the destination runway identification. It turns green when the go-around phase becomes active.
After the last waypoint of the missed approach, the display shows the alternate flight plan in NAV mode.
When NAV mode is engaged, the flight crew can only clear or modify the TO waypoint by using the DIR key on the MCDU console.

PREDICTIONS

The system calculates and displays predictions for all waypoints.
It uses the current wind to compute TO waypoint predictions, and uses predicted winds to compute all others.

CONSTRAINTS

The database may define an altitude and speed constraint for each waypoint of the climb, descent, and approach phases, or the pilot may manually insert such constraints (except at origin, destination, FROM, and pseudo-waypoints).
The constraints are displayed in magenta, as long as predictions are not completed.
Once predictions are available, constraints are replaced by speed and altitude predictions, preceded by stars. If the star is in magenta, the system predicts that the aircraft will match the constraint (altitude within 250 ft, speed not more than 10 kt above the constraints). If the star is in amber, the system predicts that the aircraft will miss the constraint and the MCDU displays: “SPD ERROR AT WPT”.

Note: *SPD and ALT CSTR may either be entered on the VERT REV page or directly on the F-PLN A page, whereas TIME CSTR may only be entered from the RTA page.*

PSEUDO-WAYPOINTS

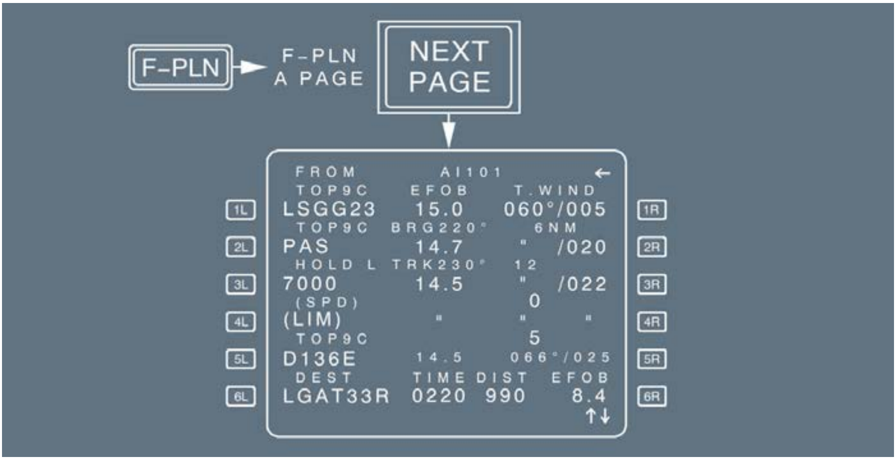
Pseudo-waypoints are geographical positions corresponding to an event in the vertical flight plan: T/C (top of climb), T/D (top of descent), SPD /LIM (speed limit), DECEL (deceleration for approach), etc. The display shows them as waypoints in parentheses.

APPROACH DISPLAY

The flight crew cannot enter an altitude constraint at destination or Missed Approach Point (MAP).

FLIGHT PLAN B PAGE

This page displays fuel predictions and forecast winds at each waypoint.
The pilot calls it up by pressing the NEXT PAGE key when the FLIGHT PLAN A page is displayed.



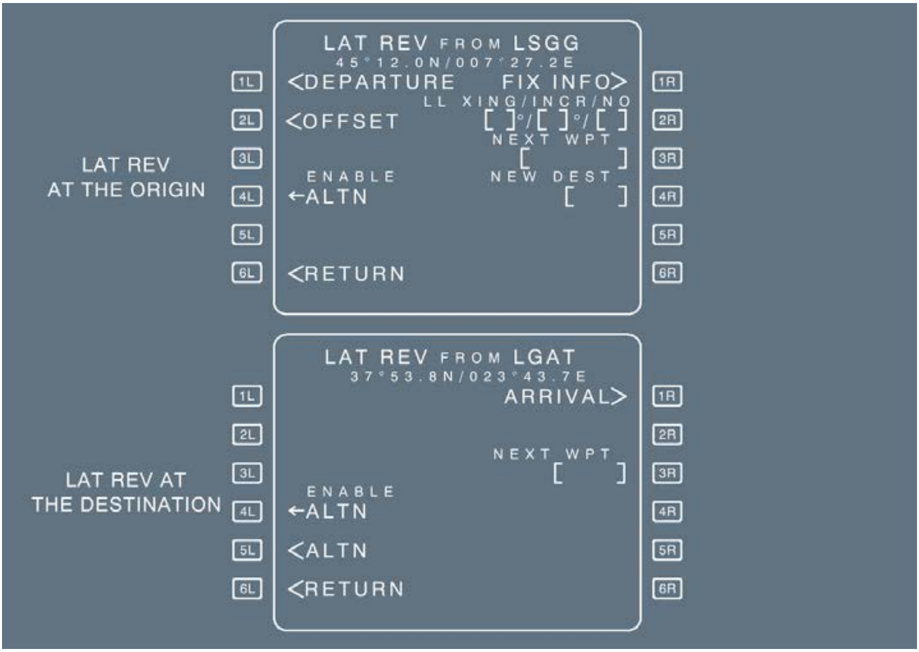
TITLE	FLIGHT NUMBER (blank if no flight number has been entered).

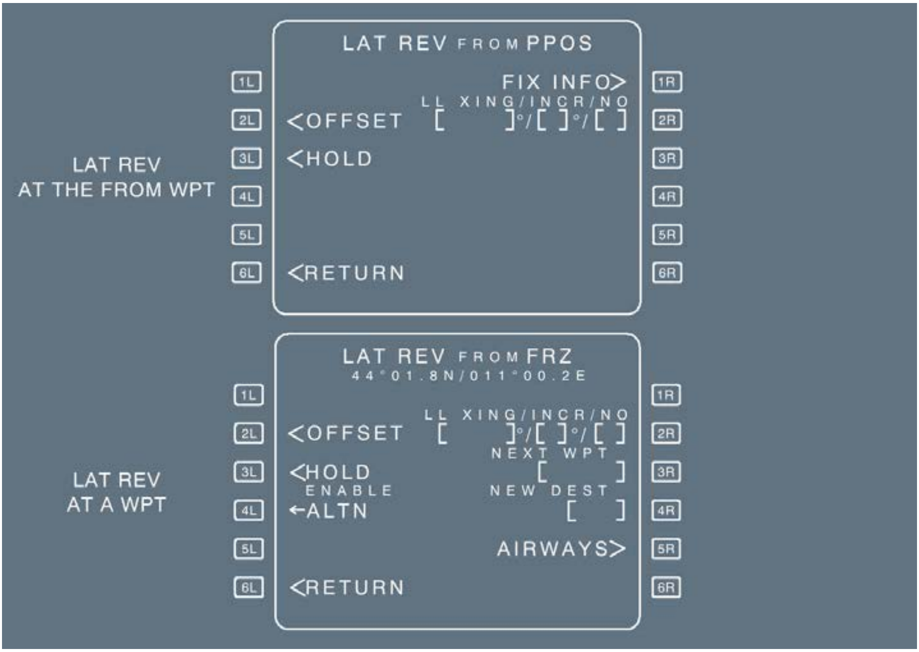
Line 1 to Line 5 WPT-EFOB-WIND	These lines display consecutive waypoints and associated fuel predictions, and the forecast wind profile. The direction of forecast winds is relative to true north. Forecast winds include winds entered by the pilot (large font) and the propagated winds at intermediate waypoints (small font). If the flight crew uses a trip wind, it will be displayed for each waypoint. If no other wind entry is made after takeoff, the FROM waypoint will display the actually recorded wind, and the waypoints downpath will still display the trip wind.
Line 6 DEST-UTC/DIST-EFOB	Identical to F-PLN A page.

LATERAL REVISION PAGES

Ident.: DSC-22_20-50-10-25-00000564.0009001 / 01 OCT 12
Applicable to: ALL

These pages give the pilot a list of the lateral flight plan revisions, which can be used to change the flight plan beyond a selected waypoint.
The pilot calls up these pages from the flight plan pages (A or B) by pressing the left key adjacent to the selected waypoint.
Different lateral flight plan revisions are available for different waypoints.


LAT REV FROM LSGG
45°12.0N/007°27.2E
<DEPARTURE
FIX INFO>
LL XING/INCR/NO
<OFFSET
[ ]°/[ ]°/[ ]
NEXT WPT
[ ]
LAT REV
AT THE ORIGIN
ENABLE
←ALTN
NEW DEST
[ ]
<RETURN
LAT REV FROM LGAT
37°53.8N/023°43.7E
ARRIVAL>
NEXT WPT
[ ]
LAT REV AT
THE DESTINATION
ENABLE
←ALTN
<ALTN
<RETURN

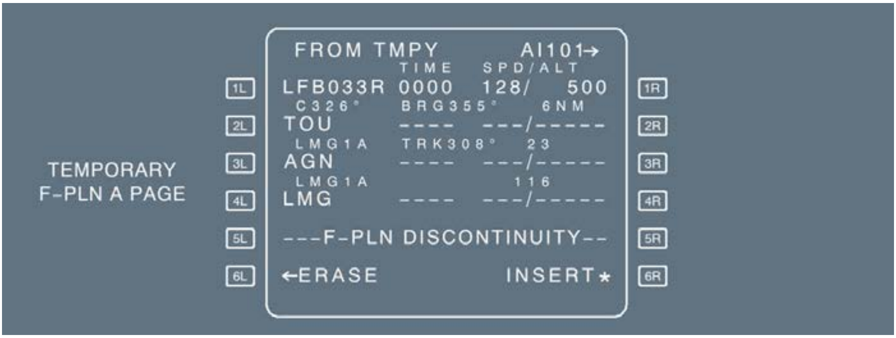


TITLE	The ident of the waypoint or airport selected for revision, along with its latitude and longitude. If the selected waypoint is the FROM waypoint, the title omits the aircraft latitude and longitude, and displays the "PPOS" (present position) instead.
[1L] DEPARTURE	This prompt gives the pilot access to the departure pages, where he can select and insert runways, SID s, and TRANSs.
[2L] OFFSET	This prompt gives the flight crew access to the OFFSET page.
[3L] HOLD	This prompt gives access to the hold pages.
[4L] ENABLE ALTN	This prompt allows the pilot to switch to the alternate flight plan at the selected revision waypoint, and use it as a new active flight plan. The system never displays this prompt at the FROM waypoint.
[5L] ALTN	This prompt gives access to the alternate airport page. The system displays it only at the destination.
[6L] RETURN	This prompt returns the display to the flight plan page.
[1R] ARRIVAL	This prompt calls up the arrival pages, where RWY , APPR, STAR TRANS and VIA can be selected and inserted.

[1R] FIX INFO	FIX INFO is only displayed on the lateral revision page at the origin or FROM waypoint. It gives access to the FIX INFO page.
[2R] LLXING/INCR/NO	This prompt allows the pilot to create the latitude/longitude crossing point. The increment (INCR) ranges from 1 to 20 °, and the number of crossing points from 1 to 99. This prompt is not displayed for waypoints belonging to the descent procedure.
[3R] NEXT WPT	The pilot uses this prompt to enter the next waypoint. If this waypoint is a latitude/longitude, or is neither in the database nor in the pilot-defined elements, the display reverts to the NEW WAYPOINT PAGE.
[4R] NEW DEST	The pilot uses this prompt to enter a new destination.
[5R] AIRWAYS	The pilot uses this prompt to access the AIRWAYS page.
[6R] INSERT	This prompt is displayed when the pilot has created a temporary flight plan. It can be used to activate the temporary flight plan.

TEMPORARY REVISION

When the pilot selects a lateral revision, the system creates a “Temporary F-PLN ” and displays it in yellow on the MCDU , and as a dashed yellow line on the ND, enabling the pilot to review the data before inserting it. As long as the temporary flight plan is not inserted, the previous flight plan remains active and the system guides the aircraft along it.

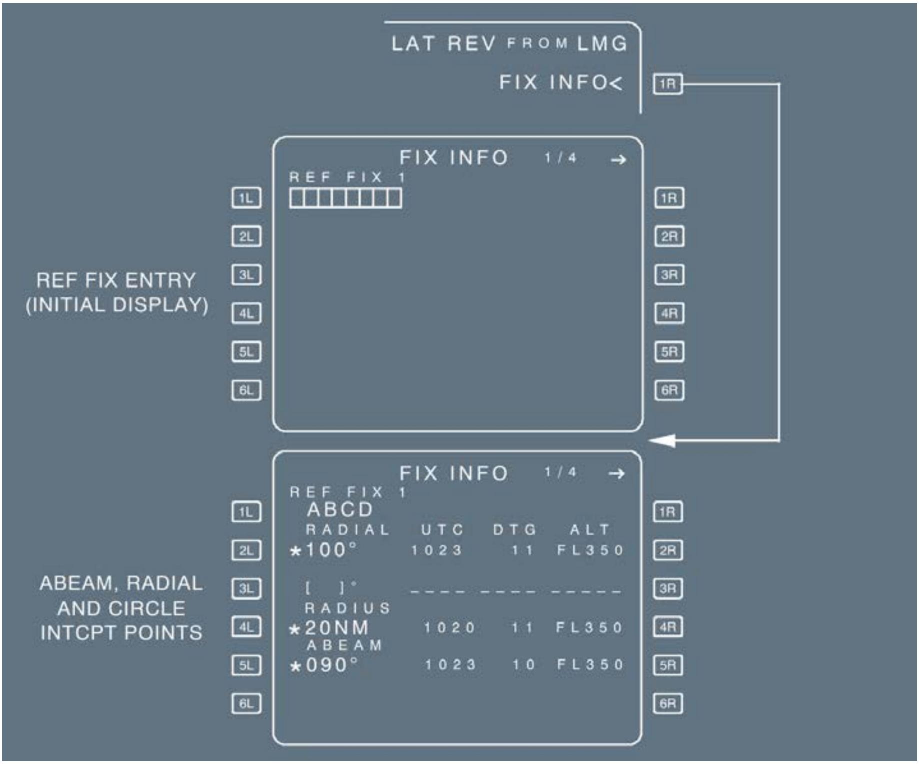


FIX INFO PAGE

Ident.: DSC-22_20-50-10-25-00000565.0009001 / 14 MAY 12
Applicable to: ALL

This page provides access to the RADIAL, CIRCLE, and ABEAM intercept functions.
The reference may be a given database fix or a pilot-defined element.
If the radial, circle or abeam intercepts the active flight plan, the intersection point can be converted to a waypoint and inserted into the flight plan.

The FIX INFO page may be accessed from the LAT REV page at the origin airport, or at FROM.



[1L] REF FIX (blue)	Allows entries of the REF FIX. This reference may be any database element (navaid, waypoint, NDB, airport, runway) or a pilot-defined element. Prior to entry, amber boxes are displayed.
[2L] - [2R] RADIAL (blue) and [3L] - [3R] (blue)	Enables entry of a radial from the REF FIX. If the radial line intersects the active flight plan, the FMGS will compute the time, the along path DTG (Distance To Go), and the altitude at the intersection point (small green font). A large blue star is then displayed to insert the intersection waypoint into the flight plan. This waypoint is not part of the pilot-stored elements. Format of the created waypoint is: XXXNNN XXX = First 3 letters of REF FIX ident. NNN = Value of the radial

[4L] - [4R] RADIUS (blue)	This function enables the flight crew to enter a radius that defines a circle around the REF FIX. When the circle intercepts the current flight path, the FMGS will compute the time, the along path distance and the altitude at the first intersection point, from the current aircraft position (small green front). A large blue star is then displayed to insert the intersection waypoint into the flight plan. This waypoint is not part of the pilot stored element. The waypoint is automatically labelled: "DNNNXXX" NNN = Value of the radius XXX = First 3 letters of the REF FIX ident.
[5L] - [5R] ABEAM	This function enables the pilot to create waypoints on a flight plan (primary or secondary) that are abeam a reference fix. Once computed, the page displays the radial number in large green font. Time, distance and altitude predictions are displayed in small green font. Selecting the key adjacent to the star creates the waypoint and inserts it into the flight plan. The waypoint is identified by AB + the REF FIX ident e.g. AB TLS. Abeam waypoints are not stored in the pilot-stored waypoint database.

Note: Four FIX INFO pages, providing the capability to define four different REF FIX elements, are available.

OFFSET PAGE

Ident.: DSC-22_20-50-10-25-00013512.0019001 / 14 MAY 12
Applicable to: ALL

This page allows the flight crew to insert a preplanned offset into the flight plan by entering:
- A start waypoint
- An end waypoint
- An offset distance to the left or to the right
- The intercept angle value.

The flight crew calls up this page from the LATERAL REVISION page, by pressing [2L] key.

TITLE	OFFSET in white large font. If a temporary flight plan exists, it is displayed in yellow large font.
[1L] OFFSET	This field displays the lateral offset distance, left or right, in the flight plan. The offset may be between 1 and 50 NM. Blue brackets are displayed until an offset is inserted. When the flight crew enters an offset, or modifies another element in the OFFSET page, the OFFSET field becomes yellow. One time the temporary flight plan is inserted, the field becomes blue. The flight crew can delete an inserted offset either by pressing the CLR key, by entering a zero for the amount of the offset, or by pressing OFFSET DELETE in 6L field.
[2L] START WPT	The START WPT ident for the offset is displayed in yellow if a temporary flight plan exists, in blue if already inserted, or in green when the field is not modifiable. The default START WPT shall be the waypoint where the lateral revision is performed, the first waypoint offsettable, or PPOS if the offset is currently flown. This waypoint can also be selected from the list of waypoints in the fields 3L to 5L, or can be manually entered by the flight crew.
[3L] to [5L]	Display the start waypoints available for selection. Two scrolling list are available. The active start waypoint is displayed in green in the list. Other waypoints are displayed in blue. The currently selected start waypoint does not have selection arrow associated.
[6L] RETURN ERASE	RETURN: The flight crew presses this key to return to the last displayed LAT REV page. ERASE: It is displayed when a temporary flight plan has been created, and it enables the flight crew to erase the temporary flight plan.

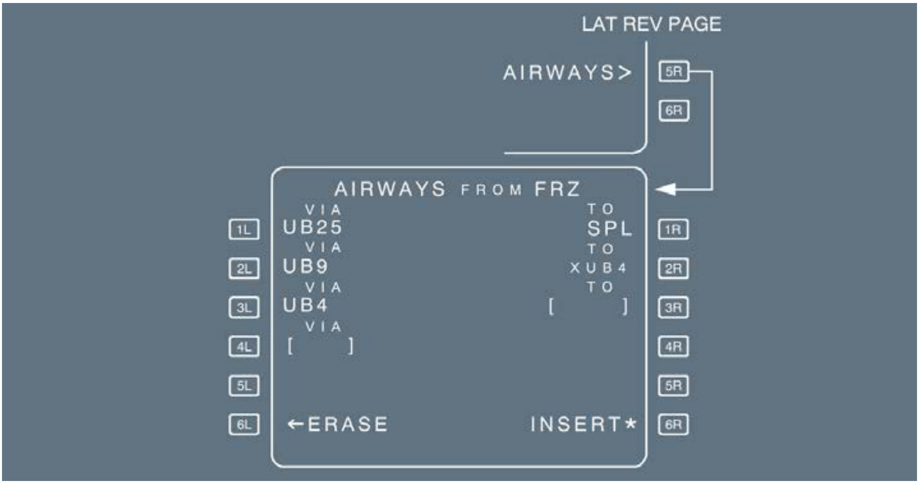
[1R] INTCPT ANGLE	This field displays the intercept angle. The angle may be between 10 ° and 50 °. The intercept angle in the AMI is the default value, and is shown in blue. When the flight crew enters an intercept angle, or modifies another element in the OFFSET page, the field becomes yellow. One time the temporary flight plan is inserted, the field becomes blue.
[2R] END WPT	The END WPT ident for the offset is displayed in yellow if a temporary flight plan exists, or in blue if already inserted. The default END WPT shall be the waypoint terminating the last consecutive offsettable leg from default or currently selected START WPT. This waypoint can also be selected from the list of waypoints in the fields 3R to 5R, or can be manually entered by the flight crew.
[3R] to [5R]	Display the end waypoints available for selection. Two scrolling lists are available. The active end waypoint is displayed in green in the lists. Other waypoints are displayed in blue. The currently selected end waypoint does not have selection arrow associated.
[6R] INSERT OFFSET DELETE	INSERT: This field allows the flight crew to activate the temporary flight plan and reverts the display to the active flight plan. This field is displayed when the offset segment is completely defined on OFFSET page. OFFSET DELETE: This prompt enables the flight crew to create a temporary flight plan where the predefined offset is canceled. This field is displayed when an offset exists in the active flight plan.

<u>Note:</u> *If the waypoint lists in lines 3 to 5 do not fit in one page, the flight crew can scroll in an open loop, two lines by two lines. To keep the initial order of the list, two markers appear:*
- *- START OF LIST - : This marker is displayed at the beginning of the list*
- *- END OF LIST - : This marker is displayed at the end of the list.*

AIRWAYS PAGE

Ident.: DSC-22_20-50-10-25-00000566.0009001 / 14 MAY 12
Applicable to: ALL

This page allows the pilot to select up to five airways for stringing into the flight plan, after the revise waypoint.
The pilot calls up this page by pressing the lateral revision page [5R] key.



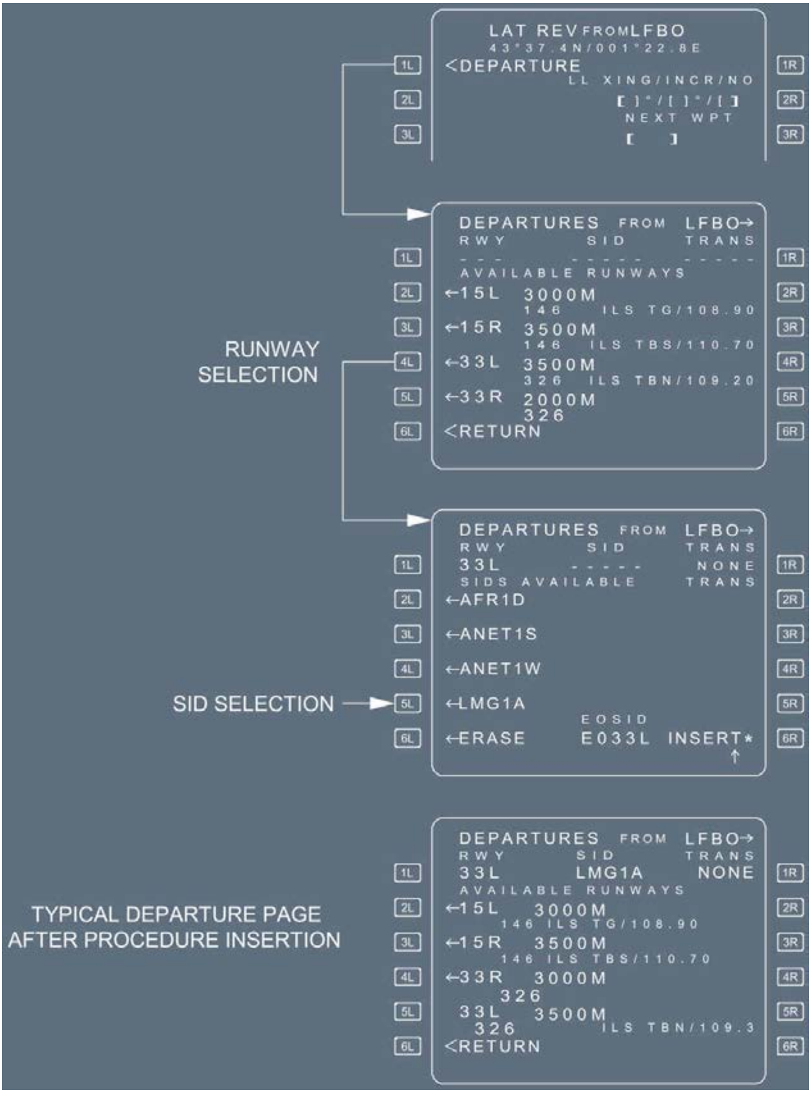
TITLE	Revise point ident (large green font)
[1L] to [5L] VIA	This field displays the airways entered by the pilot.
[6L] ERASE or RETURN	The flight crew presses this key to return to the lateral revision page. This field displays ERASE when a temporary flight plan is created. It enables the temporary flight plan to be erased.
[1R] to [5R] TO	Displays the end points of the corresponding airways entered on the [1L] to [5L] entries. The ending point is displayed in large blue font, if manually-entered, in blue small font if FMGC-computed.
[6R] INSERT (amber)	Allows the entered VIA/TO segments to be inserted into the flight plan. The display reverts to the F-PLN page.

<u>Note:</u>
1. *If the entered airway contains at least one fixed radius transition waypoint as defined in the navigation database, and the TO waypoint is defined and, the fixed radius transition waypoint is in the flight plan, then, "FIXED TURN RADIUS AWY " is displayed between the VIA and TO fields.*
2. *If the condition for display "FIXED TURN RADIUS AWY" is satisfied for two consecutives airways lines, the second line displays (") instead of the whole message.*

DEPARTURE PAGES

Ident.: DSC-22_20-50-10-25-00000567.0001001 / 17 MAR 11
Applicable to: ALL

These pages allow the pilot to review departure procedures (RWY , SID , TRANS) and enter them into the active flight plan.
When the display shows the lateral revision page for the origin, the pilot calls them up by pressing the 1L key.
Three pages are available: RWY , and SID S and TRANS (if any).
The pilot sequentially calls up each page by selecting a data item (such as RWY), or by pressing the NEXT PAGE key on the MCDU console.



Line 1 RWY, SID TRANS	This line displays the RWY , SID , and TRANS in green after they have been inserted into the active flight plan, or in yellow if selected but not yet inserted. If nothing has been selected or inserted, the line displays dashes.

[2L] to [5L] RWY/SIDs	These fields display selectable and selected RWY s or SID s (including EOSID and NO SID option). The pilot can slew each list. Selectable RWY s and SIDs are displayed in blue with an arrow. Once a RWY or SID is selected, the arrow disappears. A RWY or SID, already inserted in the flight plan, is displayed in green. The display shows the length, heading, and, if available, the ILS ident and frequency for each runway.
[6L] ERASE or RETURN	The pilot presses this key to erase a selected data item and revert to the previous selection. If the pilot erases the page, the display reverts to the active flight plan page. The display shows RETURN instead of ERASE, when the pilot has not created a temporary flight plan.
[2R] to [5R] TRANS	This field displays the selectable and selected enroute transitions in blue and green respectively. They are blank, if there are no transitions.
[6R] INSERT or BLANK	The pilot uses this key to insert a temporary procedure into the flight plan. The page reverts to the active flight plan page, when the insertion is completed. It is associated with RETURN (6L).
[6M] EOSID	Once a runway is inserted into the flight plan, this field displays any ENG OUT SID for that runway. If there is none, it displays NONE.

HOLD PAGES

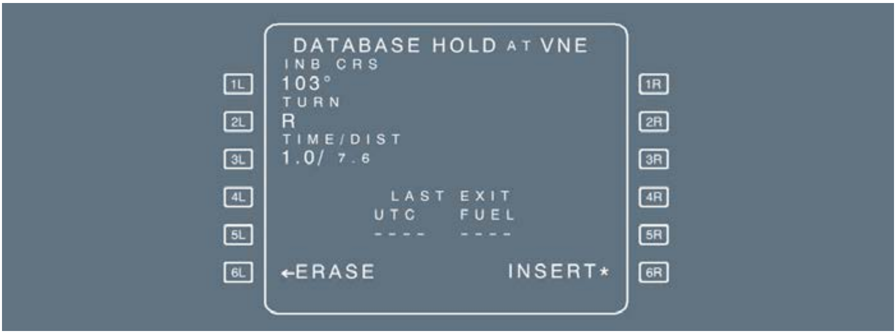
Ident.: DSC-22_20-50-10-25-00000568.0001001 / 01 OCT 12
Applicable to: ALL

These pages allow the pilot to review and modify the holding pattern parameters at the selected revise waypoint.
The flight crew calls up these pages by pressing the HOLD key on the LAT REV page for the waypoint. The flight crew can insert database hold, holds computed by the FMS or holds that they manually define.

At first access, the HOLD page appears as follow:

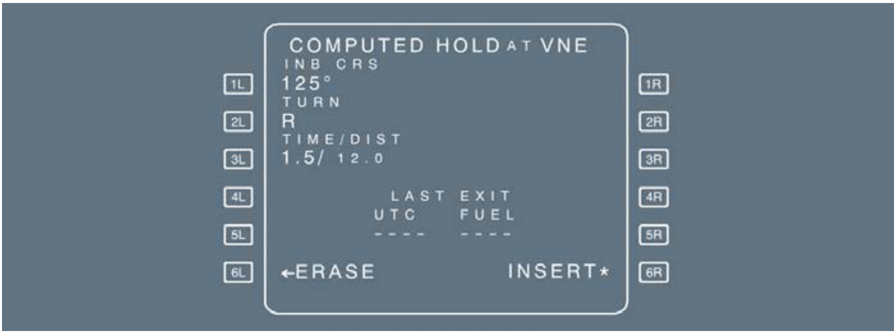
DATABASE HOLD

If a hold is defined in the navigation database for the revised waypoint, and can be inserted, the parameters in [1L], [2L] and [3L] appear in yellow.



COMPUTED HOLD

If a default hold is computed by the FMS and can be inserted, the parameters in [1L], [2L] and [3L] appear in yellow.

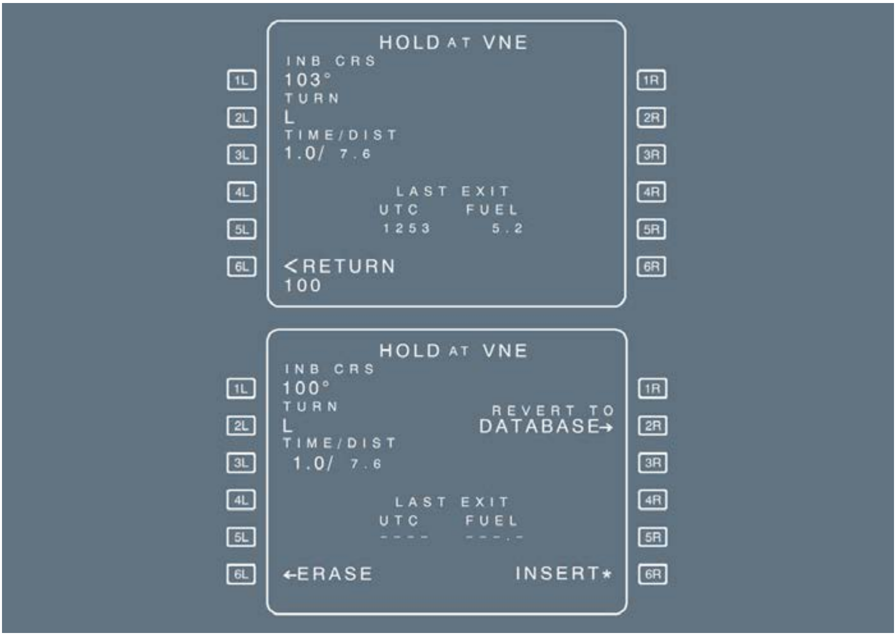


A computed hold has the following default parameters:

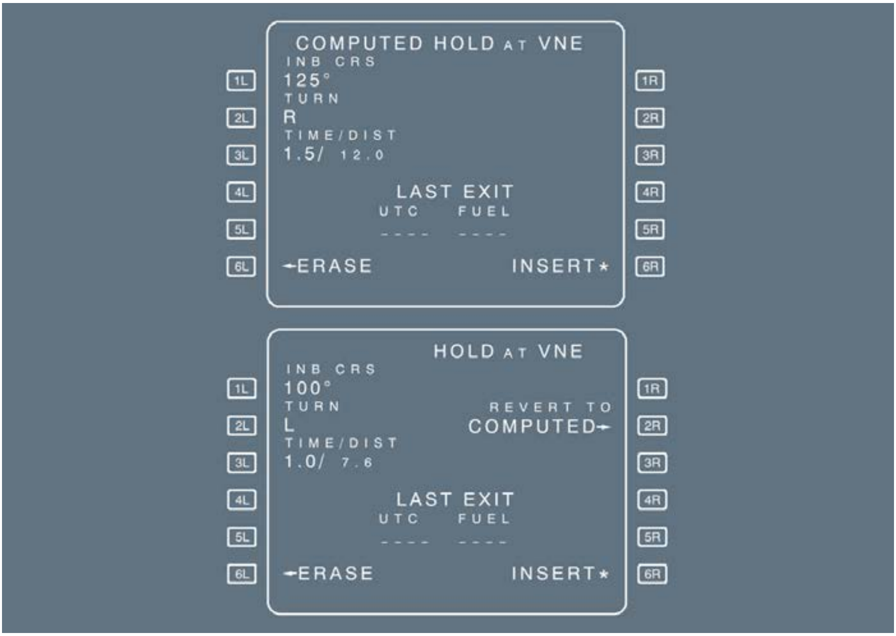
[1L] INB CRS	Inbound track of the F-PLN leg leading to the revised waypoint
[2L] TURN	Direction right (R) to turn in the hold
[3L] TIME/DIST	TIME on outbound leg is 1.5 min above 14 000 ft, 1 min below 14 000 ft.
[2R]	This field shows “REVERT TO COMPUTED” when the flight crew has modified the holding pattern.

HOLD MODIFIED BY FLIGHT CREW

If the flight plan contains a holding pattern that was defined by the pilot from an existing database or computed hold, the parameters in [1L], [2L] and [3L] appear in blue.
If the pilot has modified holding pattern data from the database, the field next to [2R] displays “REVERT TO DATABASE” or “REVERT TO COMPUTED” to enable the pilot to revert to default parameters.



EXAMPLE	The pilot modifies the inbound course.

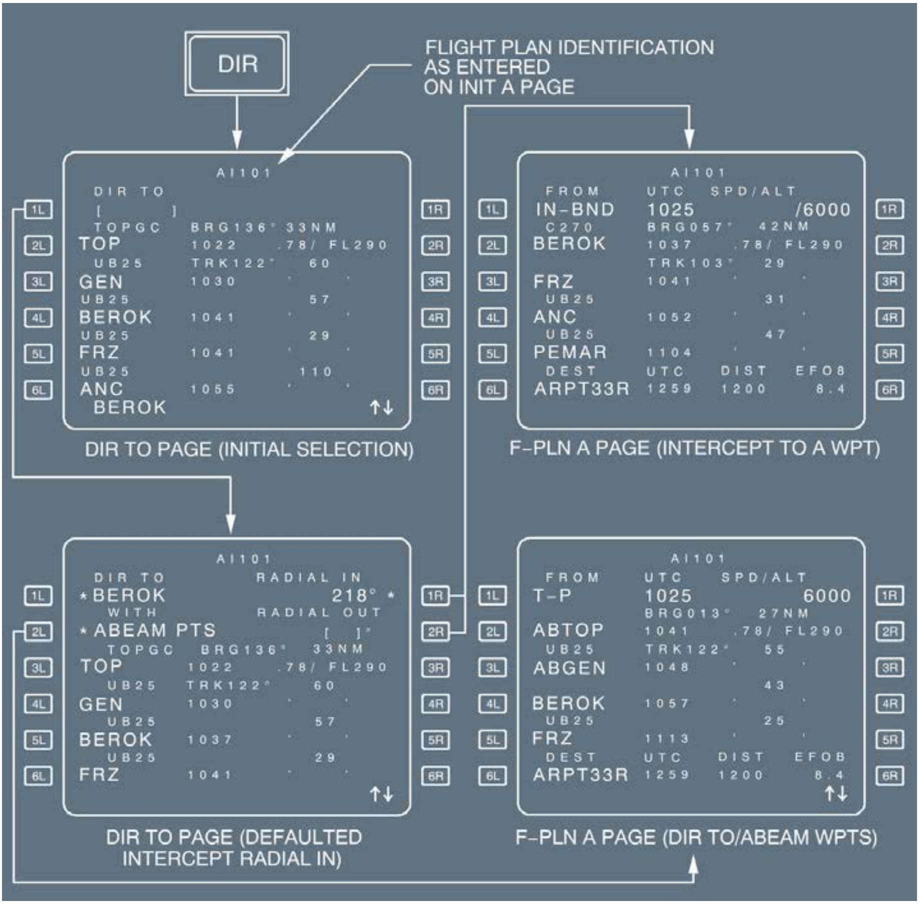


[1L] INB CRS	This field displays the inbound course of the holding pattern. The data may be manually or automatically modified.
[2L] TURN	This field shows the direction to turn in the hold (L or R). The data may be modified.
[3L] TIME/DIST	This field shows the time and distance for the outbound leg. The data may be modified, but time and distance cannot be entered simultaneously. Time and distance are dependent values that the system calculates from the predicted true airspeed, which in turn depends upon the holding speed (speed for maximum endurance, ICAO speed limit, or constraint speed, whichever is lower).
[6L] ERASE or RETURN	The pilot presses this key when the field shows “ERASE”, to erase the holding pattern. The pilot presses this key when the field shows “RETURN”, to return to the LAT REV page, if the hold is already inserted in the flight plan.
[2R] REVERT TO...	The pilot presses this key to delete manual modifications to the database hold (or computed hold), and to revert to the database (or computed) holding data.

[6R] INSERT	The pilot presses this key to insert the hold into the active flight plan.
LAST EXIT UTC FUEL	This field displays the time at which the aircraft must leave the holding pattern in order to meet fuel policy criteria (extra fuel = 0). The system also displays the estimated fuel on board at that time. Always displayed in thousand of kilograms or pounds.

DIRECT TO PAGE

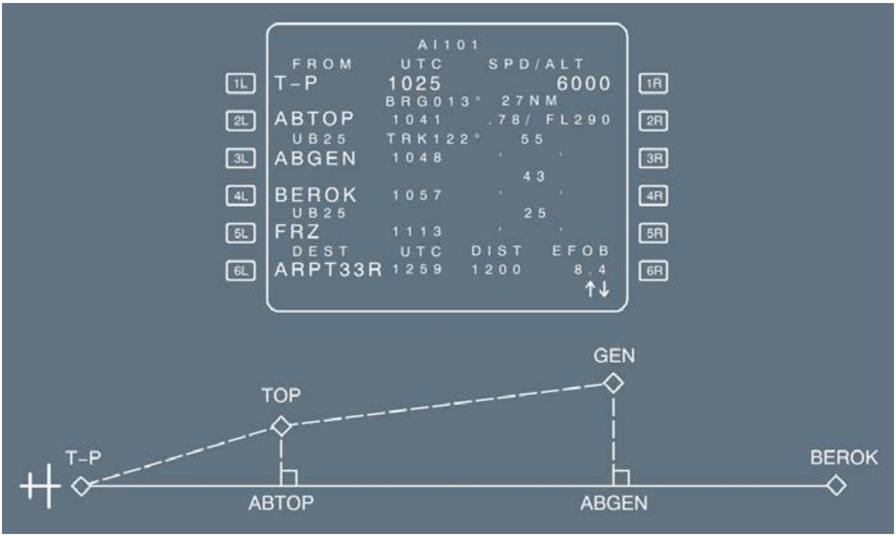
Ident.: DSC-22_20-50-10-25-00000569.0001001 / 23 JUN 15
Applicable to: ALL



Pressing the “DIR ” key under the MCDU screen brings up the DIR TO page. On this page, the [1L] key is the DIR TO key. The pilot presses it to modify the flight plan by creating a direct leg from the aircraft's present position to any selected waypoint. When in NAV mode, the pilot must use this key to modify the active leg or the TO waypoint. The pilot cannot call up this page when the aircraft's present position is not valid.

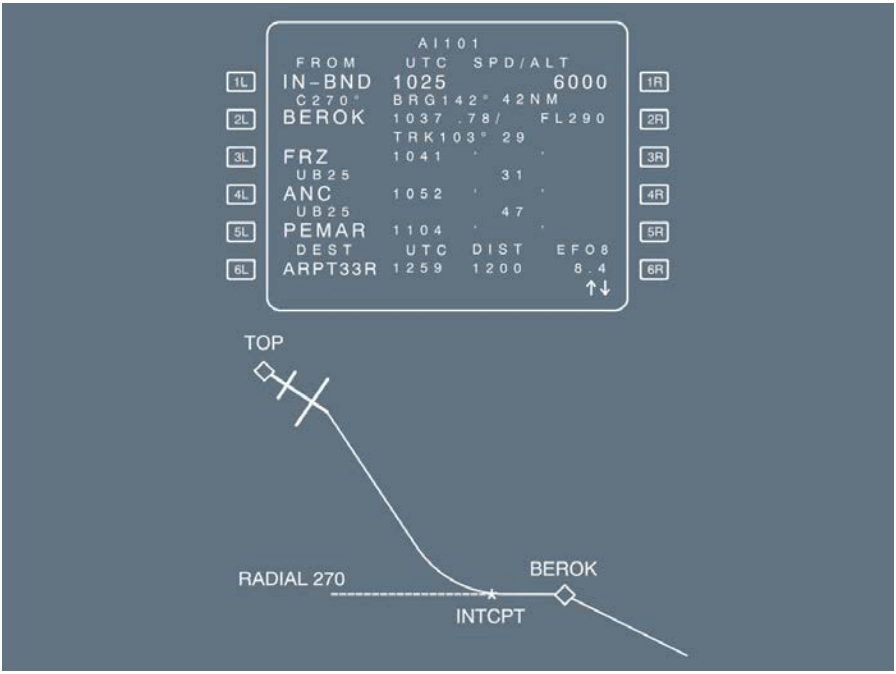
[1L] DIR TO	Pressing this key selects the DIRECT TO or INTERCEPT waypoint. The pilot can identify the waypoint to be inserted by using its identifier, its latitude and longitude, place/bearing/distance, or place-bearing/place-bearing. <u>Note:</u> *If the entered DIR TO is a latitude/longitude, the NEW WAYPOINT page is automatically called up.* If the pilot does not select the RADIAL IN (1R) or RADIAL OUT (2R) or ABEAM PTS (2L), the DIR TO function routes the aircraft from the present position to the waypoint inserted in the DIR TO field.
Line 3 to Line 6	These lines display the active flight plan with time/speed/distance predictions. The display may be slewed ↑ ↓. Pressing any key activates the DIRECT TO function from the present position to the waypoint adjacent to that key.
[2L] ABEAM PTS	The flight crew presses this key to activate the DIR TO /ABEAM function which projects the flight plan waypoints perpendiculary on the DIR TO leg:

EXAMPLE: DIR TO BEROK - ABEAM.



[1R] RADIAL IN and [2R] RADIAL OUT	The pilot fills in these fields to define a radial, associated to the waypoint defined in 1L. These keys respectively activate the DIR TO /INTERCEPT TO and DIR TO/INTERCEPT FROM functions. The pilot enters the radial in, or radial out, as : XXX, XXX being the radial. The aircraft intercepts from its current position and tracks the selected waypoint and radial to (or from) this waypoint.

EXAMPLE: RADIAL INBND - DIR TO BEROK - RADIAL 270 ° INBOUND



If the DIR TO /INTCPT WPT entry is to a waypoint already in the flight plan, a default RADIAL IN is displayed in small font. However, no radial is displayed on the ND for this default radial. No default radial is provided for the RADIAL OUT field.

Selecting the INTCPT TO (RADIAL IN [1R]) function:
- Activates the intercept radial INTO the WPT.
- Sets the course = radial IN + 180 °.
- Reverts the display to the F-PLN A page.

Selecting the INTCPT FROM (RADIAL OUT [2R]) function:
- Activates the intercept radial FROM the WPT.
- Sets the course = radial OUT.
- Reverts the display to F-PLN A page.

For details, DSC_22_20_30 Flight Planning.

Note: *It is not recommended to use the DIR TO function when the aircraft is on the ground. The use of the DIR TO function when the aircraft is on the ground may result in the loss of all departure data, that includes both of the following:*

- *The takeoff speeds*
- *The derated level, or the flexible temperature.*

ARRIVAL PAGES

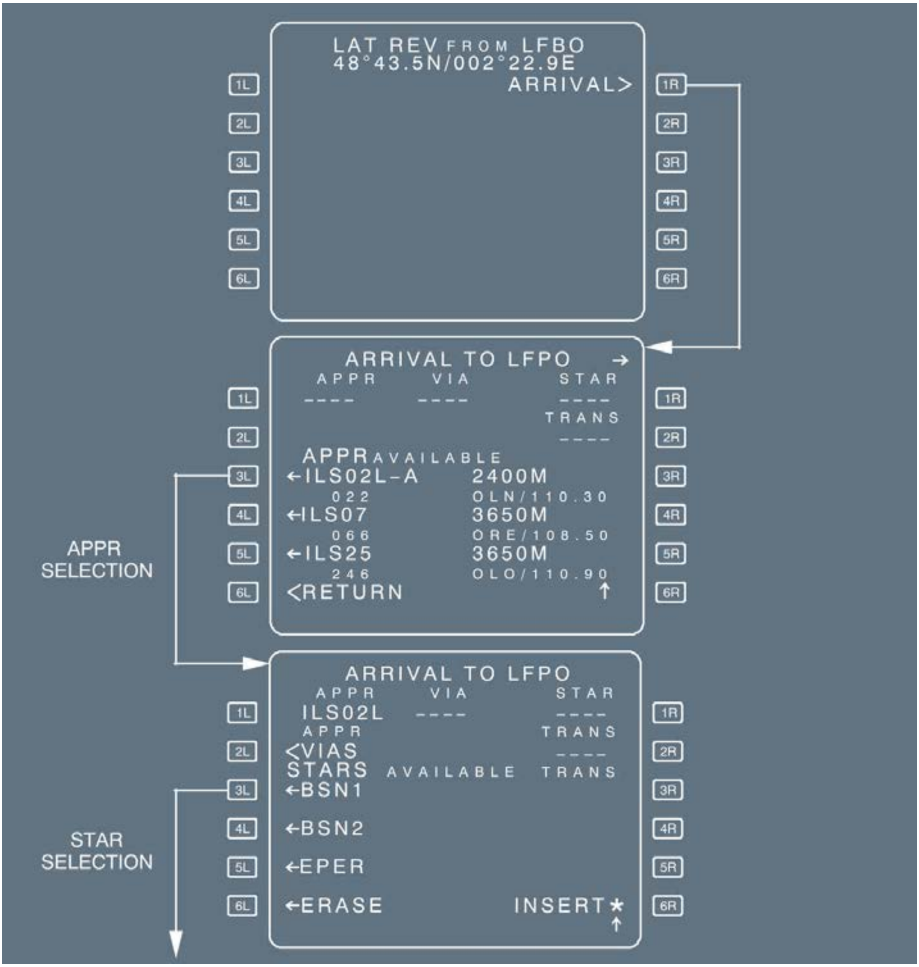
Ident.: DSC-22_20-50-10-25-00000570.0009001 / 14 MAY 12
Applicable to: ALL

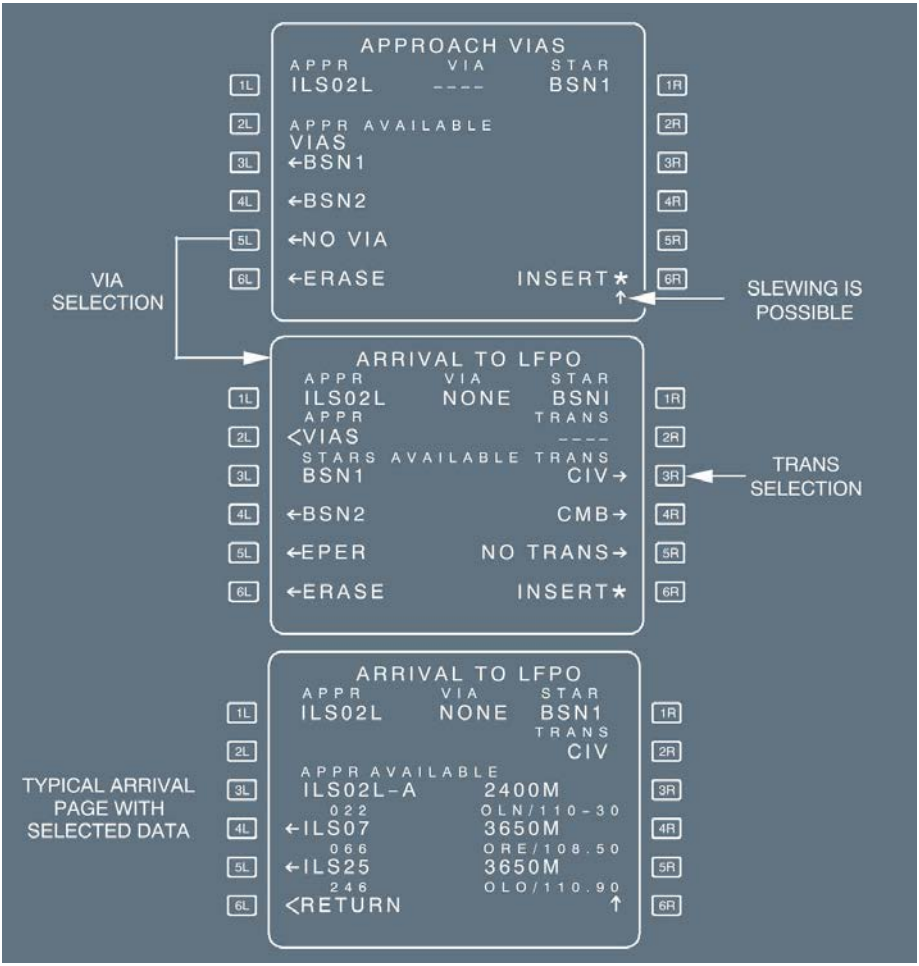
These pages enable the pilot to review arrival procedures (approaches, VIAs, STAR s, TRANS) and enter them into the active flight plan.
The pilot calls them up from the LAT REV page for the destination by the pressing the 1R key.
Three pages, APPR , STAR , and VIA, are available, along with a fourth,TRANS, if there are any transitions.
The pilot calls up each page sequentially, either by selecting a data item (such as APPR), or by pressing the NEXT PAGE key on the MCDU console.

Line [1L] - [1R] [2R]	This line displays the APPR , VIA, STAR , and TRANS in green, if they have been inserted in the flight plan, and in yellow, as a temporary flight plan, if they have been selected but not yet inserted. It displays dashes or NONE, if nothing has been selected or inserted.
[2L] APPR VIAS	The pilot presses this key to call up transitions from the last point of the STAR to the first point of the approach.
[3L] to [5L]	These fields list selectable and selected APPR s, STAR s, and VIAs. The flight crew can slew the pages, when necessary. Selectable APPR s, STARs, and VIAs are displayed in blue with an arrow. Once the pilot has selected an APPR , STAR , or VIA, the arrow disappears. After the APPR , STAR, or VIA is inserted into the flight plan, it is displayed in green. For each approach, the display shows runway length, heading, and the frequency and identifier of the ILS when ILS is available. In case there are multiple approaches for the same runway, the approach is identified with the runway plus the multiple indicator (i.e. ILS 33L-S).
[6L] ERASE or RETURN	The pilot presses this key to erase selected data and to revert to the previous selection. The page reverts to the LAT REV page. The field displays “RETURN”, instead of ERASE, when the flight crew has not created a temporary flight plan.

[3R] TRANS to [5R] These fields display selectable and selected enroute transitions (if any). They are blue when selected, and become green when inserted into the active flight plan.

[6R] INSERT The pilot presses this key to insert the temporary procedure into the active flight plan. The page reverts to the active flight plan page when this occurs.

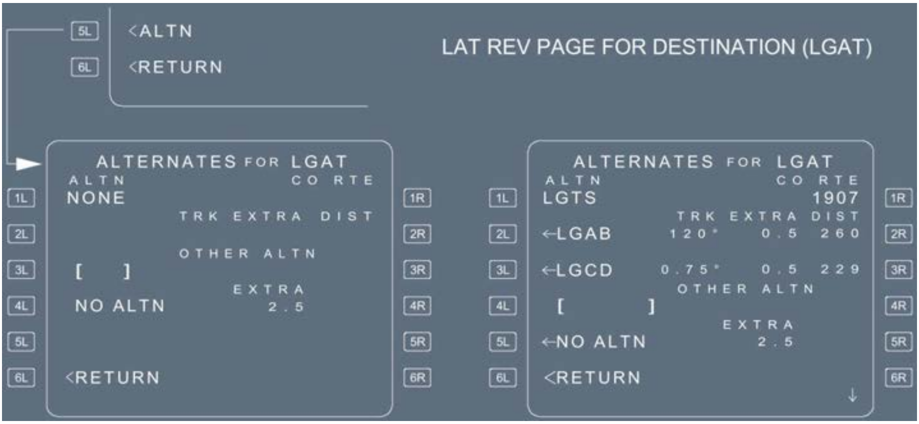




ALTERNATE PAGE

Ident.: DSC-22_20-50-10-25-00000571.0001001 / 17 MAR 11
Applicable to: ALL

This page enables the pilot to review, in the NAV database, the alternate airports that are paired with the destination, and define additional alternates, if needed. (Alternate airports are linked to the destination). The pilot calls up this page with the ALTN prompt, from the lateral revision page for the destination.



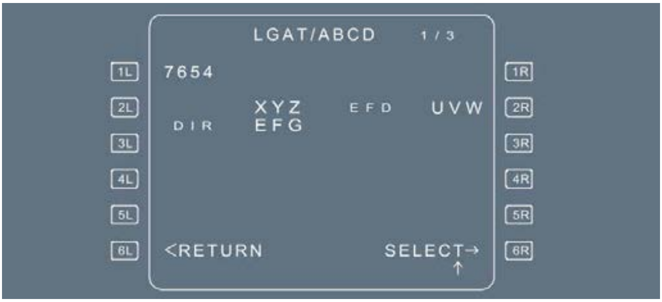
TITLE	The destination airport is displayed large green font.
[1L] ALTN	This field displays the selected alternate: In green, if it is active; in yellow, if it is temporary. “NONE” is displayed, if NO ALTN option is selected, or if the destination has no alternate.
Line 2 to line 5	These lines display the identifications of alternates (up to 6), the extra fuel weight remaining after landing at the alternates, and the great-circle track and distances to them from the destination. If the database contains a company route between the destination and the alternate, the distance shown is an airway distance, not a great-circle distance. When the database defines a preferred alternate, it is displayed on Line 2 (if no scrolling has been performed).

[4L] OTHER ALTN	The pilot can enter an airport identifier in the brackets (Line 3). If that airport is not stored in the database , the NEW RUNWAY page appears for the pilot to use in defining it. If it is stored in the database, the ROUTE SELECTION page appears, and the pilot can use it to select the best route. The pilot may enter a distance in the DIST field of the OTHER ALTN prompt, in order to get preliminary fuel predictions. However, once he has selected the alternate airfield as a temporary alternate and then inserted it, the ALTN distance reverts either to the airway distance, if he has selected a company route, or otherwise to the direct distance to the alternate. The pilot can use OTHER ALTN to overwrite and replace the previous OTHER ALTN.
NO ALTN	The pilot uses this key to select the NO ALTN option.
[6L] RETURN or ERASE	The pilot presses this key to make the display revert to the LAT REV page. Pressing this key erases the temporary selection.
[1R] CO RTE	Pressing this key displays the active company route between the destination and the selected alternate.
[6R] INSERT	Pressing this key activates the temporary selection.

ROUTE SELECTION PAGE FOR ALTERNATE

Ident.: DSC-22_20-50-10-25-00000572.0001001 / 17 MAR 11
Applicable to: ALL

This page enables the pilot to review the company route between the destination and the alternate, and to select a different route, if that seems appropriate.
This page comes up automatically, when the flight crew enters an ident in the OTHER ALTN field.
See the “Route Selection” page *Refer to DSC-22_20-50-10-25 Route Selection Page*for a description of this page.

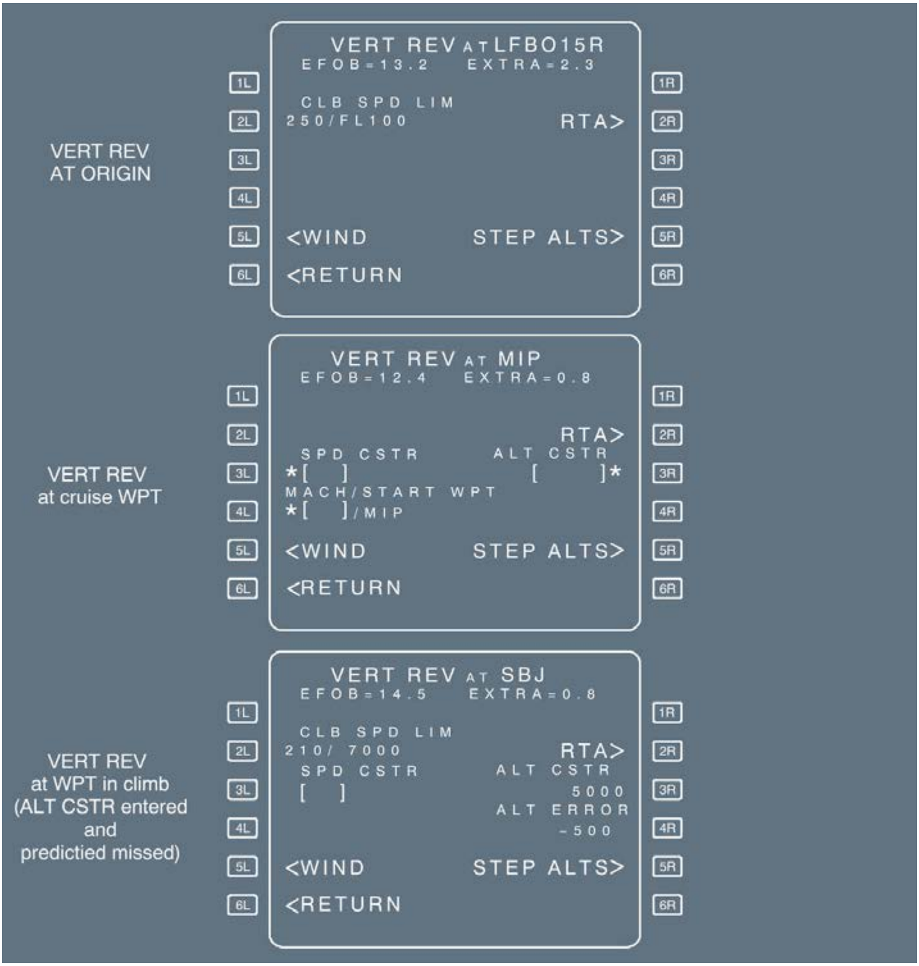


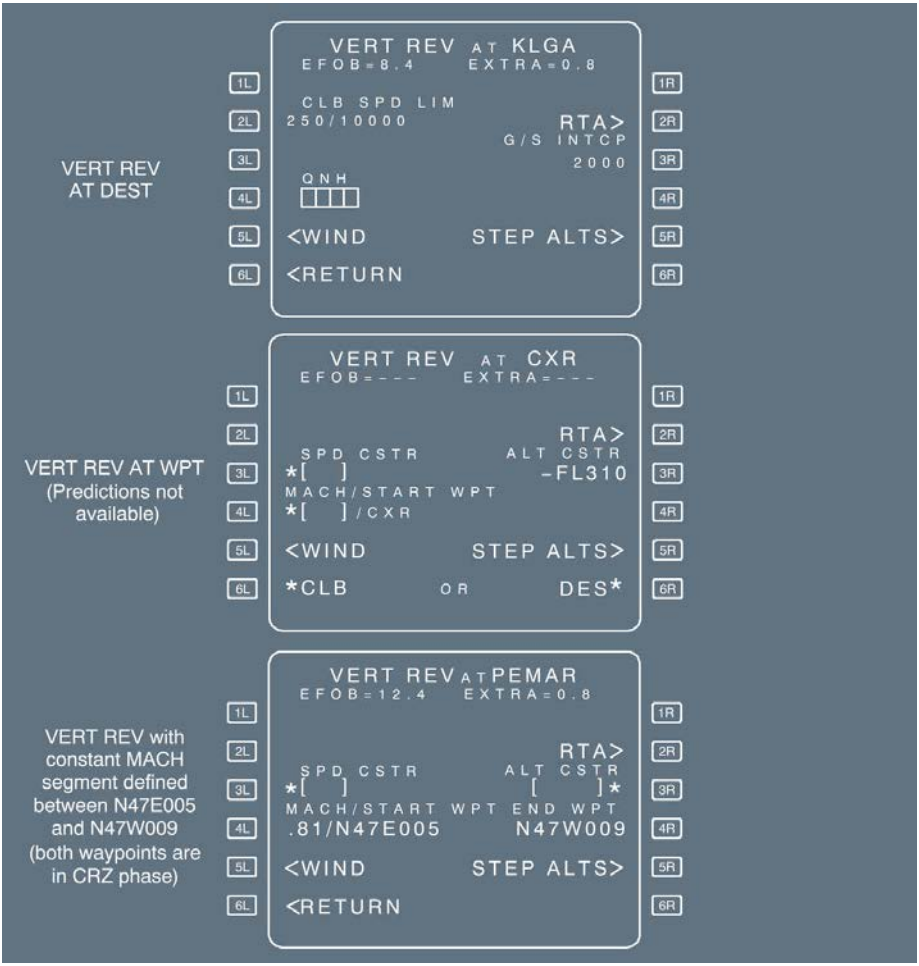
[6R] SELECT	Pressing this key reverts the display to the alternate page. (The distance between the destination and the alternate is then the airway distance).

VERTICAL REVISION PAGES

Ident.: DSC-22_20-50-10-25-00000573.0009001 / 14 MAY 12
Applicable to: ALL

These pages contain the menu of available vertical flight plan revisions that can be applied at a selected waypoint.
The pilot calls up these pages from the flight plan A or B pages by pressing the right hand key next to the selected revised waypoint.
The pilot may make several different vertical revisions (although some may not be available at all waypoints): Speed limit, speed constraint, altitude constraint, time constraint, wind page and STEP ALTS page.


VERT REV
AT ORIGIN
VERT REV AT LFBO15R
EFOB=13.2 EXTRA=2.3
CLB SPD LIM
250/FL100
RTA>
<WIND
STEP ALTS>
<RETURN
VERT REV
at cruise WPT
VERT REV AT MIP
EFOB=12.4 EXTRA=0.8
RTA>
SPD CSTR
ALT CSTR
*[ ]
[ ]*
MACH/START WPT
*[ ]/MIP
<WIND
STEP ALTS>
<RETURN
VERT REV
at WPT in climb
(ALT CSTR entered
and
predictied missed)
VERT REV AT SBJ
EFOB=14.5 EXTRA=0.8
CLB SPD LIM
210/ 7000
RTA>
SPD CSTR
ALT CSTR
[ ]
5000
ALT ERROR
-500
<WIND
STEP ALTS>
<RETURN
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R



TITLE (white)	"VERT REV AT [location]" The second line shows remaining fuel and extra fuel at the waypoint being revised.
[1L] "TOO STEEP PATH BEYOND" (amber)	This message is displayed, if the waypoint is part of a leg with too steep a descent path.

[2L] CLB/DES SPD LIM (magenta)	This field displays the speed limit applicable to the climb or descent phase. It displays it in large font when data has been inserted manually, and in small font when data comes from the database.
[3L] SPD CSTR (magenta)	This field displays any speed constraint assigned to the revised waypoint. It is in large font when inserted manually, and in small font when it comes from the database. It is not displayed at the origin airport, at a FROM waypoint, a speed limit pseudo waypoint, or the destination airport.
[4L] QNH	This field only functions when the revised waypoint is the primary destination. It allows the pilot to enter the atmospheric pressure at sea level. This field is identical to the QNH field of the PERF APPR page.
[4L] MACH/START WPT (blue)	This prompt allows the pilot to enter or modify the start point of a constant Mach segment, and its associated Mach. It is not displayed at primary destination and alternate flight plan waypoints. (*Refer to DSC-22_20-30-20-25 Constant Mach Segment - Entering a Constant Mach Segment*).
[5L] WIND (blue)	The pilot presses this key to access the wind pages. The first wind displayed page, corresponds to the selected waypoint (e.g. climb page), if the selected waypoint is a climb phase waypoint. A CLR action reverts it to brackets.
[6L] RETURN or CLB	The pilot presses this key to return to the last displayed flight plan page. When displayed, pressing this key assigns the constraint to CLB phase and inserts it into the vertical flight plan. The page reverts to the flight plan page.
[2R] RTA prompt	This prompt gives access to the RTA page. It is not displayed when the VERT REV page is accessed from the alternate F-PLN.
[3R] ALT CSTR (magenta)	This field displays the altitude constraint assigned to this revised waypoint. It uses large font when the constraint is manually-entered, and small font when it is from the database. A CLR action reverts it to brackets. The constraint may be: - “At”, entered as XXXXX (Example: FL 180). - “At or above”, entered as + XXXXX or XXXXX + (Example: FL +310). - “At or below”, entered as – XXXXX or XXXXX – (Example: -5 000). - A “window” constraint. The altitude window consists of two altitudes between which the aircraft should fly. The crew cannot manually enter a “window” constraint.

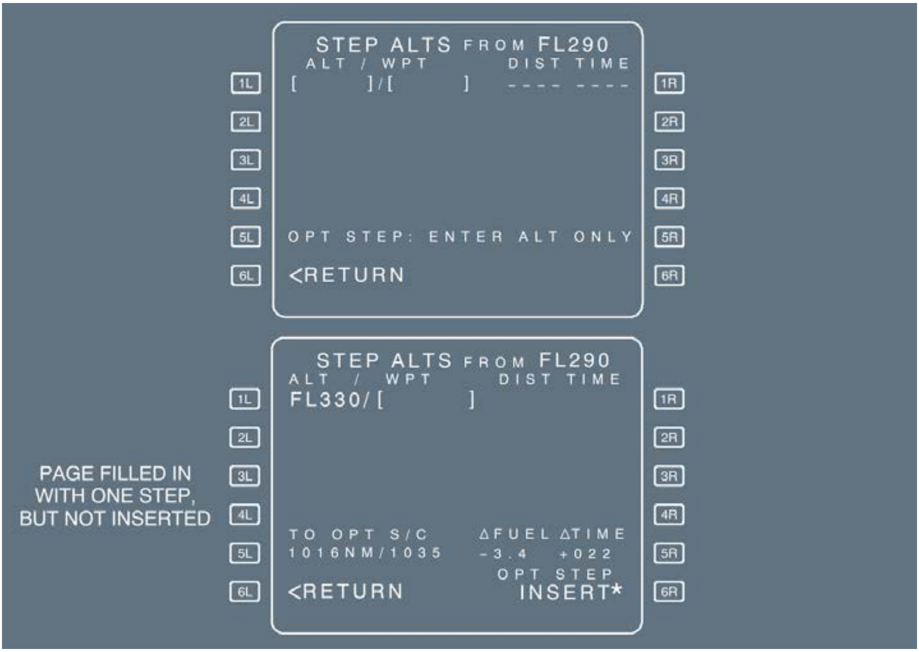
G/S INTCP (green)	This field displays the glide intercept altitude for an ILS approach on the vertical revision page at destination.
[4R] ALT ERROR (green)	When the aircraft misses a predicted altitude constraint, this field displays the difference between the altitude constraint and the predicted altitude. If, for example, "-500" appears in this field in green, the aircraft will reach the waypoint at an altitude 500 ft below the constraint altitude. This only applies to waypoints in the climb and descent phases.
[4R] END WPT (blue)	This prompt allows the pilot to enter or modify the endpoint of a constant Mach segment. It is displayed when a pair Mach/start exists in 4L field. This prompt is not displayed on the destination VERT REV page. (*Refer to DSC-22_20-30-20-25 Constant Mach Segment - Entering a Constant Mach Segment*).
[5R] STEP ALTS (white)	This legend appears for any waypoint, once a cruise altitude has been entered. It is not available in engine-out, descent, approach, and go-around phases. This gives the pilot access to the STEP ALTS page.
[6R] DES	When this field displays "DES ", pressing this key assigns the constraints to the descent phase and inserts them into the vertical flight plan. The page reverts to the F-PLN page. (See note below).

Note: *Altitude and speed constraints may apply to the climb, descent, or approach phase, but never to the cruise phase. Fields 6L/6R display "CLB /DES " when the revised waypoint is a cruise phase waypoint and the FMGS needs to know if the new constraint is to be applied in climb or descent phase. The FMGS will modify the cruise phase accordingly. These 2 prompts also display "CLB /DES" when the predictions are not computed. (Top of climb and top of descent not yet defined).*

STEP ALTS PAGE

Ident.: DSC-22_20-50-10-25-00000574.0009001 / 14 MAY 12
Applicable to: ALL

This page allows the pilot to insert up to four geographic step points and one optimal step point into the flight plan. This page also displays the fuel/time savings associated with the optional step.
The flight crew calls it up either from the vertical revision page.



TITLE [1L] - [1R] [4L] - [4R] STEP ALTS in white followed by the current cruise altitude in green.

ALT/WPT {blue} : The waypoint identifier, as well as the altitude to step, can be entered in this field. Both are displayed in large font. The waypoint may either be an active (or secondary) flight plan waypoint, or an inserted optimal point (OPT). When an entry is made, a temporary F-PLN is created.

DIST / TIME (UTC) (small green font)

Displays the distance to go, and time from the present aircraft position along the flight plan to the step point.

Note: *The following messages may be displayed in the DIST/TIME field:*
- *ABOVE MAX , if the step altitude exceeds the MAX altitude.*
- *"IGNORED", if the step start or end point is less than 50 NM from the top of descent or if the step climb is located prior to the top of climb or after the top of descent.*
- *"STEP AHEAD", when the aircraft is within 20 NM of the start step point.*
- *"NO OPTIMAL" if a non inserted optimal step falls in a discontinuity due to a flight plan change, or when no new optimal exists after an UPDATE or when no optimal step point exists for the entered altitude.*

Note: *If no optimal step point exists for the altitude displayed in [1L], the "NO OPTIMAL" message is displayed in the FUEL/TIME field. This message is also displayed, if the optimal step falls into a discontinuity.*

[5L] OPT STEP: ENTER ONLY ALT (white) TO OPT S/C (green small front)

This field displays the distance and time to an uninserted optimal step point, if one exists. It is displayed to guide the flight crew for the entry format of an optional step.

Note: *On any flight plan change, an inserted optimal step remains in the flight plan at a fixed distance to destination.*

[6L] RETURN

The flight crew presses this key to return to the previous page.

[5R] SAVINGS

This field displays the fuel and time savings prior to the insertion of the optimal step point.

Fuel savings are displayed in thousand of kilograms (or pounds) (maxi 99.9). The value is preceded by:
"–" in case of fuel saving,
"+" in case of additional fuel cost.

Time savings are displayed in hours and minutes. The value is preceded by
"–" in case of time saving,
"+" in case of additional time cost.

[6R] INSERT* (amber) This field displays INSERT*, when an optimal step point exists but is not yet inserted. When INSERT is selected:
- The optimal step point is inserted into the flight plan.
- OPT is displayed in line 1L.
- Optimal step distance and time are deleted in line 5L.
- The UPDATE* blue prompt replaces the INSERT* prompt.

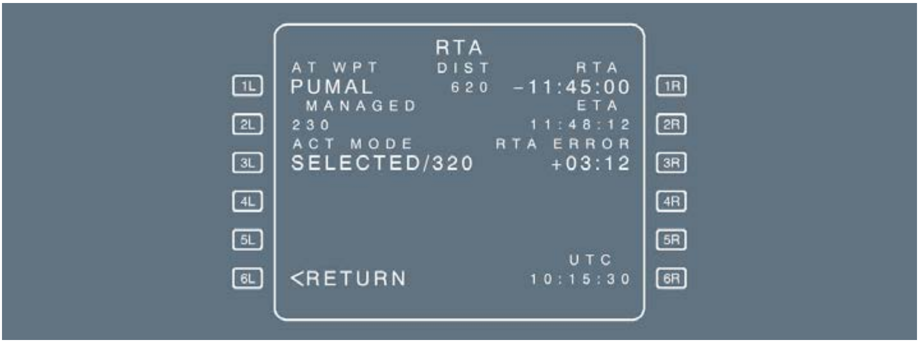
UPDATE* This prompt enables the computation of another optimal step point. The UPDATE* prompt is then replaced by the INSERT* prompt.

RTA PAGE

Ident.: DSC-22_20-50-10-25-00000575.0009001 / 14 MAY 12
Applicable to: ALL

The Required Time of Arrival (RTA) page allows the entry and display of a waypoint identifier, with associated time constraints. The page also displays the entered or computed Estimated Takeoff Time (ETT), as well as the following data:
- Predicted ETA at the time-constrained waypoint;
- Performance adjusted SPD target;
- Time error;
- Distance to time constrained waypoint;
- Active speed mode;

The flight crew calls up this page with the RTA prompt from the vertical revision page.



TITLE RTA (large white font)

line 1	This line displays: - AT WPT , DIST and RTA when a time constraint can be defined. The identifier of the revised waypoint or the first following waypoint at which the time constraint can be defined, is displayed by default in large blue font - AT WPT , DIST and RTA when a time constraint has already been defined. The associated constrained waypoint identifier is displayed by default in large blue font - AT WPT and white dashes when no time constraint can be defined - AT WPT and blue brackets if a time constraint can only be introduced before the waypoint at which the VERT REV has been initiated. Only when the waypoint identifier has been defined (by the flight crew or by default), blue brackets and a blue start are displayed in [1R] field. The flight crew enters the time constraint as “HHMMSS”, preceded by: - for at or before; + for at or after; no sign for at.
[2L] MANAGED	This field displays the FMGS -computed ECON speed/Mach (*Refer to DSC-22_20-40-10 Optimization*)
[3L] ACT MODE	This field displays the active speed mode : MANAGED or SELECTED/NNN (NNN is the selected target speed). The pilot cannot modify it through this field.
[6L] RETURN	The pilot presses this key to revert the display to the VERT REV page.
[2R] ETA	When a required time at arrival has been defined, the 2R field displays the estimated time of arrival as “HHMMSS”.
[3R] RTA ERROR	This field is blank when the RTA is predicted as made. If the RTA is predicted as missed, “RTA ERROR” is displayed in small white font, and the time error between ETA and RTA is displayed in small amber font.
[6R] ETT	The Estimated Takeoff Time (ETT) field is available in the preflight phase. If no ETT is available, the 6R field displays blue brackets and a blue star. Once available, the ETT is displayed in magenta.
UTC	Universal time is displayed in green for takeoff, climb, cruise, descent and approach phases.

DATA INDEX PAGES

Ident.: DSC-22_20-50-10-25-00000576.0001001 / 17 MAR 11
Applicable to: ALL

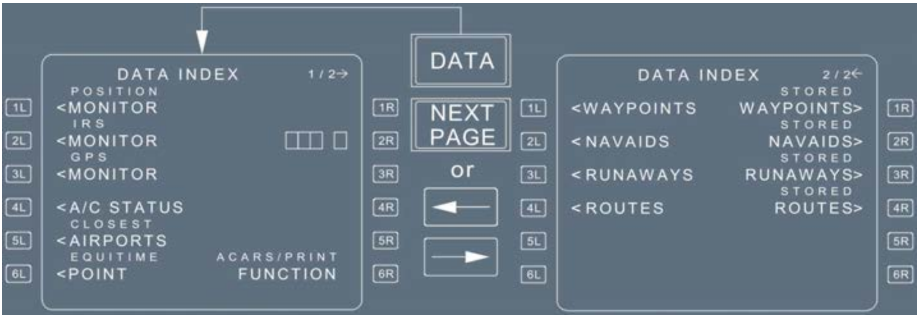
There are two INDEX pages:

The DATA INDEX 1/2 page gives access to various pages devoted to navigation.

The DATA INDEX 2/2 page lists the navigation data, entered in the FMGS.

The pilot enters those items labeled “stored” and can modify them. The pilot can call up the others, but cannot modify them.

The pilot calls up these pages by pressing the DATA key on the MCDU console:



DATA INDEX 1/2 PAGE

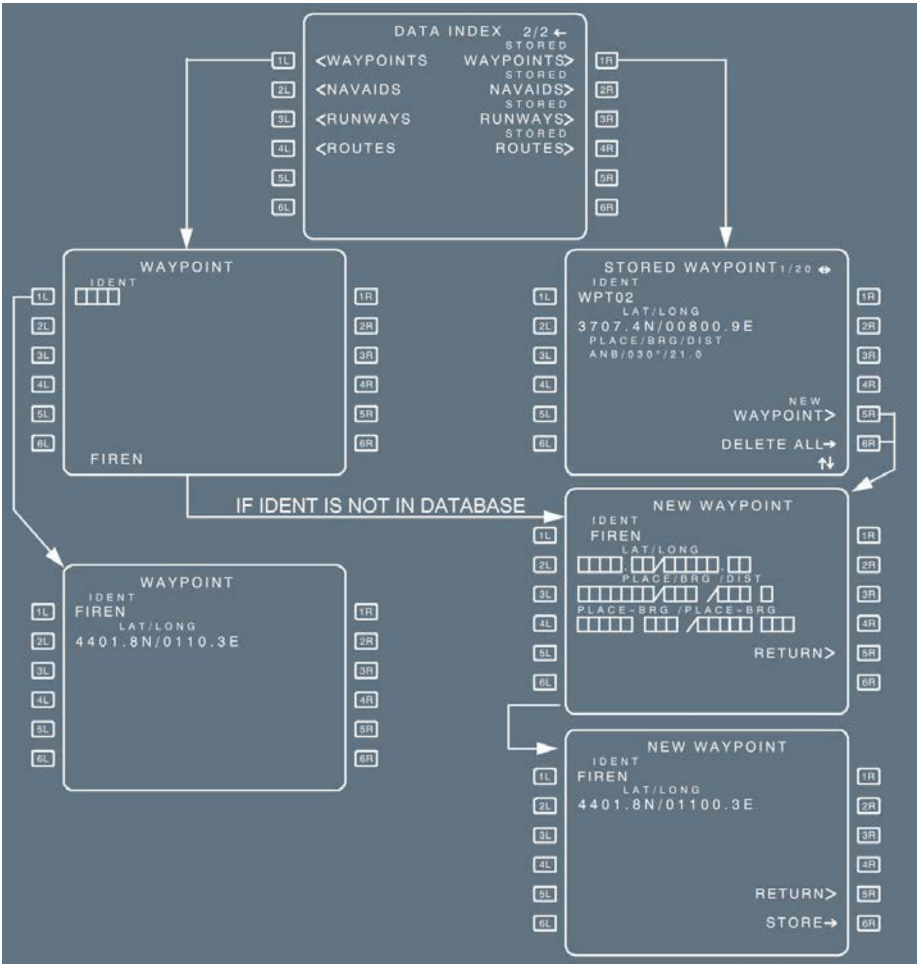
[1L] POSITION MONITOR - [2L] IRS MONITOR	When the flight crew presses these keys, the display shows all essential navigation data.
[3L] GPS MONITOR	This key calls up the GPS MONITOR page.
[4L] A/C STATUS	This key calls up the aircraft status page.
[5L] CLOSEST AIRPORTS.	This key calls up the closest airports page.
[6L] EQUITIME POINT	This key calls up the equitime point page.
[6R] ACARS/PRINT	This key calls up the PRINT function pages and the ACARS function pages.

DATA INDEX 2/2 PAGE

[1L] WAYPOINTS [2L] NAVAIDS [3L] RUNWAYS [4L] ROUTES	These keys call up descriptions of waypoints, NAVAIDs, runways, and routes stored in the database, so that they can be reviewed.
[1R] STORED WAYPOINTS [2R] STORED NAVAIDS [3R] STORED RUNWAYS [4R] STORED ROUTES	These keys call up waypoints, NAVAIDs, runways, and routes that the pilot has stored, enabling the pilot to review and store them in, or delete them from, the database. The airline can choose to automatically have all pilot-stored data erased in the done phase.

WAYPOINT/STORED WAYPOINT/NEW WAYPOINT PAGES

Ident.: DSC-22_20-50-10-25-00000577.0001001 / 01 OCT 12
Applicable to: ALL



WAYPOINT PAGE

- The pilot can call up this page by pressing the 1L key on the DATA INDEX page. The display then shows waypoint information associated with the identifier the flight crew inserts it in the [1L] field.
- With this page it is possible to call any waypoint not stored in the stored waypoint list, if they belong to the active, temporary, or secondary flight plan.

STORED WAYPOINT PAGE

The pilot calls up this page by pressing the 1R key on the DATA INDEX page.
This page displays waypoints, defined and stored by the pilot. It lists each stored waypoint, along with a number that shows the relative order in which it was inserted in the database. This number is displayed in the upper righthand corner of the page. For example, “1/20” indicates that the waypoint was the first of 20 stored.

Note: *Latitude/Longitude crossing points and Abeam/Radial Intercept points are never included in the stored waypoint list.*

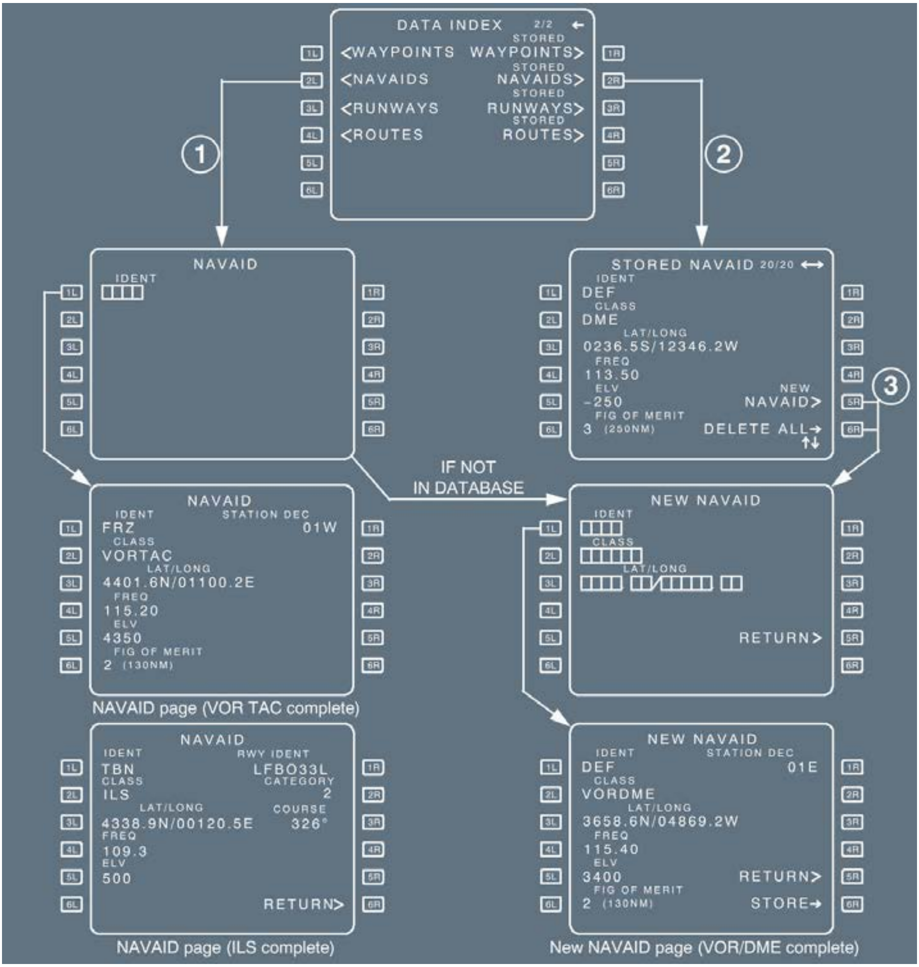
[1L] IDENT	To delete a waypoint, the pilot clears the 1L ident display.
[2L] LAT/LONG	Latitude and longitude of the waypoint are displayed in this field.
[3L]	This field either displays PLACE/BRG /DIST or PLACE-BRG/ PLACE-BRG or PLACE/DIST, depending on how the waypoint was defined.
[5R] NEW WAYPOINT	The pilot presses this key to call up the NEW WAYPOINT page.
[6R] DELETE ALL	The pilot presses this key and the label changes to amber CONFIRM DELETE ALL. Pressing this key a second time deletes all the waypoints, stored by the flight crew, except those currently used in the active or secondary flight plan. (“F-PLN ELEMENT RETAINED” appears on the MCDU).

NEW WAYPOINT PAGE

- The pilot calls up this page by pressing the 5R key on the STORED WAYPOINT page.
- The pilot can use this page to define and store up to 20 waypoints. Entering an additional waypoint deletes the first one.
  The pilot defines a waypoint by entering its ident in the data field next to 1L, then by entering its position in the amber boxes.
  The STORE prompt appears next to 6R when the boxes are filled in, and the pilot presses the key to store the waypoint in the database.
  If the pilot enters the waypoint's position as place/bearing/distance, or place-bearing/place-bearing, the FMGC computes its latitude and longitude.

NAVAID/STORED NAVAID/NEW NAVAID PAGES

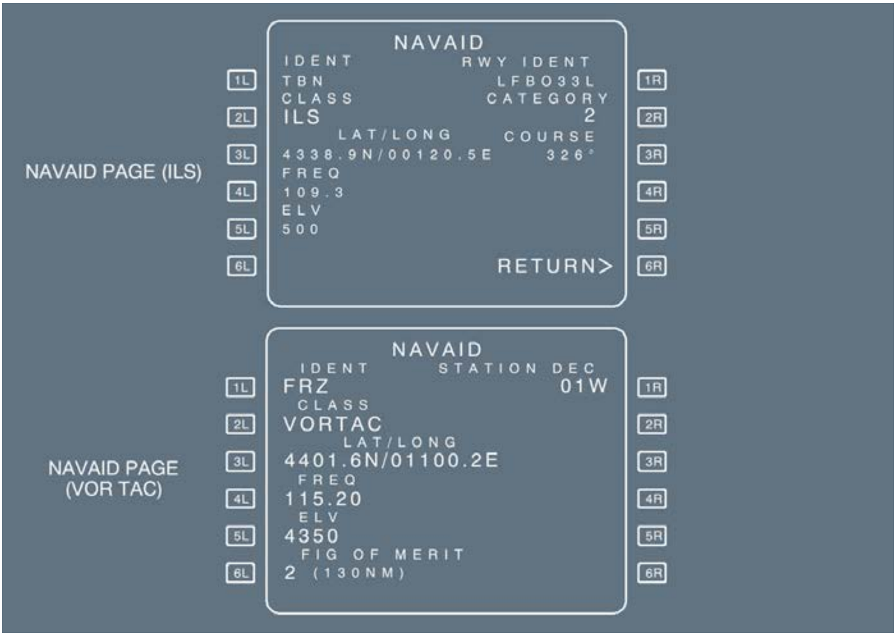
Ident.: DSC-22_20-50-10-25-00000578.0001001 / 01 OCT 12
Applicable to: ALL



NAVAID PAGE

The pilot calls up this page by pressing the 2L key on the DATA INDEX page 2.

This page displays NAVAID information associated with the identifier the pilot inserts in the [1L] field.

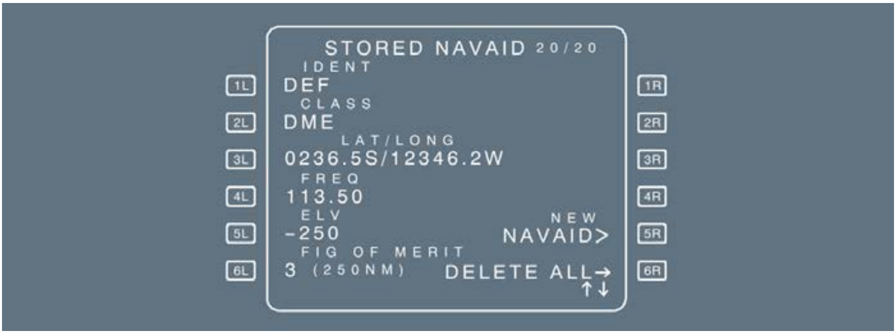


[2L] CLASS	This field identifies the NAVAID as VOR , DME , VOR DME , VORTAC, NDB , LOC , ILS , MLS , ILS /DME , MLS /DME , ILS /TAC or TACAN. It displays NON COLLOCATED, if the NAVAID is uncollocated.
[4L] FREQ or CHAN	CHAN is displayed, if the class of NAVAID is an MLS or an MLS DME.
[5L] ELV	This field gives the NAVAID elevation in feet above sea level. It is not displayed for VOR or NDB.
[6L] FIG OF MERIT	This field shows how far out the FMGS can autotune a VOR , VOR /DME , VORTAC, or DME for display or for computing position. 0 : up to 40 NM 1 : up to 70 NM 2 : up to 130 NM 3 : up to 250 NM

[1R] STATION DEC or RWY IDENT	This is the magnetic declination in the NAVAID area (used only for VOR , VOR /DME, and VORTAC). The field displays RWY IDENT , if the NAVAID is a LOC , ILS , MLS , ILS /DME , MLS /DME or ILS/TAC.
[2R] CATEGORY	This field shows the NAVAID 's category, if it is an ILS , ILS /DME , MLS , MLS /DME or ILS /TAC. A LOC DME has a category = 0.
[3R] COURSE	This is the localizer course, if the NAVAID is an ILS or a LOC.
[6R] RETURN	This prompt is displayed, if the page has been accessed from the SELECTED NAVAID page. The pilot presses this key to return to the SELECTED NAVAID page.

STORED NAVAID PAGE

The pilot calls up this page by pressing the 2R key on the DATA INDEX page. This page is used to display or delete defined and stored NAVAIDs.

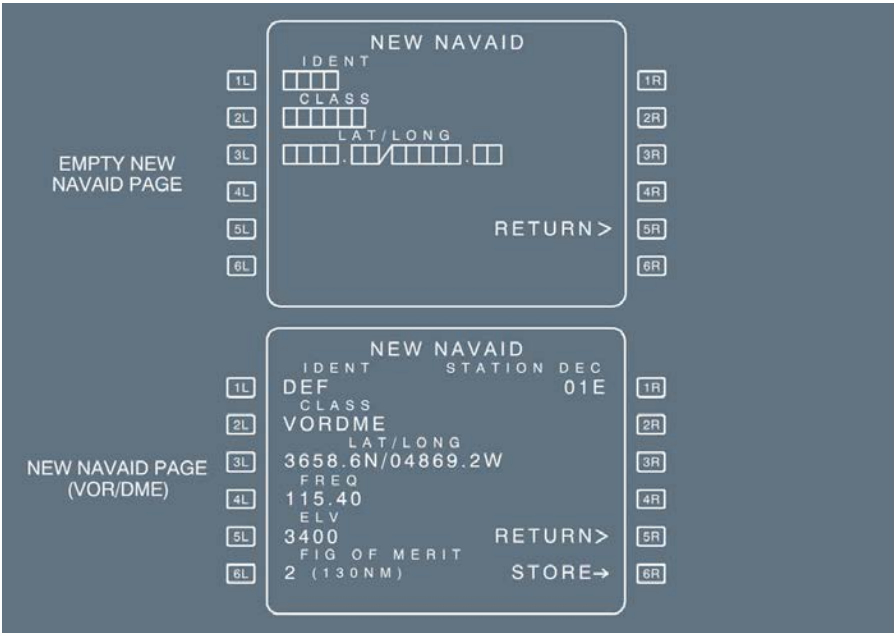


A number in the upper righthand corner of the screen shows the relative order in which the NAVAIDs were stored. (For example, 3/7 means the third out of the seven stored).
Slew keys give the pilot access to the different stored NAVAIDs.

[1L] IDENT	The pilot deletes a stored NAVAID by entering its ident in this field, then by pressing the CLR key at the bottom of the MCDU control panel.
[6R] DELETE ALL and CONFIRM DELETE ALL	The pilot presses this key to erase all the stored NAVAID s, except those currently used in the active or secondary flight plan. (The MCDU displays “F-PLN ELEMENT RETAINED.”).

NEW NAVAID PAGE

The pilot calls up this page by pressing the 5R key on the STORED NAVAID page.



It can be used to define and store up to 20 NAVAID s. Entering an additional waypoint deletes the first one. The NAVAID elements must be entered in two steps:

1. Enter the data in the lines of amber boxes.
2. Enter frequency, elevation, figure of merit, and station declination or ILS category and course, if applicable.

<u>Note:</u> *The pilot cannot create an ILS /DME or an uncollocated NAVAID.*
If the runway associated with the ILS has been entered through the new runway page, the course, IDENT , and runway IDENT are already displayed on the new NAVAID page when it comes up (copied from the new runway page). For details, see the new runway page info below.

[1R] STATION DEC — The pilot must enter the magnetic declination, if the prompt is displayed. This prompt is displayed only for VOR , VORTAC or VOR /DME.

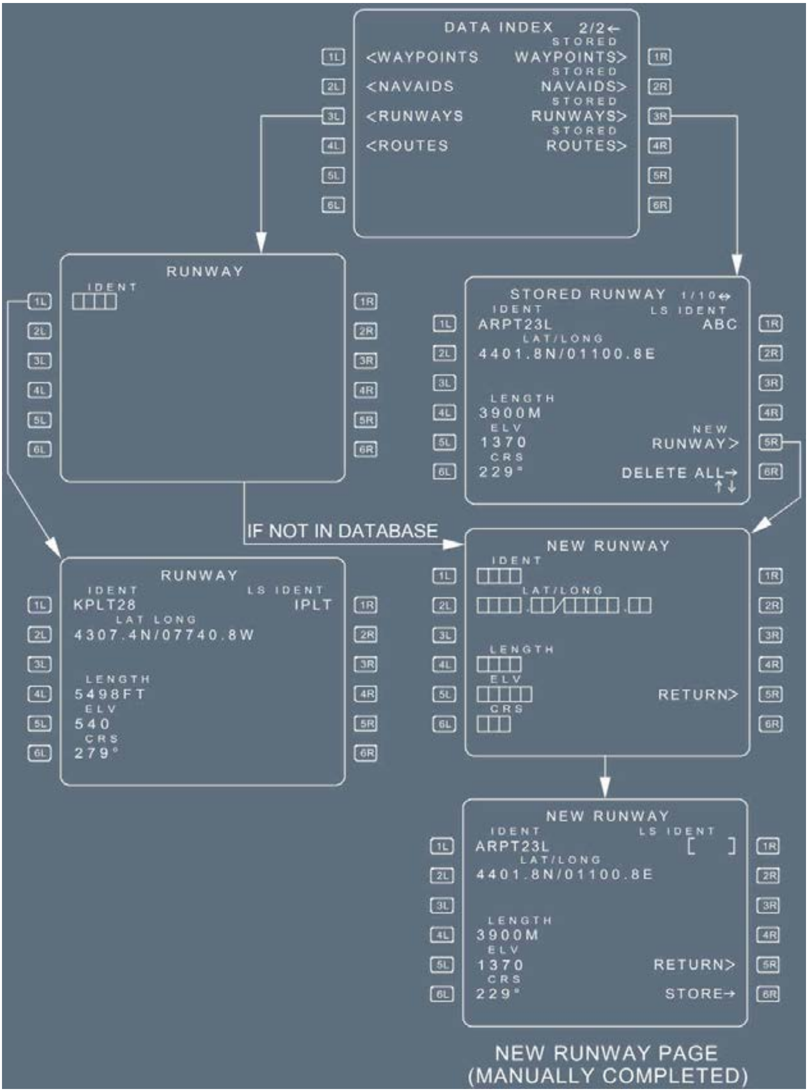
[3R] COURSE — If the NAVAID is an ILS , LOC, enter the course.

[6R] STORE — This prompt appears when all the amber boxes are filled in. The pilot presses the key to store the NAVAID.

A stored NAVAID is never used for position computation.

RUNWAYS/STORED RUNWAYS/NEW RUNWAY PAGES

Ident.: DSC-22_20-50-10-25-00000579.0001001 / 17 MAR 11
Applicable to: ALL



RUNWAY PAGE

This page displays the following information:

[1L] IDENT	The runway IDENT, which comprises the airport identification and the runway direction, uses six or seven digits (Example: CYYZ 24L and LFRJ 08).
[2L] LAT/LONG	The latitude and longitude of the runway threshold.
[4L] LENGTH	The runway length in meters (M) or feet (ft), in five digits (9 999 ft).
[5L] ELV	The elevation of the threshold in feet above sea level.
[6L] CRS	The runway course (degrees magnetic).
[1R] LS IDENT	The LOC or ILS identifier.

STORED RUNWAY PAGE

The pilot uses this page to display or delete the defined and stored runways. The stored runways are listed and numbered in the order in which they were inserted. The number is displayed in the upper righthand corner of the page. (For example, 2/4 means the runway is the second of the four stored runways).
The pilot can delete any stored runway from the database by displaying its IDENT in the 1L field, then by pressing the CLR key on the MCDU control panel.

[6R] DELETE ALL and CONFIRM DELETE ALL	The pilot presses this key to erase all the stored runways, except those used in the active or secondary flight plan. (The MCDU displays “F-PLN ELEMENT RETAINED”).
[1L] to [6L]	These fields are similar to the RUNWAY page fields.

NEW RUNWAY PAGE

The pilot can use this page to define and store up to 10 runways.

- **When the pilot enters an ILS /LOC IDENT in the [1R] field the new NAVAID page comes up. When the pilot has entered and stored the necessary data in the new NAVAID page, the new runway page reappears.**

The new runway page and the new NAVAID page (ILS /LOC) are not independent:

- **When the flight crew first defines the ILS /LOC (on the new NAVAID page) the new runway page, when called up, already displays the RWY course, RWY IDENT , and ILS IDENT (copied from the new NAVAID page).**
- **When the flight crew first defines the runway (on the new runway page) the new NAVAID page, when called up, already displays the ILS course, ILS IDENT , and runway IDENT.**

The pilot must enter the two runway directions on two different new runway pages (Example: LFRJ 08 and LFRJ 26) to allow the flight plan to select either one.

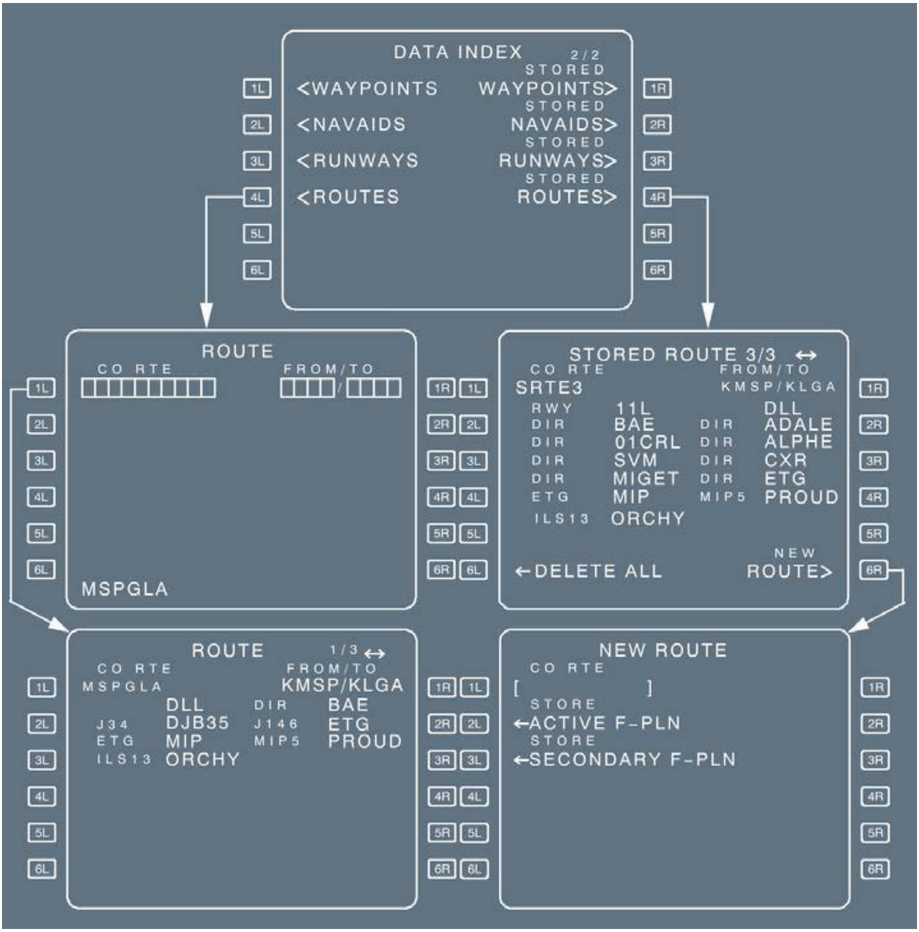
Note: *When 10 runways are stored, entering a new stored runway deletes the first one of the list (1/10).*

[1L] to [6L]	Enter information about the new runway.
[1R] LS IDENT	Enter the ILS /LOC IDENT . The NEW NAVAID page comes up.
[5R] RETURN	The pilot presses this key to return to the NEW NAVAID page.
[6R] STORE	This prompt only appears when all the amber boxes have been filled in.

Note: *The NEW RUNWAY may be used for departure or destination, but no SID or STAR can be associated or stored with this runway. Therefore, the pilot will use it as an “independent” airport.*
A new runway is identified by the 4–letter ICAO airport identifier, although all six or seven digits must be entered.

ROUTE/STORED ROUTE/NEW ROUTE PAGES

Ident.: DSC-22_20-50-10-25-00000580.0001001 / 01 OCT 12
Applicable to: ALL



ROUTE PAGES

(Not-modifiable)

[1L] CO RTE — Any company route IDENT, entered in this field, causes all the elements of the route to be displayed.

Line 2 to Line 6	These lines display the various route elements, including waypoints and airways.
[1R] FROM/TO	This field is automatically filled in, when the pilot enters the IDENT for a company route. When the pilot manually enters a city pair, the MCDU displays “NOT IN DATA BASE” if the city pair is not in the navigation database. If the city pair is in the database, the CO RTE field displays the first route stored (small blue font). If more than one route is stored, the pilot can slew to see the different routes.

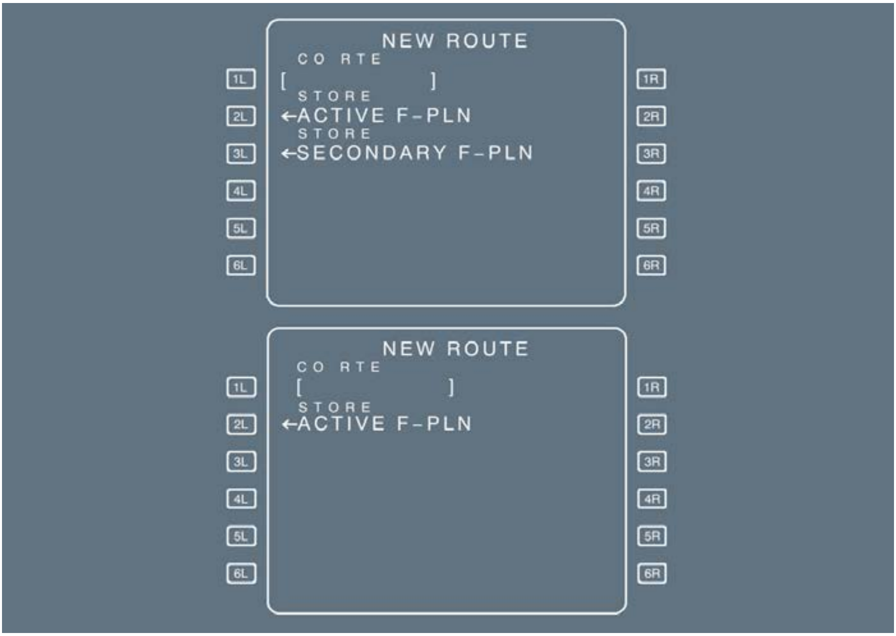
STORED ROUTE PAGE

This page displays up to 5 routes, stored by the pilot. The stored routes are listed and numbered in the order of insertion. The number is displayed in the upper right-hand corner of the page.

[1L] CO RTE	This field identifies the stored route. Clearing this field deletes the stored route.
Line 2 to Line 5	The fields in these lines are identical to the corresponding fields in the route page.
[6L] DELETE ALL	Pressing this key changes the label to amber CONFIRM DELETE ALL. Pressing this key a second time deletes all previously-stored routes.
[1R] FROM/TO	This identifies the city pair of the stored route.
[6R] NEW ROUTE	Pressing this key calls up the new route page.

NEW ROUTE PAGE

The pilot calls up this page by pressing the NEW ROUTE key on the stored route page. It can be used to store up to five new routes that have already been defined in the active or secondary flight plan.



[1L] CO RTE	This field enables the pilot to enter a new company route IDENT . If that IDENT has already been assigned, the entry is rejected.
[2L] STORE ACTIVE F-PLN (blue)	Pressing this key stores parameters of the active flight plan as new route. The display shows this prompt when the system contains a FROM/TO, but only during preflight.
[3L] STORE SECONDARY F-PLN (blue)	Pressing this key stores parameters of the secondary flight plan as new route. The display shows this prompt when the system contains a FROM/TO and the secondary flight plan has not yet been sequenced.

<u>Note:</u>
- *If it has not already been named, a stored route is automatically named when stored: SRTE 1 to SRTE 5.*
- *When 5 routes are already stored, the pilot cannot insert a new stored route. The "STORED ROUTE FULL" message is displayed, and the pilot must manually delete a route in order to store a new one.*
- *Several flight plan elements are not retained when the route is stored:*
  - *Pilot-entered holds*
  - *Offset*
  - *Pilot-entered constraints*
  - *Modifications to terminal procedures*
  - *Pseudo-waypoints*
  - *Step at optimum.*
  - *Pilot-entered constant Mach segment.*
    The MCDU then displays "REVISIONS NOT STORED".

AIRCRAFT STATUS PAGE

Ident.: DSC-22_20-50-10-25-00000581.0001001 / 28 APR 14
Applicable to: ALL

The system automatically displays this page at power up, but the pilot may also call it up by pressing the DATA key on the MCDU console.

TITLE	AIRCRAFT TYPE
[1L] ENGINE TYPE	The system uses this to calculate predictions.

<u>Note:</u> *When the same performance database is used for various aircraft configurations, the aircraft type displayed may differ from the actual aircraft.*

[2L] ACTIVE DATABASE	The validity period and part number are displayed in large font.
[3L] SECOND DATABASE	The validity period is displayed in small font. The pilot can press the 3L key to switch to the second database as the active database.

CAUTION	Cycling the database erases the primary and secondary flight plans, as well as the stored data. The flight crew must never do this in flight.

[5L] CHG CODE	This field allows the entry of a code to change the IDLE and/or PERF factor, displayed in 6L. It is displayed in the PREFLIGHT and DONE phases. The label is displayed in small white font. The brackets, or the entered value, is displayed in large blue font.
[6L] IDLE/PERF	It is only possible to modify these factors when the aircraft is on ground. If no value was entered, the FMS displays default values coded in the Airline Modifiable Information (AMI) file. Default values are displayed in small font, although manually entered values are displayed in large font. When it is necessary to modify the IDLE or the PERF factor: - ENTER the change code in the CHG CODE field [5L]. The default value for this code is “ARM” but it is possible to modify it on airline request (the applicable code is then coded in the Airline Modifiable Information (AMI) file). When a valid change code is entered, the IDLE and PERF factors are displayed in blue. - ENTER the new IDLE and/or PERF factor(s) in the scratchpad. - PRESS the [6L] key to insert the new IDLE and/or PERF factor(s). The new IDLE and/or PERF factor(s) is (are) displayed in large blue font.
[4R] STORED	This field displays pilot-stored data in a large green font. The field is blank, if no data is stored. (The airline can choose to have this data automatically erased at the done phase).
[5R] DELETE ALL	Pressing this key changes the label to amber CONFIRM DELETE ALL. Pressing this key a second time deletes all pilot-stored data, except data that is part of the active and secondary flight plans.
[6R] STATUS/XLOAD	This prompt gives access to the P/N STATUS and P/N XLOAD pages.

P/N XLOAD PAGE

Ident.: DSC-22_20-50-10-25-00000582.0001001 / 17 MAR 11
Applicable to: ALL

This page allows the crossloading of all databases or configuration files part numbers which are different between both sides. Crossloading from this page avoids reviewing each individual P/N STATUS page.

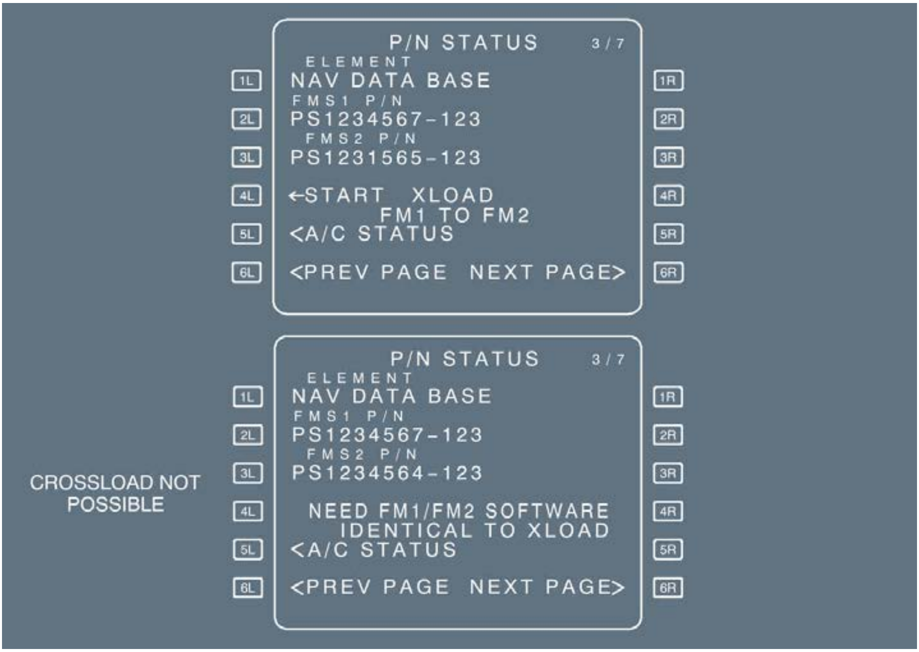
TITLE	P/N XLOAD
[1L]	FMS 1 UPDATE: FMS 1 can be loaded on the right side MCDU. FMS 2 UPDATE: FMS 2 can be loaded on the left side MCDU
[4L]	START XLOAD: This blue prompt is displayed, only if the system detects a difference between both sides' part numbers. FMS 1/FMS 2 IDENTICAL: Displayed in green, when there is no difference between both sides' part numbers.
Line 5	FM 1 TO FM 2 or FM 2 TO FM 1: Indicates the crossloading direction. This line is not displayed when there is no difference between both side part numbers.
[5L]	A/C STATUS: This white prompt is displayed, when there is no crossloading in process. It gives access to the A/C STATUS page. MM: SS MIN REMAINING: Indicates the time remaining for crossload completion, when a crossload is in process.
[6L] PREV PAGE	The pilot presses this key to return to the A/C STATUS page.
[6R] NEXT PAGE	Pressing this key calls up the next P/N XLOAD page.

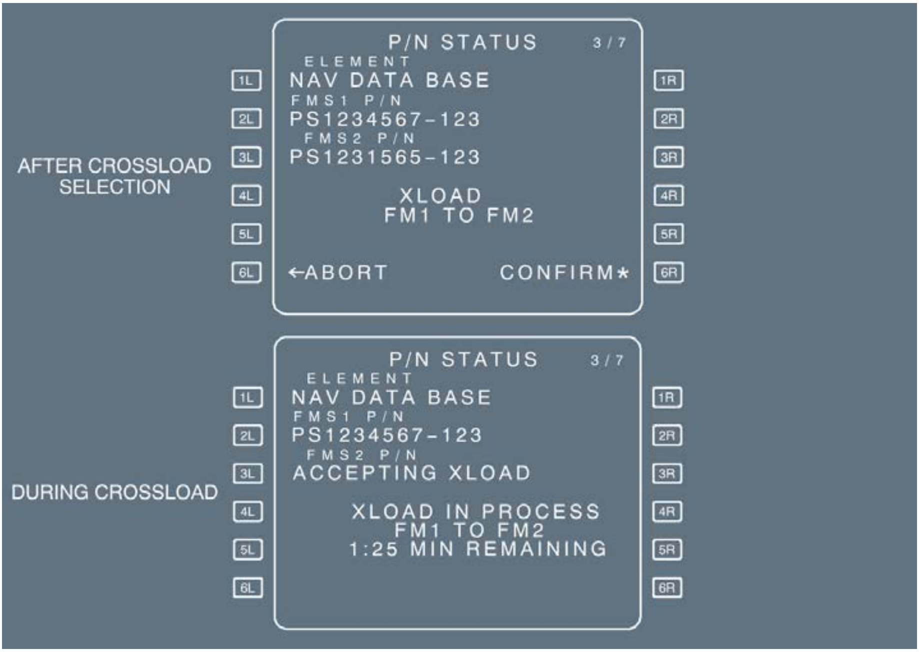
P/N STATUS PAGES

Ident.: DSC-22_20-50-10-25-00000583.0001001 / 01 OCT 12
Applicable to: ALL

These pages allow reviewing and crossloading the following databases and configuration files between both FMS:

- Page 2 FMS SOFTWARE part numbers
- Page 3 NAV DATA BASE part numbers
- Page 4 FM AIRLINE CONFIG part numbers
- Page 5 FM OPTIONS CONFIG part numbers
- Page 6 PERF DATA BASE part numbers
- Page 7 FLIGHT TEST DATA BASE





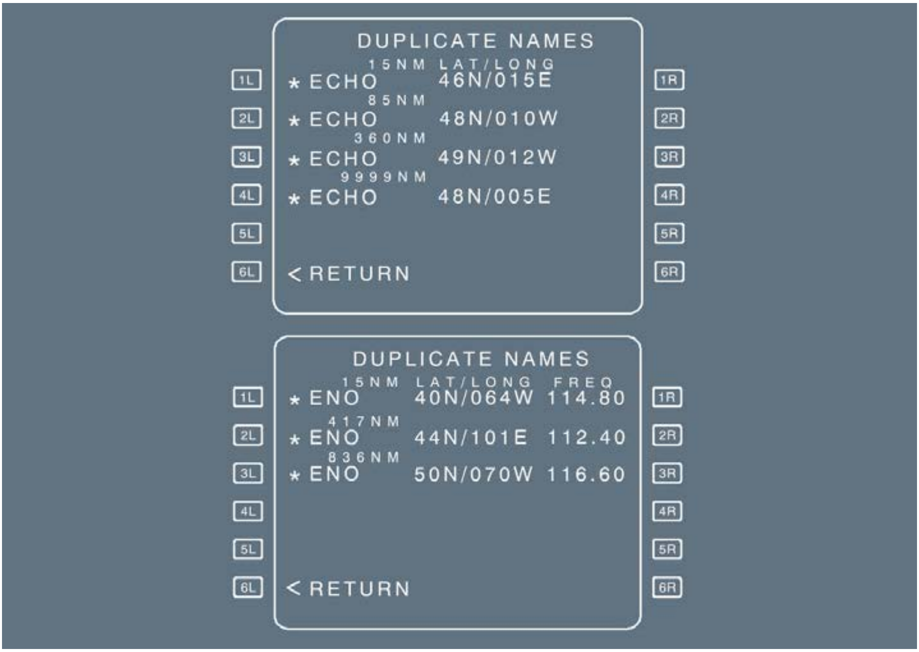
TITLE	P/N STATUS
Line 1 ELEMENT	Indicates the name of the database or configuration file that can be crossloaded: - FMS SOFTWARE on Page 2 - NAV DATA BASE on Page 3 - FM AIRLINE CONFIG on Page 4 - FM OPTIONS CONFIG on Page 5 - PERF DATA BASE on Page 6 - FLIGHT TEST DATABASE on Page 7.
Line 2 FMS1 P/N Line 3 FMS2 P/N	These fields display the part numbers of the database or configuration file (stated on line 1), that are installed on the FMS 1 and 2. Identical part numbers are displayed in green, different ones in amber. During crossload, the updated part number is replaced by the amber "ACCEPTING XLOAD" message.

Line 4	This line is empty when the active flight phase is not Preflight or Done. XLOAD FMx TO FMy or START XLOAD FMx TO FMy: This blue prompt is displayed when the database or configuration file (stated on line 1) can be crossloaded. XLOAD ARMED: Displayed in blue on the receiving FM when the crossload has been requested, but not yet confirmed. XLOAD IN PROCESS: Displayed in white when the crossload is ongoing. XLOAD NOT SUPPORTED: Crossloading is unavailable for this element. NO P/N TO XLOAD: The element is missing. NEED FG 1/FG 2 IDENTICAL TO XLOAD: The receiving side's FG software is incompatible with the FG software to be crossloaded. NEED FM 1/FM 2 SOFTWARE IDENTICAL TO XLOAD: The crossloaded element is incompatible with the receiving side's FM software.
[5L] A/C STATUS	This prompt is available, when no crossload is in process. This gives the pilot access to the aircraft status page. MM: SS MIN REMAINING: Displays the time remaining to complete the crossload, when a crossload is in process.
[6L] PREV PAGE ABORT	This key calls up the previous P/N STATUS page. This amber prompt is displayed when a crossload is in process. The pilot uses it to stop the crossload.
[6R] NEXT PAGE CONFIRM*	This key calls up the next P/N STATUS page. This amber prompt is displayed when a crossload has been armed. The pilot presses it to start the crossload.

DUPLICATE NAMES PAGE

Ident.: DSC-22_20-50-10-25-00000584.0001001 / 01 OCT 12
Applicable to: ALL

This page, which automatically appears, allows the pilot to select a specific waypoint, airport, or NAVAID when the database holds more than one under the same identifier.



The pilot presses the key adjacent to a waypoint, NAVAID, or airport to select it as the one to be entered. When the pilot has finished, the page automatically reverts to the previously displayed page.

DISTANCE

The direct distance to the aircraft is displayed in green above each name. If this distance is greater than 9 999 NM, 9 999 NM is displayed.

LAT /LONG COLUMN

This column lists the rounded off latitudes and longitudes of the different points, using the same identifier.

FREQ/CHAN COLUMN

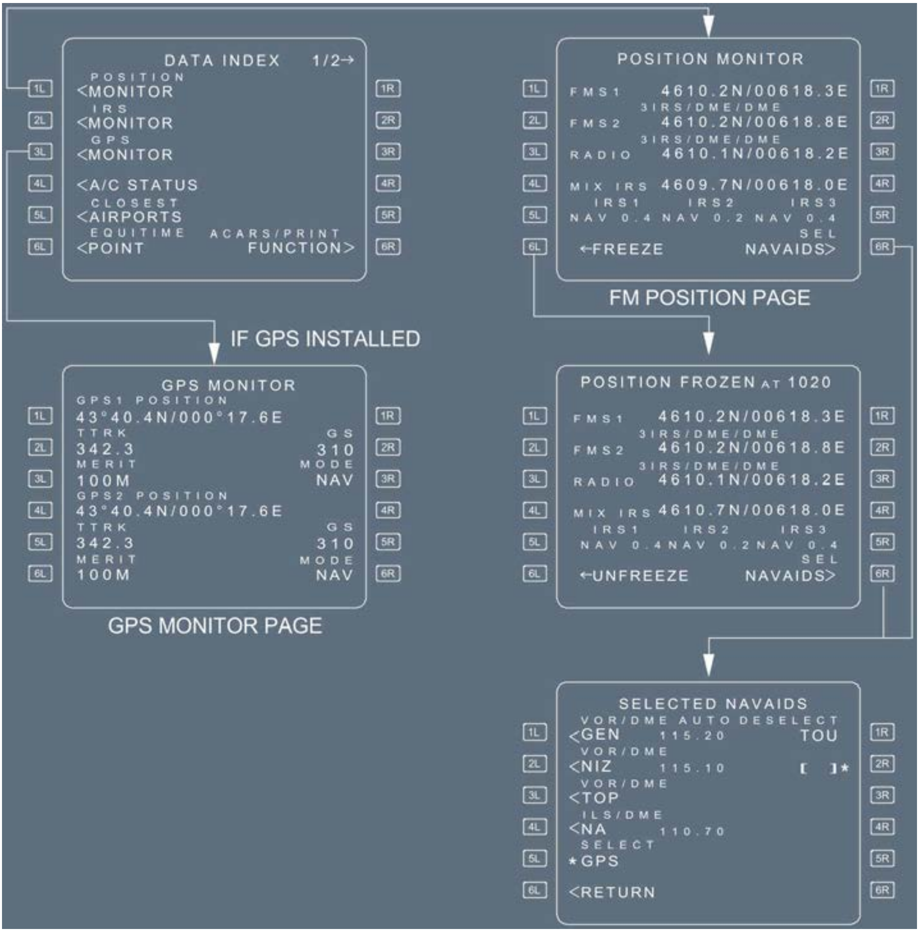
This column lists the NAVAID s frequencies, if any. It displays CHAN for a MLS.

Note:
- *The DUPLICATE NAMES page is not displayed when 2 waypoints with the same IDENT belong to the same airway. The system selects the first waypoint found in the database.*
- *The waypoints or NAVAIDs are ranked by their distance from the aircraft position.*
- *When a waypoint is named using ICAO phonetic alpha characters, a minus sign and the ICAO code of the country where the waypoint is located, are displayed. e.g. Alpha in France becomes A-LF; Bravo in England becomes B-EG.*

POSITION MONITOR PAGE

Ident.: DSC-22_20-50-10-25-00000585.0001001 / 17 MAR 11
Applicable to: ALL

This page displays all the different positions that the FMGC has computed with the various available methods of navigation. It also shows which method obtained each position. (The positions should be almost identical).
The pilot calls up this page by pressing the 1L key on the data index page.



POSITION MONITOR AND POSITION FROZEN PAGE

Ident.: DSC-22_20-50-10-25-00009133.0001001 / 29 MAR 12
Applicable to: ALL

Line 1 FMGC 1	This line shows the latitude and longitude, as calculated by the FMGC 1, and the navigation method used by the FMGC for that calculation (Example: "3 IRS /DME /DME").

Line 2 FMGC 2	This line shows the latitude and longitude, as calculated by the FMGC 2, and the navigation method used.
Line 3 RADIO or GPS or GPIRS	This line shows the latitude and longitude, calculated by the onside FMGC from selected radio NAVAID s (Example: DME /DME , VOR /DME , or LOC) or from GPS or GPIRS.
Line 4 MIX IRS	This line shows the latitude and longitude of the weighted mean inertial reference system (IRS) calculated by the onside FMGC from the available IRSs.
Line 5 IRS 1,2,3	This line shows the deviation in nautical miles of each IRS position from the onside FMGC position. It also displays the IRS mode, which can be INVAL, ALIGN, NAV or ATT. _Note:_ *INVAL is displayed when an ADIRS has failed, or the IRS position is not refreshed.*
[6L] FREEZE/UNFREEZE	The pilot presses this key to freeze (or unfreeze) all the data displayed on the page. When the data is frozen, the title of the page specifies the time at which it was frozen.
[6R] SEL NAVAIDS	The pilot presses this key to access the selected NAVAIDs page.

SELECTED NAVAIDS PAGE

Ident.: DSC-22_20-50-10-25-00000586.0014001 / 03 APR 13
Applicable to: ALL

MODIFIABLE ONLY FOR DESELECTION

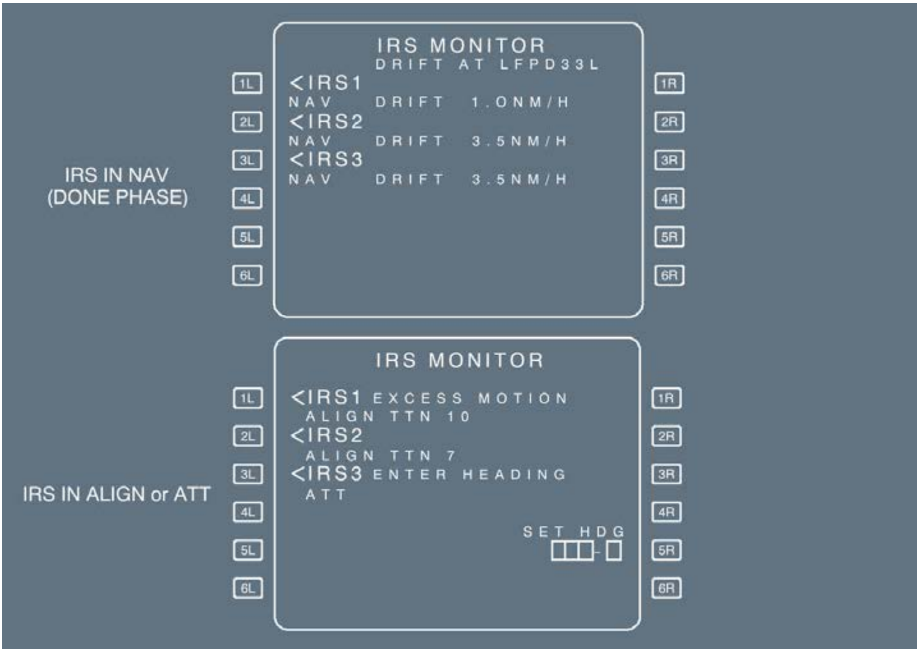
Line 1	This field displays the NAVAID tuned for display purposes, and the tuning mode (AUTO, MAN , or RMP).
Line 2 and 3	These fields display the NAVAID s, if any, tuned for the calculation of radio position by the FMGC.
[4L]	This field displays the tuned ILS, GLS ⊲ , MLS ⊲ , if any.
[5L] DESELECT/SELECT RADIONAV	The flight crew presses this key to manually select or deselect the NAVAIDs. If the flight crew selects (deselects) the NAVAID s for position calculation, “RADIONAV SELECTED” (“RADIONAV DESELECTED”) is displayed in the label line in blue small font and “DESELECT” (“SELECT”) is displayed in white large font. By default NAVAIDs are selected. The deselection of the RADIONAV inhibits use of radio position (either DME /DME or VOR /DME) for position calculation.

[6L] DESELECT/SELECT GPS	The crew presses this key to manually select or deselect the GPS for position computation. Upon transition to the DONE phase, the prompt returns to DESELECT status. If the pilot deselects the GPS , “GPS IS DESELECTED” is displayed when the aircraft is less than 80 NM from the top of descent, or in approach phase.
[1R] DESELECT to [4R]	The pilot deselects a NAVAID by entering its identifier in one of these six fields. Once deselected in this way, the NAVAID can no longer be tuned manually through the entry of its IDENT, nor can it be autotuned for display or determination of the position for the rest of the flight. The deselection is cleared: - Manually, by a CLR action into this field, or - Automatically upon transition to the done or preflight phase, or upon activation of the second database. The pilot may deselect as many as four stations.
[6R] RETURN	The pilot presses this key to return to the POSITION MONITOR page.

IRS MONITOR PAGE

Ident.: DSC-22_20-50-10-25-00000587.0010001 / 01 OCT 12
Applicable to: ALL

This page displays the IRS data. The crew calls up this page by pressing the IRS monitor prompt of the DATA INDEX page.

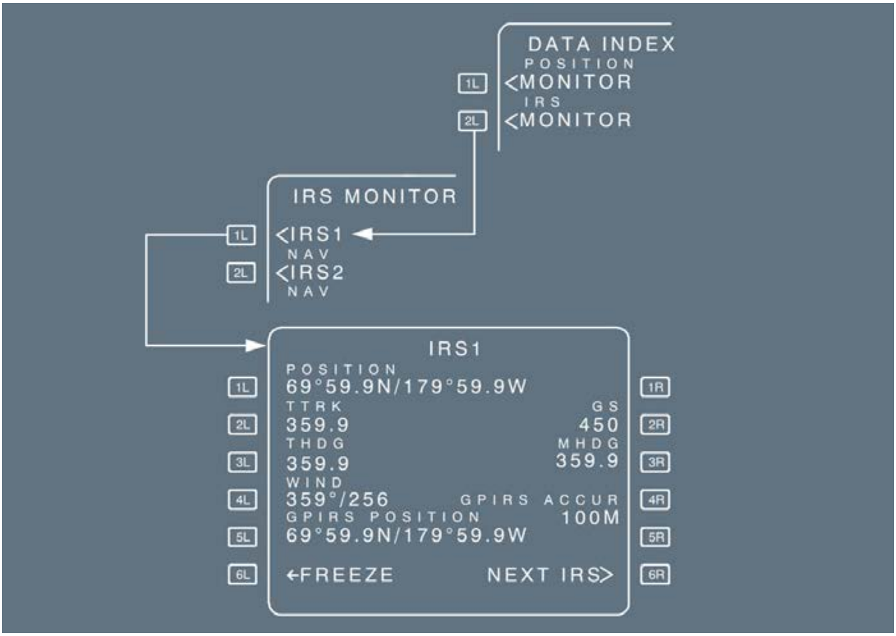


TITLE DRIFT AT XXXX (amber)	Displays “DRIFT AT” runway identifier, if at least one IRS average drift is displayed.
[1L] to [3L] IRS 1(2) (3) (white)	These prompts allow access to the associated IRS pages. Each label line displays the mode (NAV , ALIGN, ATT or INVAL), the average drift (upon transition to DONE phase), and the Time To NAV (if IRS in align) for each IRS.

[1R] to [3R]	Displays the status message of the associated IRS in small green font. List of available messages: IR FAULT CHECK C/B DELAYED MAINT CDU FAULT ENTER PPOS ENTER HEADING SELECT ATT REENTER PPOS EXCESS MOTION SYS BELOW -15 ° SWITCH ADR
[5R] SET HDG (white)	This field is displayed, if at least one IRS is in ATT mode. This function allows initialization of a heading for IRS in ATT mode: - If a heading has been entered in this field, or on the ADIRS panel, the value is displayed in blue. - If not, amber boxes are displayed.

IRS 1 (2)(3) PAGE

This page displays the IRS parameters and GPS /IRS hybrid parameters. The pilot calls up this page by pressing either the 1L key from the IRS MONITOR page, or the NEXT IRS prompt on another IRS page (closed loop).



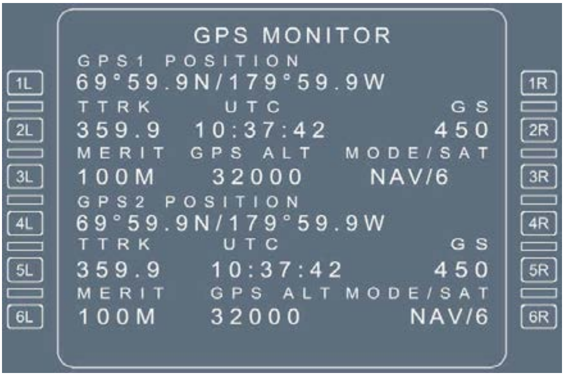
TITLE	Displays the selected IRS in large white font. When data is frozen, IRS is replaced by “IRS FROZEN AT”, followed by the time at which the pilot has frozen the display.
[1L] POSITION	Displays the latitude/longitude given by the selected IRS.
[2L] TTRK	True track
[3L] THDG	True heading
[4L] WIND	True wind direction/velocity
[5L] GPIRS	GPS /IRS hybrid position of the IRS
[6L] FREEZE/UNFREEZE	Allows the crew to freeze or unfreeze all data displayed on all three IRS pages. When the data is frozen, the title of the page specifies the time at which it was frozen. It is automatically unfrozen when exiting the page.
[2R] GS	Ground speed
[3R] MHDG	Magnetic heading
[4R] GPIRS ACCUR	GPS /IRS Figure of Merit (meters or feet)

[6R] NEXT IRS	This prompt enables another IRS page (closed loop IRS 1 → 2 → 3 → 1) to be displayed.

GPS MONITOR PAGE

Ident.: DSC-22_20-50-10-25-00000588.0001001 / 17 MAR 11
Applicable to: ALL

This page displays the GPS data. The pilot calls up this page by pressing the GPS MONITOR prompt of the DATA INDEX page.



Line 1 and 4 GPS 1,2	POSITION
[2L] and [5L] TTRK	GPS 1, 2 true track
[3L] and [6L] MERIT	GPS 1, 2 figure of merit (meters or feet)
[2R] and [5R] GS	GPS 1, 2 ground speed
[3R] and [6R] MODE/SAT	GPS 1, 2 mode (INIT , ACQ, NAV, TEST, FAULT, AIDED or ALTAID) and Number of satellites tracked.

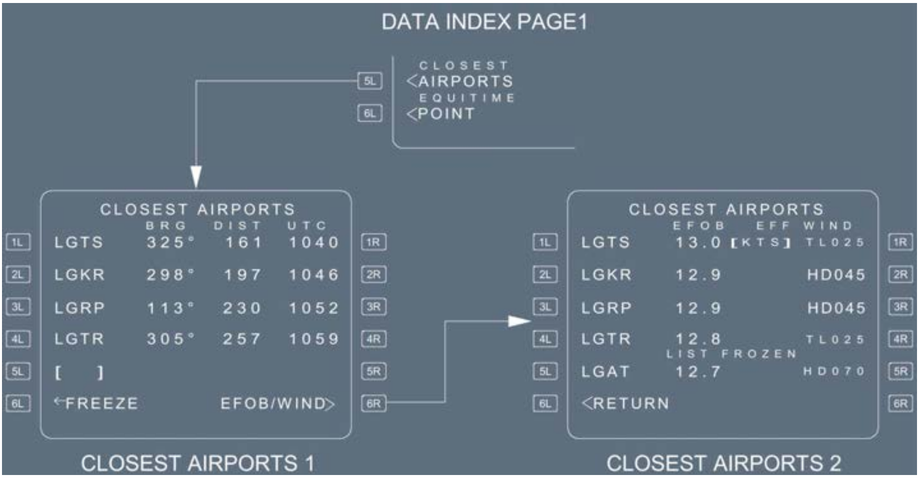
INIT	:	System initialization
ACQ	:	Satellite acquisition
NAV	:	Normal mode
TEST	:	System test
FAULT	:	Invalid system
ALTAID/AIDED	:	Degraded modes. GPS uses aircraft inputs for computation purposes.

[2] and [5] UTC	:	GPS 1, 2 UTC
[3] and [6] GPS ALT	:	GPS altitude is displayed for information purposes. It is not used by the FMGS.

CLOSEST AIRPORTS PAGES

Ident.: DSC-22_20-50-10-25-00000589.0001001 / 17 MAR 11
Applicable to: ALL

The system automatically selects the closest 4 airports from the current aircraft position, and displays them on these pages. A fifth one can be selected by the pilot.
Page 1 displays the bearing, distance, and time to go to each airport; page 2 displays the EFOB and allows the crew to enter an effective wind to be flown to each airport.
The flight crew accesses the CLOSEST AIRPORTS page 1 by pressing the 5L key from the DATA INDEX A page. They access the CLOSEST AIRPORTS page 2 by pressing the EFOB/WIND prompt (6R key) on page 1.



[1L] - [1R] to [4L] - [4R] The closest four airports are extracted from the database, and ranked by distance from the aircraft position.

BRG	Displays the current bearing from the aircraft's position to the airport.
DIST	Displays the current great-circle distance from the aircraft's position to the airport.
TIME or UTC	Displays the predicted time to the airport, computed using the current wind or a wind vector entered on page 2, and the speed according to the current mode (managed or selected). The time is only computed in cruise phase.

[5L]	The crew may enter a fifth airport here, using the 4-letter code. The entry may be modified at any time, even when “LIST FROZEN” is displayed.

If the pilot enters an airport that is not in the database, then “NOT IN DATABASE” appears in the scratchpad.

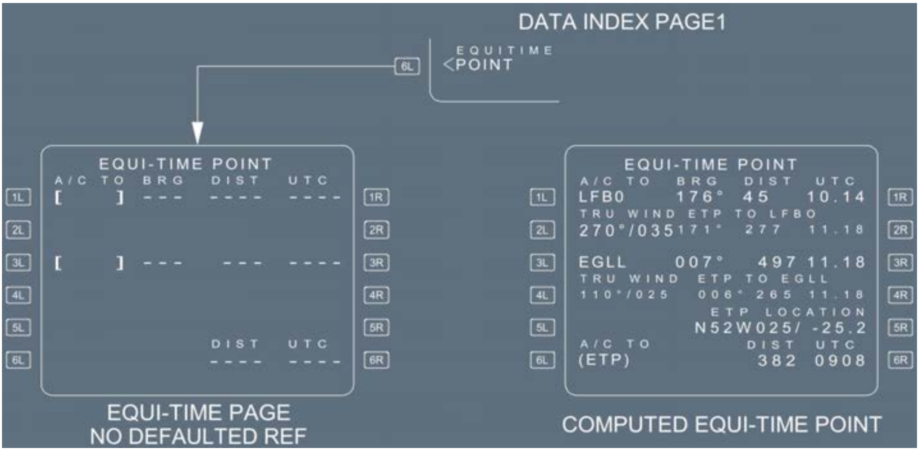
[1L] - [1R] EFOB to [5L]	Displays the EFOB at each airport. EFOB is only computed in cruise phase.
- [5R] EFF WIND	Used to enter an anticipated headwind or tailwind along the bearing to the airport. If the entry is preceded by +, T, or TL, a tailwind is assumed. If the entry is preceded by -, H, or HD, a headwind is assumed. Before pilot entry, a default value may be displayed, based on the current wind. The effective wind is used to compute the EFOB and time to the airport.
[6L] FREEZE/UNFREEZE	This prompt enables the pilot to freeze and unfreeze the list of four airports. The list is automatically frozen when accessing page 2. It will remain frozen upon returning to page 1. The “LIST FROZEN” message is always displayed on page 2.
RETURN	Returns to page 1.
[6R] EFOB/WIND	Gives access to page 2. Pressing this prompt automatically freezes the list of the four closest airports.

Note:
- *If the aircraft position becomes invalid, all fields are dashed, FREEZE/UNFREEZE and EFOB /WIND prompts are removed, LIST FROZEN is displayed, and the A/C POSITION INVALID message is displayed in the scratchpad. Page 2 cannot be accessed.*
- *Predictions (EFOB, TIME) displayed on the page assume:*
  - *ECON CRZ speed (managed) or current selected speed (selected)*
  - *CI (for managed speed only) and CRZ FL from primary F-PLN are kept*
  - *constant wind value*
  - *In case of engine out, the aircraft altitude is the minimum of (CRZ FL , EO MAX ALT)*
  - *Downpath steps are not considered*
  - *Descent fuel burn is a conservative value which only depends on the difference between current CRZ ALT and destination altitude.*

EQUI-TIME POINT PAGE

Ident.: DSC-22_20-50-10-25-00000590.0001001 / 18 DEC 12
Applicable to: ALL

The pilot uses this page to require an equitime point computation between two different points (airport, NAVAID , runway, NDB or waypoint). This pseudo-waypoint (ETP) is displayed on the navigation display along the F-PLN. The EQUI-TIME POINT page is accessed by pressing the 6L key from the DATA INDEX page:



[1L] A/C TO and (blue) [3L]	Displays reference waypoint 1. Displays reference waypoint 2.

<u>Note:</u> *Origin and destination airports are used by default for respective reference points 1 and 2, until a pilot entry is made.*

[1R] BRG/DIST/UTC and [3R] (green)	Displays the bearing, distance, time, from the aircraft's current position to the reference waypoint 1. Displays the bearing, distance, time, from the current position of the aircraft to the reference waypoint 2.

- BRG : Displays the current great-circle bearing from the position of the aircraft to the reference waypoint.
- DIST : Displays the current great-circle distance from the position of the aircraft to the reference waypoint.
- UTC : Displays the predicted time of arrival at the reference waypoint (computed using the current wind or a wind vector, entered by the crew).
  The time is only computed in cruise phase. In other phases, it is dashed.

[2L] and [4L] TRU WIND (blue)	The pilot may enter the wind (direction/velocity) at the reference waypoint and the CRZ FL: This wind is used to compute the time from the aircraft's position to the reference waypoint, and to locate the equitime point. If no entry is made, the wind/velocity field will read zero.

[2R] and [4R] EPT TO XXX (green)	This field displays the bearing distance and the time from the equitime point position (ETP) to the reference waypoint.
[5R] ETP LOCATION	This field displays the ident of the next waypoint following the equitime point. It provides the distance along the flight plan from the equitime point to the indicated waypoint.
[6L] - [6R] A/C TO (ETP) DIST/UTC (green)	This field displays the distance and time from the aircraft's current position to the equitime point along the flight plan. If at least one reference waypoint exists, but no equitime point exists, the field is blank and NO ETP is displayed in 6L.

Note: *The assumptions for the equitime point computation include the cost index, speed managed (with SPD LIM), and winds.*
In case of engine-out, the EO LRC speed is considered.

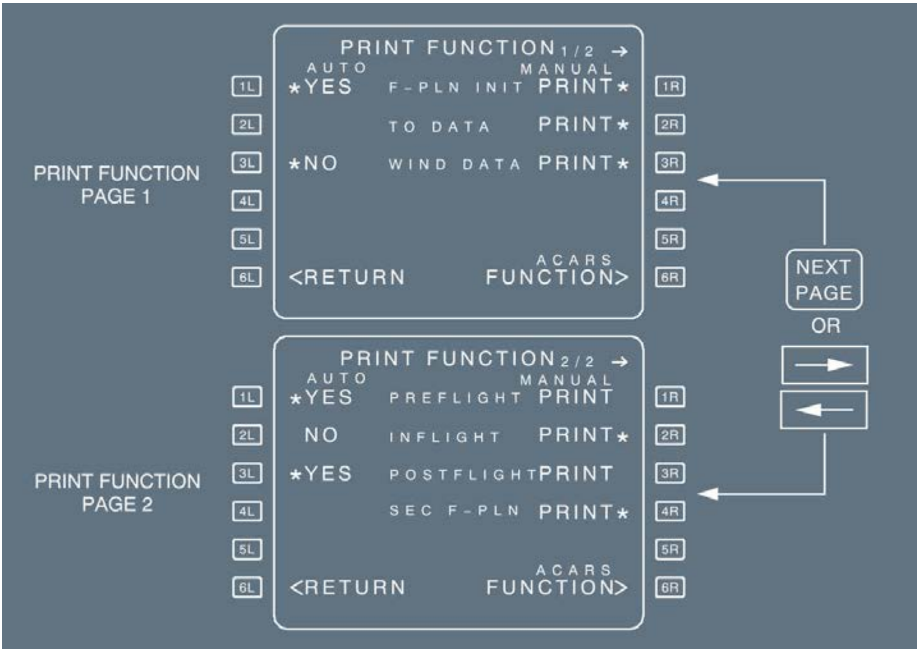
PRINT FUNCTION PAGES

Ident.: DSC-22_20-50-10-25-00000591.0001001 / 01 OCT 12
Applicable to: ALL

The PRINT FUNCTION pages enable the crew to print the data relative to the current flight.

This data comes from 2 different sources:
- ACARS uplink messages, and
- Active data from the current flight.

The pilot may access these pages from the “DATA INDEX” page1/2 by pressing the [6R] ACARS/PRINT FUNCTION key.



PRINT FUNCTION PAGE 1/2

This page displays the status of the automatic printing capabilities, for the uplink messages (left column), and the status of the manual printing capabilities of the current active data (right column).

LEFT COLUMN

AUTO		
* YES (blue)	Line 1:	Uplink messages related to flight plan INIT data are automatically printed when received.
	Line 2:	Uplink messages related to takeoff data are automatically printed when received.
	Line 3:	Uplink messages related to wind data are automatically printed when received.
* NO (blue)	When “NO”, preceded by a star, is displayed in front of a line, automatic printing is deselected. The pilot can reactivate it by pressing the left key of the line.	
NO (without a star)	Automatic printing is internally deactivated for the data of the line. The pilot cannot reactivate it manually.	
Blank	The ACARS function is not available for this line. Uplink messages can neither be received nor automatically printed.	

RIGHT COLUMN

MANUAL	Displays the status of the manual printing capability of the active data (and not of the ACARS uplink data).
PRINT * (amber)	Pressing the right keys prints the following active data: Line 1: Active flight plan INIT data Line 2: Active takeoff data Line 3: Active wind data

If the star is not displayed, printing is not possible.
When the key is pressed, the star is removed until the data is printed.

[6L] RETURN	Pressing this key reverts the display to the DATA INDEX page.
[6R] ACARS FUNCTION	Pressing this key reverts the display to the ACARS FUNCTION page.

PRINT FUNCTION PAGE 2/2

This page describes the printing capabilities of the reports displayed on lines 1 to 4.

LEFT COLUMN

AUTO (white) * YES (blue)	Line 1: The PREFLIGHT report is automatically printed at engine start. Line 2: The INFLIGHT report is automatically printed at takeoff. Line 3: The POSTFLIGHT report is automatically printed at engine shutdown.
* NO (blue)	The report, displayed on the line, is not printed automatically. The pilot can reactivate the function by pressing the left key of the line.
NO (without a star)	Automatic printing is internally deactivated for the report. The pilot cannot reactivate it.

RIGHT COLUMN

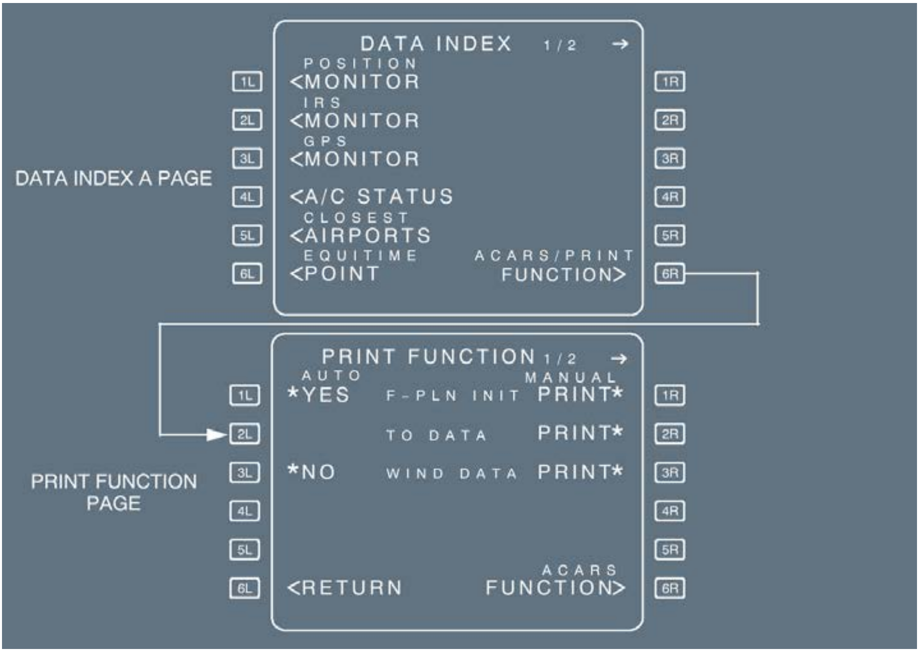
MANUAL PRINT *	Pressing a right key prints the report displayed on the line. If the star is not displayed, printing is not possible. When the key is pressed, the star is removed until the report is printed. For the PREFLIGHT, INFLIGHT and POSTFLIGHT reports, only one type of report is available for printing at any given time, depending on the current flight phase. For the SEC F-PLN report, the print selection start is only displayed if a secondary flight plan exists.

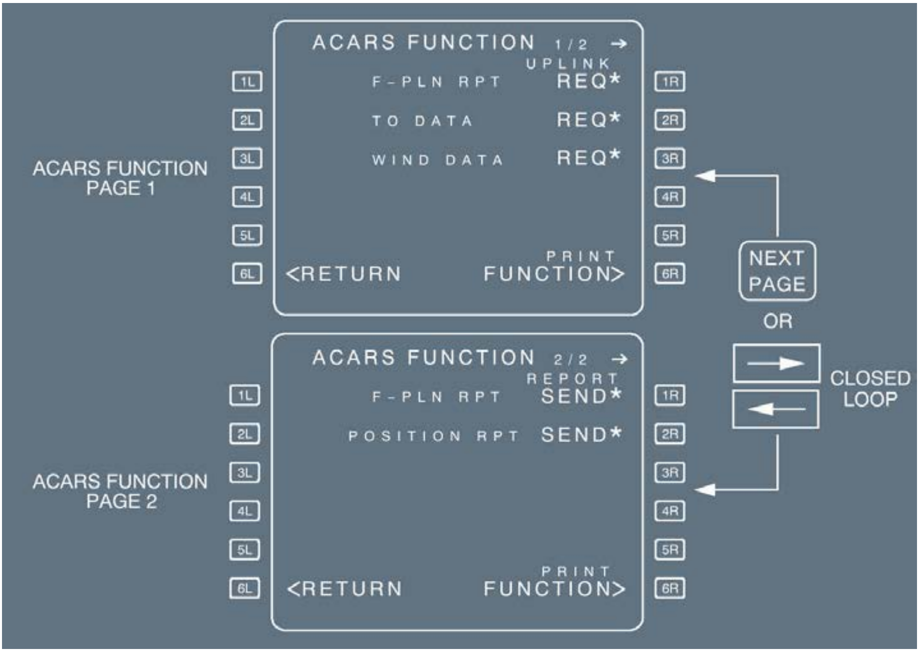
ACARS FUNCTION PAGE

Ident.: DSC-22_20-50-10-25-00000592.0001001 / 01 OCT 12
Applicable to: ALL

The ACARS FUNCTION pages display the functions enabling the crew to send manual requests or reports to the ground.

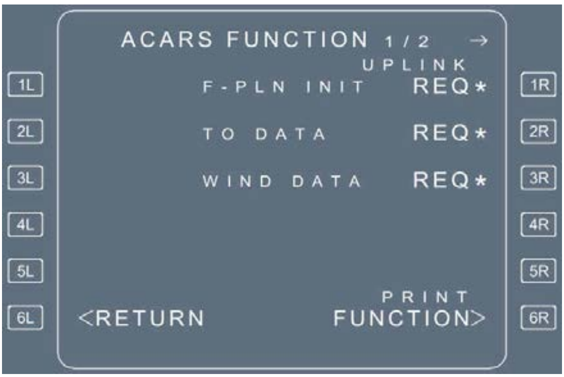
All functions, displayed on pages 1 and 2, may be inhibited through a pin program.
The ACARS /PRINT FUNCTION prompt is displayed on the DATA INDEX page 1/2. Pressing this key displays the PRINT FUNCTION page from which the ACARS FUNCTION page can be accessed.





ACARS FUNCTION PAGE 1

Ident.: DSC-22_20-50-10-25-00000593.0001001 / 17 MAR 11
Applicable to: ALL



TITLE	ACARS FUNCTION 1/2 in white

Line 1 F-PLN INIT REQ*	Pressing this key sends a request for flight plan to the ground (downlink message) The INIT REQUEST prompt of the INIT A page provides the same function.
Line 2 TO DATA REQ*	Pressing this key sends a request for takeoff data. Displayed in the DONE and PREFLIGHT phases. The TO DATA REQUEST prompt of the UPLINK TO DATA REQ page provides the same function.
Line 3 WIND DATA REQ*	Pressing this key sends a request for wind data. The WIND REQUEST prompt of the CLIMB, CRUISE, and DESCENT WIND pages provides the same function.

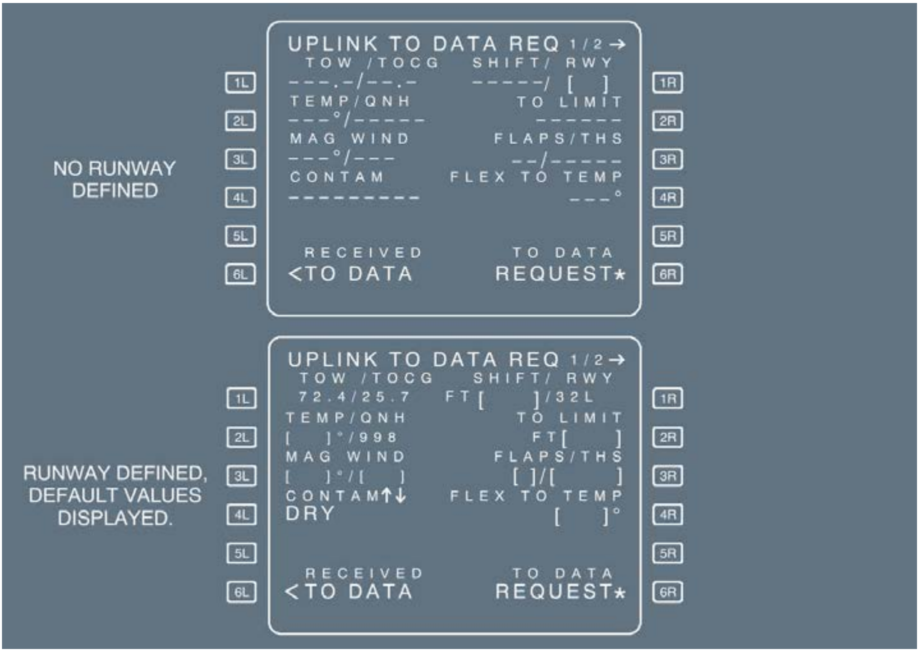
Note: *If "REQ" is not followed by a star, the request cannot be sent (downlink message).*
When a function (line 1 or 2 or 3) is deactivated internally, the corresponding line is blank.

[6L] RETURN	The pilot presses this key to make the display revert to the DATA INDEX page.
[6R] PRINT FUNCTION	The pilot presses this key to access the PRINT FUNCTION page. (*Refer to DSC-22_20-50-10-25 Print Function Pages*).

UPLINK TO DATA REQ PAGES

Ident.: DSC-22_20-50-10-25-00000594.0009001 / 14 MAY 12
Applicable to: ALL

This page allows the flight crew to send a request for takeoff data for up to 2 runways. There is one page for each runway. The page is accessed from the PERF TAKEOFF page, or from the UPLINK XXX (MAX or DRT or FLX) TO DATA page, by pressing the UPLINK TO DATA prompt.



TITLE	White.
[1L] TOW/TOCG (green)	This field is dashed, until a runway is defined in the [1R] field. The TOW /TOCG is defaulted to the values of the INIT B and FUEL PRED pages. If not available, dashes are displayed. It cannot be modified by the pilot.
[2L] TEMP/QNH or QFE (green/blue)	This field is dashed, until a runway is defined in the [1R] field. It displays the temperature at origin and baro setting. TEMP = If the temperature is not defined, blue brackets are displayed, and the flight crew can modify this field according to the weather information. BARO = Defaulted to FCU selection and can be modified by the pilot.
[3L] MAG WIND (blue)	This field is dashed, until a runway is defined in the [1R] field. It displays the wind at the origin. If the wind is not defined, blue brackets are displayed. The pilot can modify this field.

[4L] CONTAM (blue)	This field is dashed, until a runway is defined in the [1R] field. The display is defaulted to DRY. The scroll keys allow the crew to modify the runway contamination. DRY, WET, 1/4 WATER, 1/2 WATER, 1/4 SLUSH, 1/2 SLUSH, COMP SNOW.
[6L] RECEIVED TO DATA	This field calls up the UPLINK MAX (or FLX or DRT) TO DATA page that displays the data received by AOC.

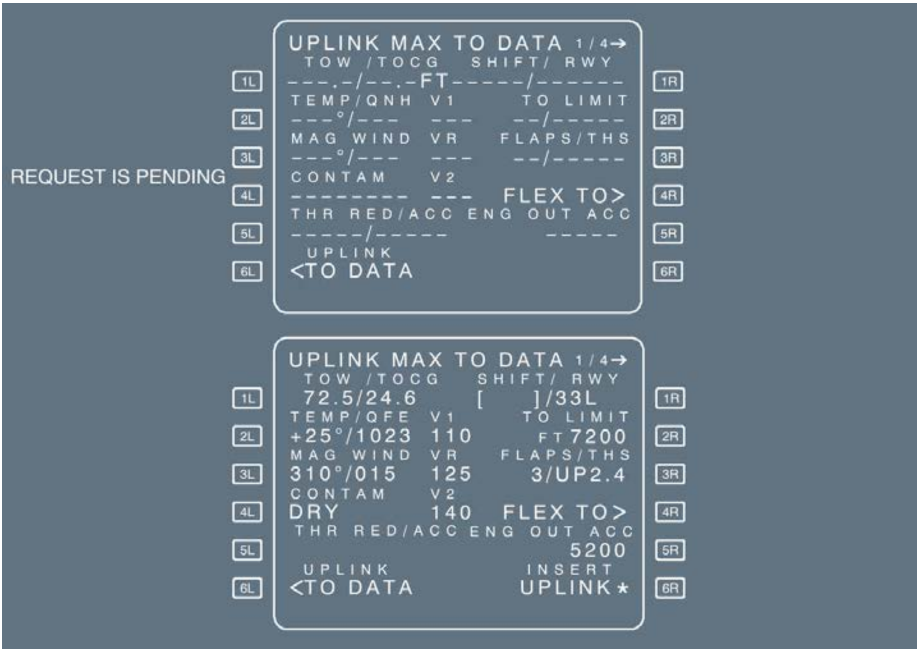
[1R] SHIFT/RWY (blue)	This field is dashed, until a runway is defined in the F-PLN . If a runway is defined in the F-PLN, it is automatically filled in as: SHIFT = Value from the PERF TO page, or blue brackets [ ], if no value is defined. RWY = F-PLN departure runway. The pilot can modify this field.
[2R] TO LIMIT (blue)	It is dashed, until a runway is defined in the [1R] field. It displays blue brackets [ ], when a runway is defined. The pilot may enter a length, considering runway obstacles.
[3R] FLAPS/THS (blue)	This field is dashed, until a runway is defined in the [1R] field; it is then defaulted to values from the PERF TO page. Blue brackets are displayed, if the PERF TO page does not have any defined values.
[4R] FLEX TO TEMP (blue)	This field is dashed, until a runway is defined in the [1R] field; it is then defaulted to values from the PERF TO page. Blue brackets are displayed, if the PERF TO page does not have any defined values. The pilot can modify this field and enter a FLEX TO temperature (FXX).
[6R] TO DATA REQUEST* (amber)	Pressing the key sends the takeoff data request message to the ground. The asterisk disappears when the request is sent. It reappears when the data is available.

Page 2/2 is a page used for requesting a second runway data.

<u>Note:</u> *If the UPLINK TO DATA REQ Page 2 is accessed (Page 1 being filled), the fields of this page are filled with default values after entry of a runway in [1R]. QNH or QFE and wind are common with Page 1.*

UPLINK MAX TO DATA PAGES

Ident.: DSC-22_20-50-10-25-00000595.0010001 / 01 OCT 12
Applicable to: ALL



This page is accessed from the UPLINK TO DATA REQ page by pressing the RECEIVED TO DATA key.
There is a set of 2 pages (MAX TO DATA and FLEX TO DATA) for each of the 4 uplinked runway data. Uplinked data is displayed in green. (It cannot be modified by the flight crew).

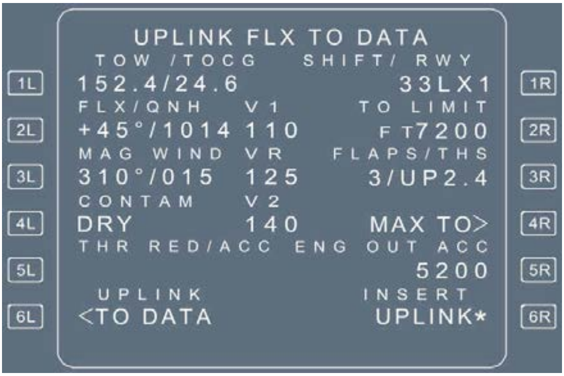
[1L] TOW/TOCG	Uplinked reference Takeoff Gross Weight and Takeoff Center of Gravity.
[2L] TEMP/QNH (or QFE)	Uplinked assumed temperature and BARO setting.
[3L] MAG WIND	Uplinked takeoff runway wind.
[4L] CONTAM	Uplinked takeoff runway contamination.

[5L] THR RED/ACC	Uplinked Thrust Reduction and Acceleration altitudes.
[6L] UPLINK TO DATA	Pressing the key calls up the UPLINK TO DATA REQ page.
V1, VR, V2	Uplinked takeoff speeds.
[1R] SHIFT/RWY	Uplinked TO runway IDENT, runway intersection and position shift.
[2R] TO LIMIT	Uplinked runway length remaining.
[3R] FLAPS/THS	Uplinked FLAPS/SLATS CONF and TRIM position.
[4R] FLEX TO	Pressing this key calls up the UPLINK FLEX TO DATA pages.
[5R] ENG OUT ACC	Uplinked engine-out acceleration altitude.
[6R] INSERT UPLINK*	Uplinked takeoff data is available for insertion. Selecting this prompt inserts the following data on the PERF TO page: - V1 , VR , V2 - THR RED/ACC, ENG OUT ACC altitudes - FLAPS/THS - SHIFT - FLEX The display reverts to the PERF TO page, the asterisk disappears. This field is not displayed, if the runway does not match the active runway. If the runway matches the active runway but the uplinked TOW differs from the current TOW (the uplinked TOW is 3 t greater or 1 t lower than the TOW estimated by the FMS): - The asterisk disappears and the insertion is not possible - The TOW value is displayed in amber in [1L] field.

<u>Note:</u> *All previously-received data is replaced by the new uplinked data.*

UPLINK FLX TO DATA PAGES

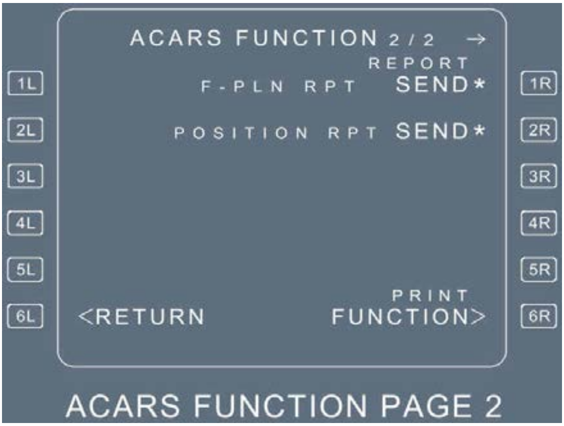
Ident.: DSC-22_20-50-10-25-00000596.0001001 / 23 JUN 15
Applicable to: ALL



TITLE	UPLINK FLX TO DATA.
[2L]	FLX/QNH (or QFE) When the UPLINK FLEX TO DATA page is selected, it displays uplink assumed Flex Temperature and BARO setting (QNH or QFE).
[4R] MAX TO	Pressing this key calls up the MAX TO DATA page. For all other fields, *Refer to DSC-22_20-50-10-25 Uplink MAX TO Data Pages*

ACARS FUNCTION PAGE 2

Ident.: DSC-22_20-50-10-25-00000597.0001001 / 17 MAR 11
Applicable to: ALL



ACARS FUNCTION PAGE 2

Line 1 F-PLN RPT SEND	Pressing this key sends the flight plan report to the ground.
Line 2 POSITION RPT SEND	Pressing this key sends a Position Report to the ground.

<u>*Note:*</u>
- *No report can be sent, if “SEND” is not followed by a star*
- *When a function (line 1 or 2) is deactivated through the navigation database policy file, the corresponding line is blank.*

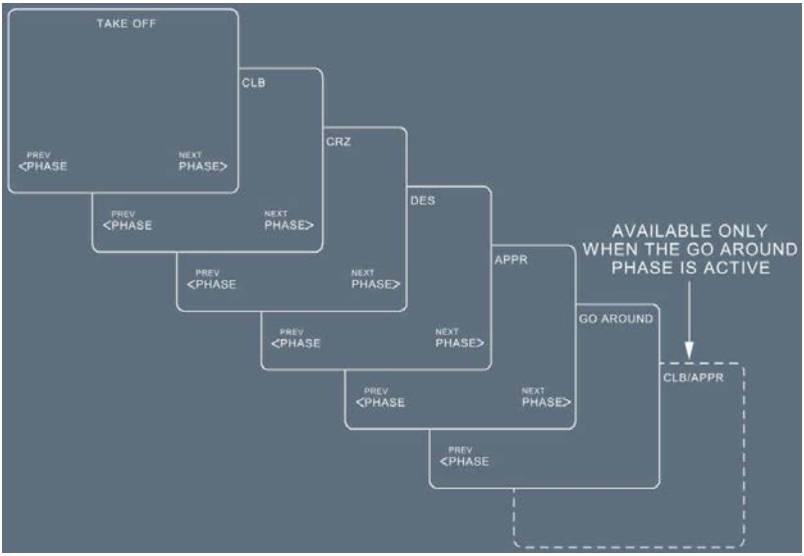
[6L] RETURN	The pilot presses this key to revert to the DATA INDEX page.
[6R] PRINT FUNCTION	The pilot presses this key to access the PRINT FUNCTION page.

PERF PAGE

Ident.: DSC-22_20-50-10-25-00000598.0001001 / 17 MAR 11
Applicable to: ALL

The flight plan is divided into the following phases:
PREFLIGHT, TAKEOFF, CLIMB, CRUISE, DESCENT, APPROACH, GO-AROUND, DONE.
Each phase, except for the preflight and done phases, has a performance (PERF) page. The PERF pages display performance data, speeds related to the various phases, and predictions.
Pressing the PERF key on the MCDU console calls up the performance page for the current active phase. Performance pages, relating to phases already flown, are not available.
In the preflight and done phases, pressing the PERF key brings up the takeoff performance page.

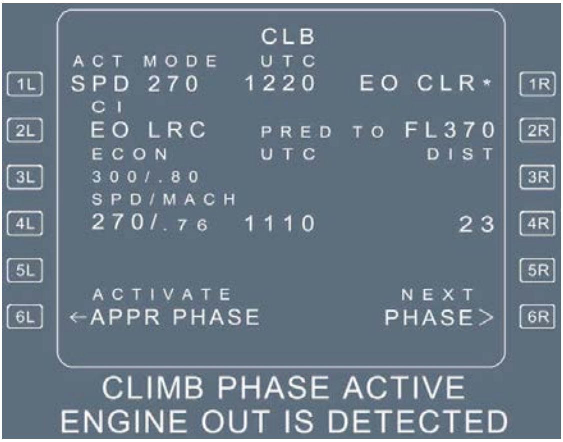
Pressing the PERF key in the done phase makes the phase transition to the preflight phase.



The FMGS flight phases are not related to the FWC flight phases.

Line 6	Fields may display two different prompts, depending upon whether the phase is active or not.
[6L] PREV PHASE	To review the performance page for the previous phase. The prompt is unavailable on the takeoff performance page. It is also unavailable for phases already flown.
[6L] ACTIVATE APPR PHASE	To activate, then confirm, the APPR phase. Available only on the page corresponding to the active phase.
[6R] NEXT PHASE	To review the performance page for the next phase.

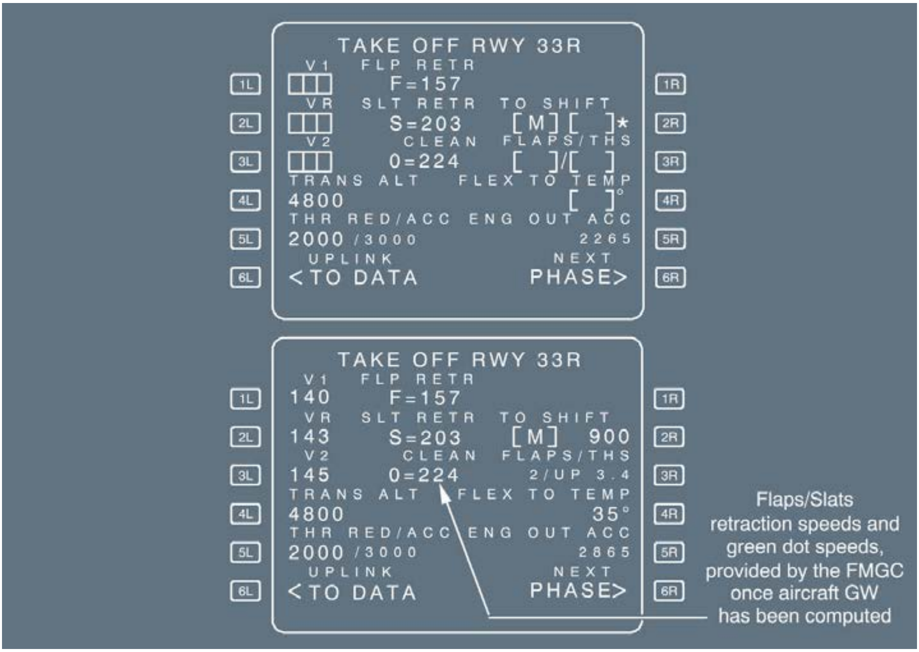
Note: ***Engine-out condition***
- *When the FMGS detects an engine-out condition, the system automatically calls up the performance page for the current flight phase (except when this occurs before the diversion point during takeoff or no EOSID exists in the flight plan) and displays “EO CLR *” in the [1R] field and EO LRC (engine-out long range cruise) in the [2L] field. On the CLB , CRZ and DES (when the descent phase is not active) PERF pages, the pilot can enter a cost index value and overwrite to “EO LRC”. Clearing the cost index reverts to EO LRC.*
  If the pilot presses the [1R] key, the system reverts to the normal processing (with no engine failed) and suppresses the EO information. (Refer to DSC-22_20-30-10-15 General).
- *If the engine-out condition is detected before the diversion point at takeoff, a temporary flight plan is created.*



PERF TAKEOFF PAGE

Ident.: DSC-22_20-50-10-25-00000599.0010001 / 08 JUL 15
Applicable to: ALL

During the preflight phase, the pilot presses the PERF key to call up the takeoff performance page.



TITLE

TAKE OFF RWY is in large green font when the takeoff phase is active, and in large white font when it is inactive. The active flight plan selected runway is displayed in large green font.

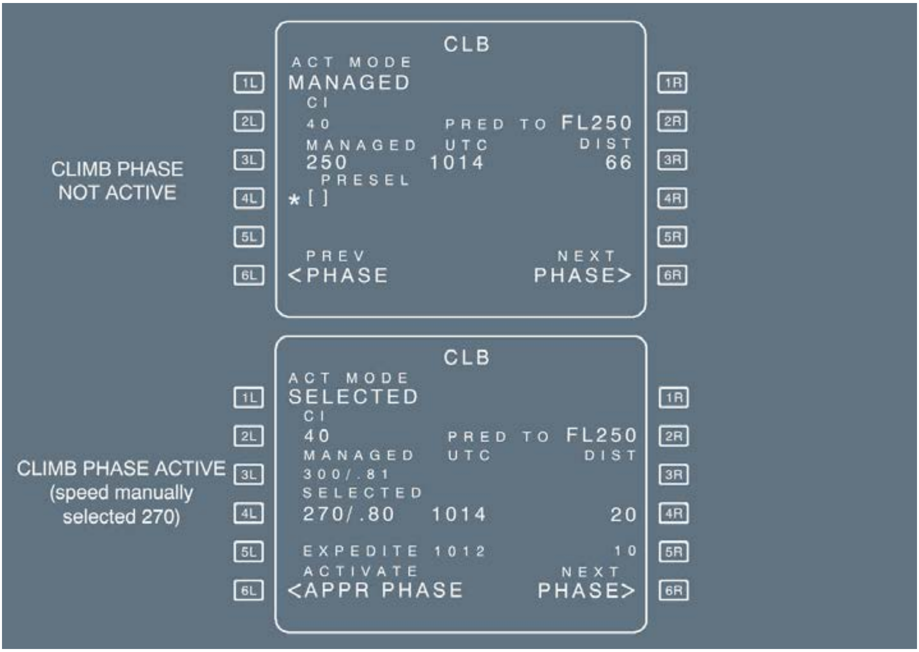
<u>Note:</u> *If the takeoff shift, or the flaps/THS , or the runway is changed after V1 , VR or V2 insertion, but the origin airport remains the same, the MCDU "CHECK TAKE OFF DATA" message appears. All takeoff parameters are retained except in case of runway change. In case of runway change, the parameters are invalidated, but still displayed adjacent to each field. The "CONFIRM TO DATA" prompt in [6R] allows reverting to the previous values.*

[1L] V1 [2L] VR [3L] V2	The boxes remain amber, as long as the pilot does not make entries in them. The pilot can modify any entry, as long as the takeoff phase is not active. *Note:* *1. If the flight crew does not enter V2 , the SRS mode will be unavailable at takeoff.* *2. The MCDU "V1 /VR /V2 DISAGREE" amber message appears if the inserted V1 , VR , V2 speeds do not satisfy the condition: V1 ≤ VR ≤ V2.* *3. The MCDU "TO SPEED TOO LOW" amber message appears if the inserted V1 , VR , V2 speeds do not satisfy the existing regulatory conditions regarding VMCG /VMCA and VS1G speeds.*
[4L] TRANS ALT (transion altitude)	This field displays the navigation database default altitude (if defined) once the origin airport is entered. The pilot can modify it.
[5L] THR RED (thrust reduction altitude)	This is the altitude at which the pilot should reduce the thrust from TOGA /FLX to MAX CLIMB (CL detent) with all engines operative ("CLB " or "LVR CLB " flashing on the FMA). - The thrust reduction altitude defaults to 1 500 ft above the runway elevation, or to the altitude set by the airline - The pilot can modify this altitude: The minimum is 400 ft above the runway elevation.
ACC (Acceleration altitude)	This is the altitude at which the climb phase is triggered. - The target speed jumps to the initial climb speed - The default value is 1 500 ft above runway elevation - The flight crew can modify the value. The minimum value is 400 ft above runway elevation, and it can be higher than, or equal to, or lower than THR RED. *Note:* *- A clearing action reverts both values to the defaulted ones* *- When the flight crew selects an altitude on the FCU that is below THR RED, it brings THR RED and ACC down to this altitude. (The 400 ft minimum still applies).*
[6L] UPLINK TO DATA	This key calls up the UPLINK TO DATA REQ page. It is only displayed in the preflight and done phases.
[1R] EO CLR	EO CLR is displayed when an engine-out is detected and when active flight phase is takeoff.

[2R] TO SHIFT	The takeoff shift is the distance in meters or feet between the beginning of the runway and the aircraft's takeoff position. When taking off from an intersection, the flight crew should insert this value to ensure a correct update of the FM position. The takeoff shift value must be positive, and cannot be greater than the runway length.
[3R] FLAPS/THS	This is a flight crew entry for the positions of the flaps and the trimmable horizontal stabilizer (THS) at takeoff. The flight crew can modify it until takeoff, by entering “UP X.X” or “X.X UP”, or “DN X.X” or “X.X DN ” for the THS.
[4R] FLX TO TEMP	The flight crew inserts the FLX TO temperature for FLX takeoff setting purposes. The flight crew can only enter it during preflight. The system sends it to the FADEC and displays the entered data on the upper ECAM display. The TEMP value is always entered in degrees Celsius.
[5R] ENG OUT ACC	This field displays the engine-out acceleration altitude, as defined in the database, or is manually entered by the flight crew. This is for display only, as a reminder. It cannot be cleared. The above ACC altitude rules of [5L] apply to this field.
[6R] NEXT PAGE or CONFIRM TO DATA*	This key calls up the climb performance page, or allows the flight crew to revert to the previously-entered T.O. parameters, in case of runway change with the same origin airport.

PERF CLIMB PAGE

Ident.: DSC-22_20-50-10-25-00000600.0001001 / 14 MAY 12
Applicable to: ALL

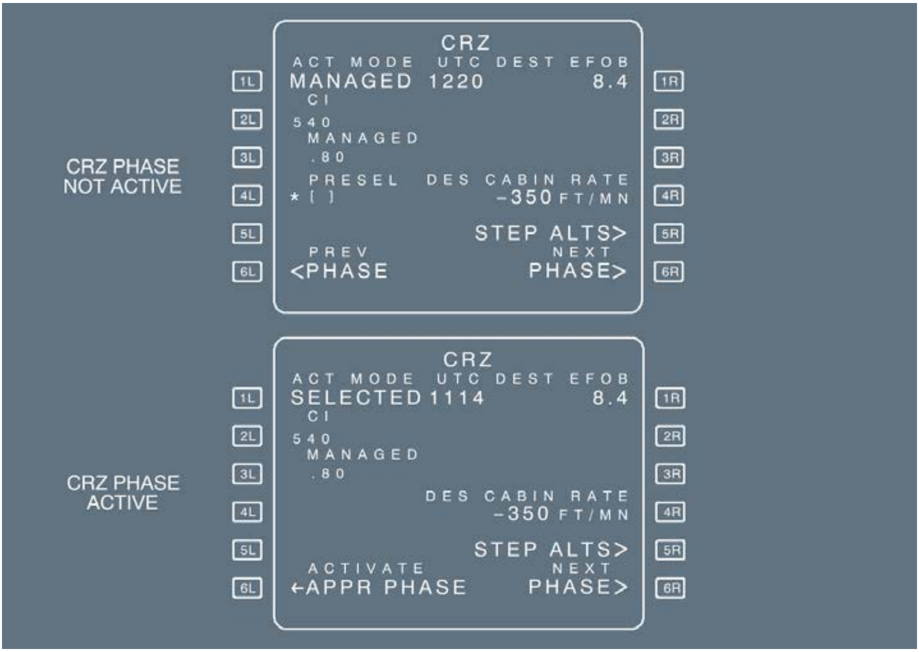


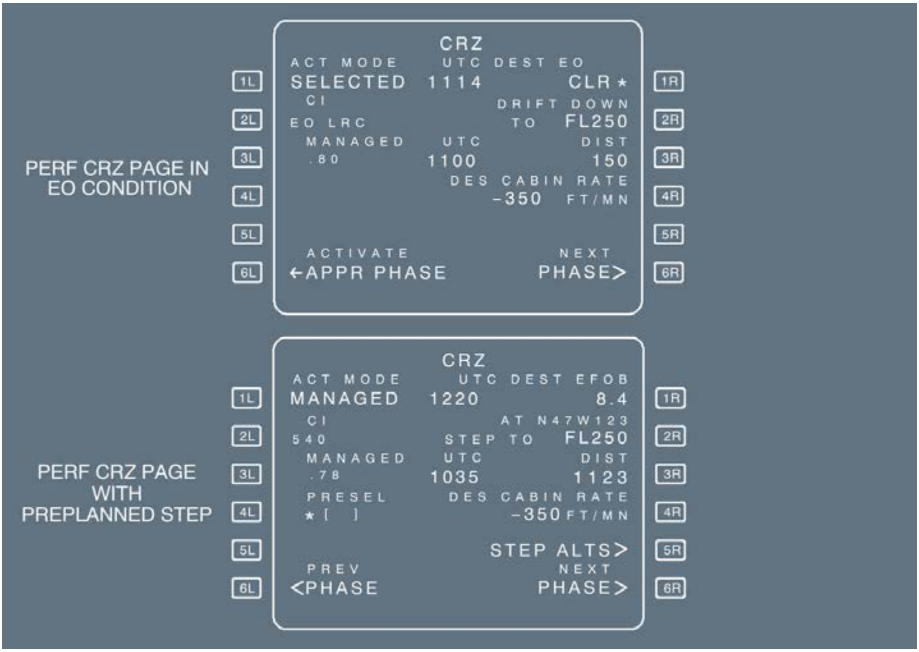
TITLE	CLB is displayed in large white fonts when the climb phase is inactive, and in large green fonts if it is active.
[1L] ACT MODE	This field displays the preselected or active speed mode: SELECTED or MANAGED. The pilot cannot modify it from this field.
[2L] CI (Cost Index)	This field displays the cost index, as initialized on the INIT A or defaulted from the database, or inserted in this field by the pilot. EO LRC automatically replaces the cost index value in case of engine-out.
[3L] MANAGED	This field displays the FMGS computed ECON speed/Mach (*Refer to DSC-22_20-40-10 Optimization*). Before CLIMB phase is active, if the preselected speed mode is SELECTED, a star is displayed next to the MANAGED speed. Pressing the 3L key in this case preselects MANAGED speed, and 4L reverts to brackets.

[4L] PRESEL or SELECTED	If the climb phase is not active: This field displays PRESEL as long as the climb phase is not active. The pilot can enter a preselected speed only. If the climb phase is active: The title of this field becomes SELECTED. This field displays the selected (or preselected) SPD or MACH target. The pilot cannot modify it directly in this field, but can adjust it with the SPD /MACH selection knob on the FCU. If the pilot pushes in the FCU SPD /MACH selection knob to revert to managed speed, the system selects (or reselects) ECON SPD/MACH and [4L] is blank.
[5L] Blank or EXPEDITE	This field is blank as long as the aircraft is in preflight. This field displays this legend when the takeoff or climb phase is active. The flight crew cannot engage EXPEDITE from this field. It indicates the time and distance required to reach the altitude displayed in the 2R field, in case of climb at green dot.
[6L] PREV PHASE	This field displays this legend if climb phase is not active. The pilot presses this key to call up the takeoff page.
[6L] ACTIVATE APPR PHASE	The field displays this legend if the climb phase is active. Pressing this key once displays “CONFIRM APPR PHASE*”. Pressing it again activates the approach phase.
[1R] EO CLR	The system displays the EO CLR prompt in case of engine out in climb.
[2R] PRED TO...	This field displays the target altitude for the predictions shown in 3R, 4R, or 5L. It defaults to FCU altitude, but the pilot can modify it to any altitude below CRZ FL.
[3R] [4R] [5R]	These fields show time and distance predictions for the target altitude selected in [2R], computed for the current vertical mode and speed mode (MANAGED, SELECTED). These fields are displayed only while the takeoff, or climb phase is active.
[6R] NEXT PHASE	The flight crew presses this key to call up the PERF CRZ page.

PERF CRUISE PAGE

Ident.: DSC-22_20-50-10-25-00000601.0009001 / 30 MAR 15
Applicable to: ALL





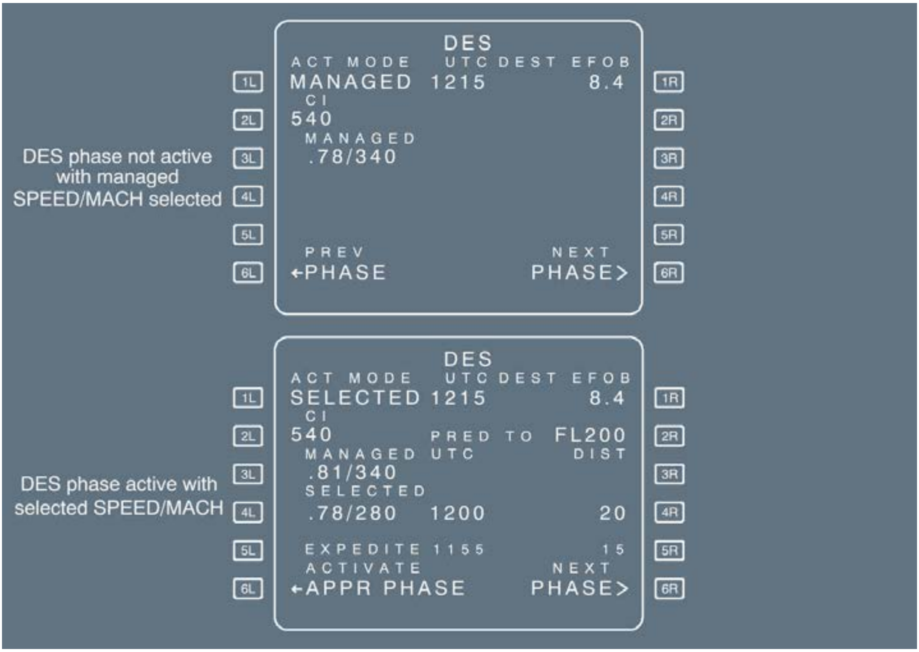
TITLE	CRZ in white large font, when cruise phase is not active, in green large font, when it is.
[1L] ACT MODE	This field shows the preselected or active speed mode: SELECTED or MANAGED. The pilot cannot modify it through this field.
[2L] CI	This field shows the cost index as initialized on the INIT A page or defaulted from the database, or as inserted in this field by the crew. EO LRC replaces automatically the cost index value in case of engine out.
[3L] MANAGED	This field displays the FMGS computed ECON speed/Mach (*Refer to DSC-22_20-40-10 Optimization*). Before CRUISE phase is active, if the preselected speed mode is SELECTED, a star is displayed next to the MANAGED speed. Pressing the 3L key in this case preselects MANAGED speed, and 4L reverts to brackets.

[4L] PRESEL	If cruise phase is not active: The pilot can enter a preselected speed or Mach number. If cruise phase is active: This field is blank. *Note: If the flight crew enters a value in the PRESEL field during the cruise altitude capture (ALT CRZ*), the FCU selected speed may revert to M 0.01.*
[6L] PREV PHASE or	The pilot can press this key to call up the climb page, if the cruise phase is not yet active.
[6L] ACTIVATE APPR PHASE	This field displays this legend if the cruise phase is active. The flight crew presses the key once to change the legend to “CONFIRM APPR PHASE*”. A second press activates the approach phase. *Note: If the pilot activates the approach phase inadvertently, it can reselect the cruise flight level into the progress page to reactivate the cruise phase.*
[1R] TIME/UTC DES EFOB	Before takeoff this field displays the flight time to destination and the predicted remaining fuel on board. If the crew enters an estimated takeoff time, the field displays automatically the predicted arrival time (UTC) at destination. After takeoff it displays the predicted arrival time at destination (UTC) and the remaining fuel on board (DEST EFOB) at destination, in green font. The DEST EFOB field will turn to amber, if the EFOB at destination becomes less than the MIN DEST FOB value displayed on the FUEL PRED page. EO CLR is displayed when an engine-out is detected.
[2R] STEP TO FL XX, DRIFT DOWN TO FL XX, or TO T/D	The field, in combination with 3R, displays the predictions for the step point and the step altitude, the drift down altitude, or the Top of Descent.
[3R] TIME/UTC and DIST	This field displays the time and distance to go to the various points identified in 2R.
[4R] DES CABIN RATE	This field displays MAX [computed DES cabin rate, maximum descent cabin rate]. The pilot may modify the value: the FM recomputes then the top of descent in order to match this value. If the FM cannot match the pilot entry, the FM computed value overwrites the pilot entry. A clear action reverts to the default value (-350 ft/min). DES CAB RATE being a negative value, 'minus” is not a necessary entry.
[5R] STEP ALTS	This key calls up the STEP ALTS page (vertical revision *Refer to DSC-22_20-50-10-25 VERTICAL REVISION Pages*).

[6R] NEXT PHASE	This key calls up the DES page.

PERF DESCENT PAGE

Ident.: DSC-22_20-50-10-25-00000602.0011001 / 23 JUN 15
Applicable to: ALL



TITLE	DES is in large white font if the descent phase is not active; it is in large green font, if it is.
[1L] ACT MODE	This field displays the preselected or active speed mode (MANAGED or SELECTED). The flight crew cannot modify it through this field.
[2L] CI	This field displays the cost index, as initialized on the INIT A page or defaulted from the database, or inserted in this field by the flight crew. The flight crew cannot modify it when the descent phase is active.

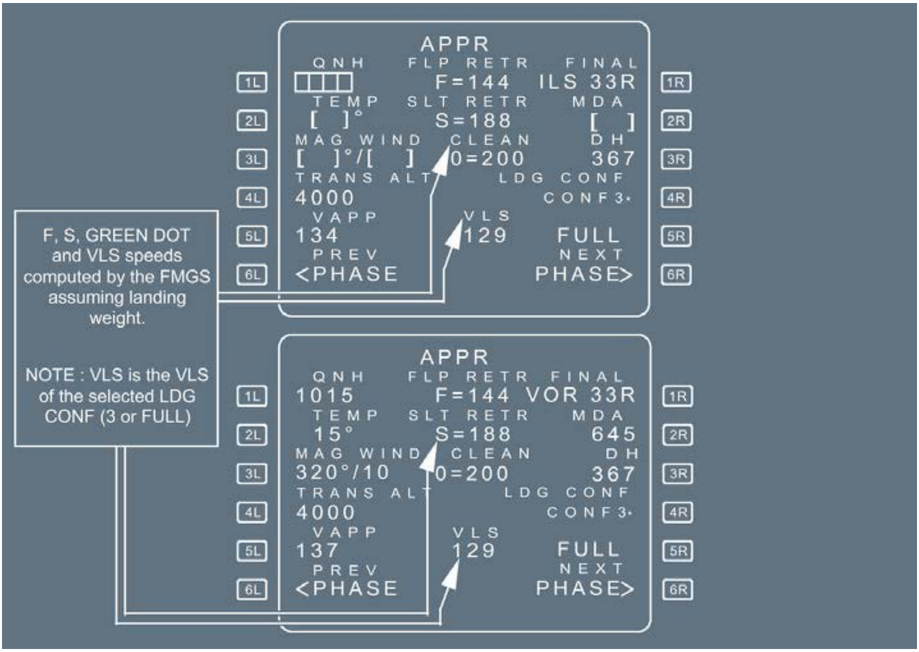
[3L] MANAGED	If the descent phase is not active: Before the flight crew makes any entry. This field displays MANAGED in white, with the associated ECON descent Mach or speed in blue. The crew may overwrite the ECON descent Mach or speed by entering a Mach number or a speed in this field. The system uses the pilot entry to compute the descent profile. The descent may be flown in managed using this new pilot entry. The entry is modifiable. It can be cleared to revert to ECON speed/Mach. If the descent phase is active: The flight crew cannot make an entry in this field. The field displays the ECON speed/Mach or the speed/Mach value previously entered by the pilot.
[4L] blank or SELECTED	If the descent phase is not active, or the descent phase is active but the active speed mode is MANAGED: This field is blank. If the descent phase is active and the active speed mode is SELECTED: The field displays the speed or Mach target manually selected by the pilot. "SELECTED" is displayed in the [1L] field. To modify the field value, the pilot will use the SPD /MACH selector knob of the FCU . [4L] field and FCU window will display the same value. Pushing in the FCU speed selector knob activates the managed SPD/MACH target displayed in the [3L] field.
[5L] Blank or EXPEDITE	If the descent phase is not active this field is blank. Displays this legend if the descent phase is active. It indicates the time and distance required to reach the altitude displayed in the 2R field at MMO /VMO speed. The pilot cannot select the EXPEDITE mode through this field.
[6L] PREV PHASE or ACTIVATE APPR PHASE	This key calls up the cruise phase page if the descent phase is not yet active. Displayed if the descent phase is active. First press causes "CONFIRM APPR PHASE" to be displayed. Second press activates the approach phase.

[1R] TIME/UTC DEST EFOB	Before takeoff, this field displays the flight time to destination and the predicted remaining fuel on board. If the crew enters an estimated takeoff time, the field displays automatically the predicted arrival time (UTC). After takeoff, it displays the predicted arrival time at destination (UTC) and the remaining fuel on board (DEST EFOB) at destination in green font. The DEST EFOB field will turn to amber, if the EFOB at destination becomes less than the MIN DEST FOB value displayed on the FUEL PRED page. EO CLR is displayed when an engine-out is detected.
[2R] PRED TO...	This field displays the target altitude for the predictions in [3R] [4R], or [5R]. The display defaults to the altitude selected on the FCU. The flight crew can modify it to any altitude lower than present altitude.
[3R] [4R] [5R]	These fields display time and distance predictions down to the target altitude selected in [2R], computed for the current vertical mode (DES or OP DES) and the indicated speed mode (MANAGED, SELECTED).
[6R] NEXT PHASE	The pilot presses this key to call up the PERF APPR page.

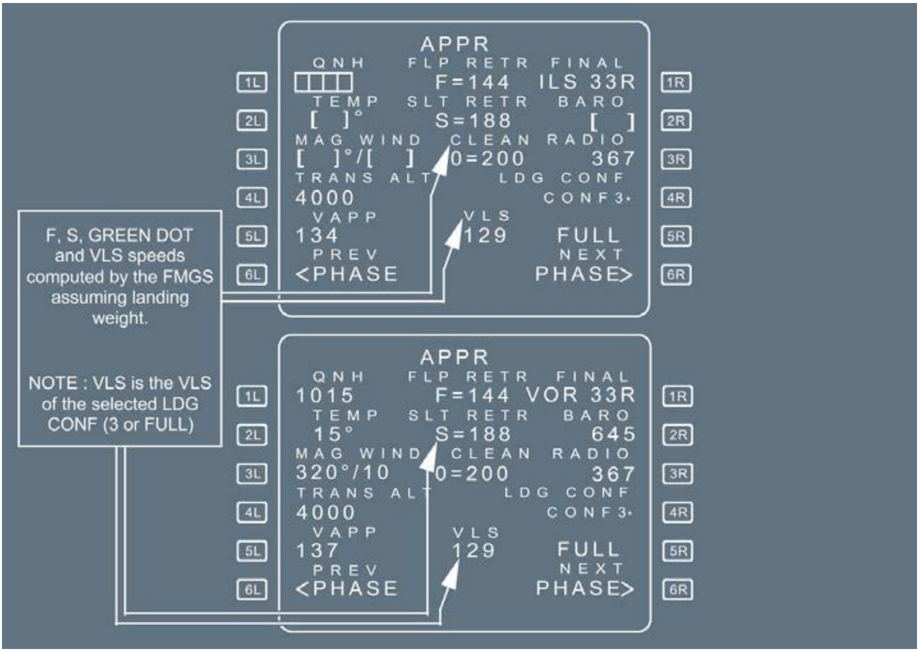
PERF APPR PAGE

Ident.: DSC-22_20-50-10-25-00016132.0002001 / 24 FEB 15
Applicable to: ALL

PERF APPR Page



PERF APPR Page (with BARO/RADIO option)



APPR is in large white font, if the approach phase is not active; it is in large green font, if it is.

[1L] QNH

This field displays brackets, when the aircraft is more than 180 NM from the destination. Inside 180 NM, a mandatory amber box appears. The flight crew must enter the QNH in hPa or in inches of mercury.

- For hPa, enter three or four digits
- For inches of mercury:
  - Enter two digits, or
  - Enter two digits followed by a decimal point and two additional digits.

The system interprets:
- 1 003 as 1 003 hPa;
- 29 as 29.00 in.
- 29.92 as 29.92 in.

Note: *An erroneous entry of an OAT in QNH field, for example 22 °C, or a higher value, is accepted by the system.*

The flight crew can modify this entry at any time.
The Cabin Pressure Controller (CPC) uses the QNH to compute the cabin repressurization segment. Therefore, an erroneous QNH entry may result in a cabin pressurization that is not appropriate.

[2L] TEMP

This field displays the temperature at destination. The field displays brackets until the pilot enters the temperature. The pilot can modify this figure.
The system uses this temperature to refine its computation of the descent profile (ISA model).

[3L] MAG WIND

The flight crew enters the magnetic wind in knots at the destination in this field. The system transmits any entry made in this field to the vertical revision and flight plan B pages (which display wind direction as true, not magnetic).

[4L] TRANS ALT

This field displays the transition altitude taken from the data base (small font) or entered by the flight crew (large font).
The flight crew can modify it at any time.

[5L] VAPP

The FMGC computes this approach speed, using the formula:
VAPP = VLS + 5 + 1/3 of the headwind components (1/3 of the headwind component is limited to 15 kt).
The flight crew can modify VAPP . A clear action reverts VAPP to the computed value.

Note: *VLS = 1.23 VS1G of the selected landing configuration (full or 3).*

[6L] PREV PAGE

This field displays this legend if the approach phase is not active.
Pressing this key calls up the descent performance page.

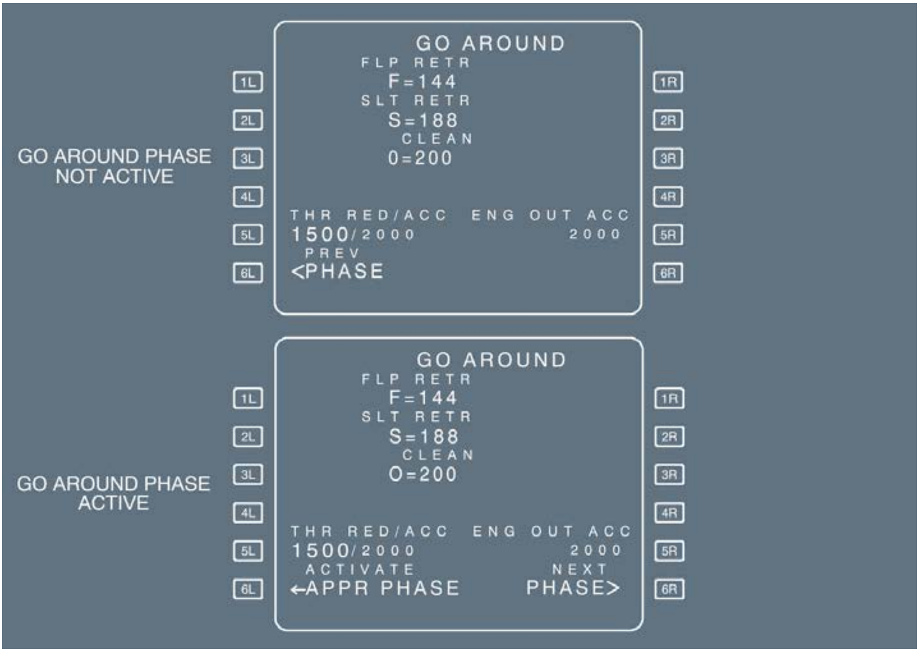
[1R] FINAL	This field displays the approach specified in the flight plan. The flight crew cannot modify it through this field.

[2R] MDA/MDH or BARO ⧆	This field displays:
	- The Minimum Descent Altitude with associated brackets, or
	- The Minimum Descent Height with associated brackets, if:
	  - The QFE pin program is activated, or
	  - The FCU setting is QFE, on aircraft equipped with the BARO ⧆ option.
	
	The flight crew inserts the value, which it can modify at any time. If the flight crew makes an entry in [3R] or changes the approach, it clears this figure.

[3R] DH or RADIO ⧆	If the flight plan includes an ILS approach, this field displays “DH " or "RADIO" ⧆ and empty brackets. The flight crew inserts the decision height. The system will accept an entry of “NO", "NODH" or "NO DH". If the flight crew inserts an MDA or an MDH (or a BARO ⧆ value) in FIELD [2R], this erases the decision height, and this field reverts to brackets. The DH or RADIO range is 0 to 700 ft.
[4R] LDG CONF CONF 3	The flight crew can select configuration 3 by pressing the 4R key. This moves the * down to the [5R] field, which is displaying “FULL"?.
[5R] FULL	The flight crew can use this key to select configuration FULL when necessary configuration FULL is the default landing configuration.
[6R] NEXT PHASE	Pressing this key calls up the go-around performance page.

PERF GO AROUND PAGE

Ident.: DSC-22_20-50-10-25-00000604.0002001 / 01 OCT 12
Applicable to: ALL



TITLE	GO AROUND is in large white font, if the go-around phase is not active; it is in large green font, if it is.

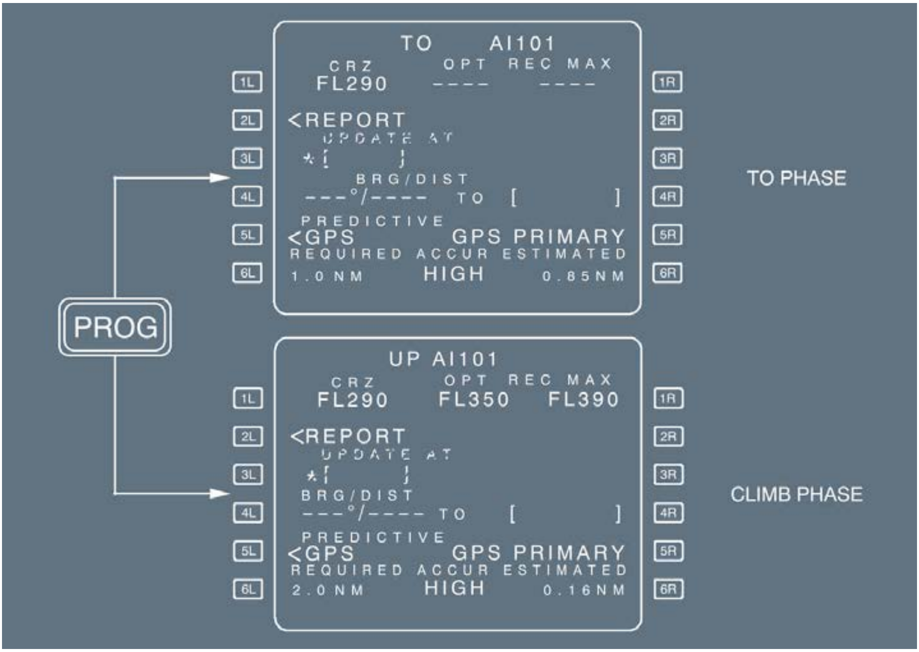
[5L] THR RED ACC	This field displays the thrust reduction altitude and the acceleration altitude. **<u>Thrust reduction altitude:</u>** - Altitude at which thrust must be reduced from takeoff/go-around thrust to maximum climb thrust - "CLB " or "LVR CLB" flashing on flight mode annunciator - Defaults to 1 500 ft above destination runway elevation, or to the altitude set by the airline - Can be modified by the crew (minimum 400 ft above destination runway elevation). **<u>Acceleration altitude:</u>** - Altitude at which target speed jumps to green-dot speed (see the note below) - Defaults to 1 500 ft above destination runway elevation, or to the altitude set by the airline. - Can be modified by the crew, but is always equal to (or higher than) the thrust reduction altitude.
[6L] PREV PHASE or	This field displays this legend if the go-around phase is not active. Pressing the key calls up the PERF APPR page.
ACTIVATE APPR PHASE	This field displays this legend if the go-around phase is active. Pressing it once makes "CONFIRM APPR" appear. A second press activates the approach phase.
[5R] ENG OUT ACC	This display has the same characteristics as the display beside the 5R key on the takeoff page. It is for display only, and the pilot can modify it.
[6R] NEXT PHASE	Pressing this key calls up the PERF APPR page.
[IR] Blank or EO CLR*	This field is normally blank. EO CLR* is displayed when GO AROUND is the active phase and an engine-out condition is detected.

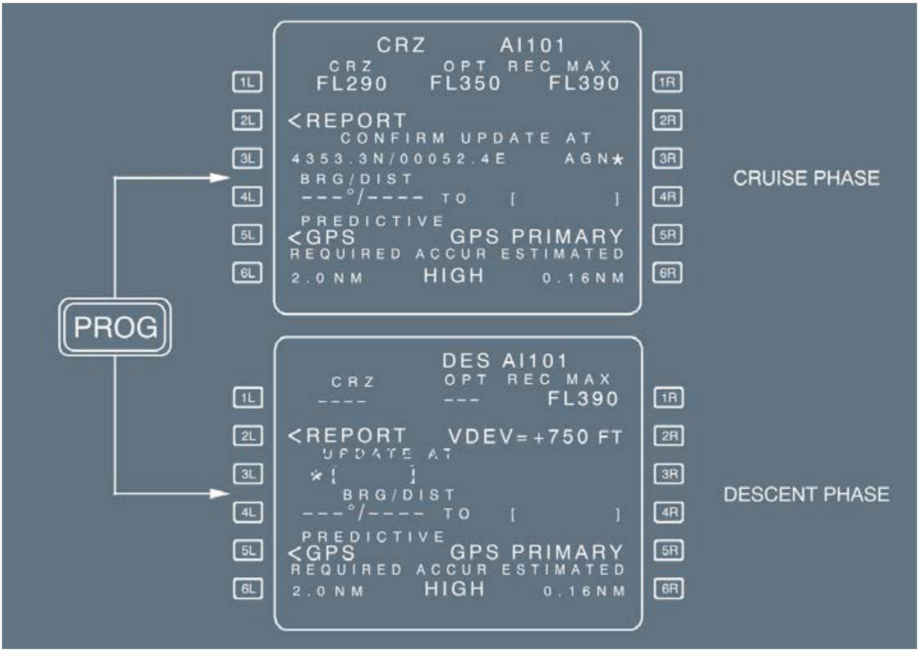
<u>*Note:*</u> *When the go-around phase is active, if the pilot enables ALTN or if the pilot inserts a new destination in the active flight plan and a new cruise flight level on the progress page, the go-around phase shifts automatically into the climb phase. (The target speed jumps from green dot speed to initial climb speed).*

PROG PAGES

Ident.: DSC-22_20-50-10-25-00000605.0051001 / 22 MAR 17
Applicable to: ALL

The progress page is a multifunction page that enables the pilot to:
- Select a new cruise flight level
- Crosscheck the navigation accuracy of the Flight Management (FM) system and validate it
- Update the FM position
- Monitor the descent.



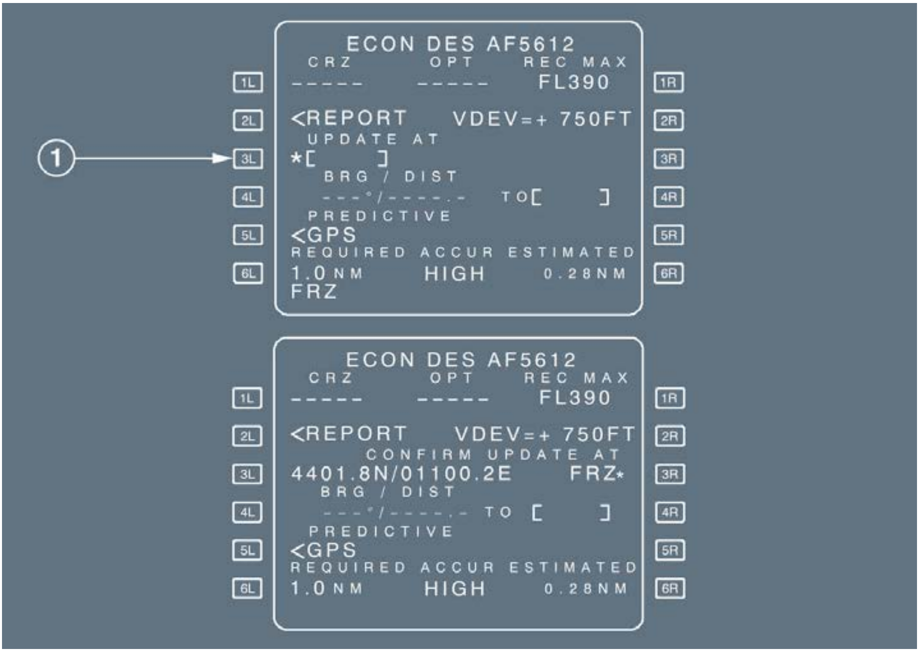


TITLE	Different for each flight phase (see above). The vertical phase is in large green font. The flight number is in large white font. EO is large amber font, if the engine-out condition is detected.
Line 1 CRZ (blue)	This line displays the cruise flight level, inserted on the INIT A page or directly in this field in blue. If the flight crew uses the FCU to select an altitude that is higher than the one displayed in this field, the system changes the number displayed to agree. In this line, the flight crew cannot insert a flight level that is lower than the FCU-selected altitude. This field shows dashes when the descent or approach phase is active.
OPT	This field displays the optimum flight level (in green), that is computed based on the current gross weight, cost index, temperature and wind. This flight level requires a 5 min minimum cruise at a minimum cruise flight level of FL 100. It displays dashes if an engine-out is detected.

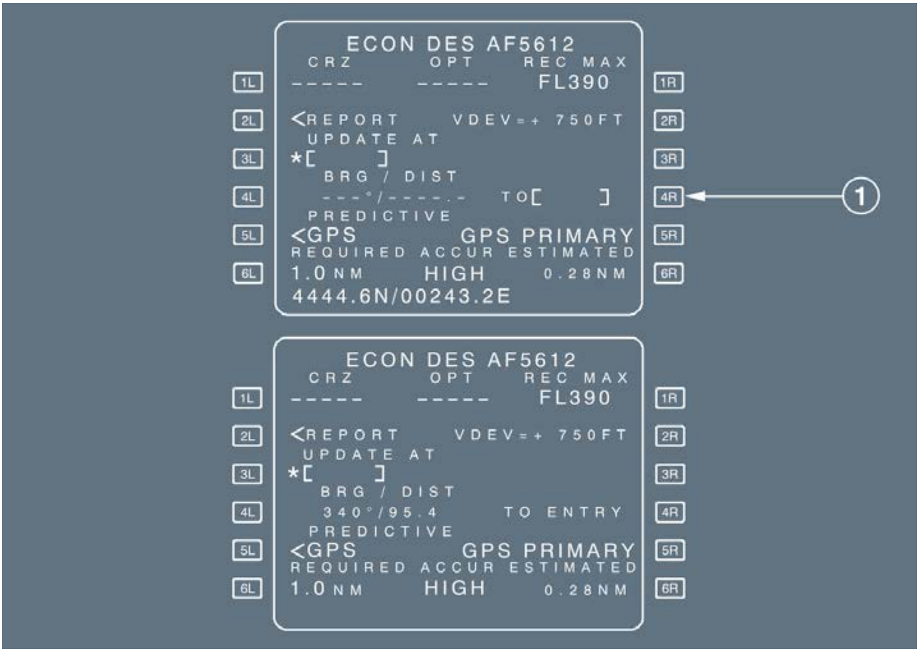
REC MAX	This field displays the recommended maximum altitude (in magenta), that is computed based on the current gross weight and temperature, and assuming that the anti-ice is off (if icing conditions are expected, *Refer to QRH/PER-M Optimum & Maximum Altitudes (Paper Only)* or the performance application of FlySmart with Airbus). It provides the aircraft with a 0.3 g buffet margin, a minimum rate of climb at MAX CL thrust, and level flight at MAX CRZ thrust. This field is limited to FL 398. If one engine is out, this field displays the recommended maximum engine-out altitude, that is computed based on the long-range cruise speed and assuming that anti-ice is off.
[2L] REPORT	This key calls up the REPORT PAGE.
[2R] VDEV	This field is displayed during the descent and approach phases, when NAV mode is engaged, or in HDG mode, provided that the crosstrack error (XTK) is less than 5 NM. It displays the vertical deviation between the aircraft's current altitude and the FMS-computed vertical profile.

Line 3 POSITION UPDATE AT ◁*	The flight crew can update the FMS position via this field by entering either the IDENT of a waypoint, a NAVAID , an airport, a latitude and longitude (LL), a place/bearing/distance, or a place-bearing/place-bearing (PBX). When the flight crew has entered this data, this field changes its format to: “CONFIRM UPDATE AT”, followed by the latitude/longitude and IDENT of the inserted position with an asterisk. The flight crew presses the right-hand key adjacent to the asterisk to confirm the update, when the aircraft overflies the inserted position.

Note: *If no IDENT has been inserted, the field displays “ENTRY” instead of an IDENT.*



Line 4 BRG/DIST	On this line, the pilot can enter an airport, a waypoint, a NAVAID , or a runway. The pilot may enter each as an IDENT , a latitude/longitude (LL), a place/bearing/distance (PBD), or a place-bearing/place-bearing (PBX). The field then shows the FMGC -computed bearing and distance from this site to the aircraft's present position. The last distance digit is in 1/10 of a NM. If it does not have an IDENT, the point is called “ENTRY”. <u>Example:</u> BRG /DIST 340 °/95.4 to ENTRY



[5L] PREDICTIVE GPS This prompt gives access to the PREDICTIVE GPS page.

[5R] GPS PRIMARY This prompt is displayed, when the FMS navigation mode is GPS PRIMARY. When GPS PRIMARY is not available, or navigation mode is not GPS /IRS, this field is blank.
The scratchpad displays the relevant “GPS PRIMARY″ message when this prompt appears; and “GPS PRIMARY LOST”, when the field turns to blank.

[6L] REQUIRED This field displays the default value for the required navigation accuracy level. The pilot can modify it. Provided no pilot entry has been made, the default value changes according to the actual flight area (En route, terminal, approach).

ACCUR HIGH/LOW This field shows the flight management system's estimate of the navigational accuracy. “HIGH” indicates that the FMS estimates that the navigational accuracy matches the accuracy criteria of the area currently flown. “LOW” indicates that the criteria are not matched.

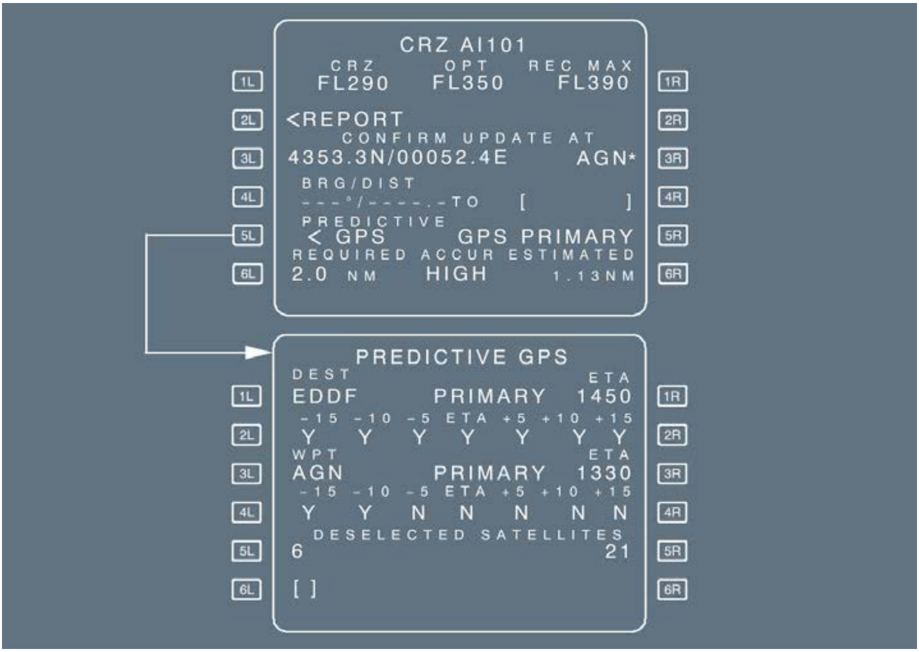
[6R] ESTIMATED This field displays the current estimated navigation accuracy value (EPE) as computed by the FMS.

PREDICTIVE GPS PAGES

Ident.: DSC-22_20-50-10-25-00009139.0001001 / 31 AUG 17
Applicable to: ALL

Note: *1. This page is only operative with Honeywell ADIRS.*
2. This page cannot be used as a substitute to determine pre-flight planning RAIM availability when required by operational regulations. Refer to PRO-NOR-SOP-02 GPS PRIMARY Availability (If Installed).

The pilot accesses this page by pressing the PREDICTIVE GPS prompt of the PROG page.
This page displays information relative to theoretical predictive availability of GPS PRIMARY at destination, and at any waypoint selected by the crew.



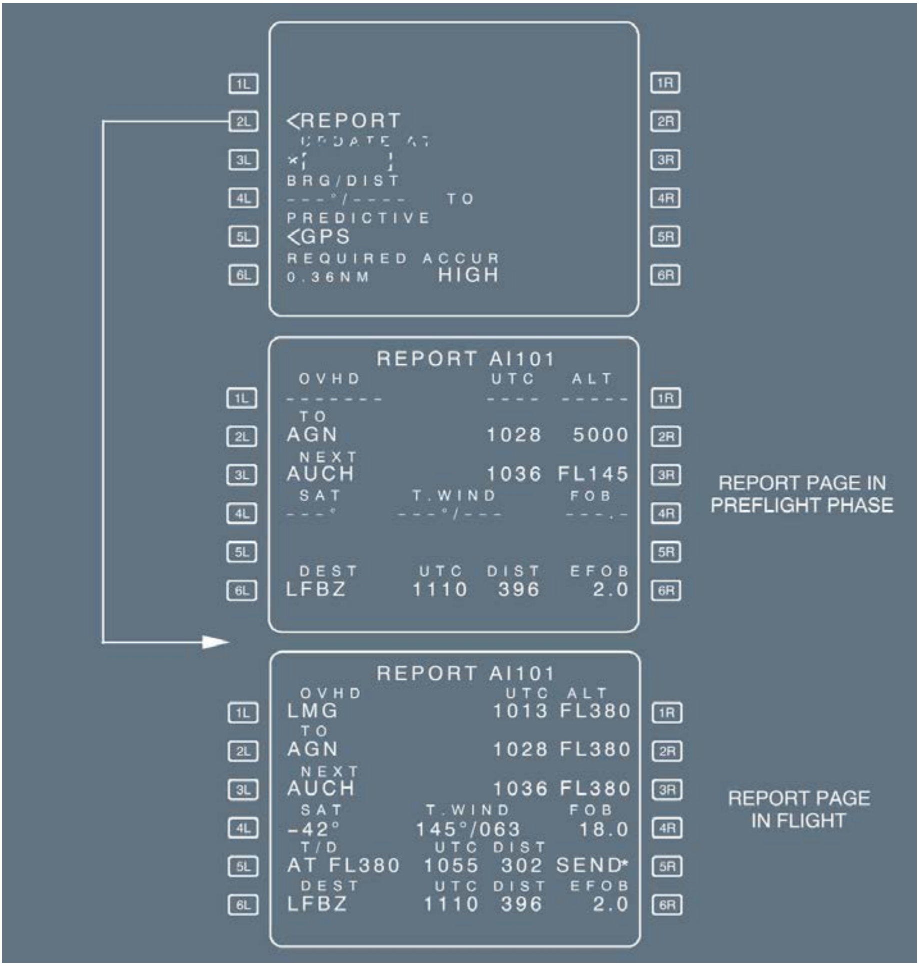
[1L] DEST	Destination, airport as currently selected in active flight plan. It is not modifiable. This field displays dashes, when no destination airport exists.
[1R] ETA	This field is defaulted to the Estimated Arrival Time, as computed by the FMS (small blue font). The pilot may enter a value in this field (large blue font). Amber boxes are displayed, when no prediction exists, or the crew entry has been cleared.

Line 2 PRIMARY Y/N	Predicted primary status at destination airport, at the following times: Estimated time of arrival ±5, 10, 15 min. Availability of GPS PRIMARY at the corresponding time is indicated by Y, when PRIMARY is predicted to be available; and, by N, when GPS PRIMARY is predicted not to be available. These fields are blanked when the destination [1L] field, or the time [1R] field is not defined.
[3L] WPT	The pilot may enter a reference waypoint in this field. Blue brackets are displayed, when no entry has been made.
[3R] ETA	When a reference waypoint has been entered in the [3L] field, amber boxes are displayed. The crew is requested to enter a reference time in this field.
Line 4 PRIMARY Y/N	Information equivalent to [2L] / [2R] is displayed for any pilot-selected waypoint. The corresponding time of arrival is also displayed.
Line 5 DESELECTED SATELLITES and Line 6 SATELLITES	Enables the pilot to deselect up to four satellites by inserting the corresponding satellite number ; the number is then displayed in large blue font. When deactivated, the satellites are not considered for predictive GPS availability at destination, or at the selected waypoint. The deselection is cancelled when the entry is cleared (blue brackets are displayed), or the field is overwritten by a different satellite number.

REPORT PAGE

Ident.: DSC-22_20-50-10-25-00000606.0009001 / 14 MAY 12
Applicable to: ALL

The pilot calls this page by pressing the [2L] key on the PROG page:



This page displays information related to the FROM, TO , NEXT and DEST waypoints, as well as the current wind, temperature, distance and time to the next cruise profile change.

TITLE (White)	Displays the flight number. This line displays EO in amber, in case an engine-out is detected.
[1L] OVHD (green)	Displays the last sequenced waypoint. This field never displays the pseudo-waypoints and the F-PLN markers (T-P , PPOS, IN-BND, OUT-BND).

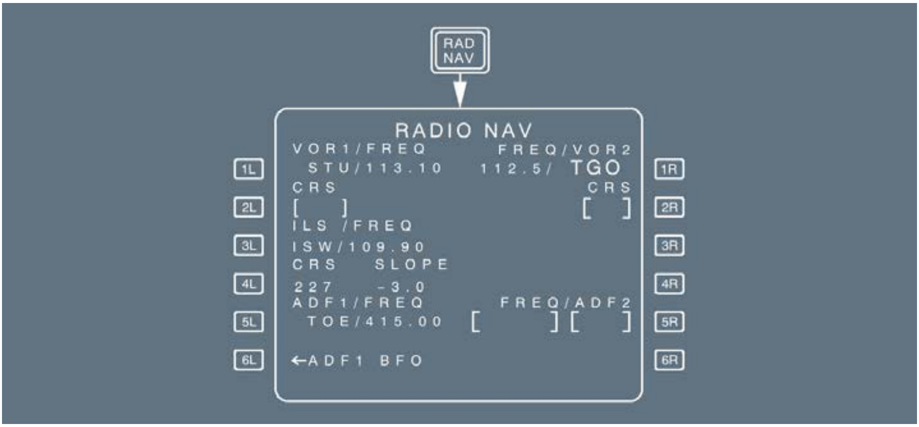
[1R] UTC/TIME ALT (green)	This field displays the time and altitude recorded at the time of sequence.
[2L]-[2R] TO (green)	This field displays the active waypoint, predicted time of arrival and predicted altitude at this waypoint. *Note:* *Time and altitude values are identical to those values on the F-PLN pages.*
[3L]-[3R] NEXT (green)	Same information for the next waypoint.
[4L] [4R] SAT/T.WIND/FOB (green)	This field displays the static air temperature, the wind direction and velocity, and the FOB recorded at waypoint sequencing.
[5L] T/D/UTC/DIST (green)	This field displays the estimated time, and the distance to go to the next change of the cruise profile (T/D , S/C , S/D). These data are only displayed when the cruise phase is active.
[5R] SEND* (blue)	The crew uses this prompt to downlink a position report. This field may be blank, depending on airline policy.
Line 6 DEST/UTC/DIST/EFOB	This field displays the estimated time of arrival, the distance along the F-PLN , and the estimated fuel on board (DEST EFOB) at destination. The DEST EFOB field will turn to amber, if the EFOB at destination becomes less than the MIN DEST FOB value displayed on the FUEL PRED page.. This display is identical to the information on the F-PLN pages.

Note: *No data can be inserted or modified on the REPORT page.*

RADIO NAV PAGE

Ident.: DSC-22_20-50-10-25-00000607.0009001 / 06 APR 16
Applicable to: ALL

This page enables the pilot to select or verify the radio NAVAIDs, tuned for display purposes only. These NAVAID s include: VOR , VOR /DME , TAC , VORTAC, ILS , and ADF.



Line 1 VOR1/FREQ FREQ/VOR2	This line displays the identifiers and frequencies of VORs 1 and 2, whether they are automatically or manually tuned. To manually tune a VOR , the pilot inserts the IDENT or frequency. If the IDENT is not in the database, the new NAVAID page comes up. A “clear” action reverts the selection to the autotuned NAVAID.
Line 2 CRS	This line displays courses for the NAVAIDs in Line 1. The pilot can manually enter the courses through these fields.
[3L] LS/FREQ	This field displays the IDENT of an ILS and its frequency (for ILS). It is autotuned, if the ILS is associated to the departure runway, or if the flight plan contains an ILS approach. The flight crew may also enter an ILS manually. When the manually entered ILS differs from the ILS that the FMS would autotune, “RWY-LS MISMATCH” appears.

[4L] CRS SLOPE	CRS : This field displays the course associated with the LS displayed in Line 3. It comes up automatically if an LS is autotuned, or if an LS has been manually tuned via its IDENT. Otherwise, the course must be entered manually. The course may be backbeam (Bxxx) or frontbeam (Fxxx).. SLOPE: This field displays the slope associated with the LS displayed in Line 3. It comes up automatically if an LS is autotuned for approach, or if an LS has been manually tuned via its IDENT. *Note:* *1. The slope does not apply to LOC only, LDA, SDF or Backbeam approaches.* *2. If the flight crew intends to manually tune an ILS that is not in the navigation database or to manually tune an ILS by its frequency (ident not entered), and if they do not enter the course, the flight crew will not be able to arm approach modes.*
Line 5 ADF1/FREQ FREQ/ADF2	This line displays the identifiers and frequencies of ADFs 1 and 2. The pilot can use the IDENT or the frequency to manually tune the ADF.
Line 6 ADF1/BFO BFO/ADF2	When an ADF is selected, these fields display an ADF /BFO prompt. The flight crew presses the key once to erase the arrow and put the ADF in BFO mode. A clear action brings the arrow back and cancels BFO.

Note:
- *The autotune function only works for NAVAIDs stored in the database.*
- *When tuning manually, the operator should use the IDENT , rather than the frequency, unless the NAVAID is not in the database.*
- *Manually-tuned frequencies are displayed in large font.*

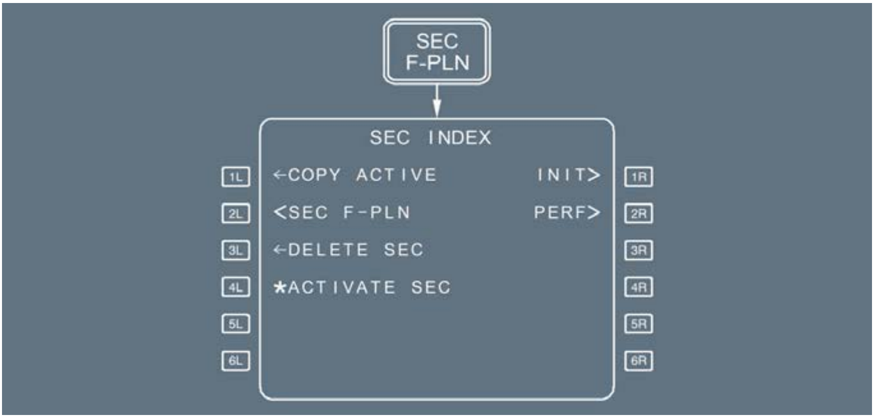
SECONDARY PAGES

Ident.: DSC-22_20-50-10-25-00000608.0009001 / 13 FEB 13
Applicable to: ALL

The SEC F-PLN key on the MCDU console allows the flight crew to call up the secondary index page and the secondary flight plan page. The secondary flight plan is generally for a diversion, for predictable runway changes for takeoff or landing, or for training.
There are two types of secondary index pages. The type selected depends on the presence of a secondary flight plan.

SECONDARY INDEX PAGE

A SECONDARY FLIGHT PLAN IS ALREADY DEFINED



[1L] COPY ACTIVE (blue)	The flight crew presses this key to copy the active flight plan into the secondary flight plan and delete the previous secondary plan.
[2L] SEC F-PLN (white)	The flight crew presses this key to call up the secondary flight plan pages.
[3L] DELETE SEC (blue)	The flight crew presses this key to delete the current secondary flight plan.
[4L] ACTIVATE SEC (amber)	The flight crew presses this key to activate the secondary flight plan as the active flight plan.

Note: *"ACTIVATE SEC " routinely appears if the HDG /TRK mode is active. If the NAV mode is active, "ACTIVATE SEC" appears only if the active and secondary flight plans have a common active leg.*

[1R] INIT (white)	The flight crew presses this key to call up the SEC INIT A page.
[2R] PERF (white)	The flight crew presses this key to call up the performance pages for the secondary flight plan.

A SECONDARY FLIGHT PLAN IS NOT DEFINED

[1L] COPY ACTIVE (blue)	The pilot presses this key to copy the primary active flight plan into the secondary flight plan.
[2L] SEC F-PLN (white)	The pilot presses this key to call up the secondary flight plan pages.
[1R] INIT (white)	The pilot presses this key to call up the secondary INIT page. It is similar to the active INIT page, but blue brackets replace all the amber boxes.

SECONDARY FLIGHT PLAN PAGES

The secondary flight plan pages A and B are identical to those of the active flight plan, but are automatically sequenced, only when the secondary is copied from the primary and their active legs are identical.
The active and secondary flight plans pages differ from each other as follows:

SECONDARY LATERAL REVISION PAGES:

- ERASE and INSERT are not displayed.
- FIX INFO is not available.
- A lateral revision of the secondary flight plan does not create a temporary flight plan:
  All revisions are directly applied to the secondary flight plan.

SECONDARY VERTICAL REVISION PAGES:

A vertical revision on the secondary flight plan does not create a temporary flight plan.

SECONDARY INIT A AND B PAGES:

- They use blue brackets, instead of amber boxes.
- They have no align prompt.
- They do not provide for slewing or entering data in the 4L-4R fields (airport reference).

SECONDARY STEP ALTITUDE PAGES:

These pages operate as the primary STEP ALTS page, except that optimal step, savings are not available.

SECONDARY WIND PAGES:

They have no history wind page.

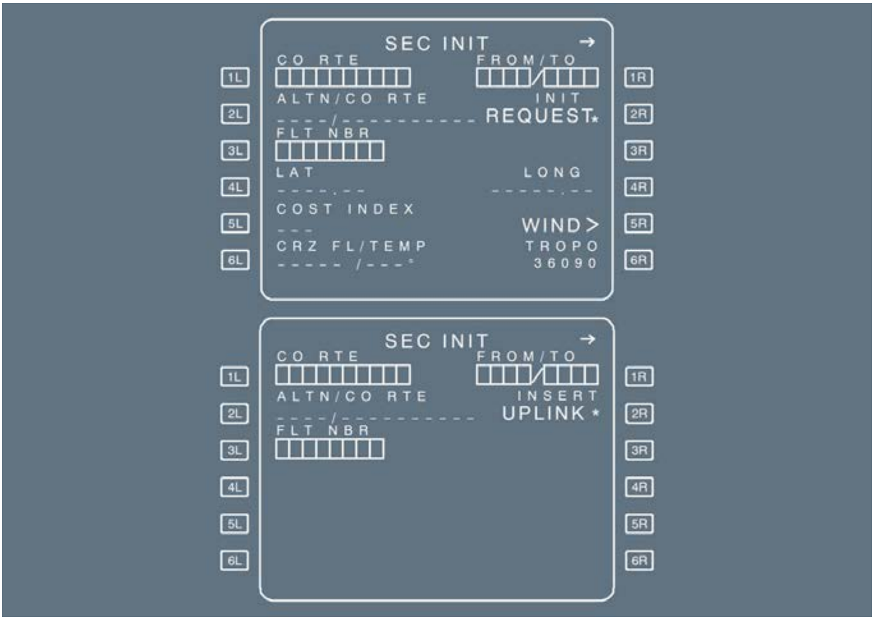
SECONDARY PERFORMANCE PAGES:

- All boxes are replaced by blue brackets.
- They have no engine-out mode, no engine-out long range cruise cost index.
- They have no expedite predictions.
- They have no ACTIVATE/CONFIRM APPROACH PHASE prompt.
- They have no PRED TO ALTN predictions on the PERF CLB and PERF DES pages.
- They have no engine-out drift down, no top of descent, no cabin descent rate information on the PERF CRZ page.

The secondary flight plan has no FUEL PRED page.

SECONDARY INIT A PAGE IS ALSO USED TO REQUEST OR DISPLAY AN UPLINK INIT MESSAGE RECEIVED AFTER ENGINE START.

This uplink INIT message can be cleared or inserted as SECONDARY INIT data.



[2R] INIT REQUEST* Enable to request init data from the ground or,

[2R] INSERT UPLINK* A downlink message has been received following a request. The message can be cleared or entered in the SEC INIT page.

FMS2 Honeywell

MCDU MESSAGE LIST

Ident.: DSC-22_20-50-20-35-00000918.0009001 / 03 NOV 14
Applicable to: ALL

Messages displayed on the MCDU are of two types and displayed in two colors.

Type I : A direct result of a pilot action;
Type II : Information about a situation, or a call for pilot action;
Type II messages are stored in a first-in/first-out message queue (5 messages max)
They are suppressed, if correct data is entered or when they no longer apply
The flight crew can clear all messages by pressing the CLEAR key on the MCDU console.
Amber (A) : Important
White (W) : Less important

MESSAGE	TYPE/COLOR	CONDITIONS
A/C POSITION INVALID	II/A	The aircraft position has become invalid. If the message has been cleared and the flight crew attempts to call up the HOLD at PPOS or DIR TO page while the aircraft position is still invalid, then the message is displayed again.
ACT RTE UPLINK (ACARS msg)	II/W	A flight plan is stored in the active flight plan.
ALIGN IRS	II/A	Appears when the IRS are ready for alignment, but the INIT A page is not displayed on either side of the flight deck. The ALIGN IRS message requires that one of the flight crew call up the IRS INIT page, to align the IRS.
AREA RNP IS XX-XX	II/A	Displayed when the RNP value, manually-entered on the PROG page, is larger than the default RNP value associated to the current flight area and when there is no RNP value defined in the navigation database for the active leg or route.
AWY /WPT MISMATCH	I/W	The pilot entered VIA on the AIRWAYS page does not contain the revised point. If you enter a second airway IDENT, it must contain the first airway ending point.
BLOCK IGNORES RTA	II/W	A time constraint existing at initiation of flight planning, or an entry of a time constraint made after initiation of flight planning, are ignored by the fuel planning function.
CABIN RATE EXCEEDED	II/W	This message appears when the aircraft gets within 200 NM of the destination and the computed rate of descent makes it impossible for the cabin to be repressurized at the maximum rate.
CHECK ALTN WIND (ACARS msg)	II/W	The uplinked alternate cruise flight level differs from the defaulted alternate cruise flight level.

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MESSAGE	TYPE/COLOR	CONDITIONS
CHECK APPR SELECTION (On PFD : "CHECK APP GUIDANCE" (A), or "CHECK APP SEL" (W) (if CPIP3)	II/W	Displayed when a NON ILS approach is part of the F-PLN and an ILS is manually tuned on RAD NAV page. This message reminds the flight crew that available guidance modes for the approach are APP NAV/FINAL. Displayed when in cruise at less than 100 NM from the top of descent or in descent or approach phase.
CHECK CO RTE (ACARS msg)	II/W	The uplinked company route identifier differs from the one specified in the request.
CHECK DATA BASE CYCLE	II/W	The current date does not match the effective date of the active database, and someone attempts to enter a FROM/TO or CO RTE.
CHECK IRS 1(2)(3)/FM POSITION	II/A	Each IRS position is compared to the FM position. The difference is greater than a threshold function of time.
CHECK IRS /AIRPORT POS	I/A	The distance between ADIRS alignment position and the NAV Database Airport Reference Point is at least 5 NM
CHECK DEST DATA (ACARS msg)	II/A	The aircraft is at 180 NM from destination and the destination QNH , TEMP or WIND displayed on the PERF APPR page received by ACARS uplink has to be checked. If a modification of these parameters is performed creating a conflict with previous data, the message is triggered again.
CHECK FLT NBR (ACARS msg)	II/A	The uplinked flight number differs from the flight number specified in the request.
CHECK MIN DEST FOB	II/W	This message appears when the flight crew has manually entered the MIN DEST FOB value, and MIN DEST FOB < ALTN + FINAL, being FINAL an ALTN valid data.
CHECK NORTH REF * EFIS ND	II/A	The MAG/TRUE sw does not correspond to the airport MAG /TRUE bearing reference (as stored in the FMGS navigation database), either at the departure airport (during preflight), or at the destination airport (when entering the ARRIVAL area).
CHECK QFE	II/A	This appears at the transition from QNH to QFE reference, when the QFE altitude differs by more than 100 ft from the predicted altitude, with the QNH set on the MCDU by means of the airport elevation in the NAV database.
CHECK TAKEOFF DATA	II/A	Following a flight crew entry or modification of one of the take-off parameters, there may be an inconsistency between the take-off runway or the TO shift and V1 , VR , V2 , FLEX TO temperature or derated level. The flight crew activated the secondary F-PLN in PREFLIGHT or DONE phase.
CHECK WEIGHT	II/A	The gross weights (GW) computed by the flight management computer (FMC) and the flight augmentation computer (FAC) disagree by more than 7 t (7.7 US tons).

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MESSAGE	TYPE/COLOR	CONDITIONS
CLK IS TAKEOFF TIME	II/W	This appears when the flight crew has entered an Estimated Takeoff Time (ETT), and the actual time is equal to ETT.
CLOCK/GPS TIME DIFF XX	II/A	Aircraft clock time and GPS time differ by more than XX minutes.
CROSSLOAD ABORTED	II/W	Message displayed on the transmitting MCDU, indicating an error in the transmission process.
CROSSLOAD COMPLETE	II/W	The database crossload from one FMGC to the other was successfully completed.
CRZ FL ABOVE MAX FL	II/W	This appears when the flight crew enters a cruise altitude that is above the computed maximum altitude.
CSTR DEL ABOVE CRZ FL	II/W	This appears when a flight plan altitude constraint has been deleted because the flight crew has inserted a cruise flight level, or step-down altitude that is at or below the flight plan constraint.
CSTR DEL UP TO WPT 01	II/W	This appears when constraints get deleted because the aircraft transitions to a go-around flight phase, before the FMGS sequences the flight plan destination.
DECELERATE or T/D REACHED (Also displayed on PFD)	II/W	One of these messages appears when the aircraft has reached the T/D in managed speed and it has not yet begun the descent.
DELETING OFFSET	II/W	This appears when the system is deleting an offset automatically, which it does under certain specific conditions, such as: - Change of active leg due to lateral revision. - Termination of next leg at destination runway and the current distance to go is less than or equal to the distance required to reach the path, or the next leg is not a CF, FM or TF leg.
DEST /ALTN MISMATCH	I/W	The pilot attempts to enter an alternate CO RTE (which starts at an origin that is not the primary flight plan destination).
DEST EFOB BELOW MIN	II/A	The EFOB at destination calculated by the FMS is less than the MIN DEST FOB value specified on the FUEL PRED page, for more than 2 min. The message is triggered in flight, except during Takeoff and Climb phases.
DIR TO IN PROCESS	I/W	The flight crew calls up the vertical or lateral revision page on one MCDU while the direct to page is displayed on the other MCDU.
ENTER DEST DATA	II/A	The flight crew has not entered wind, QNH, or temperature for the destination, and the aircraft is 180 NM out.
ENTRY OUT OF RANGE	I/W	The flight crew attempts to enter data that is out of the range specified for the selected field.
FLT NBR UPLINK (ACARS msg)	II/W	A flight number has been added to the uplink flight plan without previous request.
F-PLN ELEMENT RETAINED	I/W	The flight crew attempts to delete stored NAVAIDs, waypoints or runways that are contained in any flight plan or that are being tuned.

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MESSAGE	TYPE/COLOR	CONDITIONS
F-PLN FULL	II/W	There is not enough memory in the flight plan allotment for the computer to accept more flight plan data.
FMS 1/FMS 2 A/C STS DIFF	II/W	This message always precedes a transition to independent mode, and appears at power-up if the system detects a difference in one of the following: - NAV database serial number - Performance database - FM operational program - Aircraft and airline program pins
FMS 1/FMS 2 GW DIFF	II/W	Onside and offside aircraft weight differ by 2 t or more.
FMS 1/FMS 2 PGM PIN DIFF	II/W	Onside and offside program pins are different.
FMS 1/FMS 2 POS DIFF	II/A	Onside and offside positions differ by 0.5 NM or more (5 NM when GPS is not installed).
FMS 1/FMS 2 SPD TGT DIFF	II/W	Onside and offside target speeds displayed on the PFD differ by 5 kt or more.
FORMAT ERROR	I/W	A data entry does not meet the specified entry format for a given field.
GPS PRIMARY LOST (also displayed on ND)	II/A	Displayed when GPS PRIMARY mode is lost.
GPS PRIMARY	II/W	Displayed when the FMS is transitioning to GPS PRIMARY
GPS IS DESELECTED	II/A	This message appears when GPS has been manually deselected and the aircraft is 80 NM before the top of descent or in approach phase.
INDEPENDENT OPERATION	II/A	The FMGCs operate independently of each other.
INITIALIZE WEIGHT/CG	II/A	The zero-fuel weight or block fuel (FOB) is undefined after engine start.
INVALID FLT NBR UPLINK (ACARS msg)	II/W	The uplink message contains a valid flight plan but no flight number.
INVALID PERF UPLINK (ACARS msg)	II/W	Performance uplink message has been rejected.
INVALID RTE UPLINK (ACARS msg)	II/W	An error was detected into the uplink message and it is rejected.
INVALID TAKEOFF UPLINK (ACARS msg)	II/W	The current uplink takeoff data message is rejected.
INVALID WIND UPLINK (ACARS msg)	II/W	The current uplink wind message is rejected.
LAT DISCONT AHEAD	II/A	The next leg is a discontinuity and the aircraft is 30 s from flying the leg.
LIST OF 10 IN USE	I/W	The flight crew has tried to enter more than ten stored runways into the database, and all of the first ten are included in a flight plan or a pilot-stored route.

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MESSAGE	TYPE/COLOR	CONDITIONS
LIST OF 20 IN USE	I/W	The flight crew has tried to create a PBD, LAT /LONG , or PBX, or store a pilot-defined waypoint or NAVAID when 20 are already in use (in a flight plan or pilot-stored routes).
MACH SEGMENT DELETED	II/W	A constant Mach segment of the active flight plan has been automatically deleted. This occurs when the secondary flight plan or the alternate is activated, or engine out is detected or when the flight phase changes from CRZ to another one.
MCDU OVERHEATED	II/A	This message is displayed for 15 s in case of MCDU overheating.
MORE DRAG (EFIS PFD)	II/W	DES mode is engaged, idle is selected and the aircraft must decelerate in order to recover the path, or to respect an altitude constraint, a speed limit or a speed constraint.
NAV ACCUR DOWNGRAD (also displayed on ND)	II/A	NAV accuracy has been downgraded from HIGH to LOW. (See FMGS principles for an explanation).
NAV ACCUR UPGRAD (*EFIS ND)	II/W	NAV accuracy has been upgraded from LOW to HIGH.
NEW ACC ALT-HHHH	II/W	The acceleration altitude has been changed.
NEW CRZ ALT-HHHHH	II/W	The cruise altitude has been changed.
NEW THR RED ALT-HHHH	II/W	The thrust reduction altitude has been changed.
NO ANSWER TO REQUEST (ACARS msg)	I/W	A crew request, was previously sent to the ground and no answer has been received for 4 min.
NO INTERSECTION FOUND	I/W	The system could not find any common waypoint nor intersection point through the airway.
NON UNIQUE ROUTE IDENT	I/W	The flight crew has tried to enter on the new route page a company route IDENT that is identical to an existing company route IDENT (pilot-defined or in the database).
NOT ALLOWED	I/W	Data entry is not allowed in the selected field, or a selection action is not allowed.
NOT ALLOWED IN NAV	I/W	An attempt to modify the TO waypoint is made while in NAV mode.
NO NAV INTERCEPT	II/A	It is triggered, when NAV mode is armed and, no INTERCEPT waypoint exists before the TO waypoint.
NOT IN DATA BASE	I/W	The pilot is trying to enter or call up a company route IDENT , a FROM/TO pair, a place defined by place-bearing-distance (PBD) or place-bearing/place-bearing (PBX) or an airport NAVAID , waypoint runway, or NAVAID frequency (including pilot-defined elements) that is not in the current database.
NOT XMITTED TO ACARS (ACARS msg)	II/W	A pilot request or a crew report was sent but the communication was not established or not acknowledged.
ONLY SPD ENTRY ALLOWED	I/W	The pilot is trying to enter a Mach number for a preselected speed value on the CLIMB page.

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MESSAGE	TYPE/COLOR	CONDITIONS
OPP FMGC IN PROCESS	II/W	The offside FMGC is unhealthy, and the FM system mode is SINGLE. The message indicates that the MCDU on which the message is displayed is being driven by the FMGC on the other side.
PAGE UPDATE IN PROCESS	I/W	The pilot presses a key on the flight plan page while predictions are being updated.
PERF DATA UPLINK (ACARS msg)	II/W	Performance data are received from ground.
PLACE/D IN TRANSITION	I/W	If a place/distance waypoint is defined within a pre-planned “fixed turn radius” transition, the entry is rejected and the “PLACE/D IN TRANSITION” scratchpad message is displayed.
PLEASE WAIT	I/W	Resynchronization between both FMGCs is in progress.
PROCEDURE RNP IS XX.XX	II/A	Displayed when the RNP value, manually-entered on the PROG page, is larger than the RNP value defined in the navigation database for the active leg or route.
PRINTER NOT AVAILABLE (ACARS msg)	II/W	A printer communication error has been detected while printing a report. The printing is terminated.
RADIONAV IS DESELECTED	II/A	Radio navaids have been manually deselected and the aircraft is 80 NM before the top of descent or in approach phase.
REF/GPS POS DIFF	I/A	This message is displayed when there is a discrepancy between the reference position entered by the pilot and the GPS position.
REF/LAST IRS POS DIFF	I/A	This message is displayed when there is a discrepancy between the reference position entered by the pilot and the last stored IRS position.
REVISIONS NOT STORED	II/W	This message, displayed when a pilot-defined route or company route (active or secondary flight plan) is stored, indicates that the following elements are not retained: - Pilot-entered holds - Offsets - Modifications to terminal area procedures - Pilot-entered constraints - Pseudo waypoints - Step at optimum.

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MESSAGE	TYPE/COLOR	CONDITIONS
RTA DELETED	II/W	A time constraint is automatically deleted: - In case of engine-out - When entering the holding pattern - In case of go-around - At phase transition from descent or approach to climb or cruise - When a time constraint is inserted in the same flight plan at a different waypoint - When the alternate flight plan is activated - When a DIR TO/ABEAM is performed, only if the time constrained waypoint is projected as an ABEAM waypoint - The time constrained waypoint is cleared or sequenced (regardless of active lateral mode) - Valid clock data is lost - The time constraint belongs to the active flight plan and the secondary flight plan is activated - The time constraint belongs to the secondary flight plan and COPY ACTIVE is performed.
RTA EXISTS	I/W	Displayed if the pilot tries to clear an estimated takeoff time defined by the system.
RTE DATALINK IN PROG (ACARS msg)	I/W	A flight plan modification is performed after a F-PLN INIT request has been sent. This message is displayed until the uplink is entirely received.
RWY/LS MISMATCH	II/A	- During climb, cruise, (ILS or MLS) descent approach, or go-around, the LS frequency entered on the RAD NAV page does not match the LS associated with the destination runway. - During preflight or takeoff, the LS frequency entered on the RAD NAV page does not match the LS associated with the takeoff runway.
SEC RTE UPLINK (ACARS msg)	II/W	A flight plan is stored in the secondary flight plan.
SELECT DESIRED SYSTEM	I/W	The MCDU displays its MENU page.
SELECT TRUE (also displayed on the ND)	II/A	The MAG/TRUE sw is set to MAG , while the IRS send true HDG /TRK.
SENSOR IS INVALID	I/W	- The pilot has selected FF or FQ, or FF + FQ, or FQ + FF on the FUEL PRED page and the sole sensor or both of the selected sensors are invalid, or - The flight crew has entered fuel on board only, and the FF sensor is invalid.

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MESSAGE	TYPE/COLOR	CONDITIONS
SET GREEN DOT SPEED ("SET GREEN DOT" displayed on PFD)	II/W (W)	This message appears when the following conditions are all met: - Engine-out condition - Aircraft in selected speed mode - FCU -selected speed equal to or greater than green-dot speed +10 kt, and ALT * or ALT not active, or FCU-selected speed equal to or less than green-dot speed -10 kt.
SET HOLD SPEED (also displayed on PFD)	II/W (W)	This instruction appears when the aircraft is in selected speed, the pilot has inserted a hold in the flight plan, the aircraft is 30 s or less from the point where it must start decelerating towards hold speed, and the selected speed differs from the hold speed by more than 5 kt.
SET MANAGED SPEED or CHECK SPEED MODE (Also displayed on PFD)	II/W (W)	The target speed is selected for the current phase, but there is no preselected speed for the next flight phase. When this is so, one of these messages is displayed at transitions from climb to cruise, and from climb or cruise to descent. The message is always displayed at the transition to descent from climb or cruise if selected speed is active. It is not displayed if managed speed is active.
SETTING SPD/RTA	II/W	Displayed when the system recomputes its managed speed target to satisfy the RTA constraints.
SPECIF NDB UNAVAIL	II/A	The NDB to be autotuned (specified for a NDB approach) is not available.
SPECIF VOR-D UNAVAIL (also displayed on ND)	II/A	- The VOR , VOR -DME , or VORTAC to be autotuned (specified for an RNAV or VOR approach) has previously been deselected by the flight crew, or - The bearing, the frequency, or the IDENT of the VOR (or VORDME or VORTAC) to be autotuned is invalid.
SPD ERROR AT WPT 01	II/W	In lateral managed flight, the system predicts that the aircraft will miss a speed constraint by more than 10 kt. When the prediction changes to bring the miss within 5 kt, the message is cleared.
SPD LIM EXCEEDED	II/A	The aircraft is more that 150 ft below the speed limit altitude and more than 10 kt over green dot or the speed limit (which ever is smaller).
STEP ABOVE MAX FL	II/W	The pilot has entered a step altitude that is above the predicted maximum altitude.
STEP AHEAD	II/W	Indicates that the aircraft is within 20 NM of the active step point.
STEP DELETED	II/W	A step has been automatically deleted.
STORED ROUTES FULL	I/W	The system already contains five pilot-defined routes. (Only five are allowed.)
TAKEOFF DATA UPLINK (ACARS msg)	II/W	A takeoff data message is received.

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MESSAGE	TYPE/COLOR	CONDITIONS
TEMPORARY F-PLN EXISTS	I/W	The flight crew has selected any key (except ERASE or INSERT) or attempted a flight planning operation on the secondary flight plan while the system is displaying a temporary flight plan.
TIME ERROR AT WPT 01	II/W	While the aircraft is in lateral managed flight the FMGC predicts that it will miss a time constraint (*Refer to DSC-22_20-30-20-25 Required Time of Arrival (RTA) - Entering a Required Time of Arrival*).
TIME MARKER LIST FULL	I/W	The system already contains four time markers. (Only four are allowed).
TIME TO EXIT	II/A	The aircraft must leave holding immediately to satisfy fuel reserve requirements. (Extra fuel is zero).
TO SPEED TOO LOW	II/A	This message appears if the inserted V1 , VR , V2 speeds do not satisfy the existing regulatory conditions regarding VMC and VS1G speeds.
TOO STEEP PATH AHEAD	II/A	The system displays this message in cruise phase if the aircraft is within 150 NM of its destination or in descent or approach phase and in NAV mode and the descent profile contains a segment that is too steep.
TUNE BBB FFF.FF	II/A	The system cannot autotune the VOR for approach or position because of a manual VOR selection.
TURN AREA EXCEEDANCE	II/A	This message is displayed 1.5 min before entry of the PI leg, when in NAV mode, if the PI lateral path exceed the protection envelope defined in the Navigation database.
UNKNOWN PROGRAM PIN	II/W	The system has been unable to initialize because of an incompatible or undefined aircraft pin program combination (A/C type, engine type, VMO /MMO parity) in the FMGC software.
UPLINK INSERT IN PROG (ACARS msg)	II/W	Displayed when an uplink message is currently inserted in the FMGS.
USING COST INDEX-NNN	I/W	This message is displayed when the system contains a flight plan, and the flight crew tries to enter a zero fuel weight or a gross weight into it before defining a Cost Index (CI). (In this case, the FMS defaults to the Cost Index from the last flight). It is also displayed when the flight crew inserts the ALTN F-PLN (in this case, the FMS defaults the cost index to 0).
V1 /VR /V2 DISAGREE	II/A	This message is displayed when the entered V1 , VR and V2 speeds do not satisfy the condition V1 ≤ VR ≤ V2.
WAIT FOR SYSTEM RESPONSE	I/W	During the time between a subsystem selection and the display of the subsystem page, the MCDU MENU page remains displayed with this message.
WIND DATA UPLINK (ACARS msg)	II/W	Uplink wind message has been received.
WIND UPLINK EXISTS (ACARS msg)	I/W	A flight plan modification (active or secondary) is attempted when uplink winds are not inserted yet.

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MESSAGE	TYPE/COLOR	CONDITIONS
WIND UPLINK PENDING (ACARS msg)	II/A	A temporary flight plan exists or a DIR TO page is displayed and a wind uplink is received and stored.
XXXX IS DESELECTED	I/W	The flight crew attempts to enter a deselected NAVAID , via the SELECTED NAVAID page, that has already been deselected.

MCDU DATA FORMAT LIST

Ident.: DSC-22_20-50-30-00000920.0022001 / 23 JUN 15
Applicable to: ALL

The following chart lists all the data the pilot may enter on the MCDU.
It also shows the acceptable format for the various data items, the acceptable range, the units of entry, and the MCDU pages on which the data can be entered.

The following codes are used to indicate various data formats:

- A : letters
- N : numbers
- X : letters and numbers

DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
ACCEL ALT	See ALT		ft (MSL)	TAKEOFF (ACT/SEC (2)) GO AROUND (ACT/SEC (2))
ALT	NNNN or NNNNN (leading zeros must be included)	Max ALT = 39 000 Entry is rounded to the nearest 10 ft	ft (MSL)	PERF CLB PERF DES
ALT CSTR	See ALT	See ALT	ft (MSL)	VERT REV F-PLN A SEC F-PLN A
AIRWAYS (VIA)	XXXX	If not in data base "NOT IN DATA BASE" is displayed	N/A	LAT REV AIRWAYS ⊲
ARPT	AAAA 1 character minimum. 4 maximum.	If AAAA is not in the database airport file, the New Runway page is displayed		INIT A (ACT/SEC (2)) LAT REV ALTN F-PLN A-B (ACT/SEC (2)) WAYPOINT DIR TO
BLOCK FUEL	NN.N leading zeros may be omitted.	0-80/0-175.2	Thousands of Kg or thousands of Lb	INIT B (ACT/SEC (2))
CABIN RATE	- NNN (- may be omitted)	100 - 999	ft/min	DES FORECAST or CRUISE PERF PAGE ⊲
CG	NN.N	8.0 - 45.0	% MAC	INIT B. (ACT/SEC (2)) FUEL PRED
CHANNEL ⊲	NNN	500 - 699		NEW NAVAID RAD NAV

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DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
CLASS (NAVAID)	AAAAAA (refer to RANGE for exact inputs allowed)	VOR DME VORDME VORTAC LOC , ILS NDB ILSDME MLS TACAN	N/A	NEW NAVAID
CO RTE	XXXXXXX 7 or 10 characters (pin program)	If not in the NAVdatabase, a message will be displayed	N/A	INIT A ROUTE SELECTION NEW ROUTE ALTERNATE
COST INDEX	NNN may be entered as 1-3 digits; leading zeros lay be omitted	0 to 999	Kg/Min or 100 lb/Hr	INIT A (ACT/SEC (2)) PERF CLB (ACT/SEC (2)) PERF CRZ (ACT/SEC (2)) PERF DES (ALT/SEC (2))
CRS	See INB CRD	See INB CRS	degrees	RADIO NAV NEW NAVAID NEW RUNWAY
CRZ FL	Must be entered as FLIGHT LEVEL	Maximum FL (See FLIGHT LEVEL)	Hundred of ft	INIT A (ACT/SEC (2)) PROG
CRZ TEMP	See TEMP		See TEMP	INIT A (ACT/SEC (2)) FUEL PREDICTION
CRZ WIND	See WIND DIR/MAG	See WIND DIR/MAG	See WIND DIR/MAG	INIT A (ACT/SEC (2)) FUEL PREDICTION
DH	NNN	0 - 700 No is accepted if an ILS APPR is selected	ft	PERF APPR (ACT/SEC (2))
DIST	NN.N leading and trailing 0's may be omitted.	0 - 99.9 or 0 - 999 (or 9999)	NM NM	HOLD ALTN
DRT TO	"D"NN	Eight possible values		PERF TAKEOFF

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DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
EFF WIND	± NNN "+" may be entered as "T" or "TL" "-" may be entered as "H" or "HD" Leading zeros may be omitted If no sign is input, "+" is taken	0 - 500	kts	CLOSEST AIRPORT EQUI-TIME INIT A SEC INTA
ELV	± NNNN if no sign, + assumed Leading 0's may be omitted	Entry displayed to nearest 10 ft -400 to 20 470 ft (RWY) (or - 1000 to 20 470 ft) -2 000 to 20 470 (NAVAID)	ft (MSL)	NEW RUNWAY NEW NAVAID
ETT/RTA	HH:MM:SS	00:00:00 to 23:59:59	Hour HH Min MM Sec SS	RTA
FF/FQ Sensors	One or both may be entered, Both - /FF + FQ or - / FQ + FF Fuel flow - /FF Fuel Quantity - / FQ		N/A	FUEL PREDICTION
FIG OF MERIT	N	0 - 3	N/A	NEW NAVAID
FINAL/TIME	Only one may be entered at a time. NN.N or (NNN.N) for FINAL NNNN for TIME	FINAL 0 - 10.0 (or 0 - 100) or 0 - 22.0 0 - 90 TIME	Thousand of kg or Thousand of lb minutes	FUEL PRED INIT B
FLAPS		0, 1, 2, or 3		TAKEOFF

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DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
FLEX TO TEMP	1. If Derated TO option not implemented: same as TEMP 2. If Derated TO option is implemented: F NN		NN in degrees centigrade	TAKEOFF
FLIGHT LEVEL	FLNNN or NNN Leading zeros on NNN may be omitted	Max FL = 390 (or Max FL = 410)	Hundreds of ft (MSL)	F-PLN A-B, PROG VERT REV INIT A (ACT, SEC(2)) PERF CLB PERF DES STEP PRED STEP ALTS
FLIGHT NUMBER	XXXXXXXX The 8 alphanumeric are not mandatory	N/A	N/A	INIT A F-PLN A-B
FOB	NN.N (leading zeros may be omitted)	See BLOCK	Thousands of kg or Thousands of Lb	FUEL PREDICTION
FREQ	NNN.NN ILS /VOR NNN.N NDB	108.00 - 117.95 190.0 - 1 750.0	MHz KHz	PROG. NEW NAVAID RADIO NAV
FROM/TO	AAAA /AAAA	AAAA must be in data base or message will be displayed	N/A	INIT A (ACT/SEC (2))
GW	NN.N Leading and trailing zeros may be omitted	35 - 99.9 or 77.2 - 218	Thousands of kg or Thousands of Lb	FUEL PREDICTION
IDLE FACTOR	± N.N Leading and trailing zeros may be omitted	-9.9. +9.9	%	A/C STATUS
INB CRS	NNN Leading zeros may be omitted. An entry of 360 is displayed as 0.	000 - 359	Degrees	HOLD

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DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
LAT	DDMM.MB or BDDMM.M DD - degrees, MM.M - minutes, B - direction. Leading zeros may be omitted but the direction (B) is necessary. Latitude is displayed as DDMM.MB	B: N or S 0 ≤ DD ≤ 90 0 ≤ MM.M ≤ 59.9	Degree minutes tenths of minutes	INIT A (ACT/SEC (2))
LAT /LONG	LAT /LONG See LAT and See LONG except both must be entered with "/" in between	See LAT and See LONG	See LAT and See LONG	F-PLN A-B (ACT/SEC (2)) PROG NEW WAYPOINT NEW NAVAID DIR TO LAT REV NEW RUNWAY
LENGTH	NNNN Leading zeros may be omitted	1 000 - 8 000 m 3 282 - 9 999 ft	Meters or feet	NEW RUNWAY
LONG	DDDMM.MB or BDDDMM.M DDD - degrees MM.M - minutes B - direction. Leading zeros may be omitted but the direction (B) is necessary	B: E or W 0 ≤ DDD ≤ 180 0 ≤ MM.M ≤ 59	Degree minutes tenths of minutes	INIT A
MACH	.NN The decimal point is necessary. Trailing zeros are not necessary	MAX = 0.82 MIN = 0.15	Mach Number	F-PLN A (ACT/SEC (2)) PERF CLB PERF CRZ PERF DES
MACH/SPD	MACH and SPD must be entered with "/" between (See MACH and See SPD formats)	See MACH and See SPD	See MACH and See SPD	PERF DES (ACT/SEC (2))
MDA	See ALT	LDG elevation to LDG elevation +5 000	ft (MSL)	PERF APPR (ACT/SEC (2))

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DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
MDH	± NNNNN	0 - 5 000	ft (AGL)	PERF APPR (ACT/SEC [2])
NAVAID	XXXX	Any alphanumeric	N/A	PROG NEW NAVAID NAVAID F-PLN A-B (ACT/SEC [2]) LAT REV DIR TO RADIO NAV SELECTED NAVAIDS
OFST	NNB or BNN NN offset distance B direction	B: L or R 1 < NN < 50	NM	LAT REV
PERF FACTOR	NN.N leading or trailing zeros may be omitted (± N.N)	-10.0 to +10.0 (or -9.9 - +9.9)	N/A	A/C STATUS
PLACE/BRG /DIST	PLACE can be any data base ARPT , NAVAID or WAYPOINT - BRG must be a 3 digit entry without decimal digit. An entry of BRG = 360 is displayed as 0.	PLACE - If not in data base, a message "NOT IN DATA BASE" is displayed BRG - 000 - 360	N/A degrees	LAT REV(ACT/SEC [2]) NEW WAYPOINT PROG DIR TO F-PLNA-B (ACT/SEC [2]) STEP ALTS
	DIST is NNN.N where leading zeros may be omitted ; all 3 parameters must be entered with "/" between	DIST - 0 - 999.9	NM	
PLACE-BRG / PLACE-BRG	See PLACE/BRG/ DIST A couple PLACE-BRG is entered with a dash in the middle. 2 couples have to be entered with "/" between	See PLACE/BRG/ DIST	See PLACE/BRG/ DIST	See PLACE/BRG/DIST

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DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
PLACE/DIST	PLACE: See PLACE/ BRG/DIST DIST: See PLACE/ BRG/DIST	PLACE: See PLACE/ BRG/DIST DIST: 0 - 999.9	N/A NM	F-PLN A and B SEC F-PLN A and B LAT REV NEW WAYPOINT DIR TO STEP ALTS
QNH	NNNN (leading zero may be omitted).	950 - 1 050 (or 745 - 1050)	Hecto-Pascals (hPa)	PERF APPR (ACT/SEC [(2)])
	NN.NN (leading and trailing zeros may be omitted).	28.06 - 31.01 (or 22.00 - 31.00)	In.Hg	
RADIAL	NNN(T) 3 digits entry	000 - 360	Degrees	FIX INFO 1 to 4
RADIAL IN	NNN(T) 3 digits entry	000 - 360	Degrees	DIR TO
RADIAL OUT	NNN(T) 3 digits entry	000 - 360	Degrees	DIR TO FIX INFO 1 to 4
RADIUS	DNNN 3 digits entry D is the identifiant of the circle radius	000 - 256	NM	FIX INFO 1 to 4
REF FIX	See waypoint			FIX INFO 1 to 4
RTE RSV	may be entered as fuel or percentage of trip fuel	Fuel 0 - 10.0 0 - 21.7 % : 0 - 15.0	thousands of kg thousands of lb	INIT B (ACT/SEC [(2)]) FUEL PRED
RWY	AAAANND Where AAAA is See ARPT. NN is runway number (2 digits) must be entered D is L or R to be included only when there is more than one runway with the same number at ARPT.			RUNWAY NEW RUNWAY F-PLN A-B
SAT /ALT	TEMP /ALT	See TEMP and See ALT	N/A	CRUISE WIND
SET HDG	NNN/N (leading and trailing zeros may be omitted) will always be displayed as NNN/N	000.0 - 360.0	Degrees	IRS MONITOR

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DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
SLOPE	NN.N	00.0 -90.0	Degrees	NEW NAVAID
SPD	NNN (leading zero may be omitted)	MAX = 350 kt MIN = 90 kt	kt (CAS)	SEC F-PLN A PERF CLB PERF CRZ (ACT, SEC (2)) PERF DES
SPD CSTR	See SPD	See SPD	kt (CAS)	F-PLN A (ACT/SEC (2)) VERT REV (ACT/SEC (2))
SPD LIM	SSS/NNNNN SSS is a speed NNNNN is an ALT or FLIGHT LEVEL (See ALT and See FLIGHT LEVEL)	SSS: See SPD	kt/ft (MSL)	VERT REV (ACT/SEC (2))
SPD/MACH	See MACH/SPD	See MACH and See SPD	See MACH and See SPD	PERF DES (ACT/SEC (2))
STATION DEC	NND Where NN is the declination and D is the direction. Leading zeros may be omitted. D is not required for an entry of zero declination.	NN: 01 - 99 D: E or W	Degrees	NEW NAVAID
STEP ALT	SNNN or NNNS (where NNN is in Flight Level) or SNNNNN or NNNNNS (where NNNNN is in ALT) Leading zeros may be omitted	See FLIGHT LEVEL or See ALT	See FLIGHT LEVEL or See ALT	F-PLN A
TAXI	N.N Leading or trailing zeros may be omitted	0 - 9.9	Thousands of kg	INIT B (ACT/SEC (2))
TEMP	± NN If no sign, + assumed	± 99	Degrees celsius	INIT A (ACT/SEC (2)) FUEL PRED PERF APPR
THR RED ALT	See ALT	400 ft AGL mini	ft (MSL)	PERF TAKE OFF
THS	AAN.N or N.NAA where AA is UP or DN	max UP 7.0 max DN 5.0 increment 0.1	degrees	PERF TAKEOFF

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DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
TRANS ALT	See ALT			PERF GO AROUND
TIME	N.N	0 - 9.9	Minutes	HOLD
TIME MARK.	HHMM	HH: 0 - 23 MM: 0 - 59	Hours Minutes	F-PLN A and B
T.O SHIFT	NNNN	1-Length of origin runway	m or ft	PERF TAKEOFF
TRIP WIND	See EFF WIND		kts	INIT A SET INIT A
TROPO	See ALT	See ALT (or 60 000)	ft	INIT A FUEL PREDICTION SEC FUEL PREDICTION
UTC CSTR	HH MM Where HH are hours and MM are minutes. Leading zeros may be omitted 1 or 2 digit entry is interpretated as minutes	HH: 0 - 23 MM: 0 - 59	Hours and minutes	VERT REV
V1	See SPD		kt (CAS)	PERF TAKEOFF (ACT/SEC (2))
V2	See SPD		kt (CAS)	PERF TAKEOFF (ACT/SEC (2))
VR	See SPD		kt (CAS)	PERF TAKEOFF (ACT/SEC (2))
WIND	See WIND DIR/ VELOCITY	See WIND DIR/ VELOCITY	See WIND DIR/ VELOCITY	F-PLN B (ACT/SEC (2)) FUEL PREDICTION
WAYPOINT	XXXXX - may be from . 1-5 (1-7) characters for waypoint. Acceptable as waypoint IDENT: ARPT NAVAID WAYPOINT LAT /LONG, PLACE BRG / PLACE BRG and PLACE/BRG / DIST PLACE/DIST may be entered to define a waypoint			WAYPOINT NEW WAYPOINT F-PLN A and B (ACT/SEC (2)) LAT REV PROG DIR TO FIX INFO 1 AND 2 EQUI-TIME POINT STEP ALTS PREDICTIVE GPS

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DATA NAME	FORMAT	RANGE (X is input)	UNITS	DISPLAY PAGE
WIND DIR /WIND MAG	NNN/NNN Both must be entered ; leading zeros may be omitted. An entry of WIND DIR = 360 is displayed as 0.	WIND DIRECTION 0 - 360	Degrees	INIT A PERF APPR (ACT/SEC [2]) STEP PRED
		WIND MAG 0 - 200 (or 0 - 500)	Kt	WIND F-PLN B VERT REV
WIND DIRECTION/ MAG /ALT	NNN/NNN/FL NNN or NNN/NNN/NN NNN	Direction and Velocity as above Minimum ALT 1 000	FL in hundred of ft, ALT in ft	DES FORECAST WIND PAGES
ZFW	NN.N OR NNN.N Leading and trailing zeros may be omitted	MIN ZFW [1]– Max ZFW [1]	Thousands of kg or thousands of Lb	INIT B (ACT/SEC [2])

(1) *As defined in the Performance Data Base.*

(2) *ACT/SEC = Active or Secondary*

GENERAL

Ident.: DSC-22_20-60-10-00000921.0001001 / 10 DEC 09
Applicable to: ALL

The baro reference selector of the EIS (Electronic Instrument System) allows the pilot to use the standard barometric reference (STD), sea level atmospheric pressure (QNH), or atmospheric pressure at airfield elevation (QFE option) for the barometer setting.
The selected value is displayed in the baro reference display window of the EFIS control panel and on the Primary Flight Display (PFD) below the altitude scale.
The barometer setting is used as a reference for the altimeter of the PFD and for the PFD target altitude. In flight, it affects the predicted altitudes on the MCDU and the descent path computation.

MCDU ALTITUDE PREDICTIONS

Applicable to: ALL

Ident.: DSC-22_20-60-10-A-00000922.0001001 / 10 DEC 09

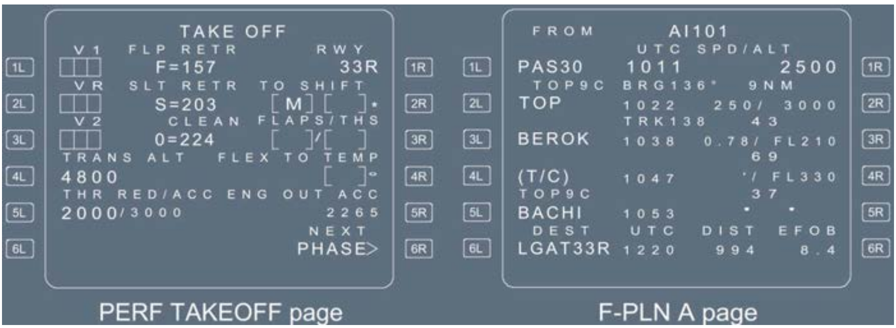
GENERAL

The FMGS predicts at each waypoint of the flight plan an altitude that is a function of all data in the lateral and vertical flight plans.

Ident.: DSC-22_20-60-10-A-00000927.0001001 / 10 DEC 09

ON THE GROUND

The altitude predicted at each waypoint is displayed as altitude in feet above mean sea level (AMSL) when it is below the transition altitude and as flight level when it is above the transition altitude. The altitude constraints are also displayed, and they follow the same rule (feet or flight level).
The predicted altitude is equal to the airport elevation plus the height you must attain in order to reach the waypoint in the applicable mode (climb or descent).



PERF TAKEOFF page F-PLN A page

Ident.: DSC-22_20-60-10-A-00000924.0001001 / 16 FEB 11

IN FLIGHT

The predicted altitude is equal to the aircraft altitude (as a function of the barometer setting), plus or minus the height you must attain to reach the waypoint in the applicable mode (climb or descent).

- In climb:
  Altitude predictions and constraints are displayed as altitude in feet above mean sea level (AMSL) at, or below, the transition altitude, and as the flight level above it.
  For example : If the transition altitude is 5 000 ft and you insert an altitude constraint as 8 000 ft, the MCDU F-PLN A page displays it as FL 80
- In descent:
  If “STD ” is selected on the EIS control panel, altitude predictions and constraints above the transition level are displayed as flight levels, and those below the transition level are displayed as altitude AMSL.
  If sea level standard pressure (QNH), or field elevation pressure (QFE option), is selected on the EIS control panel, altitude predictions and constraints are displayed as altitudes AMSL, regardless of the transition altitude.
  For example: If the transition level is FL 50 and you insert an altitude constraint of 8 000 ft into the MCDU , the MCDU F-PLN S A page will display it as FL 80, if “STD ” is selected, and as 8 000 ft, if “QNH ” (or “QFE ” option) F-PLN A page is selected.

TARGET ALTITUDE ON PFD

Ident.: DSC-22_20-60-10-00000925.0001001 / 01 OCT 12
Applicable to: ALL

The PFD target altitude may either be:
- The altitude selected on the FCU, or
- A flight management altitude constraint, if the climb mode or descent mode is engaged and the system predicts a level-off at a constraint that comes before reaching the FCU altitude.

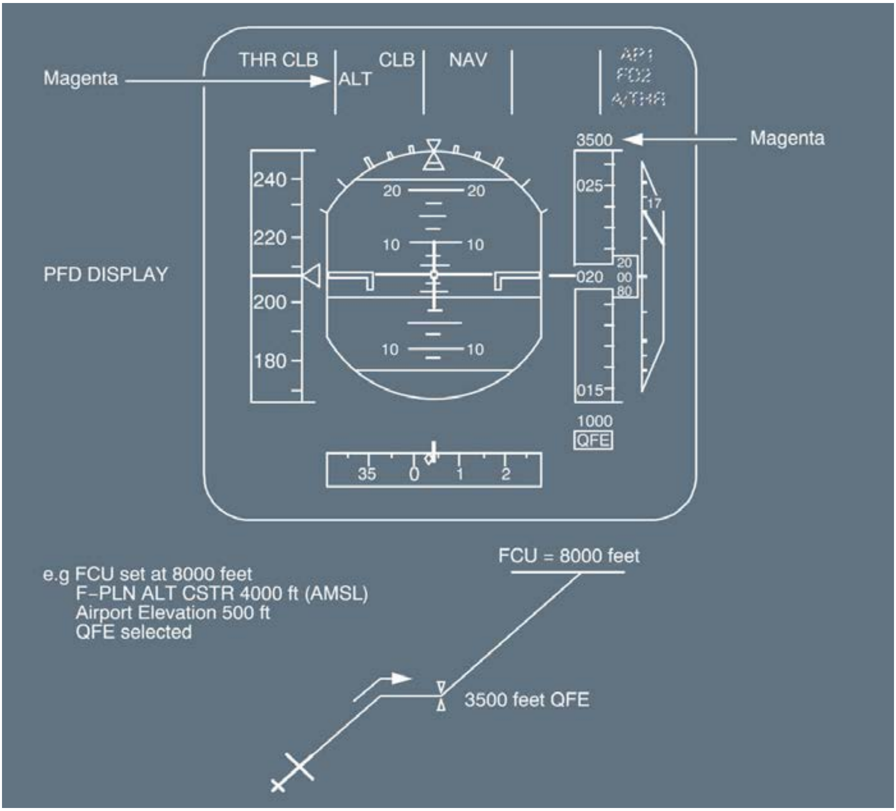
The PFD target altitude depends on the barometer setting:
- If “STD” is selected, the target is a flight level
- If “QNH ” or “QFE” is selected, the target is an altitude or height.

The aircraft will level off accordingly.

Note:
- *If the pilot changes the barometer setting during ALT * or ALT CST*, the aircraft may overshoot the target altitude, because the current value has been changed. However, the ALT * and ALT CST* modes allow the aircraft to regain the FCU altitude. As a general rule, avoid changing the barometer setting when in ALT * or ALT CST**
- *In aircraft equipped to use field elevation pressure (QFE option), switching from STD to QFE (or vice versa) in ALT CST* green changes the target value and may revert the vertical mode into V/S mode.*

NOTE FOR AIRCRAFT WITH QFE (FIELD ELEVATION PRESSURE) PIN PROGRAM

If you select “QFE ” on the EFIS control panel:
- The MCDU predictions follow the basic rules (altitudes are AMSL below the transition level, flight levels above it)
- The altitude constraints on the MCDU follow the basic rules
- The target altitude on the PFD is QFE related:
  - If the target altitude has been selected by the FCU, the aircraft will level off there.
  - If the target altitude is an altitude constraint, the PFD automatically shows that constraint as corrected by the airport elevation.



PROCEDURES

Ident.: DSC-22_20-60-10-00000928.0001001 / 16 FEB 11
Applicable to: ALL

a. The altitude constraints in departure and arrival procedures should be defined in the navigation database or by the pilot on the MCDU:
   - in terms of altitude AMSL below the transition altitude
   - in terms of flight level above the transition altitude

If a departure procedure defines an altitude constraint as an AMSL altitude above the transition altitude, you must convert it to STD, because the system and guidance will treat it as a flight level whenever you select the standard barometer setting.

b. In climb you should switch from QNH (or QFE) to STD on both EFIS control panels simultaneously when you reach the transition altitude.
   All MCDU altitude predictions and altitude constraints and all PFD altitude targets will be displayed as flight levels.
c. In descent, when ATC clears you to an altitude below the transition altitude, you can select QNH (or QFE) on both EFIS control panels simultaneously.
   All MCDU altitude predictions and contraints and PFD targets are now altitude AMSL.

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CLEARING THE SCRATCHPAD OF DATA OR MESSAGES

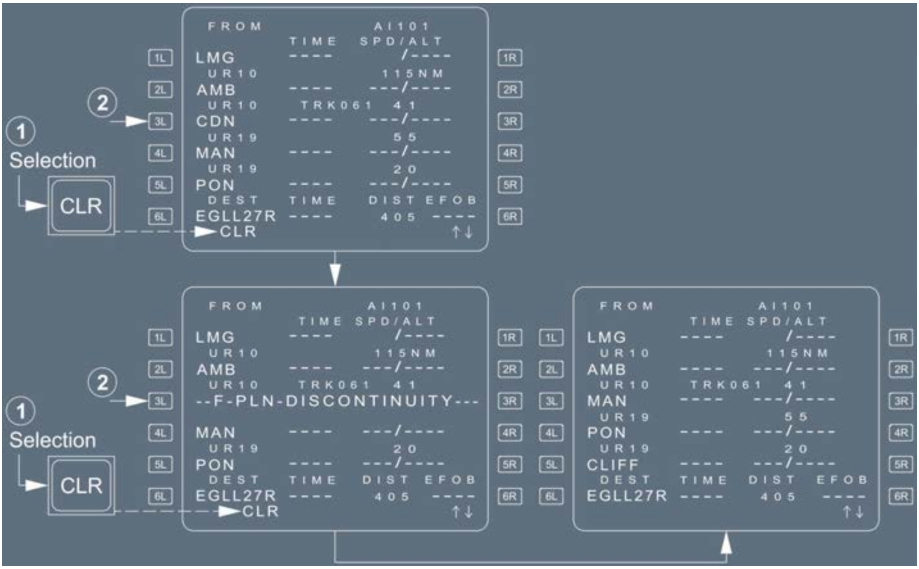
Ident.: DSC-22_20-60-20-00000929.0001001 / 16 FEB 11
Applicable to: ALL

Press the “CLR” key with a single brief touch to erase the last alphanumeric character inserted in the scratchpad.
Press the key for more than three seconds to erase all the data inserted in the scratchpad. If the scratchpad is empty, it displays “CLR”.

CLEARING DATA FIELDS

Ident.: DSC-22_20-60-20-00000930.0001001 / 16 FEB 11
Applicable to: ALL

Clear a data field by pressing the “CLR” key, the scratchpad displays CLR, then select the prompt for the field you want to clear (3L for example).
- You cannot clear all data fields:
  - If the field contains data that has a default value or a value computed by the FMGC, the data reverts to this value.
  - Any attempt to clear the defaulted value has no effect.
- Clearing a constraint on the F-PLN page deletes both the speed constraint and the altitude constraint associated with the waypoint
- If you clear a data field that is a waypoint in the flight plan (primary or secondary), you delete this waypoint from the flight plan and create a discontinuity. The discontinuity can also be cleared in a similar way.


FROM AI101
TIME SPD/ALT
LMG ---- /----
UR10 115NM
AMB ---- ---/----
UR10 TRK061 41
CDN ---- ---/----
UR19 55
MAN ---- ---/----
UR19 20
PON ---- ---/----
DEST TIME DIST EFOB
EGLL27R ---- 405 ----
CLR
1
Selection
CLR
2
FROM AI101
TIME SPD/ALT
LMG ---- /----
UR10 115NM
AMB ---- ---/----
UR10 TRK061 41
--F-PLN-DISCONTINUITY---
MAN ---- ---/----
UR19 20
PON ---- ---/----
DEST TIME DIST EFOB
EGLL27R ---- 405 ----
CLR
FROM AI101
TIME SPD/ALT
LMG ---- /----
UR10 115NM
AMB ---- ---/----
UR10 TRK061 41
MAN ---- ---/----
UR19 55
PON ---- ---/----
UR19 20
CLIFF ---- ---/----
DEST TIME DIST EFOB
EGLL27R ---- 405 ----

GENERAL

Ident.: DSC-22_20-60-30-00000932.0002001 / 16 FEB 11
Applicable to: ALL

Various features are provided to the crew in order to execute a diversion:
- The EQUITIME POINT
- The CLOSEST AIRPORTS pages
- The SECONDARY F-PLN
- The ENABLE ALTN function
- The NEW DEST revision

EN ROUTE DIVERSION WITH SEVERAL AIRPORTS AVAILABLE

Ident.: DSC-22_20-60-30-00009508.0002001 / 16 FEB 11
Applicable to: ALL

SELECT the CLOSEST AIRPORTS page.

CLOSEST AIRPORTS PAGE 2

SELECT the EFOB/WIND prompt.
INSERT the effective wind at selected airport.
CHECK the predictions and CHOOSE the adequate diversion airport.
PREPARE the diversion flight plan on the SEC F-PLN.

Note: *Fuel/time predictions on the CLOSEST AIRPORTS page assume managed speed profile.*

EN ROUTE DIVERSION OVER OCEANIC OR DESERTIC AREA

Ident.: DSC-22_20-60-30-00009528.0001001 / 16 FEB 11
Applicable to: ALL

The diversion airports are usually determined before departure or using the CLOSEST AIRPORTS data.

SELECT the EQUI-TIME POINT page.

ENTER the airport idents in 1L and 3L fields.
ENTER the associated winds in 2L and 4L fields.
CHECK the ETP position and time.
ENTER a predicted time at ETP as time marker.
PREPARE a diversion flight plan on the secondary flight plan.

DIVERSION PREPARATION ON THE SECONDARY FLIGHT PLAN

Ident.: DSC-22_20-60-30-00009530.0002001 / 16 FEB 11
Applicable to: ALL

The following procedure shall be applied for all diversion cases, once the diversion airport has been selected, as well as the “most probable diversion point of the F-PLN”:

PRESS the SEC F-PLN key
PRESS the COPY ACTIVE prompt
SELECT a lateral revision at diversion waypoint
ENTER the ident of the diversion airport in the NEW DEST field.

Then finalize the flight plan between the diversion point and the diversion airport. When the diversion airport is no longer applicable or ETP is sequenced, repeat the same procedure for the next diversion airport.

MISCELLANEOUS

Ident.: DSC-22_20-60-30-00009531.0002001 / 16 FEB 11
Applicable to: ALL

In some cases, the diversion airport may be simply chosen using the airports displayed on ND when AIRPORT is selected on the EIS control panel.

During oceanic or desertic area flights, the flight crew may use the PROG page, as follows:

ENTER the ident of the diversion airport in the 4R field of MCDU 1
ENTER the next diversion airport in the 4R field of MCDU 2

Then, the FMS continuously calculated the BRG /DIST to the selected diversion airports.

UPDATE the PROG pages when sequencing the ETP.

EXECUTION OF THE DIVERSION

Ident.: DSC-22_20-60-30-00009532.0001001 / 16 FEB 11
Applicable to: ALL

When the crew decides to divert:

PRESS the SEC F-PLN key.
SELECT the ACTIVATE SEC prompt.
SELECT DIR TO required point.

DIVERSION TO THE ALTERNATE AIRPORT

Ident.: DSC-22_20-60-30-00009537.0001001 / 16 FEB 11
Applicable to: ALL

The primary F-PLN includes an alternate flight plan from destination to the preferred alternate airport.
All fuel prediction and management (EXTRA fuel) take the alternate flight plan into consideration.
If the crew decides to divert at the end of the cruise, or beyond the last ETP, or in the descent or go-around phases, this will most probably be to the alternate airport.

When the crew decides to divert:

SELECT a lateral revision at suitable waypoint
SELECT ENABLE ALTN prompt
CHECK the temporary flight plan and INSERT
SELECT DIR TO required waypoint

Note:
- *In most cases, the LAT REV shall be selected at the TO WPT . This will facilitate the subsequent selection of the DIR TO waypoint.*
- *The ALTN flight plan shall be finalized, whenever the landing runway is known by the crew (before approach briefing).*
  In most cases, this will ensure that the most probable flight plan is displayed on the MCDU once ENABLE ALTN is selected.

GENERAL

Ident.: DSC-22_20-60-40-00000937.0001001 / 16 FEB 11
Applicable to: ALL

When the FMGS detects an engine-out condition, the following occurs:

FLIGHT MANAGEMENT PART

Ident.: DSC-22_20-60-40-00000938.0002001 / 16 FEB 11
Applicable to: ALL

- The managed target speeds is immediately set to a value that depends upon the flight phase
- All preselected speeds entered in the MCDU are deleted
- Step climb (or step descent), if entered, is deleted
- The time constraint is deleted
- The PROG page shows the engine-out maximum recommended (EO MAX REC) altitude
- The system automatically calls up the current performance page, which has the EO CLR (engine-out clear) prompt displayed in the 1R field (except during takeoff, before the diversion point is reached).
  If the crew presses the EO CLR , the 2 engine predictions and performance will be restored. Reverting back to one engine-out performance is not possible, unless the system detects a new EO condition. Therefore, the pilot should not press the EO CLR key, if an actual engine-out is detected
- It is not permitted to use the autopilot to perform non precision approaches in engine-out in the following modes: FINAL APP , NAV V/S , NAV /FPA . Only FD use is authorized.

FLIGHT GUIDANCE PART

Ident.: DSC-22_20-60-40-00000939.0002001 / 04 JUL 17
Applicable to: ALL

- All selected modes remain available (the “HDG/TRK”, “V/S”, and “OPEN” modes, for example)
- In the speed reference system (SRS) mode, the takeoff speed target is V2 , or the current speed if it is higher but no more than V2 +15. The magenta triangle indicates V2 in all cases. The GO Around speed target is VAPP , or the current speed if higher, limited to VLS +15 kt
- The system limits autopilot (AP) and flight director (FD) bank angles during takeoff and approach phases as follows:
  - 15 ° when the aircraft speed is below the maneuvering speeds (F, S, or Green Dot speed) -10 kt , and then
  - In selected lateral guidance:
    - Linear increase to 25 ° up to maneuvering speeds (F, S, or Green Dot speed) -3 kt
    - 25 ° above maneuvering speeds (F, S, or Green Dot speed) -3 kt .
  - In managed lateral guidance:
    - Linear increase to 30 ° up to maneuvering speeds (F, S, or Green Dot speed) -3 kt
    - 30 ° above maneuvering speeds (F, S, or Green Dot speed) -3 kt .

<u>Note:</u> *The engine-out bank angle limits apply, when the FG part of the FMGS has detected an engine-out. It cannot be cleared by the crew through the MCDU EO CLEAR prompt.*

AUTOTHRUST

Ident.: DSC-22_20-60-40-00000940.0001001 / 16 FEB 11
Applicable to: ALL

The system extends the active range of the active engine from idle to maximum continuous thrust (MCT instead of CL thrust).
The Flight Mode Annunciator requests maximum continuous thrust on the live engine at a time that depends on when the engine-out occurs.

ENGINE-OUT CONDITIONS

Ident.: DSC-22_20-60-40-00000941.0001001 / 16 FEB 11
Applicable to: ALL

The FMGS considers the aircraft to be in an engine-out condition, when one of the following conditions is present and the aircraft has commenced takeoff or is in flight:
- One engine master switch off, or
- N2 below idle, or

- One thrust lever angle is below 5 ° with the other above 22 °, or
- The FADEC shows an engine fault.

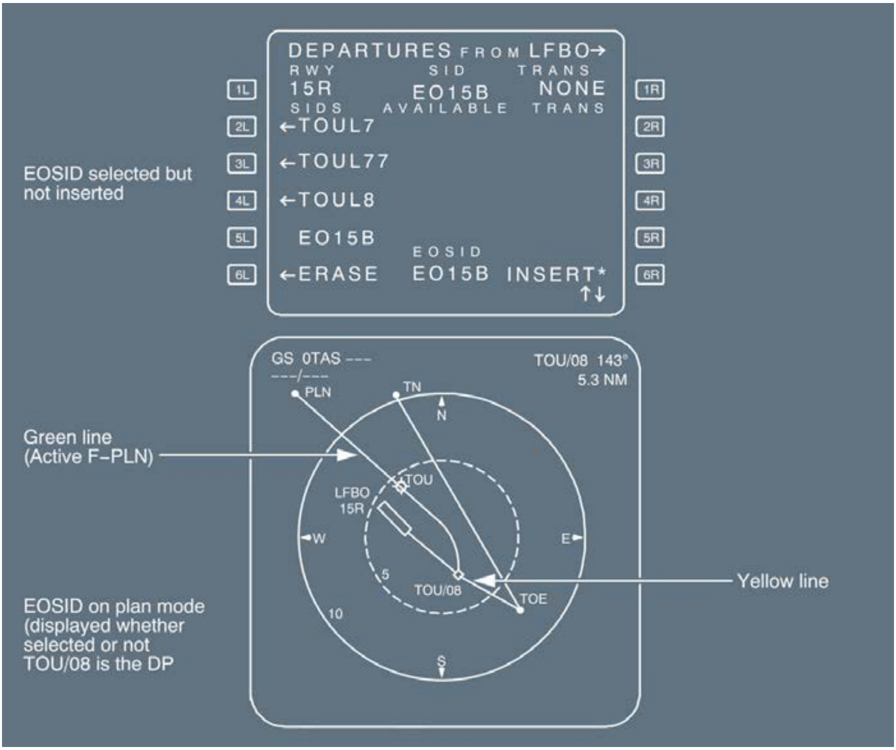
ENGINE-OUT SID

Applicable to: ALL

Ident.: DSC-22_20-60-40-A-00000942.0001001 / 14 MAY 12

GENERAL

An engine-out standard instrument departure (EOSID), when defined in the database, is always for a specific runway. It is indicated on the bottom line of the SID page for that runway, and you can select it manually.
The pilot can review the SID either by selecting the PLAN mode on the navigation display (solid yellow line), or by selecting it on the SID page. In the latter case, the navigation display shows the SID as a temporary flight plan.
The last point, if any, that is common to both the SID and engine-out SID is called the diversion point (DP).

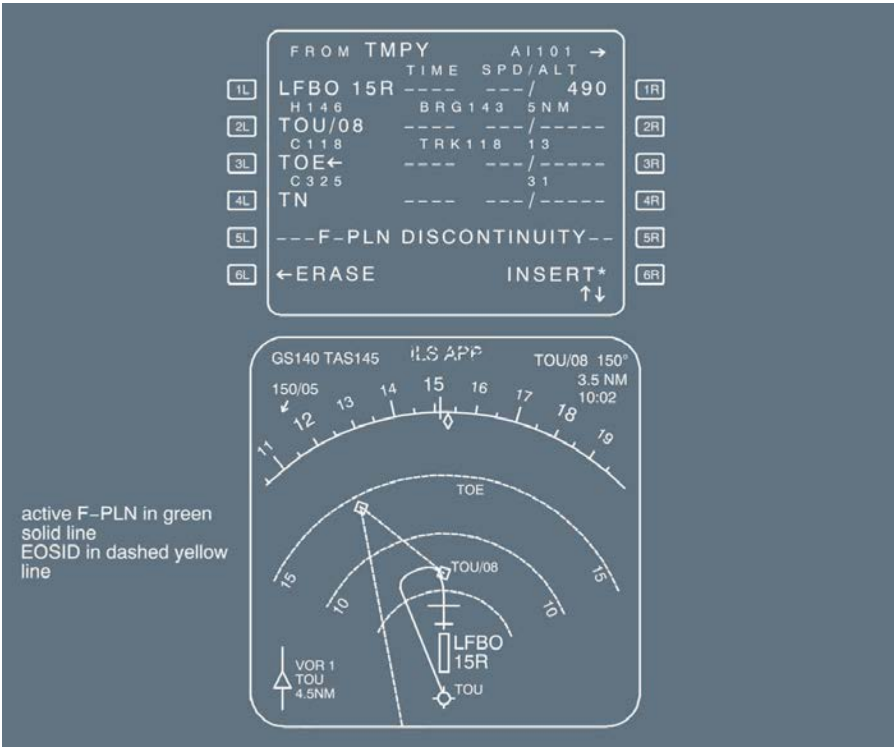


Ident.: DSC-22_20-60-40-A-00000943.0001001 / 14 MAY 12

WHEN AN ENGINE-OUT CONDITION OCCURS BEFORE THE DIVERSION POINT

The MCDU automatically shows the engine-out SID as a temporary flight plan on the F-PLN page and on the ND. The EOSID can be inserted or erased.

Note: *The EOSID Diversion Point is the waypoint at which the EOSID diverges from the active SID.*
If there is no common leg between the SID and the EOSID in the navigation database, the diversion point is by default the runway threshold. Therefore the SID and EOSID common leg(s) before the flight paths separation must be the same type and nature.

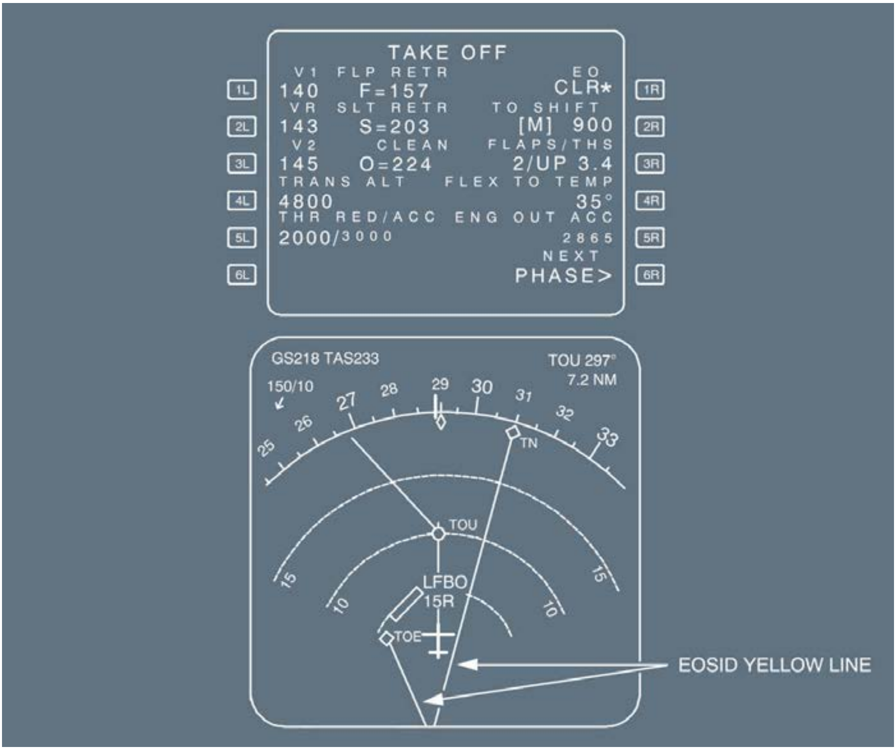


Ident.: DSC-22_20-60-40-A-00000944.0001001 / 14 MAY 12

WHEN AN ENGINE-OUT CONDITION OCCURS AFTER THE DIVERSION POINT

REMAIN on the SID path

Note: *The navigation display shows the engine-out SID as a yellow line for your information. Directing the aircraft to the EOSID should not be performed unless it allows obstacle clearance and the flight crew considers it is the best strategy for a particular case.*

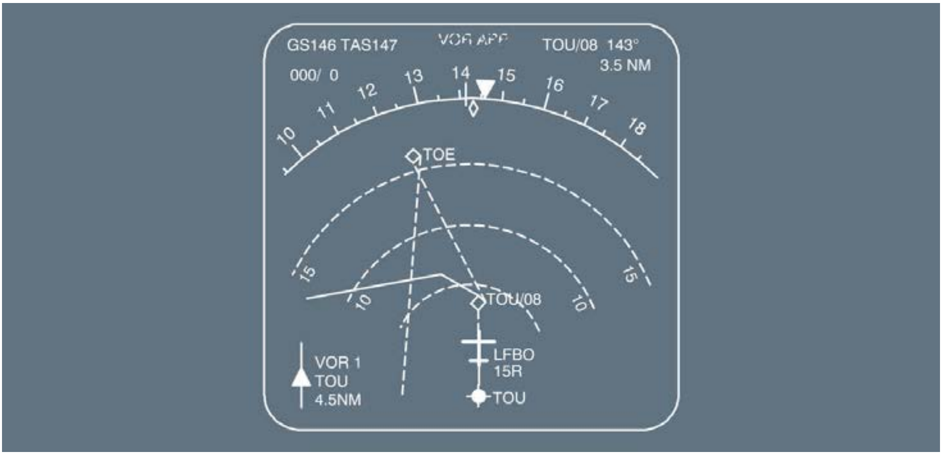


Ident.: DSC-22_20-60-40-A-00000945.0002001 / 14 MAY 12

BELOW THRUST-REDUCTION (THR RED) ALTITUDE

- The managed target speed changes to V2
- The PROG page displays the engine-out maximum recommended altitude

- The PERF TO page comes up on the display automatically with the “EO CLR” prompt in the 1R field
- The MCDU and the navigation display show the engine-out SID as a temporary flight plan, or the navigation display shows it for information only, depending upon the diversion point location.



PROCEDURE

● **When the aircraft reaches the engine-out acceleration altitude**

PUSH in the V/S knob to level off.

CLEAN up your configuration as the speed increases toward target speed.

When the aircraft is clean and has reached Green Dot speed, “LVR MCT” flashes on the FMA,

PULL out the altitude selector knob to resume the climb.

The OP CLB. mode engages.

MOVE the thrust lever for the live engine to “MCT” detent.

Ident.: DSC-22_20-60-40-A-00000946.0006001 / 16 FEB 11

ABOVE THRUST REDUCTION (THR RED) ALTITUDE

- The managed target speed changes to V2
- “LVR MCT” flashes amber on the flight mode annunciator
- The PROG page displays the engine-out maximum recommended altitude
- The PERF TO page displays the “EO CLR*” prompt in the 1R field
- The navigation display shows the EO SID.

PROCEDURE

MOVE the thrust lever of the active engine to the MCT detent.

- **When the aircraft reaches the engine-out acceleration altitude:**
  PUSH the V/S knob, in order to level off.
  CLEAN UP configuration as the speed increases.
- **When the aircraft reaches Green Dot speed:**
  PULL the ALT knob to resume the climb.

  Note: *If necessary, move the thrust lever of the active engine to the TOGA detent. The Flight Mode Annunciator will display "LVR MCT", flashing in white, when the aircraft reaches Green Dot speed.*

ENGINE-OUT IN CLB PHASE (ABOVE ACCELERATION ALTITUDE)

Applicable to: ALL

Ident.: DSC-22_20-60-40-B-00000947.0003001 / 16 FEB 11

ENGINE-OUT OCCURS WHILE AIRCRAFT IS ACTUALLY CLIMBING

- The managed target speed changes to Green Dot speed
- "LVR MCT" flashes white on the Flight Mode Annunciator
- The climb mode reverts to open climb (OP CLB) and the aircraft slowly decelerates down to Green Dot speed
- The MCDU shows the PERF CLB page with an "EO CLR*" (clear engine-out) prompt
- The PROG page shows the engine-out maximum recommended altitude (EO MAX REC ALT).

PROCEDURE

MOVE the thrust lever of the active engine to the MCT detent.
SET the altitude on the Flight Control Unit to an altitude below the engine-out maximum recovery altitude, as cleared by ATC.
INITIATE a diversion, when cleared to do so.

Ident.: DSC-22_20-60-40-B-00000948.0001001 / 16 FEB 11

ENGINE-OUT OCCURS WHILE THE AIRCRAFT IS FLYING IN ALT MODE AT AN ALTITUDE SET ON THE FLIGHT CONTROL UNIT

- The target speed is set to engine-out cruise speed (EO CRZ SPD), computed at the altitude set on the Flight Control Unit, but limited by the limit speed (SPD LIM), if there is one.

Other consequences and procedures are similar to previous engine out climb.

ENGINE-OUT IN CRUISE PHASE

Ident.: DSC-22_20-60-40-00000949.0001001 / 21 MAR 17
Applicable to: ALL

- The system sets the managed target speed to the higher of engine-out cruise Mach number or speed, or current speed.
- “LVR MCT” (or MCT) flashes on the Flight Mode Annunciator.
- The PERF CRZ page appears with the “EO CLR*” (clear engine-out) prompt.
- The PROG page displays the engine-out maximum recommended altitude (EO MAX REC ALT).

PROCEDURE

Perform engine out abnormal procedure.
Refer to PER-OEI-GEN INTRODUCTION “SINGLE ENGINE OPERATIONS”

- *For standard strategy,Refer to FCTM/PR-AEP-ENG Engine Failure During Cruise*
- *For obstacle strategy,Refer to FCTM/PR-AEP-ENG Engine Failure During Cruise*
- *For fixed strategy, Refer to FCTM/PR-AEP-ENG Engine Failure During Cruise*

Initiate a diversion if necessary.

Note: *The engine-out descent strategy requires disconnection of the autothrust, and descent in OPEN DES mode.*
Disconnecting the autothrust prevents an automatic setting of THR IDLE; therefore, the autopilot will fly the target speed in OP DES mode, with a thrust manually selected by the crew.
When reaching the FCU-selected altitude, or whenever normal descent is resumed to a lower altitude, reengage the autothrust.

ENGINE-OUT IN DESCENT PHASE

Ident.: DSC-22_20-60-40-00000951.0001001 / 16 FEB 11
Applicable to: ALL

- The managed target speed remains unchanged (ECON DES Mach number or speed, with any speed limitations).
- “LVR MCT” (or MCT) flashes on the Flight Mode Annunciator.
- The PERF DES page appears, showing the “EO CLR*” prompt.
- The PROG page displays the engine-out maximum recommended altitude (EO MAX REC ALT).
- The descent mode (if engaged) reverts to V/S , if the aircraft is above the EO REC MAX. If not, the descent mode is maintained.

PROCEDURE

MOVE the thrust lever for the live engine to the MCT detent.
If necessary, SELECT a suitable flight mode for descent.
DISCONNECT the autothrust and ADJUST thrust if necessary.

ENGINE-OUT IN APPROACH PHASE

Ident.: DSC-22_20-60-40-00000952.0001001 / 04 JUL 17
Applicable to: ALL

- The aircraft maintains approach speed (VAPP).
- “LVR MCT”(or MCT) flashes on the Flight Mode Annunciator.
- The PERF APPR page appears, showing the “EO CLR*” prompt.
- The progress page displays the engine-out maximum recommended altitude (EO MAX REC ALT).

PROCEDURE

MOVE the thrust lever for the live engine to the MCT detent.

CAUTION	Below maneuvering speed (F, S, Green Dot) – 10 kt, the autopilot or flight director (AP/FD) cannot order a bank angle greater than 15 °. Above maneuvering speed – 10 kt, this limit linearly increases until it reaches: - In selected lateral guidance: 25 ° at maneuvering speed – 3 kt. The limit is then 25 ° for all speeds above maneuvering speed – 3 kt. - In managed lateral guidance: 30 ° at maneuvering speed – 3 kt. The limit is then 30 ° for all speeds above maneuvering speed – 3 kt.

ENGINE-OUT IN GO-AROUND PHASE

Ident.: DSC-22_20-60-40-00000953.0002001 / 16 FEB 11
Applicable to: ALL

The results and procedures for takeoff phase apply, except that the displays do not show the engine-out SID.

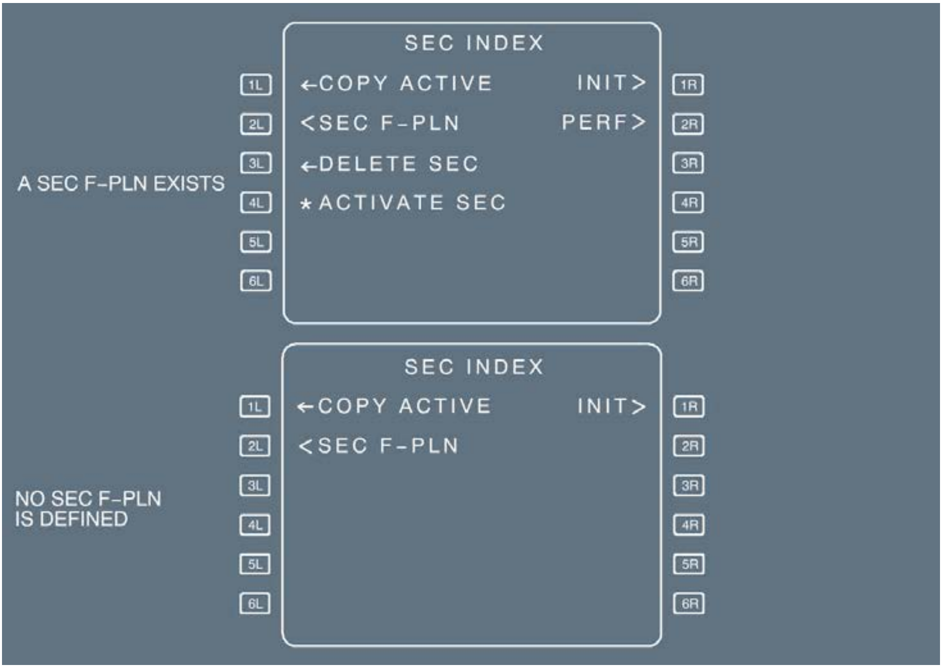
SECONDARY FLIGHT PLAN

Ident.: DSC-22_20-60-50-00000954.0011001 / 14 MAY 12
Applicable to: ALL

The secondary flight plan (SEC F-PLN) is an alternative flight plan which can be activated when required.
It may include all the vertical elements except history wind data.

The flight crew can:
- Create a secondary flight independently from the active flight plan (a secondary flight plan can be created while a temporary flight plan exists).
- Copy it from the active flight plan.
- Delete it completely.

- Activate it, when the “ACTIVATE SEC” prompt is displayed: The secondary flight plan becomes the active flight plan.



- The screen displays the “ACTIVATE SEC” prompt in flight if:
  - HDG (or TRK) mode is engaged, or
  - NAV mode is engaged, and the active leg of the primary and secondary flight plans is the same.

  The FMS sequences the secondary flight plan the same way as the active flight plan, when it is a copy of the active flight plan.

The navigation display shows the secondary flight plan in white. In PLAN mode, the crew can use the slew keys to review the secondary flight plan (as for the primary flight plan).

PREDICTIONS

The FMGS computes predictions using the same performance methods and performance factor it uses for the active flight plan. However, it predicts pseudo waypoints only for the MCDU not for the Navigation Display (ND).

- **When the flight crew initializes the secondary flight plan with the SEC INIT function:**
  The FMGS computes the secondary flight plan predictions as if the aircraft were on ground before engine start. The FMGS computes these predictions one time and does not update them to indicate the progress of the flight (aircraft position, fuel consumption, etc.).
- **When the flight crew initializes the secondary flight plan with the COPY ACTIVE function:**

  The FMGS computes the secondary flight plan predictions as for the active flight plan. However:
  - The FMGS stops the update of the predictions if the first leg of the active flight plan is no longer the same as the active leg (i.e. if both flight plans diverge). The flight phase is the same as the flight phase at the time of the divergence.

    Note: *This does not apply to the preflight phase, when the FMGS computes the predictions if the departure airports are the same, even if the takeoff runways are different.*

- **The flight crew may use the secondary flight plan in the following cases:**
  - At takeoff when an alternate takeoff runway is probable
  - On ground to initialize the FMGS again if the flight that the flight crew initially prepared is replaced by another flight (*Refer to PRO-NOR-SRP-01-05 Introduction*)
  - In flight to prepare a diversion
  - In flight when an alternate landing runway is probable
  - To prepare the next flight.

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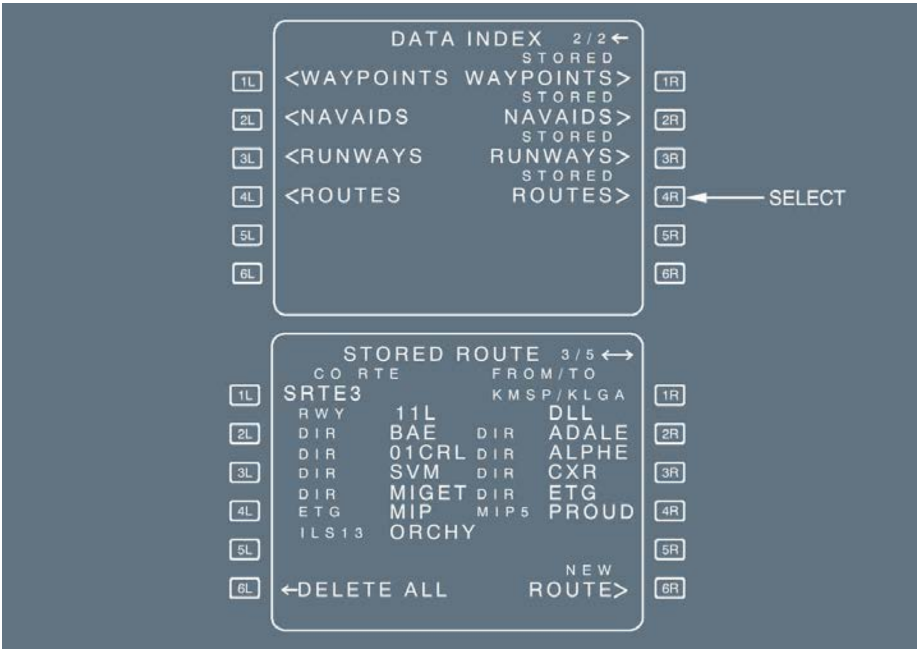
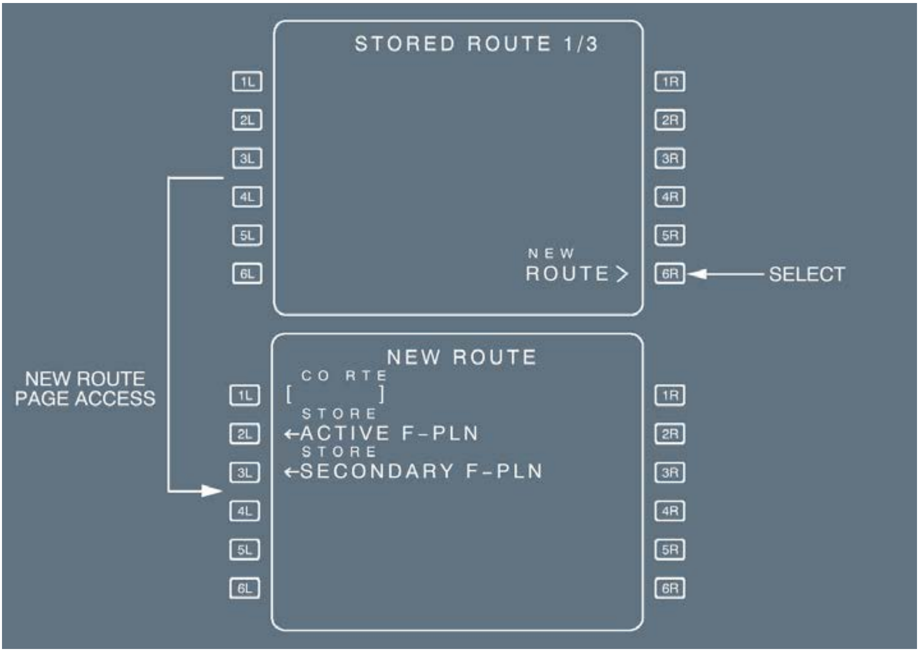
STORED ROUTE FUNCTION

Ident.: DSC-22_20-60-60-00000955.0002001 / 01 OCT 12
Applicable to: ALL

The stored route function allows the pilot to store or review as many as five different routes defined in an active or secondary flight plan.
This also allows the pilot to store a company route that is not yet in the database, but is expected to be flown several times (a charter route, for example).
Access the STORED ROUTES page from the DATA INDEX page.



A stored route can be reviewed by using the slew key.
In order to store a new route, first define the route through the active flight plan (on the ground only) or the secondary flight plan (on the ground or in flight) then proceed as described below.



HOW TO STORE THE ACTIVE FLIGHT PLAN (DURING PREFLIGHT ONLY)

SELECT the DATA key on MCDU
PRESS the “STORED ROUTES” key
PRESS the “NEW ROUTE” key
ENTER the name of the company route (optional).
PRESS the “STORE ACTIVE F-PLN” key

HOW TO STORE THE SECONDARY FLIGHT PLAN

SELECT the DATA key on MCDU
PRESS the “STORED ROUTES” key
PRESS the “NEW ROUTE” key
ENTER the company route name (optional)
PRESS the “STORE SECONDARY F-PLN” key

Note:
1. *In either case, you may only store a company route if the active or secondary flight plan is complete from origin to destination.*
2. *If you do not enter a name, the FMGS automatically names the stored route as “SRTE 1 (or 2 ...)” when it is stored.*
3. *The system does not retain several elements of the flight plans, when they are stored:*
   - *Pilot-entered holds*
   - *Offsets*
   - *Pilot-entered constraints*
   - *Modifications to a terminal procedure*
   - *Pseudo waypoints*

   When this happens, it displays “REVISIONS NOT STORED”.
4. *If five routes are already stored the system will reject a new entry and display “STORED ROUTES FULL” on the MCDU . Delete one stored route by clearing the CO RTE name before inserting a new one.*

Intentionally left blank

GENERAL

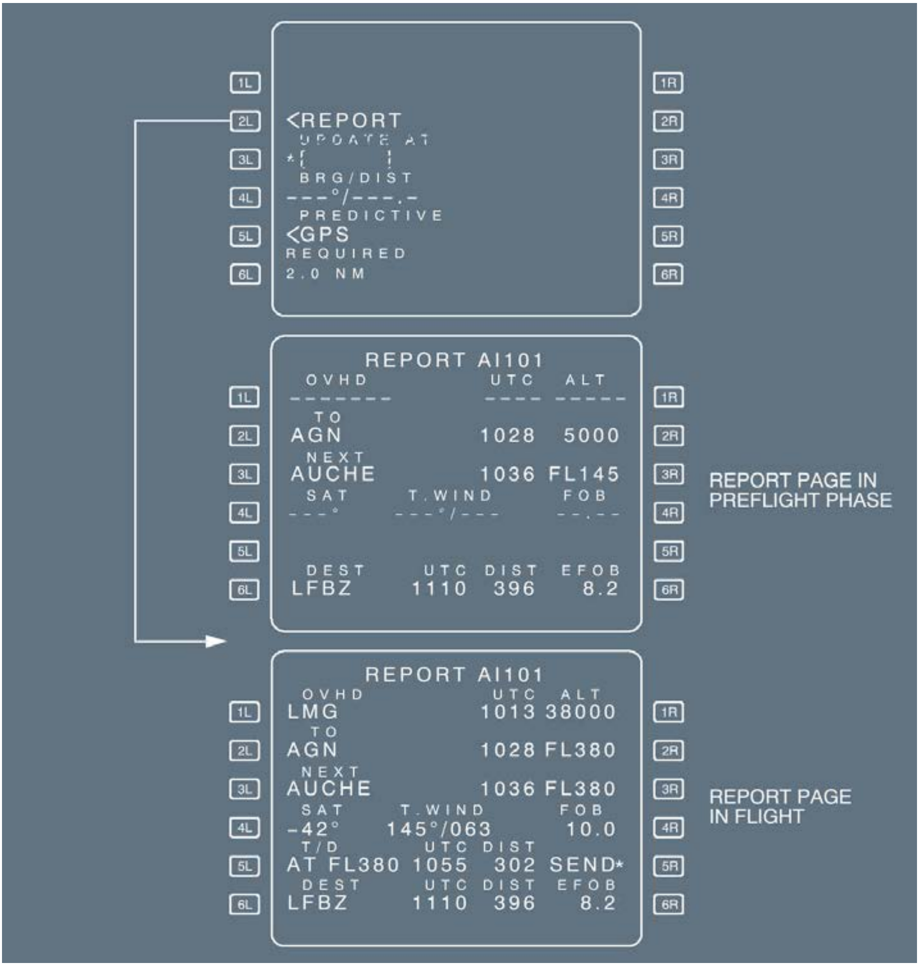
Ident.: DSC-22_20-60-70-00006017.0001001 / 16 FEB 11
Applicable to: ALL

The REPORT page allows the crew to achieve the position reporting.

REPORT PAGE ACCESS

Ident.: DSC-22_20-60-70-00009524.0008001 / 29 SEP 15
Applicable to: ALL

The report page is accessed from the PROG PAGE.



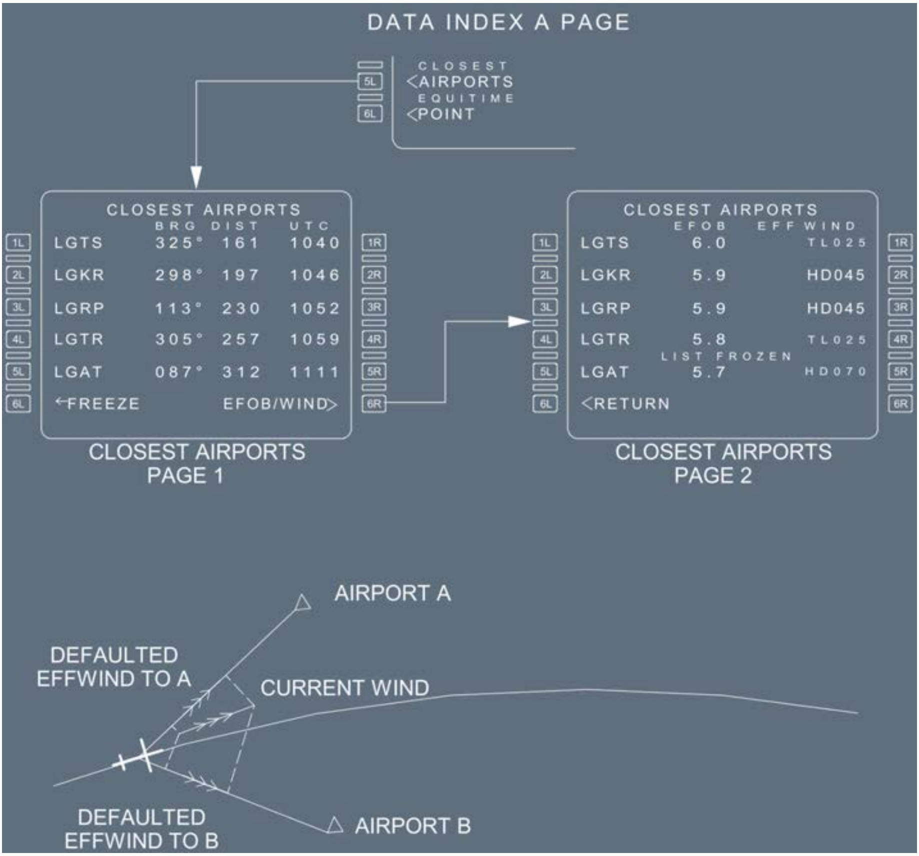
<u>Note:</u> *In case a DIR TO with ABEAM WPT s is achieved, or in case a FIX INFO with ABEAM or RADIAL/CIRCLE intersection is inserted in the F-PLN , the TO WPT (provided on the REPORT page) will be the ABEAM WPT or the RADIAL/CIRCLE intersect waypoint, if any, as on the F-PLN page.*

CLOSEST AIRPORTS

Ident.: DSC-22_20-60-80-00006018.0001001 / 07 APR 11
Applicable to: ALL

The CLOSEST AIRPORTS page displays the four closest airports, from the position of the aircraft, found in the navigation database (*Refer to DSC-22_20-50-10-25 Closest Airports Pages* for the page description), and the 5th airport, as selected by the crew.

For each airport, the FM computes:
- The BRG /DIST /ESTIMATED UTC from the position of the aircraft to the corresponding airport.
- The EFOB at the airport, assuming an EFFECTIVE WIND (defaulted or entered by the pilot).



Note: *When the CLOSEST AIRPORTS page 2 is selected, the list of airports is automatically frozen, as indicated on the page.*

The FUEL/TIME predictions to the closest airports use simplified assumptions:
- Managed speed profile in cruise, with the effective wind from the CLOSEST AIRPORTS page 2. In case of EO, Engine Out condition is considered.
- Continuous descent from CRZ FL down to the airport elevation.

Note: *In case SELECTED SPD is used, the CLOSEST AIRPORTS page still provides good use to choose the applicable closest airport for diversion purposes. However, when SELECTED SPD is significantly different from MANAGED SPD, the predictions in terms of time and fuel must be disregarded since they are misleading.*
The predictions may then be checked on the SEC F-PLN.

GENERAL

Ident.: DSC-22_20-60-90-00006019.0001001 / 16 FEB 11
Applicable to: ALL

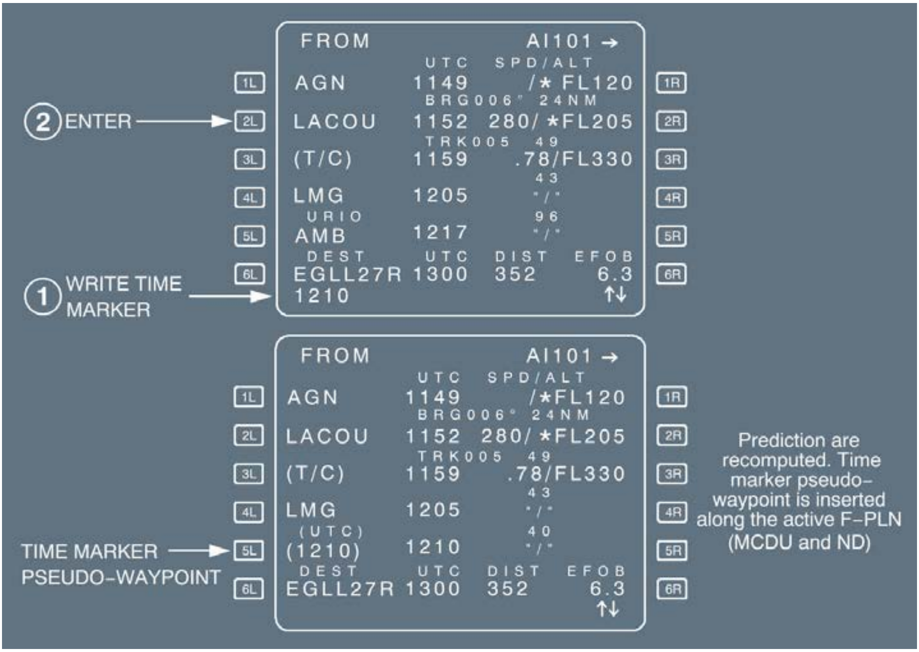
The crew can enter a time marker in the F-PLN A or B page. Once entered, the FMGS displays a pseudo waypoint along the flight plan on the MCDU and on the Navigation Display. This pseudo waypoint shows the predicted location of the aircraft at the entered time.

HOW TO INSERT A TIME MARKER

Ident.: DSC-22_20-60-90-00009522.0001001 / 01 OCT 12
Applicable to: ALL

WRITE the time marker in the scratchpad. The entry format is HHMM.
SELECT any left key of the F-PLN A or B page, to insert the time marker in the active flight plan.

The time marker is inserted in the flight plan according to time criteria, irrespective of the key chosen for entry.



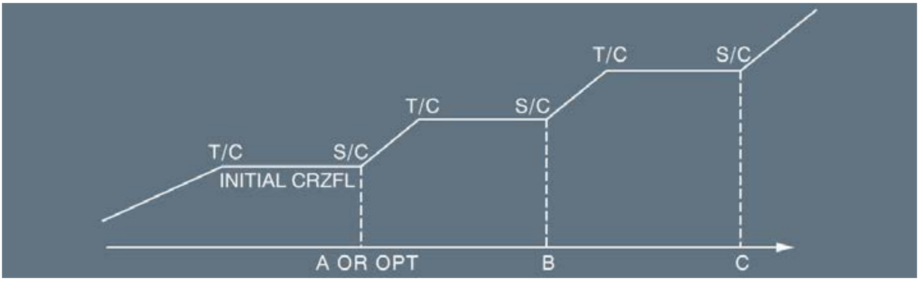
Up to four time markers may exist at a time. An attempt to enter a fifth time marker will cause the “TIME MARKER LIST FULL” message to appear on the scratchpad.

The FMGS updates the time marker position with the predictions.
When the current clock time equals or exceeds the time marker entry, the FMGS sequences the time marker (even in preflight).

STEP CLIMB/STEP DESCENT

Ident.: DSC-22_20-60-100-00006020.0012001 / 12 APR 17
Applicable to: ALL

The STEP ALTS function enables to define the successive cruise Flight Levels. The optimum position to initiate a climb, from the initial (or current) cruise Flight Level to the next one, can also be determined.



PRINCIPLE

GEOGRAPHIC STEPS

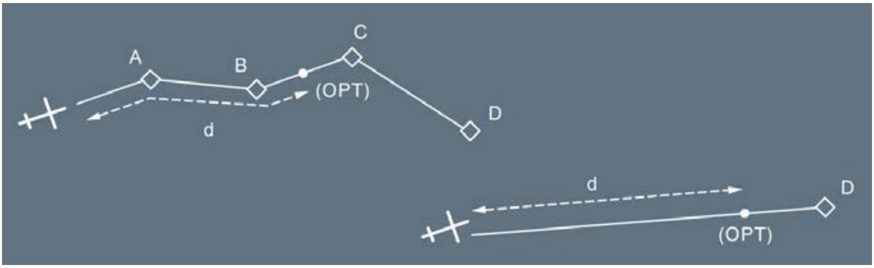
Up to four geographic steps may be defined on the STEP ALTS page. These steps are initiated at the geographical position, along the F-PLN.

Rules

- The minimum step size is 1 000 ft.
- A Step Climb (S/C) cannot follow a Step Descent (S/D).
- A STEP is automatically cleared, if:
  - The S/C (S/D) is sequenced without any level change done by the crew.
  - The crew achieves a LAT REV , which deletes the associated waypoint from the F-PLN
  - By EO condition.
- A STEP is manually cleared:
  - On the STEP ALTS page, by CLEARING the corresponding field.
  - On the F-PLN page, by CLEARING the (S/C) or (S/D) pseudo-waypoints.
- A STEP entry is IGNORED, if the remaining CRZ distance is less than about 50 NM.
- Once the steps are inserted in the F-PLN, they are displayed:
  - On the MCDU , as (S/C), (S/D), (T/C), (T/D) pseudo waypoints.
  - On the ND, by associated , , ,  white symbols.

OPTIMUM STEP

When geographic steps are inserted, or an altitude is entered, the FM proposes an OPTIMUM STEP start of climb position for the first step climb altitude ahead. Predicted FUEL and TIME savings are displayed when calculated to be greater than 100 kg or 1 min respectively. If no savings are found, no optimum step is proposed.
The OPT STEP is not automatically inserted. The crew must insert it, if appropriate. Once inserted, the OPT STEP point (OPT) becomes a fixed geographical point.
If some F-PLN parameters are subsequently changed (e.g. winds, new waypoints), an update of the optimum position relative to the previous one may be proposed. If savings exist, this new optimum may be inserted to replace the previous optimum step point.
Once an OPT STEP is inserted in the F-PLN , and the crew achieves a lateral F-PLN revision, the FM keeps the (OPT) along the new F-PLN, at the same distance from the aircraft's position, as previously determined.



Rules

- The OPT STEP is only computed by the FM , if data required for the prediction computation are inserted : F-PLN , CRZ FL , CI, GW , CG at least.
- The search of the OPT STEP begins 20 NM beyond (T/C) before Cruise, or ahead of the aircraft's position.
- The search of the OPT STEP ends 20 NM before the next STEP POINT, or 300 NM before the (T/D).
- Only one OPT STEP is computed at a time.

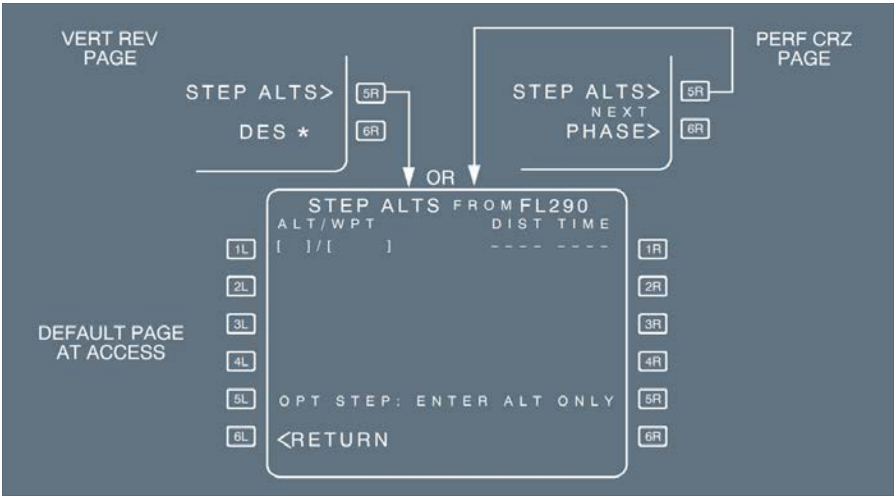
Guidance

When reaching the step point, the steps must be initiated by the crew by selecting the new CRZ FL , and pressing the FCU ALT selector knob. If sequenced without any crew action, the step is automatically deleted.

If the crew initiates the step:
- The CRZ FL is automatically reassigned to its new value.
- The guidance is THR CLB /CLB for a step climb.
  THR IDLE/DES with V/S = -1 000 ft/min for a step descent.

STEP ENTRY

The STEP ALTS page is either accessed from the :
- The VERT REV page, or
- PERF CRZ page.



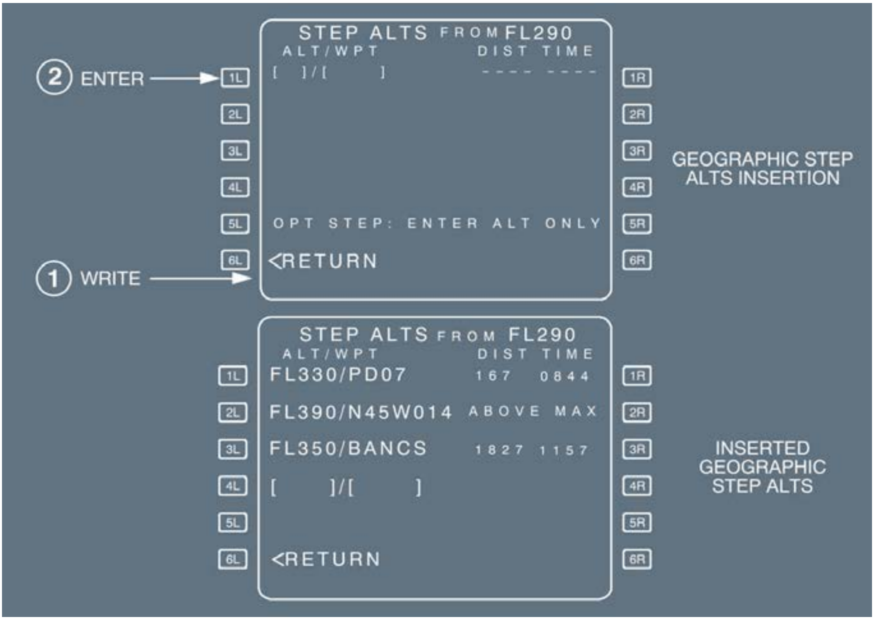
FOR GEOGRAPHIC STEP:

PRESS the F-PLN or PERF key.
SELECT vertical revision at a cruise waypoint.
SELECT the STEP ALTS prompt.

WRITE the ALT /WPT in the scratchpad, and ENTER it in [1L] to [4L].

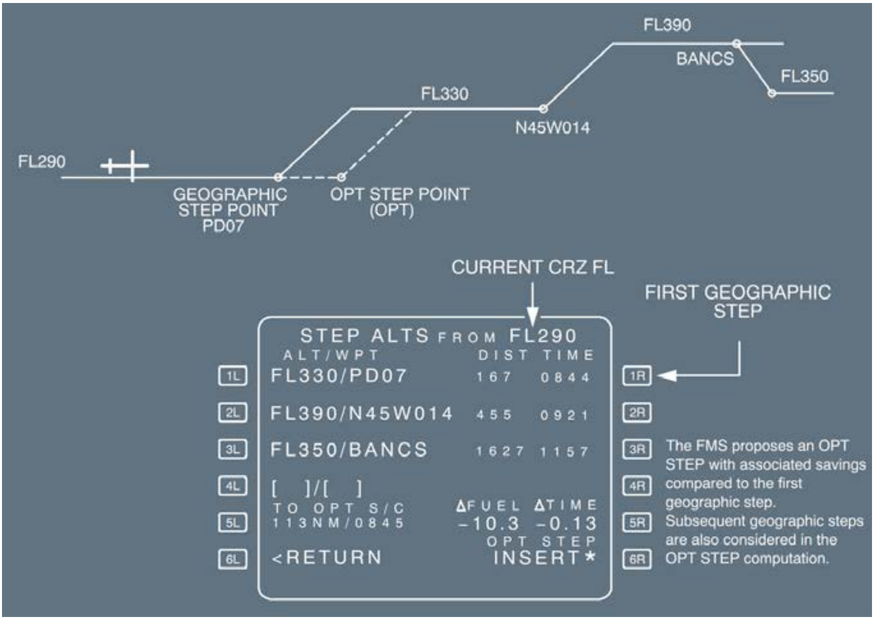
<u>Note:</u>
- *The position may be a waypoint ident, PBD, PD.*
- *The pilot may enter FL 350/LMG/–20. The FM will compute the geographic step 20 NM before LMG to FL 350.*
- *To modify an inserted STEP:*
  - *To modify the CRZ FL only, enter it in the left key, as "FLXXX".*
  - *To modify the position only, enter it in the left key, as "/XXX".*
  - *To modify both, modify the position first, and then the CRZ FL (it is not possible to modify both in a single entry).*

CHECK the PREDICTIONS.



FOR OPTIMAL STEP

Once all geographical steps are inserted, and the predictions are available, the STEP ALTS page displays the FUEL/TIME savings for the first step climb. If no significant savings are predicted, the NO OPTIMAL message is displayed.



To INSERT the proposed OPT STEP displayed in [5L]:

SELECT the INSERT* prompt in [6R].

The computed (OPT) step replaces the initially inserted step position, and is then considered at a fixed geographic position. Savings are no longer displayed, and the UPDATE* prompt replaces the INSERT* prompt. This prompt allows the crew to update the (OPT) step position, considering possible F-PLN or inserted wind changes.

If pressed, a new OPT point is proposed, with the associated SAVINGS and INSERT prompt, or NO OPTIMAL.

UPDATE prompt has been pressed, the new OPT STEP point gives additional savings:

THERE ARE ONLY 2 CRZ FL S IN THE F-PLN:

The pilot may obtain the OPT position of the STEP point, as follows:

INSERT the initial cruise FL on the INIT A page.

ENSURE that the ZFW , ZFWCG and BLOCK fuel are inserted on the INIT B page.

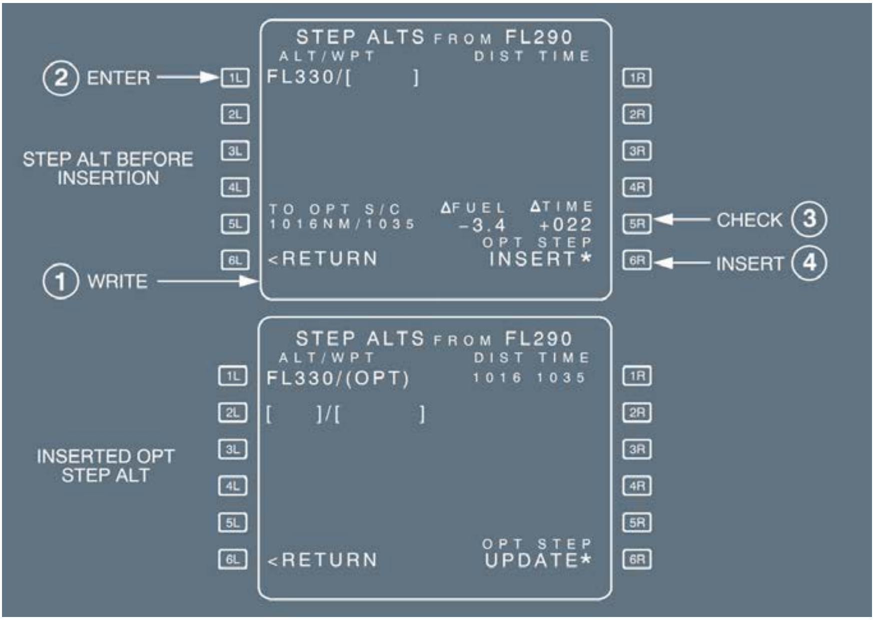
WRITE the new CRZ FL in the STEP ALTS page, in the [1L] field.

Distance and time to optimum point and fuel/time saving are displayed.

CHECK the fuel and time savings and prediction on the [5R] field.

Savings are computed by comparing the entered step altitude, and the origin altitude of the step.

INSERT, if suitable.



Note: *No OPT STEP is available in the SEC F-PLN.*

MESSAGES

Messages may be displayed in the DIST/TIME field:

- “ABOVE MAX”, if the inserted step altitude exceeds the REC MAX ALT.
  The “STEP ABOVE MAX FL” scratchpad message is associated to the “ABOVE MAX” message.
- “IGNORED”

  This message is displayed in the following cases:
  - Step climb is located prior to the top of climb, or after the top of descent.
  - Step end is at less than 50 NM from the top of descent. An optimum step point, < 200 NM from top of descent, cannot be inserted

- “STEP AHEAD”, when the distance to the step point is less than 20 NM . A “STEP AHEAD” scratchpad message is also displayed.
  The following message may be displayed in the scratchpad:
- “NOT ALLOWED”, if:
  - Four steps already exist in the F-PLN, and an additionnal entry is attempted.
  - Any attempt to enter a step at the FROM waypoint, or at a pseudo waypoint is done.
  - Two consecutive steps are entered at the same waypoint (e.g. step climb after step descent).

GENERAL

Ident.: DSC-22_20-60-110-00006021.0001001 / 01 OCT 12
Applicable to: ALL

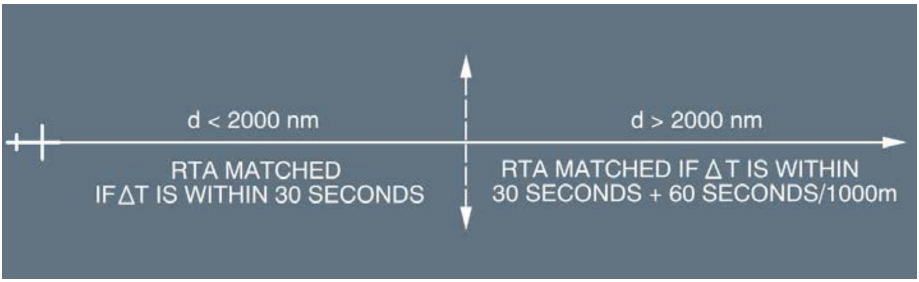
A time constraint (RTA) may be assigned at any waypoint of the F-PLN, downpath of the origin and the FROM waypoint. It can be an ”AT”, “AT OR BEFORE”, or “AT OR AFTER” constraint.
The FMS computes a new managed speed profile from the aircraft position to the constrained waypoint, in order to match the 30 s difference (ΔT) between the time predicted at the constrained waypoint and the RTA. This modified managed speed profile can be checked using the speed prediction, displayed for each waypoint of the F-PLN page.
The RTA function uses a speed range between Green Dot speed and VMO - 10 (or MMO - 0.02).
When the constrained waypoint is sequenced, the ECON SPD/MACH is resumed unless the constrained waypoint is located in a descent segment.

Note: *The FM does not compute a new managed speed profile when a RTA is entered in the descent profile while the aircraft is in cruise within 40 NM from the top of descent.*

The time constraint is inserted on the RTA page. A time constraint may be inserted at any waypoint of the primary or secondary flight plan.
If an engine-out condition is detected, the time constraint is automatically deleted and RTA DELETED message on scratchpad.
If the aircraft enters a holding pattern, the downpath time constraint is deleted.
Once inserted in the F-PLN , the RTA is displayed in magenta on the F-PLN page, as long as no predictions are available.

Once the predictions are available, the time constraint is replaced by the new predicted time at the associated waypoint, and highlighted by a star: (*)
- The (*) is magenta, if the time constraint is matched with the 30 s criteria.
- The (*) is amber, if the time constraint is missed.

Time constraint matching criteria:



Note: *ΔT is the time difference between the time predicted at the constrained waypoint and the RTA.*

TIME CSTR ENTRY

PRESS the F-PLN key.
SELECT vertical revision at the revised waypoint.
SELECT the RTA key.
ENTER a waypoint at which a time constraint is to be defined.
WRITE the time constraint (+/–HHMMSS) into the scratchpad and ENTER

The display automatically reverts to the F-PLN A page.

Note:
- *The TIME CSTR can be directly cleared on the F-PLN A page, using the CLR key.*
- *The time constraint is automatically deleted in the following cases:*
  - *Engine out, or*
  - *When entering a holding pattern, or*
  - *In case of Go-Around, or*
  - *A time constraint is entered at another waypoint, while another time constraint already exists.*

  A scratchpad “RTA DELETED” message is displayed.

ESTIMATED TAKEOFF TIME (ETT)

Ident.: DSC-22_20-60-110-00009523.0001001 / 23 JUN 15
Applicable to: ALL

The Estimated Takeoff Time (ETT) may be entered by the pilot during the preflight phase at the origin airport. This time is used as the initialization time for predictions.
The entry is accepted in the preflight phase, if the ETT is greater than the clock time.

PROCEDURE

PRESS the F-PLN key
SELECT a vertical revision at origin
SELECT the RTA page
WRITE the ETT into the scratchpad, and ENTER in the ETT field.

The display automatically reverts to the F-PLN A page.

Note:
- *If the current time exceeds the ETT entry, the CLK IS TAKE OFF TIME message is displayed ; the ETT is replaced by the clock time.*
- *At takeoff, the takeoff time is automatically updated using the actual clock time.*
- *An ETT entry is automatically deleted, if the origin airport is modified, or if the clock is inoperative.*
- *If a time constraint is entered at a waypoint in the F-PLN , the takeoff time required to match the constraint is automatically computed by the FM. This result is displayed in magenta as ETT at the origin.*

USE OF TIME/ETT CONSTRAINT

During preflight :
- If an ETT has been entered, time predictions are based on the entered value (or clock time, if greater).
- If both an ETT and a time constraint have been entered, time predictions are based on the entered ETT value (or clock time, if greater). The managed speed profile is computed to match the time constraint, as closely as possible, using a pseudo cost index value. (Not displayed).
- If only a time constraint has been entered:
  - Optimum speeds are computed to determine the ETT, so as to satisfy the time constraint.
  - If necessary, flight time (based on optimum speeds) plus clock time (current) is greater than the time constraint ; optimum speeds are modified to match the time constraint as closely as possible.

After Takeoff : The predictions are based on the current time.
Speeds are adjusted to satisfy the time constraint.

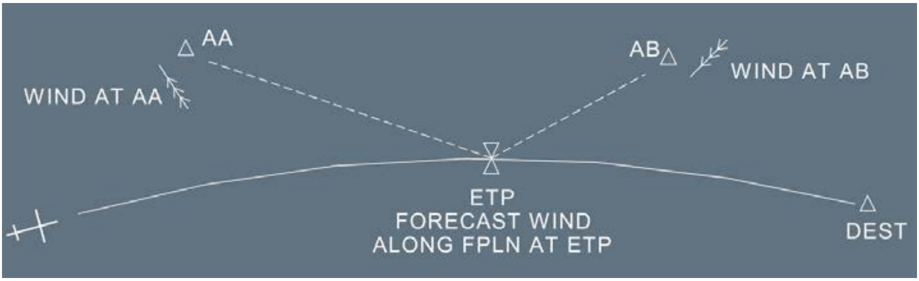
Intentionally left blank

EQUITIME POINT

Ident.: DSC-22_20-60-120-00006015.0001001 / 16 MAR 11
Applicable to: ALL

The equitime point page displays the ETP , computed along the F-PLN route between two referenced positions (airports, waypoints or navaids), defined by the pilot (*Refer to DSC-22_20-50-10-25 Equi - Time Point Page*for the page description).
When first accessing the page, the FMS proposes origin and destination airfields, as defaulted positions.
The pilot may overwrite these two positions and insert the wind in their vicinity at the applicable CRZ FL.
The FMS then computes the resulting ETP , using the managed or selected speed, and blending the forecasted winds along the F-PLN route with the inserted winds.

The FMS provides:
- TIME and DIST from the aircraft position (or origin on ground) to the ETP
- The BRG /DIST from the ETP to the defined positions
- TIME overhead each position, assuming the aircraft flies from the present position to the defined position via the ETP
- (ETP) pseudo waypoint is displayed on the ND along the F-PLN
- ETP location in relation to the subsequent waypoint.



EQUITIME POINT ENTRY

Ident.: DSC-22_20-60-120-00009536.0001001 / 01 OCT 12
Applicable to: ALL

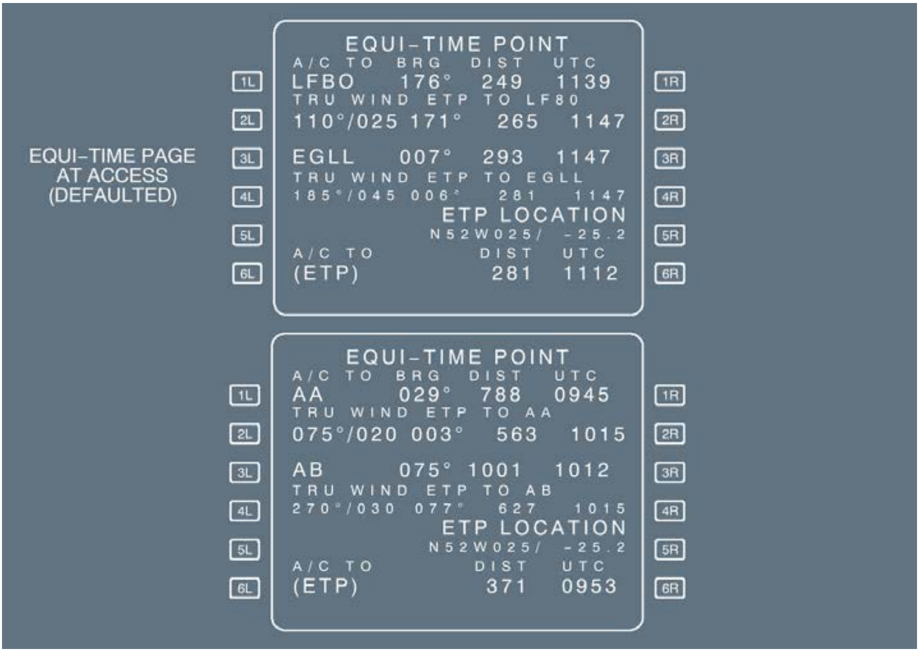
PRESS the DATA key.
SELECT the EQUI-TIME POINT prompt.
The EQUI-TIME POINT page is displayed. The origin and destination airports are used by default.
ENTER the REF POINT 1 in the [1L] field.

ENTER the associated wind in the [2L] field.

The wind to be inserted is the wind in the vicinity of the reference point at the CRZ FL.

ENTER the REF POINT 2 in the [3L] field.
ENTER the associated wind in the [4L] field.

The system displays the ETP location with regards to the next waypoint of the active flight plan following the ETP in the [5R] field, and the A/C TO (ETP) predictions in the [6R] field.

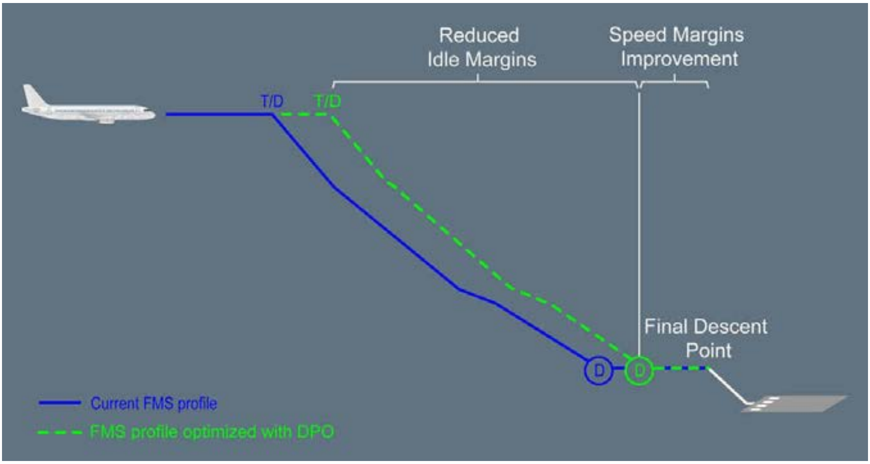


<u>Note:</u>
- *The ETP pseudo-waypoint is not displayed on the MCDU F-PLN page. In order to easily locate it, or when closing the applicable ETP , the TIME MARKER may be used; this allows the crew to visualize it in advance on the F-PLN page or, to prepare the next applicable ETP on the Equi-time Point page*
- *The ETP is computed using speed according to the current mode (managed or selected).*

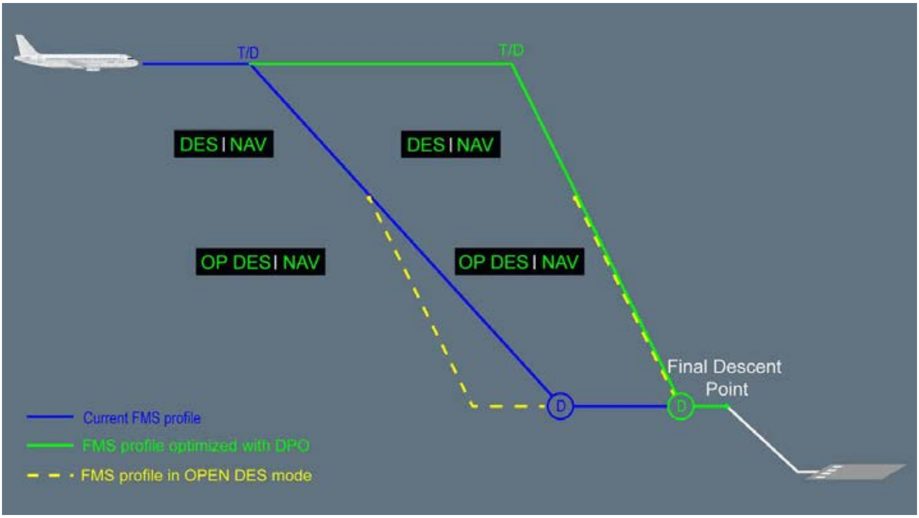
DESCENT PROFILE OPTIMIZATION

Ident.: DSC-22_20-60-150-00019723.0001001 / 07 JUN 16
Applicable to: ALL

During the idle segment in descent, margins are added to the idle thrust to have more flexibility to maintain the aircraft on the computed descent profile in case of external perturbations such as important wind change.
The Descent Profile Optimization (DPO) optimizes the computed vertical profile. It decreases the idle thrust margins in descent and the speed margins in approach to reduce fuel burn in descent phase.
With DPO, the computed vertical profile is steeper. The T/D is reached later. Before the final approach, the deceleration level-off is shorter.



With DPO, along the idle segment, without altitude constraint, the descent profile computed by the FMS is the same as the one flown in OPEN DES mode. Therefore, reverting in OPEN DES mode during the descent does not change the descent rate.



With DPO ⊲, the FMGS has less flexibility to maintain the aircraft on the computed vertical profile in case of difference between wind entry and effective wind. Therefore, the accurate winds have to be entered in the FMGS before descent.
During descent, the VDEV should be closely monitored. If the aircraft goes above the flight descent profile, the flight crew may have to extend speed brakes to go back on the computed descent profile.
If ENG ANTI ICE or ENG ANTI ICE + WING ANTI ICE are used during descent (inducing an increased idle thrust), the flight crew may have to extend speed brakes to stay on the computed descent profile.

FLIGHT PLAN INITIALIZATION THROUGH ACARS

Ident.: DSC-22_20-70-00000956.0007001 / 01 OCT 12
Applicable to: ALL

REQUEST FOR ACTIVE FLIGHT PLAN INITIALIZATION BEFORE ENGINE START

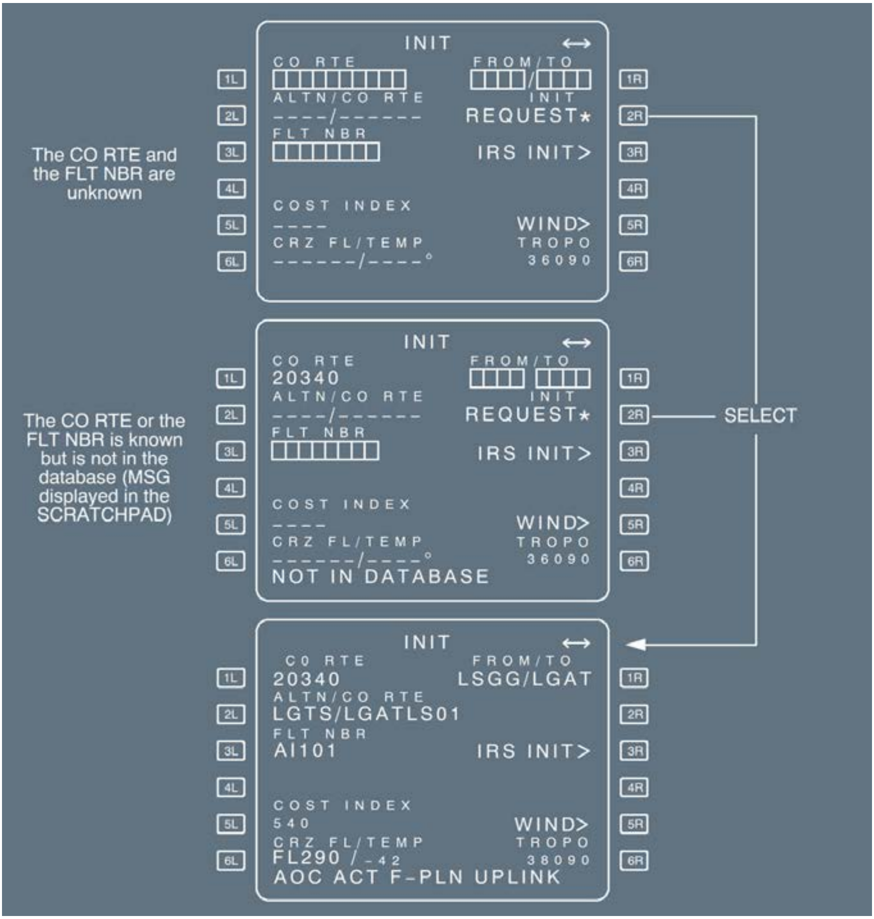
Before engine start, the crew may request a route for the active flight plan. When the route is received, "AOC ACT F-PLN UPLINK" message is displayed on the MCDU indicating that the flight plan has been received and automatically inserted.
After engine start, it is not possible to initialize directly the active flight plan since the received flight plan is automatically routed into the secondary, and the MDCU displays "AOC SEC F-PLN UPLINK".

PROCEDURE

PRESS the INIT REQUEST * prompt.

The star (*) disappears, all data fields are dashed except:
- *CO RTE , FLT NBR if previously displayed and*
- *Ddefault values.*

The star is not displayed when the FMGS cannot communicate with the ACARS. No request can be sent.
When an active flight plan exists, INIT REQUEST prompt is removed from the active INIT page and no request can be sent for the active flight plan. If a flight plan is entered manually after the request, the uplink message is routed to the secondary.



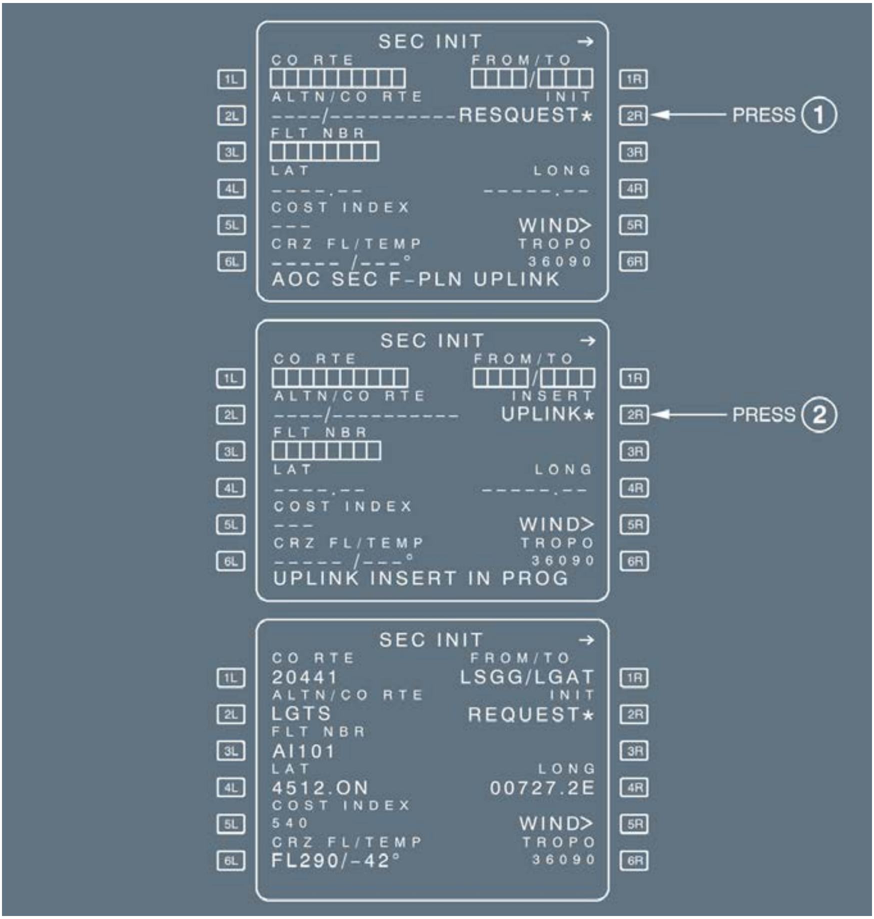
REQUEST FOR SECONDARY FLIGHT PLAN

A request for a secondary flight plan can be initiated anytime. Any flight plan received after engine start is automatically routed into the secondary flight plan.
When the flight plan is received, a message “AOC SEC F-PLN UPLINK” is displayed on the MCDU scratchpad.
Before engine start, and if the SEC F-PLN is empty, any uplinked flight plan is automatically inserted into the secondary flight plan, and no flight crew action is required.

After engine start, or if the SEC F-PLN is not empty, the flight crew must manually insert the uplinked flight plan via INSERT UPLINK prompt.

PROCEDURE TO INSERT OR REJECT A SECONDARY FLIGHT PLAN

When the uplink message is received, the INIT REQUEST prompt of the INIT A page is replaced by INSERT UPLINK (2R field). Pressing the 2R key will insert the flight plan into the secondary. Clearing the prompt will reject it.
If a temporary flight plan or a DIR TO is in progress, the uplink insertion is not accepted until the temporary flight plan or the DIR TO is completed.



TAKEOFF DATA

Applicable to: ALL

Ident.: DSC-22_20-70-A-00000957.0001001 / 15 FEB 11

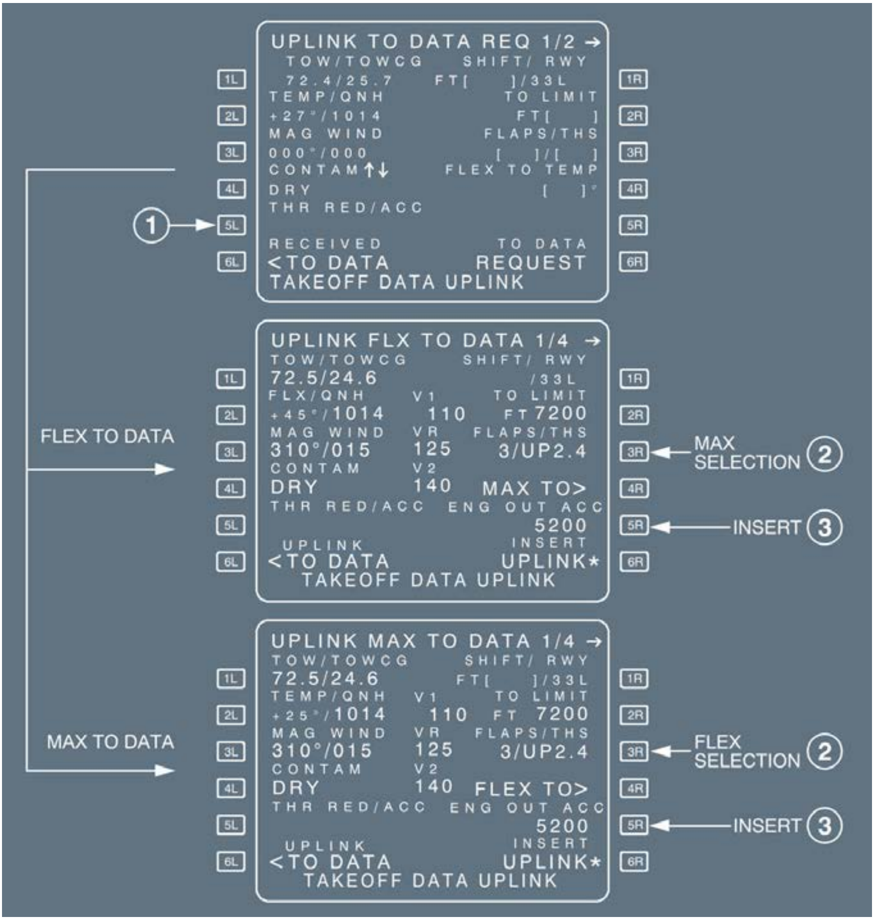
GENERAL

The takeoff data may be requested in preflight or done phase for the active flight plan only. It is always associated with the active flight plan message.

Ident.: DSC-22_20-70-A-00000959.0001001 / 23 JUN 15

PROCEDURE TO INSERT UPLINK TAKEOFF DATA

PRESS the 6L key "RECEIVED TO DATA" when the message TAKEOFF DATA UPLINK is displayed.



This displays the uplink data on 2 different pages: *UPLINK MAX TO DATA*
UPLINK FLX TO DATA

SELECT the data corresponding to the thrust to be used (MAX or FLEX) by pressing [4R].
SELECT the active runway data by slewing the pages (1/4... 4/4).

PRESS the [6R] key “INSERT UPLINK”.

UPLINK MAX TO DATA and UPLINK FLX TO DATA pages are not modifiable.

- **If the takeoff data displayed on this page are not relevant to the active runway entered in the flight plan** , the INSERT UPLINK prompt is not displayed.

- **When the takeoff data have been inserted** , the PERF TO page is amended of the new data.

WIND DATA

Applicable to: ALL

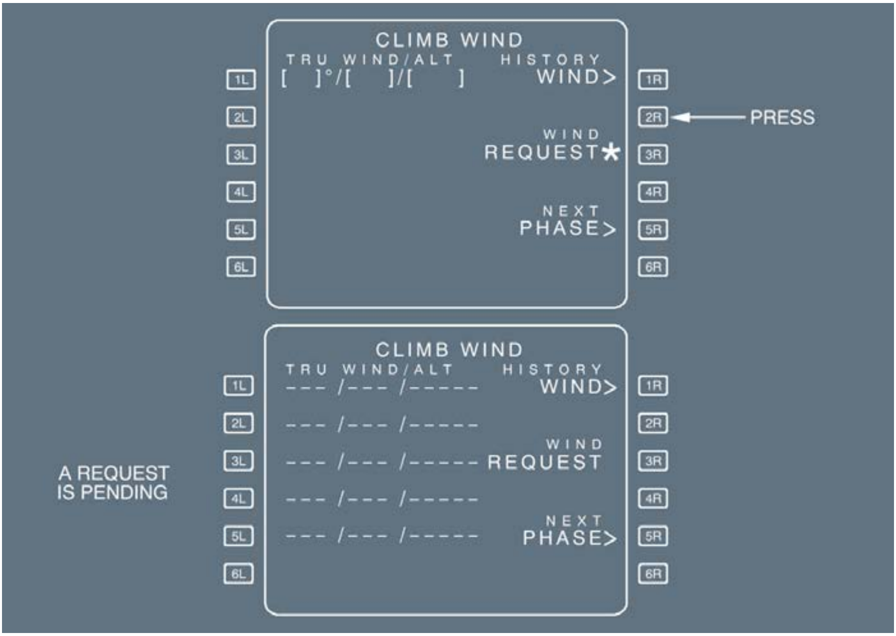
Ident.: DSC-22_20-70-B-00000961.0001001 / 01 OCT 12

REQUEST FOR WIND DATA

To send a wind request, press the “WIND REQUEST” selection key of any wind pages. This request is automatically sent to the ground for one or more flight phases and for the selected flight plan (primary or secondary). The content of the wind request message is not dependent on the selected wind page (CLIMB, CRUISE or DESCENT) but on the flight phase in progress.

- For active flight plan or secondary flight plan that is a “COPY ACTIVE”, a wind request sent by the crew:
  - during preflight or takeoff phase, initiates a demand for climb, cruise, descent and alternate winds.
  - during climb and cruise phase, initiates a demand for cruise, descent and alternate winds.
  - during descent/approach and go around, no wind request is possible.
- For secondary flight plan that is not a “COPY ACTIVE” there is no restriction linked to flight phase.

Before engine start, and if data has not been entered in any WIND page for the flight plan, the uplinked wind data is automatically inserted into the flight plan, and no flight crew action is required.
If the uplinked wind message is received after engine start, or if data has been entered in any WIND page of the flight plan, the flight crew must manually insert the uplinked wind data via the INSERT UPLINK prompt.



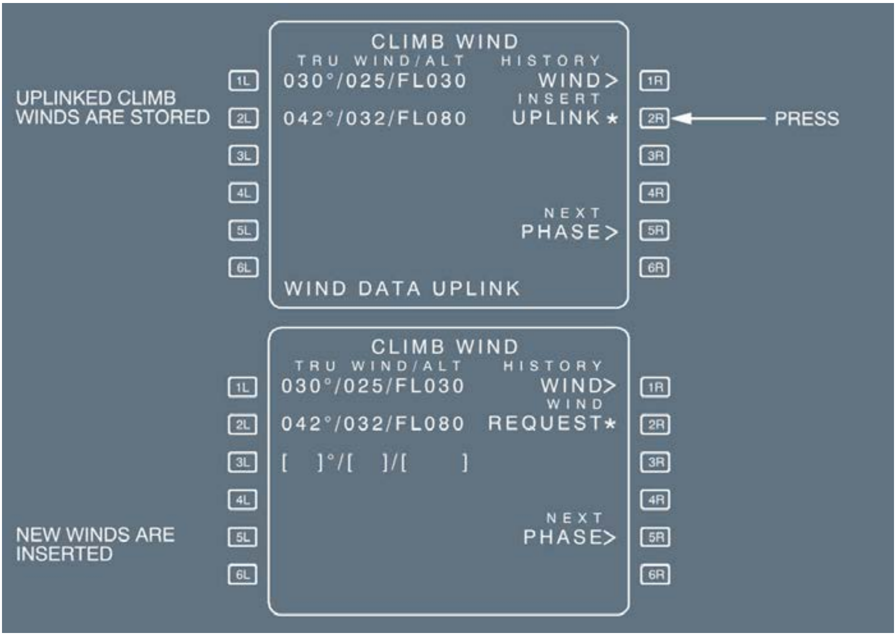
When the amber star following the “WIND REQUEST” is not displayed, the FM is not able to communicate with the ACARS and the pilot cannot send any request.

Ident.: DSC-22_20-70-B-00000962.0020001 / 14 MAY 12

PROCEDURE TO INSERT WIND DATA

When the uplink message is received, the 2R field is modified, the amber “WIND REQUEST” is replaced by the blue “INSERT UPLINK*”. This prompt, when pressed, enables the flight crew to insert the uplink wind data, phase by phase.
To access, review, insert or delete the uplink wind data of other phases, the crew uses “NEXT PHASE” or “PREV PHASE” key.

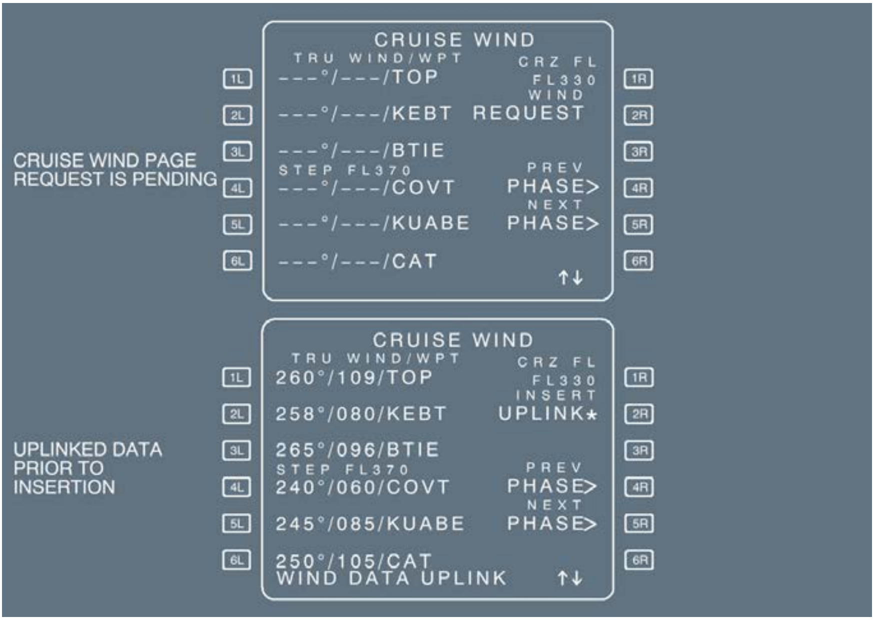
If the crew is not satisfied with the uplink winds, the flight crew will delete the winds, phase by phase clearing the “INSERT UPLINK” prompt. This will delete all the uplinked winds of the selected flight phase.



CLIMB WIND PAGE

When a request is pending, the history WIND page cannot be accessed.
When the climb phase is active, the crew cannot request neither modify the climb winds of the active flight plan or secondary flight plan if it is a copy active.

CRUISE WIND PAGE



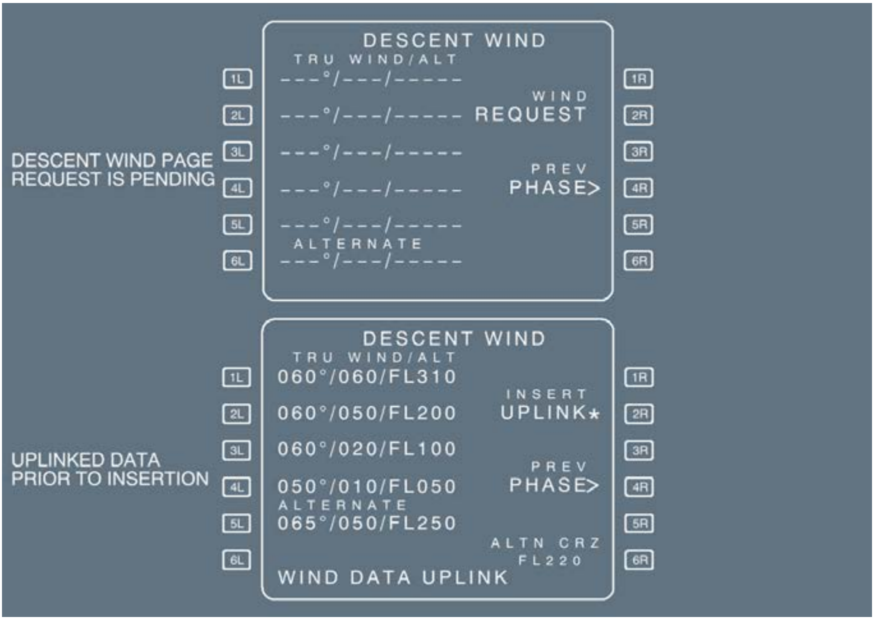
A wind request sent during cruise phase will apply for downpath waypoints of the cruise, descent, approach and alternate phases.

- If the uplink message contains more data and waypoints than the flight plan, the winds at extra waypoints are not considered and automatically discarded. This is transparent to the pilot
- Clearing the INSERT UPLINK* prompt deletes all uplink wind data of the cruise phase. Cruise page reverts to the previous data.

Note: *During cruise, whenever uplink wind data is received and not inserted or cancelled on the CRUISE WIND page, access to the DIR TO function is not possible. The "WIND UPLINK EXISTS" message is displayed on the MCDU scratchpad. Insert or cancel the uplinked wind message first and then access the DIR TO function.*

DESCENT WIND PAGE

The procedures to insert, review or delete descent winds during preflight, climb or cruise phase are described in the above wind general procedure.



If the alternate wind is not available, dashes are displayed in the field.
In descent, approach or go around phases, the pilot cannot request or modify the descent winds of the active flight plan or secondary flight plan if it is a “COPY ACTIVE”.

PRINT FUNCTION

Ident.: DSC-22_20-80-00000964.0009001 / 18 MAR 11
Applicable to: ALL

The PRINT function allows various reports to be printed either automatically (when linked to ACARS or ATSU) or manually.

The manual PRINT function allows printing of FM-generated flight reports and additional data:

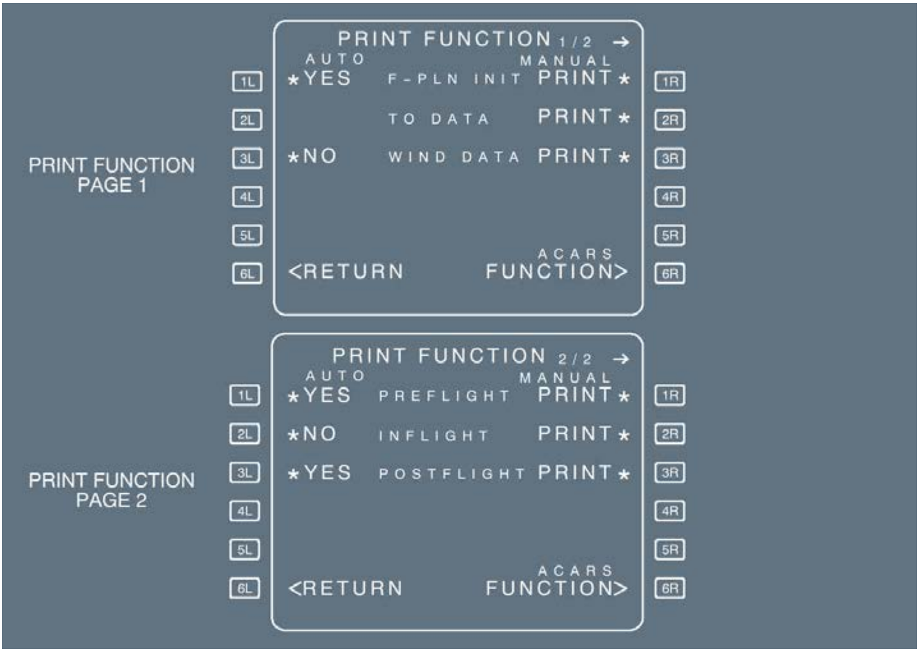
F-PLN	INITialization data
T.O.	Data
WIND	Data
PREFLIGHT	REPORT
IN FLIGHT	REPORT
POSTFLIGHT	REPORT

A detailed description of the PRINT FUNCTION pages is provided in *Refer to DSC-22_20-50-10-25 Print Function Pages*.
The print function is available if ACARS or ATSU are available or not.
The various flight reports contain most of the prediction information required by the flight crew to monitor the progress of the flight. The resulting documents can therefore be used as realistic master documents, based on the latest data provided by the flight crew to the computer, in terms of ATC clearances and weather information.

PRINT FUNCTION ACCESS

Ident.: DSC-22_20-80-00000965.0004001 / 01 OCT 12
Applicable to: ALL

The PRINT FUNCTION page is accessed:
- From the DATA INDEX A PAGE, or
- From the AOC FUNCTION page (if ACARS).



Note: *For an automatic printing, "time" is the time of the reception of the message. For a manual printing, "time" is the time of the print request.*

ON GROUND BEFORE ENGINE START

Ident.: DSC-22_20-80-00000966.0001001 / 23 JUN 15
Applicable to: ALL

When the overall F-PLN data (lateral, vertical including winds, steps, constraints) and the ZFW and ZFWCG values have been inserted:

SELECT the FUEL PLANNING prompt [3R],

- **If the computed BLOCK fuel does not correspond to the actual block fuel required for the flight:**

  ENTER the actual block required for the flight in the [2R] field,

  PRINT the PREFLIGHT report.

  The flight crew may then use the PREFLIGHT report to monitor the progress of the flight.

Note: *Before printing the PREFLIGHT report, the flight crew must check that the F-PLN is complete (all F-PLN discontinuities must be cleared) and that all the F-PLN elements (including winds, steps, constraints, alternate airport) have been inserted, in order to obtain an accurate PREFLIGHT report.*

EXAMPLE (FM PREFLIGHT REPORT)

Ident.: DSC-22_20-80-00000967.0001001 / 18 MAR 11
Applicable to: ALL

```
FM PREFLIGHT REPORT                                               DATE : 24 OCT 06
                                                                   TIME : 07 : 24
A/C TYPE              : A320-200          DATABASE       : AB49402001
ENG TYPE              : CFM56-5B4         CYCLE          : 29 SEP-26 OCT
FLT NUMBER            : AIB 105           FROM/TO        : EINN/LFBO
CO RTE                : . . . . . . .     ALTN           : LFBP
ALTN CO RTE           : . . . . . . .
PERF FACTOR           : +1.5              COST INDEX     : 100
IDLE FACTOR           : +0.0
CRUISE FL/STEP START WPT
CRZ FL 1              : FL410
FLIGHT PLAN DATA
                        DIST      TIME     CRZ FL
DEST-LFBO             : 714       01:32    FL410
ALTN-LFBP             : 80        01:52    FL220
DEP RWY               : 24                 ARV PRC        : . . . . . . . . . . . . . . . . . .
DEP PRC               : . . . . . . .      APR PRC        : . . . . . . . . . . . . . . . . . .
                                           ARV RWY        : . . . . . . . . . . . . . . . . . .
```

WPT	TIME	SPD/ALT	FOB	T. WIND	TAS	SAT	CRS	DIST
PREDICTED VALUES								
EINN24	00:00	133/-95	13.6	TL/040	-	+11	183	0
1520	00:00	159/1574	13.2	TL/040	163	+12	240	2
SHA	00:02	190/FL70	13.0	TL/040	211	+01	059	3
CRK	00:10	295/FL300	11.4	TL/040	459	-44	173	55
TIVLI	00:16	.82/FL400	11.2	TL/040	467	-57	140	50
LND	00:27	.84/FL410	11.0	TL/040	482	-57	140	99
NAKID	00:33	.84/FL410	10.9	TL/040	482	-57	130	46
LIZAD	00:34	.84/FL410	9.2	TL/040	482	-57	129	14
BALOT	00:38	.84/FL410	8.7	TL/040	482	-57	130	37
BERAT	00:41	.84/FL410	8.2	TL/040	482	-57	129	23
DIN	00:46	.84/FL410	7.6	TL/040	482	-57	128	47
NTS	00:56	.84/FL410	7.3	TL/040	482	-57	173	88
MINEL	01:02	.84/FL410	7.1	TL/040	482	-57	153	46
VENAR	01:05	.84/FL410	6.6	TL/040	482	-57	152	25
CGC	01:08	.84/FL410	6.1	TL/040	482	-57	153	34
VELIN	01:14	320/FL280	5.9	TL/040	482	-41	158	45
AGN	01:25	250/FL60	5.2	TL/040	274	+02	157	72
LFBO	01:32	128/550	5.2	TL/040	129	+14	001	27

```
FUEL PREDICTIONS
TAXI :                  0.2               ZFWCG          : 25.0 %
TRIP (DEST) :           8.4               ZFW            : 51.2
RSV :                   1.3               TOW            : 66.5
ALTN :                  0.6               LW             : 55.9
FINAL :                 1.8               CG             : —.-
EXTRA :                 0.8
BLOCK :                 15.5
MISC PERF DATA
TROPOPAUSE :            36090
CLB TRANS :             5000
CRZ TEMP :              -60
```

IN FLIGHT

Ident.: DSC-22_20-80-00000968.0007001 / 18 MAR 11
Applicable to: ALL

Once the aircraft has reached the CRZ FL once, all the latest ATC clearances have been inserted in the FM, when all the WINDS/STEPS have been properly updated:

ACCESS the PRINT FUNCTION page
PRINT the INFLIGHT REPORT

The inflight report provides the list of all the overflown F-PLN waypoints (HISTORY VALUES) with their associated data (Time, ALT, Fuel, ...), and the predictions to all the downpath waypoints (PREDICTED VALUES).
This new document replaces the PREFLIGHT report, since it carries all the latest expected F-PLN changes. It is the new applicable master document used to monitor the progress of the flight.
The inflight report will be printed after each important F-PLN modification.

Note: *If the selected Fuel Unit option is pounds, the HISTORY FOB values may be incorrectly printed in tons on the INFLIGHT REPORT. The CURRENT and PREDICTED FOB values, however, are correctly printed in pounds.*

EXAMPLE (FM INFLIGHT REPORT)

Ident.: DSC-22_20-80-00000969.0001001 / 18 MAR 11
Applicable to: ALL

FM INFLIGHT REPORT — DATE : 24 OCT 06 — TIME : 09 : 24

A/C TYPE	: A320-200		DATABASE	: AB49402001	
ENG TYPE	: CFM56-5B4		CYCLE	: 29 SEP-26 OCT	
FLT NUMBER	: AIB 105		FROM/TO	: LFBO/EINN	
CO RTE	:		ALTN	: EIDW	
ALTN CO RTE	:				
PERF FACTOR	: +1.5		COST INDEX	: 90	
IDLE FACTOR	: +0.0				
CRUISE FL/STEP START WPT					
CRZ FL 1	: FL390				
FLIGHT PLAN DATA					
	DIST	TIME	CRZ FL		
DEST-EINN	: 730	10:24	FL390		
ALTN-EIDW	: 106	10:50	FL220		
DEP RWY	: 14R		ARV PRC	:	
DEP PRC	: LMG3A		APR PRC	:	
			ARV RWY	:	

WPT	TIME	SPD/ALT	FOB	T. WIND	TAS	SAT	CRS	DIST
HISTORY VALUES								
LFB014R	08:29	126/536	13.6	HD/070	-	+12	142	0
1000	08:30	141/982	13.2	056°/003	141	+10	143	2
CURRENT POSITION : N43-37.9/E001-22.0								
	08:32	252FL63	13.6	HD/070	297	-11	350	10
PREDICTED VALUES								
OSKAM	08:34	320/FL130	10.4	HD/070	387	-11	350	14
LMG	08:52	.84/FL390	10.2	HD/070	482	-57	359	119
VERAC	08:59	.84/FL390	10.0	HD/070	482	-57	310	48
MAIXE	09:01	.84/FL390	9.9	HD/070	482	-57	310	18
NTS	09:11	.84/FL390	8.2	HD/070	482	-57	310	70
DIN	09:24	.84/FL390	7.7	HD/070	482	-57	352	88
BERAT	09:31	.84/FL390	7.2	HD/070	482	-57	309	47
BALOT	09:34	.84/FL390	6.6	HD/070	482	-57	309	23
LIZAD	09:40	.84/FL390	6.3	HD/070	482	-57	310	37
NAKID	09:42	.84/FL390	6.1	HD/070	482	-57	309	14
LND	09:48	.84/FL390	5.6	HD/070	482	-57	309	46
TIVLI	10:03	.84/FL390	5.1	HD/070	482	-57	322	99
CRK	10:10	320/FL170	4.9	HD/070	407	-19	319	50
SHA	10:23	128/900	4.2	HD/070	130	+13	353	55
EINN	10:24	128/100	4.2	HD/070	128	+15	001	2

FUEL INFORMATION AT 08:32

WEIGHT	CG	FOB	RSV/RSW%	FINAL	EXTRA
65.0	37.3%	13.6	0.4/5.0%	3.1	2.8

Note: *In case of a major failure such as an engine out, a new print will be done when time permits.*

REACHING THE GATE AFTER LANDING

Ident.: DSC-22_20-80-00000970.0007001 / 18 MAR 11
Applicable to: ALL

The POSTFLIGHT REPORT gives a complete list of all the overflown waypoints during the flight (HISTORY VALUES).

Furthermore it provides:
- FUEL/TIME summary
- IRS Drift and G/S

When at the gate, after engine shutdown:
- ACCESS the PRINT FUNCTION page
- PRINT the POSTFLIGHT REPORT

<u>Note:</u> *If the selected Fuel Unit option is pounds, the HISTORY FOB values may be incorrectly printed in tons on the POSTFLIGHT REPORT.*

EXAMPLE (FM POSTFLIGHT REPORT)

Ident.: DSC-22_20-80-00000971.0001001 / 18 MAR 11
Applicable to: ALL

FM POSTFLIGHT REPORT — DATE : 24 OCT 06 — TIME : 12 : 05

A/C TYPE	: A320-200	DATABASE	: AB49402001
ENG TYPE	: CFM56-5B4	CYCLE	: 29 SEP-26 OCT
FLT NUMBER	: AIB 105	FROM/TO	: EINN/LFBO
CO RTE	:	ALTN	: LFBP
ALTN CO RTE	:		
PERF FACTOR	: +1.5	COST INDEX	: 90
IDLE FACTOR	: +0.0		

FLIGHT PLAN DATA

	DIST	TIME	CRZ FL	
DEST-LFBO	: —	11:52	FL—	
ALTN/——	: —	—:—	FL—	
DEP RWY	: 06		ARV PRC	: AGN2T
DEP PRC	:		APR PRC	: VOR32L
			ARV RWY	: 32L

WPT	TIME	SPD/ALT	FOB	T. WIND	TAS	SAT	CRS	DIST
HISTORY VALUES								
EINN06	10:17	134/44	17.0	043/005	-	+11	053	0
1550	10:18	163/1536	16.9	235'/019	165	+08	050	2
SHA	10:18	161/1691	16.9	236'/019	163	+08	049	0
ABCRK	10:27	305/FL280	15.1	295'/049	459	-41	149	53
TIVLI	10:33	.80/FL330	14.8	298'/057	448	-64	143	46
LND	10:44	.84/FL330	14.1	320'/034	477	-61	129	111
ABLIZAD	10:51	.84/FL330	13.6	326'/034	474	-61	141	47
ABBERAT	10:58	.84/FL330	12.4	313'/029	480	-59	141	21
ABOIN	11:03	.84/FL330	12.2	326'/030	479	-60	142	44
ABNTS	11:13	.84/FL330	12.0	330'/034	481	-60	142	126
ABVENAR	11:21	.84/FL330	10.2	335'/028	479	-60	143	24
CGC	11:25	.84/FL330	9.7	339'/031	476	-61	150	33
VELIN	11:31	.84/FL330	9.2	352'/028	476	-60	154	45
AGN	11:40	312/FL220	8.6	050'/024	429	-26	149	72
SOTAK	11:40	321/FL190	8.3	052'/025	425	-20	141	5
D191K	11:44	253/FL90	8.1	347'/015	288	+00	137	24
D165R	11:46	253/4360	7.6	309'/014	265	+04	103	11
CD32L	11:49	175/2967	6.9	293'/009	180	+05	322	5
FD32L	11:50	253/FL1609	6.2	308'007	132	+08	323	4
LFB032L	11:52	132/674	6.2	326'/006	131	+11	321	3

FUEL AND TIME SUMMARY

START UP	SHUT DOWN	
FUEL : 17.0	FUEL	: 4.2
WEIGHT : 75.8	WEIGHT	: 65.0
TIME : 10.09	TIME	: 12:01
TO TIME : —.-	LDG TIME	: 11:52

IRS DATA AT : LFB032L

	IRS 1	IRS2	IRS 3
AVERAGE DRIFT	- 00.3 NM/H	00.4 NM/H	00.3 NM/H
RESIDUAL GND SPD	- 01.0 KTS	03.0 KTS	1.0 KTS

AUTOMATIC FMGC RESET AND RESYNCHRONIZATION

Applicable to: ALL

Ident.: DSC-22_20-90-10-A-00012661.0001001 / 07 MAR 13

FM RESET

When the FM software cannot work properly or receives instructions to perform impossible operations, it automatically resets itself. A resynchronization with the other FM always follows. When the reset is a minor one, the system will recover by itself. One single reset lasts 2 to 3 s maximum followed by 25 s of resynchronization.

When the reset is a major one:
- Resets recur at short intervals (several in 2 or 3 min)
- The memories are cleared, leading to the loss of F-PLN , GW , CI , CRZ FL , MCDU -entered speeds and NAVAIDs and to database switching.

Note: *If three dual FM resets occur in 2 min, pilot-entered data is lost. If a dual reset is identified, it is recommended that the flight crew does not perform again the last MCDU actions for 1 min (in order to avoid a potential second dual reset, leading to the loss of pilot-entered data).*

Ident.: DSC-22_20-90-10-A-00012662.0001001 / 10 JAN 11

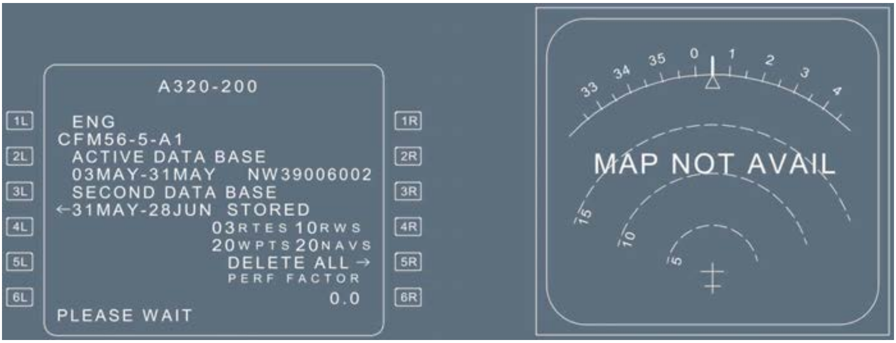
FM RESYNCHRONIZATION

An FM resynchronization automatically occurs after an FM reset but it may occur independently each time self comparisons between FM 1 and FM2 reveal discrepancies.
One single resynchronization lasts approximately 25 s.
If 5 several resynchronizations occur within 5 min, independent mode commences.

Ident.: DSC-22_20-90-10-A-00012663.0001001 / 29 SEP 15

FMGC STATUS DURING A RESET/RESYNCHRONIZATION

While a RESET/RESYNCH occurs:
- The ND shows “MAP NOT AVAIL”
- The MCDU reverts to the A/C STATUS page, with “PLEASE WAIT” displayed in the scratchpad
- Autotuning of Navaids (VOR , DME , ADF) are lost on the failed side
- AP and managed modes may be transiently lost (reversion to HDG /V/S or TRK/FPA)
- If the pilot presses a key while the scratchpad is showing “PLEASE WAIT”, there is no change at MCDU level. This is normal, and the crew should not respond by pulling the MCDU circuit breaker.



Ident.: DSC-22_20-90-10-A-00012664.0001001 / 10 JAN 11

SINGLE RESET OR DUAL RESET WITH AUTORECOVERY

If the RESET/RESYNCH succeeds, all functions are recovered.

Note: *When an FMGC is recovered, its FD if previously engaged, is also recovered and its status is displayed on the FMA.*

PROCEDURE

RESELECT the convenient MCDU page.
REENGAGE managed modes and the AP.

WAIT 1 min after the "PLEASE-WAIT" message has disappeared, before engaging the AP /FD of the failed FMGC.

If "MAP NOT AVAIL" remains displayed, along with "SET OFFSIDE RNG/MODE" on one ND , temporarily SELECT a different mode on the corresponding EIS control panel.

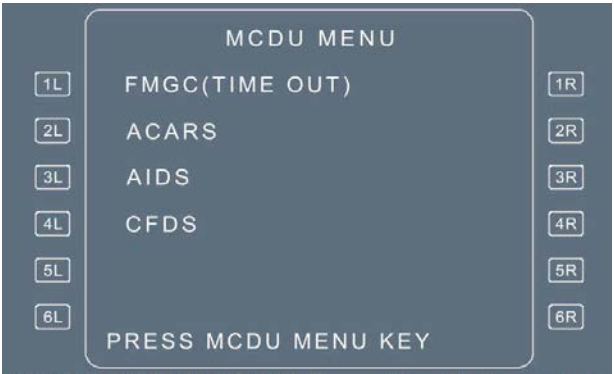
Ident.: DSC-22_20-90-10-A-00012665.0001001 / 10 JAN 11

SINGLE LATCH

If five successive resets occur, the failing FMGC will latch, and single mode operation will start.

While failed, the following occurs:
- The failed ND side displays "MAP NOT AVAIL" and "SELECT OFFSIDE RNG/MODE" (if the NDs are not both in the same mode or range)
- The MCDU reverts to the MENU PAGE and shows an "FMGC TIME OUT" prompt

- If the AP and FD were previously engaged on the failed side, the AP and FD disengage and the right-hand column of the FMA shows that the operating FD is offside. The ECAM displays the “AP OFF” warning, and the master warning light and audio remind the pilot of the AP disengagement
- All functions are restored on the operative side.



MCDU MENU PAGE on the failed side

PROCEDURE

Select the same range and mode on both ND s to give the failed ND side something to display. Select any function key on the affected FMGC MCDU. (The page will display “OPP FMGC IN PROGRESS”).

Both MCDU s are now driven by the other FMGC , and only one AP /FD is available. The system works in SINGLE Mode.

Perform a manual reset of the failed FMGC, when convenient.

Ident.: DSC-22_20-90-10-A-00012666.0001001 / 10 JAN 11

DUAL RESET WITH LOSS OF DATA AND AUTORECOVERY

Three successive dual resets without result erases all pilot-entered data (F-PLN , GW , CRZ FL , CI...).

When FMGS recovery is obtained:
- Database cycle may have switched
- The FM position bias is lost. The FM position returns to the MIX IRS position
- Autotuning the VOR /DME is restored, based on the aircraft’s IRS position
- FMGS tuning of the ILS and ADF is not possible
- Lateral and vertical managed mode cannot reengage

- The “CAB PR LDG ELEV FAULT” ECAM message is displayed
- A map display may be lost on one ND.

PROCEDURE

When the system has recovered:

SELECT the initial database.
SELECT DIR TO the required downpath waypoint.
SELECT LAT REV at the downpath waypoint, and redefine the DESTINATION.
SELECT the FUEL PRED page, and enter GW.
SELECT the PROG page, and enter CRZ FL.
SELECT the PERF page, and enter CI.
CHECK or reengage (as appropriate) the relevant speed/Mach target and vertical mode.

Redefine the flight plan for the remainder of the flight, as the opportunity presents itself.

If “MAP NOT AVAIL” remains displayed, along with “SET OFFSIDE RNG/MODE” on one ND , temporarily SELECT a different mode on the corresponding EFIS control panel.
PERFORM a NAV accuracy check, when possible.

A manual FM position update should be considered, if MIX IRS and actual positions differ by more than 20 NM.

Ident.: DSC-22_20-90-10-A-00012668.0001001 / 17 MAR 17

DUAL LATCH

- Both FMGC s are inoperative. FM and FG capability are lost
- Both ND s display “MAP NOT AVAILABLE”. NAVAID tuning is not performed
- AP /FD , A/THR are lost
- FMGC (TIME OUT) subsystem page is displayed on both MCDUs
- The following messages are displayed on the ECAM:
  “CAB PR LDG ELEV FAULT”
  “AUTO FLT AP OFF”, if AP was engaged
  “AUTO FLT A/THR OFF”, if A/THR was engaged.

PROCEDURE

FLY raw data.
TUNE necessary NAVAID s using the RMPs.
PERFORM a manual reset of both FMGCs.

Note: *A recovery will result in the loss of all pilot-entered data.*

Note for all FMGC automatic resets

- A single or double FM auto-reset does not affect an ILS approach below 700 ft AGL . ILS frequency is locked and AP /FDs remain engaged
- Above 700 ft , the loss of ILS tuning due to a dual reset will cause a loss of LOC and G/S , and the disengagement of AP s and FDs
- During a non ILS approach, if the master FMGC fails, AP /FD and managed modes are lost and FDs engage in basic modes.

MANUAL FMGC RESET

Applicable to: ALL

Ident.: DSC-22_20-90-10-B-00012669.0001001 / 10 JAN 11

On rare occasions, the FMGC may require manual resetting.
If this occurs in flight, reset one FMGC at a time.

Ident.: DSC-22_20-90-10-B-00020857.0001001 / 17 MAR 17

Refer to System Reset Table - AUTO FLT
for the manual reset procedure of the FMGC.

Ident.: DSC-22_20-90-10-B-00012671.0001001 / 17 MAR 17

MANUAL RESET OF BOTH FMGC

When the aircraft is on ground with the engines stopped, the flight crew may attempt a double and simultaneous CB reset when a single CB reset has failed.

Intentionally left blank

"CHECK WEIGHT" MESSAGE

Ident.: DSC-22_20-90-20-00012677.0001001 / 17 MAR 17
Applicable to: ALL

DESCRIPTION

The “CHECK WEIGHT” message appears on the MCDU when the Gross Weight (GW) computed by the FMGC and the GW computed by the FAC disagree by more than 7 t (16 055 lb).

PROCEDURE

When this message appears:

FMS FOB .... CHECK

CALL UP the MCDU FUEL PRED page and compare the FOB to the FOB from the Computerized F-PLN. Correct it if necessary.

FMS ZFW value.................... CHECK

CALL UP the MCDU FUEL PRED page and compare the ZFW to the ZFW on the loadsheet.

- **If the FMS ZFW on the MCDU is not correct:**

  FMS ZFW .... CORRECT/RE-INSERT

  The entry of a correct ZFW will clear the MCDU message.

- **If the FMS ZFW on the MCDU is correct:**

  VLS , F , S , GREEN DOT (PFD).................... DISREGARD

  If the FMS GW is correct, the characteristic speeds computed by the FAC (displayed on PFD) may not be correct.

  QRH OPERATING SPEEDS.................... USE

  Refer to QRH/OPS Operating Speeds

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MISALIGNMENT OF FMS F-PLN LEGS FOR ILS APPROACHES

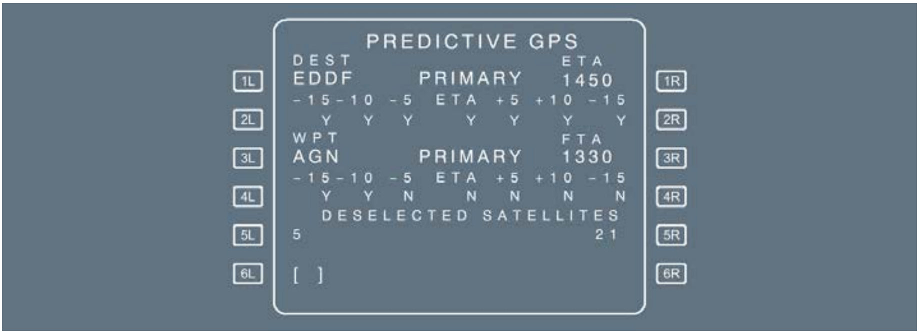
Ident.: DSC-22_20-100-20-00013650.0001001 / 23 JUN 15
Applicable to: ALL

For the F-PLN legs belonging to an ILS approach, the FMS incorrectly uses its own Magnetic Variation table instead of the Magnetic Variation of the ILS associated to the approach (coded in the Navigation Data Base). This misbehaviour occurs when the Navaid used for the ILS approach is a DME.
In some cases, it may happen that magnetic variation of the airport differs by a few degrees from the ILS navaid. Thus, the FMS F-PLN does not match with the actual beam of the ILS beam.
When the ILS approach is coded with successive legs, these legs may also appear as not matching with intermediate approach waypoint.
For all approaches affected by this behaviour, the FMS will display an incorrect trajectory on ND for the LS approach. The guidance would also be wrong if the approach legs are flown in NAV instead of LOC mode.

INCORRECT MANAGEMENT OF ETA ENTRY ON PREDICTIVE GPS PAGE

Ident.: DSC-22_20-100-20-00013652.0001001 / 22 MAY 12
Applicable to: ALL

During pre-flight, when a destination airport exists but the FMS does not compute predictions, amber boxes are displayed in the MCDU field ETA of the predicitve GPS page. When the flight crew manually enters an ETA, the value should be displayed in large cyan font.
With the current H2 standard, the FMS does not take into account the manual entry of an ETA (field 1R) for the destination (DEST, field 1L).
The FMS validates the manual entry only when an ETA is already computed by the FMS , when predictions are available (necessary conditions to have some predictions are : entry of a GW , CRZ FL , CI and F-PLN).
This anomaly does not impact the ETA of the WPT field (3L and 3R). An ETA can be entered in the field 3L even if no predictions are computed.



FLIGHT NUMBER ERASED UPON AOC FLIGHT PLAN UPLINK

Ident.: DSC-22_20-100-20-00013653.0001001 / 16 MAR 11
Applicable to: ALL

When a Flight Plan (F-PLN) uplink is performed, if the uplinked F-PLN is inserted as the active F-PLN but does not contain a Flight Number, the previously entered Flight Number is erased. In such a case, the flight crew needs to re-enter the correct Flight Number on the INIT A page.

ERRONEOUS FUEL PREDICTION IN THE CASE OF DESCENT WITH TWO ALTITUDE CONSTRAINTS

Ident.: DSC-22_20-100-20-00013655.0001001 / 16 MAR 11
Applicable to: ALL

DESCRIPTION:

If the flight plan has two altitude constraints for the descent, the flight crew may notice erroneous FMS fuel predictions.

EXPLANATION

If the flight plan has two altitude constraints for the descent, the FMS may define a geometric segment between both altitude constraints. If there is a deceleration required within the geometric segment, the FMS may consider that the geometric segment is too steep to fly without speedbrakes. In this case, the FMS tags the entire geometric segment as a speedbrake segment : The FMS assumes that during the entire segment half of the speedbrakes are extended, even for the parts where no deceleration is planned. As a consequence, the FMS will predict an increased thrust for the entire geometric segment. This may lead to erroneous fuel predictions. (a long geometric segment (e.g. above 100 NM) may lead to an error of 1.5 t for the fuel prediction at destination).

Note: *When flying the geometric segment, the predictions become better as the aircraft approaches the end of the geometric segment, and turn back to normal when the aircraft has sequenced the second altitude constraint.*

PROCEDURE:

If the flight crew suspects this behavior in preflight, or during the flight, they can delete and enter again one altitude constraint in descent and compare the fuel predictions of the flight plan with and without the geometric segment. This allows the flight crew to evaluate the impact of the geometric segment on the fuel predictions.
It is not recommended to permanently delete altitude constraints that are stored in the navigation database.

UNEXPECTED SWITCH OF SPEED TARGET WHEN RTA IS USED

Ident.: DSC-22_20-100-20-00013659.0001001 / 16 NOV 11
Applicable to: ALL

An anomaly could be experienced when the RTA (Requested Time of Arrival) function is used.
The MCDU and the PFD could suddenly display an erroneous speed target at the transition altitude when a RTA is entered and if the flight crew performs an action (Vapp entry or altitude constraint modification) that causes a F-PLN profile recomputation.
This scenario could also occur if the flight crew has inserted a RTA and then deleted this RTA (the FMS may erroneously retain the RTA target).
Some cases could happen while the aircraft is in descent (DES mode) in managed speed. This speed target change is significant at high altitude if the RTA speed target is lower than the speed target used before the beginning of the descent.

PROCEDURE

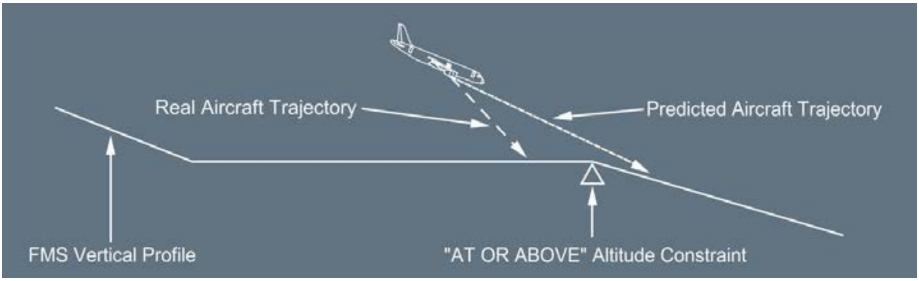
If an erroneous speed target is displayed at high altitude, the flight crew can manually select a speed to continue the descent.

UNDUE AP DISCONNECTION OR REVERSION TO V/S DURING CLIMB AND DESCENT

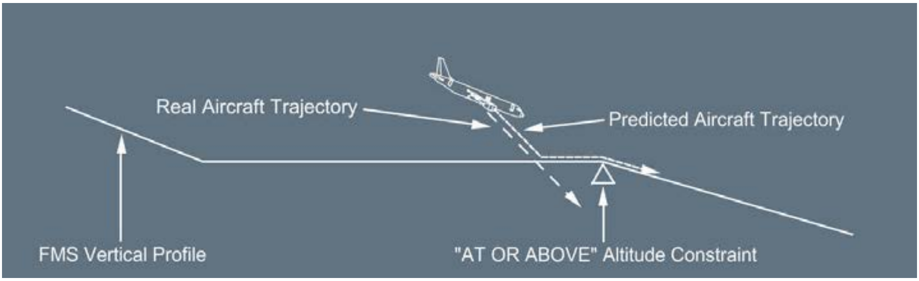
Ident.: DSC-22_20-100-20-00014436.0017001 / 23 JUN 15
Applicable to: ALL

An AP disconnection or a reversion to the V/S mode may occur when the aircraft reaches an altitude constraint in the CLB or DES mode. The following are two situations in which this behavior may occur.
Situation 1: The aircraft is above the vertical profile.
When the aircraft is not on the vertical profile, the FMS makes assumptions in order to compute the FMS predictions. For example, if the aircraft flies in selected speed, the FMS considers an immediate return to managed speed.

These assumptions can result in FMS predictions that are not consistent with the real trajectory of the aircraft. Therefore, the FMS may not anticipate the need to level off, when the FCU selected altitude is above the altitude constraint in climb or below the altitude constraint in descent.



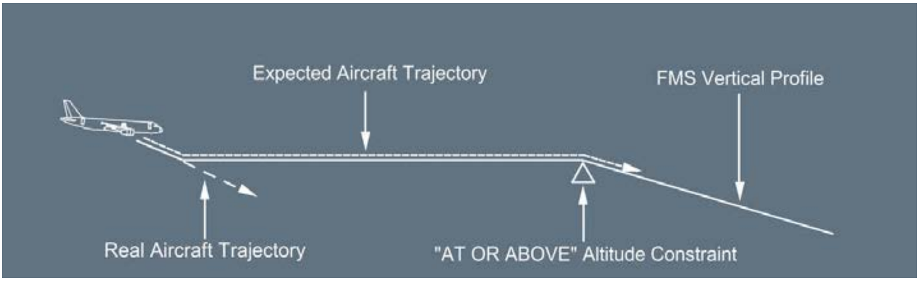
However, the FMS requests the ALT CST* mode, when the aircraft reaches the altitude constraint, in order to level off and comply with the altitude constraint.
Due to problem of communication between the FMS and the FG , the FMGC may unduly revert to the V/S mode. The FWC triggers a triple-click aural warning , and the aircraft goes beyond the altitude constraint.



Situation 2: The aircraft levels off at an altitude constraint in descent.
When the aircraft reaches an altitude constraint with the DES mode engaged and the FCU selected altitude below the altitude constraint, the FG engages the ALT CST * mode. The FG also arms the DES mode, in order to resume the descent beyond the waypoint with the altitude constraint.

In very rare cases, the FMS does not see that the FG arms the DES mode:
- If the FINAL APP mode is armed, the FMGC may unduly:
  - Disconnect the AP, or
  - Disconnect the AP and revert to the V/S mode, or
  - Revert to the V/S mode.
- If the FINAL APP mode is not armed, the FMGC may unduly revert to the V/S mode.

In both of the above-mentioned cases, the FWC triggers a triple-click aural warning , and the aircraft goes beyond the altitude constraint.
If the AP disconnects, the FWC triggers a cavalry-charge aural warning.



OPERATIONAL RECOMMENDATIONS

Understand your FMA at all times.

- **If the AP disconnects, or if the FMGC reverts to the V/S mode:**

  Adjust the vertical speed or level off in order to comply with the altitude constraint.

VOR/DME AND VOR/TACAN NOT AUTOMATICALLY TUNED

Ident.: DSC-22_20-100-20-00014440.0001001 / 04 MAY 12
Applicable to: ALL

In case there is no NAVAID in the flight plan, nor any recommended NAVAID coded in the inserted procedure, the FMS may not automatically tune the expected Terminal or Low Altitude VOR /DME or VOR /TACAN.
The FMS may not automatically tune the expected NAVAID , if the aircraft is above 12 000 ft for a Terminal VOR /DME or VOR /TACAN , and above 18 000 ft for a Low Altitude NAVAID.
As a consequence, the ND and the MCDU RAD NAV page may not display the NAVAID information.

OPERATIONAL RECOMMENDATIONS

If the flight crew encounters the misbehavior during the flight, the flight crew can manually tune the expected VOR /DME or VOR /TACAN to recover the display on the ND.
As a manual tuning overrides any automatic tuning, the flight crew must clear the manual tuning, when the NAVAID is no longer required, in order to revert to the automatic NAVAID tuning.

OPTIMUM TARGET SPEEDS NOT UPDATED FOLLOWING THE AUTOMATIC DELETION OF A STEP CLIMB

Ident.: DSC-22_20-100-20-00014756.0001001 / 18 DEC 12
Applicable to: ALL

During the FMS climb phase, if the flight crew selects an altitude on the FCU that is above the Cruise Flight Level (CRZ FL) displayed on the PROG page, the altitude selected on the FCU becomes the new CRZ FL.
If this new CRZ FL is at or above the altitude of a Step Climb of the flight plan, the FMS automatically deletes the Step Climb. The FMS displays the "STEP DELETED" message.
As the optimum target speeds (ECON CLIMB speed/Mach and ECON CRUISE speed/Mach) depend on the CRZ FL , the FMS should immediately update the ECON CLIMB speed/Mach and the ECON CRUISE speed/Mach.
Due to a FMS misbehavior, the FMS may not correctly manage the automatic deletion of the Step Climb when the CRZ FL is automatically set to the altitude selected on the FCU . The FMS may not update the ECON CLIMB speed/Mach and the ECON CRUISE speed/Mach accordingly.
If the ECON CRUISE speed/Mach was not correctly updated, the FMS updates the ECON CRUISE speed/Mach when the aircraft reaches the new CRZ FL . However the FMS updates the ECON CRUISE speed/Mach with a rate of 0.01 Mach/min, in order to avoid a sudden increase of the speed target. Therefore the aircraft may take several minutes to reach the new ECON CRUISE speed/Mach.

OPERATIONAL RECOMMENDATIONS

If the flight crew suspects this misbehavior during the flight:
REENTER the Cruise Flight Level (CRZ FL) on the PROG page, or the Cost Index (CI) on the PERF page, in order to activate an immediate update of the optimum target speeds (ECON CLIMB speed/Mach and ECON CRUISE speed/Mach).

ERRONEOUS LATERAL GUIDANCE IN NAV MODE WITH LOC MODE ARMED DURING APPROACH

Ident.: DSC-22_20-100-20-00015035.0001001 / 03 DEC 13
Applicable to: ALL

During approach, the FMS may guide the aircraft along a specific track instead of along the F-PLN with NAV mode green on the FMA , because of the LOC Convergence function (*Refer to DSC-22_30-80-30-10 Precision Approach Modes - APPR Mode*).
The logics of the LOC Convergence function is as follows:

- **If NAV mode is engaged, and LOC mode is armed,**
  and
  The aircraft is within 20 NM of the destination runway,
  and
  The difference between the aircraft track and the QFU is less than 20 °.

  The aircraft is guided with a converging track of 20 ° from the LOC axis.

  The NAV mode remains engaged. However the aircraft no longer follows the F-PLN, but converges towards the LOC axis.

- **If the difference between the aircraft track and the QFU becomes more than 20 ° when the LOC Convergence function is active:**

  The FMS deactivates the LOC Convergence function, and the aircraft follows back the F-PLN.

  It may lead to slight oscillations, since the FMS may successively activate and deactivate the LOC Convergence function.

OPERATIONAL RECOMMENDATIONS

- **If the flight crew considers that the LOC Convergence function may affect the guidance along the F-PLN trajectory in NAV mode:**

  On the intercept trajectory for the LOC axis, the flight crew should push the APPR pb (or the LOC pb-sw) when appropriate.

- **If the flight crew detects that the aircraft does not follow the intended trajectory:**

  The flight crew should revert to HDG/TRK mode, and intercept the LOC axis with the HDG/TRK mode engaged and the LOC mode armed.

UNDUE REDUCTION OF THE SPEED TARGET IN CASE OF DIR TO/ABEAM WHILE FLYING A CONSTANT MACH SEGMENT

Ident.: DSC-22_20-100-20-00015532.0003001 / 18 MAR 14
Applicable to: ALL

The FMS may erroneously command a Mach target of 0, when the following conditions are met:
- The aircraft is flying a Constant Mach Segment (CMS), and
- The TO waypoint is the end of the CMS, and
- The aircraft is close to the TO waypoint, i.e. about 1 NM, and
- The flight crew performs a DIR TO/ABEAM to a waypoint that is not part of the CMS.

In that case, the FMS does not create the abeam of the TO waypoint (end of the CMS), since it is too close from the aircraft.

In addition, the FMS erroneously keeps the CMS until the abeam of the next waypoint, and defines 0 as Mach target on the CMS . The FMS correctly computes the speed target once the abeam of the next waypoint is sequenced.

OPERATIONAL RECOMMENDATIONS

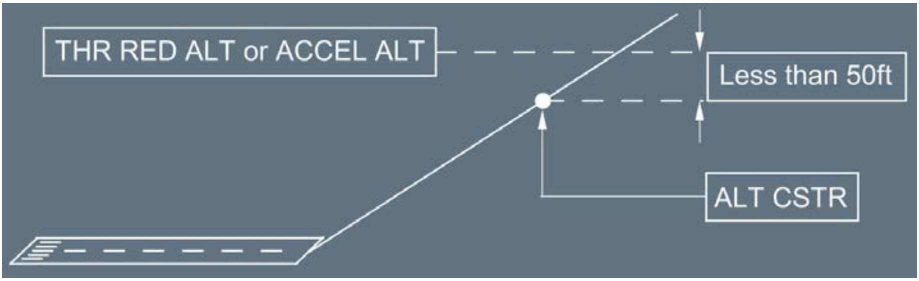
The flight crew should manually clear the CMS on the MCDU VERT REV page.

LOSS OF FUEL AND TIME PREDICTIONS DURING TAKEOFF DATA INSERTION

Ident.: DSC-22_20-100-20-00015602.0001001 / 05 AUG 14
Applicable to: ALL

The flight crew may lose fuel and time prediction when the altitude of the first constraint is less than 50 ft below either the THR RED ALT or the ACC ALT , the update of fuel and time computation predictions may last a long time. The flight crew may think that the predictions are lost (the DEST EFOB and TRIP FUEL are also dashed on the FUEL PRED page).

The flight crew may encounter the situation described above, if one of the following occurs:
- The first altitude constraint of the SID is less than 50 ft below either the THR RED ALT or the ACC ALT.
- The flight crew inserts a THR RED ALT or an ACC ALT less than 50 ft above the first altitude constraint of the F-PLN.
- The flight crew modifies the F-PLN to insert an AT or an AT OR BELOW altitude constraint less than 50 ft below the THR RED ALT or the ACC ALT.



OPERATIONAL RECOMMENDATION:
The flight crew can recover the fuel and time predictions if the flight crew sets the THR RED ALT or ACC ALT value on the PERF TAKEOFF page to the same value as the first altitude constraint of the F-PLN.

ERRONEOUS TRAJECTORY DURING PROCEDURES WITH A TURN DIRECTION ON A LEG WITH AN ALTITUDE TERMINATION

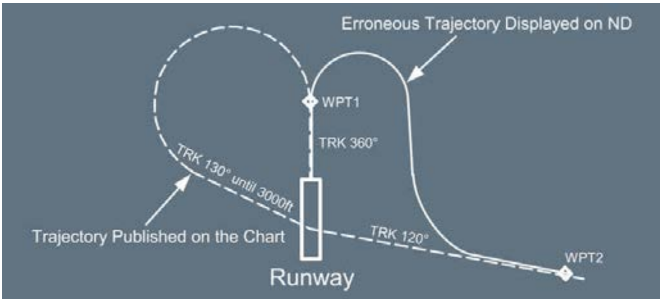
Ident.: DSC-22_20-100-20-00015748.0001001 / 09 SEP 14
Applicable to: ALL

In some very specific operational conditions that depend on the coding in the Navigation Database of the procedure, and on various performance conditions (aircraft weight, flaps, thrust setting, temperature, wind...), the FMS may compute an erroneous trajectory on some Standard Instrument Departures (SID), and on some Missed Approach procedures.

The SIDs and the Missed Approach procedures that may be affected are coded in the Navigation Database with a leg that has a turn direction and an altitude termination. The leg can be one of the following:
- A Course-to-an-Altitude (CA) leg that defines a course to follow to an altitude
- A Fix-to-an-Altitude (FA) leg that defines a track to follow from a waypoint to an altitude
- A Heading-to-an-Altitude (VA) leg that defines a heading to follow to an altitude
- A Holding-to-an-Altitude (HA) leg that defines a holding pattern to an altitude

The turn direction (left or right) that is coded on a leg indicates that the aircraft has to execute a turn in the specified direction to intercept the leg.
In some very specific operational conditions (aircraft weight, wind...), the FMS may predict that the aircraft will reach the altitude that terminates the leg, before the initiation of the leg. In that case, the FMS ignores the leg, and the associated turn direction.
The FMS computes a new trajectory to directly join the next leg. The trajectory may not be consistent with the published trajectory.

Example:
- Leg 1: a Course-to-Fix (CF) leg that defines a track (360 °) to a waypoint (WPT1)
- Leg 2 : a Course-to-an-Altitude (CA) leg that defines a track (130 °) to intercept an altitude (3 000 ft). The leg is coded in the Navigation Database with a turn direction (left). The end of the leg depends on the aircraft performance. The turn direction is indicated by an arrow on the line of leg 1 on the MCDU
- Leg 3: a CF leg that defines a track (120 °) to a waypoint (WPT2)



Depending on the aircraft performance, the FMS may predict that the aircraft will reach 3 000 ft before WPT1. In that case, the FMS ignores the leg 2 (CA leg) because the aircraft is already above the altitude that ends leg 2, before the beginning of leg 2. The FMS also ignores the turn direction that is coded on the leg.
As a result, the FMS computes again the trajectory from the end of leg 1, directly to leg 3. As shown on the above illustration, this trajectory includes a right turn, instead of a left turn, because it induces the shortest course change to intercept leg 3 (CF leg).
If the NAV mode is engaged, the aircraft follows this erroneous trajectory.

OPERATIONAL RECOMMENDATIONS

The flight crew should pay particular attention to the check of the flight plan during the Cockpit Preparation, and during the Descent Preparation.

CAUTION	Even if the flight plan is correct during the Cockpit Preparation or during the Descent Preparation, the FMS may compute and display an erroneous trajectory when the FMS updates its predictions after takeoff or after go-around initiation.

If the flight crew detects that the lateral flight plan does not agree with the published trajectory, the flight crew should revert to the HDG /TRK mode, and monitor NAVAID raw data as appropriate.
The flight crew should reengage the NAV mode when the lateral flight plan is consistent with the published trajectory.

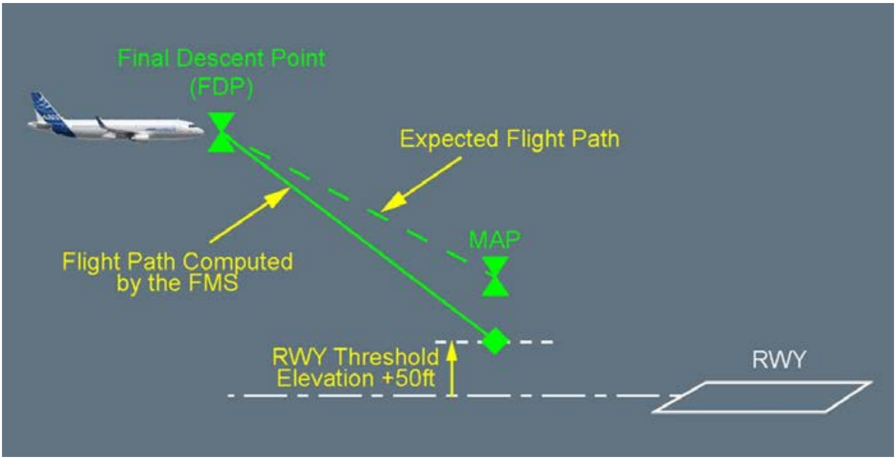
ERRONEOUS VERTICAL PROFILE DURING LOC B/C APPROACHES WITH A MAP LOCATED BEFORE THE RUNWAY THRESHOLD

Ident.: DSC-22_20-100-20-00019782.0001001 / 25 JUL 16
Applicable to: ALL

DESCRIPTION

When the flight crew selects a LOC Back Course (LOC B/C) approach in the arrival page of the MCDU , if the Missed Approach Point (MAP) is located before the runway threshold, the FMS

builds the final approach vertical flight path assuming that there is an altitude constraint at the MAP , equal to the runway (RWY) threshold elevation plus 50 ft, disregarding the actual coded MAP altitude.
As a result, the FMS computes an erroneous vertical flight path for the final approach, an erroneous crossing altitude at the MAP , and displays an erroneous vertical deviation indication (V/DEV symbol on the PFD and V/DEV value on MCDU PROG page), when flying the approach.



Therefore, the flight crew must fly the LOC B/C approaches in selected vertical guidance mode (FPA or V/S mode), and they must disregard the V/DEV displayed on the PFD and MCDU PROG page.

PROCEDURE

For LOC B/C approaches, check the position of the MAP on the approach chart:

- **If the MAP is located at the runway threshold:**
  V/DEV symbol can be used to assist the flight crew in flying the vertical flight path in selected mode. Crosscheck the final descent with the published chart using altitude versus distance, as per Standard Operating Procedures (SOPs).

- **If the MAP is located before the runway threshold:**
  DISREGARD the V/DEV symbol, and crosscheck the final descent using the altitude versus the distance to the MAP.

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ERRONEOUS PREDICTIONS

Ident.: DSC-22_20-100-40-00012672.0001001 / 17 MAR 17
Applicable to: ALL

The FMGS may display temporary erroneous predictions that can affect such data as ECON speed/Mach, optimum flight level, fuel or time predictions.

PROCEDURE

If erroneous predictions are observed:

ON GROUND, OR IN FLIGHT

Check the cruise temperature (sign and value), the gross weight, and the cruise flight level.
REENTER the same cost index to restart a computation (In descent or approach, a cost index change does not restart a computation), or
MAKE a COPY ACTIVE, then activate the secondary, or
MAKE a DIR TO the “TO” waypoint.

SPURIOUS ENGINE OUT INDICATION

Ident.: DSC-22_20-100-40-00012673.0001001 / 17 MAR 17
Applicable to: ALL

PROCEDURE

If a spurious engine-out is detected:

PRESS the EO CLR prompt of the MCDU PERF page
RE-ENGAGE previous vertical mode
RE-ENTER preselected speeds (if any). No other consequences are to be expected.

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AIRCRAFT SYSTEMS

AUTO FLIGHT - FLIGHT GUIDANCE

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DSC-22_30-10 General

DSC-22_30-20 Flight Director

DSC-22_30-30 Autopilot (AP)

DSC-22_30-40 Speed/Mach Control

DSC-22_30-50 AP/FD Modes General

DSC-22_30-60 AP/FD Lateral Modes

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DSC-22_30-70 AP/FD Vertical Modes

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DSC-22_30-80-30-20 Non Precision Approach

DSC-22_30-80-40 Go Around (GA)

DSC-22_30-90 Autothrust

DSC-22_30-100 Flight Mode Annunciator (FMA)

DSC-22_30-110 Temporary Abnormal Behaviors

GENERAL

Ident.: DSC-22_30-10-00011031.0001001 / 17 AUG 10
Applicable to: ALL

The Flight Guidance (FG) part of the FMGS controls:
- The Flight Director (FD)
- The Autopilot (AP)
- The Autothrust (A/THR).

MODE REVERSIONS

Ident.: DSC-22_30-10-00011032.0001001 / 17 AUG 10
Applicable to: ALL

There are several types of mode reversions. Each one observes a specific logic that is described in the "Mode Reversions" section. (*Refer to DSC-22_30-75 General*).

GUIDANCE MODES

Ident.: DSC-22_30-10-00011033.0002001 / 23 JUN 15
Applicable to: ALL

Two types of autopilot and flight director modes are available to guide the aircraft:
- Managed modes: When the aircraft is using managed targets, the Flight Management and Guidance System (FMGS) guides it along lateral and vertical flight paths and speed profiles computed by the Flight Management function (FM) from data in the MCDU . FM manages the guidance targets.
- Selected modes: When the flight crew is using selected targets, the FMGS guides the aircraft along lateral and vertical flight paths and speed profiles to meet targets that the flight crew has selected manually on the FCU. The flight crew selects the guidance targets.

GUIDANCE	MANAGED modes	SELECTED modes
LATERAL	NAV, APP NAV LOC *, LOC RWY RWY TRK GA TRK ROLL OUT	HDG -TRK
VERTICAL	SRS (TO and GA) CLB , DES ALT CST, ALT CST* ALT CRZ G/S *, G/S FINAL, FINAL APP FLARE	OP CLB , OP DES V/S , FPA ALT *, ALT EXPEDITE
SPEED	FMGC REFERENCE (ECON , Auto SPD , SPD LIM) EXPEDITE	FCU REFERENCE

MODE SELECTION

Ident.: DSC-22_30-10-00011034.0001001 / 23 JUN 15
Applicable to: ALL

MANAGED MODES

- At takeoff, the managed modes engage automatically when the flight crew sets the thrust levers at the TO or FLX detent.
- During flight, the flight crew can arm or engage the managed modes (if the aircraft meets engagement conditions) by pushing in the appropriate knobs on the Flight Control Unit (FCU).
- The flight crew pushes the DIR TO key on the MCDU to insert a DIR TO leg. It engages or maintains the NAV mode.
- The flight crew pushes the APPR pb on the FCU to arm or engage the localizer and glide slope or “APP NAV-FINAL”, depending upon the approach type insert in the flight plan.
- The LOC pb arms or engages only the localizer mode.

SELECTED MODES

The flight crew can engage the selected modes by pulling out the appropriate FCU selection knobs.

LATERAL MODES

Ident.: DSC-22_30-10-00011035.0001001 / 23 JUN 15
Applicable to: ALL

MODE	TYPE	GUIDANCE	REMARK
RWY	MANAGED	Mode used at takeoff to guide the aircraft along the runway centerline, using LOC.	Triggered by the thrust levers at FLX or TOGA position.
RWY TRK	MANAGED	Mode used to guide the aircraft along the track the aircraft was following at mode engagement.	
NAV	MANAGED	Mode used to guide the aircraft along the lateral F-PLN. Available above 30 ft after takeoff.	Automatically armed at takeoff, unless HDG /TRK is preset. In that case, RWY TRK engages after takeoff.
HDG -TRK	SELECTED	Mode used to guide the aircraft on a heading or a track selected by the flight crew. The target value is displayed in the FCU window.	<u>Note:</u> *HDG /TRK is called "basic mode" because it is a backup mode for certain situations:* *- F-PLN discontinuity entry* *- AP engagement with no FD* *- Loss of F-PLN.*
LOC* **LOC** **APP NAV**	MANAGED	Mode used to guide the aircraft on the lateral approach path (LOC or F-PLN approach path).	Selected by pressing APPR pb on the FCU ; the mode that engages depends upon the selected approach in the F-PLN. <u>Note:</u> *For LOC only approach, do not select the FCU's APPR pb, but rather the LOC pb.*

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MODE	TYPE	GUIDANCE	REMARK
LAND	MANAGED	Common mode engaged below 400 ft RA during an automatic ILS approach.	Engaged only if LOC mode and G/S mode are already engaged.
GA TRK	MANAGED	Mode used to guide the aircraft along the track the aircraft was following at mode engagement.	Triggered by the thrust levers at TOGA with Slats/Flaps in at least CONF 1.
ROLL OUT	MANAGED	Mode used to guide the aircraft on the runway, following an automatic landing.	FD rollout symbol is displayed on the PFD at touchdown.

VERTICAL MODES

Ident.: DSC-22_30-10-00011036.0002001 / 23 JUN 15
Applicable to: ALL

MODE	TYPE	GUIDANCE	REMARK
SRS	MANAGED	Mode used at takeoff or go-around to maintain SRS speed (V2 , V2+10, VAPP...).	Triggered by the thrust levers at FLX or TOGA position. Disengages automatically at ACC ALT or when another VERT mode is engaged.
CLB	MANAGED	Mode used to climb towards FCU selected altitude along VERT F-PLN taking into account ALT CSTR . Available only if NAV mode engaged. The A/THR is in thrust mode (CLB).	The speed target may be either selected or managed. If managed, SPD CSTR , SPD LIM and HOLD SPD are taken into account. ALT mode is always armed ; displayed in magenta if the next level off is predicted at an ALT CSTR , and in blue if the next level off is predicted at the FCU selected altitude.
DES	MANAGED	Mode used to descend towards FCU selected altitude along the computed descent path taking into account ALT CSTR . Available only if NAV mode engaged. The A/THR may be in THRUST or SPD mode.	

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MODE	TYPE	GUIDANCE	REMARK
OP CLB **OP DES**	SELECTED	Mode used to climb/descent directly to the FCU selected altitude. These modes disregard all ALT CSTR . The A/THR is in THRUST mode (CLB/IDLE).	The speed target may be either selected or managed. ALT mode is systematically armed and blue. Altitude target is blue on PFD.
EXPEDITE	SELECTED	Mode used to increase the vertical speed by selecting green dot in climb or 0.80/340 kt in descent.	Used to expedite a climb or descent towards a specific level.
ALT CST* **ALT CST**	MANAGED	Mode automatically engaged when reaching an ALT CSTR before the FCU selected altitude.	CLB /DES mode are systematically armed (blue).
ALT* **ALT** **ALT CRZ**	SELECTED	Mode used to maintain a level flight at the FCU selected altitude.	Soft ALT mode engages when FCU selected altitude = CRZ FL. Soft ALT is part of the managed guidance.
V/S -FPA	SELECTED	Mode used to guide the aircraft along a vertical speed or a selected flight path angle.	Altitude target is blue on PFD . V/S -FPA is a basic mode. (*Refer to DSC-22_30-10 Lateral Modes*).
G/S* **G/S** **FINAL**	MANAGED	Mode used to guide the aircraft along the final approach path (G/S or non ILS)	Selected by depressing the APPR pb on the FCU . The mode engaged depends upon the selected approach in the F-PLN . Linked to APPR common mode (APPR pb).
FLARE	MANAGED	Common mode which provides the alignment to the runway center line on the yaw axis and the flare on the pitch axis.	Engages below 50 ft RA as a function of the current vertical speed.

INTERACTION BETWEEN AP/FD AND A/THR MODES

Ident.: DSC-22_30-10-00011037.0002001 / 23 JUN 15
Applicable to: ALL

The AP and FD pitch modes can control a target SPD /MACH or a vertical trajectory, and the A/THR mode can control a fixed thrust or a target SPD /MACH. However, the AP /FD and the A/THR cannot both control a target SPD/MACH simultaneously.

Therefore the AP /FD pitch modes and A/THR mode are coordinated as follows:
- If an AP /FD pitch mode controls a vertical trajectory, the A/THR mode controls the target SPD/MACH.
- If an AP /FD pitch mode controls a target SPD or MACH, the A/THR mode controls the thrust.
- If no AP /FD pitch mode is engaged, the A/THR mode reverts to controlling the SPD/MACH mode.

In other words, the selection of an AP /FD pitch mode determines which mode the A/THR controls.

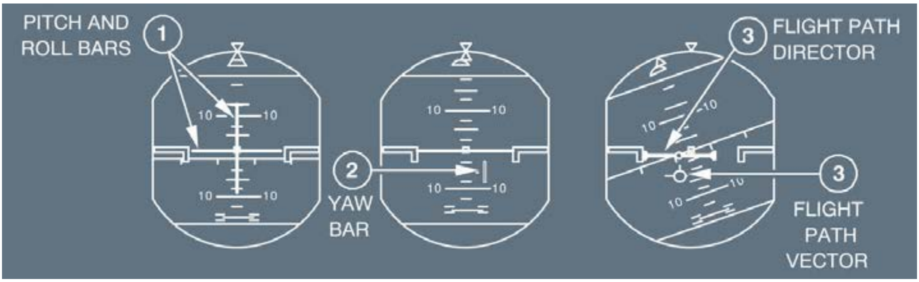
AP /FD pitch modes	A/THR modes
V/S - FPA DES (geometric path) ALT *, ALT ALT CRZ *, ALT CRZ ALT CST*, ALT CST G/S *, G/S FINAL, FINAL APP	SPEED/MACH MODE
AP /FD OFF	
CLB /DES (idle path) OP CLB /OP DES EXP CLB/EXP DES SRS	THR (CLB, IDLE) MODE
FLARE	RETARD (IDLE)

GENERAL

Ident.: DSC-22_30-20-00012468.0001001 / 14 MAY 12
Applicable to: ALL

The Flight Director (FD) displays guidance commands from the Flight Management and Guidance Computer (FMGC) on the Primary Flight Display (PFD).
The flight crew may manually fly the aircraft, following FMGC guidance commands, or crosscheck the FMGC orders when the autopilot is engaged.
In normal operations, FD 1 displays FMGC 1 orders on the PFD 1 and FD 2 displays FMGC 2 orders on the PFD2.
The FD s use their respective onside FMGCs.

On the PFD:
1. The FD pitch and roll crossbars show pitch and roll demands.
2. Below 30 ft during landing and takeoff, when a localizer is available, the vertical bar is replaced by a yaw bar that gives lateral orders.
3. The Flight Path Director (FPD) symbol relates to the Flight Path Vector (FPV).



The HDG V/S – TRK FPA pb on the FCU enables the flight crew to select either type of reference and display.
The FD pb on the Electronic Flight Instrument System (EFIS) control panel allows the FD bars to be displayed or removed.

FD BARS (HDG V/S SELECTED ON THE FCU)

- The pitch bar is displayed if a vertical mode is engaged. It gives pitch orders for the vertical guidance
- The roll bar is displayed if a lateral mode is engaged. It gives roll orders for lateral guidance.

FLIGHT PATH DIRECTOR (TRK FPA SELECTED ON THE FCU)

The display is an alternate way of transmitting flight director commands.

- The Flight Path Vector (FPV) symbol illustrates the track and flight path angle actually being flown
- The Flight Path Director (FPD) symbol shows the flight crew how to intercept the required vertical and lateral flight trajectory. When the flight crew superimposes the FPV and the FPD symbols, the aircraft is flying the required trajectory.

YAW BAR

The yaw bar is displayed in RWY mode on takeoff and in FLARE and ROLL OUT modes at landing.

FLIGHT DIRECTOR (FD) ENGAGEMENT

Ident.: DSC-22_30-20-00012469.0008001 / 01 OCT 12
Applicable to: ALL

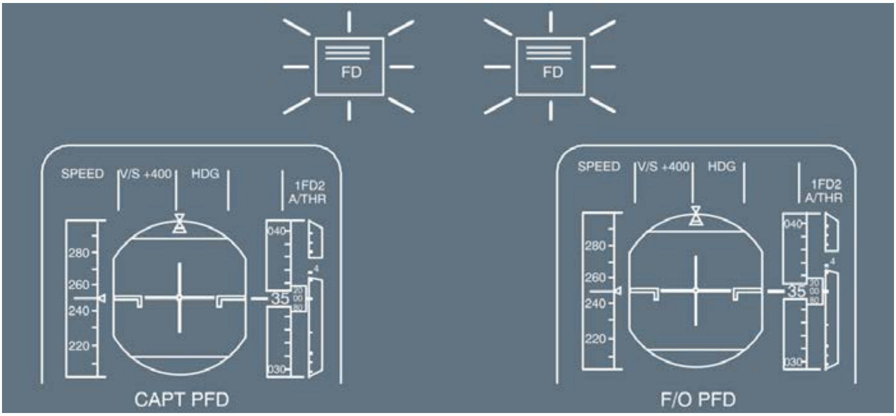
The FD s are engaged automatically when the FMGC powers up.

GROUND ENGAGEMENT

- The "1FD 2" symbol appears on both PFDs
- No FD bars appear on the PFD s. (The PFD displays FD orders when a mode is active on the corresponding axis)
- The FCU windows display dashes.

MANUAL FLIGHT ENGAGEMENT

The two FD s engage in the HDG V/S or TRK FPA modes (basic modes).



AUTOMATIC FLIGHT ENGAGEMENT

FD bars are automatically restored in SRS /GA TRK modes at go-around engagement. If FPV /FPD was previously selected, it reverts to FD bars.

FLIGHT DIRECTOR (FD) DISENGAGEMENT

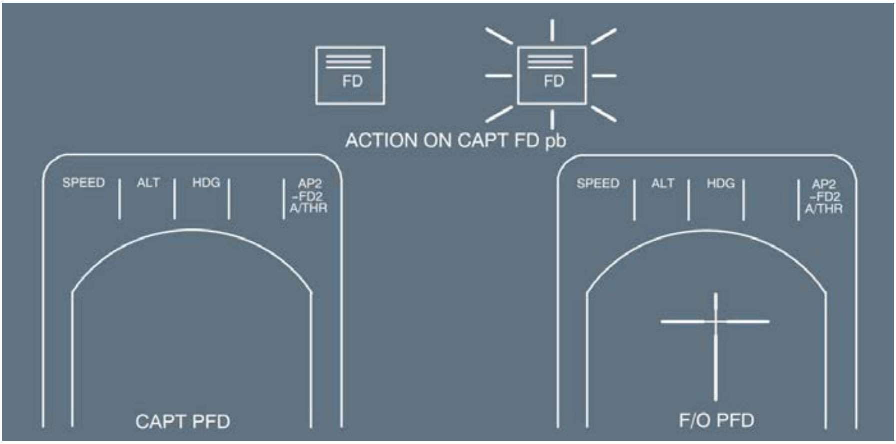
Ident.: DSC-22_30-20-00012470.0006001 / 19 DEC 12
Applicable to: ALL

The flight crew may disengage one or two FD s manually, or FDs may disengage automatically if there is a failure.

MANUAL DISENGAGEMENT

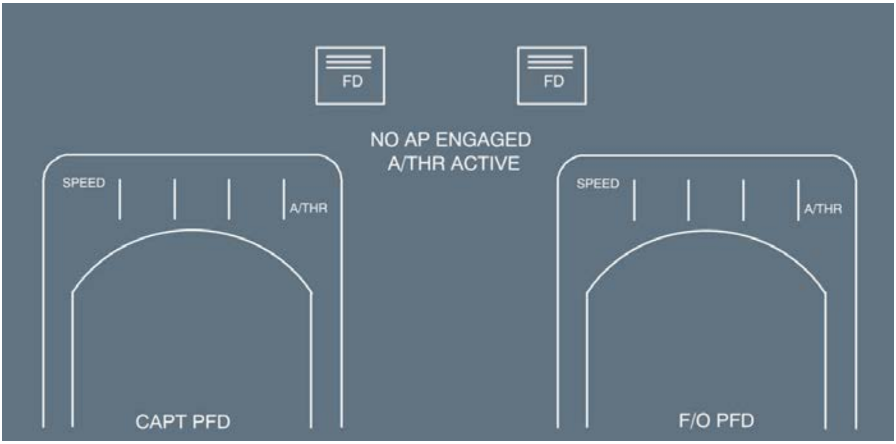
One FD OFF:

- The FD bars no longer appear on the associated PFD.
- The corresponding FD is disengaged.



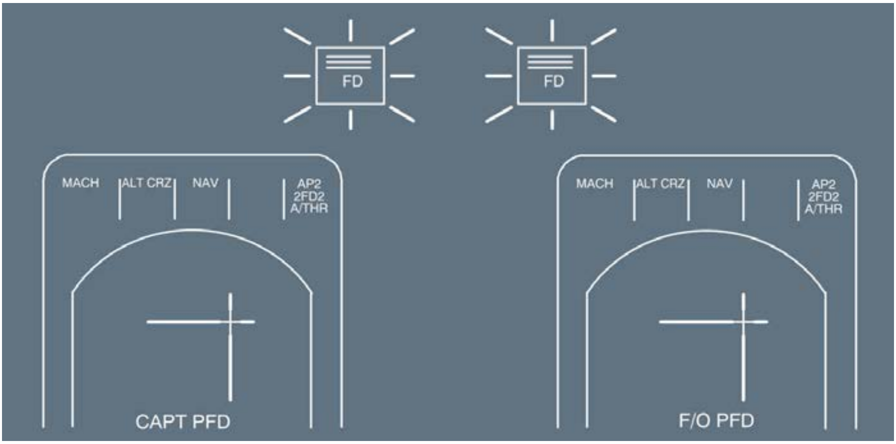
Both FDs OFF:

- The FD bars disappear from both PFDs.
- If no AP was engaged, lateral and vertical modes disengage. The A/THR, if active, automatically reverts to (or remains in) SPEED/MACH mode.
- If one AP was engaged when FD s are switched OFF, this AP remains engaged in the active modes but the FDs are no longer displayed.



AUTOMATIC DISENGAGEMENT

If one FD fails or one FMGC is not valid, both PFD s display the remaining FD.



AUTOMATIC DISENGAGEMENT DUE TO SPEED PROTECTION

When AP s are not engaged and the flight crew does not follow the FD bars to maintain the commanded trajectory in climb with CLB or OP CLB (or EXP CLB) engaged or in descent with DES or OP DES (or EXP DES) engaged, the FDs will disengage at the activation of the automatic speed mode protection.

Refer to DSC-22_30-75 Reversion with Global Speed Protection - Automatic Speed Mode Protection in Climb.

AUTOMATIC FD REMOVAL

Ident.: DSC-22_30-20-00012472.0001001 / 28 JAN 14
Applicable to: ALL

- The FD pitch bar is removed when no vertical mode is engaged or when ROLL OUT mode is engaged.
- The FD roll bar is removed when no lateral mode is engaged or when the RWY or ROLL OUT mode is engaged.
- Both FDs are removed when the aircraft pitch exceeds 25 ° up or 13 ° down, or bank angle exceeds 45 °.

FD WARNINGS

Ident.: DSC-22_30-20-00012473.0001001 / 16 MAR 11
Applicable to: ALL

FD bar WARNINGS	CONDITIONS
Pitch FD bar (or FPV) flashes 10 s and then remains steady	- If the ALT * mode is lost further to FCU altitude reference change of more than 250 ft. - When in APPR mode (G/S *, G/S , LAND, FINAL), FD reverts to V/S mode (flight crew action or loss of vertical approach mode). - One AP or one FD is engaged while both AP /FD were previously OFF.
Pitch FD bar (or FPV) flashes permanently	Transmission of the GLIDE data is interrupted when in G/S , G/S * or LAND modes above 100 ft RA.
Roll FD bar (or FPV) flashes 10 s and then remains steady	- When in APPR mode (LOC *, LOC , LAND, APP NAV), FD reverts to HDG mode (flight crew action or loss of lateral approach mode). - One AP or one FD is engaged while both AP /FD were previously OFF.
Roll FD bar (or FPV) flashes permanently	Transmission of the LOC data is interrupted when in LOC , LOC * or LAND modes above 15 ft RA.

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GENERAL

Ident.: DSC-22_30-30-00011816.0001001 / 17 AUG 10
Applicable to: ALL

The AP:
- Stabilizes the aircraft around its center of gravity
- Acquires and tracks a flight path
- Flies the aircraft to an automatic landing or go-around.

The AP commands the:
- Position of the flight control surfaces for pitch, roll and yaw
- Nose wheel position.

AP ENGAGEMENT

Ident.: DSC-22_30-30-00011817.0003001 / 17 AUG 10
Applicable to: ALL

The flight crew can engage AP 1 or AP 2 by pressing the corresponding pushbutton on the FCU if the aircraft has been airborne for at least 5 s.
When one AP is engaged, the corresponding FCU pushbutton comes on and AP 1 (or 2) is displayed on the FMAs.

- One AP can be engaged on ground if the engines are not running. It disengages when one engine is started.
- Two AP s may be engaged at a time (AP 1 active, AP2 in standby), when the localizer/glide-slope or roll out or go-around mode is armed or engaged.
  Only one AP can be engaged at a time in all other cases.
- If one AP pb is set to ON with both FD s OFF, the AP engages in HDG V/S or TRK FPA mode, depending upon which mode the flight crew has selected on the FCU.
- If one AP pb is set to ON with at least one FD already ON, the AP engages in the current active FD modes.
- At takeoff, the AP cannot be engaged below 100 ft.

AP engagement increases the break out force on the sidestick controllers and on the rudder pedals.
AP engagement is indicated by the lighting of the corresponding FCU pushbutton and by the appearance of AP 1 (or 2) on the PFD 's FMA.

AP DISENGAGEMENT

Ident.: DSC-22_30-30-00011818.0008001 / 04 NOV 13
Applicable to: ALL

AP1 or 2 disengages when:
- The flight crew presses the takeover pb on the sidestick, or
- The flight crew presses the corresponding AP pb on the FCU, or
- The flight crew pushes on the sidestick harder than a defined threshold, or moves on the rudder pedals beyond a defined threshold, or
- The flight crew moves the pitch trim wheel beyond a defined threshold, or
- The other AP is engaged, except when localizer/glideslope modes are armed or engaged, or when the rollout or go-around mode is engaged, or
- Both thrust levers are set above the MCT detent and the aircraft is on ground, or
- In a non-precision approach, the aircraft reaches the Missed Approach Point (MAP) with FINAL APP mode engaged, or
- One of the engagement conditions is lost.

In addition, in normal law with all protections available, the AP will disengage when:
- High speed protection activates, or
- Angle-of-attack protection activates:
  - From the liftoff to 100 ft RA during the landing, when α prot +1 ° is reached, or
  - Below 100 ft RA during the landing, when α MAX is reached, or
- Pitch attitude exceeds 25 ° up, or 13 ° down, or bank angle exceeds 45 °, or
- A rudder pedal deflection is more than 10 ° out of trim.

The standard manner for the flight crew to disengage the AP is to press the takeover pb on the sidestick.
When the AP is OFF, the associated pushbutton on the FCU goes off, and AP 1 (or AP 2) disappears from the FMA.

AP WARNINGS

Ident.: DSC-22_30-30-00011819.0001001 / 17 AUG 10
Applicable to: ALL

When the AP is disengaged, the system warns the flight crew:
- If the flight crew disengages it with the takeover pb on the sidestick, the warnings are temporary
- If the disengagement results from a failure, from the flight crew pushing the pushbutton on the FCU, or from a force on the sidestick, the visual and audio warnings are continual.

		AP DISENGAGEMENT	
		TAKEOVER pb on SIDESTICK	**BY OTHER MEANS**
CONSEQUENCE	**MASTER WARNING light**	Flashing red during 3 s maximum	Flashing red
	ECAM	AP OFF red message 9 s maximum	AUTO FLT AP OFF red warning
	AUDIO	Cavalry charge 0.5 s minimum 1.5 s maximum	Continuous cavalry charge 1.5 s minimum
	CLR pb on ECAM CONTROL PANEL	Extinguished	Illuminated
ACTION	**MASTER WARNING light**	- Extinguishes Master Warning light - Erases ECAM warning - Stops audio if pressed within 1.5 s	- Extinguishes Master Warning light - Stops audio after 1.5 s
	CLR pb on ECAM CONTROL PANEL	No effect	- Extinguishes CLR pb - Erases ECAM message - Calls status
	TAKEOVER pb	- Extinguishes Master Warning light - Erases ECAM warning - Stops audio if pressed within 1.5 s	- Extinguishes Master Warning light - Stops audio after 1.5 s
ECAM STATUS MESSAGE		NO	YES

AUTOLAND WARNING

Ident.: DSC-22_30-30-00011820.0001001 / 09 APR 15
Applicable to: ALL

Below 200 ft RA, an Autoland red light flashes in case of failures that require the interruption of an automatic landing.
Refer to DSC-22_30-80-30-10 Autoland Warning Light for the detailed conditions triggering the Autoland warning.

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GENERAL

Ident.: DSC-22_30-40-00011893.0001001 / 17 AUG 10
Applicable to: ALL

In flight, either the AP /FD pitch control, or autothrust may acquire and hold a target speed or Mach number, depending on the engaged modes.

Speed control is:
- Managed when the target comes from the FMGS
- Selected when the target comes from the SPD /MACH FCU window.

MANAGED SPEED/MACH TARGET

Ident.: DSC-22_30-40-00011894.0001001 / 01 DEC 14
Applicable to: ALL

When the speed target is managed, the SPD /MACH window of the FCU shows dashes, and the corresponding dot is lighted. The PFD speed scale shows the speed target in magenta.

ENGAGEMENT CONDITIONS

The SPD target is managed, whenever AP or FD is engaged, and one of the following occurs:
- The flight crew pushes in the SPD/MACH knob
- EXPEDITE mode ⊲ is engaged
- V2 is inserted in the MCDU
- The speed reference system (SRS) is engaged (takeoff or go-around mode).

Note: *At takeoff, SRS will not engage if V2 is not available.*

DISENGAGEMENT CONDITIONS

Managed speed disengages any time the flight crew selects a speed target on the FCU, or if the speed was preselected.

SPEED PROFILE

The form of the managed SPD profile depends on the lateral NAV mode.

■ **If NAV mode is engaged, the SPD profile takes into account all the constraints linked to the flight plan.**
The SPD profile is:
V2 - SPD LIM - SPD CSTR (if applicable) - ECON CLB SPD /MACH - ECON CRZ MACH - ECON or preset DES MACH/SPD -SPD LIM - SPD CSTR (if applicable) - HOLD SPD (if applicable) - VAPP.

■ **If NAV mode is not engaged, the SPD/MACH constraints are not considered.**
The SPD profile is:

V2 - SPD LIM - ECON CLB SPD /MACH - ECON CRZ MACH - ECON or preset DES MACH/SPD - SPD LIM - VAPP.

Note: *1. When both AP /FD s are OFF, A/THR reverts to selected SPEED mode, except when the approach phase is activated on MCDU where both managed and selected SPD are available.*
2. When expedite mode is engaged, the system disregards SPD LIM and SPD CSTR no matter what lateral mode is engaged.
3. The managed speed/Mach target may be set below maneuvering speed but as long as the speed target is managed, the FMGS limits the aircraft to the maneuvering speed of the current slats/flaps configuration (VAPP , F , S, Green Dot).
4. If the managed speed/Mach target is set above VMAX (VFE , VMO , MMO), the FMGS automatically limits the speed to VMAX.
5. If a SPD/MACH constraint has already been taken into account, it remains applied (until a more restrictive constraint applies).

MINI GROUND SPEED

In approach phase, the managed speed target is the Mini Ground Speed target computed by the Flight Guidance (FG) part of the FMGS. *Refer to DSC-22_30-90 General* for details.

SELECTED SPEED/MACH TARGET

Ident.: DSC-22_30-40-00011895.0002001 / 17 AUG 10
Applicable to: ALL

To use a selected speed/Mach target, the flight crew uses the knob on the FCU to set the target speed, which is then displayed in the FCU window. It is also displayed in blue on the PFD speed scale.

Note: *The selected speed/Mach target may be set beyond VLS or VMAX , but when autothrust is active, the guidance limits the speed to VLS or VMAX.*

Selected speed has priority over managed speed. The only automatic change-over from selected to managed speed target may occur at go-around mode engagement.
In flight, if the situation calls for managed speed, both the PFD and the MCDU display a message proposing a manual change to managed speed (for example, SET MANAGED SPEED, SET HOLD SPEED, or SET GREEN DOT SPEED).

ENGAGEMENT CONDITIONS

The aircraft has a selected speed target under any one of the following conditions:
- The flight crew pulls out the SPD/MACH knob (5 s after lift-off)
- Both AP /FD s are OFF (except in APPR phase)
- The FM speed target is lost (except in SRS , G/S, LAND, and GO AROUND modes)

- The MCDU has a preselected speed for the next phase, and the aircraft transitions into that phase
- The FMGC is powered up in flight.

DISENGAGEMENT CONDITIONS

The selected speed target disengages:
- When the managed SPD engages
- When the aircraft is on ground at engine start.

Note: *With engines running, the flight crew can select a speed on the FCU only after takeoff.*

AUTO SPD

Ident.: DSC-22_30-40-00011896.0001001 / 17 AUG 10
Applicable to: ALL

The flight crew may insert the AUTO SPD (speed or Mach) on the PERF DES page to replace the ECON DES SPD.
In this case, the managed speed profile takes into account the selected value. The top of descent and the descent path are computed on AUTO SPD assumption.

SPEED/MACH SWITCHING

Ident.: DSC-22_30-40-00011897.0001001 / 16 MAR 11
Applicable to: ALL

In managed speed, at the crossover altitude, the FMGC automatically changes the managed speed target to the corresponding MACH target. The FCU displays the Mach number corresponding to the speed at the switching altitude.

SPEED/MACH CROSS OVER TABLE.

ALTITUDE							
30500	280						
29500		290					
28500	295		300				
27500		305		310			
26500	300		315		325		
25500		310		325		330	
24500			320		335		350
MACH	0.76	0.77	0.78	0.79	0.80	0.81	0.82

Note: *When the speed is selected, the flight crew has to perform the switching manually by pressing the SPD/MACH pb on the FCU . The FCU then displays the aircraft Mach number.*

When the target speed is managed, the FMGC commands the switchover automatically as a function of the ECON MACH value.

MANAGED SPEED TARGET MEMORIZATION

Ident.: DSC-22_30-40-00011898.0001001 / 13 JAN 14
Applicable to: ALL

A dual FM failure has different consequences when it occurs in different phases of the flight.

The system handles target speed and SPD mode as follows:
- During approach with LOC and G/S engaged and radio height < 700 ft, the target speed is set to VAPP as previously memorized, and managed SPD target is maintained.
- At go-around, the target speed becomes the memorized go-around speed, which is the higher of VAPP or the speed when go-around was initiated. Managed SPD target is maintained.
- In all other cases, managed target speed reverts to selected, the value being the speed at the moment of the failure.

SPEED/MACH FCU WINDOW SYNCHRONIZATION

Ident.: DSC-22_30-40-00011899.0001001 / 17 AUG 10
Applicable to: ALL

When the target SPD is managed, the SPD /MACH display of the FCU shows dashes.

However, the window displays the target SPD or MACH in the following situations:
- The flight crew turns the SPD/MACH knob.
  If the flight crew does not pull the knob within 10 s after turning it, the selection reverts to dashes.
- The flight crew manually engages a selected SPD target.
- If the flight crew has manually preselected a speed or Mach number for the next phase on the MCDU PERF page, that preselected SPD /MACH engages when the aircraft enters that phase and the FCU window then displays as the target the preselected speed or Mach.
- If the FMGS is powered up in flight, the synchronized speed/Mach value is the current aircraft speed or Mach number.
- If no V2 is entered at takeoff, the V/S mode engages 5 s after lift-off (no speed reference system). The FCU speed target is the speed at V/S mode engagement. (A/THR becomes active when the thrust levers are set in the active range).

AP/FD MODES GENERAL

Ident.: DSC-22_30-50-00011767.0007001 / 23 JUN 15
Applicable to: ALL

The FMGS has guidance parameters for both AP /FD lateral and vertical modes.

The AP /FD lateral modes are:

RWY, RWY TRK	Runway, Runway track mode
NAV	Nav mode
HDG, TRK	Heading, track mode. Also called basic modes
APP NAV	Approach Nav mode
LOC*, LOC	Loc capture, Loc track mode
LAND	Land mode. Managed submode that includes LOC and G/S modes below 400 ft RA
FINAL APP	Final approach mode. Managed submode that includes APP NAV and FINAL modes during non precision approach
ROLL OUT	Roll out mode (Autoland)
GA TRK	Go-around track mode

The AP /FD vertical modes are:

SRS	SRS mode used for takeoff and go-around
CLB	Climb mode
DES	Descent mode
OP CLB	Open Climb mode
OP DES	Open Descent mode
EXP CLB ◁	Expedite mode in climb
EXP DES ◁	Expedite mode in descent
V/S or FPA	Vertical Speed mode or Flight Path Angle mode. Also called basic modes
ALT*	Altitude capture
ALT	Altitude Hold mode
ALT CST*	Altitude constraint capture
ALT CST	Altitude constraint hold mode
ALT CRZ	Altitude hold of the cruise flight level
G/S*	Glide slope capture
G/S	Glide slope mode
FINAL	Final mode (Non precision approach)
FLARE	Flare mode (Autoland)

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HEADING OR TRACK: HDG - TRK

Ident.: DSC-22_30-60-00012328.0011001 / 29 MAR 12
Applicable to: ALL

These modes guide the aircraft laterally along a heading or track selected by the flight crew. The HDG /TRK window of the FCU displays the target heading or track. The flight crew uses the HDG V/S -TRK FPA pb to select heading or track.

ENGAGEMENT CONDITIONS

HDG or TRK is engaged when one of the following conditions is met:
- The flight crew pulls out the HDG/TRK knob (not sooner than 5 s after lift-off)
- NAV , APP NAV or FINAL APP modes are disengaged, either by the loss of the lateral flight plan or when the flight crew enters a flight plan discontinuity
- LOC or LOC* mode is lost
- The flight crew engages the AP /FD with no other mode already engaged (basic mode of AP /FD engagement)
- The flight crew presses the LOC pb, when APP NAV or FINAL APP modes are already engaged

DISENGAGEMENT CONDITIONS

The engagement of any other lateral mode disengages HDG or TRK.

SYNCHRONIZING THE HDG /TRK WINDOW OF THE FCU

The lateral window of the FCU displays a heading or a track value when:
- The HDG /TRK mode is engaged. The displayed value is the current HDG /TRK or the manually selected value of the target
- The flight crew turns the HDG/TRK knob. The value in the window first synchronizes with the current HDG /TRK , then displays the manual selection. It remains displayed for 10 s or 45 s depending upon FCU standard, then vanishes if the flight crew does not pull the knob (except in HDG preset)
- A HDG /TRK is preset (*Refer to DSC-22_30-60 HDG/TRK Preset*)
- AP /FD is lost. The value becomes that of the aircraft current heading or track.

Note: *If HDG is switched to TRK (or vice versa), the value displayed in the window switches from heading to track (or vice versa).*

HDG/TRK PRESET

Ident.: DSC-22_30-60-00012329.0010001 / 29 MAR 12
Applicable to: ALL

The system has a HDG /TRK preset function for takeoff and go-around.

If the flight crew chooses not to fly the flight plan after takeoff or go-around, they may preset a HDG or a TRK on the FCU by turning the HDG/TRK knob. The value they set remains displayed in the FCU HDG /TRK window until they pull the knob.

OPERATION AT TAKEOFF

HDG /TRK preset is available before takeoff and up to 30 ft RA . Turning the HDG/TRK knob before 30 ft sets the desired HDG /TRK. As a consequence:
- NAV is disarmed
- At 30 ft, RWY TRK is annunciated until the HDG/TRK knob is pulled.

OPERATION AT GO-AROUND

Whenever the LOC *, LOC , LAND or GA modes are engaged, the HDG preset is available. If the flight crew rotates the HDG/TRK knob to set the value, it will remain displayed in the window. Pull out the HDG/TRK knob to activate the mode and turn the aircraft to the preset value.

CANCELLATION

The flight crew can cancel a preset HDG /TRK by:
- Engaging the NAV mode using the DIR TO
- Pushing in the HDG/TRK knob (arming NAV mode)
- Disengaging AP /FD.

NAVIGATION (NAV)

Ident.: DSC-22_30-60-00012330.0002001 / 23 JUN 15
Applicable to: ALL

NAV mode is a managed mode that steers the aircraft laterally along the flight plan defined in the FMGS . It is designed to have a zero cross-track error. The flight crew can arm or engage the NAV mode if the MCDU contains a lateral flight plan.

ARMING CONDITIONS

Satisfying one of the following conditions arms NAV:
- The aircraft is on ground with no HDG /TRK preset and no other lateral mode except runway mode
- The flight crew pushes in the HDG/TRK knob, unless the LOC mode is engaged
- The flight crew presses the APPR pb, if a non-ILS approach is selected.

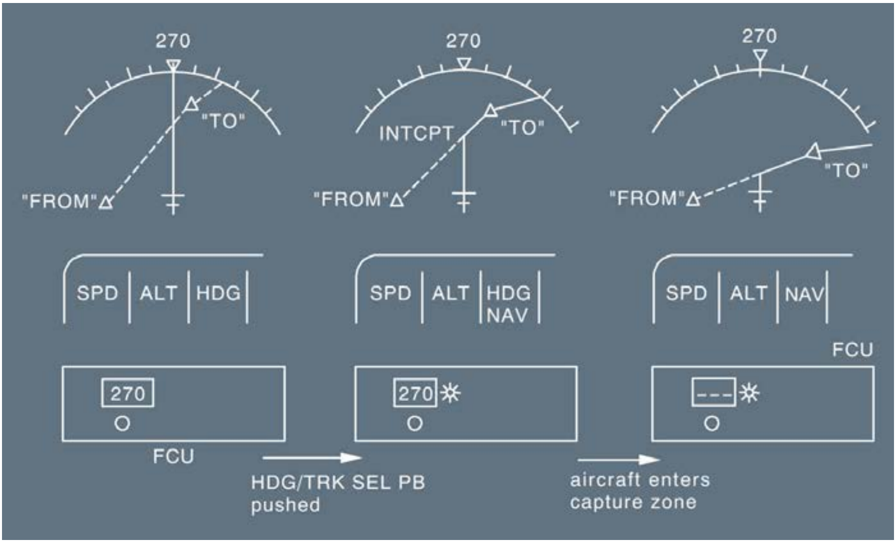
DISARMING CONDITIONS

NAV mode disarms if one of the following occurs:
- The flight crew pulls out the HDG/TRK knob
- The flight crew selects a preset HDG /TRK (TO or GA)
- The flight crew arms the LOC mode by pressing the LOC pb

- The flight crew selects GA mode
- LAND mode has engaged
- The flight crew presses the APPR pb, if an XLS approach is selected.

ENGAGEMENT CONDITIONS

NAV mode engages:
- Automatically at 30 ft RA after takeoff (if armed on the ground)
- When the flight crew orders "DIR TO " (except below 700 ft RA in LOC mode)
- When the flight crew pushes in the HDG/TRK knob when the aircraft is close to (within ~1 NM of) the active flight plan leg
- Automatically in flight when NAV is armed and the aircraft reaches the capture zone for the active flight plan leg.



CAUTION	When NAV is armed, it will automatically engage if: - The aircraft track line intercepts the flight plan before the TO waypoint, and - The intercept waypoint (INTCP) is displayed on the ND, and - The aircraft reaches the active flight plan leg.

Note: The TO waypoint is displayed in white on ND s and MCDUs.

DISENGAGEMENT CONDITIONS

The NAV mode disengages when:
- Any other lateral mode is engaged
- The flight plan is lost or the aircraft enters a flight plan discontinuity.

INTERACTIONS WITH VERTICAL MODES

When NAV mode is engaged, the vertical managed modes CLB or DES or FINAL take into account altitude and speed constraints linked to waypoints on the lateral flight plan. If NAV mode is disengaged, the vertical managed modes are not available and all downpath altitude and speed constraints are ignored.

LOCALIZER MODE THROUGH THE LOC PUSHBUTTON

Ident.: DSC-22_30-60-00012331.0001001 / 17 AUG 10
Applicable to: ALL

This mode captures and tracks a localizer beam independently of the glide path beam. Flight crew use it to fly localizer-only approaches or to initiate an ILS approach when intercepting the glide slope from above.

ARMING CONDITIONS

The flight crew arms the LOC mode by pressing the LOC pb, provided that:
- An ILS is tuned (frequency and runway course)
- The aircraft is above 400 ft RA
- TO or GA mode is not engaged.

DISARMING CONDITIONS

LOC mode is disarmed by:
- Pressing the LOC pb when LOC is armed
- Arming the NAV mode
- Engaging the GA mode.

Note: *Engaging NAV mode by selecting DIR TO does not disarm the LOC mode.*

ENGAGEMENT CONDITIONS

The LOC mode engages automatically when capture conditions are met.

DISENGAGEMENT CONDITIONS

The LOC mode disengages:
- When another lateral mode is engaged
- When the flight crew presses the LOC pb again (engaging the HDG /TRK mode on the current HDG /TRK).

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GENERAL

Ident.: DSC-22_30-70-10-00010507.0001001 / 17 AUG 10
Applicable to: ALL

Vertical modes guide the aircraft in the vertical plan.

PRINCIPLES

Ident.: DSC-22_30-70-10-00010508.0001001 / 17 AUG 10
Applicable to: ALL

To leave an FCU selected altitude for another target altitude, the flight crew must turn the Altitude (ALT) knob in order to display the new target altitude and either:
- Pull out the ALT knob to engage the OPEN CLB /DES mode, or
- Push in the ALT knob to engage the CLB /DES mode, or
- Select a target vertical speed (V/S) and pull out the V/S or FPA knob to engage V/S mode, or
- Select EXPEDITE ⊲ .

This arms ALT mode.

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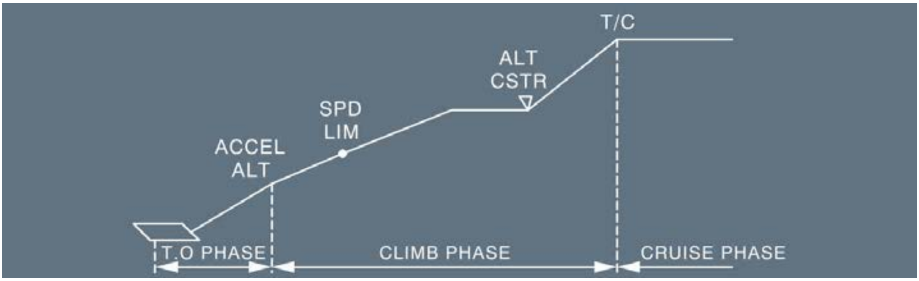
GENERAL

Ident.: DSC-22_30-70-20-00010509.0001001 / 01 OCT 12
Applicable to: ALL

CLB mode guides the aircraft in a managed climb, at either a managed or a selected target speed, to an FCU selected altitude, taking into account altitude constraints at waypoints.
The system also considers speed constraints if the target speed is managed. The vertical flight path may include several segments:



The flight crew can arm the CLB mode during the takeoff, go-around, climb, and cruise phases and engage it during the climb and cruise phases.

ARMING CONDITIONS

Ident.: DSC-22_30-70-20-00010510.0001001 / 17 AUG 10
Applicable to: ALL

The CLB mode is armed:
- On ground or when SRS mode is engaged (TO or GA) if the following conditions are met:
  - No other vertical mode is engaged
  - The ACCEL ALT (defined on the PERF TO or GA MCDU pages) is below the FCU selected altitude and the lowest altitude constraint.
- In flight, when the climb or go-around phase is active, and the following conditions are met:
  - The lateral NAV mode is engaged
  - The FCU selected altitude is above the aircraft's present altitude and the aircraft captures or flies an altitude constraint.

DISARMING CONDITIONS

Ident.: DSC-22_30-70-20-00010511.0002001 / 23 JUN 15
Applicable to: ALL

The CLB mode is disarmed, if one of the following conditions is met:
- Another vertical mode is engaged
- The FCU selected altitude is lower than the present aircraft level
- The FCU selected altitude is set at the altitude constraint while ALT CST* or ALT CST mode is engaged
- The aircraft transitions to DES or APPR phase
- Arming requirements are no longer met
- Vertical flight path validity is lost, or NAV mode is lost while ALT CST* or ALT CST mode is engaged.

ENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-20-00010512.0001001 / 17 AUG 10
Applicable to: ALL

The CLB mode can be engaged, if the following conditions are all met:
- The aircraft has been in flight for more than 5 s
- The selected FCU level is above the present aircraft level
- The descent, approach, or go-around phase is not active
- NAV mode is engaged
- Glideslope (G/S) mode is not engaged.

CLB mode automatically engages when the aircraft reaches ACC ALT , or sequences a waypoint with an altitude constraint while the CLB mode is armed.
CLB mode manually engages when the flight crew pushes in the ALT knob, with the CLB mode not armed and the current altitude is not an effective altitude constraint of the flight plan.

Note: *When CLB mode is engaged:*
- *The V/S (FPA) window of the FCU shows dashes*
- *The managed LVL/CH dot on the FCU lights up*
- *The Flight Mode Annunciator displays “CLB” in Column 2.*

DISENGAGEMENT CONDITIONS

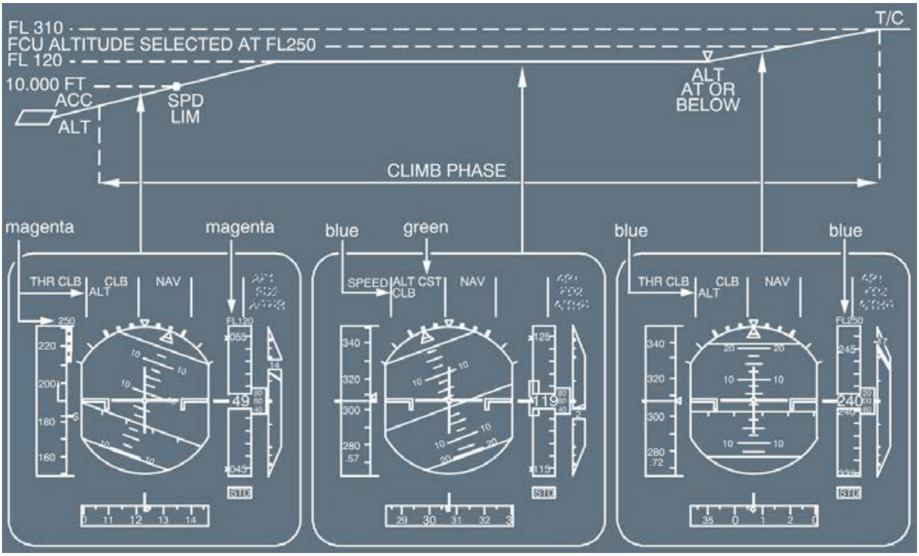
Ident.: DSC-22_30-70-20-00010513.0002001 / 17 AUG 10
Applicable to: ALL

The CLB mode disengages, if one of the following conditions is met:
- NAV mode is lost or disengaged (OP CLB engages). In this case, the reversion to OP CLB is accompanied by a triple click aural warning
- Another vertical mode engages
- The flight crew selects an altitude on the FCU that is lower than the present aircraft altitude. V/S (FPA) engages on the current V/S (FPA).

GUIDANCE

Ident.: DSC-22_30-70-20-00010514.0002001 / 01 OCT 12
Applicable to: ALL

Climb mode gives the aircraft managed vertical guidance to the FCU selected altitude. It meets altitude constraints at waypoints either with managed speed incorporating speed constraints or with selected speed as target speed. The AP /FD pitch controls the speed or Mach number target and the A/THR is in thrust mode (CLB) corresponding to maximum climb thrust. The flight path may include several segments.



- When CLB mode is engaged, the system arms ALT and displays the applicable target altitude on the ALT scale.
  - If the next predicted level-off is an ALT CSTR , ALT is magenta on the FMA and the ALT CSTR is displayed in magenta on the altitude scale
  - If the next predicted level-off is the FCU altitude, ALT is blue on the FMA and the FCU selected altitude is displayed in blue on the altitude scale.

  Note: *The system takes into account all constraints defined by the database or manually entered by the flight crew. Nevertheless this mode has the following particularity: When the aircraft is in CLB mode and the system predicts that it will miss an altitude constraint, it will not modify the target speed in an attempt to meet it. In this case, the flight crew may select an appropriate speed in order to meet the ALT CSTR.*

- The guidance does not modify the target speed in order to satisfy an altitude constraint. Therefore the constraint may not be met and may be predicted as missed
- When the aircraft levels off at the ALT CSTR , CLB mode arms automatically, then engages when the aircraft passes the constrained waypoint (if the FCU altitude is above the constraint altitude).

GENERAL

Ident.: DSC-22_30-70-30-00010515.0001001 / 17 AUG 10
Applicable to: ALL

The OPEN CLB mode is a selected mode. It uses the AP /FD pitch mode to maintain a SPD/MACH (selected or managed) while the autothrust (if active) maintains maximum climb thrust.

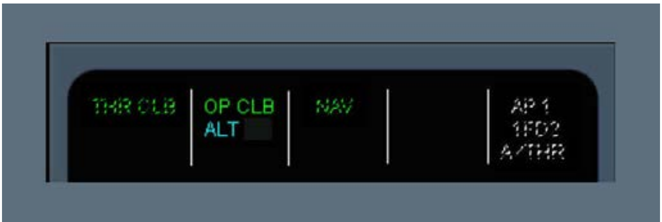
ENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-30-00010516.0002001 / 16 MAR 11
Applicable to: ALL

The OPEN CLB mode can only be engaged, if all of the following conditions are met:
- The aircraft is in flight for more than 5 s
- The LAND mode is not engaged
- The FCU selected altitude is higher than the aircraft's present altitude.

The OPEN CLB mode is engaged, if one of the following conditions occurs:
- The flight crew pulls out the ALT knob
- The flight crew pulls out the SPD/MACH knob, when TOGA mode or EXPED CLB is engaged
- Acceleration altitude is reached, with CLB armed, and NAV mode not engaged
- Guidance reverts to ensure speed protection
- NAV mode is lost (or disengaged), when previously in CLB mode. Reversion to OPEN CLB is accompanied by a triple click aural warning (*Refer to DSC-22_30-75 General*).

<u>*Note:*</u> *When OPEN CLB is engaged:*
- *The FMA displays "OP CLB"*
- *The managed LVL/CH dot on the FCU goes out.*



Typical FMA in OPEN CLIMB

DISENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-30-00010517.0001001 / 17 AUG 10
Applicable to: ALL

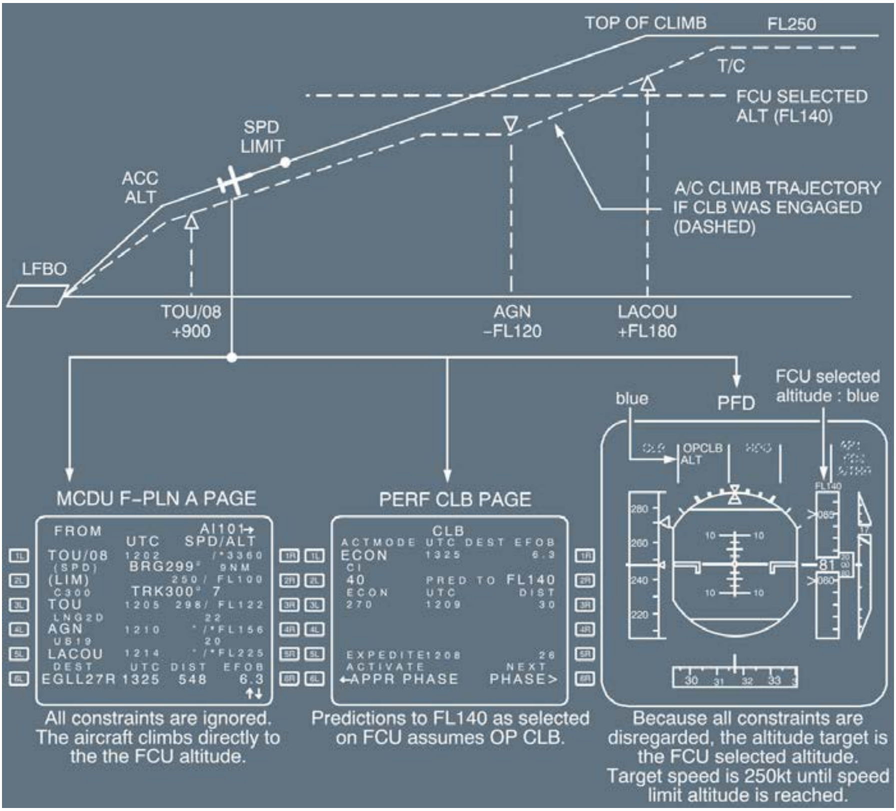
The OPEN CLB mode is disengaged by one of the following conditions:
- Engagement of any other vertical mode
- Reversion to V/S mode (*Refer to DSC-22_30-75 General*)
- Selection of a lower altitude than the current aircraft altitude. V/S (FPA) engages on the current V/S (FPA).

GUIDANCE

Ident.: DSC-22_30-70-30-00010518.0001001 / 01 OCT 12
Applicable to: ALL

When OPEN CLB is engaged, the target speed/Mach is maintained by adjusting the pitch with the elevator, whereas thrust is maintained either by the A/THR, or manually by the flight crew. Speed target may either be selected or managed.
The OPEN CLB mode disregards all altitude constraints up to the FCU selected altitude.

OPEN CLB MODES, MANAGED SPEED



Note: *If the change is less than 1 200 ft in OPEN CLB mode, the aircraft responds with a rate of climb of 1 000 ft/min.*

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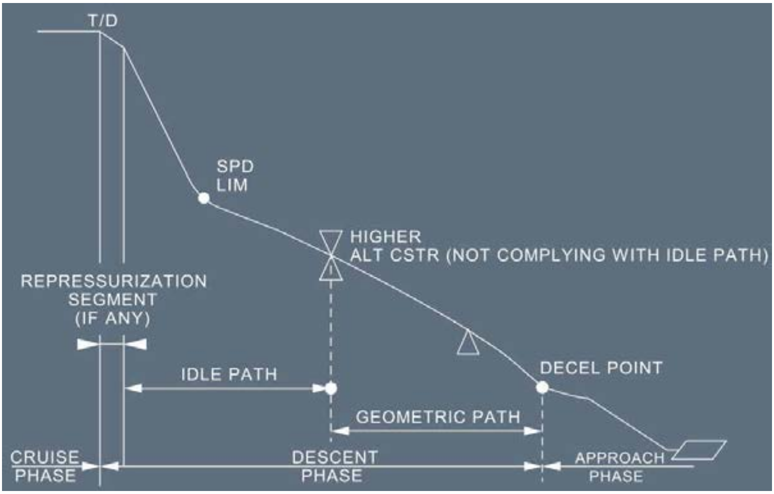
GENERAL

Ident.: DSC-22_30-70-50-00010521.0001001 / 17 AUG 10
Applicable to: ALL

The DES mode guides the aircraft along the descent path computed by the FMGS . The system computes this flight path backwards from the deceleration point up to the top of descent (T/D), with respect to the speed and altitude constraints at the deceleration point, the guidance begins the deceleration to VAPP, to be reached at 1 000 ft above touchdown on the final descent path.
Internally, the computer divides the descent path into various segments, depending on the relative positions of the constraints. It starts at top of descent (T/D) by setting up an “idle” segment that takes the aircraft down to the first constraint, and follows this with “geometric” segments between constraints.
The descent profile takes into account wind data and data from the lateral and vertical flight plans, and it is based upon the managed descent speed profile. It does not take holding patterns into consideration.

The descent profile has several segments:
- A repressurization segment. When necessary, this produces a repressurization rate for the cabin during descent. It is a function of the destination airport altitude and the selected cabin rate (defaulted to -350 ft/min but this can be modified)
- Idle path segment. The AP /FD controls the speed and the autothrust stays at idle thrust. The guidance computes this profile from the top of descent or the end of the repressurization segment to the first vertical constraint that cannot be flown at idle thrust
- Geometric path segments. The AP /FD controls the vertical path, and autothrust controls the speed. These segments take the aircraft from the first constraint to the deceleration point.



The descent mode is a managed mode that may be engaged during cruise. It can be armed or engaged in descent and approach phases (except if the FCU selected altitude is higher than the present aircraft altitude).

ARMING CONDITIONS

Ident.: DSC-22_30-70-50-00010522.0001001 / 17 AUG 10
Applicable to: ALL

The DES mode is armed when an ALT CSTR is captured and all the following conditions are met:
- FCU selected altitude is lower than present altitude
- NAV , LOC * or LOC mode is engaged
- Takeoff or go-around phase is not active
- Flight profile is available.

DISARMING CONDITIONS

Ident.: DSC-22_30-70-50-00010523.0002001 / 23 JUN 15
Applicable to: ALL

The DES mode is disarmed if one of the following conditions is met:
- Engagement of another vertical mode
- FCU selected altitude is set above the aircraft current altitude
- Loss of NAV , LOC *, or LOC mode
- Switching to the go-around phase

- Loss of vertical flight path validity
- Setting the FCU selected altitude at an altitude constraint while ALT CST* was engaged. (ALT * engages and DES mode disarms).

ENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-50-00010524.0002001 / 23 JUN 15
Applicable to: ALL

The DES mode can be engaged, when the following conditions are met:
- The FCU selected altitude is lower than present altitude
- NAV , LOC *, or LOC mode is engaged
- Takeoff, climb, or go-around phase is not active
- Vertical flight path is valid
- TO , G/S , LAND, FINAL or GA mode is not engaged, and:
  - The aircraft sequences a waypoint with an ALT CSTR , and DES mode is armed. The DES mode engages automatically, or
  - The flight crew presses the ALT knob, while ALT CST* or ALT CST is not engaged, or
  - The flight crew presses the ALT knob, while ALT * or ALT is engaged, but the current altitude is not an effective altitude constraint of the F-PLN.

Note: *When DES mode is engaged:*
- *The V/S - FPA window of the FCU shows dashes*
- *The managed LVL/CH dot on the FCU lights up.*

DISENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-50-00010525.0002001 / 17 AUG 10
Applicable to: ALL

The DES mode is disengaged, if one of the following conditions is met:
- The NAV mode is lost or disengaged and the V/S or FPA mode engages. A triple click aural warning will sound
- Another vertical mode engages
- The flight crew selects an altitude on the FCU that is higher than the aircraft present altitude and the V/S (FPA) engages on current V/S (FPA). Same triple click logic, as for the OP DES case
- NAV mode is lost due to a discontinuity in the descent profile. AP /FD reverts to basic mode, and a triple click aural warning sounds. The vertical mode is boxed in white for 10 s.

Refer to DSC-22_30-75 General.

REPRESSURIZATION SEGMENT

Ident.: DSC-22_30-70-50-00010559.0002001 / 14 MAY 12
Applicable to: ALL

The top of descent (T/D) may be updated if the flight crew modifies the cabin rate of descent (default rate is -350 ft/min).
If the flight crew enters a lower cabin rate, the system computes a repressurization segment that takes into account the additional time needed for repressurization.

DESCENT SPEED PROFILE

Ident.: DSC-22_30-70-50-00012563.0002001 / 14 MAY 12
Applicable to: ALL

The descent speed profile is usually the ECON SPD profile, amended by any speed constraints and speed limit contained in the flight plan.
Before the descent phase is active, if flight crew does not intend to fly the ECON speed/Mach profile, a different speed or Mach can be entered to amend the speed profile.
It is obtained by entering a Mach number and/or a speed in the MANAGED field of the PERF DES MCDU page (3L key).

If the flight crew reverts to the SELECTED speed/MACH mode during descent, the profile is not modified and the aircraft flies the same profile at the FCU selected speed/MACH value.

Basic managed SPD /MACH profile in DES mode is:
- ECON MACH, or SELECTED Mach
- ECON SPD, or SELECTED Speed
- SPD CSTR (if any)
- SPD LIMIT
- Green Dot/S /F /VAPP
- VAPP TARGET.

GUIDANCE IN DES MODE

Applicable to: ALL

Ident.: DSC-22_30-70-50-A-00010575.0001001 / 17 AUG 10

DESCENT INITIATION

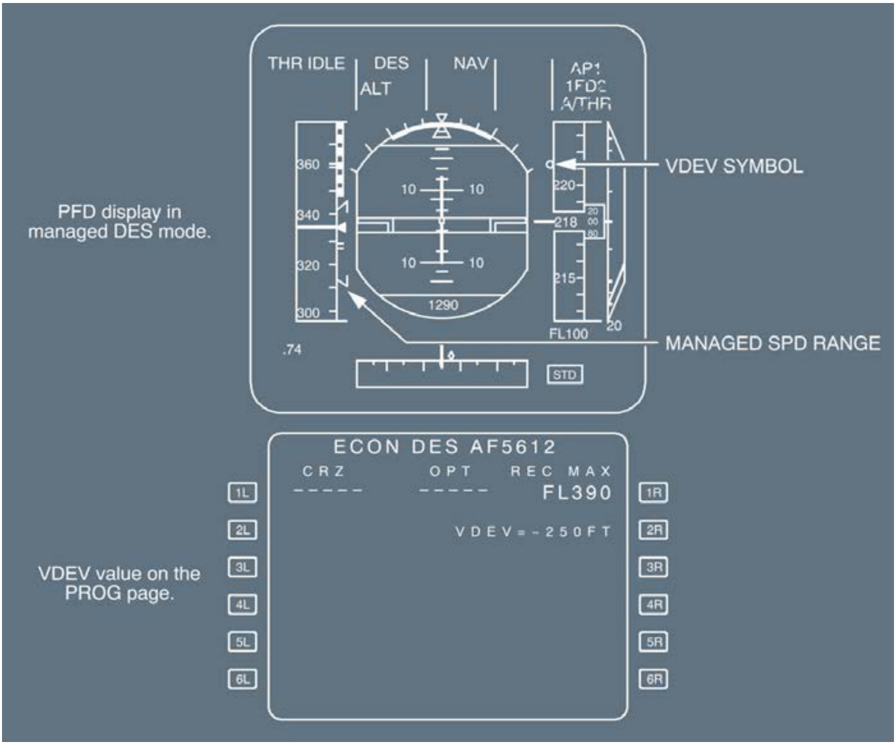
The aircraft will not start its descent automatically when reaching the top of descent (T/D). In order to initiate the descent, the flight crew sets the clearance altitude by turning the ALT knob then pushes the ALT knob.

The aircraft will descend immediately:
- If the top of descent is not reached, the aircraft descends at a constant V/S converging on the descent path
- If the aircraft is at or beyond the T/D, it descends at idle thrust.

DURING THE DESCENT

The flight crew will see a vertical deviation symbol (VDEV) along the ALT scale on the PFD and a VDEV value on the PROG page, so that the aircraft's vertical position can be monitored versus the calculated descent profile.

The aircraft may deviate from the DES profile while DES mode is engaged if:
- Unexpected wind conditions are encountered
- Anti-icing is turned on
- The lateral flight plan is changed.



When the speed is managed, a target speed range displayed on the PFD defines acceptable speed variations around the nominal descent speed target.

Ident.: DSC-22_30-70-50-A-00010565.0001001 / 19 DEC 12

FMA DISPLAY

When DES mode is engaged, the system arms ALT and displays the applicable target altitude on the PFD altitude scale.

- If the next predicted level-off is an altitude constraint, ALT is magenta on the FMA second line and the PFD displays the altitude constraint magenta above the altitude scale.
  When the aircraft flies at the altitude constraint (ALT CSTR), the system arms DES blue.
  When the aircraft meets the constraint, DES engages again automatically.
- If the next predicted level-off is the FCU altitude, ALT is blue on the FMA and the PFD displays the FCU selected altitude in blue.

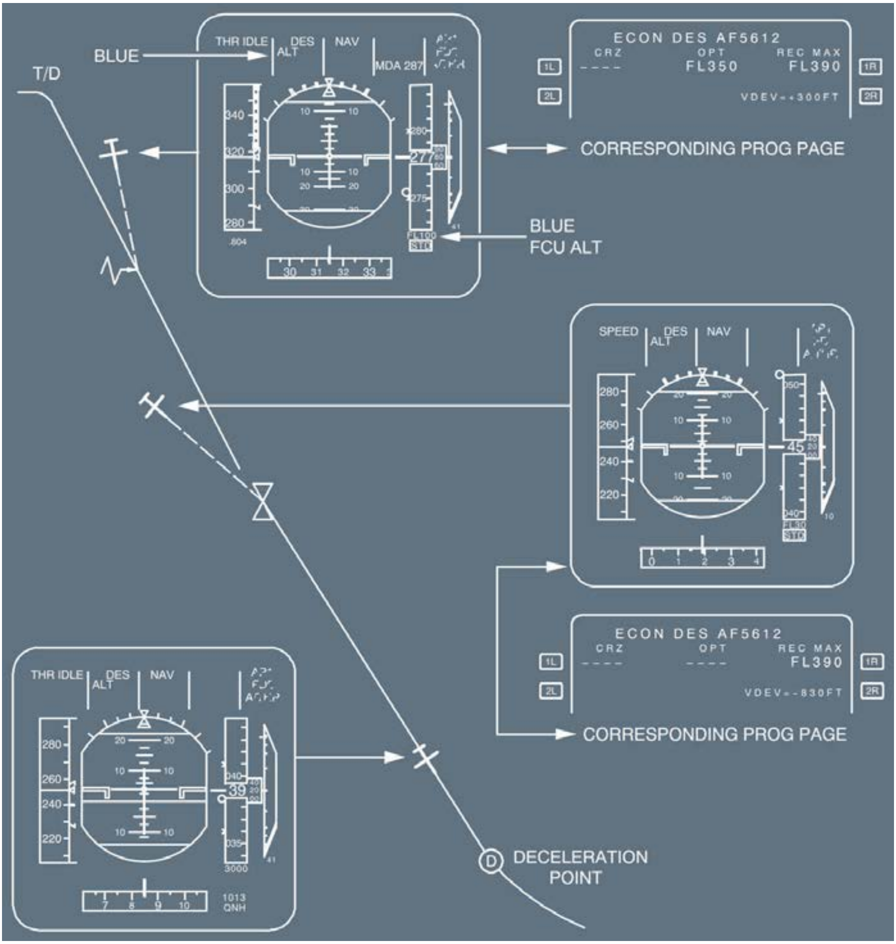
Typical FMA in DES

DES MODE PROFILE

Applicable to: ALL

Ident.: DSC-22_30-70-50-B-00010567.0002001 / 01 OCT 12

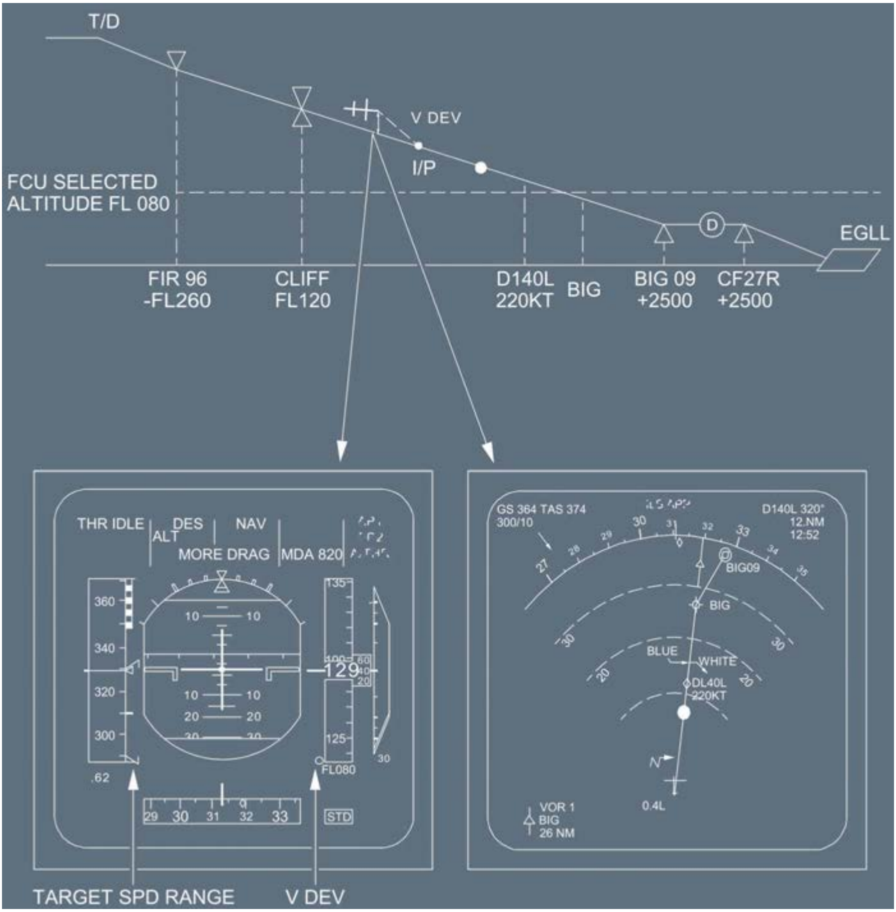
GENERAL



Ident.: DSC-22_30-70-50-B-00010568.0002001 / 17 AUG 10

INTERCEPT POINT

Associated with the VDEV displayed on PFD , the ND shows an intercept point ( ) on the flight plan. It indicates the position where the system predicts that the aircraft will intercept the descent profile.



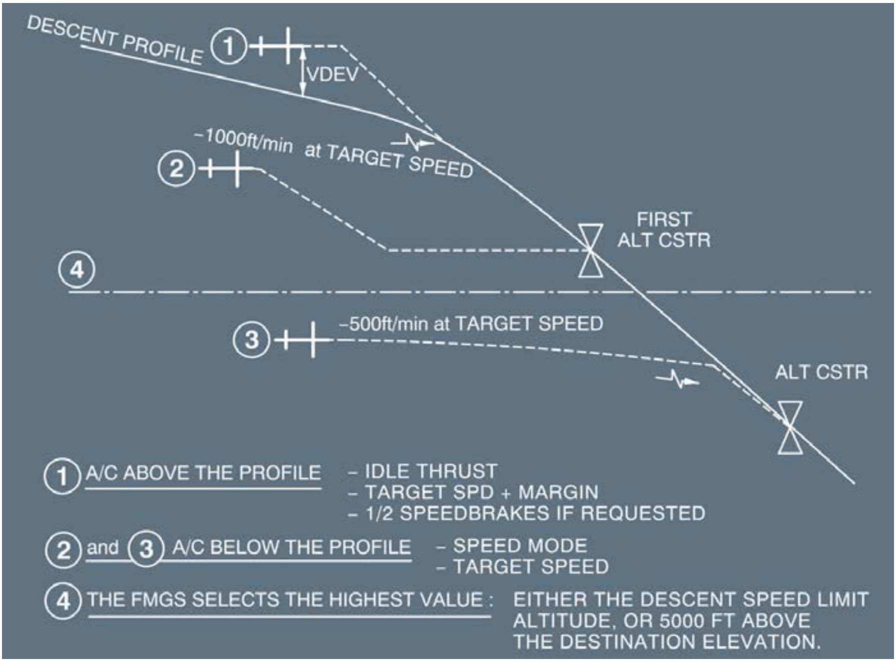
AIRCRAFT ABOVE THE DESCENT PROFILE

If the aircraft is above the descent profile, the speed will increase toward the upper limit of the managed speed range. If the speed reaches the upper limit, the aircraft will maintain the speed but will deviate from the profile (autothrust at idle).

The navigation display presents a pseudo waypoint (intercept point) along the flight plan that assumes the aircraft will return to the profile using:
- Idle thrust
- 1/2 speedbrake extension
- ECON speed plus a margin (until intercepting the profile).

If necessary, the message “AIRBRAKES” (old FMGC standard) or “MORE DRAG” comes up on the PFD and the MCDU, and remains there as long as more drag (speedbrakes) is still required.
The flight crew should respond to this message by deploying half speedbrakes.
Whenever the intercept point is predicted to be close to a constrained waypoint, the PFD and MCDU display an “AIRBRAKES” or “MORE DRAG” message depending upon the FMGS standard.

Note: *With DES mode engaged, the speedbrakes extension will not necessarily increase the descent rate. It increases only if the aircraft is above path.*



Ident.: DSC-22_30-70-50-B-00010570.0002001 / 17 AUG 10

AIRCRAFT BELOW THE DESCENT PROFILE

If the aircraft is below the descent profile, its speed will be maintained at target speed until it reaches the descent profile. The lower margin becomes effective when the aircraft is on the descent profile but has to loose speed in order to stay on it.
The intercept point on the navigation display is based on the following assumptions:

- **If the aircraft is flying at an altitude that is higher than both the descent speed limit altitude and the destination elevation +5 000 ft:**
  The FMGS maintains the V/S at -1 000 ft/min and the target speed, until the aircraft reaches the altitude constraint, or intercepts the descent profile.
- **If the aircraft is flying at an altitude that is lower than either the descent speed limit altitude, or the destination elevation +5 000 ft:**
  The FMGS maintains the V/S at -500 ft/min and the target speed, until the aircraft reaches the altitude constraint or intercepts the descent profile.

Ident.: DSC-22_30-70-50-B-00010572.0001001 / 17 AUG 10

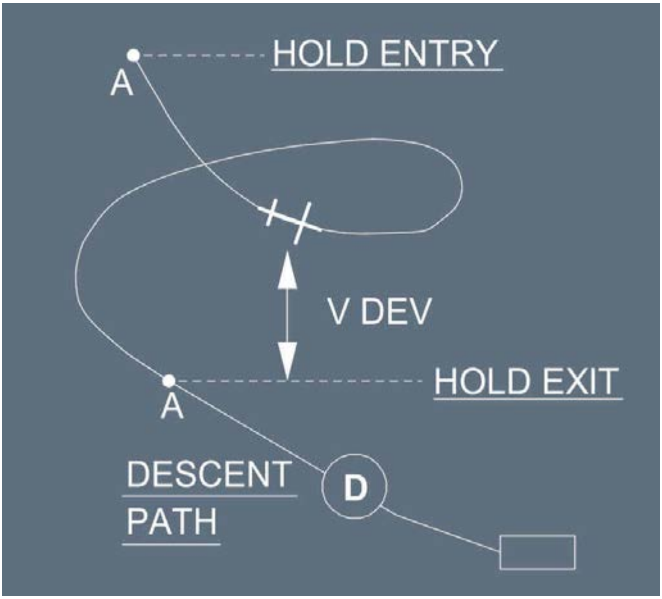
LEVELING OFF AT A CONSTRAINT

If the aircraft levels off at an ALT CSTR , the DES mode arms and remains armed until the aircraft passes the constraint, then reengages (if the FCU altitude is set below the altitude of the constraint).
If the FCU selected altitude is that of a constraint, the flight crew may continue the descent below that altitude by turning the ALT knob and pushing it in. This arms the DES mode, which reengages when the aircraft passes the constraint waypoint.

Ident.: DSC-22_30-70-50-B-00010573.0002001 / 17 AUG 10

GUIDANCE IN A HOLD

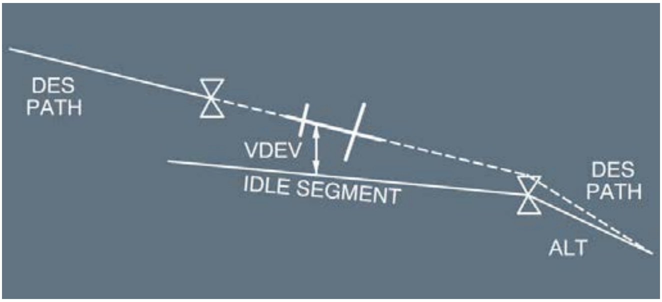
Just before the aircraft enters a holding pattern, the speed target becomes the holding speed.
In the holding pattern, the DES mode commands V/S = -1 000 ft/min while A/THR maintains the holding speed. The aircraft will level off at the next altitude constraint if it is reached during the hold.
The current vertical deviation VDEV is based on the altitude at which the aircraft is supposed to cross the exit fix in order to be properly positioned on the descent profile.
Until the flight crew exits the hold, the FMGS in DES mode will maintain V/S = -1 000 ft/min considering downpath vertical constraint. This means that the aircraft will not descent below the next altitude constraint, neither the FCU selected altitude. If the aircraft reaches the next altitude constraint it will level off and ALT CST mode will engage.



Ident.: DSC-22_30-70-50-B-00010574.0001001 / 01 OCT 12

TOO STEEP PATH

A descent segment is called “too steep path” when FM predicts that the descent segment between two constraint waypoints is impossible to fly at the planned descent speed with half speedbrakes extended.



When this occurs, the MCDU displays no predictions between the upper and the lower points of the too steep path. Relevant message “TOO STEEP PATH” is displayed on MCDU.

When the aircraft reaches the beginning of the too steep path segment, the FM recomputes the VDEV using an idle segment from the end of the too steep path segment.

GENERAL

Ident.: DSC-22_30-70-60-00010576.0001001 / 17 AUG 10
Applicable to: ALL

The OPEN DES mode is a selected mode. It maintains a SPD /MACH (selected or managed) with the AP /FD pitch mode while autothrust (if active) maintains IDLE thrust.
It is not to be used for final approach.

ENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-60-00010577.0002001 / 17 AUG 10
Applicable to: ALL

The OPEN DES mode can be engaged only if the following conditions are met:
- The aircraft has been in flight for more than 5 s
- LAND mode is not engaged
- The FCU selected altitude is lower than present altitude.

The OPEN DES mode is engaged by one of the following:
- Pulling out the ALT knob
- Selecting a manual speed when EXP mode ◁ is engaged.

<u>Note:</u> *When OP DES is engaged:*
- *The FMA displays "OP DES"*
- *The managed LVL/CH dot on the FCU goes out*
- *The system arms the ALT mode.*

DISENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-60-00010578.0003001 / 17 AUG 10
Applicable to: ALL

The OPEN DES mode is disengaged by one of the following conditions:
- Manual engagement of another vertical mode
- Selection of an altitude higher than present altitude. V/S (FPA) engages on current V/S (FPA). The vertical mode is boxed white. If within 5 s after the reversion to V/S , the flight crew does not confirm the altitude target change by another expected action, a triple click aural warning sounds, and the V/S (FPA) is boxed white and flashes for 10 s.

GUIDANCE

Ident.: DSC-22_30-70-60-00010579.0002001 / 16 MAR 11
Applicable to: ALL

When OPEN DES is engaged, pitch control maintains the target speed/Mach number, and autothrust maintains idle thrust (or the flight crew maintains it manually). The speed target may be either selected or managed.

The OPEN DES mode disregards all altitude constraints.

Typical FMA in OPEN DES

GENERAL

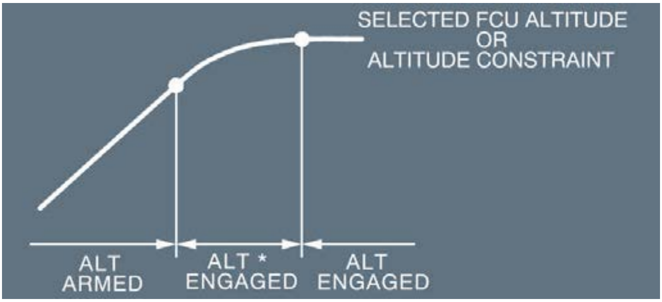
Ident.: DSC-22_30-70-65-00010580.0002001 / 07 APR 17
Applicable to: ALL

ALT * mode guides the aircraft to acquire the FCU selected altitude.
ALT CST* guides the aircraft to acquire an altitude constraint provided by Flight Management. Once the aircraft has reached the altitude, the altitude mode (ALT or ALT CST) engages.

ENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-65-00010581.0002001 / 23 JUN 15
Applicable to: ALL

The mode engages when the aircraft reaches the altitude capture zone, defined by the aircraft vertical speed (among other parameters).



<u>Note:</u> *ALT * and ALT CST* cannot be engaged below 400 ft, if either the takeoff or the go-around mode is engaged.*

DISENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-65-00010582.0008001 / 19 DEC 12
Applicable to: ALL

The mode is disengaged by one of the following conditions:
- Engagement of V/S mode on current vertical speed by turning the FCU ALT knob by more than 250 ft.

  If within 5 s after reversion to V/S (FPA) the flight crew does not confirm the altitude target change by:
  - Pulling the ALT knob, or
  - Setting a new V/S (FPA) target, or
  - Pushing the V/S or FPA knob on the FCU,

  then, a triple click aural warning sounds, and the V/S (FPA) is boxed white for additional 10 s.
- Engagement of another vertical mode provided the FCU altitude has been changed by more than 250 ft.

Typical FMA in ALT *

GUIDANCE

Ident.: DSC-22_30-70-65-00010583.0006001 / 07 APR 17
Applicable to: ALL

The ALT * and ALT CST* mode have internal V/S guidance that is a direct function of the difference between present altitude and the altitude target.
The system switches automatically to ALT (altitude hold) when the altitude deviation becomes less than 20 ft.
ALT * and ALT CST* modes have internal protections that decreases the vertical speed when VLS or VMAX is reached (VLS or VMAX becomes the priority target).

Note:
- *If the baro setting is changed during ALT * mode, this may lead to an FCU target overshoot due to the change of the current value of the altitude. However ALT * mode will allow the FCU altitude to be regained.*
- *For aircraft equipped with QFE option, a switching from STD to QFE (or vice versa) in ALT CST* mode, will change the target value and a reversion to V/S may occur if the target value is modified of 250 ft or more.*

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GENERAL

Ident.: DSC-22_30-70-70-00010584.0001001 / 17 AUG 10
Applicable to: ALL

The ALT mode maintains a target altitude. This target altitude is either the FCU selected altitude or an altitude constraint delivered by Flight Management.

ARMING CONDITIONS

Ident.: DSC-22_30-70-70-00010585.0001001 / 17 AUG 10
Applicable to: ALL

The ALT mode arms automatically whenever the aircraft climbs or descends toward the target altitude.

Note: *The ALT mode arms only if the difference between the current altitude and the FCU selected altitude is at least 250 ft.*

When ALT is armed, the FMA displays the ALT message on its second line:
- Blue when the target altitude is the FCU selected altitude
- Magenta if the target altitude is an altitude constraint.

ENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-70-00010586.0002001 / 17 AUG 10
Applicable to: ALL

The ALT mode is engaged automatically when the difference between present altitude and the target altitude becomes less than 20 ft with ALT* engaged.

Note: *The ALT mode is displayed on the FMA when the V/S knob is pushed in or is pulled out with V/S -FPA target set to zero but V/S mode is still active. In other words, if V/S knob is dialled up or down, the aircraft will climb or descend without any pulling action.*

DISENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-70-00010587.0001001 / 17 AUG 10
Applicable to: ALL

The ALT mode disengages when any other vertical mode engages.

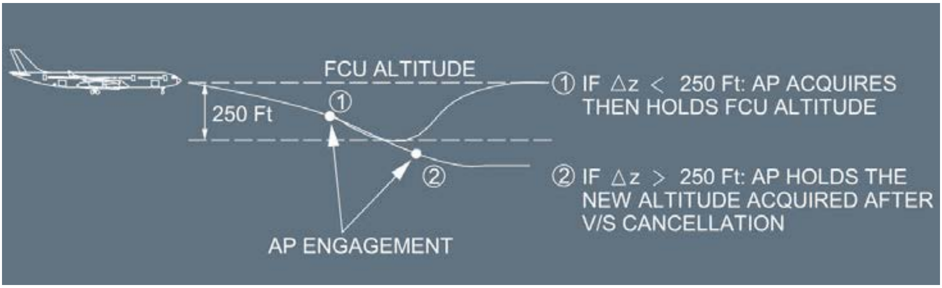
GUIDANCE

Ident.: DSC-22_30-70-70-00010588.0002001 / 23 JUN 15
Applicable to: ALL

- The altitude that ALT mode holds is the altitude it memorized when engaged. It is not affected by a change of reference in the ALT window or by a change in the barometric correction.
- When ALT is engaged, the FMA displays ALT in green (FCU altitude hold) or ALT CST in green if it is an altitude constraint.

Typical FMA in ALT MODE

- If the AP is engaged while FD is already engaged in ALT mode at the FCU selected altitude, the autopilot:
  - Acquires and holds the FCU altitude if present altitude is within 250 ft of it, or
  - Commands a level-off if present altitude is more than 250 ft from the FCU altitude.



SOFT ALTITUDE MODE (CRUISE)

Ident.: DSC-22_30-70-70-00010589.0002001 / 19 DEC 12
Applicable to: ALL

The soft altitude mode engages when the aircraft reaches the FCU altitude set as the cruise flight level (entered in the F-PLN or on PROG page).
The soft altitude mode corrects minor deviations from the Mach target by allowing a ±50 ft variation from the CRZ FL. This feature improves fuel efficiency and passenger comfort and minimizes the changes in thrust.

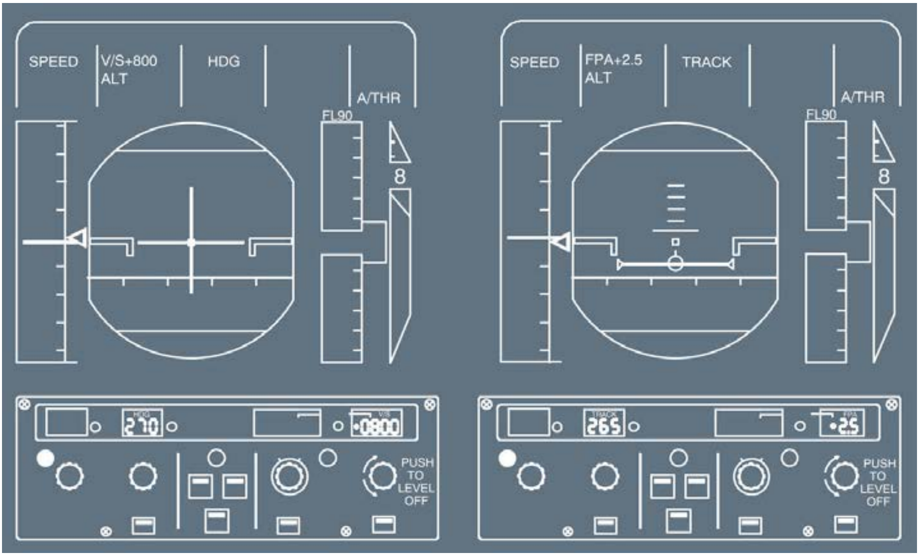
FMA in SOFT ALT HOLD MODE

Intentionally left blank

GENERAL

Ident.: DSC-22_30-70-80-00010611.0004001 / 19 DEC 12
Applicable to: ALL

The V/S - FPA mode is a selected mode. It acquires and holds the vertical speed or the flight path angle displayed in the V/S - FPA window of the FCU.
The HDG V/S -TRK FPA pb on the FCU allows the flight crew to select either type of reference to be used for guidance and for display on the PFD.



ENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-80-00010612.0003001 / 17 AUG 10
Applicable to: ALL

The flight crew can engage the mode manually as follows:
- Pull out the V/S or FPA knob (at least 5 s after lift-off) or push it in for an immediate level off (V/S=0)
- Engage the AP and/or FD if AP and FD are not engaged (basic mode of AP /FD engagement)
- Select a different altitude (more than 250 ft from present altitude) when in ALT* mode
- Select a higher altitude than present altitude when in DES , OP DES modes or EXP DES ⧎ mode
- Select a lower altitude than present altitude when in CLB , OP CLB modes or EXP CLB ⧎ mode.

The mode engages automatically:
- 5 s after lift-off, if no other vertical mode is engaged
- Upon loss of G/S * or G/S mode
- Upon loss of FINAL mode
- Upon loss of LOC * or LOC mode
- Upon loss of NAV mode when DES mode is engaged
- Upon loss of vertical flight path in DES mode.

DISENGAGEMENT CONDITIONS

Ident.: DSC-22_30-70-80-00010592.0002001 / 17 AUG 10
Applicable to: ALL

The flight crew can disengage the V/S mode manually by:
- Pulling or pushing the Altitude knob, or
- Pushing the EXPED pb, or
- Initiating a go-around.

It disengages automatically:
- When the aircraft reaches the FCU altitude, or
- Upon G/S* engagement.

GUIDANCE

Ident.: DSC-22_30-70-80-00010593.0009001 / 04 JUL 17
Applicable to: ALL

The FMGC pitch mode guides the aircraft to the target V/S or FPA . The corresponding A/THR mode is SPEED or MACH. The FMA displays V/S (FPA).
The V/S (FPA) guidance has priority over the speed guidance. If the selected target V/S or FPA is too high (relative to the current thrust condition and speed), the FMGC will steer the aircraft to the target V/S or FPA, but the aircraft will also accelerate or decelerate.
When the speed reaches its authorized limit, V/S or FPA automatically decreases to maintain the minimum (or maximum) speed limit.

<u>Note:</u> *If the flight crew sets V/S = 0 or pushes the V/S or FPA knob to level off, it automatically sets V/S or FPA target to zero and the aircraft levels off and maintains its altitude.*

<u>Note:</u> *If AP is engaged while a V/S is selected with only FD ON, the V/S will synchronise on the current aircraft V/S.*

GENERAL

Ident.: DSC-22_30-75-00010633.0001001 / 17 MAR 17
Applicable to: ALL

Mode reversions are automatic mode changes that unexpectedly occur, but are designed to ensure coherent AP , FD and A/THR operations, in conjunction with flight crew input (or when entering a F-PLN discontinuity).
Due to the unexpected nature of their occurrence, the FMA should be closely monitored for mode reversions.

INTERACTION BETWEEN LATERAL MODES, VERTICAL MODES, AND MANAGED SPEED PROFILE

Ident.: DSC-22_30-75-00012054.0006001 / 17 MAR 17
Applicable to: ALL

- **When NAV mode is engaged:**

  The FMGS guides the aircraft along the flight plan and considers the constraints attached to the F-PLN waypoints. As a result:
  - Managed CLB and DES modes are available
  - The managed speed profile includes: V2 - SPD CSTR (if applicable) - SPD LIM - ECON CLB SPD /MACH - ECON CRZ MACH - ECON DES (MANAGED SPD) - SPD /MACH - SPD CSTR - SPD LIM - HOLD SPD - VAPP /GS MIN.

  It is valid for all vertical modes, except EXPEDITE ◁ .

- **When NAV mode is not engaged:**

  The FMGS considers that the flight plan is not followed, and ignores all speed and altitude constraints linked to the F-PLN waypoints. As a result:
  - The managed vertical CLB and DES modes are not available
  - The managed SPD profile disregards the speed constraints and includes: V2 - SPD LIM - ECON CLB - ECON CRZ - ECON DES (MANAGED SPD) - SPD LIM - VAPP /GS MIN target.

As a consequence, when NAV mode disengages (manual or automatic):
- CLB mode, when engaged, reverts to OPEN CLB. The lateral mode is boxed white for 10 s. The vertical mode is boxed white.

  If within 5 s, the disengagement of the NAV mode is not confirmed by one of the following flight crew actions:
  - FCU altitude change
  - Level-off
  - Selection of the V/S mode

  then, a triple click aural warning sounds. In addition, a white box flashes around the vertical mode for additional 10 s.
- DES mode, when engaged, reverts to V/S mode on current value.

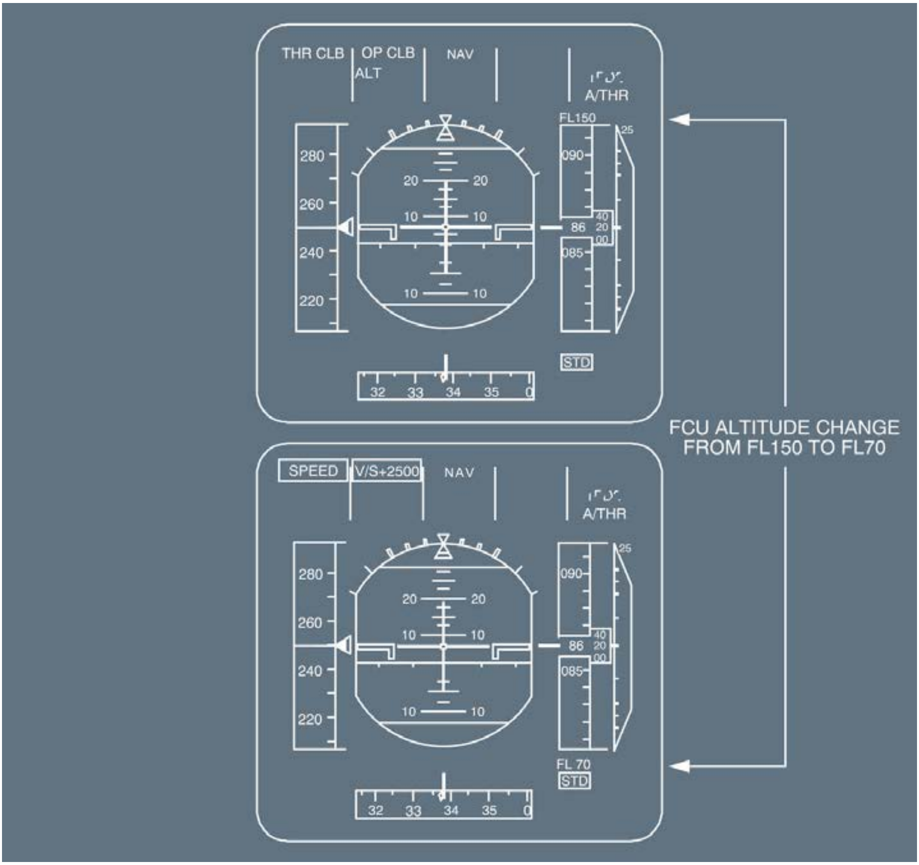
  If within 5 s, the disengagement of the NAV mode is not confirmed by one of the following flight crew actions:
  - FCU altitude change
  - Level-off
  - Selection of the V/S mode

  then, a triple click aural warning sounds. In addition, a white box flashes around the vertical mode for additional 10 s.
  This reversion to V/S (FPA) mode on the current V/S target does not modify the pitch behavior of the aircraft. It is the flight crew's responsibility to adapt pitch, if necessary.
- Speed and altitude constraints are disregarded (but speed limit is retained).

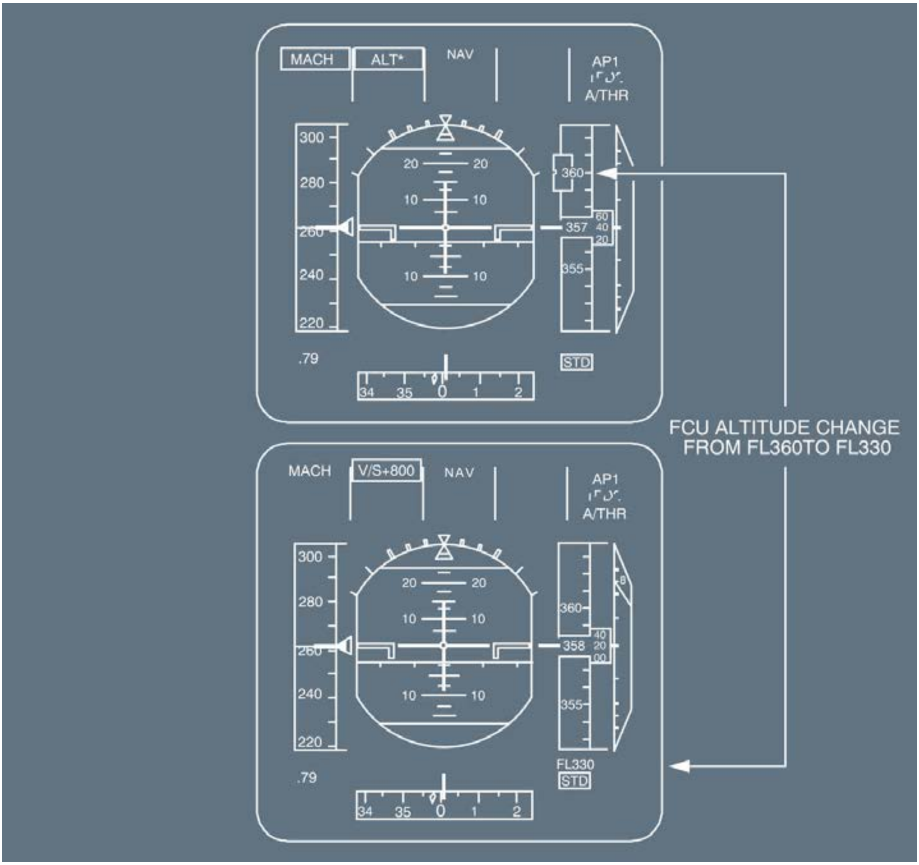
MODE REVERSION DUE TO FCU ALTITUDE CHANGE

Ident.: DSC-22_30-75-00012053.0006001 / 01 OCT 12
Applicable to: ALL

When an OPEN mode is engaged, the aircraft climbs or descends towards the altitude set on the FCU . If the flight crew sets the FCU altitude to a target not compatible with the active open mode, a mode reversion occurs and V/S (or FPA) engages on current V/S (or FPA).
This reversion applies to CLB , OP CLB , DES , OP DES, EXP DES ⊲ , EXP CLB ⊲ .
Example: Reversion from OP CLB to V/S:



With ALT * engaged, the target altitude is changed by any value greater than 250 ft, V/S (or FPA) engages on currents V/S (or FPA). *Refer to DSC-22_30-75 Mode Reversions (Summary)*.



If within 5 s after the reversion to V/S (FPA), the flight crew does not confirm the altitude target change by:
- Pulling the ALT knob, or
- Setting a new V/S (or FPA) target, or
- Pushing the V/S or FPA knob on the FCU,

then, a triple click sounds, and the V/S (FPA) is boxed white for additional 10 s.

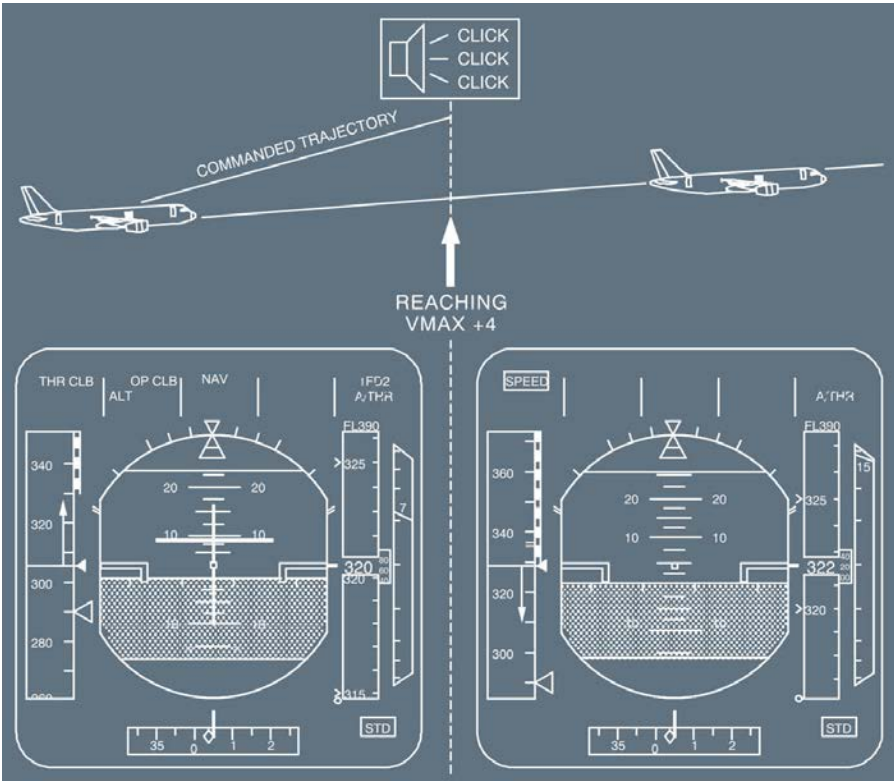
REVERSION WITH GLOBAL SPEED PROTECTION

Applicable to: ALL

Ident.: DSC-22_30-75-A-00012055.0010001 / 19 DEC 12

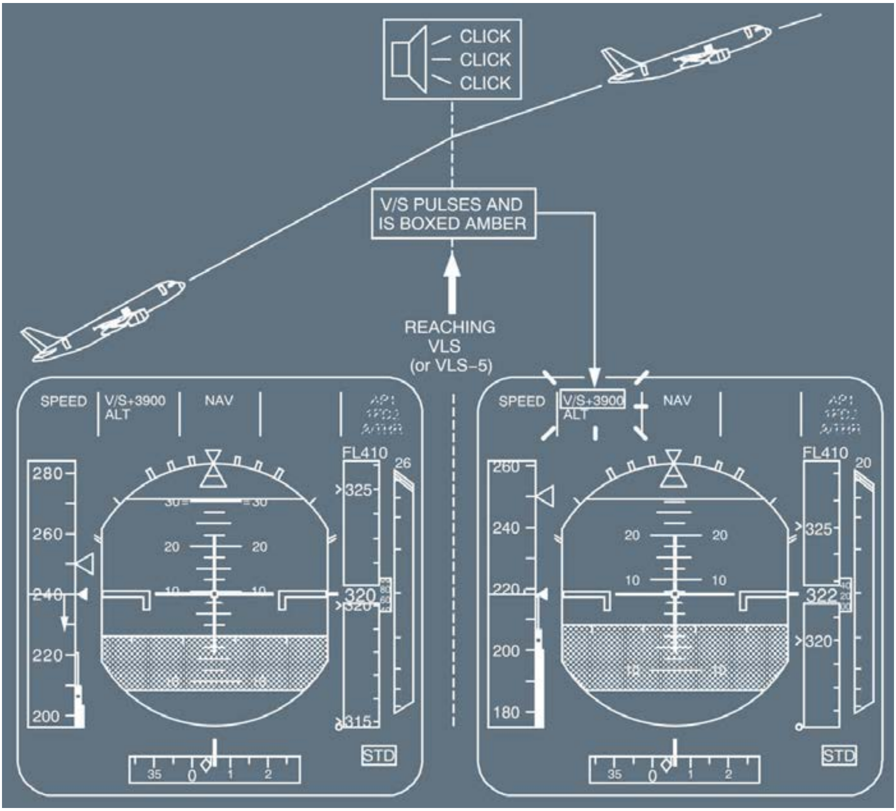
AUTOMATIC SPEED MODE PROTECTION IN CLIMB

FD s are engaged in an OPEN mode in climb with AP not engaged.
If FD s are engaged in CLIMB or OPEN CLIMB mode or EXP CLB and the flight crew does not follow the FD bars to maintain the commanded climb (pitch too low and autothrust in maximum climb thrust), the aircraft accelerates.
Both FD s disengage when VMAX +4 is reached (VMAX being VMO , VLE or VFE). If the A/THR is active, it reverts to SPEED mode and reduces the thrust to recover the speed target.
A triple click aural warning sounds.



AUTOMATIC SPEED PROTECTION IN V/S (OR FPA) MODE IN CLIMB

When climbing with V/S mode engaged: If the selected V/S value is excessive (with regards to thrust and speed), the FMGS maintains the V/S target, but the airspeed decreases. When reaching VLS (or VLS -5, if the speed target is VLS), the AP temporarily abandons the V/S target, and automatically decreases the vertical speed to maintain VLS . The same applies if FPA mode is used with an excessive FPA target.



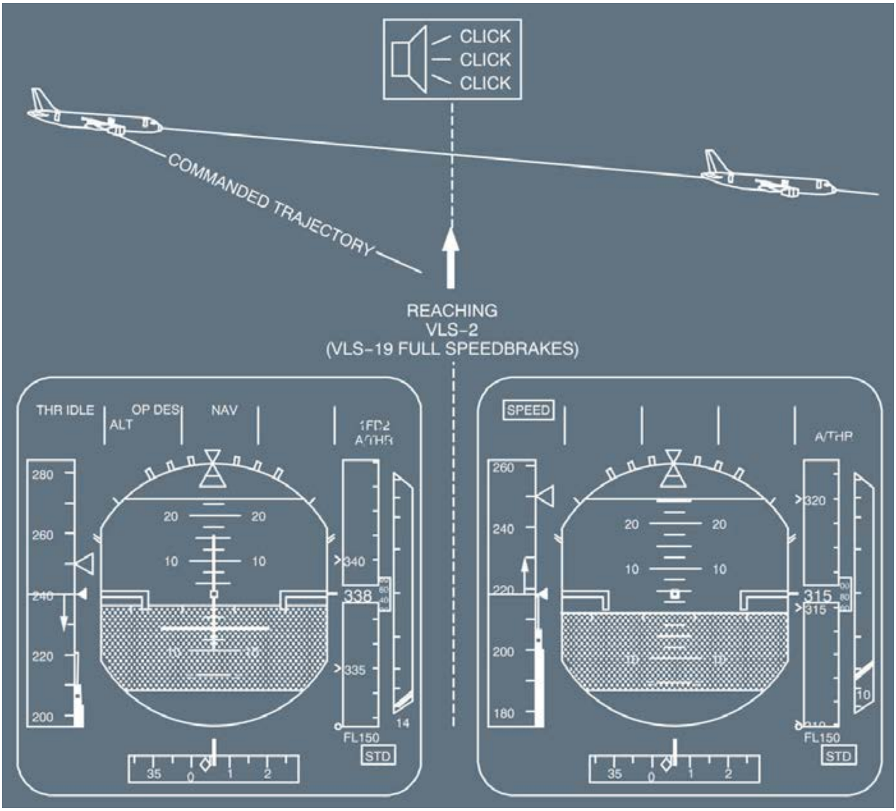
V/S mode remains engaged.
On the FMA , the V/S target is boxed with a flashing amber rectangle, and the V/S value pulses. Besides, an aural triple click is generated.

Note: *When flying with FD bars only (AP OFF), the FMGS adjusts the pitch bar so that VLS is maintained. However, no triple click is generated and the V/S target display on the FMA remains unchanged.*

Ident.: DSC-22_30-75-A-00012057.0010001 / 01 OCT 12

AUTOMATIC SPEED MODE PROTECTION IN DESCENT

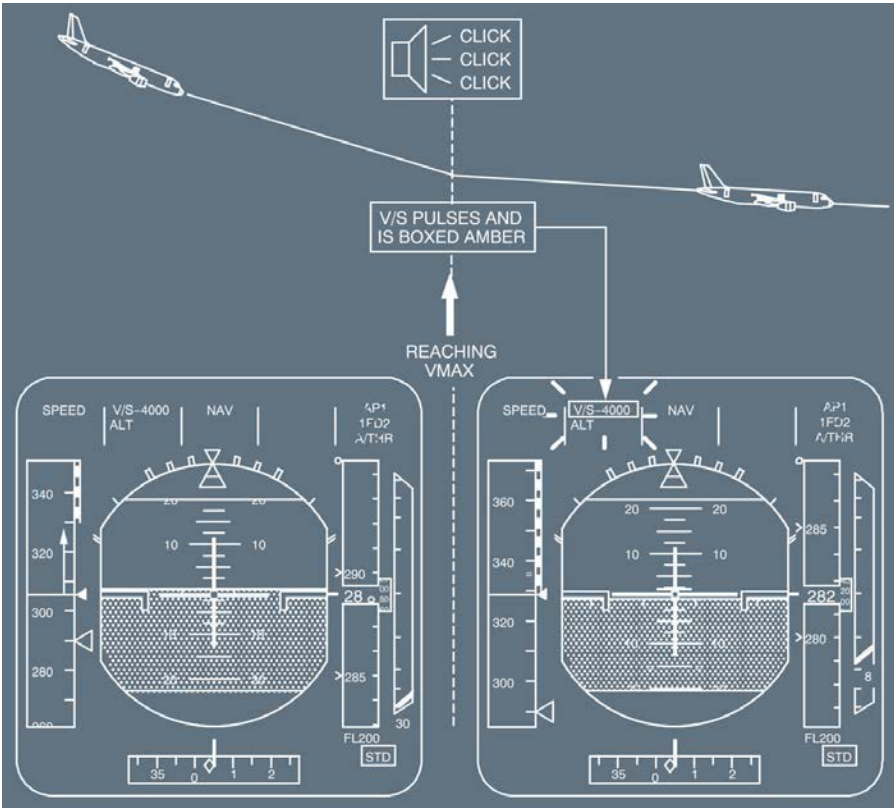
FD s are engaged in an OPEN mode in descent with the AP not engaged.
If the FD s are engaged in DES , or OP DES mode, or EXP DES ⊲ and, if the flight crew does not follow the FD bars to maintain the commanded pitch, the aircraft decelerates (insufficient descent rate and idle thrust).
If the airspeed reaches VLS -2, both FD s disengage. (If speedbrakes are extended, the FD s disengage between VLS -2 and VLS-19, depending on the position of the speedbrakes).
The A/THR , if active, reverts to SPEED mode upon FDs disengagement, and increases thrust to recover the speed target.
A triple-click aural warning sounds.



Ident.: DSC-22_30-75-A-00012058.0010001 / 01 OCT 12

AUTOMATIC SPEED PROTECTION IN V/S (OR FPA) MODE IN DESCENT

When descending with V/S mode engaged: If the selected V/S value is excessive (with regards to thrust and speed), the FMGS maintains the V/S target, but the airspeed increases. When reaching VMAX (VMO or VLE in clean, or VFE +4 kt), the AP temporarily abandons the V/S target, and automatically decreases the vertical speed to maintain VMAX.
The same applies if FPA mode is used with an excessive FPA target.



V/S mode remains engaged.
On the FMA , the V/S target is boxed with a flashing amber rectangle, and the V/S values pulses.
Besides, an aural triple click is generated.

<u>Note:</u> *When flying with FD bars only (AP OFF), the FMGS adjusts the pitch bar so that VMAX is maintained. However, no triple click is generated and the V/S target display on the FMA remains unchanged.*

MODE REVERSIONS (SUMMARY)

Ident.: DSC-22_30-75-00012052.0008001 / 23 JUN 15
Applicable to: ALL

There are only 2 types of vertical mode reversions on aircraft equipped with global speed protection.

REVERSION DUE TO A CHANGE OF THE FCU SELECTED ALTITUDE

Vertical Mode Engaged	FCU Altitude Selection Change	Vertical Mode Switches to
CLB - OP CLB EXP CLB	Below aircraft altitude	V/S on current V/S
DES - OP DES EXP DES	Above aircraft altitude	V/S on current V/S
ALT* ACTIVE	Any change	V/S on current V/S

REVERSION DUE TO THE LOSS OF NAV MODE (MANUAL OR AUTOMATIC)

CONDITIONS	EVENT	CONSEQUENCE
CLB engaged	Loss of NAV mode	OP CLB engages
DES engaged	Loss of NAV mode	V/S engages

SPEED PROTECTION WHEN FD ORDERS ARE NOT FOLLOWED BY THE FLIGHT CREW (AP NOT ENGAGED)

CONDITIONS	EVENT	CONSEQUENCE
- FD engaged only (no AP), and - OP DES or EXP DES or DES engaged - A/THR active (IDLE thrust)	IAS = VLS-2 (if speedbrakes are extended between VLS -2 and VLS-19)	FD bars disappear. If A/THR active, automatic engagement of SPEED mode on the A/THR. Thrust increases to recover the speed target.
- FD engaged only (no AP), and - OP CLB or EXP CLB or CLB engaged - A/THR active (CLIMB thrust)	IAS = VMAX+4 VMAX = VFE or VLE or VMO /MMO	FD bars disappear. If A/THR active, automatic engagement of SPEED mode on the A/THR. Thrust decreases to recover the speed target.

SPEED PROTECTION DUE TO EXCESSIVE V/S

CONDITIONS	EVENT	CONSEQUENCE
Excessive V/S or FPA selected in climb	IAS = VLS (or VLS -5, if target = VLS)	The selected V/S (or FPA) target is temporarily abandoned to maintain VLS in climb or VMAX in descent.
- Excessive V/S or FPA selected in descent, and - Clean configuration	IAS = VMAX	
- Excessive V/S or FPA < 0 selected in descent, and - Configuration other than clean	IAS = VMAX	

ENHANCED MODE REVERSION ALERTNESS

The following sequences, or mode reversions, are highlighted by a triple click:
- V/S selection in ALT*
- SPD selection in SRS
- CLB (or EXP CLB) to OP CLB, upon lateral flight crew action while climbing toward a constraint
- ALT * to V/S , upon ALT target change
- FD disengagement in OPEN modes
- Alerting FMA display when V/S -(FPA) target is not held
- CLB to OP CLB reversion, upon profile loss
- Automatic FD re-engagement in basic mode
- DES to V/S upon flight plan loss
- FINAL DES to V/S , upon NAV loss
- Reversion to AP /FD basic modes due to the selection of a new approach, while approach mode is already armed or engaged
- NAV to HDG , upon NAV loss.

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GENERAL

Ident.: DSC-22_30-80-10-00011875.0001001 / 17 AUG 10
Applicable to: ALL

These modes are called “common” because they are related to both the lateral and the vertical axes.

The AP /FD common modes are:
- On takeoff: Runway/Runway track associated to SRS vertical modes
- In approach: ILS approach (LAND) or non-ILS approach (APP NAV FINAL)
- In go around: Go around track associated to SRS vertical modes.

These modes are engaged simultaneously on both axes.

<table>
<tr><th colspan="2">COMMON MODES</th><th>VERTICAL</th><th>LATERAL</th></tr>
<tr><td colspan="2">TAKEOFF</td><td>SRS</td><td>RWY
RWY TRK</td></tr>
<tr><td rowspan="3">APPROACH
MODES</td><td rowspan="2">ILS
APPROACH</td><td>G/S*
G/S</td><td>LOC*
LOC</td></tr>
<tr><td colspan="2">LAND, FLARE,
ROLL OUT</td></tr>
<tr><td>NON-ILS
APPROACH</td><td>FINAL</td><td>APP NAV</td></tr>
<tr><td colspan="2">GO AROUND
(GA)</td><td>SRS</td><td>GA TRK</td></tr>
</table>

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GENERAL

Ident.: DSC-22_30-80-20-00012253.0001001 / 17 AUG 10
Applicable to: ALL

Takeoff mode combines the SRS (Speed Reference System) vertical mode with the RWY lateral mode. Both are simultaneously engaged, but may be disengaged separately.

Takeoff mode is available:
- During the takeoff run and initial climb for FD bars guidance
- 5 s after lift-off for AP use.

SRS (SPEED REFERENCE SYSTEM)

Applicable to: ALL

Ident.: DSC-22_30-80-20-A-00012260.0001001 / 17 AUG 10

GENERAL

The SRS mode controls pitch to steer the aircraft along a path in the vertical plan at a speed defined by the SRS guidance law.

Ident.: DSC-22_30-80-20-A-00012256.0001001 / 23 JUN 15

ENGAGEMENT CONDITIONS

The SRS mode engages automatically when the thrust levers are set to the TOGA or FLX/MCT detent, providing:
- V2 has been inserted in the MCDU PERF TAKEOFF page
- The slats are extended
- The aircraft has been on ground for at least 30 s.

Ident.: DSC-22_30-80-20-A-00012258.0002001 / 23 JUN 15

DISENGAGEMENT CONDITIONS

The SRS mode disengages:
- Automatically, at the acceleration altitude (ACC ALT), or if ALT * or ALT CST* mode engages (above 400 ft RA)
- If the flight crew engages another vertical mode
- If the flight crew selects a speed while in SRS mode: SRS reverts to OP CLB mode, and a triple-click aural warning is heard.

Note: *In Engine Out conditions, the SRS mode does not automatically disengage at EO ACC ALT. Refer to DSC-22_20-60-40 General.*

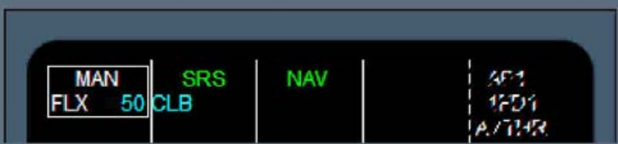
Ident.: DSC-22_30-80-20-A-00012259.0011001 / 16 MAR 11

GUIDANCE

In SRS mode, the aircraft maintains a speed target equal to V2 +10 kt in normal engine configuration. When the FMGS detects an engine failure, the speed target becomes the highest of V2 or current speed, limited by V2+15 kt.

The SRS guidance law also includes:
- Attitude protection to reduce aircraft nose-up effect during takeoff (18 ° or 22.5 ° maximum in case of windshear)
- Flight path angle protection that ensures a minimum vertical speed of 120 ft/min
- A speed protection limiting the target speed to V2+15 kt.

<u>Note:</u> *If during takeoff the flight crew inadvertently sets an altitude on the FCU below the current altitude, the aircraft will remain in SRS mode until the flight crew takes some other action.*



Typical FMA at takeoff with a Flex temperature

RUNWAY (RWY)

Applicable to: ALL

Ident.: DSC-22_30-80-20-B-00012255.0001001 / 17 AUG 10

GENERAL

The RUNWAY mode has two submodes:
- RWY mode, which gives lateral guidance orders during takeoff roll and initial climb out (up to 30 ft RA) if a LOC signal is available
- RWY TRK mode, which gives lateral guidance on the track the aircraft was flying at mode engagement (at 30 ft RA).

Ident.: DSC-22_30-80-20-B-00012323.0001001 / 17 AUG 10

ENGAGEMENT CONDITIONS

The RWY engagement conditions are:
- The conditions required for SRS mode engagement:
  - V2 is inserted in the MCDU PERF TAKEOFF page
  - Slats are extended
  - The aircraft has been on ground for at least 30 s.
- The aircraft is receiving a LOC signal and LOC deviation is less than 1/2 dot
- The aircraft heading is within 20 ° of the ILS related course
- The ILS course is identical to the runway heading of the origin airport as selected for the active flight plan, if any.

The RWY TRK mode engages automatically at 30 ft (RA) if NAV mode does not engage (NAV not armed prior to takeoff).

Ident.: DSC-22_30-80-20-B-00012324.0001001 / 17 AUG 10

DISENGAGEMENT CONDITIONS

RWY mode disengages if:
- The LOC signal is lost below 30 ft RA or the aircraft heading and the runway heading differ by more than 20 °.
- Another lateral mode is engaged.

Note: *If the takeoff runway has no ILS , RWY mode is not available and the PFD does not display the yaw bar nor "RWY " on FMA.*

Ident.: DSC-22_30-80-20-B-00012325.0002001 / 16 MAR 11

GUIDANCE

The RWY mode uses the LOC signal to guide the aircraft on the runway centerline while the aircraft is on the ground. The PFD displays the FD yaw bar and the FMA displays "RWY".
The RWY TRK mode guides the aircraft on the track the aircraft was flying at mode engagement. The FD displays the conventional guidance bar and the FMA displays “RWY TRK”.

Typical FMA with RWY mode engaged.

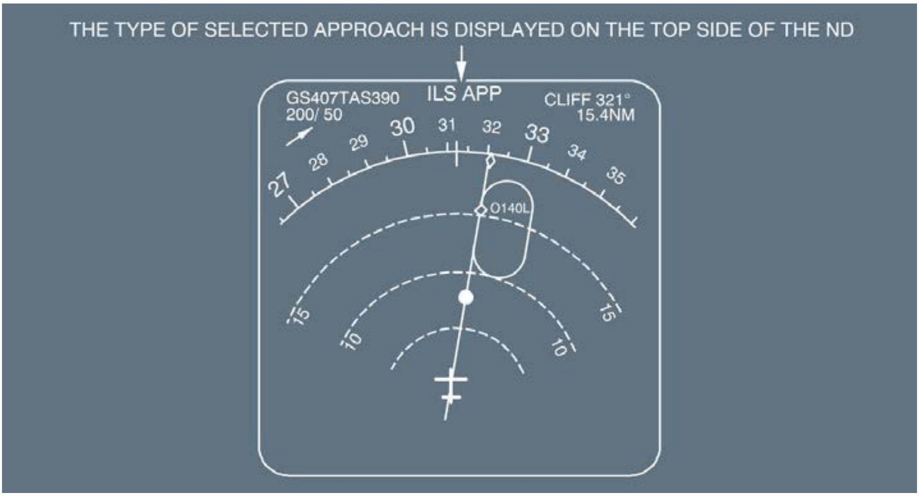
General

GENERAL

Ident.: DSC-22_30-80-30-05-00012378.0001001 / 01 OCT 12
Applicable to: ALL

The aircraft can fly different types of approaches:
- Precision approaches: ILS, MLS
- Non-precision approaches: VOR /DME , VOR , NDB (if ADF), RNAV
- Non-precision approaches using a Localizer only: LOC.

The flight crew uses an ARRIVAL lateral revision to insert these approaches into the flight plan:
- For precision approaches, the flight crew uses the APPR pb on the FCU to arm or engage the LOC and G/S guidance modes
- For non-precision approaches, the flight crew uses the APPR pb on the FCU to arm or engage the APP NAV and FINAL guidance modes, except for LOC approaches, where the flight crew only uses the LOC pb to arm or engage the LOC mode.



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Precision Approach

PRECISION APPROACH MODES

Applicable to: ALL

Ident.: DSC-22_30-80-30-10-A-00012379.0003001 / 01 OCT 12

GENERAL

The ILS approach mode includes the following modes:

VERTICAL MODE	LATERAL MODE
G/S* (capture) G/S (track)	LOC* (capture) LOC (track)
COMMON MODES: LAND - FLARE - ROLL OUT	

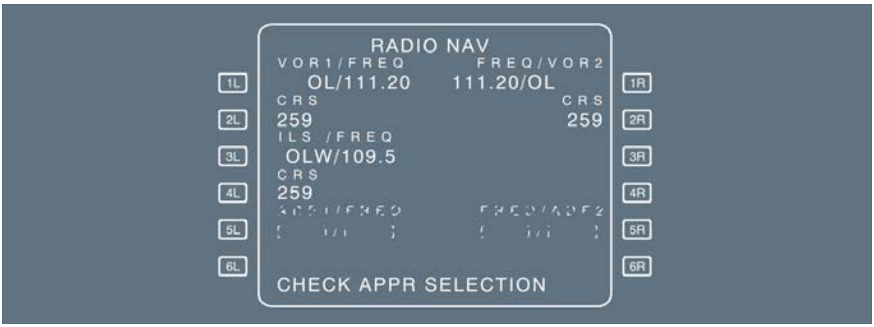
The sequencing of these modes is automatic once the flight crew has pushed the APPR pb and the conditions for engagement are met.

SELECTION

The ILS approach is selected when the APPR pb of the FCU is pressed and:
- An ILS approach or a runway only or no approach is inserted in the Flight Management flight plan (ARRIVAL page), and an ILS frequency is set in on the MCDU, or
- Both radio management panels are set to NAV and each one has the ILS frequency and course set in.

CHECK APPROACH SELECTION MESSAGE

If the flight crew inserts a non-ILS approach into the flight plan, and then uses the RAD NAV page to tune an ILS manually, the MCDU displays “CHECK APPR SELECTION”. This message is a reminder that the available APPR guidance modes are APP NAV and FINAL.



Ident.: DSC-22_30-80-30-10-A-00012380.0154001 / 02 MAY 17

APPR MODE

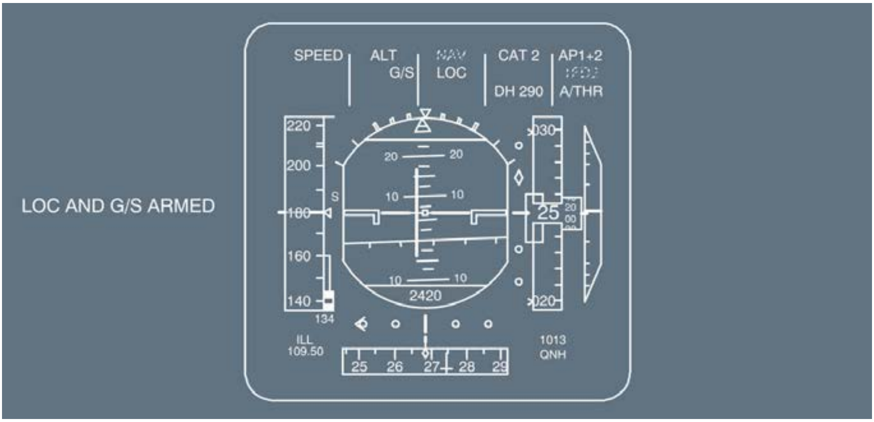
ARMING CONDITIONS OF LOC AND G/S MODES

The flight crew arms the ILS /GLS /MLS /APPR mode (LOC and G/S in blue on the FMA) by pushing the APPR pb on the FCU, provided that:
- An ILS /GLS /MLS approach is selected
- The aircraft is above 400 ft RA
- The ILS /GLS and RA are available
- Go-around or takeoff or final mode is not engaged
- ILS /GLS /MLS frequency/channel and course are identically set on both receivers.

LOC and G/S blue are displayed on the FMA. Both modes will automatically engage when conditions are met.
Second autopilot may be engaged.
Current landing capability is displayed on the FMA.

DISARMING CONDITIONS OF LOC AND G/S MODES

ILS /GLS /MLS APPR mode disarms if the aircraft is above 400 ft, and:
- When the flight crew presses the APPR pb, or when the flight crew selects another approach, both the LOC and the G/S modes disarm.
  The HDG /TRK mode engages if the LOC mode was engaged, and the V/S (FPA) mode engages if the G/S mode was engaged
- When the flight crew presses the LOC pb, only the G/S mode disarms.
  The V/S (FPA) mode engages, if the G/S mode was engaged
- When the flight crew pulls the HDG/TRK knob
- When the flight crew engages the go-around mode.



ENGAGEMENT CONDITIONS OF LOC AND G/S MODES

When ILS /GLS /MLS capture conditions are fulfilled:
- LOC* mode engages, and
- G/S * mode engages. No radio altimeter validity is required with this FMGC standard for G/S engagement. The FMA displays “LOC *”, or “G/S*”, or both, in green.

Nevertheless, the G/S* mode cannot engage, if:
- LOC* mode is not engaged, or
- The aircraft is above the glide path and its trajectory does not cross the ILS G/S beam.

When the aircraft is established on the LOC axis, the LOC mode engages.
When the aircraft is established on the G/S axis, the G/S mode engages.
The FMA displays “LOC ” and “G/S ” in green. The AP /FD guides the aircraft along the G/S down to 30 ft, and along the LOC during the flare and rollout.

Note: *G/S * or G/S modes may be engaged above the operating range of the radio altimeters (8 000 ft for TRT, and 5 000 ft for Collins and Honeywell radio altimeters). The landing capability displayed on the FMA will reflect the lack of RA validity (CAT 1) until the radio altimeters become active.*
But, if the radio altimeters fail, or if the FMGS receives no radio altimeter data, LOC , G/S , and AP /FD s will disengage and FDs will re-engage on basic modes.

DISENGAGEMENT CONDITIONS OF LOC AND G/S MODES

If the aircraft is above 400 ft, the ILS /GLS /MLS APPR mode disengages when the flight crew:
- Presses the APPR pb, HDG V/S or TRK FPA engages
- Presses the LOC pb, the LOC mode remains engaged. The system reverts to V/S (FPA), if G/S was engaged
- Pulls out the HDG/TRK knob, HDG V/S or TRK FPA engages
- Engages the go-around mode
- Selects another approach. HDG V/S or TRK FPA modes engage.
- When the LOC or G/S signal has been lost for 7 s or more above 200 ft RA . AP /FD s disengage and FD s reengage in basic modes (HDG V/S or TRK FPA).

DISENGAGEMENT CONDITIONS OF G/S ONLY

- The flight crew pulls out the V/S or FPA knob. LOC mode remains engaged, but G/S mode disengages and V/S or FPA engages.
- The flight crew pushes or pulls the ALT knob. LOC mode remains engaged, and the mode selected by the flight crew engages, as a function of the FCU selected altitude.

LOC CONVERGENCE FUNCTION

The aim of the LOC Convergence function is to help the aircraft intercept and capture the LOC axis.

The aircraft is guided with a converging track of 20 ° from the LOC axis, when all the following conditions are met:
- NAV mode is engaged, and LOC mode is armed
- The aircraft is within 20 NM of the destination runway
- The difference between the aircraft track and the QFU is less than 20 °.

ENHANCED LOC CAPTURE FUNCTION

The Enhanced LOC Capture function enhances the performance of the LOC capture and helps the aircraft to capture the LOC beam without overshoot.

<u>Pre-Capture of the LOC Beam</u>

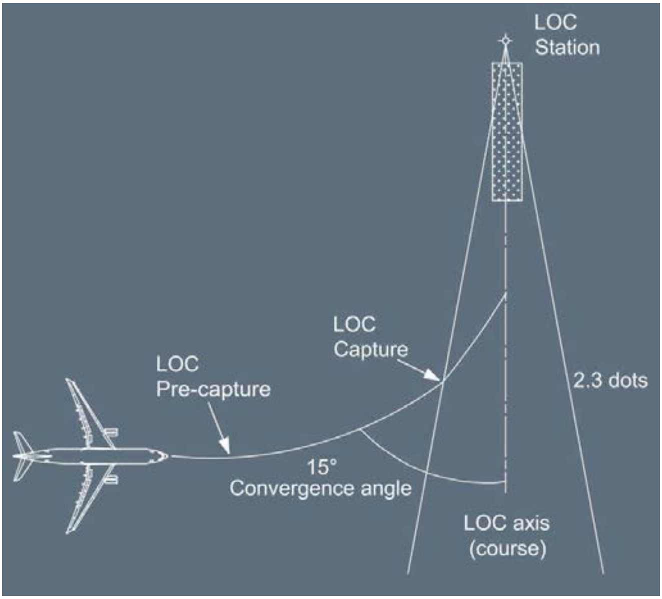
The pre-capture of the LOC beam aims to begin the LOC beam capture sooner.
LOC * mode may engage when LOC mode is armed and when the aircraft reaches the LOC pre-capture zone. The LOC pre-capture zone is a geographical zone around LOC beam where it is possible to guide the aircraft toward the LOC beam, with the help of FMS position data. To ensure the capture of the LOC beam, the aircraft is guided with a 15 ° convergence angle with respect to runway QFU.

The LOC* mode engagement in the pre-capture zone is possible, when :
- The LOC deviation is more than 2.3 dots
- The FMS is in GPS PRIMARY
- The difference between the track and the QFU is between 25 ° and 115 °
- The guidance roll order is such that LOC * will capture the LOC beam without overshoot.

When the LOC deviation becomes lower than 2.3 dots, LOC * mode no longer uses the FMS position data for guidance, but the actual LOC beam deviation to complete the capture of the axis.

Capture of the LOC Beam

Current conditions of LOC beam capture in the capture zone remain the same. This means that if approach conditions of the aircraft (interception angle, speed) do not need activation of the capture assistance, the LOC beam capture will occur as usual based on LOC deviation, aircraft track and guidance roll order conditions.



Note: *On the PFD and on the ND , the flight crew will observe movement of the LOC deviation toward the center of the scale, only when the LOC deviation is less than 2 dots. This occurs when the aircraft is in the capture zone.*

When the ILS /GLS /MLS frequency/channel or the ILS /GLS /MLS ident entered on the RAD NAV page differs from the ILS /GLS /MLS of the destination runway entered in the Flight Plan :
- The aircraft loses the LOC capture assistance function
- The "RWY/LS MISMATCH" message is displayed on the scratchpad
- The flight crew should select HDG mode to perform the LOC capture.

Note: *There is no glideslope capture assistance. The flight crew shall ensure that the aircraft flight path intercepts the G/S beam.*

Ident.: DSC-22_30-80-30-10-A-00012381.0002001 / 17 AUG 10

LAND MODE

ENGAGEMENT CONDITIONS

LAND mode automatically engages when the LOC and G/S modes are engaged, and the aircraft is below 400 ft RA . The FMA displays "LAND", indicating that LOC and G/S are locked. No action on the FCU will disengage LAND mode. FLARE and ROLL OUT modes will successively engage.

DISENGAGEMENT CONDITIONS

LAND mode disengages:
- Upon engagement of the go-around mode
- If the flight crew presses the APPR pb, when the aircraft has been on ground for at least 10 s with the autopilot disconnected
- When both AP /FDs are disengaged.

Note: *When LAND is not displayed on the FMA , at/or slightly below 400 ft, the landing capability degrades to CAT 1 and the triple click is generated. No autoland is authorized with CAT 1 displayed on the FMA.*

Ident.: DSC-22_30-80-30-10-A-00012382.0001001 / 17 AUG 10

FLARE MODE

Once the aircraft reaches approximately 40 ft RA (the precise value is a function of V/S):
- The FLARE mode engages
- The FMA displays "FLARE" in green.

At 30 ft RA , the AP /FD aligns the yaw axis with the runway centerline and the aircraft flares on the pitch axis. If the autothrust is active, thrust is automatically reduced to IDLE (*Refer to DSC-22_30-90 A/THR Modes - RETARD Mode*).
When both AP /FDs are disengaged, FLARE mode disengages.
After main landing gear touchdown, the autopilot (if engaged) sends a nose down order.

ALIGN SUB-MODE

ALIGN is a sub-mode of LAND mode that lines up the aircraft's axis with the ILS course. It is not displayed to the flight crew.

Ident.: DSC-22_30-80-30-10-A-00012383.0001001 / 17 AUG 10

ROLL OUT MODE

At touchdown, the ROLL OUT mode engages and guides the aircraft along the runway centerline. The FMA displays "ROLL OUT" in green, and the PFD displays the yaw bar and no FD bars.

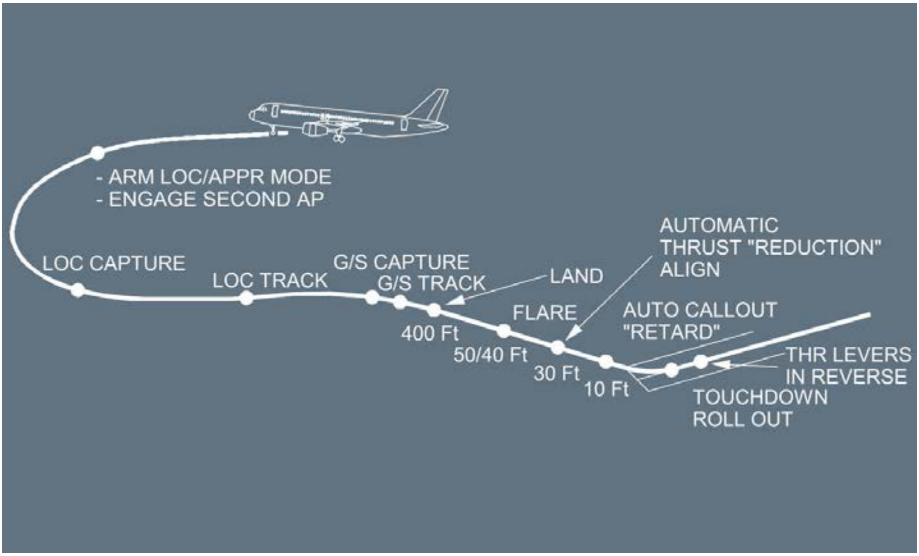
SPEED CONTROL

Ident.: DSC-22_30-80-30-10-00012384.0001001 / 17 AUG 10
Applicable to: ALL

The autothrust, when active, controls speed. The approach speed target (VAPP) is either managed by the FMGS or selected by the flight crew:
- When managed, the speed target is computed by the FMGS and may be modified by the flight crew through the MCDU . At 700 ft RA , the current speed target value is memorized by the autothrust, to ensure stabilized speed guidance, even if Flight Management fails. Below 700 ft, any new VAPP or WIND entry in the MCDU has no effect on the speed target.
- When selected, the autothrust always targets the speed selected on the FCU.

TYPICAL ILS APPROACH

Ident.: DSC-22_30-80-30-10-00012385.0001001 / 16 MAR 11
Applicable to: ALL



AUTOLAND WARNING LIGHT

Ident.: DSC-22_30-80-30-10-00012386.0002001 / 09 APR 15
Applicable to: ALL

The AUTOLAND warning flashes when:
- At least one RA indicates a height below 200 ft, and
- At least one AP is engaged with LAND or FLARE mode on the FMA, and
- At least one of the following conditions occurs:
  - The LOC deviation exceeds 1/4 dot and the aircraft is above 15 ft RA (the LOC scale flashes on the PFD), or
  - The GLIDE deviation exceeds 1 dot and the aircraft is above 100 ft RA (the GLIDE scale flashes on the PFD), or
  - Loss of LOC signal above 15 ft RA (The FD vertical bar flashes on the PFD), or
  - Loss of GLIDE signal above 100 ft RA (The FD horizontal bar flashes on the PFD), or
  - The difference between both RA indications is greater than 15 ft RA, or
  - The last autopilot disengages, or
  - The FMGS detects a long flare.

LANDING CAPABILITIES

Ident.: DSC-22_30-80-30-10-00012387.0001001 / 17 AUG 10
Applicable to: ALL

Each FMGC computes its own automatic landing capability.
The FMA displays “CAT 1”, “CAT 2”, “CAT 3 SINGLE” or “CAT 3 DUAL” messages as soon as the APPR pb is pushed in to arm ILS approach modes.
Refer to PRO-NOR-SRP-01-70 Initial Approach.

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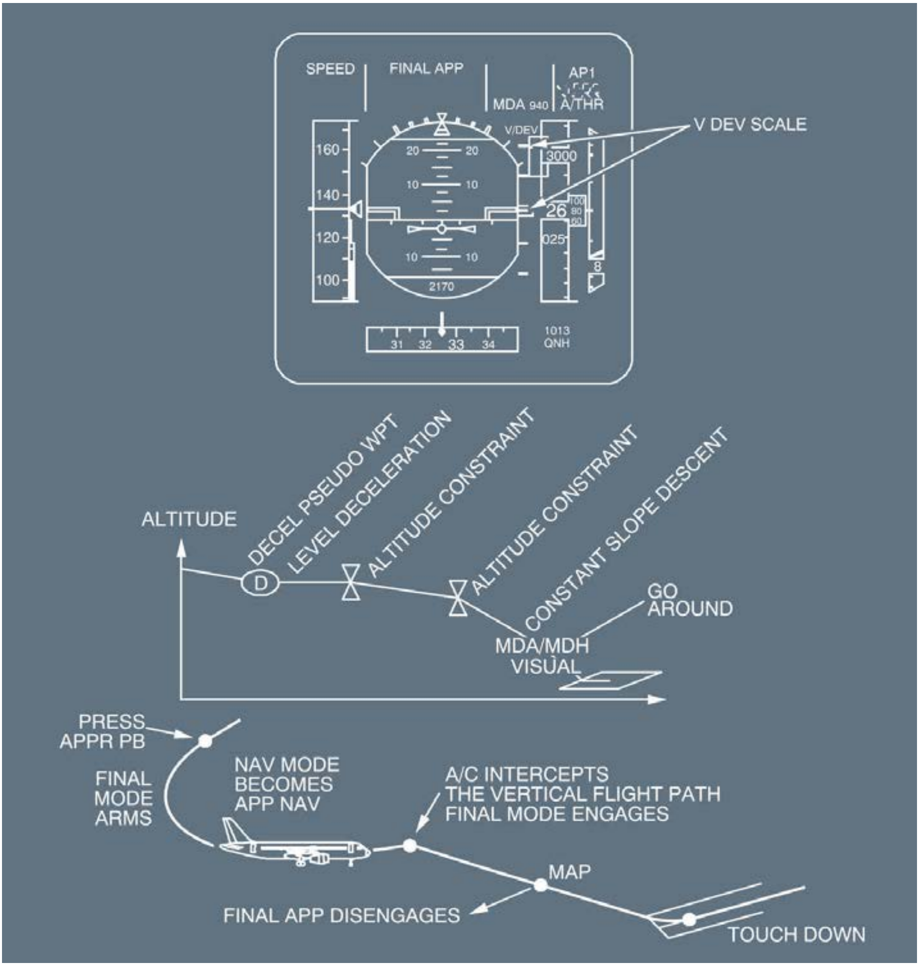
Non Precision Approach

GENERAL

Ident.: DSC-22_30-80-30-20-00012388.0119001 / 25 JAN 17
Applicable to: ALL

This mode guides the aircraft laterally and vertically down to the minimum along the final descent profile computed by the FMGS.
This mode is used to fly a non-ILS /non-GLS ⧀ approach (VOR , VOR /DME , NDB (if ADF ⧀), RNAV...) as inserted into the flight plan.



The non-ILS /non-GLS approach includes the following managed modes:
- APP NAV mode for lateral guidance
- FINAL mode for vertical guidance.

SELECTION

Ident.: DSC-22_30-80-30-20-00012389.0001001 / 17 AUG 10
Applicable to: ALL

A non-ILS approach (VOR , VOR /DME , NDB (if ADF), RNAV) is selected if the active flight plan calls for it (and it has been inserted in that flight plan).

ARMING CONDITIONS

Ident.: DSC-22_30-80-30-20-00012390.0001001 / 17 AUG 10
Applicable to: ALL

The flight crew arms the APP NAV and FINAL modes by pressing the APPR pb on the FCU, if all of the following conditions are met:
- The aircraft is above 400 ft AGL
- The flight plan is valid (lateral and vertical profile)
- The active flight plan has selected a non-ILS approach
- GA mode is not engaged.

The FMA displays “FINAL” and “APP NAV” in blue.
If NAV mode was already engaged, APP NAV engages immediately.

DISARMING CONDITIONS

Ident.: DSC-22_30-80-30-20-00012391.0006001 / 30 MAY 12
Applicable to: ALL

FINAL and APP NAV modes are disarmed when:
- The flight crew presses the APPR pb, or
- The flight crew presses the LOC pb, or
- The flight crew selects a precision approach instead of the approach currently armed, or
- The flight crew engages the GO AROUND mode.

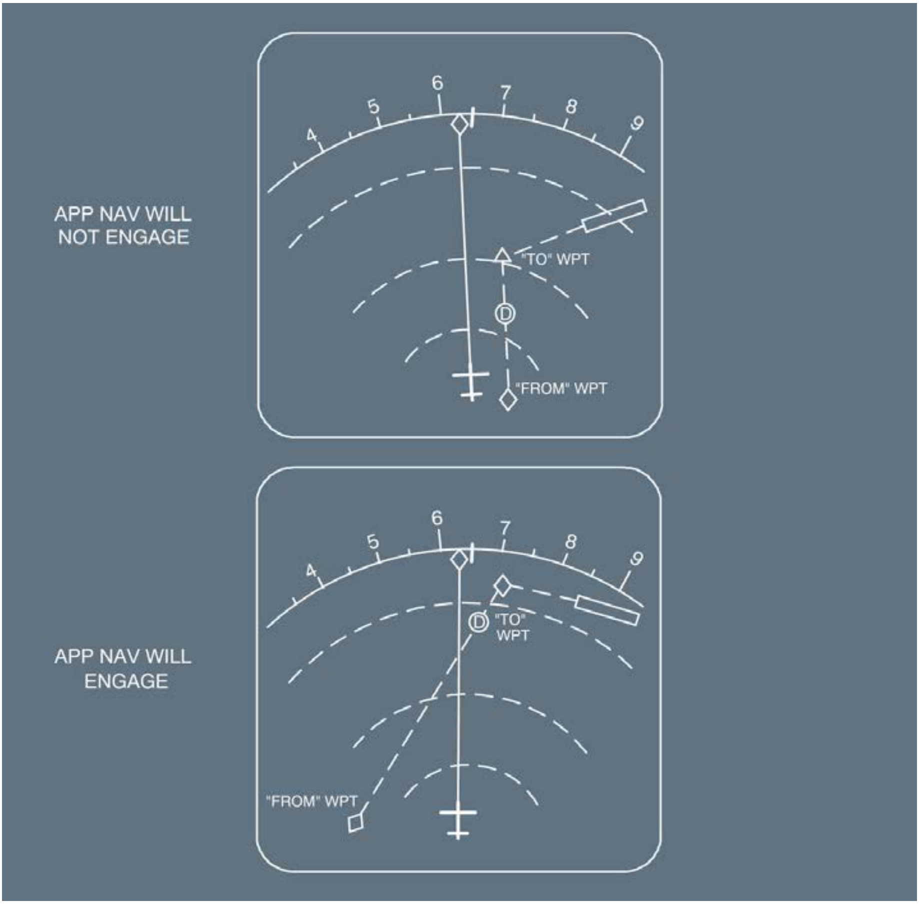
<u>*Note:*</u>
- *after pressing the LOC pb, the LOC mode is armed*
- *after the selection of a precision approach, the flight crew must press the APPR pb to arm the new approach*

ENGAGEMENT CONDITIONS

Ident.: DSC-22_30-80-30-20-00012392.0003001 / 08 AUG 17
Applicable to: ALL

APP NAV and NAV modes engage under the same conditions:
If NAV mode was engaged, APP NAV engages immediately. If HDG /TRK is engaged, APP NAV engages when the intercept conditions are met (aircraft track line must intercept the flight plan active leg).

APP NAV will not engage if the "TO" waypoint is not displayed in white on the ND and MCDU.



FINAL APP is a lateral and vertical managed guidance approach mode that aims guiding aircraft from FDP down to MAP along a defined FPA It is thus recommended to arm this mode when the TO waypoint is the FDP.

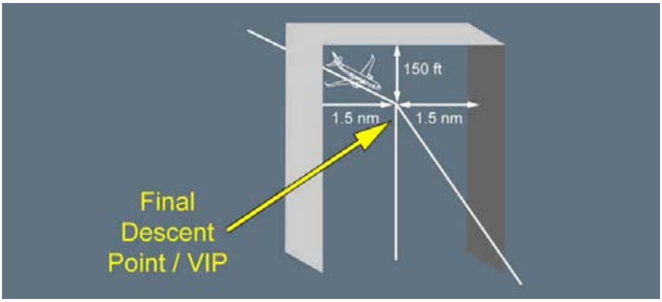
FINAL APP mode engages when:
- NAV or APP NAV is engaged,
- FINAL is armed (by pressing APPR on the FCU),
- Predictions are available in FMS,

- APPROACH phase is active,

  Note: *APPROACH phase may have to be manually activated on MCDU PERF page if the approach starts at high altitude above aerodrome level (i.e. RNAV (RNP) approaches).*

- The aircraft is within the capture area of the FMS profile:
  - Laterally: ±1.5 NM from the Final Descent Point.
  - Vertically: +150 ft above the Final Descent Point.
- The aircraft intercepts a descending leg of the vertical flight path.

  Note: *if APPR pb is pressed earlier, FINAL APP mode may engage. As a consequence, resulting speed and altitude management in FINAL APP may be inappropriate before FDP.*



A blue arrow is displayed on ND s to indicate where the FINAL APP engagement conditions are met and where the final descent will begin automatically.
If the same arrow is displayed in white, at least one engagement condition is not fulfilled, FINAL APP will not engage and the aircraft will not descend automatically.

Definition of the Final Descent Point (also called Vertical Intersection Point "VIP" for RNAV (RNP) approaches)

The Final Descent Point is the waypoint from which starts the FMS segment with coded FPA . For RNAV (RNP) approaches, this point may be indicated on the chart as "VIP".

This point is defined in the Navigation Database by:
- A constant vertical flight path beyond this point,
- A coded altitude constraint that may be "at" or "at or above" (e.g. +3 000 ft). This constraint is displayed on ND (in magenta), next to the corresponding waypoint, when the CSTR key is selected on the EFIS Control Panel. It is also shown on the F-PLN page at this WPT.

Note: The Final Approach Fix (FAF) is the position from where the obstacle clearance is defined relative to an Obstacle Clearance Surface (OCS). Obstacle clearance is only ensured if the aircraft is flying on the defined vertical flight path. Before the FAF , minimum altitudes are published with fixed Minimum Obstacle Clearance (MOC). The Final Descent Point is the point in the procedure at or before the FAF from which a constant vertical flight path is defined.

DISENGAGEMENT CONDITIONS

Ident.: DSC-22_30-80-30-20-00012393.0052001 / 21 MAR 16
Applicable to: ALL

The FINAL and APP NAV modes disengage:
- If the flight crew pushes the APPR pb (HDG-V/S or TRK-FPA modes engage), or
- If the flight crew pushes the LOC pb (LOC mode arms if an ILS/MLS /GLS is selected and HDG-V/S or TRK-FPA modes engage), or
- If the flight crew pulls out the HDG/TRK knob (the FMGS reverts to HDG-V/S or TRK-FPA basic modes), or
- If the flight crew selects a precision approach (the FMGS reverts to HDG-V/S or TRK-FPA basic modes), or
- Automatically at Missed Approach Point (the FMGS vertical mode reverts to V/S / FPA and the FMGS lateral mode reverts to HDG / TRK or NAV), or
- When the GO AROUND mode engages.

Note:
- *If the flight crew engages V/S or FPA mode, only FINAL mode disengages. NAV mode remains engaged.*
- *In the case the flight crew selects a new approach, the flight crew must press the APPR pb to engage the new approach.*

GUIDANCE

Ident.: DSC-22_30-80-30-20-00012394.0027001 / 29 MAR 12
Applicable to: ALL

The FINAL mode guides the aircraft on the vertical profile down to the minimum.
The FINAL mode displays on the PFD the aircraft vertical deviation from the descent path (VDEV symbol) on a ± 200 ft scale.

The FINAL mode:

- Anticipates leaving the altitude selected by the FCU when the aircraft reaches the Continue Descent symbol (blue arrow on the ND)
- Provides precise vertical guidance on the descent and final path with an internal vertical speed limitation to avoid excessive V/S.

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GENERAL

Ident.: DSC-22_30-80-40-00012050.0001001 / 17 AUG 10
Applicable to: ALL

Go-around mode combines the Speed Reference System (SRS) vertical mode with the GA TRK lateral mode.

ENGAGEMENT CONDITIONS

Ident.: DSC-22_30-80-40-00012210.0002001 / 17 AUG 10
Applicable to: ALL

Setting at least one thrust lever to the TOGA detent engages both SRS /GA TRK modes, if:
- The flaps lever is at least in position 1, and
- The aircraft is in flight, or
- The aircraft has been on ground for less than 30 s (AP disengages and can be re-engaged 5 s after lift-off).

FD bars are automatically restored in SRS /GA TRK modes. If FPV /FPD was previously selected, it reverts to FD bars.
The FMA displays “SRS ” and “GA TRK” in green.

DISENGAGEMENT CONDITIONS

Ident.: DSC-22_30-80-40-00012220.0028001 / 17 AUG 10
Applicable to: ALL

The SRS mode disengages:
- Automatically, at the Go-around acceleration altitude (GA ACC ALT), or if ALT * mode engages (above 400 ft RA)
- If the flight crew engages another vertical mode
- If the flight crew selects a speed while in SRS mode: SRS reverts to OP CLB mode and a triple-click aural warning is heard.

Note: *In Engine Out conditions, the SRS mode does not automatically disengage at EO ACC ALT.* *Refer to DSC-22_20-60-40 General.*

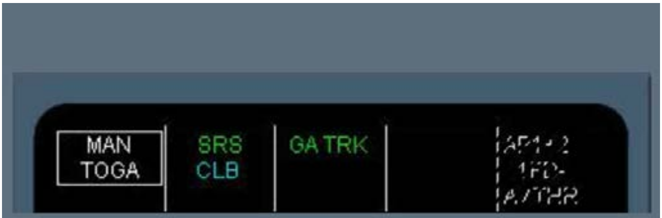
GA TRK disengages when the flight crew engages another lateral mode, above 100 ft RA.

Note: *In dual AP configuration, disengagement of the Go-around mode on either axis causes AP2 to disconnect.*

GUIDANCE

Ident.: DSC-22_30-80-40-00012213.0009001 / 16 MAR 11
Applicable to: ALL

The SRS law maintains the current speed at Go-around engagement, or VAPP , whichever is higher. Nevertheless, the SRS speed target is limited to VLS +25 kt, in a two-engine configuration, and VLS +15 kt, in an engine-out configuration. When the SRS mode disengages, the target speed becomes the smaller of green dot speed or speed constraints.
GA TRK mode guides the aircraft along the current track at Go-around initiation.



Typical FMA in Go Around

GENERAL

Ident.: DSC-22_30-90-00011930.0001001 / 17 MAR 17
Applicable to: ALL

The autothrust (A/THR) is a function of the FMGS , it includes two independent A/THR commands, one per FMGC . Each one is able to control the thrust of both engines simultaneously through two Engine Interface Units and two Electronic Engine Controls (IAE engines) or two Engine Control Units (CFM engines). Only one FMGC controls the active A/THR , it is called the master FMGC.

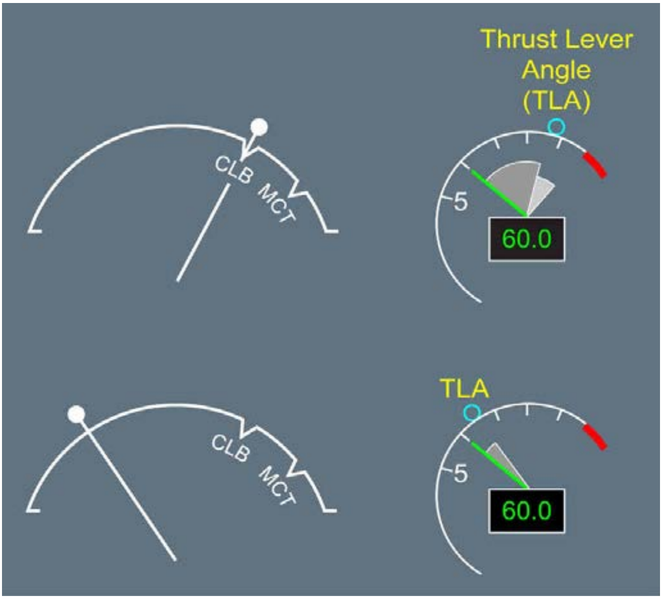
Thrust is controlled:
- Automatically when the A/THR is active
- Manually by the flight crew.

The autothrust is active when the A/THR pb of the FCU is lighted green and A/THR is displayed white in the FMA 5th column.
The position of the thrust levers determines whether A/THR is armed, active, or disconnected.

The autothrust system, when active:
- Maintains a specific thrust in THRUST mode
- Controls the aircraft speed or Mach in SPEED/MACH mode
- Uses ALPHA FLOOR mode to set maximum thrust when the aircraft angle of attack exceeds a specific threshold.

The autothrust system can operate independently or with the AP /FD:
- When performing alone, A/THR always controls the speed
- If the autothrust system is working with the AP /FD , the A/THR mode and AP /FD pitch modes are linked together. *Refer to DSC-22_30-10 Interaction between AP/FD and A/THR Modes*.

When autothrust is active, the FMGS commands the thrust according to the vertical mode logic, but uses a thrust not greater than the thrust commanded by the position of the thrust lever. For example, when the thrust levers are set at the CL (climb) detent, FG can command thrust between idle and max climb.
The autothrust system, when armed, automatically activates if the thrust levers are moved into the active range sector. Outside of this range, thrust levers control thrust directly.



THRUST LEVERS

Ident.: DSC-22_30-90-00011957.0001001 / 23 JUN 15
Applicable to: ALL

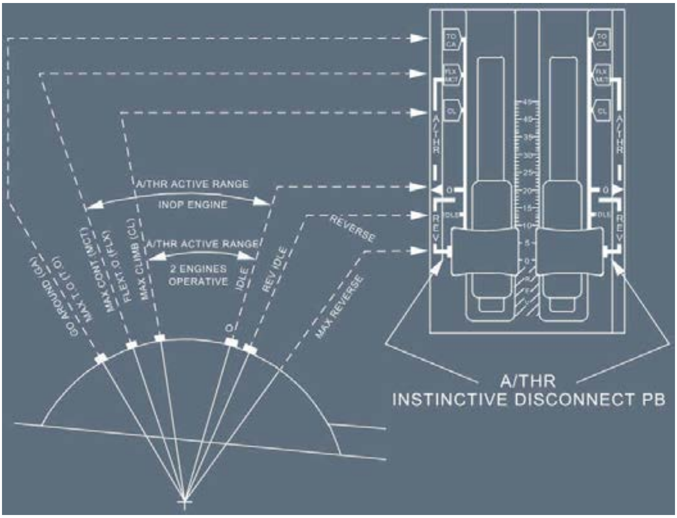
The flight crew uses the thrust levers to do the following:
- Manually select engine thrust
- Arm and activate autothrust (A/THR)
- Engage reverse thrust
- Engage the takeoff and go-around modes.

When autothrust is disconnected, the thrust levers control thrust directly: each lever position corresponds to a given thrust.

Five detents divide each of the thrust lever sectors into four segments. The detents are:

TO GA	:	Max takeoff thrust
FLX MCT	:	Max continuous thrust (or FLX at takeoff)
CL	:	Maximum climb thrust
IDLE	:	Idle thrust for both forward and reverse thrust
MAX REV	:	Maximum reverse thrust

When the thrust levers are at the IDLE position, the flight crew can pull them up to clear the IDLE stop and select reverse thrust. (There is no reverse detent as such).



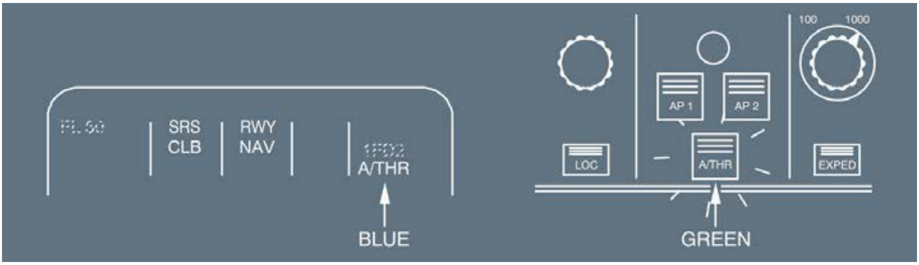
A/THR ARMING CONDITIONS

Ident.: DSC-22_30-90-00011958.0001001 / 23 JUN 15
Applicable to: ALL

Arming conditions of the A/THR are numerous. The following is a list of the most important ones:
- One FMGC operative
- One FAC operative
- Two ADIRS operative
- Two FADECs operative
- One channel of the FCU operative
- One LGCIU operative
- A/THR is not manually disabled (instinctive disconnect pb has not been pressed for more than 15 s).

The flight crew arms A/THR:
- On ground
  - By pushing the A/THR pb on the FCU when the engines are not running, or
  - By setting the thrust levers at the FLX or TOGA detent when the engines are running.
- In flight
  - By pushing the A/THR pb on the FCU while the thrust levers are out of the active range, or
  - While A/THR is active ("A/THR " white on the FMA), by setting all thrust levers beyond the CL detent or at least one lever above the MCT detent, or
  - By engaging the go around mode.

When the A/THR is armed:
- The FCU's A/THR pb light comes on
- "A/THR " is displayed in blue on the FMA.



Note: At takeoff, if the thrust levers are set back to idle, the A/THR disengages and cannot be rearmed until the aircraft becomes airborne.

A/THR ACTIVATION

Applicable to: ALL

Ident.: DSC-22_30-90-A-00011959.0001001 / 14 MAY 12

GENERAL

The A/THR is active when it controls thrust or speed. The position of the thrust lever determines the maximum thrust that the A/THR system can command (except in α-floor condition).

The A/THR being armed, is activated:
- When the flight crew sets both thrust levers between the CL and IDLE detents (two engines operative), or
- When the flight crew sets one thrust lever between the MCT and IDLE detents (one engine inoperative).

The A/THR being disconnected, is activated when the flight crew pushes the A/THR pb on the FCU while the thrust levers are within the active range, including IDLE position.

Note: *When the flight crew sets both thrust levers to IDLE position, the A/THR disconnects but, if the flight crew pushes the A/THR pb of the FCU, they will simultaneously arm and activate the autothrust. Due to the thrust levers position, IDLE thrust will be maintained.*

When ALPHA FLOOR is activated, regardless of the initial status of A/THR and the position of the thrust levers, the A/THR activates.

When A/THR is active:
- The A/THR pb on the FCU lights up
- The FMA displays A/THR mode in green in the first column and "A/THR" in white in the fifth column.

Ident.: DSC-22_30-90-A-00011960.0002001 / 16 MAR 11

EFFECTS OF THRUST LEVER MOVEMENT DURING A/THR ACTIVATION

While A/THR is active:

- When both thrust levers are set above the CL detent (both engines operative) or one thrust lever is set above MCT (one engine operative), the A/THR reverts from active to armed. “A/THR ” turns to blue on the FMA and the thrust levers control thrust directly.
  The FMA displays "MAN THR” in white in its first column.
  The thrust levers provide the flight crew with an immediate increase of thrust when both thrust levers are pushed above the CL detent (two engines) or the active thrust lever above the MCT detent (one engine operative).
- When both thrust levers are set below the CL detent (both engines operative) or one thrust lever is set below MCT (one engine operative), a repeating warning (amber caution, single chime, “A/THR LIMITED” ECAM message) is activated every 5 s until the flight crew moves the lever back into the detent. “LVR CLB ” (both engines operative) or “LVR MCT ” (one engine operative) flashes white in the first column of the FMA.
  This device reminds the flight crew that the normal operating position of the thrust levers, when A/THR active, is the CL detent (two engines) or the MCT detent (one engine operative).
- When one thrust lever is in the CL detent and the other one out of detent, the “LVR ASYM” amber message comes up until both levers are set in the CL detent (only with both engines operative).

A/THR DISCONNECTION

Applicable to: ALL

Ident.: DSC-22_30-90-B-00011961.0001001 / 17 AUG 10

GENERAL

When the A/THR is disconnected, it is neither armed nor active.

The A/THR can be disconnected in two ways:

- Standard disconnection:
  - The flight crew pushes the instinctive disconnect pb on the thrust levers, or
  - The flight crew sets both thrust levers to IDLE detent.
- Non-standard disconnection:
  - The flight crew pushes the A/THR pb on the FCU while A/THR is active/armed, or
  - The system loses one of the arming conditions.

CAUTION	If the flight crew pushes and holds one instinctive disconnect pb for more than 15 s, the A/THR system is disconnected for the remainder of the flight. All A/THR functions including ALPHA FLOOR are lost, and they can be recovered only at the next FMGC power-up (on ground).

THRUST LOCK FUNCTION

Ident.: DSC-22_30-90-00011963.0002001 / 17 AUG 10
Applicable to: ALL

The Thrust Lock function is activated when the thrust levers are in the CL detent (or the MCT detent with one engine out), and:
- The flight crew pushes the A/THR pb on the FCU, or
- The A/THR disconnects due to a failure.

The thrust is locked at its level prior to disconnection. Moving the thrust levers out of CL or MCT suppresses the thrust lock and gives the flight crew manual control with the thrust levers.

When the Thrust Lock function is active:
- “THR LK” flashes amber on the FMA
- ECAM “ENG THRUST LOCKED” flashes every 5 s
- ECAM displays “THR LEVERS......MOVE”
- A single chime sounds and the Master Caution light flashes every 5 s.

All warnings cease when the flight crew moves the thrust levers out of the detent.

A/THR DISCONNECTION CAUTION

Ident.: DSC-22_30-90-00011964.0002001 / 17 AUG 10
Applicable to: ALL

		A/THR DISCONNECTION: BY INSTINCTIVE DISCONNECT pb OR SETTING TWO LEVERS TO IDLE (if above 50 ft RA)	A/THR DISCONNECTION: BY OTHER MEANS
CONSEQUENCE	**MASTER CAUTION light**	Illuminated 3 s maximum	Illuminated
	ECAM MESSAGE	A/THR OFF amber message 9 s maximum	Flashing ENG THRUST LOCKED amber caution, AUTO FLT A/THR OFF amber caution, blue "THR LEVERS.....MOVE"
	AUDIO	Single chime	Single chime
	CLR pb on ECAM CONTROL PANEL	Extinguished	Illuminated
ACTION	**MASTER CAUTION light**	- Extinguishes MASTER CAUTION light - Erases ECAM message	Extinguishes MASTER CAUTION light
	CLR pb on ECAM CONTROL PANEL	No effect	- Extinguishes MASTER CAUTION light and CLR pb - Erases ECAM message - Calls status
	INSTINCTIVE DISCONNECT pb	- Extinguishes MASTER CAUTION light - Erases ECAM message	Extinguishes MASTER CAUTION light
ECAM STATUS MESSAGE		NO	YES

The standard disconnection triggers temporary ECAM message and caution light. Single chime sounds.
The non standard disconnection triggers caution light and ECAM message removed only by a flight crew action. Single chime sounds.

A/THR MODES

Applicable to: ALL

Ident.: DSC-22_30-90-C-00011965.0002001 / 23 JUN 15

GENERAL

Except in takeoff and go-around situations, normal operation of the A/THR system requires the thrust levers to be:

- In the CL detent for the two-engine configuration. If they are not set in the CL detent, "LVR CLB " flashes white on the FMA.
- In MCT detent when in the one-engine-out configuration. If the appropriate lever is not set in the MCT detent, "LVR MCT " flashes white on the FMA.

The A/THR modes are selected automatically in conjunction with the AP /FD modes (except for ALPHA FLOOR):

A/THR in THRUST mode	AP /FD pitch mode maintains the speed: OP CLB - OP DES - CLB - EXP CLB - EXP DES - SRS - FLARE and DES (IDLE path)
A/THR in SPEED/MACH mode	If neither AP nor FD is engaged
	If AP /FD controls a vertical path: V/S - FPA - ALT * - ALT CST* - ALT - ALT CRZ - G/S * - G/S - FINAL and DES (geometric path)
A/THR in RETARD mode	AP /FD engaged in LAND mode during an automatic landing

Ident.: DSC-22_30-90-C-00011966.0002001 / 23 JUN 15

THRUST MODE

In THRUST mode, autothrust commands a specific thrust level in conjunction with the AP /FD pitch mode. This thrust level is limited by thrust lever position.

FMA Display	Meaning
THR MCT	Single engine thrust in climb. The live engine is at maximum continuous thrust (thrust lever in MCT detent)
THR CLB	Climb thrust in two engine configuration (at least one thrust lever in the CL detent, the other one below CL)
THR LVR	Undetermined thrust (neither CLB nor MCT thrust)
THR IDLE	Minimum thrust (both engines at IDLE thrust)

Note: *When the A/THR is armed for takeoff or go-around, the FMA displays "MAN TOGA " (or "MAN FLX") in white to remind the flight crew that the thrust levers have been positioned properly.*

Ident.: DSC-22_30-90-C-00011967.0001001 / 27 JAN 12

RETARD MODE

The RETARD mode is only available during automatic landing (AP engaged in LAND mode).
At approximately 40 ft RA , the RETARD mode engages and remains engaged after touchdown.
The A/THR commands IDLE thrust during the flare, and the FMA and engine warning display "IDLE". If the autopilot is disengaged during the flare before touchdown, the SPEED mode replaces the RETARD mode, and the flight crew has to manually reduce thrust.

Note: *In an automatic landing, the system generates a "RETARD" callout at 10 ft RA , which prompts the flight crew to move the thrust levers to IDLE in order to confirm thrust reduction. In manual landing conditions, the system generates this callout at 20 ft RA, as a reminder.*

Ident.: DSC-22_30-90-C-00011968.0002001 / 17 AUG 10

ALPHA FLOOR

ALPHA FLOOR is a protection that commands TOGA thrust, regardless of the thrust levers' positions. This protection is available from lift-off to 100 ft RA on approach.

ALPHA FLOOR calls up the following indications:
- "A FLOOR" in green, surrounded by a flashing amber box on the FMA, and in amber on the engine warning display, (as long as α-floor conditions are met)
- "TOGA LK" in green, surrounded by a flashing amber box on the FMA , when the aircraft leaves the α-floor conditions. TOGA thrust is frozen.

To cancel ALPHA FLOOR or TOGA LK thrust, the flight crew must disconnect the autothrust.

Ident.: DSC-22_30-90-C-00011969.0001001 / 17 AUG 10

SPEED/MACH MODE

In SPEED/MACH mode, the A/THR adjusts the thrust in order to acquire and hold a speed or Mach target.

The speed or Mach target may be:
- Selected on the FCU by the flight crew
- Managed by the FMGC.

When in SPEED/MACH mode, the A/THR does not allow speed excursions beyond the following limits, regardless of the target speed or Mach number:
- For a selected speed target, the limits are VLS and VMAX (VMO -MMO , VFE -VLE, whichever applies)
- For a managed speed target, the limits are maneuvering speed (Green Dot, S , F , whichever applies) and maximum speed (340/0.80-VFE -VLE, whichever applies).

The changeover from SPEED to MACH mode is either automatic, performed by the FMGC, or manual, with the flight crew pushing the SPD/MACH pb.
The FMA displays “SPEED” or “MACH”.

APPROACH AUTOTHRUST:

Below 3 200 ft RA , with at least CONF 1, the A/THR logic is modified to be more responsive to speed variation. This is referred to as approach autothrust.

SPEED MODE IN APPROACH PHASE

Applicable to: ALL

Ident.: DSC-22_30-90-D-00011970.0001001 / 17 AUG 10

GENERAL

When the aircraft flies an approach in managed speed, the speed target displayed on the PFD in magenta is variable during the approach.
This managed speed target is computed in the FMGS using the “ground speed mini function”.

Ident.: DSC-22_30-90-D-00011971.0002001 / 17 MAR 17

GROUND SPEED MINI FUNCTION PRINCIPLE

The purpose of the "ground speed mini function" is to take advantage of the aircraft inertia when the wind conditions vary during the approach. It does so by providing the flight crew with an adequate indicated speed target. When the aircraft flies this indicated speed target, the energy of the aircraft is maintained above a minimum level ensuring standard aerodynamic margins versus stall.
If the A/THR is active in SPEED mode, it will automatically follow the IAS target, ensuring an efficient thrust management during the approach.
The minimum energy level is the energy level the aircraft will have at touch down if it lands at VAPP speed with the tower reported wind as inserted in the PERF APPR page.
The minimum energy level is represented by the Ground Speed the aircraft will have at touch down. This Ground Speed is called “GROUND SPD MINI”.
During the approach, the FMGS continuously computes the speed target using the wind experienced by the aircraft in order to keep the ground speed at or above the “Ground Speed Mini”.
The ground speed mini enables an efficient management of the thrust in gusts or longitudinal shears. Thrust varies in the right sense, but in a smaller range (± 15 % N1) in gusty situations, which explains why it is recommended in such situations.
It provides additional but rational safety margins in shears.
It allows pilots "to understand what is going on" in perturbed approaches by monitoring the target speed magenta bugs: when target goes up = head wind gust.

The speed target is displayed on the PFD speed scale in magenta when approach phase and managed speed are active. It is independent of the AP /FD and/or A/THR engagements.
Wind is a key factor in the "ground speed mini function".

Ident.: DSC-22_30-90-D-00011972.0001001 / 17 AUG 10

TWR WIND

It is the MAG WIND entered in the PERF APPR page. It is the average wind as provided by the ATIS or the tower. Gusts must not be inserted, they are included in the ground speed mini computation.

Ident.: DSC-22_30-90-D-00011973.0001001 / 17 AUG 10

TWR HEADWIND COMPONENT

The TWR HEADWIND COMPONENT is the component of the MAG WIND projected on the runway axis (landing runway entered in the flight plan). It is used to compute VAPP and GS mini.

Ident.: DSC-22_30-90-D-00011974.0001001 / 17 AUG 10

CURRENT HEADWIND COMPONENT

The actual wind measured by ADIRS is projected on the aircraft axis to define the CURRENT HEADWIND COMPONENT (instantaneous headwind).
The CURRENT HEADWIND COMPONENT is used to compute the variable speed target during final (IAS target).

Ident.: DSC-22_30-90-D-00011975.0002001 / 17 AUG 10

VAPP COMPUTATION

VAPP , automatically displayed on the MCDU PERF APPR page, is computed as follows:
- VAPP = VLS+1/3 of the TWR HEADWIND COMPONENT, or
- VAPP = VLS +5 kt, whichever is the highest.

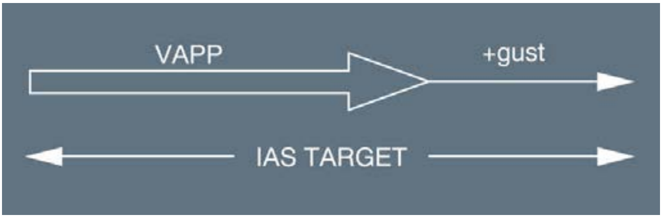
"1/3 of the TWR HEADWIND COMPONENT" has two limits:
- 0 kt as the minimum value (no wind or tailwind)
- +15 kt as the maximum value.

The flight crew can manually modify the VAPP and TWR wind values on the PERF APPR page.

Ident.: DSC-22_30-90-D-00011976.0002001 / 01 OCT 12

SPEED TARGET COMPUTATION

The FMGS continuously computes a speed target (IAS target) that is the MCDU VAPP value plus an additional variable gust.



The gust is the instantaneous difference between the CURRENT HEADWIND COMPONENT and the TWR HEADWIND COMPONENT. It is always positive (or equal to zero for no wind or tailwind).
The IAS target is displayed on the PFD as a magenta triangle moving with the gust variation.

The IAS targets have 2 limits:
- VAPP, as the minimum value
- VFE -5 kt in CONF FULL, or VFE of the next configuration in CONF 1, 2 or 3 as the maximum value.

Ident.: DSC-22_30-90-D-00011977.0001001 / 17 MAR 17

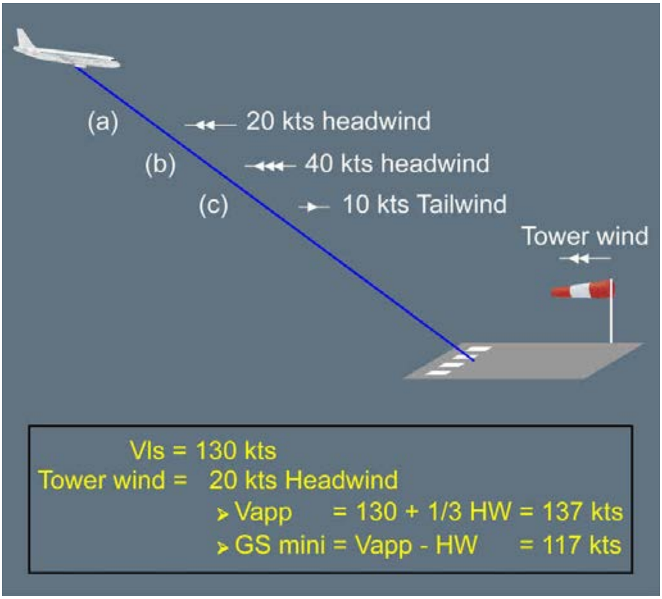
GROUND SPEED MINI (GS MINI) COMPUTATION

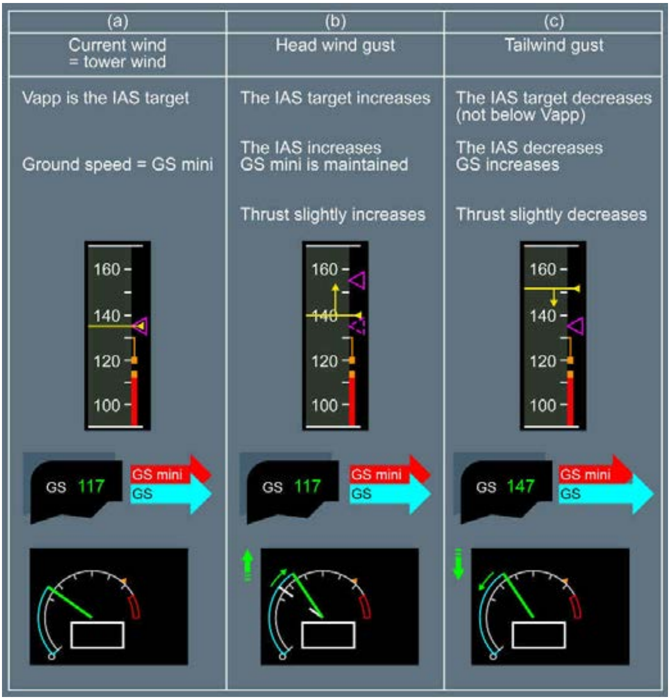
Ground speed mini concept has been defined to prevent the aircraft energy from dropping below a minimum level during final approach. The GS mini value is not displayed to the flight crew.

This minimum energy level is the energy the aircraft will have at landing with the expected tower wind; it is materialized by the ground speed of the aircraft at that time which is called GS mini:
GS mini = VAPP - Tower head wind component

In order to achieve that goal, the aircraft ground speed should never drop below GS mini in the approach, while the winds are changing. Thus the aircraft IAS must vary while flying down, in order to cope with the gusts or wind changes. In order to make this possible for the pilot or for the A/THR , the FMGS continuously computes an IAS target speed, which ensures that the aircraft ground speed is at least equal to GS mini; the FMGS uses the instantaneous wind component experienced by the aircraft:
IAS Target Speed = GS mini + Current headwind component

This target speed is limited by VAPP in case of tailwind or if instantaneous wind is lower than the tower wind.


(a)
20 kts headwind
(b)
40 kts headwind
(c)
10 kts Tailwind
Tower wind
Vls = 130 kts
Tower wind = 20 kts Headwind
Vapp = 130 + 1/3 HW = 137 kts
GS mini = Vapp - HW = 117 kts


(a)
Current wind
= tower wind
(b)
Head wind gust
(c)
Tailwind gust
Vapp is the IAS target
Ground speed = GS mini
The IAS target increases
The IAS increases
GS mini is maintained
Thrust slightly increases
The IAS target decreases
(not below Vapp)
The IAS decreases
GS increases
Thrust slightly decreases
160
140
120
100
GS 117
GS 147
GS mini
GS

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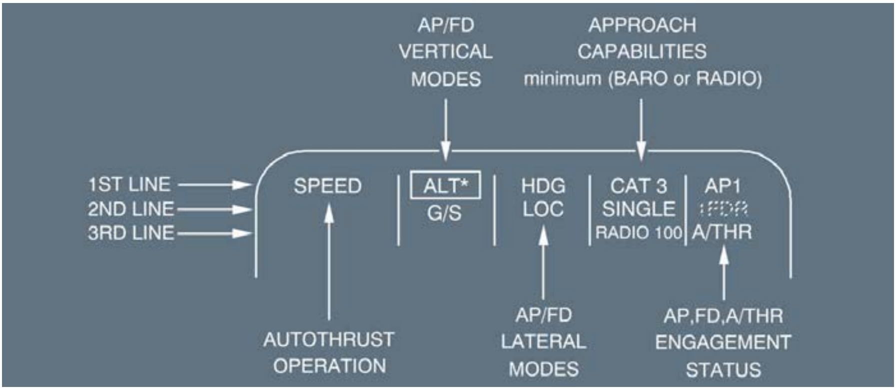
FLIGHT MODE ANNUNCIATOR (FMA)

Applicable to: ALL

Ident.: DSC-22_30-100-A-00012356.0012001 / 19 DEC 12

GENERAL

The Flight Mode Annunciator (FMA) which is just above the PFD s, shows the status of the A/THR , the AP /FD vertical and lateral modes, the approach capabilities, and the AP /FD -A/THR engagement status.
A white box is displayed for 10 s around each new annunciation. The white box display time may be increased to 15 s in some mode reversion cases associated with an aural triple click.



Ident.: DSC-22_30-100-A-00012357.0002001 / 17 AUG 10

THE THREE LEFT COLUMNS

The first line shows the engaged modes in green.
The second line shows the armed modes in blue or magenta.
Magenta indicates that the modes are armed or engaged because of a constraint.

The third line displays special messages:
- Messages related to flight controls have first priority:
  - “MAN PITCH TRIM ONLY” in red, flashing for 9 s, then steady
  - “USE MAN PITCH TRIM” in amber, pulsing for 9 s, then steady.
- Messages related to the FMGS have second priority.

Ident.: DSC-22_30-100-A-00012358.0002001 / 16 MAR 11

THE FOURTH COLUMN

Displays approach capabilities in white.

Displays DH or MDA /MDH in blue.

Note: *The DH or MDA /MDH value on the FMA is not rounded off: The exact value appears on the FMA , and is the same value as the one inserted in the MCDU PERF APPR page.*

Ident.: DSC-22_30-100-A-00012359.0001001 / 17 AUG 10

THE FIFTH COLUMN

Displays the engagement status of AP , FD , and A/THR in white.
Displays a box around FD for 10 s in case of automatic FMGC switching.
Displays A/THR in blue when autothrust is armed but not active.

Note: *The FMGS synchronizes A/THR mode, AP /FD modes and approach capability to provide identical information on both PFDs.*

AUTOTHRUST ANNUNCIATIONS (FMA COLUMN 1)

Applicable to: ALL

Ident.: DSC-22_30-100-B-00012360.0002001 / 23 JUN 15

FIRST LINE

DISPLAY	COLOR	MEANING
MAN TOGA	White White box	A/THR is armed, at least one thrust lever is in TOGA detent.
MAN FLX XX	White White box Blue numbers	A/THR is armed, at least one thrust lever is in MCT /FLX detent with FLXTO temp set at XX°. The other thrust lever is at or below the MCT/FLX detent.
MAN MCT	White White box	A/THR is armed, at least one thrust lever is in the MCT/FLX detent, the other is at, or below this detent.
MAN THR	White Amber box	A/THR is armed, and the most advanced thrust lever is above CL detent (two engines operative), or one above MCT/FLX (engine-out) and not in a detent.
THR MCT	Green	A/THR is active in thrust mode and the most advanced thrust lever is in the MCT/FLX detent (engine-out).
THR CLB	Green	A/THR is active in thrust mode and the most advanced thrust lever is in the CL detent.
THR IDLE	Green	A/THR is active in thrust mode and commands idle thrust.
THR LVR	Green	A/THR is active in thrust mode with both thrust levers below CL detent, or the live thrust lever (one engine) below MCT.
SPEED or MACH	Green	A/THR is active in SPEED or MACH mode.
A. FLOOR	Green Amber box	A/THR is active and commands TOGA thrust while α FLOOR conditions are met.
TOGA LK	Green Amber box	A/THR is active and TOGA thrust is locked (α FLOOR conditions are no longer met).

Ident.: DSC-22_30-100-B-00012361.0002001 / 17 AUG 10

SECOND LINE

Not used with this standard.

Ident.: DSC-22_30-100-B-00012362.0002001 / 16 NOV 15

THIRD LINE

DISPLAY	COLOR	MEANING
LVR CLB (flashing)	White	Request to set the thrust levers in CL detent in the case not in position while the aircraft is above the altitude of thrust reduction with both engines running.
LVR MCT (flashing)	White	Request to set the live thrust lever in MCT/FLX detent in the case not in position after an engine failure (with speed above green dot).
LVR ASYM	Amber	(Two engines only). One thrust lever in CL or MCT/FLX detent and the other one is not in this detent.
THR LK (flashing)	Amber	After A/THR disconnection (action of the flight crew on FCU or failure) resulting in thrust being frozen. Both thrust levers being in CL detent or one in MCT/FLX (engine out) detent.

Note: *The amber caution light flashes and a single chime sounds every 5 s, as long as the flight crew takes no appropriate action in the following cases:*
- *THR LK*
- *LVR CLB (if the thrust levers are below the CLB detent)*
- *LVR MCT (if the thrust levers are below the FLX/MCT detent).*

AP/FD VERTICAL MODES (FMA COLUMN 2)

Applicable to: ALL

Ident.: DSC-22_30-100-C-00012363.0011001 / 23 JUN 15

FIRST LINE

DISPLAY	COLOR	MEANING
SRS	Green	Takeoff or go-around mode is engaged.
CLB	Green	Climb mode is engaged. The FMGS target altitude is higher than the actual altitude. ALT CSTR are taken into account.
OP CLB	Green	Open Climb mode is engaged. The FCU selected altitude is higher than the actual altitude. ALT CSTR are disregarded.
ALT* or ALT CST*	Green	ALT CAPTURE is engaged: - ALT * green in case of FCU selected altitude capture - ALT CST * green in case of ALT CSTR capture (vertical profile).

Continued on the following page

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DISPLAY	COLOR	MEANING
ALT or ALT CST	Green	ALTITUDE HOLD mode is engaged: - ALT is green when the FCU selected altitude is held - ALT CST is green when an ALT CSTR is held (vertical profile).
ALT CRZ	Green	ALT mode is engaged and CRZ FL is held.
DES	Green	Descent mode is engaged. The FMGS target altitude is lower than the actual altitude. ALT CSTR are taken into account.
OP DES	Green	Open Descent mode is engaged. The FCU selected altitude is lower than the actual altitude. ALT CSTR are disregarded.
G/S*	Green	Glide Slope capture mode is engaged.
G/S	Green	Glide Slope mode is engaged.
V/S±XXXX	Green + blue numbers	Vertical speed mode is engaged to acquire and hold the V/S selected on the FCU . ALT CSTR are disregarded. If the aircraft reaches VLS or VMAX and cannot maintain the target, the indication is boxed amber and flashes, and the target pulses.
FPA±XX	Green + blue numbers	Flight Path Angle mode is engaged to acquire and hold the FPA selected on the FCU . ALT CSTR are disregarded. If the aircraft reaches VLS or VMAX and cannot maintain the target, the indication is boxed amber and flashes, and the target pulses.

Ident.: DSC-22_30-100-C-00012364.0002001 / 23 JUN 15

SECOND LINE

DISPLAY	COLOR	MEANING
CLB	Blue	Climb mode is armed.
ALT	Blue or Magenta	Altitude mode is armed: - Blue when the target altitude is the FCU selected altitude - Magenta when the target altitude is an ALT CSTR.
DES	Blue	Descent mode is armed before the descent phase.
G/S	Blue	Glide Slope mode is armed.
FINAL	Blue	Final descent mode is armed.
ALT G/S	Blue/Blue	ALT and G/S modes are armed.
ALT G/S	Magenta/ Blue	ALT CST and G/S modes are armed.
ALT FINAL	Blue/Blue	ALT and FINAL modes are armed.
ALT FINAL	Magenta/ Blue	ALT CST and FINAL modes are armed.
DES G/S	Blue/Blue	DES and G/S modes are armed.
DES FINAL	Blue/Blue	DES and FINAL modes are armed.

Ident.: DSC-22_30-100-C-00012365.0001001 / 17 AUG 10

THIRD LINE

DISPLAY	COLOR	MEANING
SPEED SEL:XXX	Blue	Indicates a preset speed associated with the cruise or climb phase.
MACH SEL:.XX	Blue	Indicates a preset Mach associated with the cruise or climb phase.

Note: *These two messages use both the first and second columns (third line).*

AP/FD LATERAL MODES (FMA COLUMN 3)

Applicable to: ALL

Ident.: DSC-22_30-100-D-00012366.0002001 / 16 MAR 11

FIRST LINE

DISPLAY	COLOR	MEANING
RWY	Green	RWY mode is engaged.
RWY TRK	Green	RWY mode is engaged once airborne at or above 30 ft RA.
HDG	Green	HEADING mode is engaged.
TRK	Green	TRACK mode is engaged.
NAV	Green	NAV mode is engaged to guide the aircraft along the FM lateral F-PLN.
LOC*	Green	LOC capture mode is engaged.
LOC	Green	LOC track mode is engaged.
APP NAV	Green	NAV mode is engaged during a non-ILS approach.
GA TRK	Green	GO-AROUND TRACK mode is engaged.

Ident.: DSC-22_30-100-D-00012367.0001001 / 17 AUG 10

SECOND LINE

DISPLAY	COLOR	MEANING
NAV	Blue	NAV mode is armed.
LOC	Blue	LOC mode is armed.
APP NAV	Blue	NAV mode is armed for a non-ILS approach.

AP/FD COMMON MODES (FMA COLUMNS 2 AND 3)

Ident.: DSC-22_30-100-00012368.0002001 / 17 AUG 10
Applicable to: ALL

DISPLAY	COLOR	MEANING
LAND	Green	Land mode is engaged below 400 ft RA.
FLARE	Green	Flare mode is engaged.

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DISPLAY	COLOR	MEANING
ROLL OUT	Green	Roll out mode is engaged.
FINAL APP	Green	APP NAV and Final modes are engaged during a non-ILS approach.

APPROACH CAPABILITIES (FMA COLUMN 4)

Applicable to: ALL

Ident.: DSC-22_30-100-E-00012369.0002001 / 17 AUG 10

FIRST LINE

DISPLAY	COLOR	MEANING
CAT 1	White	CAT 1 capability available.
CAT 2	White	CAT 2 capability available.
CAT 3	White	CAT 3 capability available.

Ident.: DSC-22_30-100-E-00012370.0002001 / 17 AUG 10

SECOND LINE

DISPLAY	COLOR	MEANING
SINGLE	White	CAT 3 capability available, with FAIL PASSIVE condition.
DUAL	White	CAT 3 capability available, with FAIL OPERATIONAL condition.

Ident.: DSC-22_30-100-E-00012371.0002001 / 17 AUG 10

THIRD LINE

DISPLAY	COLOR	MEANING
MDA /MDH XXXX	White Blue	Minimum Descent Altitude or Minimum Descent Height as inserted by the flight crew on the MCDU PERF APPR page.
DH XXX/NO DH	White Blue	Decision Height as inserted by the flight crew on the MCDU PERF APPR page. NO DH : when NO inserted on the MCDU PERF APPR page.

AP/FD - A/THR ENGAGEMENT STATUS (FMA COLUMN 5)

Applicable to: ALL

Ident.: DSC-22_30-100-F-00012372.0001001 / 17 AUG 10

FIRST LINE

DISPLAY	COLOR	MEANING
AP1 + 2	White	Autopilot 1 and 2 are engaged.
AP1	White	Autopilot 1 is engaged.
AP2	White	Autopilot 2 is engaged.

Ident.: DSC-22_30-100-F-00012373.0002001 / 17 AUG 10

SECOND LINE

DISPLAY	COLOR	MEANING
X FD Y	White	X and Y give the FD engagement status on PFD 1 and PFD2. X and Y can be 1, 2, or –: - –: No FD is engaged on the corresponding PFD - 1: FD 1 is engaged on the corresponding PFD - 2: FD 2 is engaged on the corresponding PFD. The normal status (FD 1 and 2 engaged) is 1 FD 2.

Ident.: DSC-22_30-100-F-00012374.0001001 / 17 AUG 10

THIRD LINE

DISPLAY	COLOR	MEANING
A/THR	White	A/THR is active.
A/THR	Blue	A/THR is armed.

SPECIAL MESSAGES (FMA COLUMNS 2 AND 3)

Ident.: DSC-22_30-100-00012539.0006001 / 03 NOV 14
Applicable to: ALL

The third line displays three types of messages:
- It gives first priority to Flight Control messages
- It gives second priority to vertical Flight Management messages
- It gives last priority to EFIS reconfiguration messages.

DISPLAY	COLOR	MEANING
MAN PITCH TRIM ONLY	Red	Displayed in case of loss of L+R elevators.
USE MAN PITCH TRIM	Amber	F/CTL are in direct law.
CHECK APP SEL	White	The aircraft is in cruise at less than 100 NM from the Top of Descent or in descent or in approach and: - A non-ILS approach has been selected - An ILS frequency is tuned on the MCDU RAD NAV page.
SET MANAGED SPEED or CHECK SPEED MODE (Also displayed on PFD)	White	The SPEED target is selected but a preselected SPEED does not exist for the next flight phase.

Continued on the following page

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DISPLAY	COLOR	MEANING
SET GREEN DOT SPD	White	The aircraft is in Engine Out mode and the SPEED target is selected. This message is displayed if the FCU selected speed is: ≤ Green Dot -10 kt, or ≥ Green Dot +10 kt, except in ALT * and ALT mode.
SET HOLD SPD	White	The aircraft is in selected SPEED control, a Holding pattern is inserted in the F-PLN and the aircraft is 30 s before the deceleration point to the precomputed HOLD SPEED.
DECELERATE or T/D REACHED (Also displayed on PFD)	White	This message is displayed if the thrust is not reduced when passing the top of descent and the aircraft is above the descent profile.
MORE DRAG	White	DES mode is engaged, idle is selected, and either: - The aircraft is above the vertical profile and the predicted intercept point of the theoretical profile is at less than 2 NM from the next ALT CSTR, or - In auto speed control and the aircraft enters a speedbrake decelerating segment.

CAT 3 DUAL INOPERATIVE

Ident.: DSC-22_30-110-00012674.0001001 / 28 JUN 17
Applicable to: ALL

"CAT 3 DUAL" INOP SYS is triggered in particular if one ADR or IR is rejected by FAC or FMGC.
If “CAT 3 DUAL” is displayed in INOP SYS without any other failure being detected:

CHANGE the AP in command. It may allow the CAT 3 DUAL function to be recovered.

If unsuccessful:

SET FAC 1 pb to OFF, and back to ON
WAIT for FAC 1 fault ECAM warning to disappear, and
APPLY the same sequence for FAC 2.

Note: *1. Do not reset the FACs with the C/Bs.*
2. If the CAT 3 DUAL INOP SYS is associated to another ECAM message (in particular ADR FAULT or IR FAULT...), it means that the root cause is not an ADR or IR rejection by FAC or FMGC. And consequently the AP switch or FAC reset will not clear the CAT 3 DUAL inop.

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AIRCRAFT SYSTEMS

AUTO FLIGHT - FLIGHT AUGMENTATION

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GENERAL

Ident.: DSC-22_40-10-00000840.0001001 / 24 FEB 15
Applicable to: ALL

The aircraft has two flight augmentation computers (FACs) that perform four main functions:

- Yaw function
  - Yaw damping and turn coordination
  - Rudder trim
  - Rudder travel limitation
- Flight envelope function
  - PFD speed scale management
    - Minimum/maximum speed computation
    - Maneuvering speed computation
  - Alpha-floor protection
- Low-Energy Aural Alert function
- Windshear detection function

In performing these functions the FAC uses independent channels :

Yaw damper
Rudder trim
Rudder travel limit
Flight envelope

Each FAC interfaces with the elevator aileron computers (ELAC s) when the AP s are disengaged, or with the FMGS when at least one AP is engaged.
Both FACs engage automatically at power-up.
The pilot can disengage or reset each FAC (in case of failure) by means of a pushbutton on the flight control overhead panel.
When a FAC is disengaged (FAC pushbutton set off) but still valid, the flight envelope function of the FAC remains active.
If both FAC s are valid, FAC 1 controls the yaw damper, turn coordination, rudder trim, and rudder travel limit, and FAC2 is in standby.
FAC 1 keeps the aircraft within the flight envelope through FD 1 ; FAC 2 performs this function through FD2.
If a failure is detected on any channel of FAC 1, FAC2 takes over the corresponding channel.

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YAW DAMPING

Ident.: DSC-22_40-20-00000851.0001001 / 18 MAR 11
Applicable to: ALL

Yaw damping stabilizes the aircraft in yaw and coordinates its turns.
In automatic flight (AP engaged) during takeoff and go around, it assists rudder application after an engine failure (short-term yaw compensation).

Note: *When the AP is engaged, the FMGS sends orders to the FAC to give :*
- *Yaw damping during approach*
- *Yaw control for runway alignment in ROLL OUT mode*

RUDDER TRIM

Ident.: DSC-22_40-20-00000855.0001001 / 09 DEC 09
Applicable to: ALL

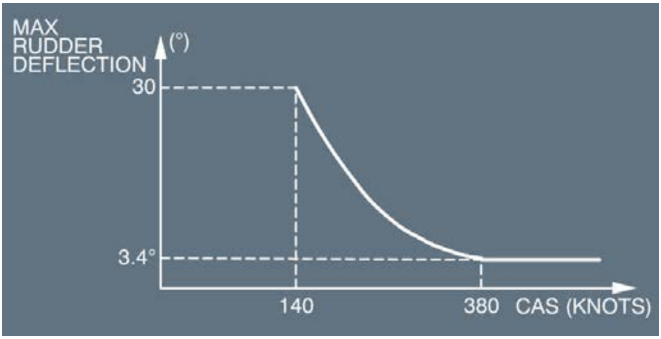
The rudder trim function :
- Executes trim orders, entered by the pilot by using the manual trim knob.
- When AP is engaged
  - ■ executes trim orders from the FMGS.
  - ■ Assists the system in recovering from engine failure (long-term yaw compensation) in all flight guidance modes.
  - ■ If the pilot pushes the rudder more than 10 ° out of trim, it disengages the AP.

  Note: *When the AP is engaged, the rudder trim knob is inoperative : the master FMGC sends rudder trim orders to the FAC.*

RUDDER TRAVEL LIMITATION

Ident.: DSC-22_40-20-00000857.0003001 / 01 OCT 12
Applicable to: ALL

This function limits rudder deflection is based on speed in order to avoid high structural loads. It is governed by the following law :



If both FACs lose the rudder travel limitation function, the value of the rudder deflection limit is locked at the time of the second failure.
When the slats are extended, the FACs automatically set the rudder deflection limit at the low-speed setting (maximum authorized deflection).

GENERAL

Ident.: DSC-22_40-30-00000859.0001001 / 09 DEC 09
Applicable to: ALL

As long as one Flight Augmentation Computer (FAC) is valid, it governs the flight envelope function, the rudder position display, and the rudder trim indication regardless of what the flight crew does with the FAC pushbutton.

PFD SPEED SCALE MANAGEMENT

Ident.: DSC-22_40-30-00000860.0001001 / 21 MAR 17
Applicable to: ALL

The FAC controls the speed scale on the PFD (*Refer to DSC-31-40 Attitude Data*).
When both FAC s are operative, FAC 1 supplies data to PFD 1 and FAC 2 supplies it to PFD2.

The FAC computes:
- The minimum and maximum speeds:
  - VSW (stall warning)
  - VLS
  - VFE and VFE for the next configuration
  - VLE
  - VMO /MMO
- The maneuvering speeds:
  - Green Dot Speed
  - S speed
  - F speed

The FAC also computes the speed trend and displays it as an arrow on the PFD speed scale.
The PFD displays these various speeds as appropriate, and they also go to the FMGC to be used as limits for various guidance modes.

Note: *The principle of the speed computation is as follows:*
- *First, the FAC computes VS1G (stall speed). From VS1G it computes the Gross Weight (GW) which is also sent to the Elevator Aileron computers:*
  - *When the aircraft is below 14 500 ft and 250 kt, it computes this from current angle of attack, speed/Mach, altitude, thrust, and CG.*
  - *When the aircraft is above 14 500 ft or 250 kt, it computes this out of the GW , which it has memorized and updated with a fuel consumption model set in the FAC.*
- *Finally the FAC computes the various minimum and maneuvering speeds, Vα prot and Vsw.*
- *The accuracies of the various minimum and maximum speeds are functions of the accuracy with which the FAC computes aircraft gross weight. Normal accuracy for VLS in CONFIG FULL is about ± 3 kt.*

ALPHA-FLOOR PROTECTION

Ident.: DSC-22_40-30-00006198.0015001 / 17 MAR 17
Applicable to: ALL

Alpha-floor protection automatically sets the thrust at TOGA thrust, when the aircraft reaches a very high angle of attack.
The Flight Augmentation Computer (FAC) generates the signal that triggers the alpha-floor mode. This, in turn, sets TOGA thrust on the engines, regardless of the thrust lever positions (*Refer to DSC-22_30-90 A/THR Modes - General*).

The FAC sends this signal when:
- The angle of attack is above a predetermined threshold, that is a function of the configuration.
- In CONF 3 and CONF FULL, this threshold decreases as a function of the aircraft deceleration rate (down to – 3 °).

Alpha-floor is available from lift-off until the aircraft reaches 100 ft RA in approach.

Note: *The αfloor is activated through the A/THR system, when:*
- *α is greater than αfloor (9.5 ° in configuration 0; 15 ° in configuration 1, 2; 14 ° in configuration 3; 13 ° in configuration FULL), or*
- *Sidestick deflection is greater than 14 ° nose up, with either the pitch attitude or the angle-of-attack protection active.*
  The αfloor function is available from lift-off to 100 ft RA before landing.

Alpha-floor is inhibited above M 0.6.

Note: - *Alpha-floor is lost, when one of the following combinations of failures occurs:*
SFCC 1 and FAC2, or
SFCC 2 and FAC1, or
Both FCU channels, or
1 EIU, or
Both FMGCs.
- *Alpha-floor is lost under alternate or direct flight control law.*
- *Alpha-floor is lost in engine-out, when slats/flaps are extended.*

LOW - ENERGY AURAL ALERT

Ident.: DSC-22_40-30-00006197.0001001 / 24 FEB 15
Applicable to: ALL

An aural low-energy “SPEED SPEED SPEED” alert, repeated every 5 s, warns the pilot that the aircraft’s energy level is going below a threshold under which he has to increase thrust, in order to regain a positive flight path angle through pitch control.

It is available in Configuration 2, 3, and FULL. The FAC computes the energy level with the following inputs:
- Aircraft configuration
- Horizontal deceleration rate
- Flight path angle.

The aural alert is inhibited when:
- TOGA is selected, or
- Below 100 ft RA, or
- Above 2 000 ft RA, or
- Alpha-floor, or the ground proximity warning system alert is triggered, or
- In alternate or direct law, or
- If both radio altimeters fail.

During deceleration, the low-energy aural alert is triggered before alpha floor (unless alpha floor is triggered by stick deflection). The amount of time between the two alerts depends on the deceleration rate.

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WINDSHEAR DETECTION FUNCTION

Ident.: DSC-22_40-40-00006194.0001001 / 07 JUL 11
Applicable to: ALL

The windshear detection function is provided by the Flight Augmentation Computer (FAC) in takeoff and approach phase in the following conditions:
- At takeoff, 3 s after liftoff, up to 1 300 ft RA
- At landing, from 1 300 ft RA to 50 ft RA
- With at least CONF 1 selected.

The warning consists of:
- A visual “WINDSHEAR” red message displayed on both PFDs for a minimum of 15 s.
- An aural synthetic voice announcing “WINDSHEAR” three times.

WINDSHEAR DETECTION PRINCIPLES

Ident.: DSC-22_40-40-00006195.0001001 / 23 JUN 15
Applicable to: ALL

The FACs generate the windshear warning whenever the predicted energy level for the aircraft falls below a predetermined threshold.
In computing this energy level prediction, the FAC s use data from different sources. From ADIRS comes data such as vertical speed, air and ground speeds and slope ; from other sources come such derived parameters as total slope, longitudinal wind gradient, and vertical wind.
The FACs express this energy level as an angle of attack and compare it with an angle-of-attack threshold above which windshear conditions are most likely and pilot action is required.

GUIDANCE

Ident.: DSC-22_40-40-00006196.0001001 / 09 DEC 09
Applicable to: ALL

In windshear conditions, flight guidance acts on specially adapted FD pitch orders received from the speed reference system (SRS). The pilot must set go around thrust immediately (which also triggers the FD SRS mode), and follow the pitch order to execute the optimum escape maneuver.

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FAC ENGAGEMENT

Ident.: DSC-22_40-50-00000861.0001001 / 09 DEC 09
Applicable to: ALL

Refer to DSC-27-10-20 Yaw Control - General

RUDDER TRIM OPERATION

Ident.: DSC-22_40-50-00000862.0001001 / 09 DEC 09
Applicable to: ALL

Refer to DSC-27-10-20 Yaw Control - General

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AIRCRAFT SYSTEMS

AUTO FLIGHT - AOC FUNCTIONS

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PRELIMINARY PAGES - TABLE OF CONTENTS

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GENERAL

Ident.: DSC-22_45-00000864.0001001 / 18 MAR 11
Applicable to: ALL

The FMS AOC function gives an interface between a ground station and one onboard FMGC , allowing data transmission between these two computers via the ACARS Management Unit or the ATSU.

Two different sets of message can be exchanged:

UPLINK messages from the ground station. They consist in reception of data requested or directly sent to the crew.

DOWNLINK messages from the FMGC (master). They consist in reports or requests sent to the ground station.

The FMGS /ACARS or FMGS /ATSU interface enables the following AOC capabilities.
- F-PLN initialization (flight plan and performance data)
- Takeoff data
- Wind data
- Flight reports
- Broadcast data

Crews can send message using ACARS FUNCTION pages or relevant MCDU pages.
Only one FMGC talks to the ground station. This FMGC is called FMGC “master”.

GENERAL SCRATCHPAD MESSAGES

NOT XMITTED TO ACARS:	A crew request or report was sent to the ground but the communication was not established or not acknowledged.
NO ANSWER TO REQUEST :	A crew request was previously sent to the ground and no answer (uplink message) was received within 4 min.

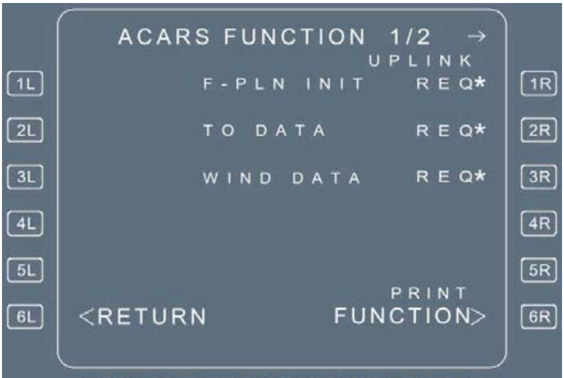
FLIGHT PLAN INITIALIZATION FUNCTION

Ident.: DSC-22_45-00000865.0001001 / 18 MAR 11
Applicable to: ALL

This function enables lateral and vertical flight plan data as well as initialization data to be exchanged between the aircraft and a ground station. The aircraft may send flight plan requests for active and secondary flight plan. (downlink messages). The ground station may send flight plan and initialization data (uplink messages) either under aircraft request or automatically without any request.
Each uplink message concerns either the active or secondary flight plan but never both flight plans at the same time. The data sent to the aircraft are checked for flight plan consistency.
A MCDU message comes up when an uplink message is received. “ACT (or SEC) RTE UPLINK”.

If an error prevents the decoding process of the message, “INVALID RTE UPLINK” is displayed on MCDUs.
An uplink message can be routed to the active flight plan if no engine is started and no active flight plan exists. Otherwise, it is routed to the secondary. The crew will insert it into the secondary flight plan or will reject it using the CLR key.

Note: *The flight plan may also be initialized using the ACARS FUNCTION page selected from DATA INDEX page.*



ACARS FUNCTION PAGE 1
(FROM DATA INDEX)

PERFORMANCE DATA

On ground and before engine start, the ground station may also send performance data to the aircraft.
Performance data are always associated with the uplink flight plan. It is either automatically inserted with the active flight plan data, or stored in the secondary with the corresponding flight plan.
This message contains part or all of the following data:
ZFW, ZFWCG, taxi fuel, block fuel, cruise flight level, tropopause altitude, cruise temperature, transition altitude, cost index, performance factor.

Note: *After engine start an uplink performance data message is rejected automatically without any scratchpad message.*

SCRATCHPAD MESSAGES RELATED TO FLIGHT PLAN AND PERFORMANCE

INVALID RTE UPLINK	An error is detected, the uplink message is rejected.
ACT or SEC RTE UPLINK	A F-PLN is stored in the active or secondary flight plan.

FLT NUMBER UPLINK	FLT NBR has been initialized within a F-PLN message without previous request.
CHECK FLT NUMBER	The uplinked FLT NBR differs from the one specified in the request.
CHECK CO RTE	The uplinked CO RTE ident differs from the one specified in the request.
INVALID FLT NBR UPLINK	The uplink contains a valid F-PLN but the FLT NBR is invalid.
PERF DATA UPLINK	Performance data is received
INVALID PERF UPLINK	Performance uplink message has been rejected
RTE DATALINK IN PROG	A flight plan modification is performed after a F-PLN INIT request has been sent; this message is displayed until the uplink is received.
UPLINK INSERT IN PROG	This message is displayed during insertion of a Flight Plan.

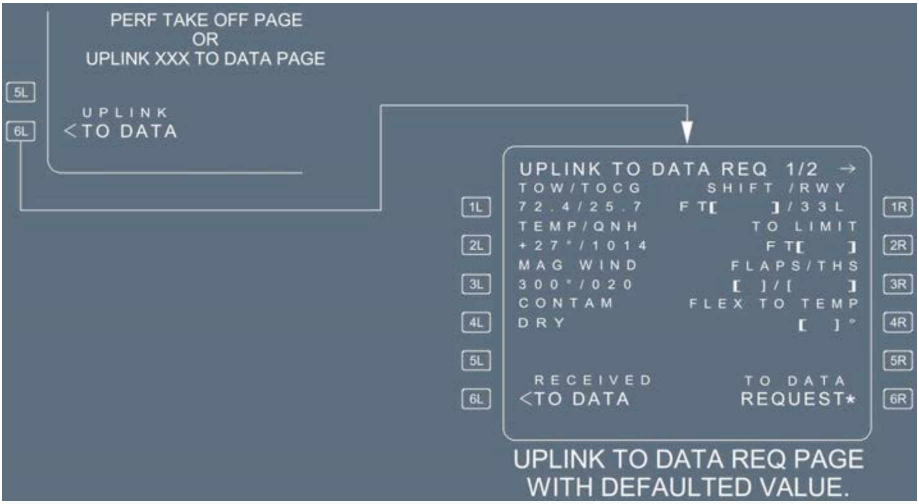
TAKEOFF DATA FUNCTION

Ident.: DSC-22_45-00000866.0001001 / 18 MAR 11
Applicable to: ALL

The takeoff data function is available for the active flight plan only. It is used to request to the ground station, information data for up to 2 runways and to receive this data for up to 4 runways.
The crew sends a request indicating the departure airport, runway idents, CG , GW and weather conditions (such as BARO setting wind, temperature...). In response he receives the takeoff speeds for up to 4 runways but only one set of data may be inserted in the active flight plan for the selected active runway.
Takeoff speeds are computed for max and flex takeoff.

The takeoff data function has required the modification of the standard PERF TAKEOFF page and the addition of 2 news pages:
- UPLINK TO DAT REQ page that enables the crew to specify a request to the ground.
- UPLINK XXX TO DATA page (XXX for MAX or FLEX)

These 2 pages are accessed from the PERF TAKEOFF page in PREFLIGHT and DONE phase only.



SCRATCHPAD MESSAGES RELATED TO TAKEOFF DATA

TAKEOFF DATA UPLINK	:	Takeoff data uplink message is received
INVALID TAKEOFF UPLINK	:	The UPLINK message is rejected

WIND DATA FUNCTION

Ident.: DSC-22_45-00000867.0001001 / 18 MAR 11
Applicable to: ALL

This function enables the crew to request and to receive forecasted winds associated to the active or secondary flight plan.
The uplink message (ground station to aircraft) may be received upon crew request or automatically without crew request.
The request is initiated from WIND pages or from ACARS FUNCTION page (*Refer to DSC-22_20-70 Wind Data - Request for Wind Data*).

The uplink wind data when received are directly displayed on the wind pages but not inserted in the flight plan, one set for each flight phase: CLIMB, CRUISE, DESCENT. The alternate wind at alternate cruise flight level is displayed on DESCENT page.
- Winds are associated to altitude for climb an descent phases
- Winds are associated to waypoint for cruise phase and step level. One wind per waypoint.
  - On ground and without entered winds, an uplink message is directly inserted in the flight plan.
  - In flight, winds are temporary stored until the crew inserts it phase per phase.
    Phase of flight is indicated in the WIND title page.
  - Clearing the INSERT UPLINK* prompt using the CLR key deletes the uplink wind data for the selected phase.

When uplink winds are deleted, the wind page reverts to the previous status.
The flight plan B page is modified of the uplink wind only after it is inserted by the crew. AOC uplink winds are then considered as crew manual entries (large font).

SCRATCHPAD MESSAGES RELATED TO WIND DATA

INVALID WIND UPLINK	An error is detected, the uplink is rejected.
WIND DATA UPLINK	Uplinked winds are received.
WIND UPLINK PENDING	A temporary flight plan exists or a DIR TO page is displayed when a wind uplink is received. The message is stored.
WIND UPLINK EXISTS	A F-PLN modification (active or secondary) is attempted when uplink winds are not inserted. This message disappears automatically when the wind uplink is inserted or deleted.
CHECK DEST DATA	The aircraft is at 180 NM from destination, and the destination QNH , TEMP or WIND displayed on the PERF APPR page was received by AOC uplink or, if following insertion of a descent wind uplink, a conflict concerning the above parameters exists.
CHECK ALTN WIND	The uplinked alternate cruise flight level differs from the default alternate cruise flight level.

FLIGHT REPORTS

Ident.: DSC-22_45-00000868.0001001 / 01 OCT 12
Applicable to: ALL

Flight reports provide real time information to the ground concerning the aircraft current situation and position.

Several types of flight reports are available:
- The Position report : provides current aircraft position
- the Progress report : provides data relative to the destination

- The Flight-Plan report : provides the active route
- the Performance Data report : provides performance data currently used by FMS.

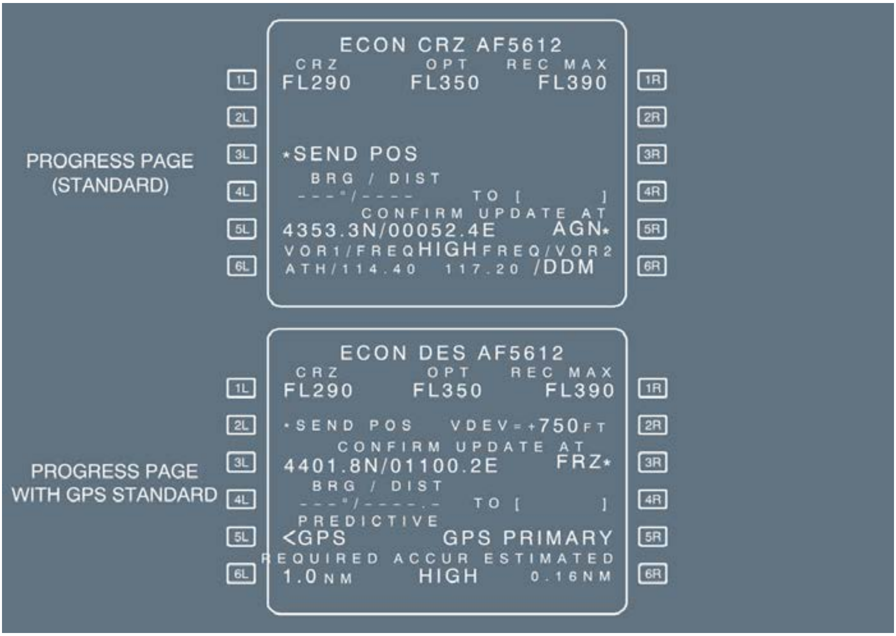
These reports may be manually initiated via a dedicated prompt or automatically sent in response to a ground request or upon specific conditions.

POSITION REPORT

This report is sent:

- manually via a MCDU prompt or
- following a ground request or
- automatically upon sequencing a designated reporting fix (designated by the ground in a uplink message).

The manual POSITION REPORT downlink prompt is displayed on the PROG page. (SEND POS prompt).



Note: Position report are initiated from active flight plan only.

POSITION REPORT CONTENT

- Aircraft position
- Overfly reporting waypoint
- Time of report (UTC)
- Aircraft altitude
- Next reporting waypoint
- ETA at next reporting waypoint
- Reporting waypoint following next report
- SAT
- Current wind
- Remaining fuel

PROGRESS REPORT

A progress report contains data relative to the aircraft arrival time and EFOB at destination for the active F-PLN.

This downlink message is automatically sent following:
- a ground request or
- a change of destination or
- a change of runway or
- a specific event. The possible events that can be selected in the navigation database policy file are :
  - X minutes to Top of Descent
  - Z minutes to Destination
  - ETA changes more than W minutes from the previous report.
    X, Z and W are minutes of time set in the navigation database policy file.

The progress report cannot be manually sent by the crew via a dedicated MCDU prompt.

PROGRESS REPORT CONTENT

- Flight Number
- Arrival Airport Ident
- Destination Runway Ident
- Predicted remaining fuel
- ETA at destination
- Reason for report (specific event, ground request...).

FLIGHT PLAN REPORT

The F-PLN report broadcasts flight plan data to the ground. Only data from the active flight plan can be sent.

This downlink message is sent to the ground:
- automatically following a ground request
- manually by the crew using a prompt displayed on the ACARS FUNCTION page (DSC-22_20 Auto Flight - Flight Management/50 Controls and Indicators/10 MCDU - Page Description/25 FMS2 Honeywell/ACARS Function Page). This prompt may be invalidated through the navigation database policy file.

The Flight Plan report can be downlinked either while on ground or in flight during any flight phase.

FLIGHT PLAN REPORT CONTENT

The report contains the active and alternate flight plan.

PERFORMANCE DATA REPORT

The Performance Data report is a downlink message that allows the transmission of performance data (CG , FUEL, CG ...) relative to the active F-PLN.
This message is automatically sent following a ground request. Manual sending is not possible.

PERFORMANCE DATA REPORT CONTENT

Sends to the ground:
- Current GW
- Cruise Altitude
- Current CG
- Fuel on Board
- Block Fuel
- Reserve Fuel
- Cost Index
- Top of Climb Temperature
- Climb Transition Altitude
- Tropopause Altitude
- Taxi Fuel
- ZFW
- ZFWCG

AIRCRAFT SYSTEMS

AUTO FLIGHT - PRINT INTERFACE

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PRINT FUNCTION

Ident.: DSC-22_46-00000869.0003001 / 01 APR 11
Applicable to: ALL

The print function enables several types of data and report to be printed :
- Flight plan initialization data
- Takeoff data
- Wind data
- Preflight report
- In flight report
- Post flight report

The 3 first reports may differ when automatically or manually printed for the following reason :
The automatic process prints the uplink message although the manual process prints the current active data as displayed on the relevant MCDU pages.
The last 3 reports being processed from the same sources are identical in automatic or manual printing.

Note: *ACARS is not necessary linked to printing process. The printing function may be activated within the FMGS and selected independently from the ACARS.*

- One or several print functions may be deactivated *Refer to DSC-22_20-50-10-25 Print Function Pages*.
- If an ACARS function is not active, (not selected in the nav database policy file) the printing process is invalidated for this specific ACARS function.

AOC/PRINTER PROGRAMMING OPTIONS

Ident.: DSC-22_46-00000870.0002001 / 11 FEB 11
Applicable to: ALL

Option programming for the AOC /PRINTER functions is obtained through the Navigation Data Base policy file or the Airline Modifiable Information (AMI) file.

The list summarizes the possible options:

Data Link (ACARS or AOC) Inhibit	Disables AOC function
F-PLN Data Request Inhibit	Disables uplink and downlink requests of F-PLN initialization data
Performance Data Request Inhibit	Disables uplink and downlink requests of Performance Initialization data
Takeoff Data Request Inhibit	Disables uplink and downlink request of Takeoff Initialization data
Wind Data Request Inhibit	Disables uplink and downlink request of predicted wind data

Flight Number Enable	Flight Number is included within the F-PLN Request or Progress Report downlinks
Position Report Inhibit	Disables a manual Position Report downlink
Progress Report Triggers	Defines the triggers for the automatic downlink of the Progress Report
F-PLN Report Inhibit	Disables the manual downlink of the F-PLN Report
Auto Print of ACARS or AOC uplinks	Selects/Deselects the automatic printing of the F-PLN , INIT , TO and wind data uplinks. If Autoprint is selected, the crew can deselect it manually. If auto printing is deselected, the crew cannot manually reselect it.
Auto Print of Flight Reports	Selects/Deselects the automatic printing of the Preflight, Inflight, Postflight reports. If selected, the crew can deselect it manually. If autoprint is deselected, the crew cannot manually preselected it.

AIRCRAFT SYSTEMS

COMMUNICATIONS

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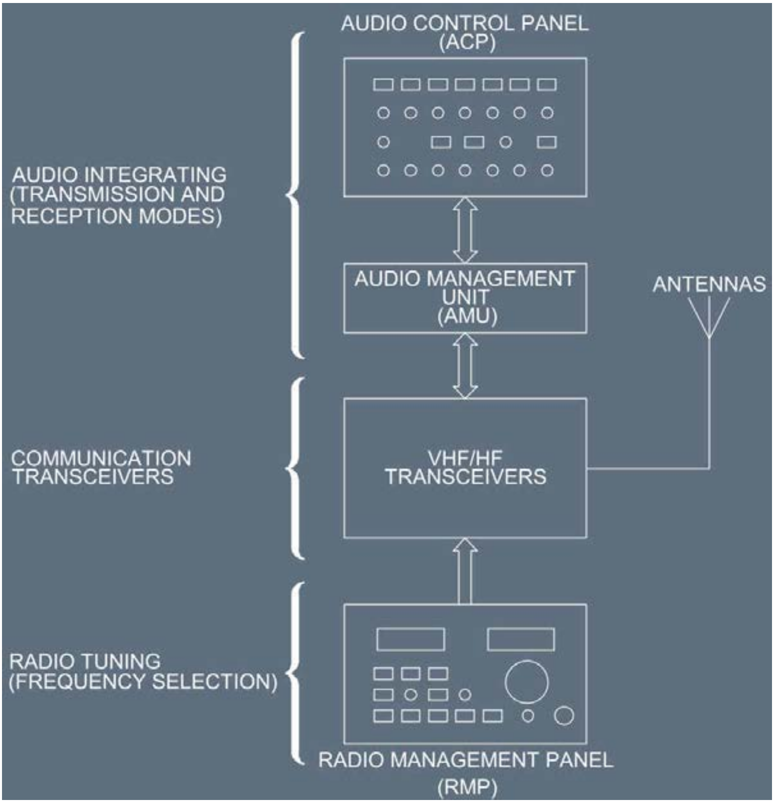
INTRODUCTION

Ident.: DSC-23-10-10-00018503.0001001 / 17 MAR 17
Applicable to: ALL

The communications system comprises the following subsystems :
- VHF/HF transceivers
- Radio tuning systems (Radio Management Panels).
- Audio integrating system (Audio Management Unit, Audio Control Panels).



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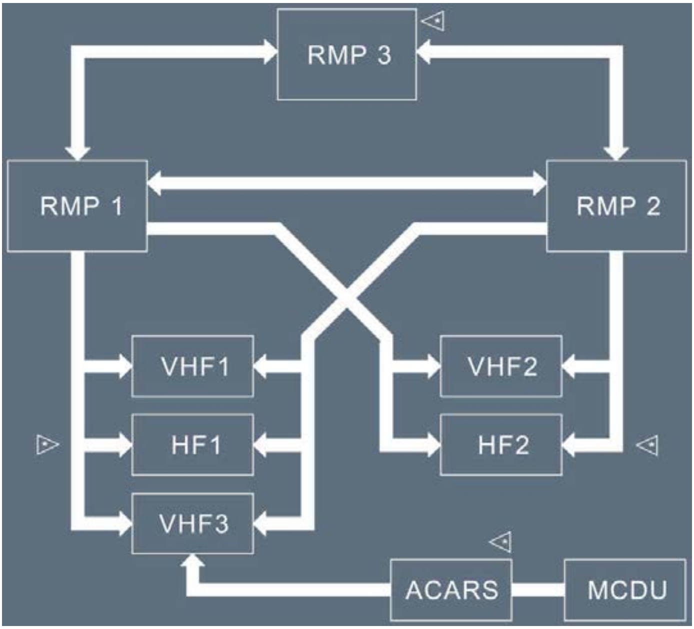
DESCRIPTION

Ident.: DSC-23-10-20-00018494.0001001 / 17 MAR 17
Applicable to: ALL

Identical Radio Management Panels (RMPs):
- Give the flight crew control of all VHF radio communication systems (HF systems).
- Provide backup to the FMGCs for controlling radio navigation systems (*Refer to DSC-34-NAV-30-10 General*).

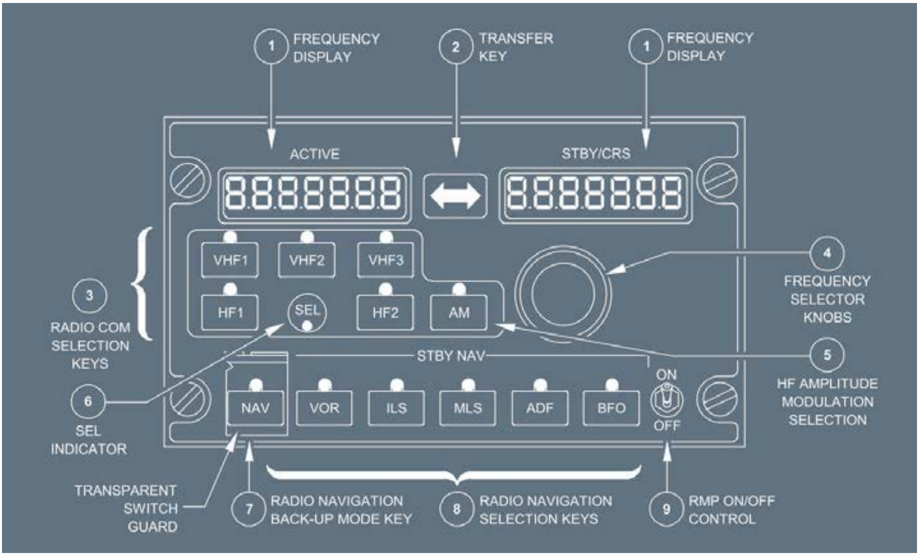
The two RMPs are on the center pedestal (and the third is on the overhead panel).
Each RMP can control any VHF (HF) transceiver. RMP 1 and RMP 2 are connected directly to all VHF (HF) transceivers, (whereas RMP3 is connected to them via RMP 1 and RMP 2). RMP s are connected together so that each RMP is updated to the selections made on the other RMPs.
Only RMP1 functions in EMER ELEC CONFIG.



If one RMP fails, the remaining one controls all the VHF (HF) transceivers.

RADIO MANAGEMENT PANEL

Ident.: DSC-23-10-20-00018495.0001001 / 22 MAR 17
Applicable to: ALL



(1) Frequency displays
The ACTIVE display window shows the active frequency of the selected radio, which is identified by a green light on the selection key.
The STBY /CRS (standby/course) display window shows a standby frequency that the pilot can activate by pressing the transfer key or change by rotating the tuning knobs. (For a description of the CRS function *Refer to DSC-34-NAV-30-30 Radio Management Panel (RMP)*).

(2) Transfer key
Pressing this key moves the active frequency to the standby window and the standby frequency to the active window.
This tunes the selected receiver to the new active frequency.

(3) Radio com selection keys

When the pilot presses one of these keys:
- The ACTIVE window displays the frequency set on that radio.
- The STBY /CRS window displays the selected standby frequency or course.
- The selected key displays a green monitor light.

(4) Frequency selector knobs
The pilot uses these concentric knobs to select the STBY frequency or CRS.
The outer knob controls whole numbers; the inner knob controls decimal fractions.

(5) AM pushbutton
If the aircraft has HF radios and the flight crew has selected an HF tranceiver, this switch selects the AM mode. (The default mode is the SSB, or single side-band mode).
This key displays a green monitor light when the AM mode is active.

(6) SEL indicator

The SEL indicator on both RMP s comes on amber when a transceiver, normally associated with one RMP, is tuned by another:
- If 2 RMP installed:
  - VHF 1 (VHF3, , HF1), tuned by RMP2,
  - VHF 2 (HF2), tuned by RMP1.
- If 3 RMP installed:
  - VHF 1 tuned by RMP 2 or RMP3,
  - VHF 2 tuned by RMP 1 or RMP3,
  - VHF 3, HF 1, (HF2) tuned by RMP 1 or RMP2.

(7) NAV pushbutton (with transparent switchguard)
The pilot presses this key to select navigation receivers and courses through the RMP.
It does not affect the selection of communication radios and their frequencies. (*Refer to DSC-34-NAV-30-30 Radio Management Panel (RMP)*, for additional information).

(8) Radio navigation selection keys
The pilot presses one of these keys to select a navigation radio to control through this RMP.
This turns on the key's green monitor light.
Refer to DSC-34-NAV-30-30 Radio Management Panel (RMP), for additional information.

(9) ON/OFF switch
This switch controls the RMP power supply.

Note: *RMP 3 is able to control VHF and HF transceivers through RMP 1 and RMP2 even when either of the latter is OFF.*

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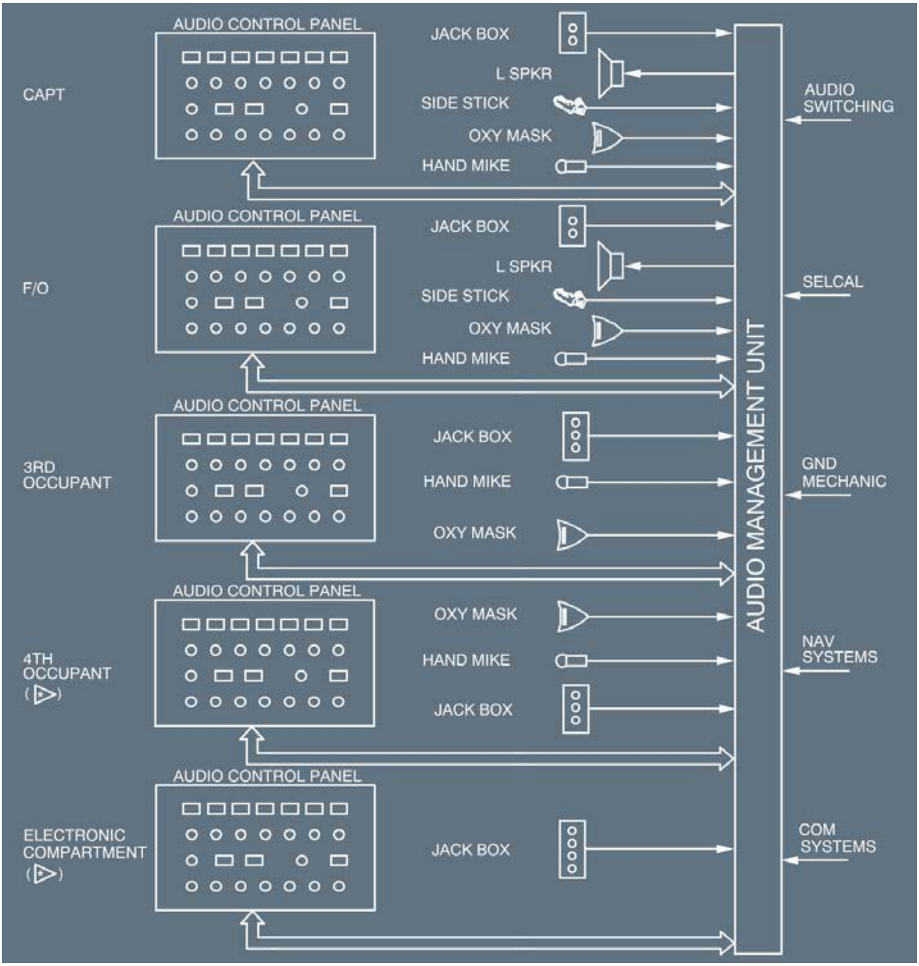
AUDIO MANAGEMENT SYSTEM

Ident.: DSC-23-10-30-00018496.0001001 / 17 MAR 17
Applicable to: ALL

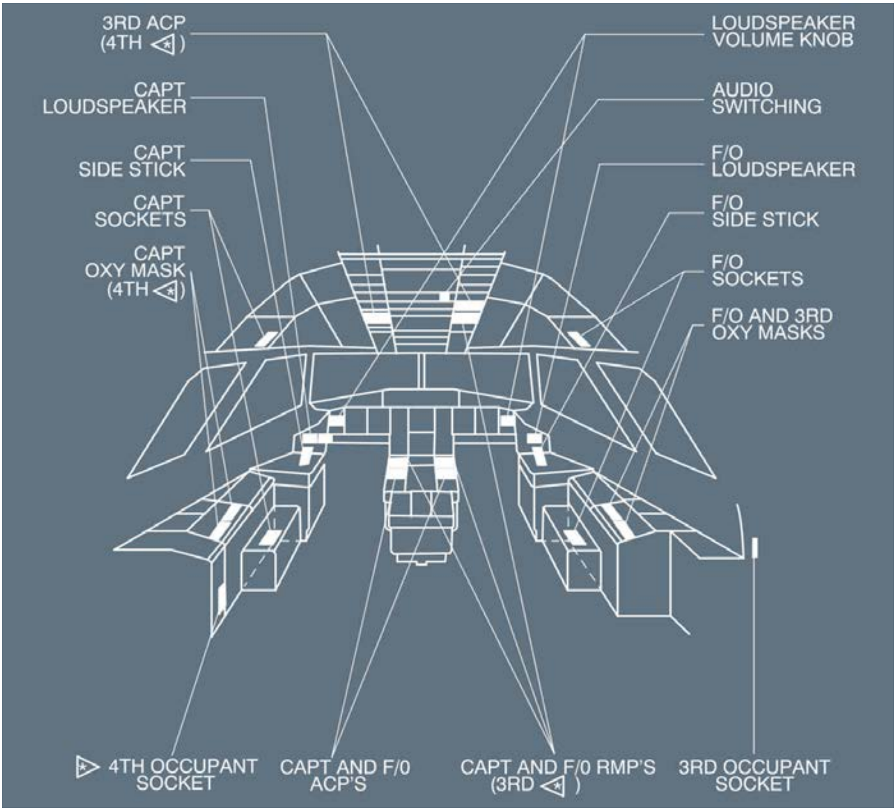
The audio management system allows the flight crew to use :
- All the radio communication and radio navigation facilities installed on the aircraft in transmission and reception mode.
- The interphone systems
- The call systems
- The passenger address system

The audio management system includes :
- An audio management unit (AMU)
- Three audio control panels (ACPs) (fourth and fifth optional)
- Sockets at each station
  - Headset jack and boomset connector (hand microphone connector ◁✻) for pilot, copilot, and third occupant
  - Headset jack for fourth occupant
- One interphone jack at the ground power receptacle
- Boomsets for the pilot, copilot, and third occupant, and three hand microphones (fourth ◁✻)
- Three cockpit oxygen mask microphones
- One radio press-to-talk switch on each sidestick
- One SELCAL code selection panel (avionics compartment)
- Two cockpit loudspeakers with separate volume controls
- If installed, a jack panel in the electronic compartment that groups the headset jack, service interphone jack, hand mike connector, and boomset
- An audio switching facility

If audio channel 1 or 2 fails due to a failure either in an ACP or the corresponding AMU, the crew can use the AUDIO SWITCHING selector to select the third audio channel.


AUDIO CONTROL PANEL
CAPT
JACK BOX
L SPKR
SIDE STICK
OXY MASK
HAND MIKE
AUDIO CONTROL PANEL
F/O
JACK BOX
L SPKR
SIDE STICK
OXY MASK
HAND MIKE
AUDIO CONTROL PANEL
3RD OCCUPANT
JACK BOX
HAND MIKE
OXY MASK
AUDIO CONTROL PANEL
4TH OCCUPANT
OXY MASK
HAND MIKE
JACK BOX
AUDIO CONTROL PANEL
ELECTRONIC COMPARTMENT
JACK BOX
AUDIO MANAGEMENT UNIT
AUDIO SWITCHING
SELCAL
GND MECHANIC
NAV SYSTEMS
COM SYSTEMS

LOCATION OF COMPONENTS (PILOT'S STATION)



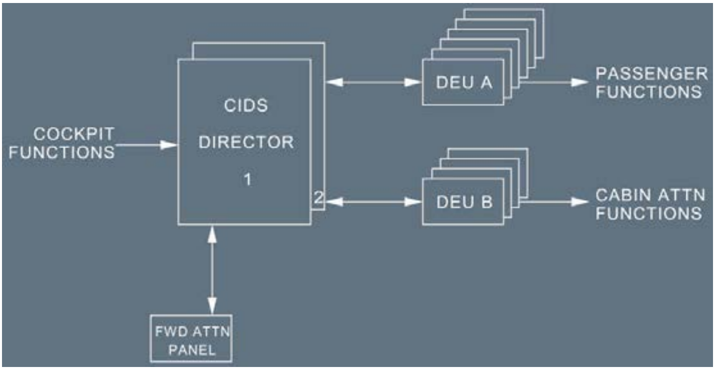
CABIN INTERCOMMUNICATION DATA SYSTEM

Ident.: DSC-23-10-30-00018497.0001001 / 17 MAR 17
Applicable to: ALL

The Cabin Intercommunication Data System (CIDS) transmits, controls, and processes signals for the following cabin systems:
- Cabin and service interphone
- Passenger address
- Passenger lighted signs
- Reading light
- General cabin illumination

- Emergency evacuation signalling
- Lavatory smoke indication
- Passenger entertainment music and video ◁
- Escape slide bottle pressure monitoring ◁

The CIDS has the following main components:
- Two CIDS directors connected in parallel, one active, and the other on standby.
- Forward attendant panel for control of the cabin systems.
- Programming and test module that allows the system to be reprogrammed after changes are made in the cabin configuration.



Decoder/Encoder Units (DEUs) linked to the two directors.
- Type A units (for passengers) installed along each side of the passenger cabin.
  The loudspeakers, lighted signs, call buttons, call lights and general illumination ballast units are divided into small groups, each connected to a type A DEU.
- Type B units (for attendants) installed near the exit doors. The Area Call panels, attendant handsets, slide and door pressure sensors, and attendant indicator panels, are connected to type B DEUs.

DESCRIPTION

Ident.: DSC-23-10-40-00018569.0002001 / 17 MAR 17
Applicable to: ALL

The cockpit voice recorder (CVR) records :
- direct conversations between crew members in the cockpit
- all aural warnings sounded in the cockpit
- audio communications received and transmitted
- intercommunications conversations between crew members
- announcements transmitted over the passenger address system, if PA reception is selected on at least one audio control panel.

Only the last 2 h of recording are retained.

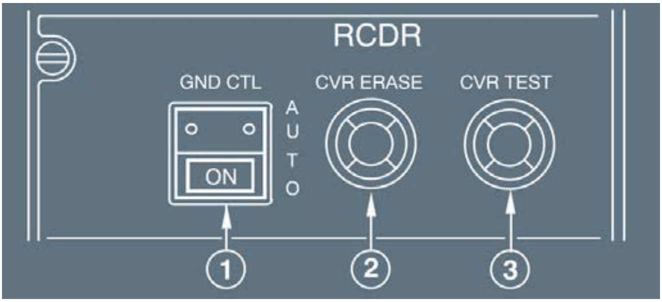
The CVR system consists of :
- a remote microphone behind the overhead panel
- a “hot mike” function, which records the crew members voice directly from their microphone, even if the push to talk switch is not activated.
- a crashproof four-track recorder, equipped with an underwater locating beacon, in the aft section of the aircraft
- a control panel on the overhead panel.

It is energized automatically :
- on the ground during the first 5 min after the aircraft electrical network is energized
- on the ground with one engine running
- in flight

On the ground, it is stopped automatically 5 min after the last engine shutdown provided the CVR jack is not used.
On the ground, the crew can energize the CVR manually by pressing the GND CTL pushbutton.

CONTROLS AND INDICATORS

Ident.: DSC-23-10-40-00018570.0001001 / 17 MAR 17
Applicable to: ALL



(1) GND CTL switch (spring-loaded)

ON : The CVR , DFDR , and QAR are on.
The ON light comes on blue.

AUTO : The CVR , DFDR , and QAR are on, according to the logic. (*Refer to DSC-23-10-40 Description*).

(2) CVR ERASE pb

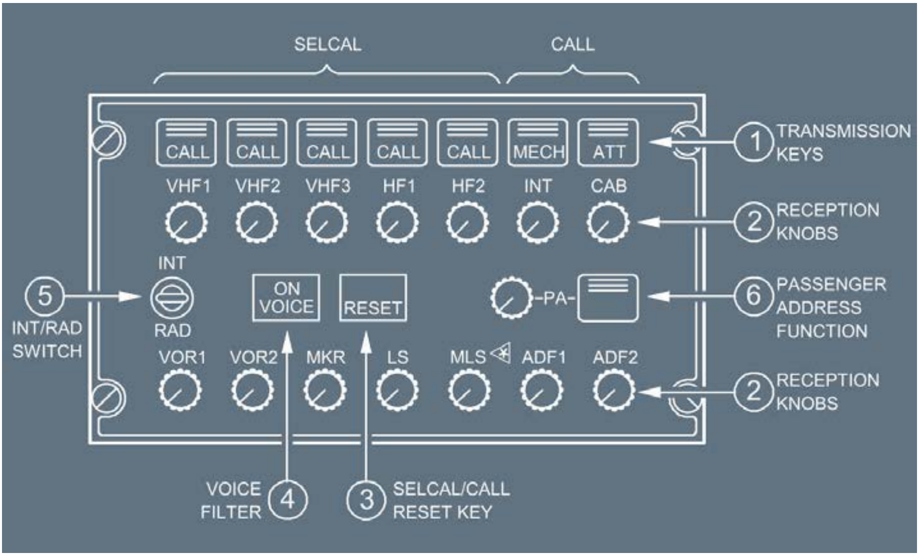
Pressed for 2 s : This completely erases the tape, if :
- The aircraft is on the ground, and
- The parking brake is on.

(3) CVR TEST pushbutton

Pressed and held : This activates the test, if the CVR is on (the GND CTL pushbutton pressed, or during the first 5 min after energization of the aircraft electrical network), and the parking brake is on.
Refer to PRO-NOR-SOP-06 Overhead Panel - RCDR for additional information.

AUDIO CONTROL PANEL

Ident.: DSC-23-10-50-00018498.0001001 / 17 MAR 17
Applicable to: ALL



(1) <u>Transmission keys</u>

Pressed	:	The associated channel is selected for transmission. The three green lines come on. The pilot deselects the channel by pressing the pushbutton again, or by selecting another channel.
CALL	:	The legend flashes amber (and buzzer sounds) when the SELCAL system detects a call.
MECH	:	The legend flashes amber (and buzzer sounds) for a call from the nose gear bay. The MECH light goes off after 60 s, if it is not reset.
ATT	:	The legend flashes amber (and buzzer sounds) for a call from a cabin attendant. The ATT light goes off after 60 s, if it is not reset.

(2) <u>Reception knobs</u>

- Pressing and releasing the knob (knob out) selects the associated audio reception channel and the integral white light comes on
- Rotating the knob adjusts the volume

- The INTEG LT knob or ANN LT knob controls the brightness
- Pressing the knob (knob stays in) disconnects the associated audio reception channel.

Note: *To receive DME audio navigation signals that are associated with an ILS or MLS station: the flight crew must select the ILS pb (or LS pb) on the FCU . On some aircraft, the VOR reception channel must also be active on the ACP.*

(3) SELCAL/CALL RESET key
Pressing this key extinguishes CALL, MECH , and ATT lights.

(4) ON VOICE key
This key allows the flight crew to inhibit the audio navigation signals (VOR , ADF)
Pressing this key filters out IDENT signals and turns on the green ON light.

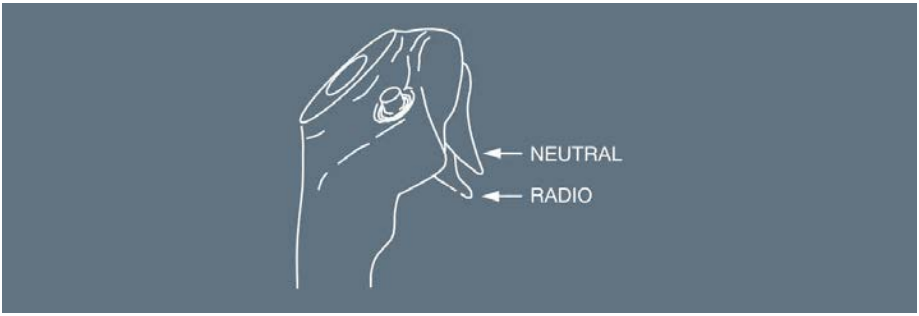
(5) INT/RAD switch
This switch operates as a press-to-talk switch for boom mike or oxygen mask mike.

INT	:	Boom and mask mikes transmit on interphone regardless of which transmission key is selected. For reception on interphone, the crew member must have INT selected (INT reception knob out).
Neutral	:	Reception is normal. Boom and mask mikes do not transmit.
RAD (press and hold)	:	Boom and mask mikes transmit on the radio selected on the audio control panel.

(6) Passenger address (PA) function
(*Refer to DSC-23-20-40 Description*)

SIDE STICK RADIO SELECTOR

Ident.: DSC-23-10-50-00018499.0001001 / 17 MAR 17
Applicable to: ALL



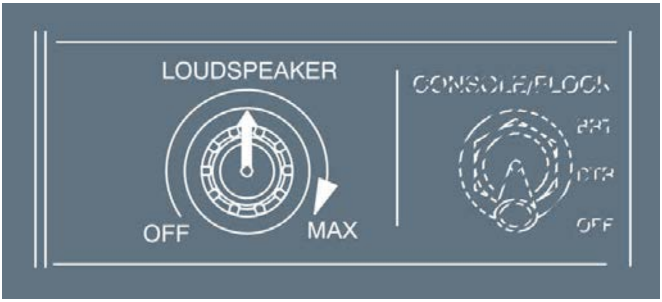
This selector has the same function as the INT/RAD switch on the ACP.

NEUTRAL (spring-loaded)	:	Boom and mask mikes are dead. Reception is normal.
RADIO (squeezed)	:	Boom and mask mikes transmit through the equipment selected by the transmission key on the ACP.

Note: *If RADIO is selected on the side stick when the INT/RAD switch is on INT, the radio function has priority over the interphone function.*

LOUDSPEAKER VOLUME KNOB

Ident.: DSC-23-10-50-00018500.0001001 / 17 MAR 17
Applicable to: ALL



This knob adjusts the volume of the loudspeaker for radio communication.

OFF	:	Loudspeaker does not respond to signals from the aircraft's radio equipment.
Clockwise rotation	:	Loudspeaker broadcasts signals from the aircraft's radio equipment at increasing volume.

Note: *This knob does not control the loudness of aural alert and voice messages.*
In the case of acoustic feedback (i.e. Larsen effect) from the cockpit loudspeaker, the flight crew should reduce the volume of the cockpit loudspeaker. However, the flight crew should ensure that the volume of the cockpit loudspeaker is sufficient to hear radio communication.

AUDIO SWITCHING

Ident.: DSC-23-10-50-00018501.0001001 / 17 MAR 17
Applicable to: ALL

The crew can switch to the third ACP if ACP 1 or ACP2 fails.
When the crew does this, it takes away the third occupant's access to the acoustic equipment.
AUDIO 3 XFRD appears in green on the ECAM MEMO display.

NORM : Each crew member uses his dedicated communication equipment.

CAPT 3: The pilot uses his acoustic equipment and the third occupant's ACP.

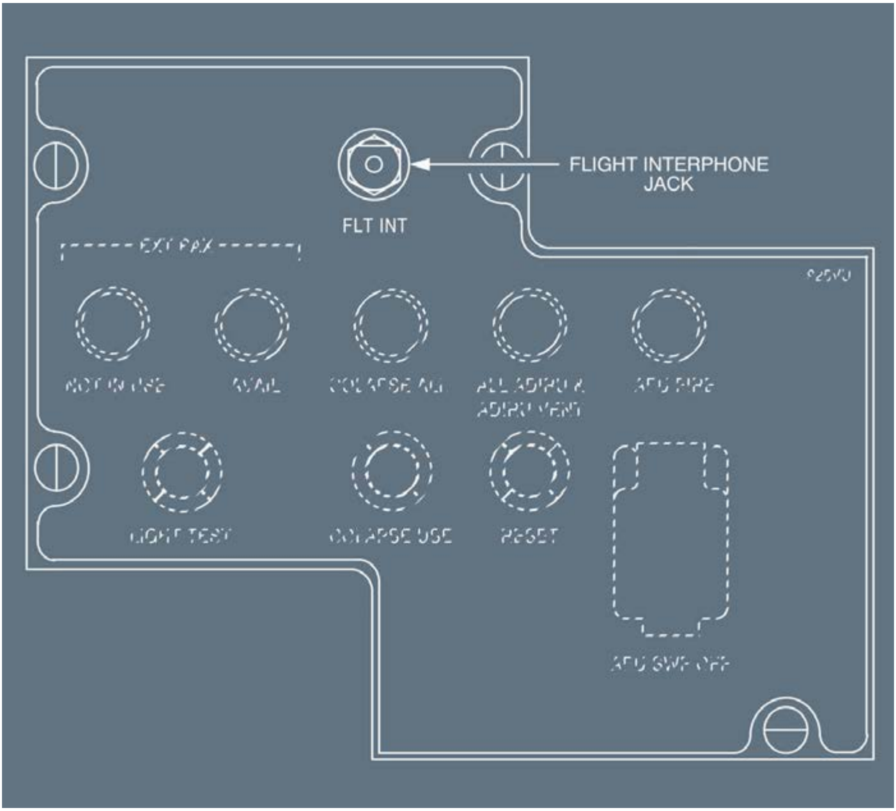
F/O 3 : The copilot uses his acoustic equipment and the third occupant's ACP.

FLIGHT CREW INTERPHONE SYSTEM

Ident.: DSC-23-20-10-00019716.0001001 / 17 MAR 17
Applicable to: ALL

This system allows the flight crew members to communicate among themselves and, through a jack on the external power panel, with the ground mechanic.

EXTERNAL POWER PANEL (FORWARD OF THE NOSE L/G BAY)



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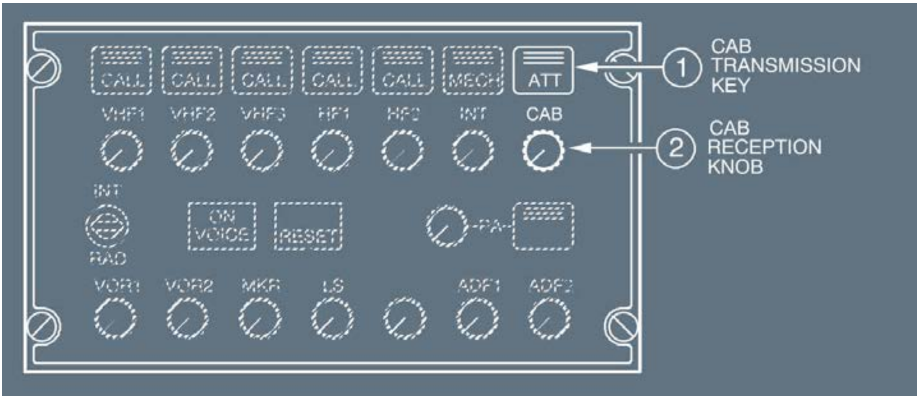
INTRODUCTION

Ident.: DSC-23-20-20-00018481.0001001 / 20 JUL 17
Applicable to: ALL

The system allows the flight crew to communicate with the flight attendants, and the flight attendants to communicate among themselves.

Note: *Cabin interphone monitoring may be deactivated in flight depending on CIDS customization.*



(1) CAB transmission key

Pressed: Three green lines come on.
Boom, mask, and hand mikes may be used for cabin interphone.

(2) CAB reception knob

Pressed and released (knob out)	:	The integral white light comes on. The station receives audio signals from the cabin. Rotating the knob adjusts the volume.
Pressed (knob in)	:	The white light goes out. The cabin interphone is disconnected.

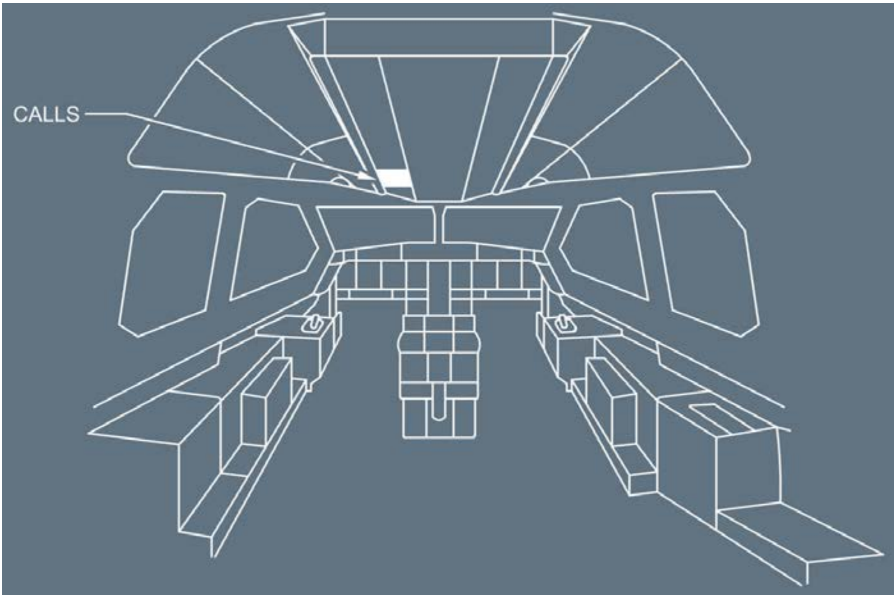
CABIN CALL SYSTEM

Applicable to: ALL

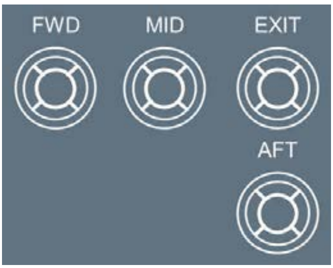
Ident.: DSC-23-20-20-10-00018482.0001001 / 02 NOV 16

CALLS FROM THE COCKPIT

The pushbuttons described here below are installed on the CALLS panel located on the overhead panel.



PURS /FWD/MID /EXIT /AFT PUSHBUTTON



When pressed, the following aural and visual alerts will trigger in the cabin:
- Two lights come on in pink on the related area of the CALLS panel, as applicable.
- On the Attendant Indication Panel (AIP), the "CAPTAIN CALL" message appears and a light comes on in green.
- A high-low chime sounds in the related section of the cabin, as applicable.

ALL pb

When pressed, all the stations simultaneously respond, as indicated above.

EMER pb-sw (GUARDED)

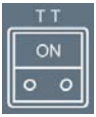
When pressed, the following aural and visual alerts will trigger in the cabin:
- Two pink lights flash on all area call panels.
- The "EMERGENCY CALL" message appears on all AIPs.
- A high-low chime sounds three times, on all of the loudspeakers.

Depending on aircraft configuration, on the cockpit CALLS panel, the white ON light and the amber CALL light come on.

The following aural and visual alerts will trigger in the cockpit, when an emergency call is made from the cabin to the cockpit:
- On the EMER pb-sw: The amber CALL light flashes.
- The ATT lights will flash on all Audio Control Panels (ACPs).
- Three buzzers will sound consecutively (for approx. three seconds each).

The cabin call system will reset, when the cabin crewmember hangs up the handset.

TT light



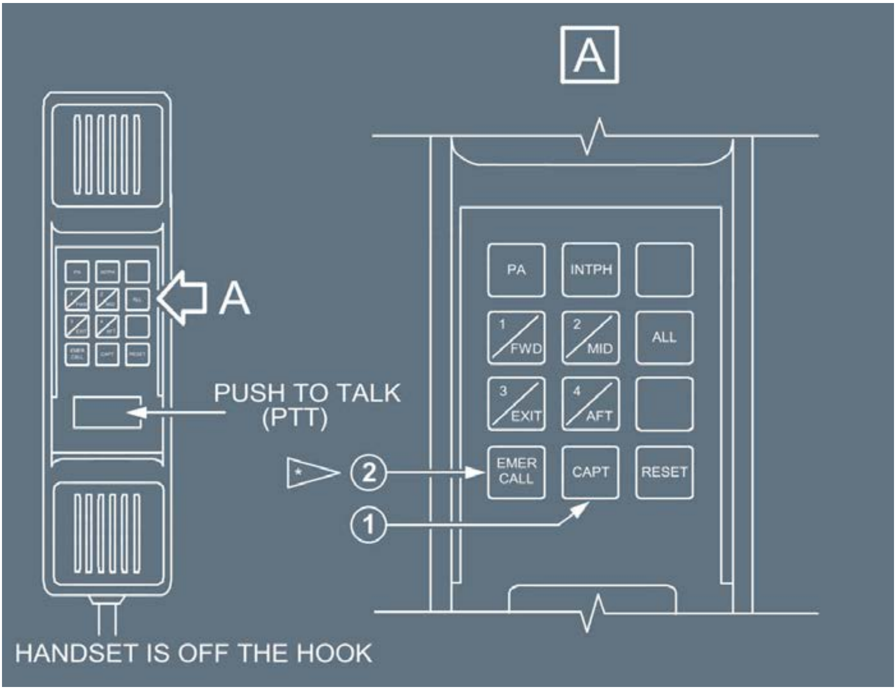
When the TT pb on the FWD or AFT Attendant Panel is pressed, the TT light on the cockpit CALLS panel comes ON and a buzzer sounds three times in the cockpit.

ATTND ADV pb

When pressed, in the case of an imminent takeoff or landing, the ON light comes on in blue, in addition to a green light on the area call panel in the cabin.

Ident.: DSC-23-20-20-10-00018483.0002001 / 17 MAR 17

CALLS FROM THE CABIN



(1) CAPT key

When pressed, the following aural and visual alerts will trigger in the cockpit:
- The ATT lights will flash on all Audio Control Panels (ACPs).
- A buzzer (inhibited during takeoff and landing) will sound.

In the cabin, the “CAPTAIN” message will appear on the Attendant Indication Panel (AIP) for which the CAPT key was pressed.

(2) EMER CALL key

When pressed, the following aural and visual alerts will trigger in the cockpit:
- On the EMER pb-sw: The ON light flashes in white, and the CALL light flashes in amber.
- The ATT lights will flash on all ACPs.
- Three buzzers (inhibited during takeoff and landing) will sound consecutively.

In the cabin, the “EMERGENCY CALL” message will appear on all AIPs or on the AIP of the originating station based on its customization.

INTRODUCTION

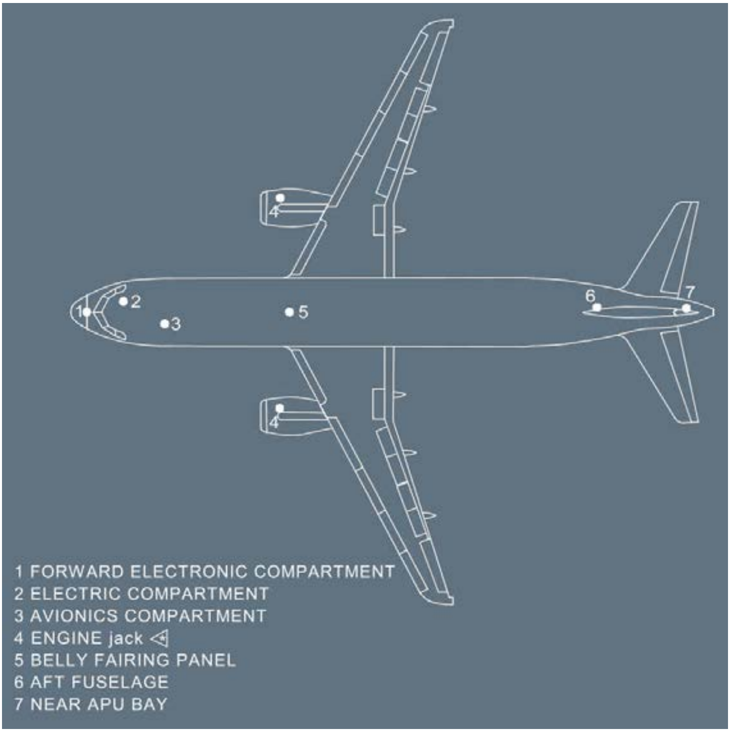
Ident.: DSC-23-20-30-00018485.0001001 / 20 JUL 17
Applicable to: ALL

The system allows for communication between :
- The flight crew and the service interphone jacks.
- The flight attendant stations and the service interphone jacks.
- The different service interphone jacks.

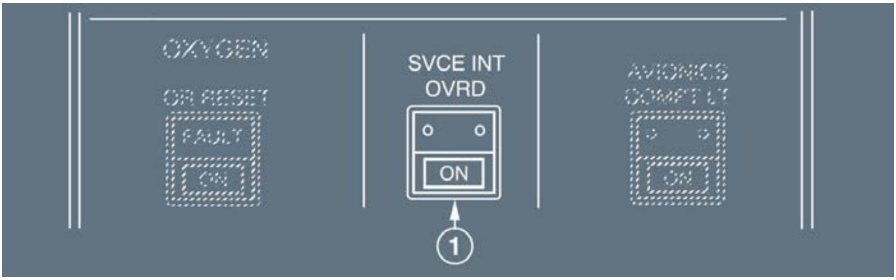
The Service Interphone system has :
- Seven interphone jacks.
- An OVRD switch located on the overhead panel.

The audio lines from the interphone jacks are connected to both CIDS directors.

LOCATION OF INTERPHONE JACKS



CONTROLS AND INDICATORS AT OVERHEAD PANEL



(1) SVCE INT OVRD pushbutton switch

Auto : Ground personnel can communicate with the flight crew by means of the service interphone jacks 10 s after the aircraft has landed. The landing gear must be compressed.

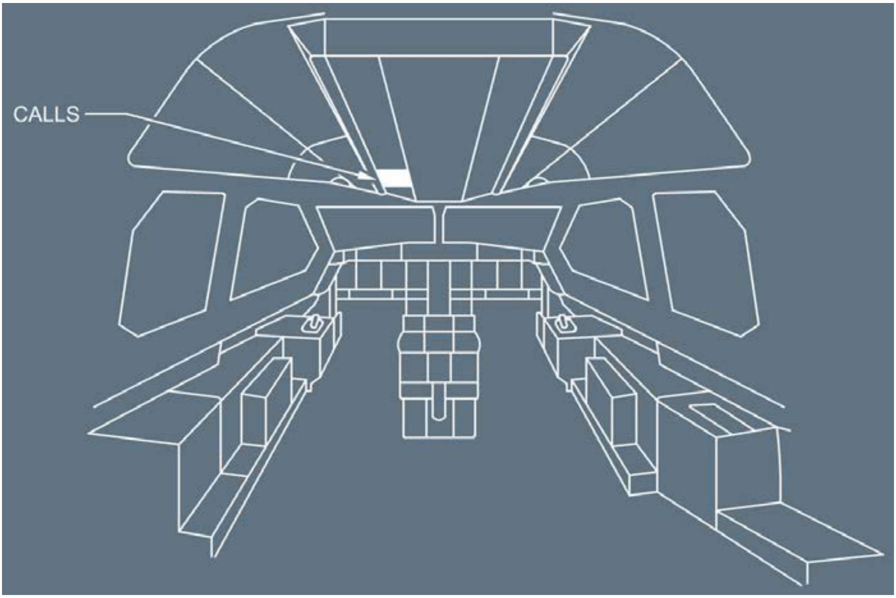
ON : Communication is possible when the landing gear is not compressed.
The ON light is white.

GROUND MECHANIC CALL SYSTEM

Applicable to: ALL

Ident.: DSC-23-20-30-10-00018486.0001001 / 17 MAR 17

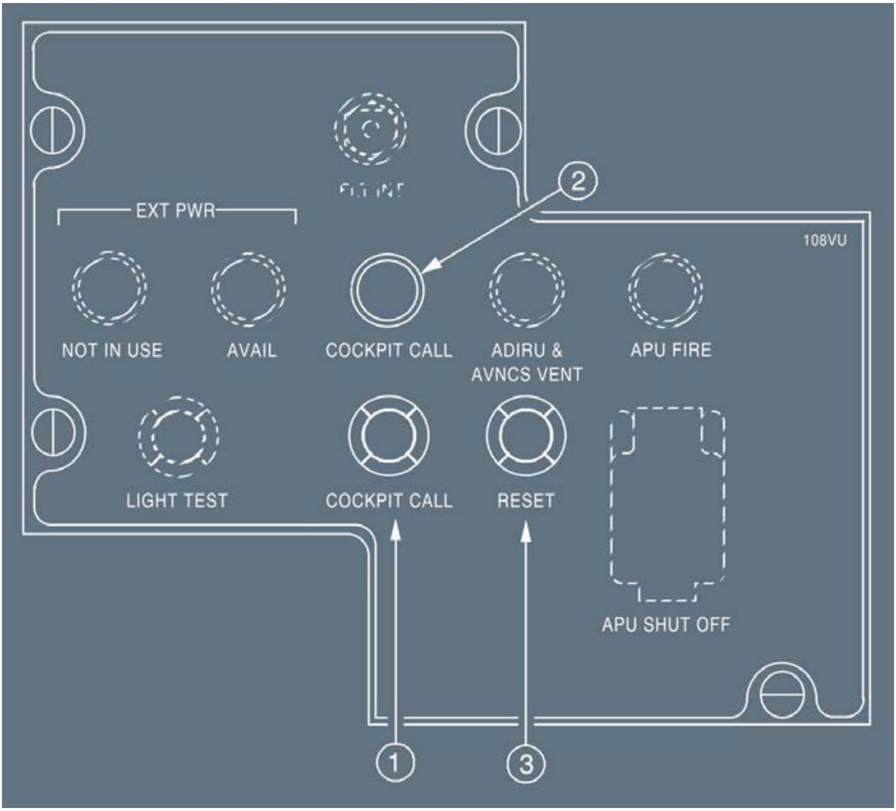
CONTROLS AND INDICATORS ON OVERHEAD PANEL



MECH pb

Pressed (and held)	:	COCKPIT CALL lights up blue on the external power panel in the nose L/G bay. An external horn sounds.
Released	:	COCKPIT CALL remains lighted. The ground mechanic can extinguish it by pressing the RESET button on the external power panel. The external horn stops sounding.

CONTROLS AND INDICATORS ON THE EXTERNAL POWER PANEL



(1) COCKPIT CALL pushbutton

Pressed : This calls the cockpit.
The MECH lights flash amber on the ACPs and a buzzer sounds.

Released : The MECH lights go out after 60 s if they are not reset on the ACPs.
The buzzer stops.

(2) COCKPIT CALL light

The blue light appears when cockpit calls the ground mechanic. An external horn also sounds.

(3) RESET pushbutton

Pressed — The COCKPIT CALL light goes out.

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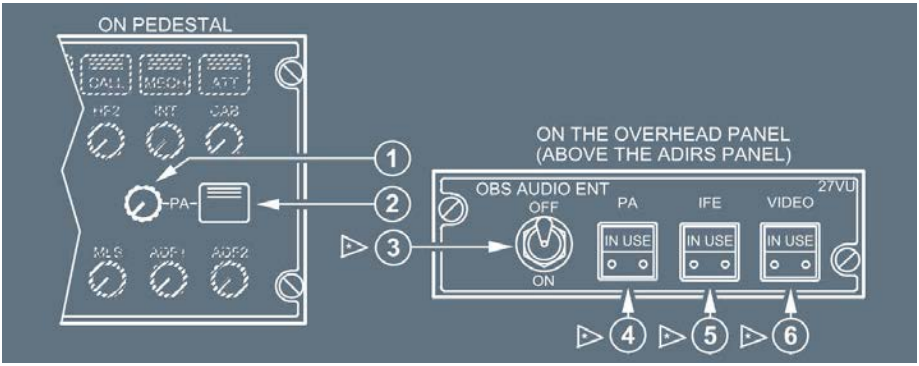
DESCRIPTION

Ident.: DSC-23-20-40-00018685.0001001 / 17 MAR 17
Applicable to: ALL

The passenger address allows all crew members to make announcements to passengers in the cabin through loudspeakers. It can be operated from the cockpit (with ACP or handset) or from the cabin (attendant stations).

CONTROLS AND INDICATORS

Ident.: DSC-23-20-40-00018686.0001001 / 20 JUL 17
Applicable to: ALL



(1) PA reception knob

Pressed and released (knob out)	:	The message goes to the loudspeakers, and the integral white light comes on. The flight crew can turn the knob to adjust the volume.
Pressed (knob in)	:	The PA reception to the loudspeakers is disconnected. The white light goes out.

(2) PA transmission key

Pressed and held	:	The flight crew may use a boom, mask, or hand mike to make an announcement. Three green lines come on.

Note: *The flight crew may use a cockpit handset to make PA announcements without action on the ACPs.*

(3) OBS AUDIO ENT sw

ON : Announcement from the cockpit can be heard through channel 9 of Passenger Entertainment System (PES).

OFF : Normal functionning of PES is restored.

(4) PAIN USE light

The light comes on when the PA is activated from the cockpit or from the cabin (cabin attendant or prerecorded announcement).

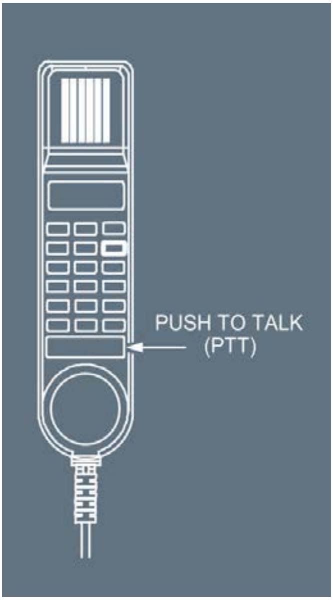
(5) IFEIN USE light

The light comes on when the IFE system is in use.

(6) VIDEO IN USE light

The light comes on when the video system is in use.

The flight crew can also use the cockpit handset, located at the bottom of the pedestal, for PA announcements.



Note: Due to numerous customizations of the handset and keypad, their functions are not described in detail.

DESCRIPTION

Ident.: DSC-23-30-10-00018475.0001001 / 17 MAR 17
Applicable to: ALL

Either of the two Radio Management Panels (RMPs) (third RMP ⊲) can be used to tune each transceiver.
To transmit, the flight crew uses the Audio Control Panel (ACP) to select a VHF or HF system. The ACP works through the Audio Management Unit (AMU). Each system is connected to the RMP s, for frequency selection, and to the AMU for connection to the audio integrating and SELCAL (selective calling) systems.

VHF

Ident.: DSC-23-30-10-00018472.0001001 / 27 APR 17
Applicable to: ALL

Two identical VHF communication systems (third VHF system ⊲) are installed.
Each system has a transceiver in the avionics compartment, and an antenna on the fuselage. Only VHF1 functions in EMER ELEC CONFIG. Its range is from 118.0 to 136.975 MHz.

HF

Ident.: DSC-23-30-10-00018473.0001001 / 17 MAR 17
Applicable to: ALL

Two identical HF communication systems are optional. Each has a transceiver in the avionics compartment, and a common tuner and antenna in the vertical stabilizer. Its range is from 2.8 to 24 MHz.

SELCAL (SELECTIVE CALLING)

Ident.: DSC-23-30-10-00018476.0001001 / 17 MAR 17
Applicable to: ALL

Upon receiving a call code corresponding to that of the aircraft, the SELCAL system aurally and visually advises the flight crew that a ground station is calling the aircraft.
The aural warning is inhibited during takeoff and landing.

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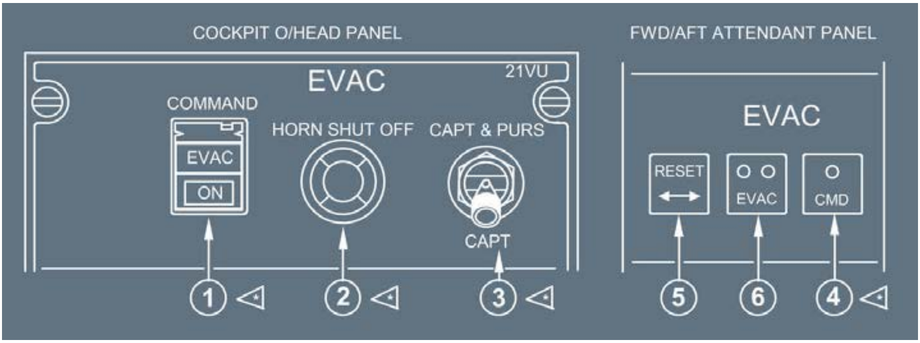
CONTROLS AND INDICATORS

Ident.: DSC-23-40-10-00018468.0001001 / 18 MAY 17
Applicable to: ALL



(1) COMMAND pb (guarded)

ON : In the cockpit :
- EVAC light flashes red.
- Depending on aircraft configuration, horn sounds.

In the cabin :
- EVAC lights flash at FWD and AFT attendant panels.
- Evacuation tone sounds.

OFF : The alert is stopped.
The EVAC light flashes red when the alert is activated.

(2) HORN SHUT OFF pb
Pressing this button silences the cockpit horn.

(3) CAPT and PURS/CAPT sw

CAPT and PURS : The alert may either be activated from the cockpit or the cabin.

CAPT : The alert may only be activated from the cockpit.
If one of the cabin CMD pb is pressed, only the cockpit horn sounds for 3 s.

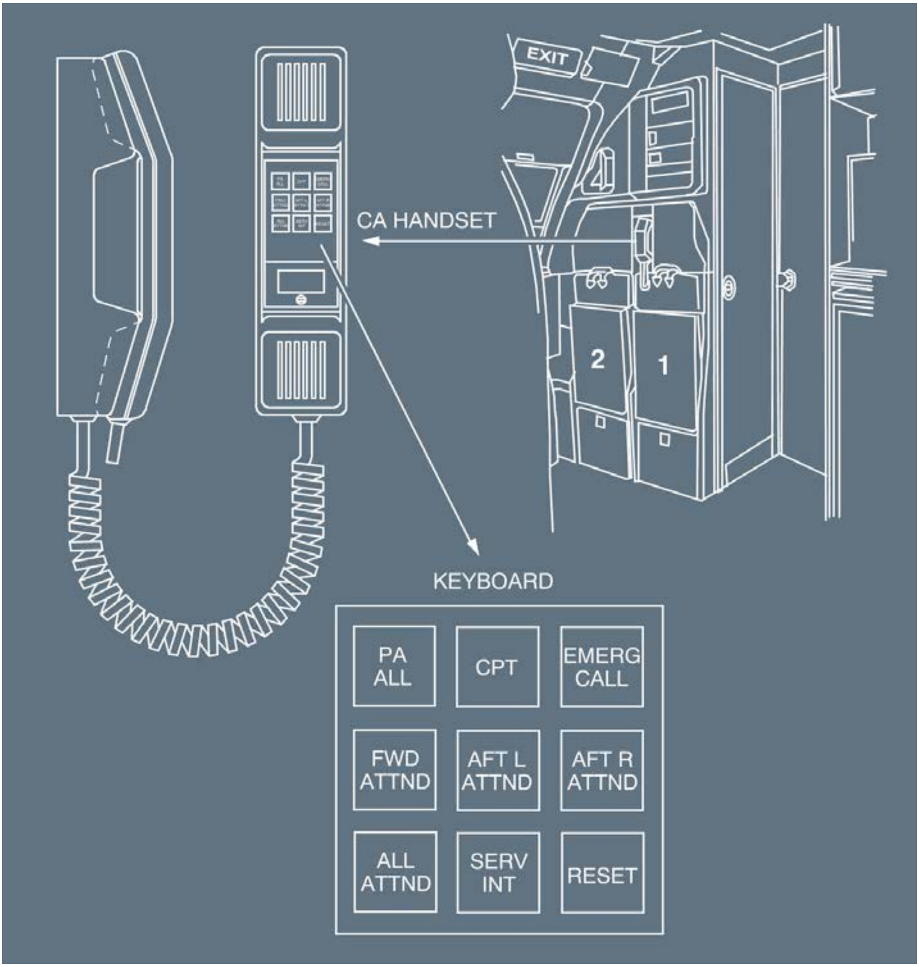
(4) CMD pb
Pressing this button activates the alert, if the cockpit switch is at the CAPT & PURS position.
Pressing it again stops the alert.

(5) RESET pb
Pressing this button silences the EVAC tone.

(6) EVAC light
This light flashes when the alert is activated.

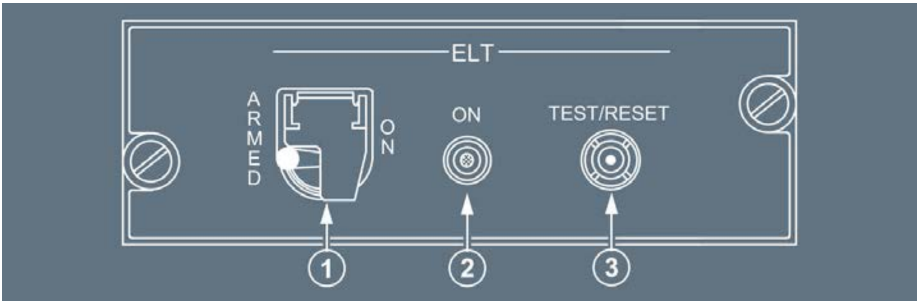
PURSER STATION

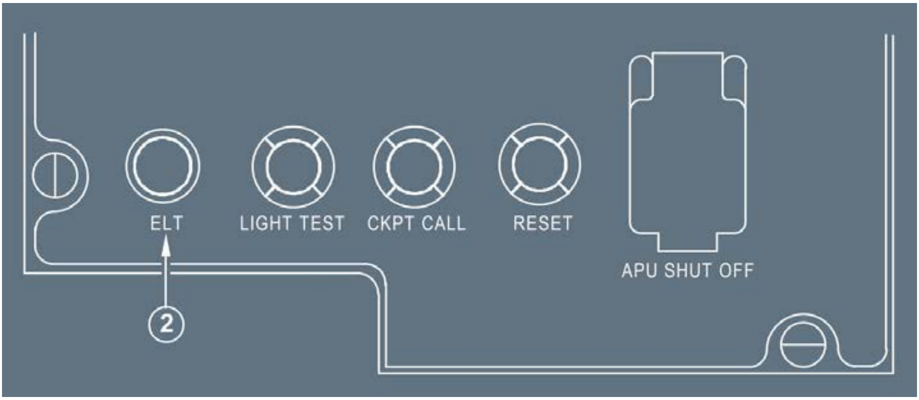
Ident.: DSC-23-40-10-00018469.0001001 / 17 MAR 17
Applicable to: ALL



CONTROLS AND INDICATORS

Ident.: DSC-23-40-30-00018516.0003001 / 17 MAR 17
Applicable to: ALL





(1) ELT sw
The guard keeps this switch in the ARMED position.

ON : The Emergency Locator Transmitter (ELT) transmits an emergency signal.

ARMED : In the case of impact, the ELT transmits an emergency signal (on 121.5, 243 and 406.025 MHz).

(2) ON and ELT light
These lights come on amber either when the emergency signal is transmitted, or during ELT autotest.

(3) TEST/RESET pb
Pressing this pushbutton starts the ELT auto test.

Note: *If the ELT is unduly triggered in ARMED mode (by an external impact, hard landing, etc.), select the TEST/RESET position to reset the ELT and stop signal transmission.*

ACARS

Ident.: DSC-23-50-00018505.0001001 / 31 AUG 17
Applicable to: ALL

ACARS CALL : This memo appears in green when ACARS has received a message from the ground requesting a voice communication on VHF. This message is pulsing green during 60 s then steady.

VHF 3 VOICE : This memo appears in green when VHF 3 is operating in voice mode and ACARS communication is interrupted.

ACARS MSG : This memo appears in green when ACARS has received a message from the ground. This message is pulsing green during 60 s then steady.

ACARS STBY : This memo appears in green when ACARS communications between the aircraft and the ground are lost, or when a failure occurs at ATSU initialization to indicate to the crew to enter some initialization parameters.

ATSU

Ident.: DSC-23-50-00018506.0001001 / 31 AUG 17
Applicable to: ALL

VHF 3 VOICE : This memo appears in green, if VHF 3 is operating in voice mode and ACARS communication is interrupted.

HF VOICE : This memo appears in green, if both HF s are operating in voice mode. This message flashes for 10 s and then steady.

AUDIO 3 XFRD

Ident.: DSC-23-50-00018507.0001001 / 17 MAR 17
Applicable to: ALL

AUDIO 3 XFRD : This memo appears in green, if the AUDIO SWITCHING selector is not on NORM.

SATCOM

Ident.: DSC-23-50-00018508.0001001 / 31 AUG 17
Applicable to: ALL

SATCOM ALERT : This memo appears in green when a message with priority level below 4 is received from the ground.

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AIRCRAFT SYSTEMS

ELECTRICAL

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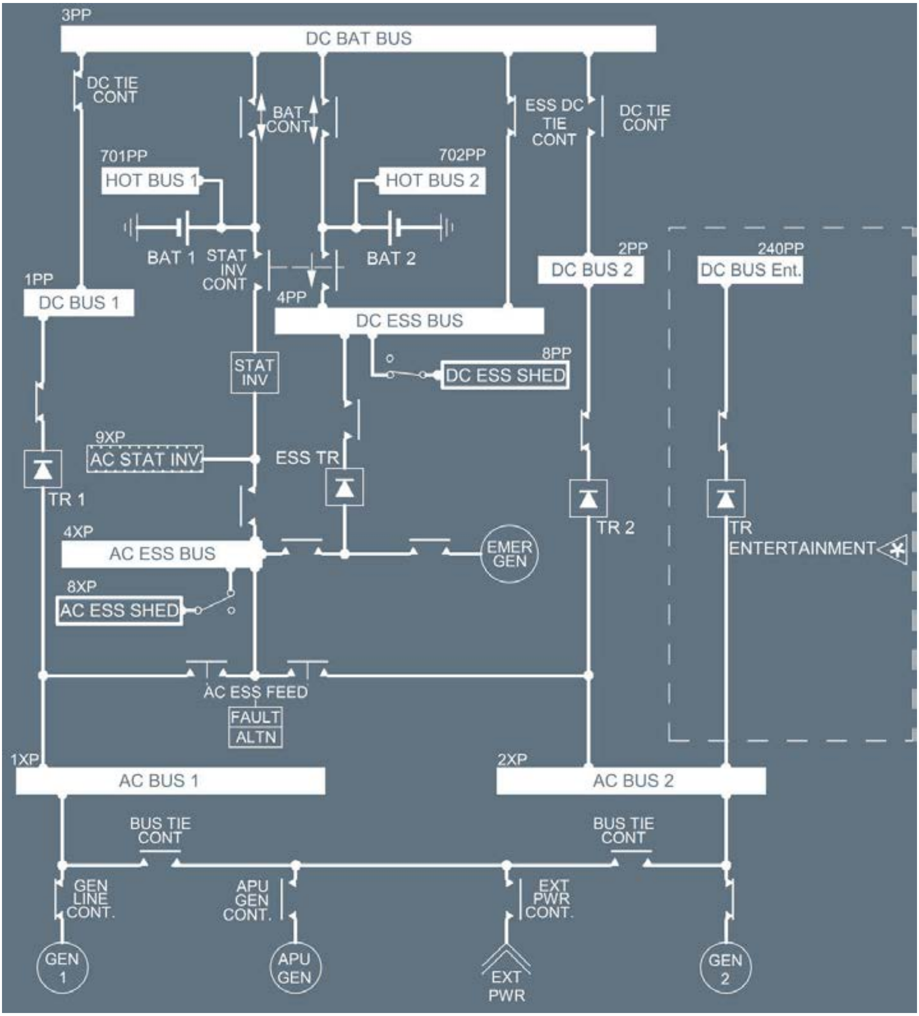
GENERAL

Ident.: DSC-24-10-10-00017750.0001001 / 21 MAR 16
Applicable to: ALL

The electrical power system consists of a three-phase 115/200 V 400 Hz constant-frequency AC system and a 28 V DC system. Electrical transients are acceptable for equipment. Commercial supply has secondary priority.
In normal configuration, the electrical power system provides AC power. The electrical power system is constituted of 2 engine generators and 1 APU generator. Each generator can provide AC power to all electrical bus bars. A part of this AC power is converted into DC power for certain applications.
In the event that normal AC power is not available, an emergency generator can provide AC power.
In the event that all AC power is not available, the electrical power system can invert DC power from the batteries into AC power.


3PP
DC BAT BUS
DC TIE CONT
BAT CONT
ESS DC TIE CONT
DC TIE CONT
701PP
HOT BUS 1
702PP
HOT BUS 2
BAT 1
STAT INV CONT
BAT 2
2PP
DC BUS 2
240PP
DC BUS Ent.
1PP
DC BUS 1
4PP
DC ESS BUS
8PP
DC ESS SHED
STAT INV
9XP
AC STAT INV
ESS TR
TR 1
TR 2
TR ENTERTAINMENT
4XP
AC ESS BUS
EMER GEN
8XP
AC ESS SHED
AC ESS FEED
FAULT
ALTN
1XP
AC BUS 1
2XP
AC BUS 2
BUS TIE CONT
BUS TIE CONT
GEN LINE CONT.
APU GEN CONT.
EXT PWR CONT.
GEN 1
APU GEN
EXT PWR
GEN 2

AC GENERATORS

Ident.: DSC-24-10-20-00017751.0001001 / 21 MAR 16
Applicable to: ALL

ENGINE – DRIVEN GENERATORS

Two AC generators (GEN 1, GEN 2), one driven by each main engine through an integrated drive, supply aircraft electrical power. Each generator can supply up to 90 KVA of three phase 115/200 V 400 Hz power.

Two Generators Control Units (GCU) control the output of their respective generator. The main functions of each GCU are :
- Control the frequency and voltage of the generator output.
- Protect the network by controlling the associated generator line contactor.

APU GENERATOR AND EXTERNAL POWER

A third generator (APU GEN), driven directly by the APU and producing the same output as each main engine generator, can replace either or both main engine generators at any time.
A ground power connector near the nosewheel allows ground power to be supplied to all busbars.

A Ground Power Control Unit (GPCU) :
- Protects the network by controlling the external power contactor, or

A Ground and Auxiliary Power Control Unit (GAPCU) ⊲ :
- Regulates, via the APU Electronic Control Box, the frequency and voltage of the APU generator.
- Protects the network by controlling the external power contactor and the APU generator line contactor.

EMERGENCY GENERATOR

The blue hydraulic circuit drives an emergency generator that automatically supplies emergency AC power to the aircraft electrical system, if all main generators fail. This generator supplies 5 KVA of three-phase 115 and 200 V 400 Hz power.

A Generator Control Unit (GCU) :
- Keeps the emergency generator at a constant speed,
- Controls the generator's output voltage,
- Protects the network by the controlling the emergency generator line contactor, and
- Controls the emergency generator start-up.

STATIC INVERTER

A static inverter transforms DC power from Battery 1 into one KVA of single-phase 115 V 400 Hz AC power, which is then supplied to part of the AC essential bus. When the aircraft speed is above

50 kt, the inverter is automatically activated, if only the batteries are supplying electrical power to the aircraft, regardless of the BAT 1 and BAT 2 pushbutton positions.
When the aircraft speed is below 50 kt, the inverter is activated, if only the batteries are supplying electrical power to the aircraft, and both BAT 1 and BAT 2 pushbuttons are on.

DC GENERATION

Ident.: DSC-24-10-20-00017752.0001001 / 21 MAR 16
Applicable to: ALL

TRANSFORMER RECTIFIERS (TRS)

Two main transformer rectifiers, TR 1 and TR 2, supply the aircraft's electrical system, with up to 200 A of DC current.
A third (identical) Transformer Rectifier, the ESS TR , can power the essential DC circuit from the emergency generator, if the engine and APU generators all fail, or if TR 1 or TR 2 fails.
Each TR controls its contactor by internal logic.
A fourth Transformer Rectifier (TR Entertainment ◁) powers the DC Entertainment bus bar dedicated to the In-Flight Entertainment system (IFE) in order to take into account IFE needs.

BATTERIES

Two main batteries, each with a normal capacity of 23 Ah, are permanently connected to the two hot buses.
Each battery has an associated Battery Charge Limiter (BCL).
The BCL monitors battery charging and controls its battery contactor.

CIRCUIT BREAKERS (C/BS)

Ident.: DSC-24-10-20-00000874.0002001 / 15 FEB 11
Applicable to: ALL

The aircraft has two types of C/Bs:
- Monitored (green): When out for more than 1 min, the C/B TRIPPED warning is triggered on the ECAM.
- Non-monitored (black).

The Wing Tip Brake (WTB) C/Bs have red caps on them to prevent them from being reset.
The C/B TRIPPED warning on the ECAM indicates the location of the affected C/B . The following panels are monitored: OVHD PNL , L(R) ELEC BAY, REAR PNL J-M or N-R or S-V or W-Z.

Note: *The flight crew can clear the ECAM C/B TRIPPED caution by pressing:*
- *The EMER CANC pb: When pressed, this pushbutton clears and inhibits the ECAM C/B TRIPPED caution for the remainder of the flight, or*
- *The CLR pb: When pressed, this pushbutton only clears the ECAM C/B TRIPPED caution. If the C/B remains pulled, any additional tripped circuit breakers on the same panel will not be detected, and the ECAM will not trigger the caution. However, if the C/B is pushed, any additional tripped circuit breakers will be detected, and the ECAM will trigger the caution again.*

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General

GENERAL

Ident.: DSC-24-10-30-10-00017759.0001001 / 21 MAR 16
Applicable to: ALL

GEN 1 and 2 when operating have priority over the APU generator and over external power.
External power has priority over the APU generator when the EXT PWR pb switch is ON.
The APU generator or external power can supply the entire network.
One engine generator can supply the entire network, except the DC BUS Entertainment.
The generators cannot be connected in parallel.

<u>Note:</u> *Two generators are needed to supply the DC BUS Entertainment ⊲, except on ground, where the APU generator (if not overloaded) or the external power is sufficient.*

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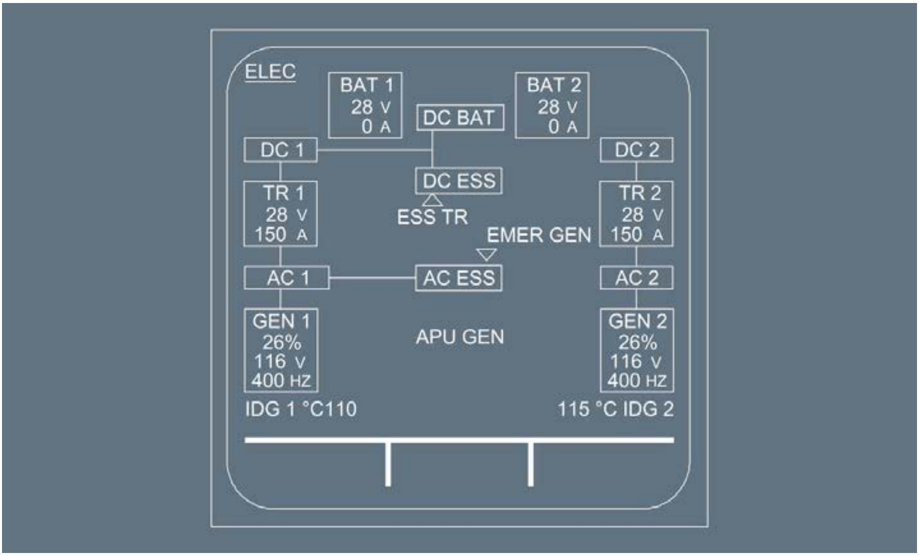
Normal Configuration

IN FLIGHT

Ident.: DSC-24-10-30-20-00000876.0001001 / 09 OCT 12
Applicable to: ALL

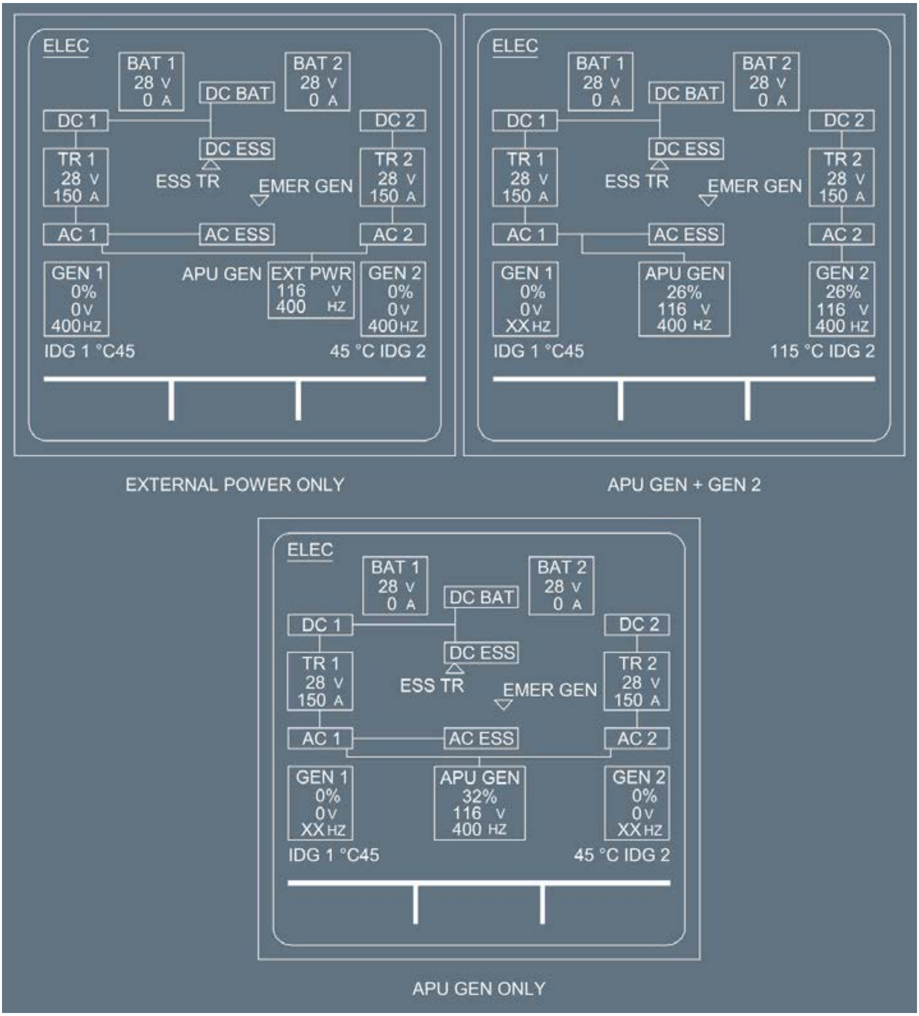
Each engine-driven generator supplies its associated AC BUS (1 and 2) via its generator line contactor (GLC 1 and GLC 2).
AC BUS 1 normally supplies the AC ESS BUS via a contactor.
TR 1 normally supplies DC BUS 1, DC BAT BUS, and DC ESS BUS.
TR 2 normally supplies DC BUS 2.
The two batteries are connected to the DC BAT BUS, if they need charging. When they are fully charged, the battery charge limiter disconnects them.



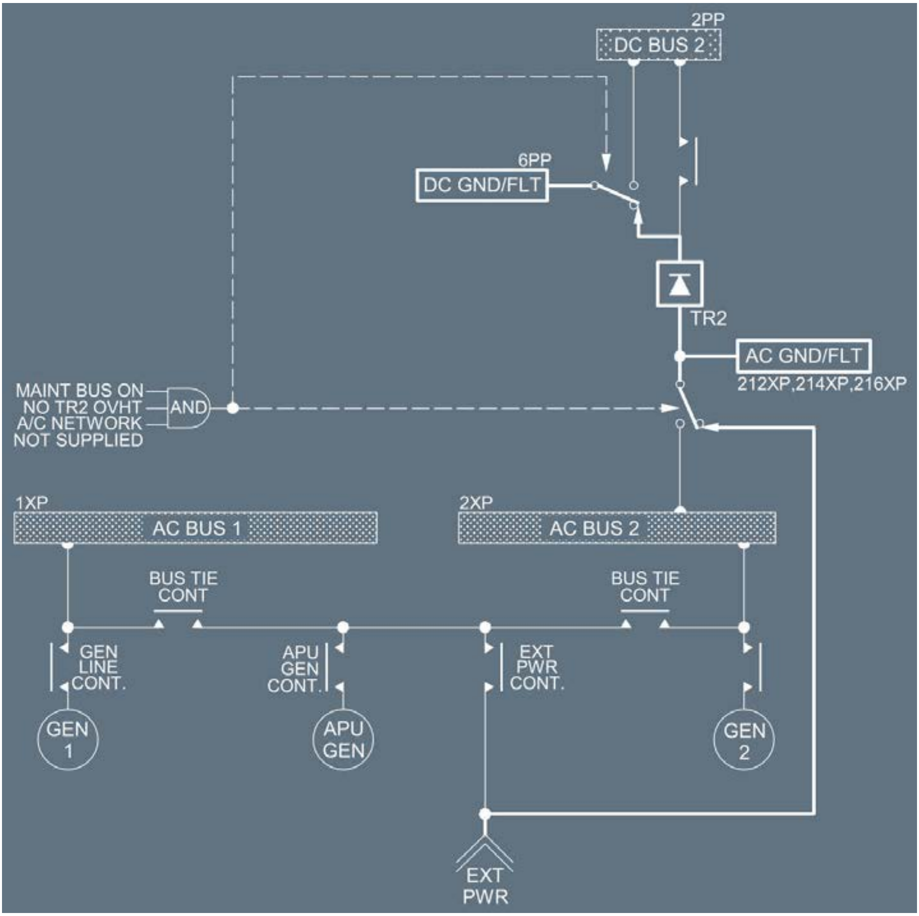
ON GROUND

Ident.: DSC-24-10-30-20-00000877.0001001 / 22 MAY 12
Applicable to: ALL

Either the APU generator, or external power, may supply the complete system.



On ground, when only ground services are required, external power can supply the AC and DC GND /FLT BUSES directly without supplying the entire aircraft network.
Personnel select this configuration with the MAINT BUS switch in the forward entrance area.


2PP
DC BUS 2
6PP
DC GND/FLT
TR2
AC GND/FLT
212XP,214XP,216XP
MAINT BUS ON
NO TR2 OVHT
A/C NETWORK
NOT SUPPLIED
AND
1XP
AC BUS 1
2XP
AC BUS 2
BUS TIE
CONT
BUS TIE
CONT
GEN
LINE
CONT.
APU
GEN
CONT.
EXT
PWR
CONT.
GEN
1
APU
GEN
GEN
2
EXT
PWR

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Abnormal Configurations

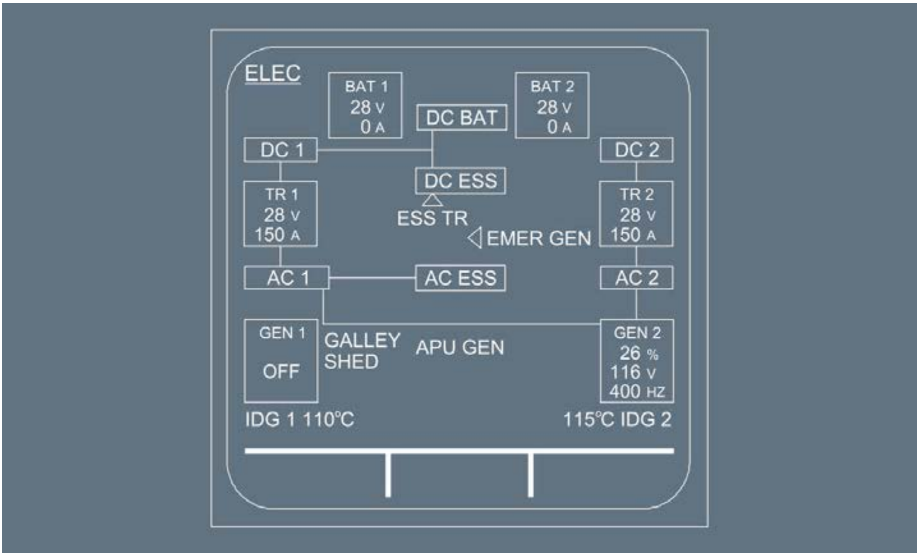
FAILURE OF ONE ENGINE GENERATOR

Ident.: DSC-24-10-30-30-00017760.0001001 / 21 MAR 16
Applicable to: ALL

The system automatically replaces the failed generator, with the :
- APU GEN, if available, or
- Other engine generator.

Part of the galley load and the DC BUS Ent are automatically shed.

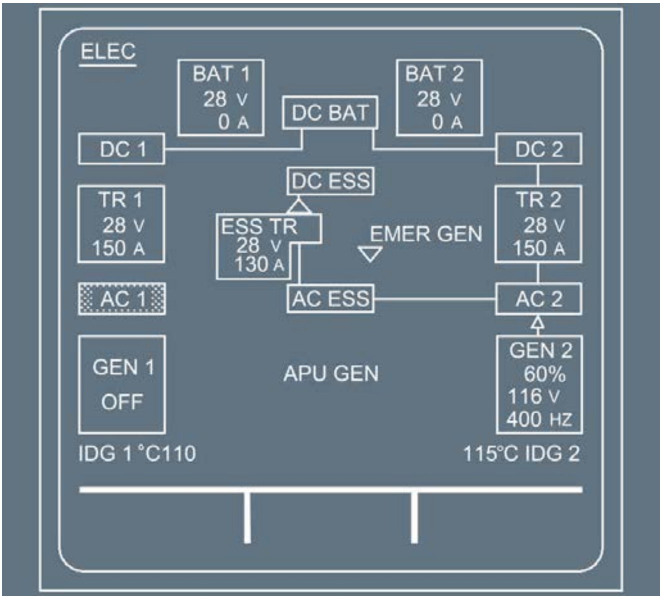
Note: The Galley Load Automatic Shedding allows all the galley load to be automatically shed.



FAILURE OF AC BUS 1

Ident.: DSC-24-10-30-30-00017761.0001001 / 21 MAR 16
Applicable to: ALL

- AC BUS 2 can supply AC ESS BUS, and ESS TR can supply DC ESS BUS, both via the AC ESS FEED pb. This is done automatically with the AC ESS FEED Auto Switching .
- DC BUS 2 supplies DC BUS 1 and DC BAT BUS automatically after 5 s.

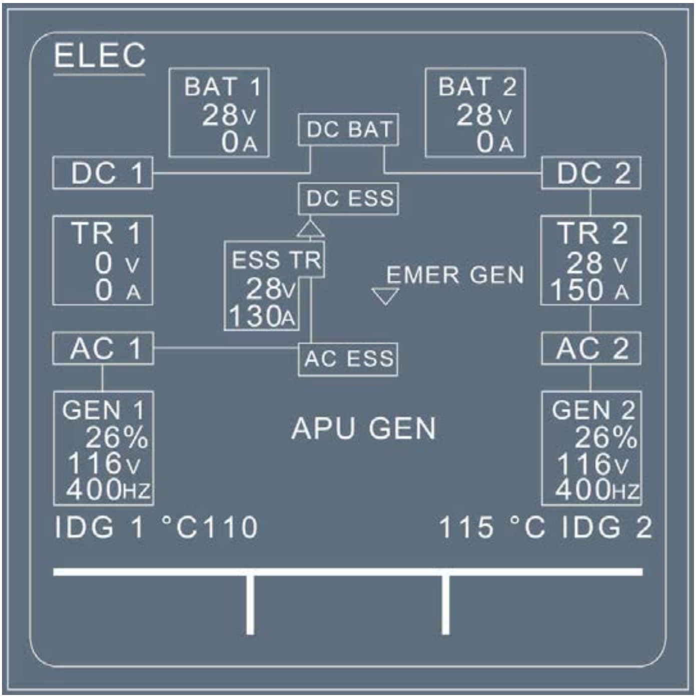


FAILURE OF ONE TR

Ident.: DSC-24-10-30-30-00000880.0001001 / 21 MAR 16
Applicable to: ALL

The contactor of each TR opens automatically, in case of :
- Overheat
- Minimum current

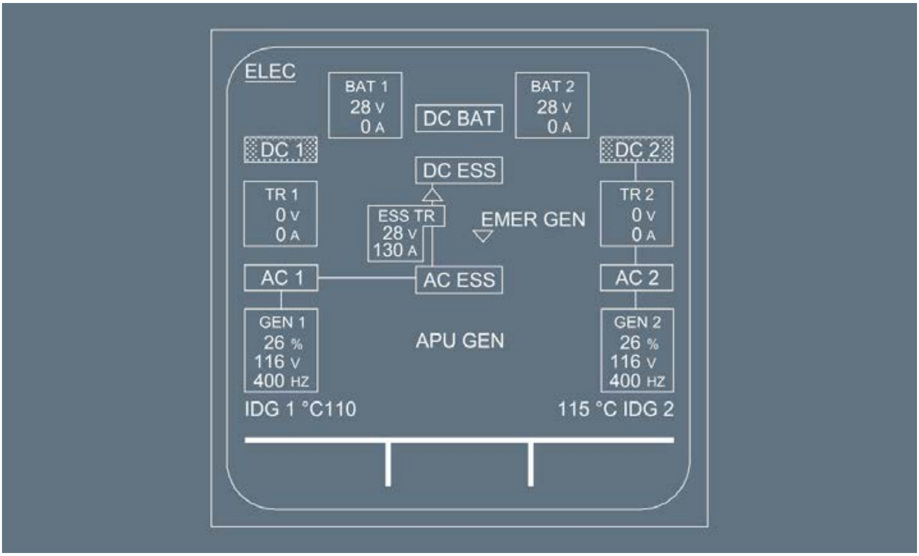
The other TR automatically replaces the faulty one.
The ESS TR supplies the DC ESS BUS.



FAILURE OF TR 1 AND TR 2

Ident.: DSC-24-10-30-30-00000881.0001001 / 09 OCT 12
Applicable to: ALL

If TR 1 and TR 2 are lost, DC BUS 1, DC BUS 2, and DC BAT BUS are lost. The DC ESS BUS is supplied by the ESS TR.



EMERGENCY GENERATION AFTER LOSS OF ALL MAIN GENERATORS

Ident.: DSC-24-10-30-30-00000882.0002001 / 21 MAR 16
Applicable to: ALL

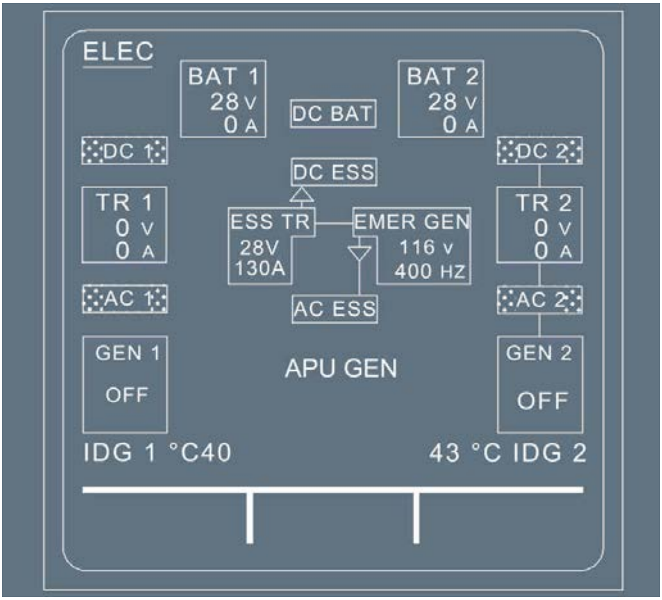
If both AC BUS 1 and AC BUS 2 are lost and the aircraft speed is above 100 kt, the Ram Air Turbine (RAT) extends automatically. This powers the blue hydraulic system, which drives the emergency generator by means of a hydraulic motor. This generator supplies the AC ESS BUS, and the DC ESS BUS via the ESS TR.
If the RAT stalls, or if the aircraft is on the ground with a speed below 100 kt, the emergency generator has nothing to drive it. The emergency generation network automatically transfers to the batteries and static inverter, and the system automatically sheds the AC SHED ESS and DC SHED ESS buses.

When the aircraft is on ground :
- Below 100 kt, DC BAT BUS is automatically connected to the batteries.
- Below 50 kt, AC ESS BUS is automatically shed, leading to the loss of all display units.

Note: *1. During RAT extension and emergency generator coupling (about 8 s), the batteries power the emergency generation network.*
2. On ground, if only the batteries are powering the emergency generation network, APU start is only available when the speed is below 100 kt.

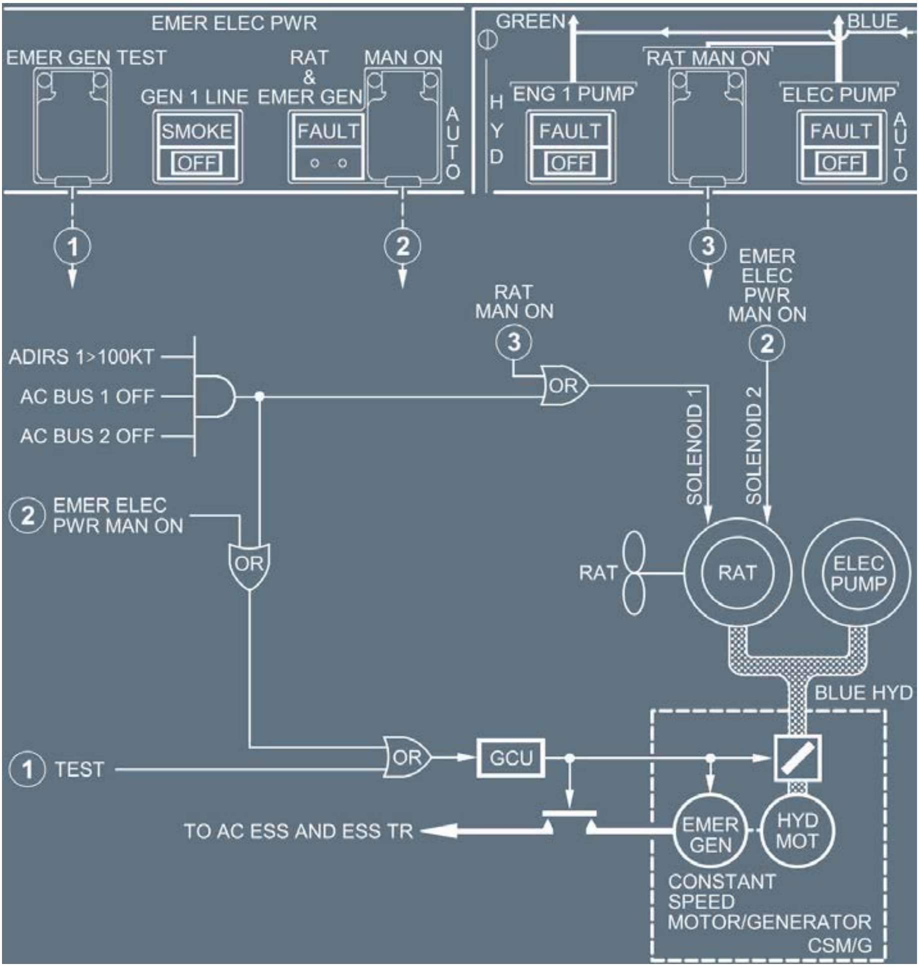
EMER GEN RUNNING

Ident.: DSC-24-10-30-30-00000883.0001001 / 21 MAR 16
Applicable to: ALL



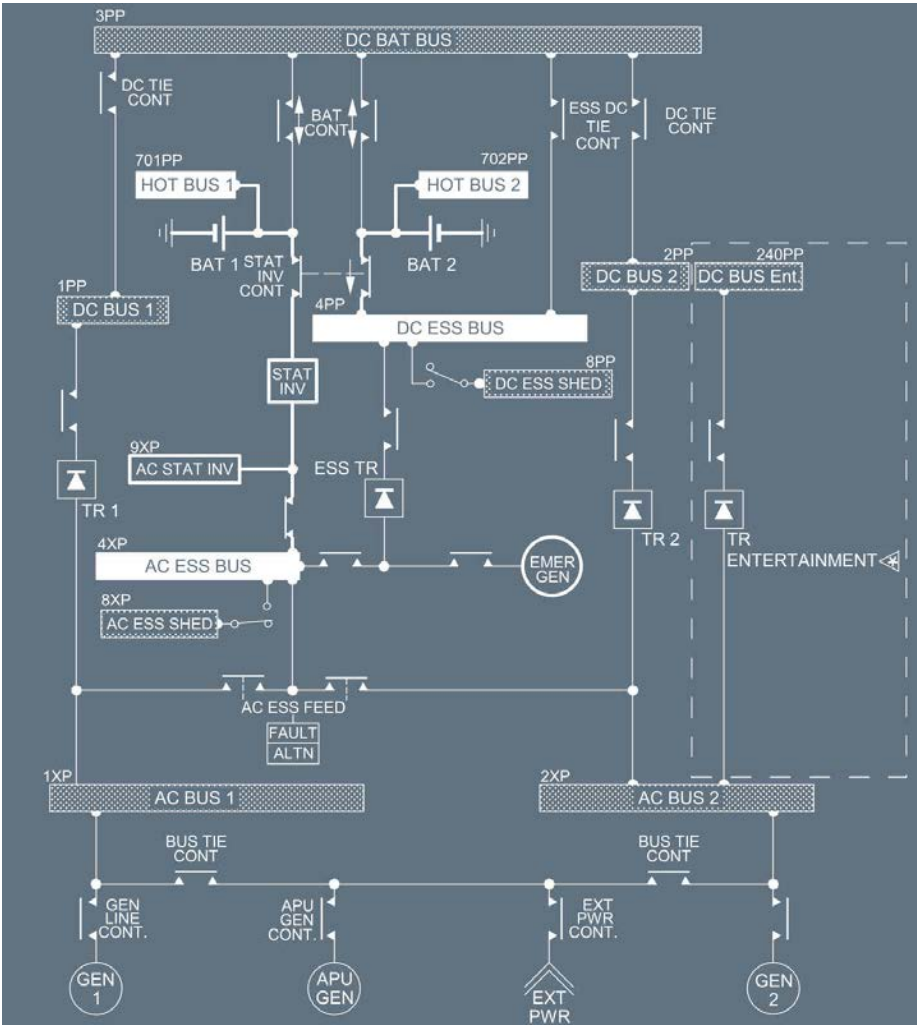
EMER GEN RUNNING (CONT'D)

Ident.: DSC-24-10-30-30-00000884.0002001 / 21 MAR 16
Applicable to: ALL



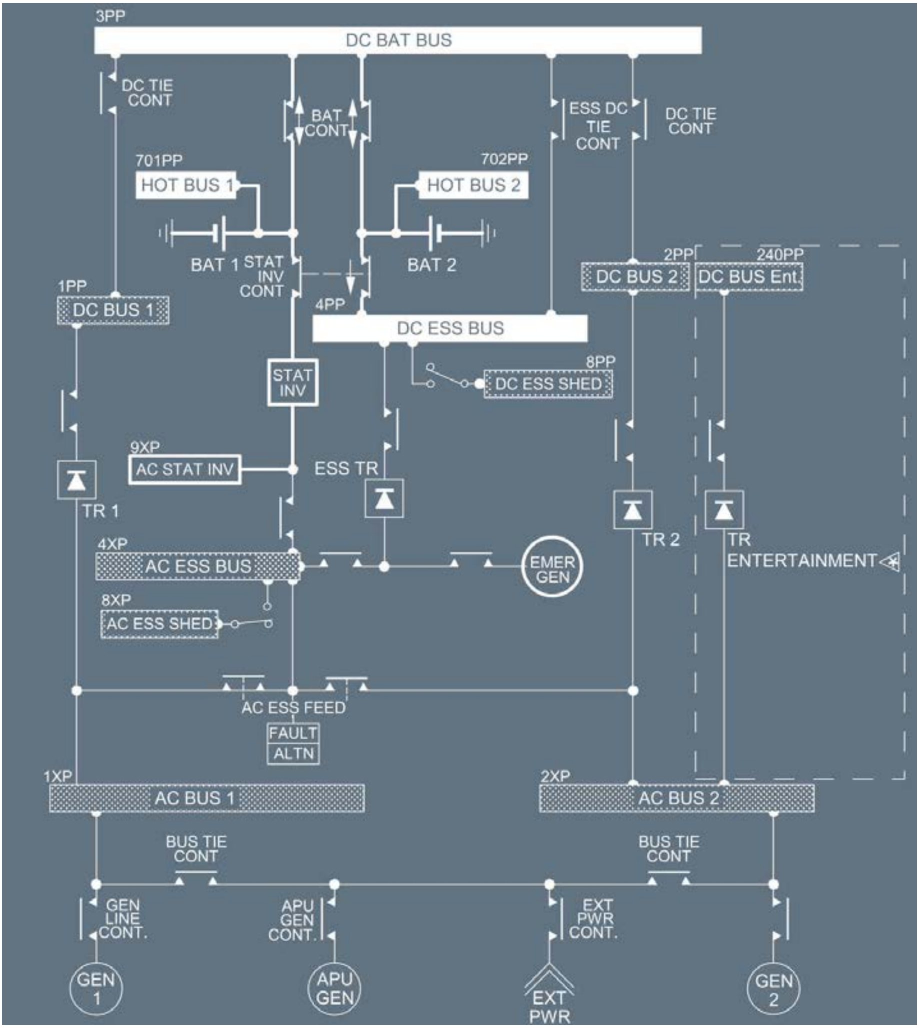
FLIGHT WITH BATTERIES ONLY

Ident.: DSC-24-10-30-30-00017762.0001001 / 21 MAR 16
Applicable to: ALL



ON GROUND, BATTERIES ONLY (SPEED < 50 KT)

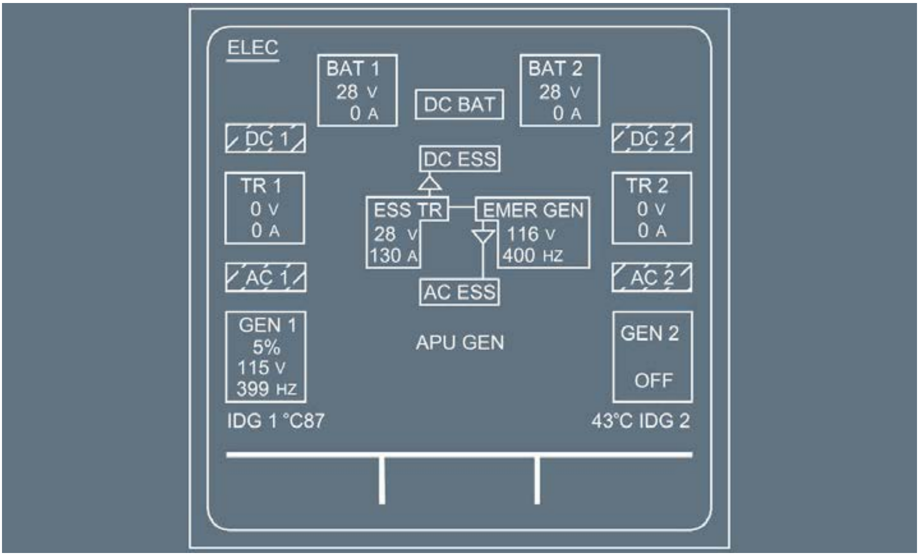
Ident.: DSC-24-10-30-30-00017763.0001001 / 21 MAR 16
Applicable to: ALL

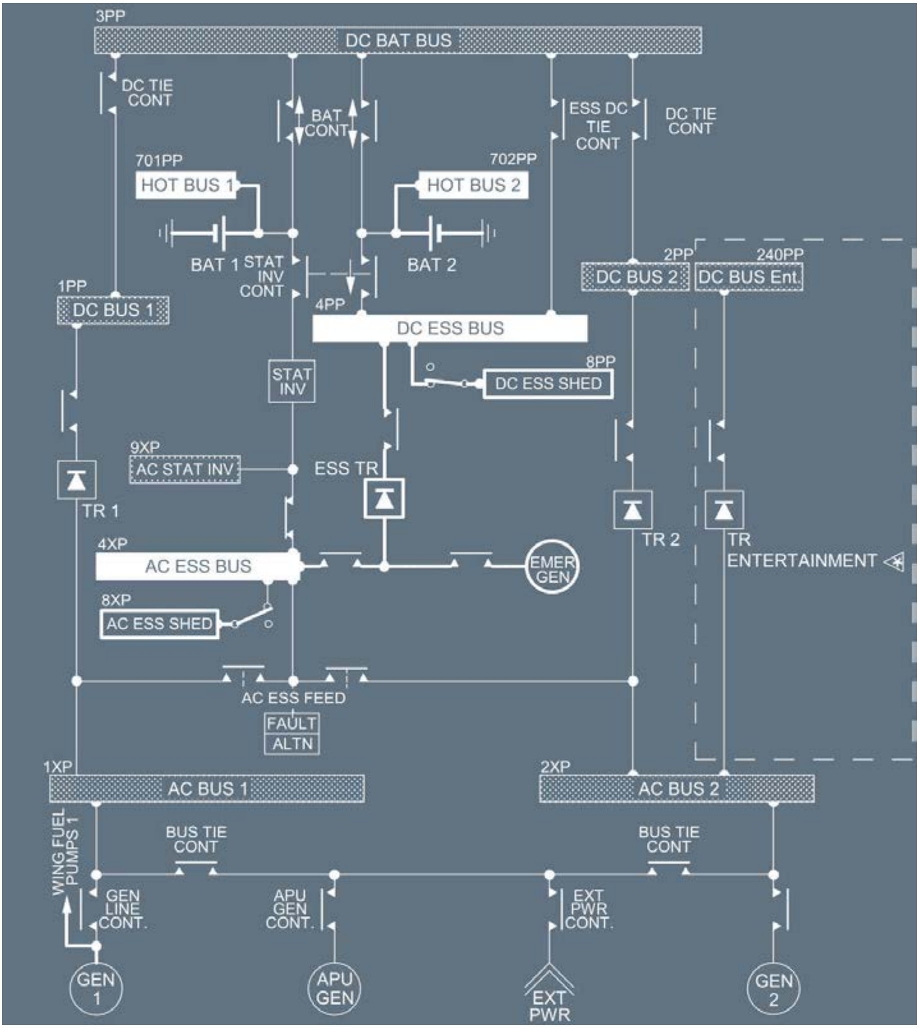


SMOKE CONFIGURATION

Ident.: DSC-24-10-30-30-00017764.0001001 / 21 MAR 16
Applicable to: ALL

In this configuration the main busbars are shed. The electrical distribution is the same as it is in the emergency electrical configuration (loss of main generators), except the fact that in smoke configuration the fuel pumps are connected upstream of the GEN 1 line connector.
The procedure sheds approximately 75 % of electrical equipment. All equipment that remains powered is supplied via the circuit breakers on the overhead panel (except for equipment supplied by hot buses).





Note: *ECAM ELEC page is identical to that for emergency generator running.*

Distribution Table

DISTRIBUTION TABLE

Ident.: DSC-24-10-30-40-00017765.0002001 / 21 MAR 16
Applicable to: ALL

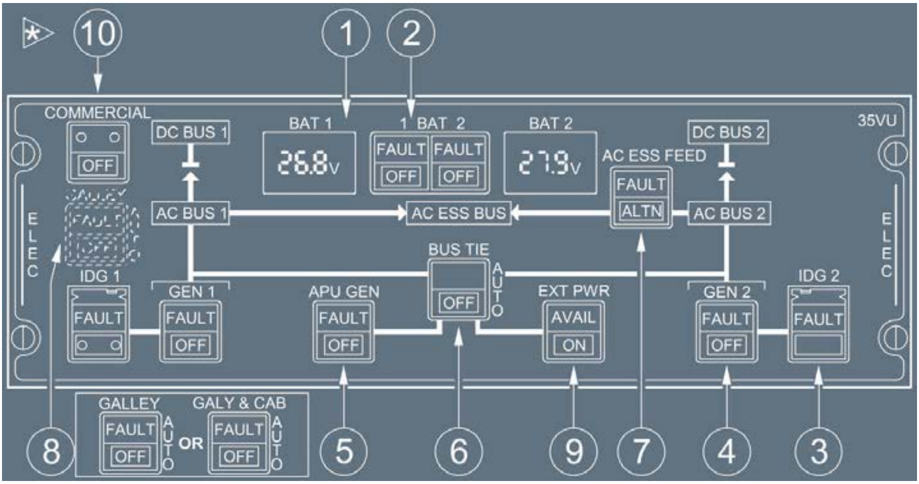
	AC BUS 1	AC BUS 2	AC ESS BUS	AC SHED ESS	AC STAT INV	TR 1	TR 2	ESS TR	TR Ent. (1)	DC BUS 1	DC BUS 2	DC BUS Ent. (1)	DC BAT BUS	DC ESS BUS	DC SHED ESS	HOT BUS 1	HOT BUS 2
NORM CONF	GEN 1	GEN 2	GEN 1	GEN 1	-	GEN 1	GEN 2	-	GEN 2	TR 1 GEN 1	TR 2 GEN 2	TR ENT GEN 2	TR 1 GEN 1	TR 1 GEN 1	TR 1 GEN 1	BAT 1	BAT 2
ONE GEN INOP AVAIL-X- (1, 2 or APU)	GEN X	GEN X	GEN X	GEN X	-	GEN X	GEN X	-	GEN X	TR 1 GEN X	TR 2 GEN X	TR ENT GEN X	TR 1 GEN X	TR 1 GEN X	TR 1 GEN X	BAT 1	BAT 2
EMER CONF • BEFORE EMER GEN AVAILABILITY (about 8 s)	-	-	ST INV BAT 1	-	ST INV BAT 1	-	-	-	-	-	-	-	-	BAT 2	-	BAT 1	BAT 2
• EMER GEN RUNNING	-	-	EMER GEN	EMER GEN	-	-	-	EMER GEN	-	-	-	-	-	ESS TR EMER GEN	ESS TR EMER GEN	BAT 1	BAT 2
TR 1 FAULT	GEN 1	GEN 2	GEN 1	GEN 1	-	-	GEN 2	GEN 1	-	TR 2 GEN 2	TR 2 GEN 2	-	TR 2 GEN 2	ESS TR GEN 1	ESS TR GEN 1	BAT 1	BAT 2
TR 2 FAULT	GEN 1	GEN 2	GEN 1	GEN 1	-	GEN 1	-	GEN 1	-	TR 1 GEN 1	TR 1 GEN 1	-	TR 1 GEN 1	ESS TR GEN 1	ESS TR GEN 1	BAT 1	BAT 2
TR 1 + 2 FAULT	GEN 1	GEN 2	GEN 1	GEN 1	-	-	-	GEN 1	-	-	-	-	-	ESS TR -GEN 1	ESS TR -GEN 1	BAT 1	BAT 2

(1) *Two generators are needed to supply the DC BUS Entertainment , except on ground, where the APU generator (if not overloaded) or the external power is sufficient.*

ON GROUND BAT. ONLY	AC BUS 1	AC BUS 2	AC ESS BUS	AC SHED ESS	AC STAT INV	TR 1	TR 2	ESS TR	TR Ent.	DC BUS 1	DC BUS 2	DC BUS Ent.	DC BAT BUS	DC ESS BUS	DC SHED ESS	HOT BUS 1	HOT BUS 2
Speed >100 kt	-	-	EMER GEN	EMER GEN	-	-	-	EMER GEN	-	-	-	-	-	ESS TR EMER GEN	ESS TR EMER GEN	BAT 1	BAT 2
Rat stall or 50 kt ≤ speed ≤ 100 kt	-	-	ST INV BAT 1	-	ST INV BAT 1	-	-	-	-	-	-	-	BAT 1-2	BAT 2	-	BAT 1	BAT 2
Speed < 50 kt	-	-	-	-	ST INV BAT 1	-	-	-	-	-	-	-	BAT 1-2	BAT 2	-	BAT 1	BAT 2

OVERHEAD PANEL

Ident.: DSC-24-20-00017766.0004001 / 21 MAR 16
Applicable to: ALL



(1) BAT 1(2) ind.
Shows battery voltage in white.

(2) BAT 1(2) pb-sw
Controls the operation of the corresponding battery charge limiter.

Auto : The battery charge limiter controls automatically the connection and the disconnection of the corresponding battery to the DC BAT BUS (3 PP) by closing and opening of the battery line contactor.

- The batteries are connected to the DC BAT BUS in the following cases:
  - APU starting (MASTER SW pb-sw at ON and N < 95 %).

    Note: The connection is limited to 3 min when the emergency generator is running.

  - Battery voltage below 26.5 V (battery charge). The charging cycle ends when battery charge current goes below 4 A.
    - ■ On ground, immediately
    - ■ In flight, after a time delay of 30 min.
  - Loss of AC BUS 1 and 2 when below 100 kt (EMER GEN not supplying).
- If AC BUS 1 and 2 are not energized and the EMER GEN is not supplying:
  - Battery 1 supplies the AC STAT INV BUS, and, if speed is greater than 50 kt, the AC ESS BUS.
  - Battery 2 supplies the DC ESS BUS.

    Note: In normal configuration the batteries are disconnected most of the time.

    Note: A battery automatic cut-off logic prevents the batteries from discharging completely when the aircraft is on the ground (parking).

    Automatic battery contactors open when:
    - *The aircraft is on the ground*
    - *The BAT pb switches are at AUTO*
    - *The main power supply (EXT PWR + GEN) is cut off*
    - *Battery voltage is low.*

    The flight crew can reset the contactors by switching the BAT pb-sw to OFF then to AUTO.

OFF : The battery charge limiter is not operating: the battery line contactor is open. OFF comes on white if the DC BAT BUS is supplied. Hot buses remain supplied.

FAULT light : Comes on amber, accompanied by an ECAM caution, when the charging current for the corresponding battery is outside limits.
In this case the battery contactor opens.

(3) IDG 1(2) (Integrated Drive Generator) pb-sw (guarded)

CAUTION	1. Maintaining the IDG pb-sw during more than 3 s may damage the IDG disconnection mechanism. 2. Disconnect the IDG only when the engine is running or windmilling. If not, the IDG will be damaged when starting the engine.

The IDG switches are normally springloaded out.
Pressing this switch disconnects the IDG from its driveshaft: only maintenance personnel can reconnect it.

FAULT light : Lights up amber, and ECAM caution comes on, if:
- IDG oil outlet overheats (above 185 °C), or
- IDG oil pressure is low (inhibited at low engine speed: N2 below 14 %).

It extinguishes when the IDG is disconnected.

(4) GEN 1 (2) pb-sw

ON : The generator field is energized and the line contactor closes if electrical parameters are normal.

OFF : The generator field is de-energized and the line contactors opens.
The fault circuit is reset.

FAULT light : Lights up amber, and an ECAM caution comes on, if:
- The associated generator control unit (GCU) trips it.

  Note: If a differential fault trips the protection, reset action has no effect after two attempts.

- Opening of the line contactor (except if the GEN pb-sw is selected OFF).

(5) APU GEN pb-sw

ON : The APU generator field is energized and the line contactor closes if parameters are normal and the EXT PWR line contactor is open.
The bus tie contactor 1(2) closes automatically if GEN 1(2) is not operating.

OFF : The generator field is de-energized and the line contactor opens. The fault circuit is reset.

FAULT light : Same as GEN 1 or 2 FAULT
The APU GEN FAULT light is inhibited when APU speed is too low or if the APU GEN line contactor opens after EXT PWR or ENG GEN takes over.

(6) BUS TIE pb

AUTO : The bus tie contactors (BTC s) automatically open or close to maintain power supply to both AC BUS 1 and 2.
- One contactor is closed, when:
  - One engine generator supplies the associated AC BUS, and
  - The APU generator, or external power supplies the other side.
- Both contactors are closed during single-engine operation, or operation on the APU generator, or external power supply.

OFF : Both bus tie contactors open.

(7) AC ESS FEED pb

NORMAL : The AC ESS BUS is supplied by AC BUS 1.

ALTN : The AC ESS BUS is supplied by AC BUS 2. The light comes on when manually selected.

Note: With the AC ESS FEED Auto Switching ⊲, AC BUS 2 will automatically supply AC ESS BUS when AC BUS 1 is lost.

FAULT light : The amber light, and ECAM caution come on, when the AC ESS BUS is not electrically-supplied.

Note: In case of a total loss of the main generators, the AC ESS BUS is automatically supplied by the emergency generator, or by the static inverter, if the emergency generator is not available.

(8) GALLEY pb or GALY & CAB pb

AUTO : Main galley, secondary galley, in-seat power supply ⊲ and IFE ⊲ system (prerecorded announcement, telephone system, video/airshow, music…), are supplied.

The main galley, the in-seat power supply ⊲ and the IFE ⊲ systems are automatically shed:
- In flight: When only one generator is operating.
- On ground: When only one engine generator is operating. (All galleys are available when the APU GEN or EXT PWR is supplying power.)

Note: With the Galley Load Automatic Shedding ⊲ the secondary galley is also automatically shed.

OFF : The main galley, secondary galley, in-seat power supply and IFE system (prerecorded announcement, telephone system, video/airshow, music ....) are not supplied.
The electrical supply of the heating floor panels is shed.

FAULT light : The amber light, and ECAM caution come on, when the load on any generator is more than 100 % of rated output.

(9) EXT PWR pb

AVAIL light comes on green, if:
- External power is plugged in, and
- External power parameters are normal.

When pressed:
- If the AVAIL light was on:
  • The external power line contactor closes
  • The AVAIL light goes off
  • The ON light comes on blue.
- If the ON light was on:
  • The external power line contactor opens
  • The ON light goes off
  • The AVAIL light comes on.

Note: *1. External power has priority over the APU generator. The engine generators have priority over external power.*
2. The ON light stays on, even when the engine generators supply the aircraft.

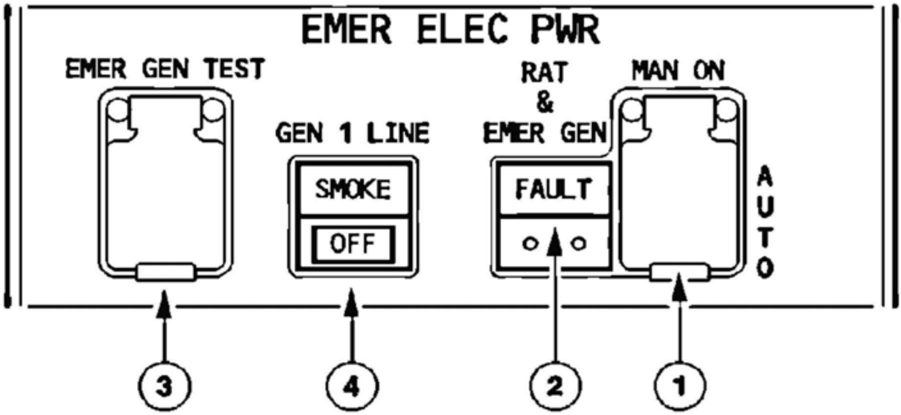
(10) COMMERCIAL pb

ON : All aircraft commercial electrical loads are supplied:
- Cabin and cargo lights
- Water and toilet system
- Drain mast ice protection
- Galley
- Passenger's entertainment
- Semi-automatic cargo loading

OFF : Switches off all aircraft commercial electrical loads.

OVERHEAD PANEL (CONT'D)

Ident.: DSC-24-20-00017778.0002001 / 21 MAR 17
Applicable to: ALL



(1) MAN ON pb (guarded)

AUTO : When the following conditions are met:
- AC BUS 1 is not electrically supplied, and
- AC BUS 2 is not electrically supplied, and
- Aircraft speed is greater than 100 kt.
  - The RAT extends, and
  - The blue hydraulic system drives the emergency generator.

As soon as the emergency generator electrical parameters are within tolerance the emergency generator is connected to the aircraft network.

Pressed : This selects manual RAT extension.
Emergency generator coupling occurs 3 s after the RAT supplies the emergency generator.

(2) FAULT light

This light comes on red if the emergency generator is not supplying power when AC BUS 1 and AC BUS 2 are not powered.

(3) EMER GEN TEST pb (guarded)

Pressed and held:
- If AC NORMAL BUSES are supplied:
  - The EMER GEN is driven hydraulically if the blue electric pump is running.
    The AC ESS BUS and the DC ESS BUS are connected to the emergency generator.
    (The DC ESS SHED and AC ESS SHED buses are not powered.)
  - ECAM displays the ELEC page automatically (only on the ground).
- If only the batteries supply the aircraft:
  - The static inverter powers the AC ESS BUS.

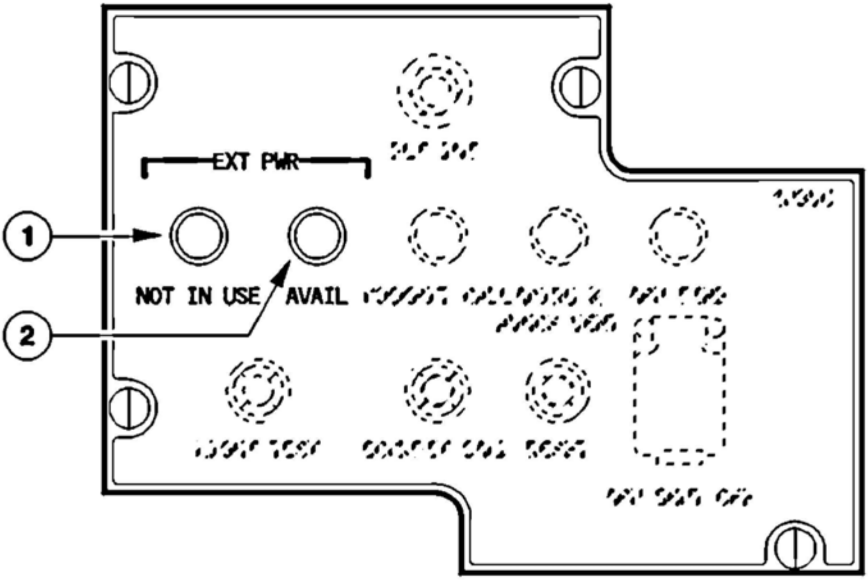
(4) GEN 1 LINE pb-sw

OFF : GEN 1 line contactor opens.
The AC BUS 1 channel is supplied from GEN 2 through bus tie contactors. This is used for smoked drill.

SMOKE light : *Refer to DSC-26-30-20 GEN 1 LINE pb-sw*.

EXTERNAL POWER PANEL

Ident.: DSC-24-20-00000891.0001001 / 21 MAR 16
Applicable to: ALL

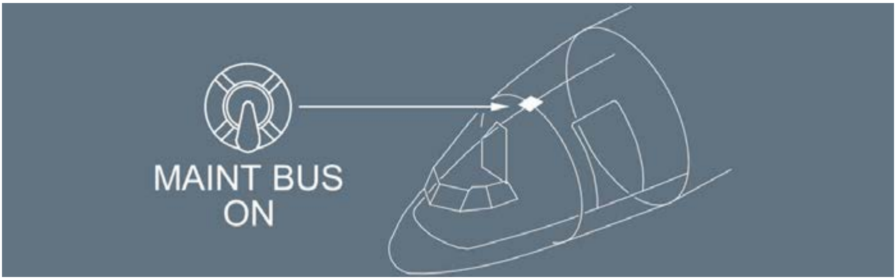


(1) EXT PWR NOT IN USE
This white light comes on to inform ground personnel that the ground power unit is not supplying the aircraft network and can be removed.

(2) EXT PWR AVAIL
This amber light comes on to indicate that external power is available and the voltage is correct.

Ident.: DSC-24-20-00000892.0001001 / 22 MAY 12
Applicable to: ALL

MAINT BUS SW:



This switch allows personnel to energize electrical circuits for ground servicing without energizing the entire aircraft electrical system.

ON : The switch latches magnetically if external power is connected and normal (AVAIL light on).

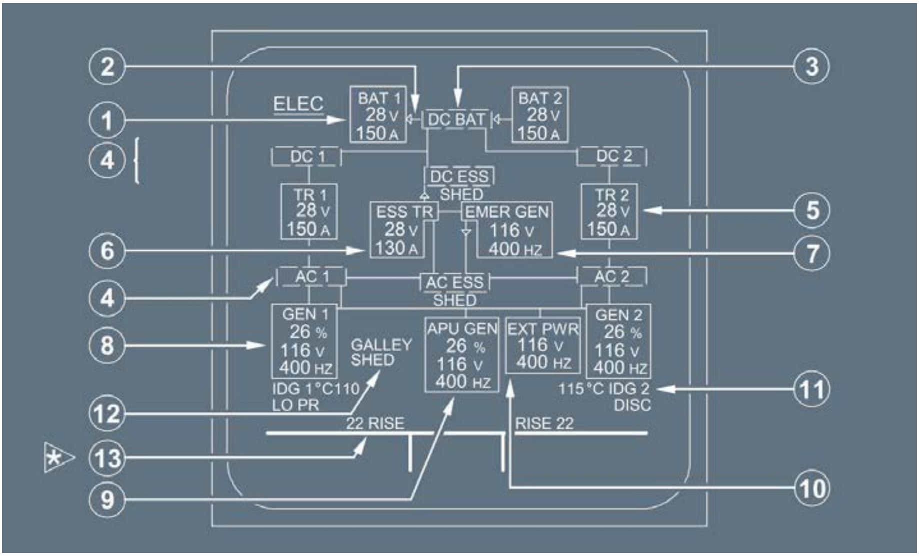
The AC and DC GND /FLT buses have power and the following loads can be energized:
- passenger compartment lighting
- galley lighting
- entrance area lights
- lavatory lighting and service
- vacuum cleaner sockets
- flight compartment service outlets
- hydraulic pump (yellow system)
- flight compartment flood lighting
- fuel quantity indications
- refueling
- cargo hold lighting
- main and nose landing gear compartment lighting
- belly fairing panel service outlets
- ground call
- equipment compartment lights and service outlets
- navigation lights.

The switch trips when the external source is removed.

OFF : The AC and DC GND /FLT buses are connected to AC BUS 2 and DC BUS 2.

ECAM ELEC PAGE

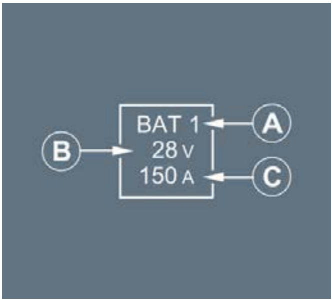
Ident.: DSC-24-20-00017780.0001001 / 21 MAR 16
Applicable to: ALL



(1) Battery indications

- BAT pb-sw at OFF:
  Legend is in white.

- BAT pb-sw at Auto:



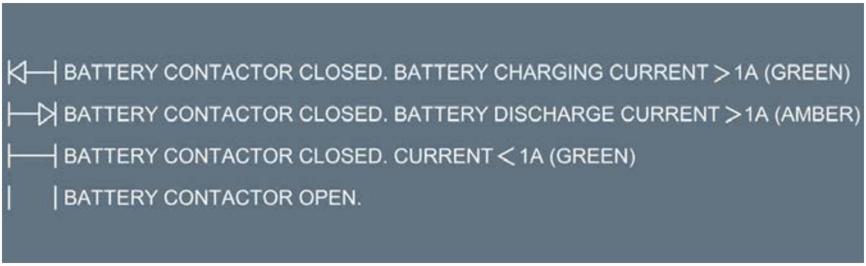
(A)

Legend is normally white, but becomes amber:
- when voltage and current indications change to amber, or
- in case of a BAT FAULT alert.

(B) Battery voltage is normally green, but becomes amber if V > 31 V or V < 25 V.

(C) Battery current is normally green, but becomes amber if discharge current > 5 A.

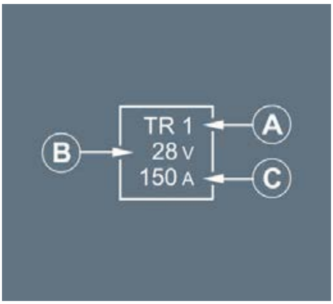
(2) Battery charge/discharge indication



(3) DC BAT indication
It is normally in green. It becomes amber, if DC BAT voltage ≤ 25 V.

(4) Bus bar indication
The bus bar indication is normally green. It becomes amber when the corresponding bus bar is not powered.
SHED appears in amber, when AC or DC SHED ESS BUS is shed.

(5) TR 1 (2) indication



(A) Normally white, this legend becomes amber when legends B and C do.

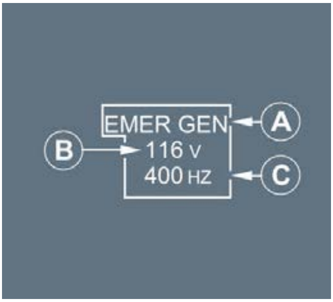
(B) The TR voltage is normally in green. It becomes amber, if V > 31 V, or V < 25 V.

(C) The TR current is normally in green. It becomes amber, when the TR current ≤ 5 A.

(6) ESS TR indication

This legend follows the logic of the above-noted TR 1 (2) legend.
The voltage and current are not displayed, when the essential TR contactor is open.

(7) EMER GEN indication



(A) This legend is normally in white. It becomes amber when either the voltage or frequency legend becomes amber.

(B)

This legend is normally in green. It becomes amber, if:
- V > 120 V or
- V < 110 V.

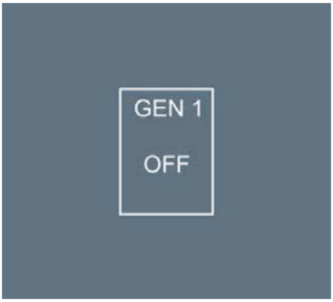
(C)

This legend is normally in green. It becomes amber, if:
- F > 410 Hz or
- F < 390 Hz .

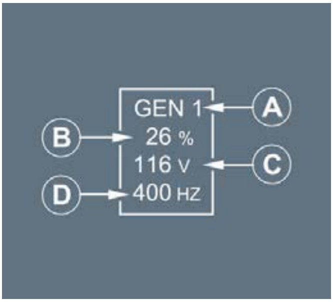
Voltage and frequency indications are not displayed, when the EMER GEN line contactor is open.

(8) GEN 1(2) indications

- GEN pb-sw is OFF:
  GEN is amber.
  OFF indication is white
  1 or 2 indication is white if the associated engine is running, amber if it is not.



- GEN pb-sw is ON.



(A) GEN 1 or GEN 2, normally white, becomes amber if any of the following legends become amber.

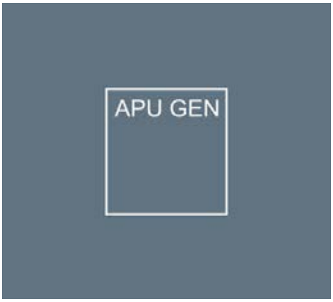
(B) The load legend, normally green, becomes amber if load > 100 %.

(C) The voltage legend, normally green, becomes amber if V > 120 V or V < 110 V.

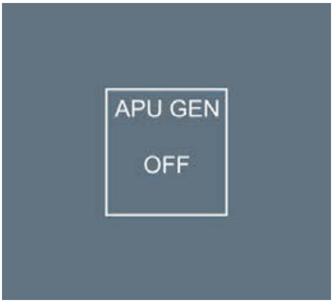
(D) The frequency legend, normally green, becomes amber if F > 410 Hz or F < 390 Hz.

(9) APU GEN indications

- When the APU MASTER sw is OFF this legend is white regardless of the position of the APU GEN pb-sw.



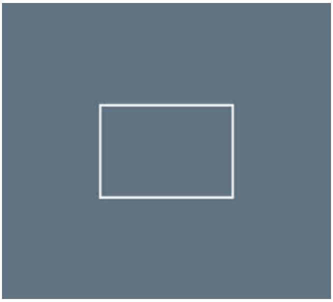
- When the APU MASTER sw is ON, and the APU GEN pb-sw is OFF:
  The APU GEN legend is amber.
  The OFF legend is white.



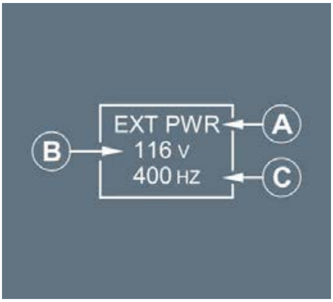
- When the APU MASTER sw is ON and the APU GEN pb-sw is ON:
  The indications are the same as for GEN 1 (2).

(10) EXT PWR indications

- External power is not available.



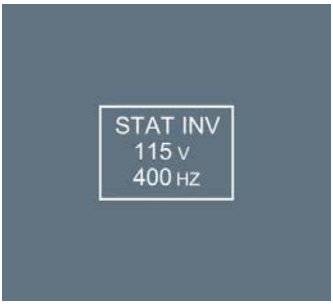
- When external power is available:



(A) This legend is normally white, but becomes amber, if either of the following legends turns amber.

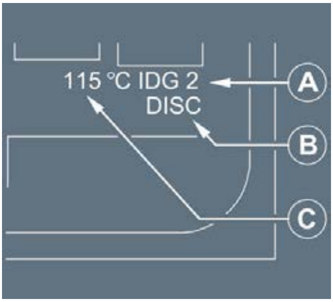
(B) This legend is normally green, but becomes amber, if V > 120 V or if V < 110 V.

(C) This legend is normally green, but becomes amber, if F > 410 Hz or if F < 390 Hz.



- This legend appears during the static inverter test, and when pressing the ELEC pb on the ECAM control panel while ESS BUSES are supplied by the batteries. It is normally green, but becomes amber, if:
  V < 110 V or V> 120 V.
  F < 390 Hz or F > 410 Hz.

(11) IDG indications



(A) IDG1 (2) legend

The IDG legend is normally white, but becomes amber, if:

- Oil outlet temperature > 185 °C.
- Oil pressure gets too low.
- IDG becomes disconnected.

The 1 or 2 is white if the corresponding engine is running, amber if it is not and the FADEC is powered.

(B) DISC/LO PR indication
The DISC legend appears in amber, when the IDG is disconnected.
LO PR appears in amber, when IDG low pressure is detected and the associated engine is running.

(C) Oil outlet temperature
This legend is normally in green, but appears amber, if T > 185 °C.
It flashes, if 147 °C < T < 185 °C (advisory).

(12) GALLEY SHED indication

This legend appears in white when:
- The GALLEY pb-sw is OFF, or
- The main galleys are shed, meaning:
  - In flight, only one generator is operating.
  - On ground, the aircraft is being supplied by one engine generator only.

The legend is not displayed, when the aircraft is in its normal configuration.

(13) RISE indication

This number, displayed in green, is the difference between the temperature at the IDG inlet and that at the IDG outlet.

MEMO DISPLAY

Ident.: DSC-24-20-00016808.0001001 / 21 MAR 16
Applicable to: ALL

EMER GEN : This memo appears in green, when the emergency generator is running.

AIRCRAFT SYSTEMS

EQUIPMENT

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DSC-25-10 Flight Deck

DSC-25-10-10 General

DSC-25-10-20 Cockpit Plan

DSC-25-10-30 Seats

DSC-25-10-40 Main Instrument Panels

DSC-25-10-50 Pedestal

DSC-25-10-60 Overhead Panel

DSC-25-10-70 C/B Panels

DSC-25-10-80 Foot Warmer (If Installed)

DSC-25-20 Emergency Equipment

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GENERAL

Ident.: DSC-25-10-10-00020853.0001001 / 17 MAR 17
Applicable to: ALL

The aircraft and system controls, required for piloting the aircraft, are arranged in such a way that the crew faces forward and all crewmembers can monitor instruments and systems.
The designers concentrated system controls on the overhead panel by making extensive use of pushbuttons, directly installed in the system synoptic.

Note: *This chapter describes the panels and equipment of the basic aircraft configuration, and may not correspond to the customized configuration of a specific aircraft.*
For more information on the installed equipment or panels, refer to the relevant chapter's system description.

PRINCIPLES FOR PUSHBUTTONS WITH INTEGRATED INDICATIONS

Ident.: DSC-25-10-10-00000983.0001001 / 21 MAR 16
Applicable to: ALL

Whenever possible, pushbuttons used for corrective actions, have integrated status and failure indications.

The pushbutton positions, and their illuminated indications, follow the "lights out" principle.

- While corresponding to particular aircraft configurations, indications also have the following color codes :
  - Warnings
    RED : A failure requiring immediate action.
  - Cautions
    AMBER : A failure, of which the flight crew should be aware, but does not call for immediate action.
  - Indications
    GREEN : For normal system operation.
    BLUE : For normal operation of a system used temporarily
    WHITE :
    - For an abnormal pushbutton position.
    - For a test result or maintenance information.

  When the aircraft is in a normal configuration, only green lights can be permanently lit, whereas blue lights can be intermittently.
- Pushbutton positions :

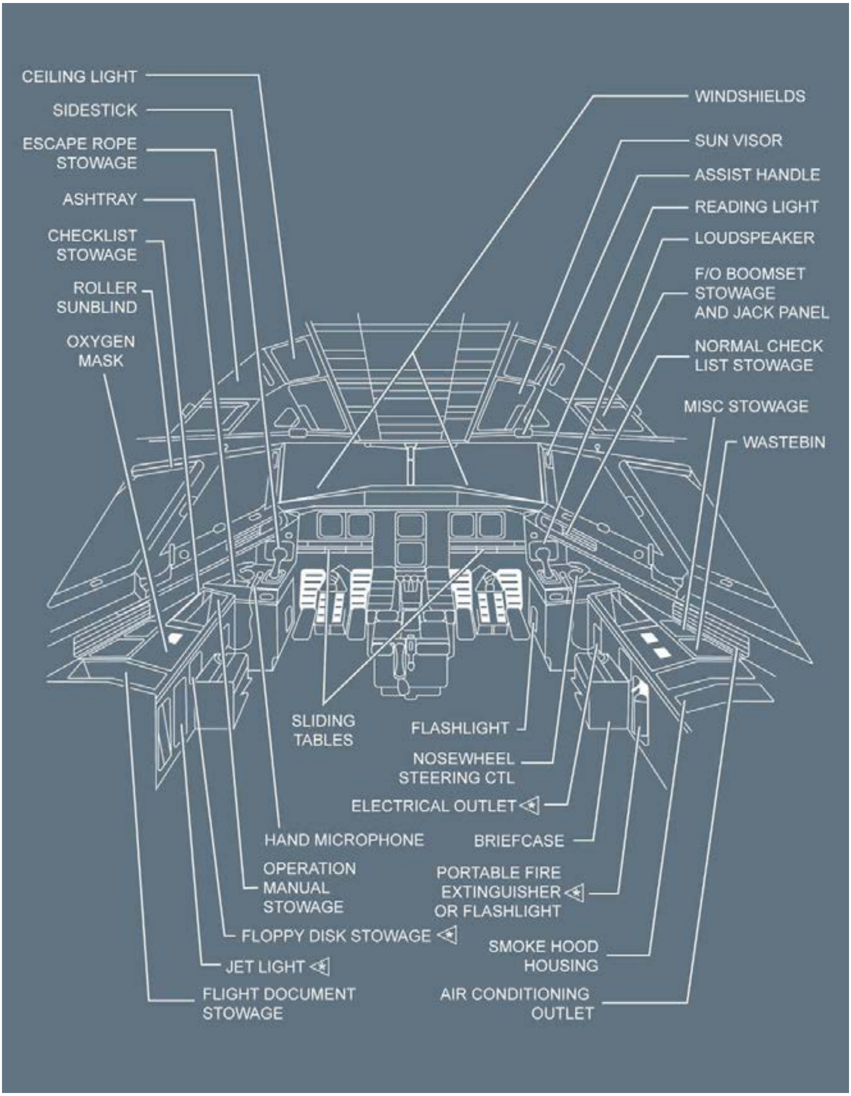
POSITION	BASIC FUNCTION
Pressed In	ON, AUTO, OVRD, OPEN
Released Out	OFF, MAN , ALTN, SHUT

Note: *1. Certain pushbutton lights have two dots, indicating that the corresponding part of the pushbutton is not used.*
2. Certain pushbuttons do not remain pressed in. These are referred to as "Momentary Action" pushbuttons.

GENERAL ARRANGEMENT

Ident.: DSC-25-10-10-00018419.0001001 / 17 MAR 17

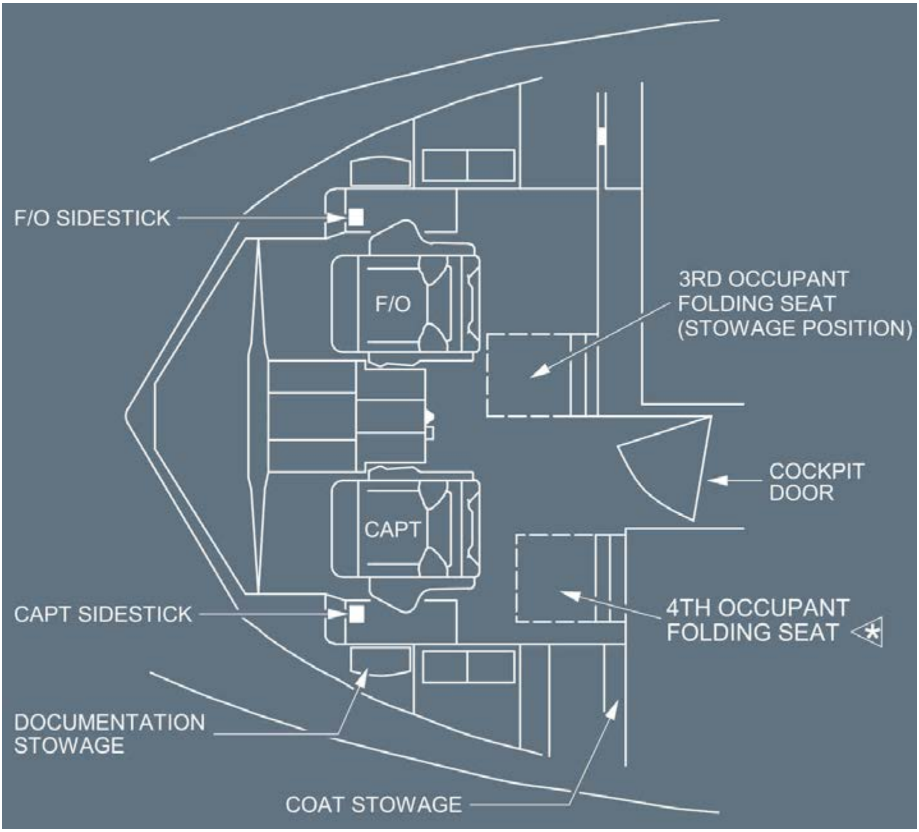
Applicable to: ALL



GENERAL

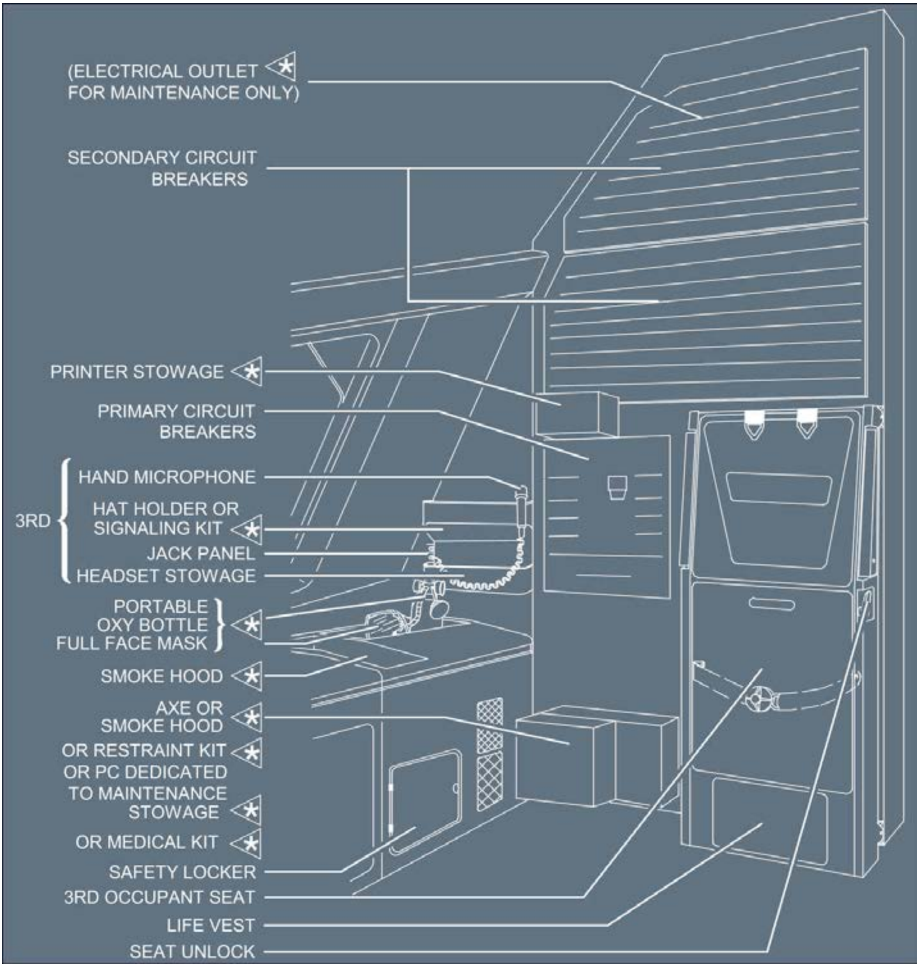
Ident.: DSC-25-10-20-00017002.0001001 / 17 MAR 17
Applicable to: ALL

The cockpit can accommodate two crewmembers, plus a third and fourth occupant.
The two pilot seats are mounted on columns.
The third and fourth occupant seats are folding seats.



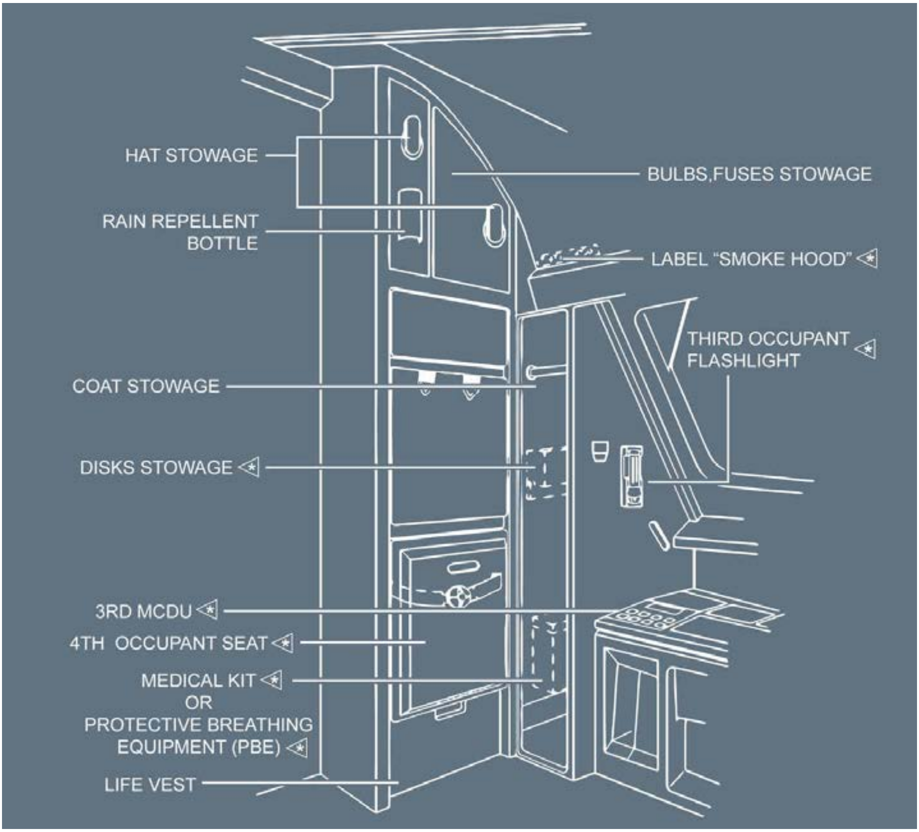
RIGHT REAR CORNER

Ident.: DSC-25-10-20-00000986.0001001 / 06 DEC 16
Applicable to: ALL



LEFT REAR CORNER

Ident.: DSC-25-10-20-00018428.0001001 / 17 MAR 17
Applicable to: ALL



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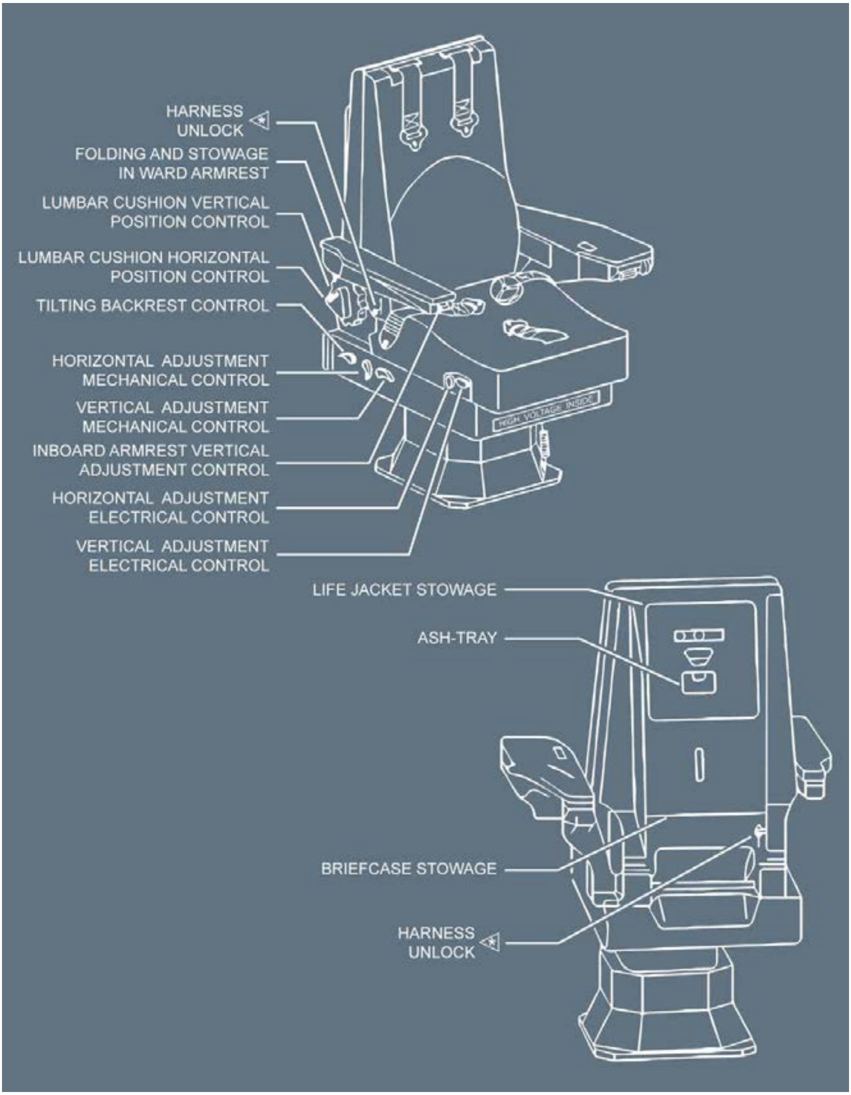
PILOT SEATS

Ident.: DSC-25-10-30-00018429.0002001 / 17 MAR 17

Applicable to: ALL



PILOT SEAT MECHANICAL ADJUSTMENT

Ident.: DSC-25-10-30-00000989.0001001 / 22 MAR 17
Applicable to: ALL

To adjust a seat mechanically, the occupant must lift the appropriate control handle. This unlocks the seat so that it may be moved. Releasing the control handle returns it to springloaded locked position. On electrically-powered seats, the mechanical adjustment is a backup: The seat should be adjusted electrically.

PILOT SEAT ELECTRICAL ADJUSTMENT ⋖

Ident.: DSC-25-10-30-00018405.0001001 / 17 MAR 17
Applicable to: ALL

To adjust a seat electrically, the occupant must press the appropriate control switch in the desired direction, and release it when the seat reaches the desired position. The switch then returns to the springloaded neutral position.

To adjust the vertical position of the lumbar cushion, the occupant must:
- Pull the control out to the unlocked position
- Turn the control to adjust the position of the cushion
- Push the control into the locked position.

HEAD REST ADJUSTMENT ⋖

Ident.: DSC-25-10-30-00018406.0001001 / 17 MAR 17
Applicable to: ALL

To adjust the headrest in inclination, the occupant presses the inclination control button, and releases it to lock the position.
To control the height of the headrest, the occupant must push it horizontally, adjust the height, and release it to lock the position.

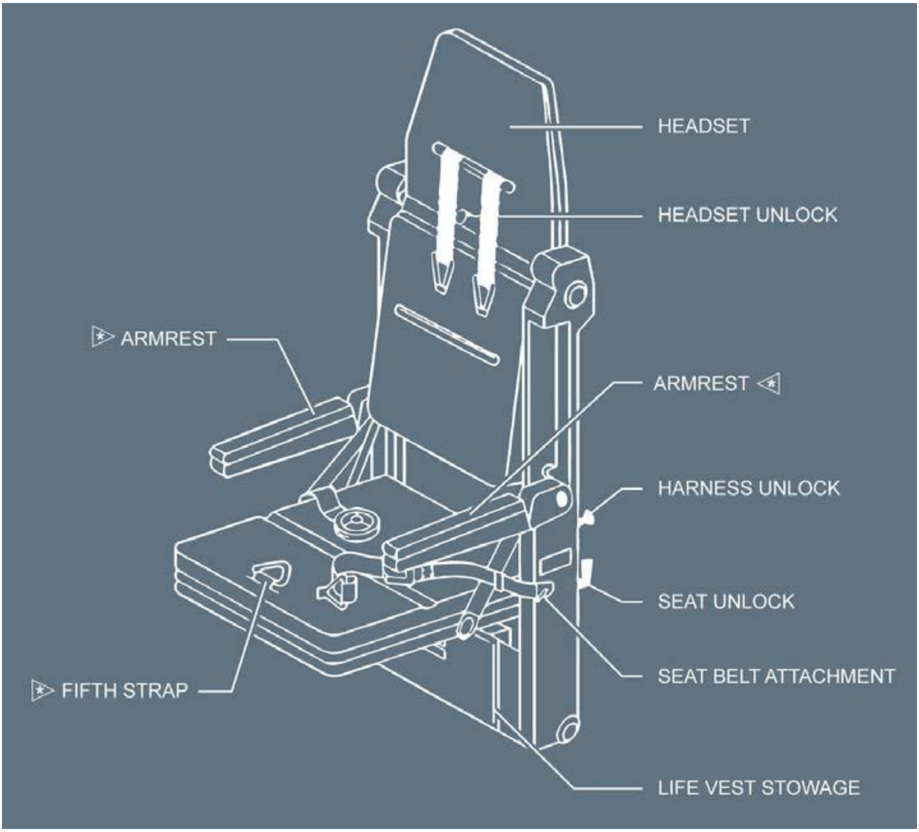
ARMREST ADJUSTMENT

Ident.: DSC-25-10-30-00000993.0001001 / 21 MAR 17
Applicable to: ALL

To adjust the inboard armrest, the occupant must turn the knurled knob, located on the bottom surface of the armrest.

OBSERVER SEAT

Ident.: DSC-25-10-30-00018430.0001001 / 17 MAR 17
Applicable to: ALL



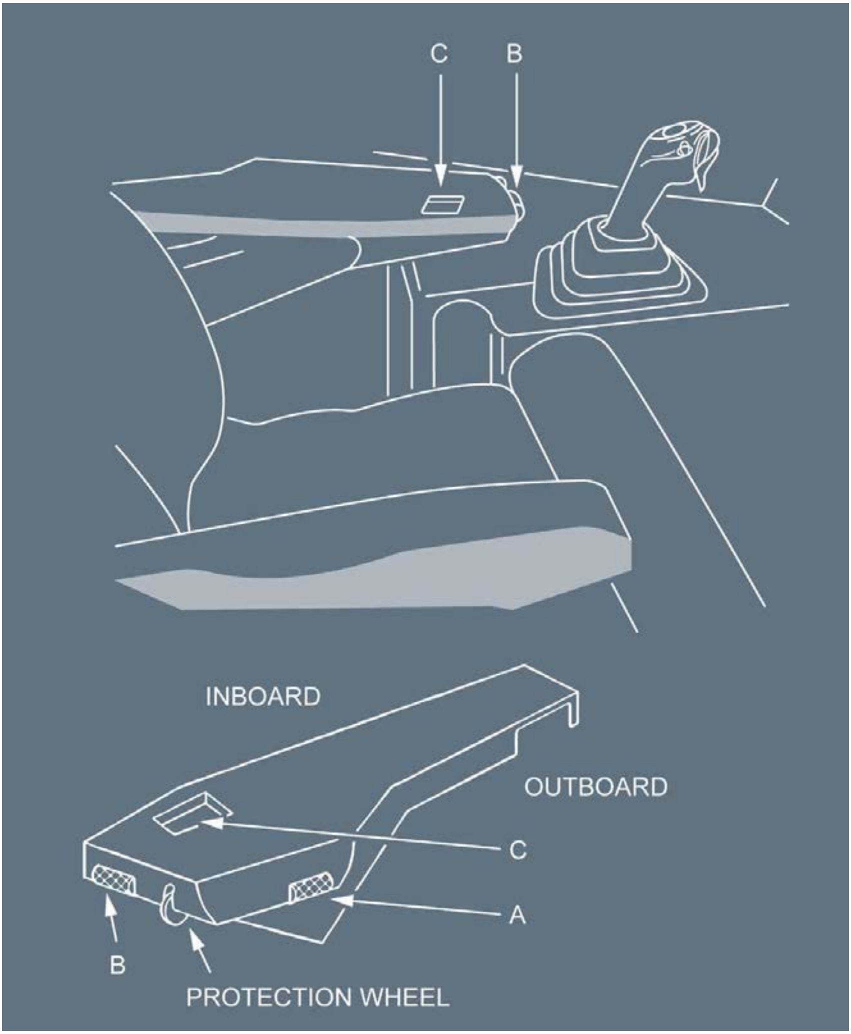
OBSERVER SEAT ADJUSTMENT

Ident.: DSC-25-10-30-00000995.0001001 / 21 MAR 17
Applicable to: ALL

This seat has three positions :
- Normal : Centered on aircraft axis.
- Intermediate : Clear of the cockpit entrance.
- Stowed : Seat vertical and headrest folded back. The seat is usable in this position, and does not impede access to the documents and equipment on the right side of the cockpit.

ARMREST

Ident.: DSC-25-10-30-00018431.0001001 / 17 MAR 17
Applicable to: ALL



The position of the armrest is adjustable as follows:

A. Height adjustment

B. Pitch adjustment

The armrest also has a memory display (C) that shows pitch and height.

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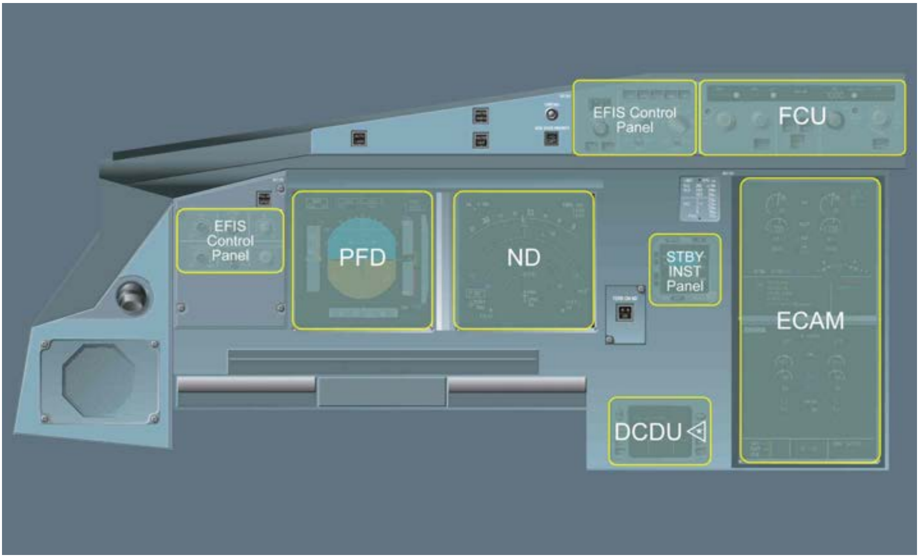
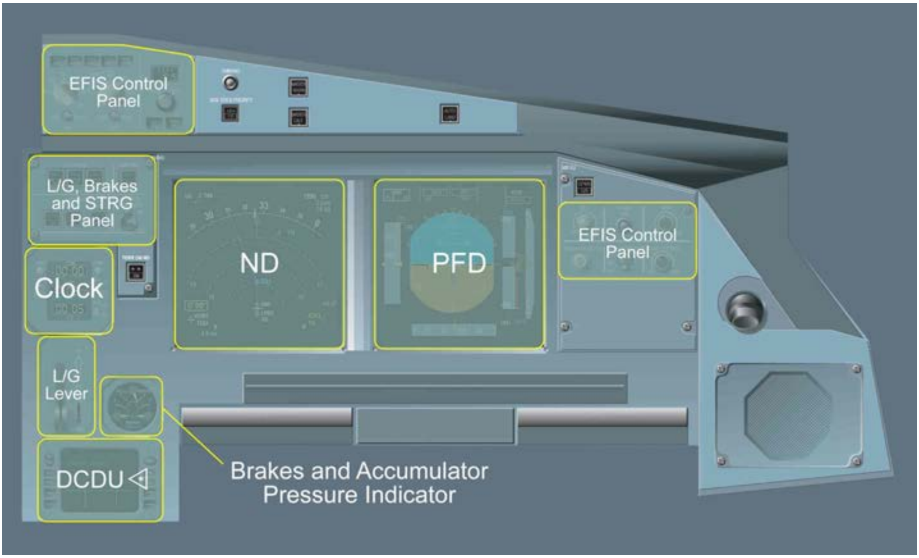
MAIN INSTRUMENT PANEL - CAPTAIN SIDE

Ident.: DSC-25-10-40-00020851.0001001 / 21 MAR 17
Applicable to: ALL



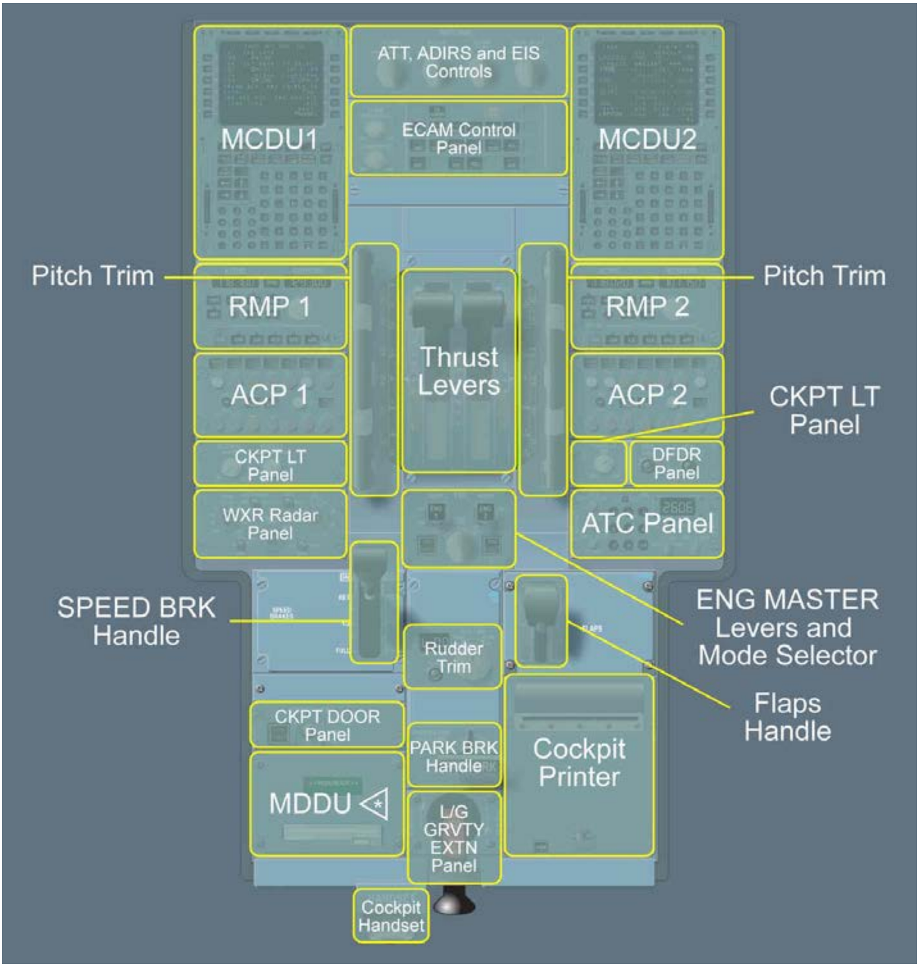
MAIN INSTRUMENT PANEL - FIRST OFFICER SIDE

Ident.: DSC-25-10-40-00020852.0001001 / 21 MAR 17
Applicable to: ALL



PEDESTAL

Ident.: DSC-25-10-50-00020854.0001001 / 17 MAR 17
Applicable to: ALL



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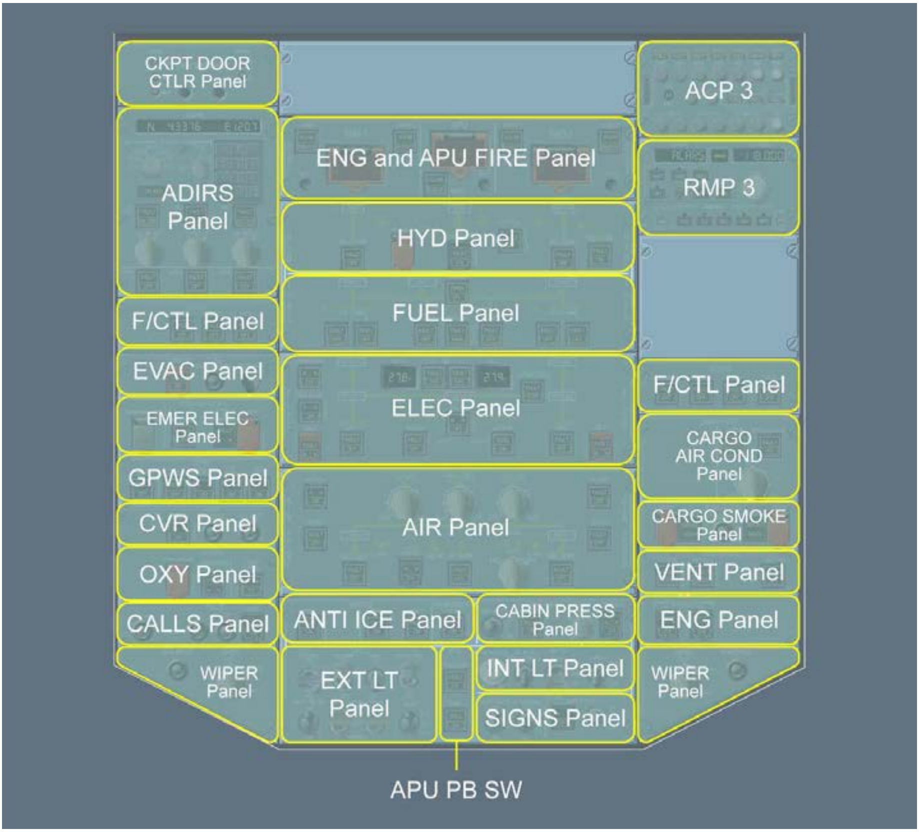
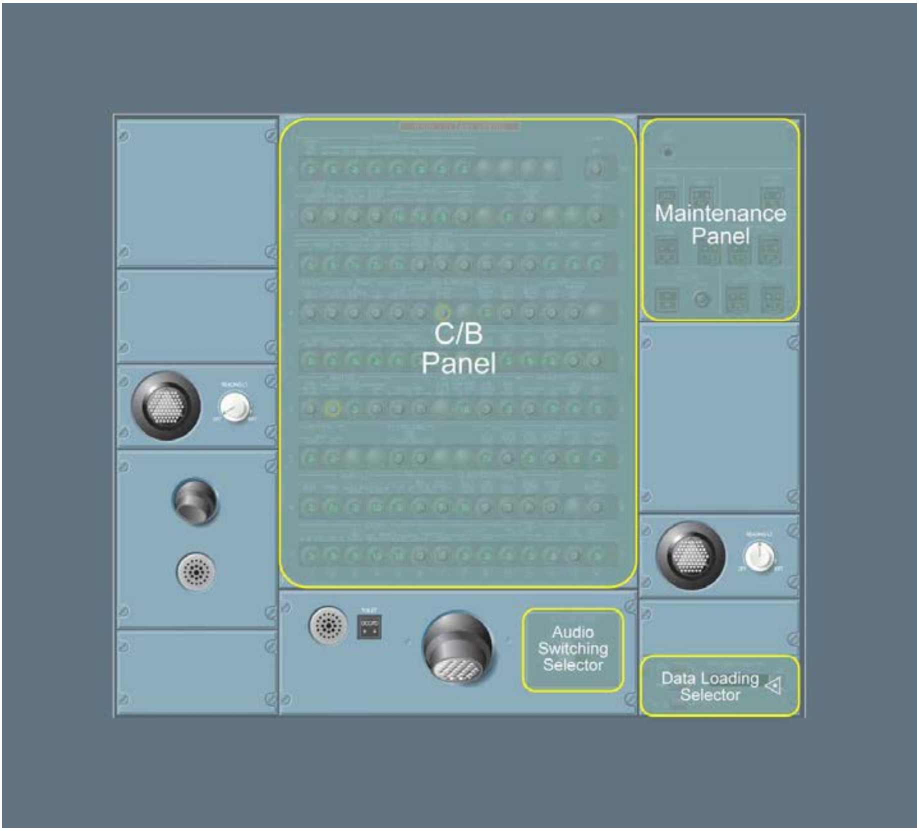
OVERHEAD PANEL

Ident.: DSC-25-10-60-00020855.0001001 / 17 MAR 17
Applicable to: ALL

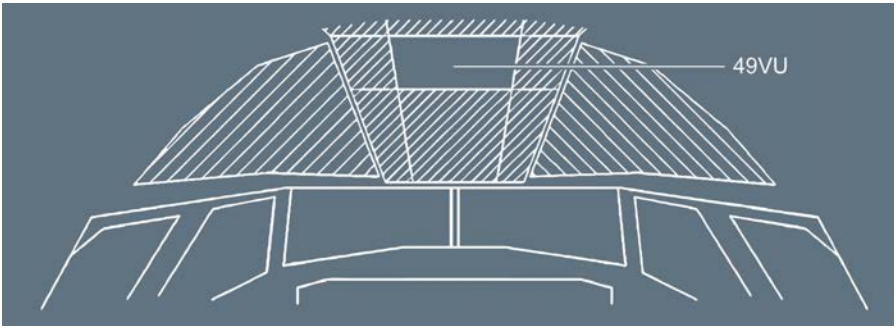



C/B
Panel
Maintenance
Panel
Audio
Switching
Selector
Data Loading
Selector

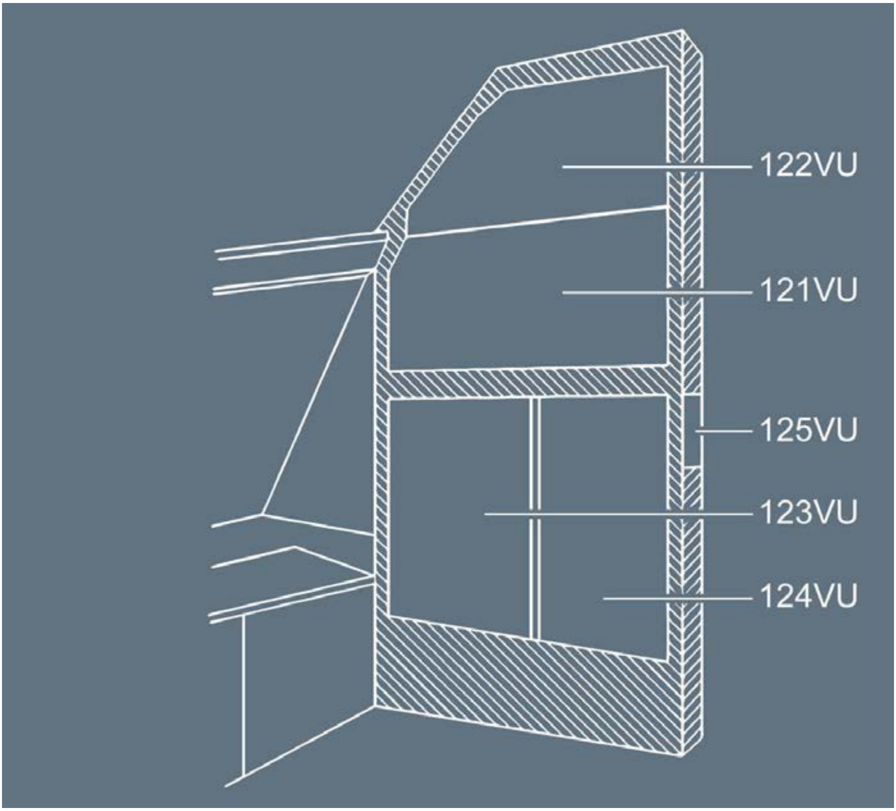
C/B PANELS

Ident.: DSC-25-10-70-00018436.0001001 / 17 MAR 17
Applicable to: ALL

OVERHEAD PANEL



RIGHT REAR PANEL



GENERAL

Ident.: DSC-25-10-80-00017009.0001001 / 17 MAR 17
Applicable to: ALL

The foot warmer system has a heating panel attached to each pedal. The temperature of the panels is about 20 °C (68 °F).

CONTROLS

Ident.: DSC-25-10-80-00017008.0001001 / 17 MAR 17
Applicable to: ALL

The Foot Warmer ON/OFF control switch is located on the main instrument panel, on the captain's and first officer's side.

FOOT WARMER sw

Operation of the associated heating panel on captain's pedals or first officer's pedals.

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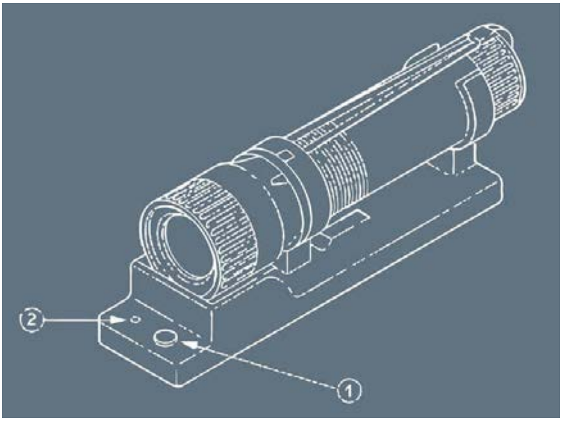
FLASHLIGHTS

Ident.: DSC-25-20-00018439.0001001 / 17 MAR 17
Applicable to: ALL

Emergency flashlights are installed in a bracket at each lateral console.
Each flashlight comes on automatically when it is removed from its bracket.
A push-to-test button and its associated red/green LED indicate the battery status.



(1) Push-to-Test Button
Pressing this button indicates the battery status.

(2) Charge Indicator (LED)

When the Push-to-Test button is pressed:
- If the LED comes on in green (flashes green one time), the flashlight battery is charged
- If the LED comes on in red (flashes red one time), the battery is low, and should be changed
- If the LED does not come on, the flashlight system has a failure and must be repaired.

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AIRCRAFT SYSTEMS

FIRE PROTECTION

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DESCRIPTION

Ident.: DSC-26-10-00021387.0006001 / 17 MAR 17
Applicable to: ALL

The fire and smoke protection system includes:
- Fire and overheat detection for the engines and APU
- Smoke detection for the cargo compartments, the lavatories, and the avionics bay
- Fire extinguishing for the cargo compartments, the engines, the APU, and the lavatories.

In addition, the aircraft includes portable fire extinguishers in the cockpit and in the cabin areas.

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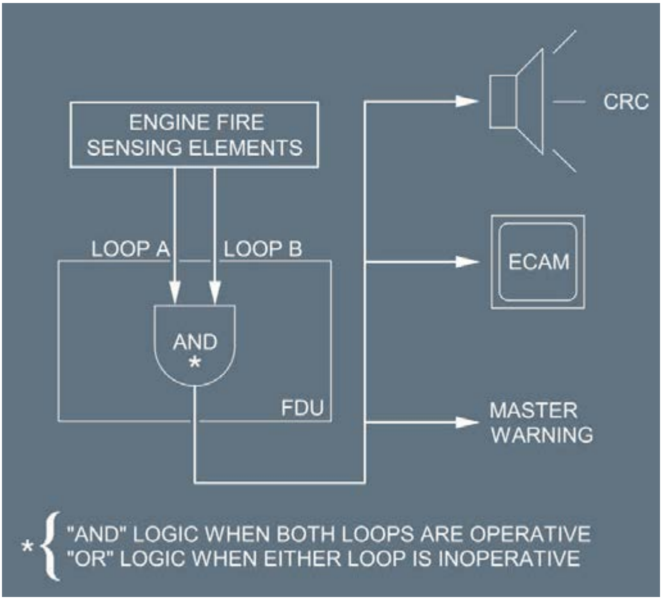
FIRE DETECTION

Ident.: DSC-26-20-10-00021393.0001001 / 17 MAR 17
Applicable to: ALL

The engines and the APU each have a fire and overheat detection system consisting of:
- Two identical detection loops (A and B) mounted in parallel
- A Fire Detection Unit (FDU).

The fire detection loops consist of:
- Three or four (as installed) engine fire sensing elements, in the pylon nacelle, in the engine core, and in the engine fan section
- One fire sensing element in the APU compartment.



When a sensing element is subjected to heat, it sends a signal to the FDU. As soon as loops A and B detect temperature above a preset level, the fire warning system is triggered.
A fault in one loop (break or loss of electrical supply) does not affect the warning system and the unaffected loop still protects the aircraft.

EXTINGUISHING

Ident.: DSC-26-20-10-00021395.0001001 / 04 JUL 17
Applicable to: ALL

ENGINES

Each engine has two fire extinguisher bottles, with electrically-operated squibs to discharge their agents. Each squib has a dual electric supply. The flight crew controls the discharge of the fire extinguisher bottles from the FIRE panel in the cockpit.

APU

The APU has one fire extinguisher bottle, with two electrically-operated squibs to discharge its agent. The flight crew controls the discharge of the fire extinguisher bottle from the FIRE panel in the cockpit. When an APU fire is detected on the ground, the APU automatically shuts down, and the extinguisher bottle discharges automatically.

FIRE DETECTION AND DETECTION FAULT LOGIC

Ident.: DSC-26-20-10-00021394.0001001 / 17 MAR 17
Applicable to: ALL

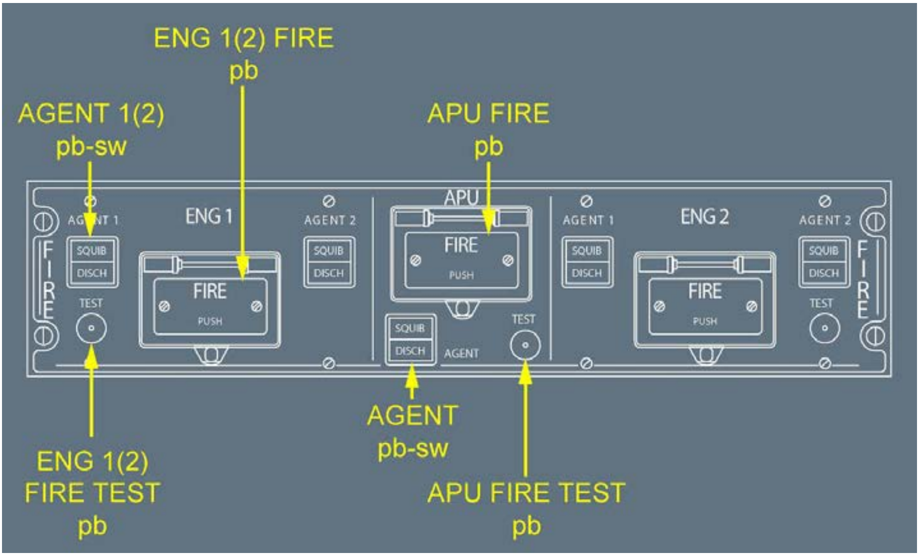
Fire detection units process all the warnings and cautions originating in the sensing elements.

- A fire warning appears, if:
  - Both loops A and B send a fire signal, or
  - One loop sends a fire signal and the other one is failed, or
  - Breaks occur in both loops within 5 s of each other (flame effect), or
  - A test is performed on the FIRE panel
- A loop-fault caution appears, if:
  - One loop is failed, or
  - Both loops are failed, or
  - The FDU fails.

FIRE PANEL

Applicable to: ALL

Ident.: DSC-26-20-20-10-00021396.0002001 / 17 MAR 17



Ident.: DSC-26-20-20-10-00021415.0001001 / 17 MAR 17

ENG 1(2) FIRE PB

The pushbutton normal position is in, and guarded. When the flight crew pushes it, the pushbutton is released and sends an electrical signal that performs the following for the corresponding engine:
- Silences the aural fire warning
- Arms the fire extinguisher squibs
- Closes the low-pressure fuel valve
- Closes the hydraulic fire shut off valve
- Closes the engine bleed valve
- Closes the pack flow control valve
- Cuts off the FADEC power supply
- Deactivates the IDG.

The red lights come on, regardless of the pushbutton position, whenever the fire warning for the corresponding engine is activated.

Ident.: DSC-26-20-20-10-00021420.0001001 / 17 MAR 17

AGENT 1(2) PB-SW

Both AGENT pushbutton-switches of an affected engine become active when the flight crew releases the ENG 1(2) FIRE pb.
A brief push on the pushbutton-switch discharges the corresponding fire agent.

- “SQUIB” comes on white when the flight crew releases the ENG 1(2) FIRE pb to help the flight crew identify the AGENT pb-sw to be activated.
- “DISCH” comes on amber when the corresponding fire extinguisher bottle has lost pressure.

Ident.: DSC-26-20-20-10-00021421.0001001 / 17 MAR 17

ENG 1(2) FIRE TEST PB

This pushbutton tests the operation of the fire detection and extinguishing system for ENG 1(2).

When pressed:
- A continuous repetitive chime (CRC) sounds
- The MASTER WARNING lights flash
- ENG FIRE warning appears on ECAM.
- On the FIRE panel:
  - The ENG 1(2) FIRE pb lights up red
  - The SQUIB lights come on white if discharge supplies are available
  - The DISCH lights come on amber.
- On the ENG MASTER panel (pedestal):
  - The FIRE lights come on red.

Ident.: DSC-26-20-20-10-00021423.0001001 / 17 MAR 17

APU FIRE PB

The pushbutton normal position is in, and guarded. When the flight crew pushes it, the pushbutton is released and sends an electrical signal that performs the following for the APU:
- Shuts down the APU
- Silences the aural warning
- Arms the squib on the APU fire extinguisher
- Closes the low-pressure fuel valve
- Shuts off the APU fuel pump
- Closes the APU bleed valve and X bleed valve and deactivates the APU generator.

The red lights come on, regardless of the pushbutton position, whenever an APU fire warning is activated.

Ident.: DSC-26-20-20-10-00021424.0001001 / 17 MAR 17

AGENT PB-SW

The APU AGENT pb-sw becomes active when the flight crew releases the APU FIRE pb.
A brief push on the pushbutton-switch discharges the corresponding fire agent.

- "SQUIB" comes on white when the pilot releases the APU FIRE pb.
- "DISCH" comes on amber when the fire extinguisher bottle has lost pressure.

Note: *A red disk, which is outside at the rear of the fuselage, signals that the agent is not discharged overboard due to bottle overpressure.*

Ident.: DSC-26-20-20-10-00021425.0001001 / 17 MAR 17

APU FIRE TEST PB

This pushbutton tests the operation of the APU fire detection and extinguishing system.

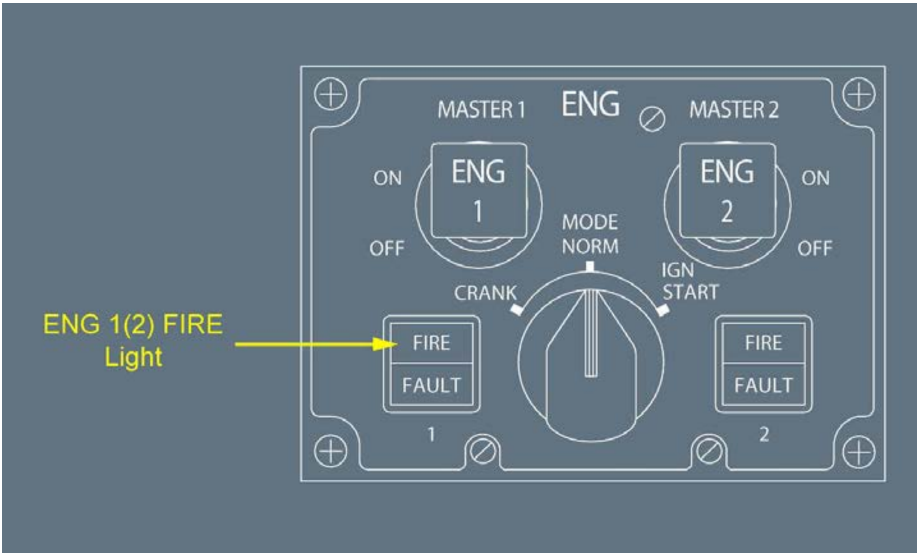
When pressed:
- A continuous repetitive chime (CRC) sounds
- The MASTER WARNING lights flash
- APU FIRE warning appears on ECAM.
- On the FIRE panel:
  - The APU FIRE pb lights up red
  - The SQUIB light comes on white if discharge supplies are available
  - The DISCH light comes on amber.

Note: *The automatic shutdown of the APU on the ground does not occur when the flight crew performs this test.*

ENG MASTER PANEL

Applicable to: ALL

Ident.: DSC-26-20-20-20-00021427.0001001 / 17 MAR 17



Ident.: DSC-26-20-20-20-00021428.0001001 / 17 MAR 17

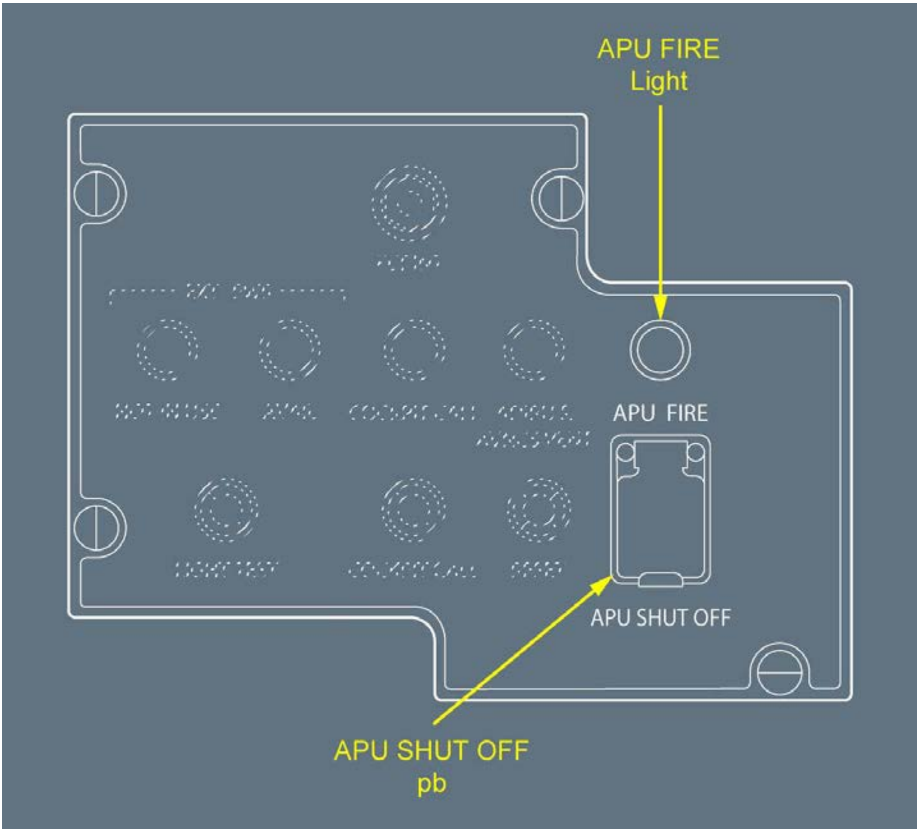
ENG 1(2) FIRE LIGHT

This light identifies the engine to be shutdown in the case of fire.
The light comes on red when an engine fire warning is triggered.

EXTERNAL POWER PANEL

Applicable to: ALL

Ident.: DSC-26-20-20-30-00021429.0001001 / 17 MAR 17



Ident.: DSC-26-20-20-30-00021430.0001001 / 17 MAR 17

APU FIRE LIGHT

The red APU FIRE light comes on and an external warning horn sounds when the system detects an APU fire.
The APU fire extinguisher discharges automatically 3 s after the appearance of the fire warning.
The light goes out when the fire has been extinguished.

Ident.: DSC-26-20-20-30-00021431.0001001 / 17 MAR 17

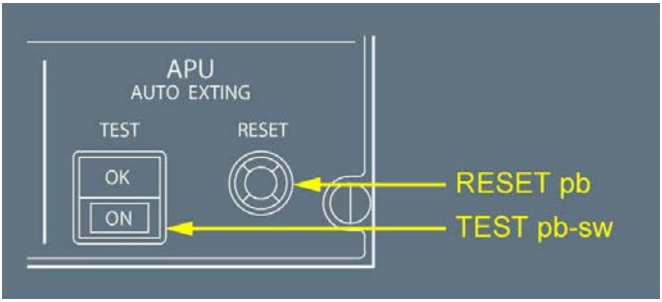
APU SHUT OFF PB

This pushbutton is used for manual APU emergency shutdown, if an emergency situation is detected on ground by the ground crew. When this pushbutton is pressed, the APU low pressure fuel shutoff valve closes, and the ECB receives a signal that starts the shutdown sequence. The shutdown sequence is the same as the APU automatic shutdown sequence, except that there is no cool down cycle. Pressing this pushbutton also silences the external warning horn.

MAINTENANCE PANEL

Applicable to: ALL

Ident.: DSC-26-20-20-40-00021432.0001001 / 17 MAR 17



Ident.: DSC-26-20-20-40-00021435.0001001 / 17 MAR 17

TEST PB-SW

When pressed, tests the following APU circuits:
- Fire warning
- Auto extinguishing
- Shutdown.

During the test sequence, the APU MASTER sw must be ON.
If all circuits are operating correctly, the OK light comes on.

Note: *If the APU was running, it shuts down.*

Ident.: DSC-26-20-20-40-00021436.0001001 / 17 MAR 17

RESET PB

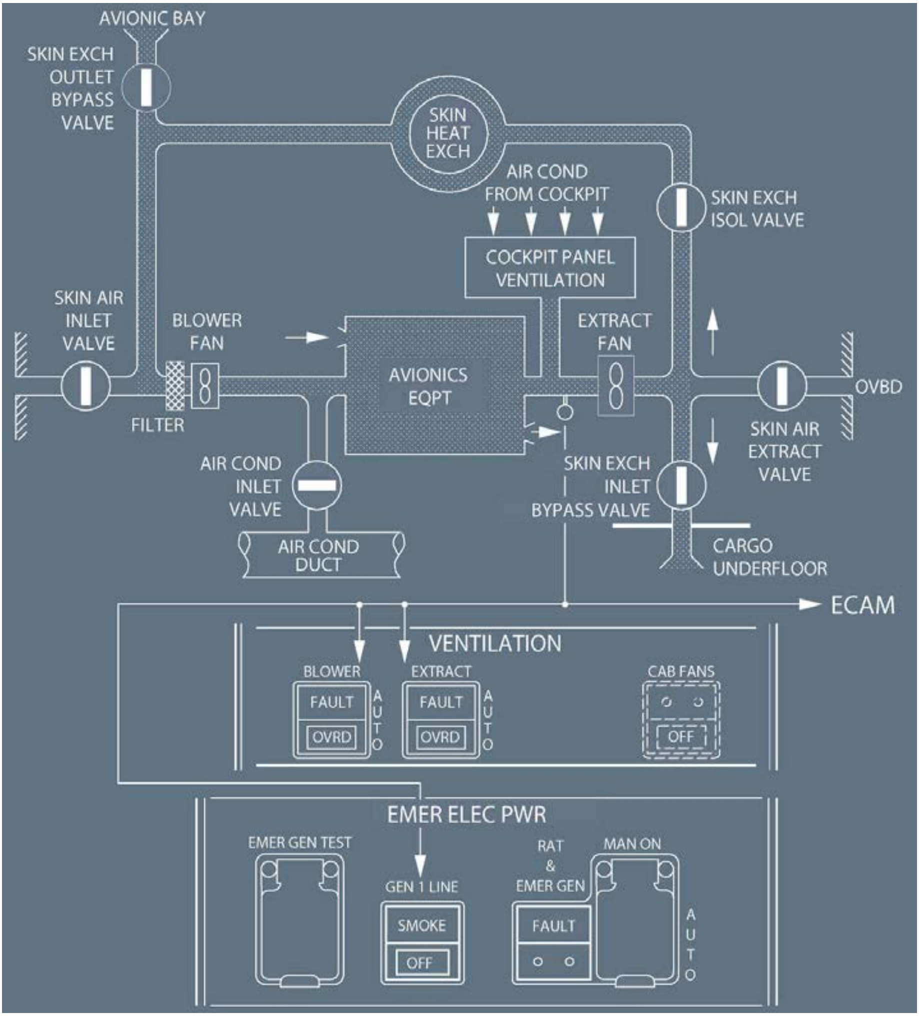
When pressed, resets the test circuit.

SMOKE DETECTION

Ident.: DSC-26-30-10-00021401.0001001 / 17 MAR 17
Applicable to: ALL

The air extraction duct of the avionics ventilation system has one smoke detector.

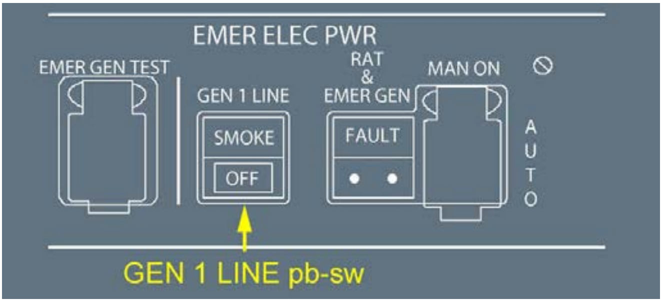
When smoke is detected for more than 5 s:
- The Single Chime (SC) sounds
- The MASTER CAUTION lights flash
- The ECAM AVIONICS SMOKE alert triggers
- On the EMER ELEC PWR panel, the SMOKE light of the GEN 1 LINE pb-sw comes on
- On the VENTILATION panel, the FAULT lights of the BLOWER pb-sw and the EXTRACT pb-sw come on.


AVIONIC BAY
SKIN EXCH OUTLET BYPASS VALVE
SKIN HEAT EXCH
AIR COND FROM COCKPIT
SKIN EXCH ISOL VALVE
COCKPIT PANEL VENTILATION
SKIN AIR INLET VALVE
BLOWER FAN
EXTRACT FAN
AVIONICS EQPT
OVBD
FILTER
SKIN AIR EXTRACT VALVE
AIR COND INLET VALVE
SKIN EXCH INLET BYPASS VALVE
AIR COND DUCT
CARGO UNDERFLOOR
ECAM
VENTILATION
BLOWER
EXTRACT
CAB FANS
FAULT
OVRD
AUTO
OFF
EMER ELEC PWR
EMER GEN TEST
GEN 1 LINE
SMOKE
OFF
RAT & EMER GEN
MAN ON
FAULT
AUTO

EMER ELEC PWR PANEL

Applicable to: ALL

Ident.: DSC-26-30-20-A-00021439.0001001 / 17 MAR 17



Ident.: DSC-26-30-20-A-00021440.0001001 / 17 MAR 17

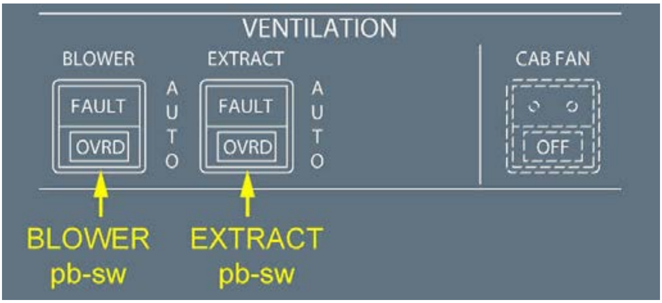
GEN 1 LINE PB-SW

SMOKE light on : The amber light comes on when smoke is detected in the avionics ventilation duct.

VENTILATION PANEL

Applicable to: ALL

Ident.: DSC-26-30-20-B-00021402.0001001 / 17 MAR 17



Ident.: DSC-26-30-20-B-00021437.0001001 / 17 MAR 17

BLOWER PB-SW

FAULT light on : The amber light comes on when smoke is detected in the avionics ventilation duct.

Ident.: DSC-26-30-20-B-00021438.0001001 / 17 MAR 17

EXTRACT PB-SW

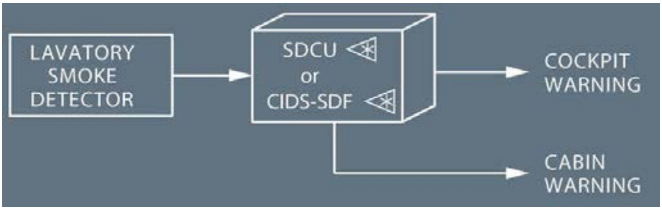
FAULT light on : The amber light comes on when smoke is detected in the avionics ventilation duct.

SMOKE DETECTION

Ident.: DSC-26-40-10-00021441.0001001 / 17 MAR 17
Applicable to: ALL

The lavatory smoke detection system consists of:
- One smoke detector, in the air extraction duct of the lavatory
- A double channel Smoke Detection Control Unit (SDCU) or a Cabin Intercommunication Data Systems (CIDS) with a Smoke Detection Function (SDF) that triggers the applicable alerts (cockpit and cabin).

In the case of smoke in a lavatory, the detector sends a signal to the SDCU or CIDS , which transmits it to the Flight Warning Computer (FWC) for warning in the cockpit and in the cabin.



WASTEBIN FIRE EXTINGUISHING

Ident.: DSC-26-40-10-00001034.0001001 / 21 MAR 16
Applicable to: ALL

Each lavatory wastebin has an automatic fire extinguishing system.

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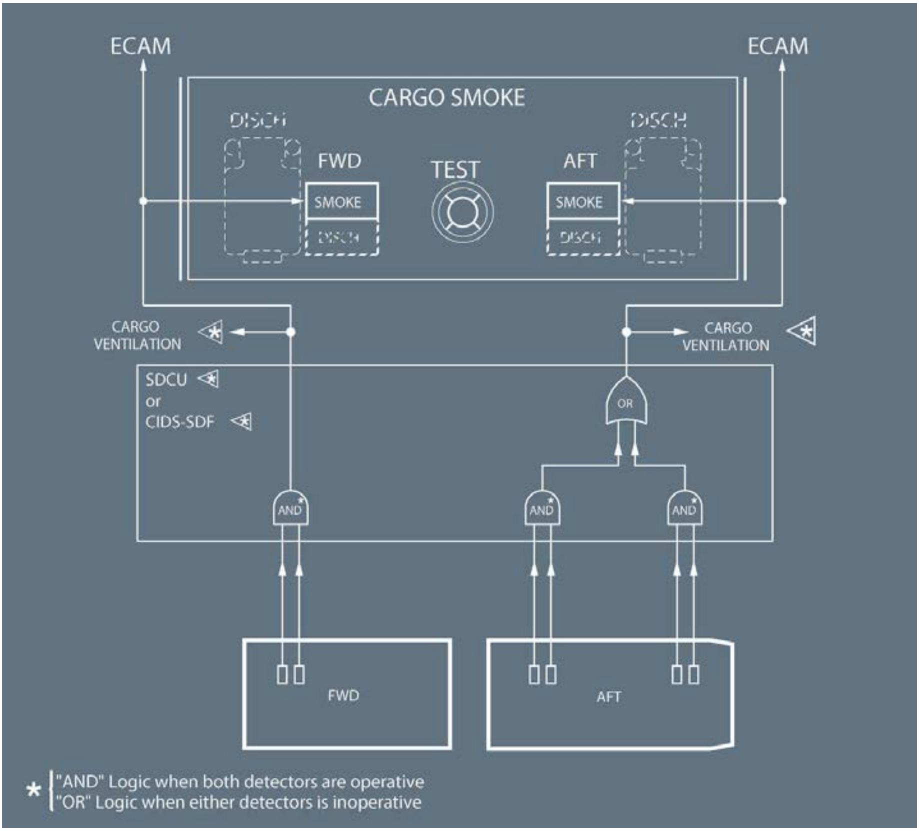
SMOKE DETECTION

Ident.: DSC-26-50-10-00021442.0003001 / 17 MAR 17
Applicable to: ALL

The forward and aft cargo compartments smoke detection system consists of:
- Two smoke detectors that are in the forward cargo compartment ceiling panel cavities. Each detector is linked to one of the two detection loops (dual loop principle).
- Four smoke detectors that are in the aft cargo compartment ceiling panel cavities. Each detector is linked to one of the two detection loops (dual loop principle).
- A Smoke Detection Control Unit (SDCU) with two identical channels, or a Cabin Intercommunication Data Systems (CIDS) with a Smoke Detection Function (SDF) , that receives signals from the smoke detectors, and transmits it to the ECAM.

Smoke in one cavity activates the cargo smoke warning if:
- Both smoke detectors detect smoke, or
- One smoke detector detects smoke and the other is inoperative.

Cargo isolation valves close automatically, and the extraction fan stops when the cargo smoke warning is activated.



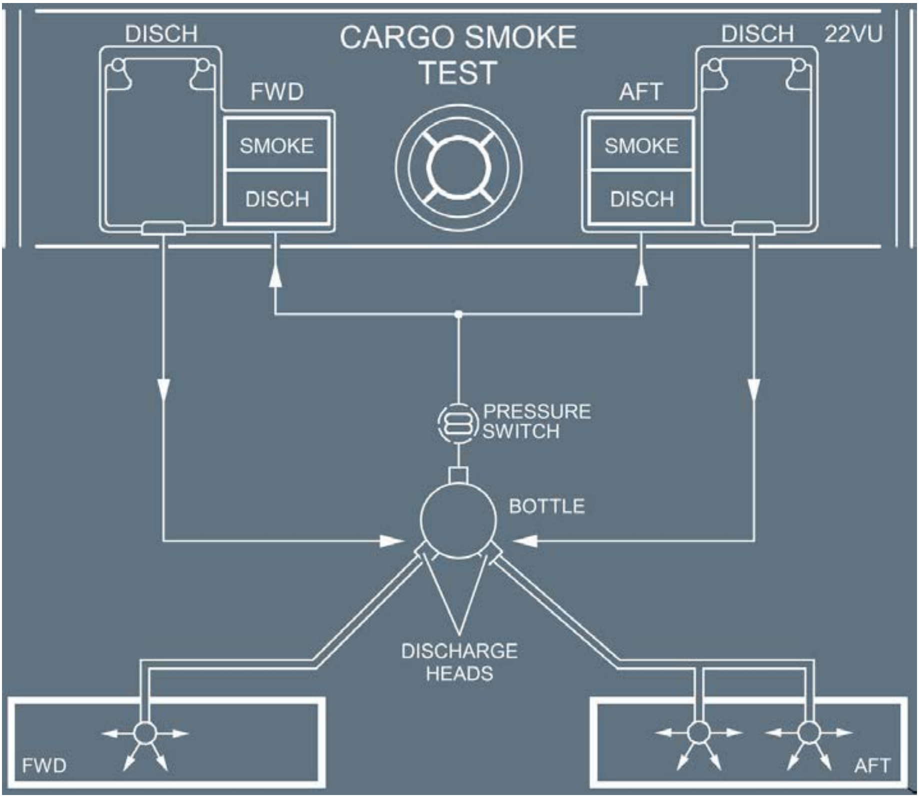
FIRE EXTINGUISHING

Ident.: DSC-26-50-10-00021443.0005001 / 17 MAR 17
Applicable to: ALL

A fire extinguishing system protects the forward and aft cargo compartments.

One fire bottle with two discharge heads, one for each compartment, supplies three nozzles:
- One nozzle in the forward cargo compartment
- Two nozzles in the aft cargo compartment.

When the flight crew presses the FWD(AFT) DISCH pb, the action ignites the corresponding squib on the fire bottle, which then discharges the extinguisher agent into that cargo compartment.
When the bottle is empty, the DISCH light comes on amber.


DISCH
CARGO SMOKE
TEST
DISCH
22VU
FWD
AFT
SMOKE
DISCH
SMOKE
DISCH
PRESSURE
SWITCH
BOTTLE
DISCHARGE
HEADS
FWD
AFT

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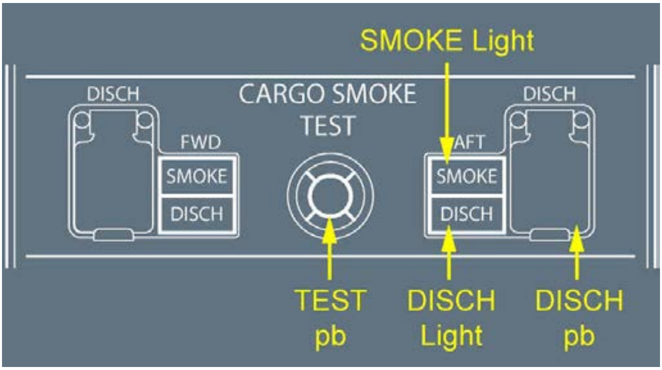
CARGO SMOKE PANEL

Applicable to: ALL

Ident.: DSC-26-50-20-10-00021446.0005001 / 17 MAR 17



Ident.: DSC-26-50-20-10-00021450.0001001 / 17 MAR 17

SMOKE LIGHT

This red light, and the associated ECAM warning, come on when the system detects smoke in the indicated cargo compartment. This light comes on, if:
- Both channels detect smoke, or
- One channel detects smoke and the other channel is faulty.

Ident.: DSC-26-50-20-10-00021451.0002001 / 17 MAR 17

TEST PB

Tests the operation of the cargo smoke detection system.

When pressed for at least 3 s, and until released:
- Tests the smoke detectors in sequence
- Turns on the red SMOKE lights twice, and displays the ECAM warning
- Closes the isolation valves of the cargo ventilation system
- The DISCH lights come on in amber.

Ident.: DSC-26-50-20-10-00021452.0001001 / 17 MAR 17

DISCH LIGHT

Within 60 s after pressing the discharge pushbutton, the amber DISCH light comes on when the associated bottle is fully discharged.

Ident.: DSC-26-50-20-10-00021454.0001001 / 17 MAR 17

DISCH PB

The DISCH pb ignites the squib, thereby discharging the extinguishing agent in the affected cargo compartment.

AIRCRAFT SYSTEMS

FLIGHT CONTROLS

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DSC-27-10 General

DSC-27-10-10 General

DSC-27-10-20 Architecture

DSC-27-20 Flight Control System

DSC-27-20-10 Normal Law

DSC-27-20-10-10 General

DSC-27-20-10-20 Pitch Control

DSC-27-20-10-30 Lateral Control

DSC-27-20-10-50 Sideslip Target

DSC-27-20-10-70 Aircraft Trimming

Continued on the following page

Continued from the previous page

GENERAL

Ident.: DSC-27-10-10-00001043.0001001 / 21 MAR 16
Applicable to: ALL

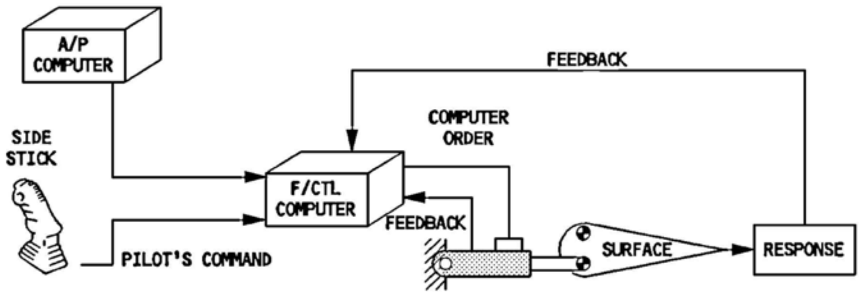
The fly-by-wire system was designed and certified to render the new generation of aircraft even more safe, cost effective, and pleasant to fly.

BASIC PRINCIPLE

Ident.: DSC-27-10-10-00001044.0001001 / 21 MAR 16
Applicable to: ALL

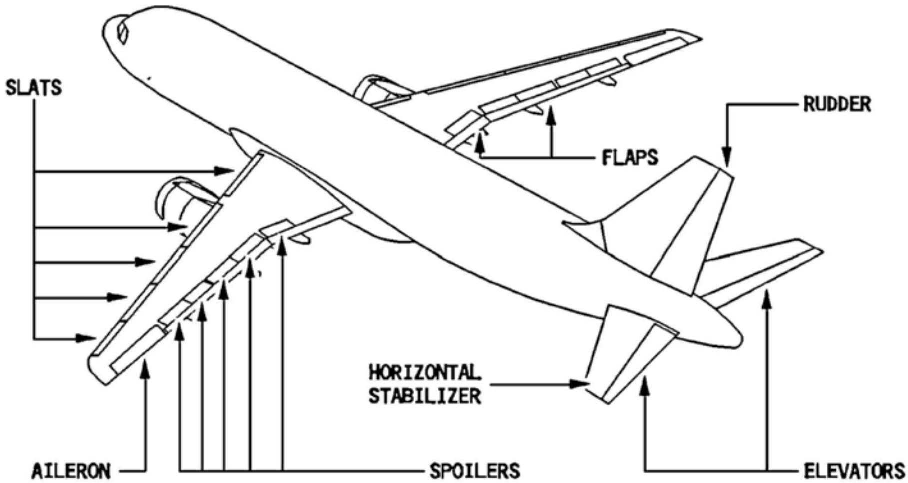
Flight control surfaces are all :
- Electrically-controlled, and
- Hydraulically-activated.

The stabilizer and rudder can also be mechanically-controlled.
Pilots use sidesticks to fly the aircraft in pitch and roll (and in yaw, indirectly, through turn coordination).
Computers interpret pilot input and move the flight control surfaces, as necessary, to follow their orders.
However, when in normal law, regardless of the pilot’s input, the computers will prevent excessive maneuvers and exceedance of the safe envelope in pitch and roll axis.
However, as on conventional aircraft, the rudder has no such protection.



CONTROL SURFACES

Ident.: DSC-27-10-10-00001045.0001001 / 21 MAR 16
Applicable to: ALL



The flight controls are electrically or mechanically controlled as follows :

PITCH AXIS

Elevator	=	Electrical
Stabilizer	=	Electrical for normal or alternate control. Mechanical for manual trim control

ROLL AXIS

Ailerons	=	Electrical
Spoilers	=	Electrical

YAW AXIS

Rudder	=	Mechanical, however control for yaw damping, turn coordination and trim is electrical.

SPEED BRAKES

Speed brakes	=	Electrical

Note: All surfaces are hydraulically actuated.

COCKPIT CONTROLS

Ident.: DSC-27-10-10-00001046.0001001 / 21 MAR 16
Applicable to: ALL

- Each pilot has a sidestick controller with which to exercise manual control of pitch and roll. These are on their respective lateral consoles.
  The two sidestick controllers are not coupled mechanically, and they send separate sets of signals to the flight control computers.
- Two pairs of pedals, which are rigidly interconnected, give the pilot mechanical control of the rudder.
- The pilots control speed brakes with a lever on the center pedestal.
- The pilots use mechanically interconnected handwheels on each side of the center pedestal to control the trimmable horizontal stabilizer.
- The pilots use a single switch on the center pedestal to set the rudder trim.
- There is no manual switch for trimming the ailerons.

COMPUTERS

Ident.: DSC-27-10-10-00001047.0001001 / 21 MAR 16
Applicable to: ALL

Seven flight control computers process pilot and autopilot inputs according to normal, alternate, or direct flight control laws.
The computers are :

2 ELAC s

(Elevator Aileron Computer)

For : Normal elevator and stabilizer control.
Aileron control.

3 SEC s

(Spoilers Elevator Computer)

For : Spoilers control.
Standby elevator and stabilizer control.

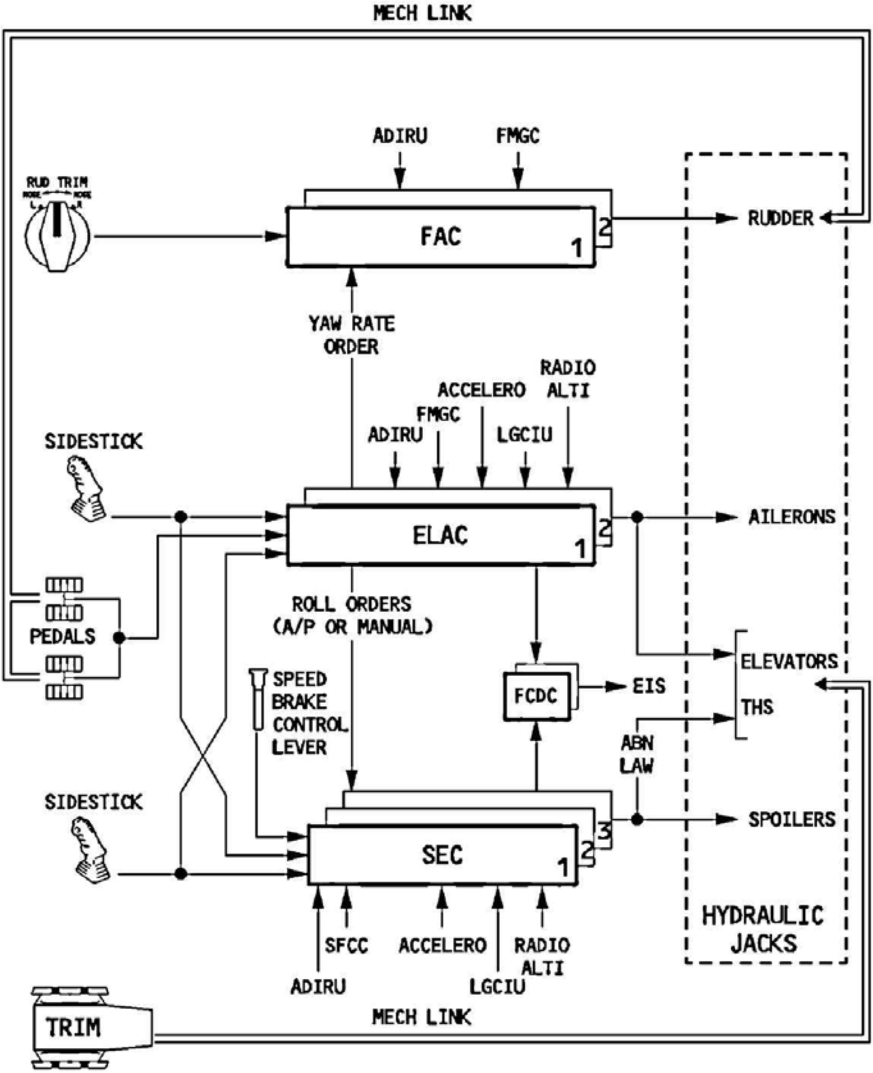
2 FAC s

(Flight Augmentation Computer)

For : Electrical rudder control.

IN ADDITION 2 FCDC

Flight Control Data Concentrators (FCDC) acquire data from the ELAC s and SEC s and send it to the electronic instrument system (EIS) and the centralized fault display system (CFDS).


MECH LINK
ADIRU
FMGC
RUD TRIM
FAC
1
2
RUDDER
YAW RATE
ORDER
RADIO
ALTI
ACCELERO
FMGC
ADIRU
LGCIU
SIDESTICK
ELAC
1
2
AILERONS
PEDALS
ROLL ORDERS
(A/P OR MANUAL)
SPEED
BRAKE
CONTROL
LEVER
FCDC
EIS
ELEVATORS
THS
ABN
LAW
SIDESTICK
SEC
1
2
3
SPOILERS
HYDRAULIC
JACKS
SFCC
ACCELERO
RADIO
ALTI
ADIRU
LGCIU
TRIM
MECH LINK

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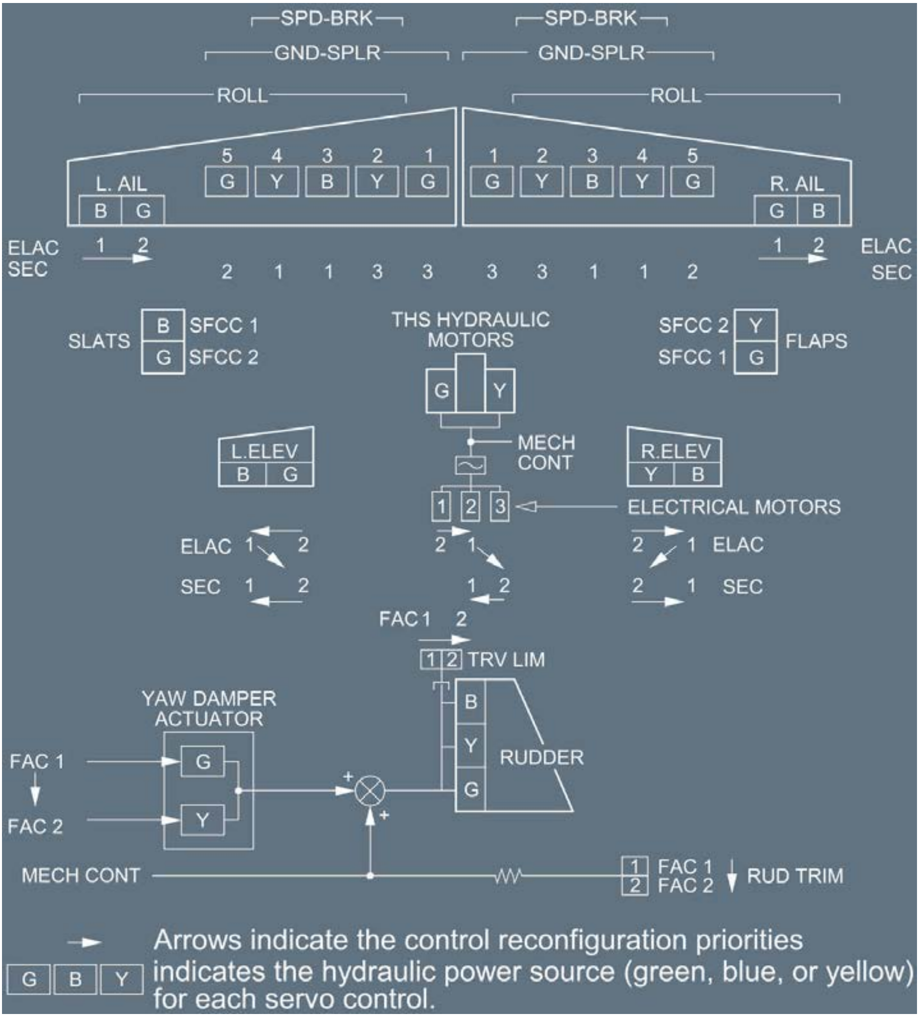
GENERAL ARCHITECTURE

Ident.: DSC-27-10-20-00001048.0002001 / 13 JAN 14
Applicable to: ALL

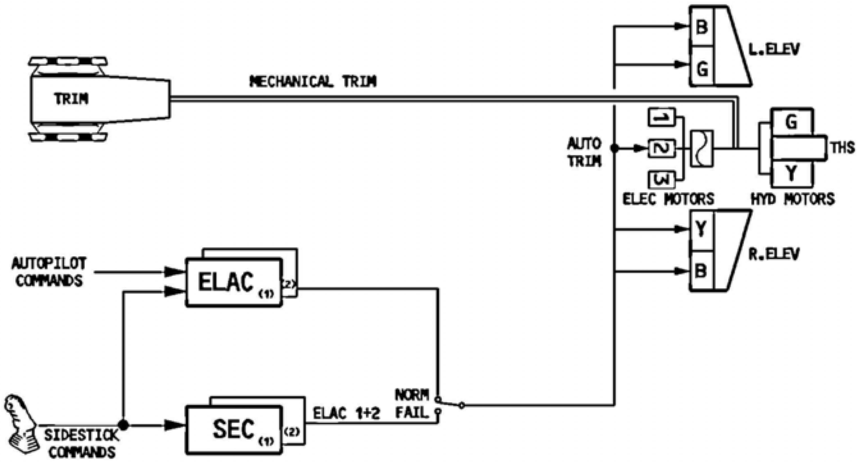


PITCH CONTROL

Applicable to: ALL

Ident.: DSC-27-10-20-A-00001049.0001001 / 21 MAR 16

GENERAL



Two elevators and the Trimmable Horizontal Stabilizer (THS) control the aircraft in pitch. The maximum elevator deflection is 30 ° nose up, and 17 ° nose down. The maximum THS deflection is 13.5 ° nose up, and 4 ° nose down.

Ident.: DSC-27-10-20-A-00001050.0001001 / 21 MAR 16

ELECTRICAL CONTROL

- In normal operations, ELAC2 controls the elevators and the horizontal stabilizer, and the green and yellow hydraulic jacks drive the left and right elevator surfaces respectively.
  The THS is driven by N° 1 of three electric motors.
- If a failure occurs in ELAC 2, or in the associated hydraulic systems, or with the hydraulic jacks, the system shifts pitch control to ELAC 1. ELAC 1 then controls the elevators via the blue hydraulic jacks and controls the THS via the N° 2 electric motor.
- If neither ELAC 1 nor ELAC 2 is available, the system shifts pitch control either to SEC 1 or to SEC 2, (depending on the status of the associated circuits), and to THS motor N° 2 or N° 3.

In case of failure, the actuators are reconfigured, *Refer to DSC-27-10-20 Pitch Control - Schematic*.

Ident.: DSC-27-10-20-A-00001051.0001001 / 21 MAR 16

MECHANICAL CONTROL

Mechanical control of the THS is available from the pitch trim wheel at any time, if either the green or yellow hydraulic system is functioning.
Mechanical control from the pitch trim wheel has priority over electrical control.

Ident.: DSC-27-10-20-A-00001053.0002001 / 21 MAR 16

ACTUATION

ELEVATORS

- Two electrically-controlled hydraulic servojacks drive each elevator.

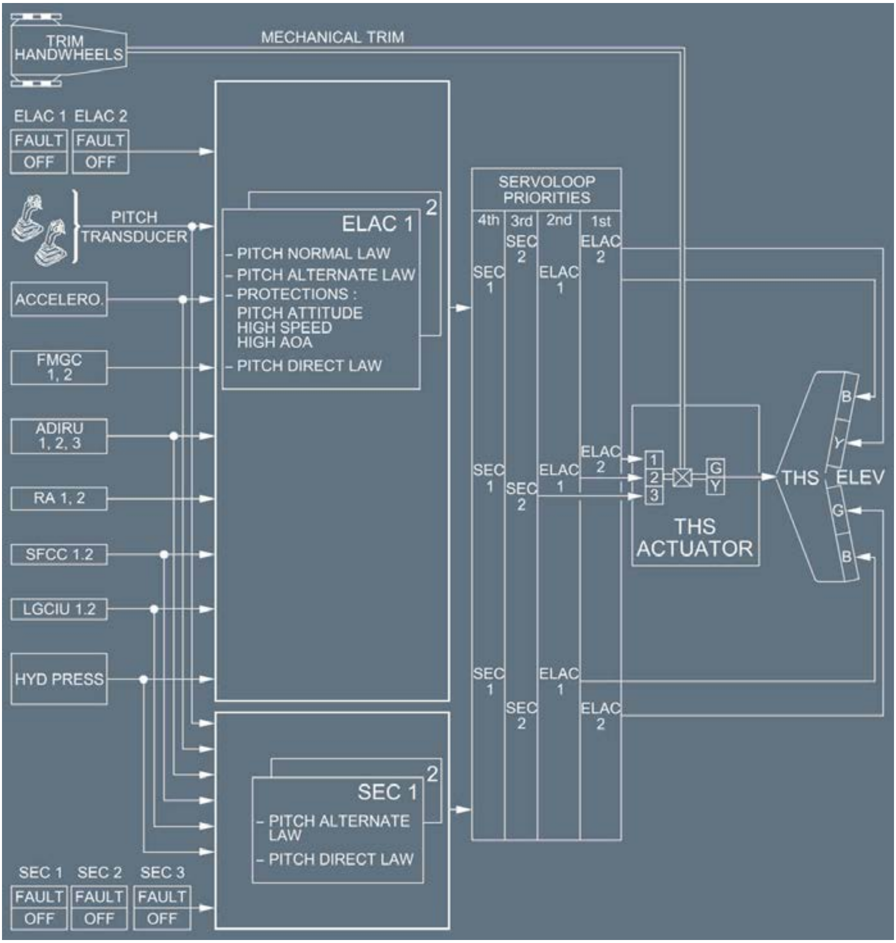
  Each servojack has three control modes :
  - Active : The jack position is electrically-controlled.
  - Damping : The jack follows surface movement.
  - Centering : The jack is hydraulically retained in the neutral position.
- In normal operation :
  - One jack is in active mode.
  - The other jack is in damping mode.
  - Some maneuvers cause the second jack to become active.
- If the active servojack fails, the damped one becomes active, and the failed jack is automatically switched to damping mode.
- If neither jack is being controlled electrically, both are automatically switched to the centering mode.
- If neither jack is being controlled hydraulically, both are automatically switched to damping mode.
- If one elevator fails, the deflection of the remaining elevator is limited in order to avoid putting excessive asymmetric loads on the horizontal tailplane or rear fuselage.

STABILIZER

- A screwjack driven by two hydraulic motors drives the stabilizer.
- The two hydraulic motors are controlled by :
  - One of three electric motors, or
  - The mechanical trim wheel.

Ident.: DSC-27-10-20-A-00001054.0001001 / 09 OCT 12

SCHEMATIC

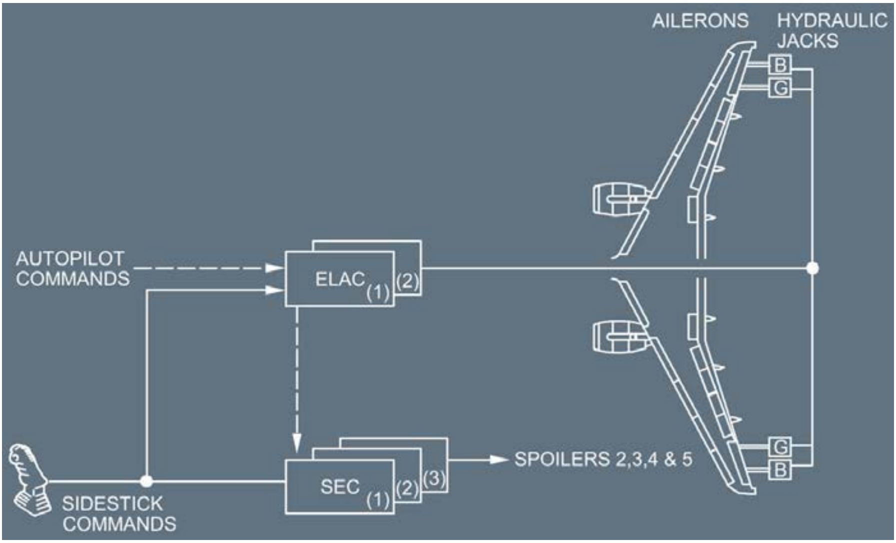


ROLL CONTROL

Applicable to: ALL

Ident.: DSC-27-10-20-B-00001055.0003001 / 09 OCT 12

GENERAL



One aileron and four spoilers on each wing control the aircraft about the roll axis.
The maximum deflection of the ailerons is 25 °.
The ailerons extend 5 ° down when the flaps are extended (aileron droop).
The maximum deflection of the spoilers is 35 °.

Ident.: DSC-27-10-20-B-00001056.0001001 / 21 MAR 16

ELECTRIC CONTROL

- The ELAC 1 normally controls the ailerons.
  If ELAC 1 fails, the system automatically transfers aileron control to ELAC2.
  If both ELACs fail, the ailerons revert to the damping mode.
- SEC 3 controls the N° 2 spoilers, SEC 1 the N° 3 and 4 spoilers, and SEC2 the N° 5 spoilers.
  If a SEC fails, the spoilers it controls are automatically retracted.

Ident.: DSC-27-10-20-B-00001057.0001001 / 21 MAR 16

ACTUATION

AILERONS

Each aileron has two electrically controlled hydraulic servojacks.
One of these servojacks per aileron operates at a time.

Each servojack has two control modes :

Active	:	Jack position is controlled electrically
Damping	:	Jack follows surface movement.

The system automatically selects damping mode, if both ELACs fail or in the event of blue and green hydraulic low pressure.

SPOILERS

A servojack positions each spoiler. Each servojack receives hydraulic power from either the green, yellow, or blue hydraulic system, controlled by the SEC1, 2 or 3 (*Refer to DSC-27-10-20 General Architecture* diagram).
The system automatically retracts the spoilers to their zero position, if it detects a fault or loses electrical control.
If the system loses hydraulic pressure, the spoiler retains the deflection it had at the time of the loss, or a lesser deflection if aerodynamic forces push it down.
When a spoiler surface on one wing fails, the symmetric one on the other wing is inhibited.

SPEED BRAKES AND GROUND SPOILERS

Applicable to: ALL

Ident.: DSC-27-10-20-C-00001058.0014001 / 26 MAY 14

The pilot controls the speedbrakes with the speedbrake lever.
The speedbrakes are actually spoilers 2, 3 and 4.

Speedbrake extension is inhibited, if:
- SEC 1 and SEC3 both have faults, or
- An elevator (L or R) has a fault, or
- Angle-of-attack protection is active, or
- Flaps are in configuration FULL, or
- Thrust levers above MCT position, or
- Alpha Floor activation.

If an inhibition occurs when the speedbrakes are extended, they automatically retract and remain retracted until the inhibition condition disappears and the pilots reset the lever. (The speedbrakes can be extended again, 10 s or more after the lever is reset).

When a speedbrake surface on one wing fails, the symmetric one on the other wing is inhibited.

Note:
1. *For maintenance purposes, the speedbrake lever will extend the N° 1 surfaces when the aircraft is stopped on ground, regardless of the slat/flap configuration.*
2. *When the aircraft is flying faster than 315 kt or M 0.75 with the autopilot engaged, the speedbrake retraction rate is reduced (Retraction from FULL to in takes about 25 s).*

L3 The maximum deflection for the spoilers is:
- 25 ° for spoilers 3 and 4;
- 12.5 ° for spoiler 2 in configuration 3, and 17.5 ° in other configurations.

For these surfaces (which perform both roll and speedbrake functions) the roll function has priority. When the sum of a roll order and a simultaneous speedbrake order on one surface is greater than the maximum deflection available in flight, the same surface on the other wing is retracted until the difference between the two surfaces is equal to the roll order.

Ident.: DSC-27-10-20-C-00017787.0002001 / 28 APR 16

GROUND SPOILER CONTROL

The ground spoiler function involves all spoilers (full extension) and ailerons (Aileron Anti Droop).
When a ground spoiler surface on one wing fails, the symmetric ground spoiler surface on the other wing is inhibited.

ARMING

The pilot arms the ground spoilers by pulling the speedbrake control lever up into the armed position.

FULL EXTENSION – REJECTED TAKEOFF PHASE

- If the ground spoilers are armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as both thrust levers are reset to idle.
- If the ground spoilers are not armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as reverse is selected on one engine (the other thrust lever remains at idle).

FULL EXTENSION - LANDING PHASE

The ground spoilers will automatically extend when the following conditions are met:
- Speed brake lever not in the retracted position or ground spoilers armed and:
  - Both main landing gears on ground,
  - Both thrust levers at or below Idle position, or Reverse selected on at least one engine (and the other thrust lever below MCT position).
- Speed brake lever in the retracted position but ground spoilers not armed and:
  - Both main landing gears on ground,
  - Reverse selected on at least one engine (and the other thrust lever below MCT position).

The ailerons are fully-extended (Aileron Anti Droop), provided one aileron servocontrol is available on each side, when:
- The ground spoilers are fully extended
- Flaps are not in clean CONF
- Pitch attitude is lower than 2.5 °
- Flying manually
- In normal law only.

PARTIAL EXTENSION

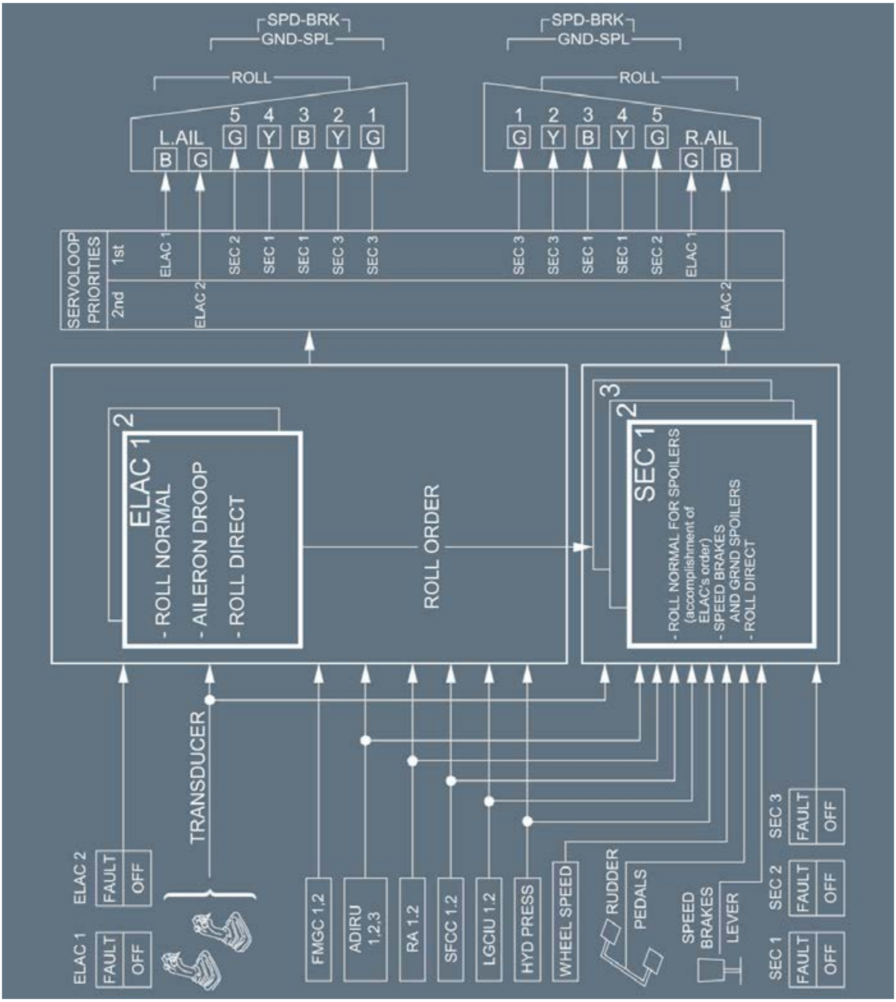
In order to accelerate the full spoiler extension, the Phased Lift Dumping (PLD) function allows the ground spoilers to deploy with a reduced deflection when the following conditions are met:
- Speed brake lever not in the retracted position or ground spoilers armed and:
  - One main landing gear on ground,
  - Both thrust levers at or below Idle position.
- Speed brake lever in the retracted position but ground spoilers not armed and:
  - One main landing gear on ground,
  - Reverse selected on at least one engine (and the other thrust lever below MCT position).

In order to reduce the bounce severity at landing in the case of an inappropriate thrust lever handling during flare, ground spoilers are also partially deployed when the following conditions are met:
- Ground spoilers armed,
- Both main landing gears on ground,
- Both thrust levers at or below the Climb position.

RETRACTION

The ground spoilers retract:
- After landing,
- After a rejected takeoff, when the ground spoilers are disarmed.
- During a touch and go, when at least one thrust lever is advanced above 20 °.

ROLL CONTROL - SCHEMATIC

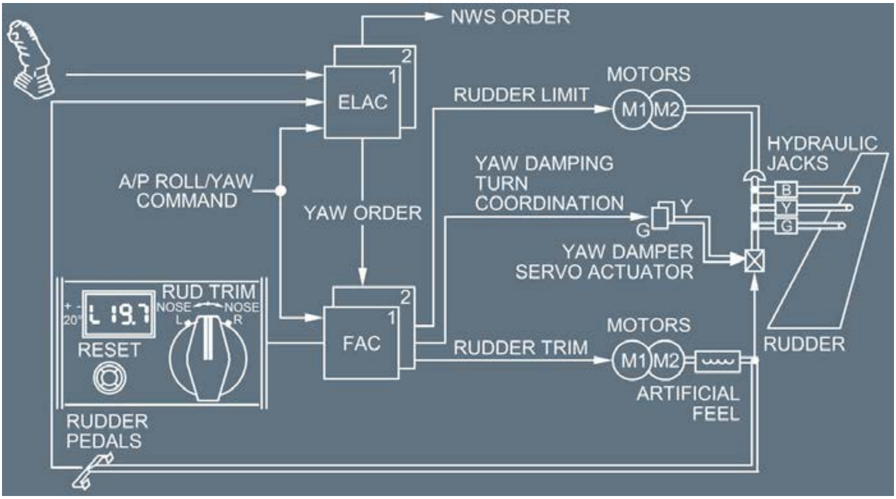


YAW CONTROL

Applicable to: ALL

Ident.: DSC-27-10-20-D-00001061.0001001 / 09 OCT 12

GENERAL



One rudder surface controls yaw.

Ident.: DSC-27-10-20-D-00001062.0001001 / 21 MAR 16

ELECTRICAL RUDDER CONTROL

The yaw damping and turn coordination functions are automatic.
The ELAC s compute yaw orders for coordinating turns and damping yaw oscillations, and transmit them to the FACs.

Ident.: DSC-27-10-20-D-00001063.0001001 / 21 MAR 16

MECHANICAL RUDDER CONTROL

The pilots can use conventional rudder pedals to control the rudder.

Ident.: DSC-27-10-20-D-00001064.0001001 / 21 MAR 16

RUDDER ACTUATION

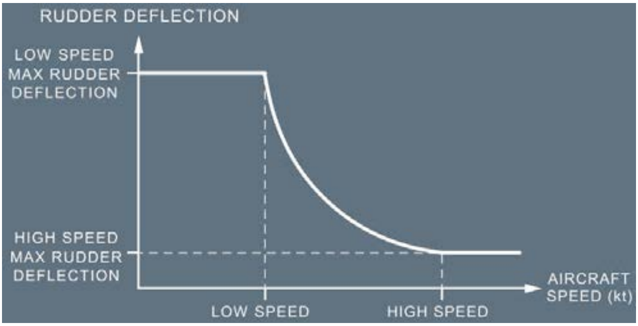
Three independent hydraulic servojacks, operating in parallel, actuate the rudder. In automatic operation (yaw damping, turn coordination) a green servo actuator drives all three servojacks. A yellow servo actuator remains synchronized and takes over if there is a failure.

There is no feedback to the rudder pedals from the yaw damping and turn coordination functions.

Ident.: DSC-27-10-20-D-00001065.0003001 / 21 MAR 16

RUDDER TRAVEL LIMIT

The maximum rudder travel deflection gradually reduces as the speed increases, to avoid structural loads:



In the case of a failure that causes loss of the Rudder Travel limit system, the rudder deflection limit stops at the last value reached. At slats extension, full rudder travel authority is recovered.
In all cases, the available rudder deflection provides sufficient yaw control within the entire flight envelope. This includes the case of maximum asymmetric thrust.

Ident.: DSC-27-10-20-D-00015506.0001001 / 21 MAR 16

RELATIONSHIP BETWEEN SIDESLIP/RUDDER DEFLECTION/RUDDER PEDAL TRAVEL

Regardless of the aircraft speed, therefore the maximum rudder deflection, full rudder pedal travel remains available. However, except at low speed, maximum rudder deflection is achieved before reaching maximum rudder pedal travel.

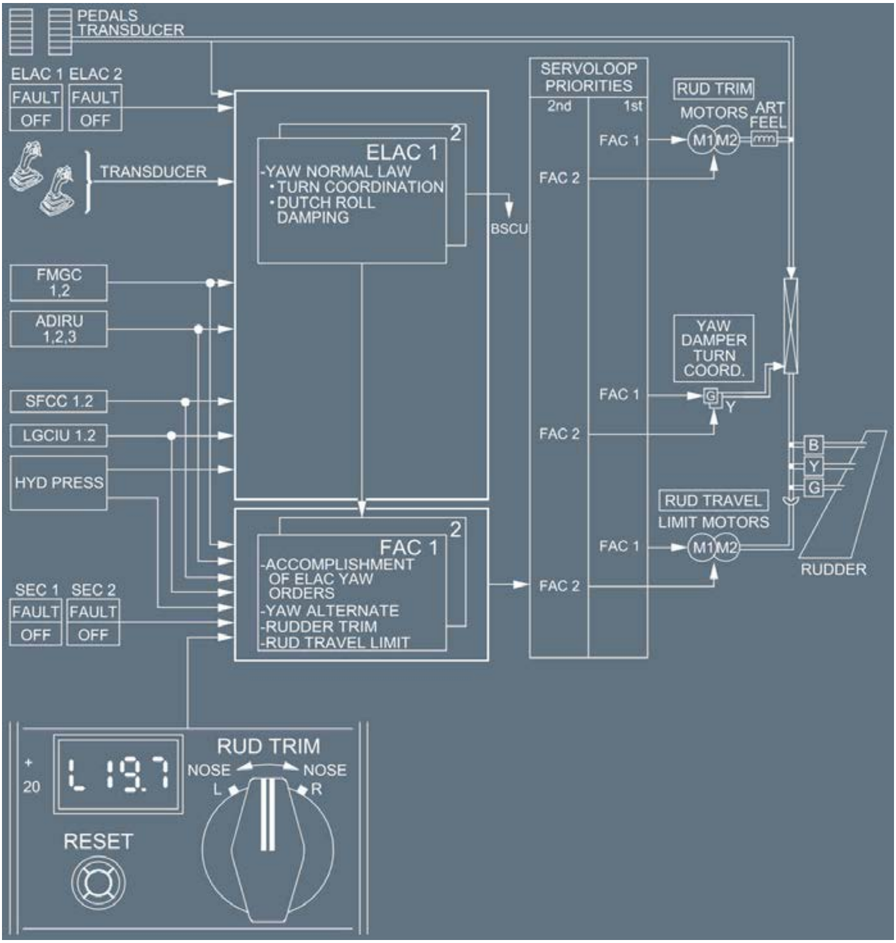
Ident.: DSC-27-10-20-D-00001066.0002001 / 21 MAR 16

RUDDER TRIM

The two electric motors that position the artificial feel unit also trim the rudder. In normal operation, motor N° 1 (controlled by FAC 1), powers the trim, and FAC2 with motor N° 2 remains synchronized as a backup.
In manual flight, the pilot can apply rudder trim via the rotary RUD TRIM switch on the pedestal.
The pilot can use a button on the RUD TRIM panel to reset the rudder trim to zero.

Note: *With the autopilot engaged, the FMGC computes the rudder trim orders. The rudder trim rotary switch and the rudder trim reset pushbutton are not active.*

SCHEMATIC


PEDALS TRANSDUCER
ELAC 1 ELAC 2
FAULT FAULT
OFF OFF
TRANSDUCER
ELAC 1
2
-YAW NORMAL LAW
• TURN COORDINATION
• DUTCH ROLL DAMPING
BSCU
SERVOLOOP PRIORITIES
2nd 1st
FAC 1
FAC 2
RUD TRIM
MOTORS
ART FEEL
M1 M2
FMGC 1,2
ADIRU 1,2,3
YAW DAMPER TURN COORD.
SFCC 1.2
LGCIU 1.2
HYD PRESS
G Y
B Y G
RUD TRAVEL LIMIT MOTORS
RUDDER
FAC 1
-ACCOMPLISHMENT OF ELAC YAW ORDERS
-YAW ALTERNATE
-RUDDER TRIM
-RUD TRAVEL LIMIT
SEC 1 SEC 2
FAULT FAULT
OFF OFF
RUD TRIM
NOSE L
NOSE R
L 19.7
+ 20
RESET

General

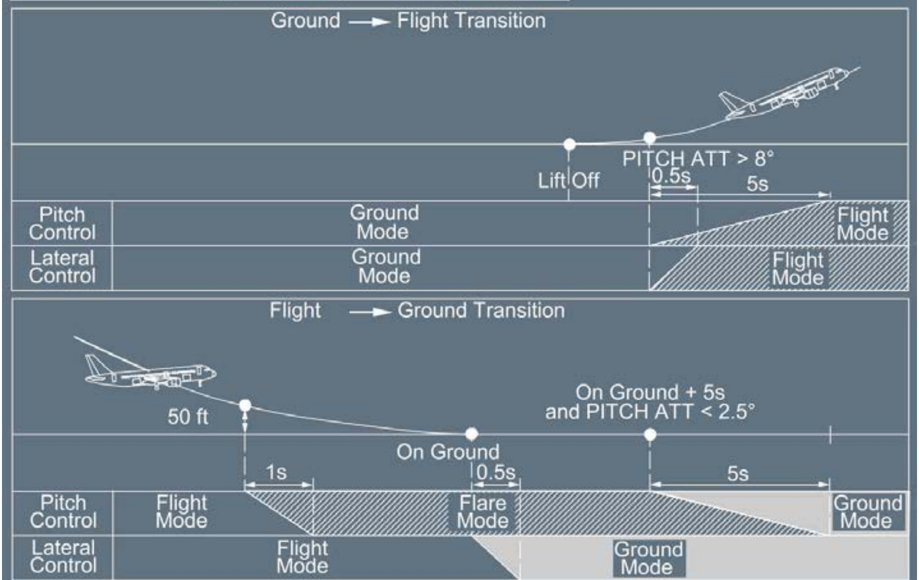
GENERAL

Ident.: DSC-27-20-10-10-00001068.0001001 / 17 MAR 17
Applicable to: ALL

Flight control normal law covers:
- three-axis control
- flight envelope protection
- alleviation of maneuver loads

NORMAL LAW protection	Pitch Control		
	Ground Mode	Flight Mode	Flare Mode
Pitch Attitude		X	
Load Factor		X	
High Speed		X	
High Angle Of Attack		X	X

NORMAL LAW Protection	Lateral Control	
	Ground Mode	Flight Mode
Bank Angle		X



One of the PF's primary tasks is to maintain the aircraft within the limits of the normal flight envelope. However, some circumstances, due to extreme situations or aircraft mishandling, may provoke the violation of these limits.
Despite system protections, the PF must not exceed deliberately the normal flight envelope. In addition, these protections are not designed to be structural limit protections (e.g. opposite rudder pedal inputs). Rather, they are designed to assist the PF in emergency and stressful situations, where only instinctive and rapid reactions will be effective.

Protections are intended to:
- Provide full authority to the PF to consistently achieve the best possible aircraft performance in extreme conditions
- Reduce the risks of overcontrolling, or overstressing the aircraft
- Provide PF with an instinctive and immediate procedure to ensure that the PF achieves the best possible result.

Pitch Control

GROUND MODE

Ident.: DSC-27-20-10-20-00001069.0001001 / 20 SEP 13
Applicable to: ALL

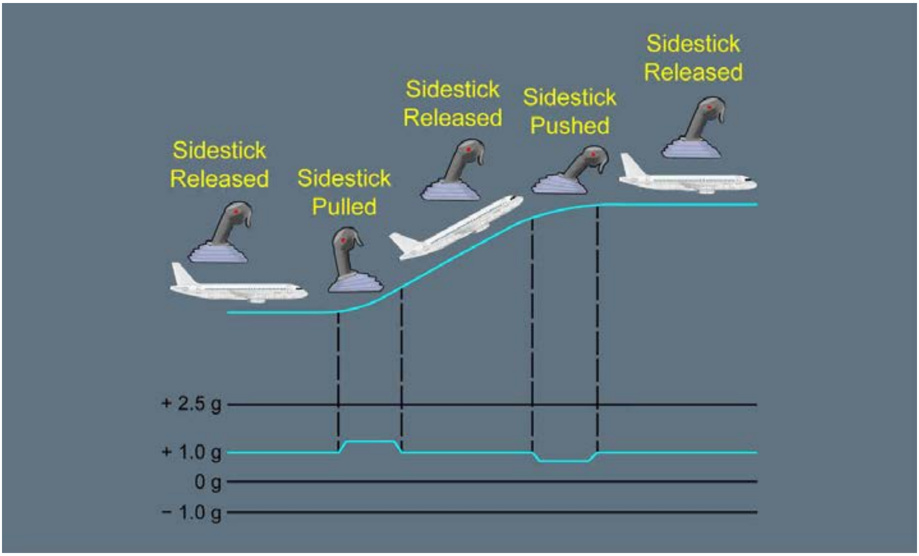
Ground mode is a direct relationship between sidestick deflection and elevator deflection, without auto trim.
It automatically sets the trimmable horizontal stabilizer (THS) at 0 ° (inside the green band).
A setting that the pilot enters manually to adjust for CG has priority for takeoff.
When the aircraft reaches 75 kt during the takeoff roll, the system reduces the maximum up elevator deflection from 30 ° to 20 °.

FLIGHT MODE

Ident.: DSC-27-20-10-20-00001070.0001001 / 17 MAR 17
Applicable to: ALL

The normal-law flight mode is a load-factor-demand mode with automatic trim and protection throughout the flight envelope.
Following normal law, the sidestick controllers set the elevator and THS to maintain load factor proportional to stick deflection and independent of speed.
With the sidestick at neutral, wings level, the system maintains 1 g in pitch (corrected for pitch attitude), and there is no need for the pilot to trim by changing speed or configuration. Therefore pilots only need to perform minor corrections on the sidestick, if the aircraft deviates from its intended flight path. If the pilot senses an overcontrol, the sidestick should be released.

Airbus Pitch Characteristic



Pitch trim is automatic both in manual mode and when the autopilot is engaged. In normal turns (up to 33 °C of bank) the pilot does not have to make any pitch corrections once the turn is established. The flight mode is active from takeoff to landing, and follows the logic shown schematically (*Refer to DSC-27-20-10-10 General*).

Automatic pitch trim freezes in the following situations:
- The pilot enters a manual trim order.
- The radio height is below 50 ft (100 ft with autopilot engaged).
- The load factor goes below 0.5 g.
- The aircraft is under high-speed or high-Mach protection.

When angle-of-attack protection is active, the THS setting is limited between the setting at the aircraft's entry into this protection and 3.5 ° nose down. (Neither the pilot nor the system can apply additional nose-up trim).
Similarly, when the load factor is higher than 1.25 g or when the aircraft exceeds 33 ° of bank, the THS setting is limited to values between the actual setting and 3.5 ° nose down.

CONTROL WITH AUTOPILOT ENGAGED

- The ELAC s and SECs limit what the autopilot can order.
- The pilot has to overcome a restraining force in order to move the sidestick when the autopilot is engaged. If he overcomes this force and does move the sidestick, he disconnects the autopilot.

- The pilot can also disconnect the autopilot by pushing on the rudder pedals (10 ° out of trim), or by moving the pitch trim wheel beyond a certain threshold.
- All protections of normal laws remain effective except pitch attitude protection.

FLARE MODE

Ident.: DSC-27-20-10-20-00001071.0001001 / 21 MAR 16
Applicable to: ALL

When the aircraft passes 50 ft RA, the THS is frozen and the normal flight mode changes to flare mode as the aircraft descends to land. Flare mode is essentially a direct stick-to-elevator relationship (with some damping provided by the load factor and the pitch rate feedbacks).
The system memorizes the aircraft's attitude at 50 ft, and it becomes the initial reference for pitch attitude control.
As the aircraft descends through 30 ft, the system begins to reduce the pitch attitude to -2 °nose down over a period of 8 s. Consequently, to flare the aircraft, a gentle nose-up action by the pilot is required.

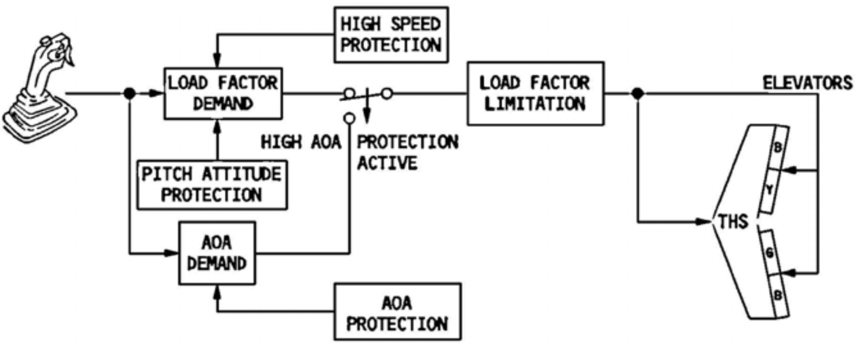
PROTECTIONS

Applicable to: ALL

Ident.: DSC-27-20-10-20-A-00001072.0001001 / 21 MAR 16

GENERAL

The normal law protects the aircraft throughout the flight envelope, as follows :
- load factor limitation
- pitch attitude protection
- high-angle-of-attack (AOA) protection
- high-speed protection.



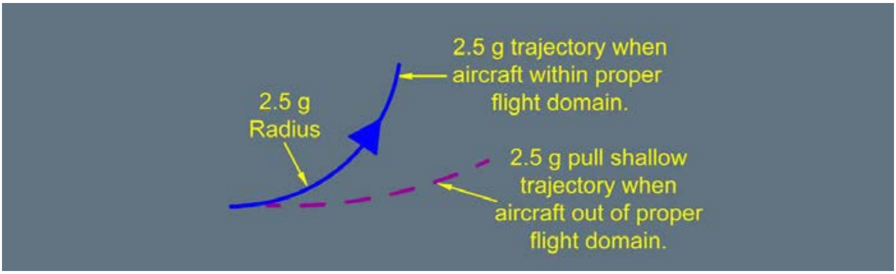
Ident.: DSC-27-20-10-20-A-00001073.0001001 / 17 MAR 17

LOAD FACTOR PROTECTION

High load factors can be encountered during evasive maneuvers due to potential collisions, or CFIT …
Pulling "g" is efficient, if the resulting maneuver is really flown with this "g" number. If the aircraft is not able to fly this trajectory, or to perform this maneuver, pulling "g" will be detrimental.

The load factor is automatically limited to:
- +2.5 g to -1 g for clean configuration.
- +2 g to 0 for other configurations.

Airbus LOAD FACTOR PROTECTION AND SAFETY



On most commercial aircraft, the potential for an efficient 2.5 g maneuver is very remote. Furthermore, as G Load information is not continuously provided in the cockpit, airline pilots are not used to controlling this parameter. This is further evidenced by inflight experience, which reveals that: In emergency situations, initial PF reaction on a yoke or sidestick is hesitant, then aggressive.
With load factor protection, the PF may immediately and instinctively pull the sidestick full aft: The aircraft will initially fly a 2.5 g maneuver without losing time. Then, if the PF still needs to maintain the sidestick full aft stick, because the danger still exists, then the high AOA protection will take over. Load factor protection enhances this high AOA protection.
Load factor protection enables immediate PF reaction, without any risk of overstressing the aircraft.
Flight experience has also revealed that an immediate 2.5 g reaction provides larger obstacle clearance, than a hesitant and delayed high G Load maneuver (two-second delay).

Ident.: DSC-27-20-10-20-A-00001074.0001001 / 17 MAR 17

PITCH ATTITUDE PROTECTION

Excessive pitch attitudes, caused by upsets or inappropriate maneuvers, lead to hazardous situations:

- Too high a nose-up ▸ Very rapid energy loss
- Too low a nose-down ▸ Very rapid energy gain

Furthermore, there is no emergency situation that requires flying at excessive attitudes. For these reasons, pitch attitude protection limits pitch attitude:

- 30 ° nose up in conf 0 to 3 (progressively reduced to 25 ° at low speed).
- 25 ° nose up in conf FULL (progressively reduced to 20 ° at low speed).
- 15 ° nose down (indicated by green symbols “=” on the PFD’s pitch scale).

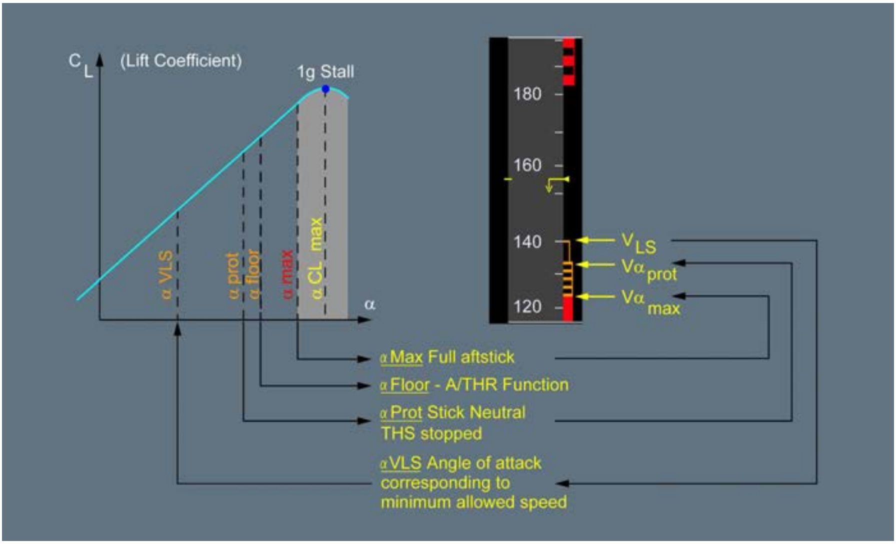
The flight director bars disappear from the PFD when the pitch attitude exceeds 25 ° up or 13 ° down. They return to the display when the pitch angle returns to the region between 22 ° up and 10 ° down.
Pitch attitude protection enhances high speed protection, high load factor protection, and high AOA protection.

Ident.: DSC-27-20-10-20-A-00001075.0002001 / 17 MAR 17

HIGH ANGLE-OF-ATTACK PROTECTION

In the normal law, the aircraft is protected against stall, in dynamic maneuvers or gusts. When the current angle-of-attack becomes greater than αPROT , the high angle-of-attack (AOA) protection activates.
Without pilot input, the F/CTL computers will maintain the AOA equal to αPROT . The AOA can be further increased by the pilot input, up to a maximum value equal to αMAX . When the High AOA protection is activated, the normal law demand is modified and the side stick input is an angle-of-attack demand, instead of a load factor demand.
The PF must not deliberately fly the aircraft in the High AOA, except for brief periods, when maximum maneuvering speed is required.

Airbus AOA Protection



Vα PROT , Vα floor, Vα MAX are mainly computed based on the AOA, and therefore they vary with configuration, weight and load factor.

*Refer to DSC-22_10-50-20 Characteristic Speeds*for more information.

The angle-of-attack will not exceed αMAX , even if the pilot gently pulls the sidestick all the way back. The pilot can hold full back stick, if it is needed, and the aircraft stabilizes at an angle-of-attack close to but less than the 1 g stall. When flying at αMAX , the PF can make gentle turns, if necessary. If the pilot releases the sidestick, the angle-of-attack returns to αPROT and stays there. As the aircraft enters protection at the amber and black strip (αPROT), the system inhibits further nose-up trim beyond the point already reached. The nose-down trim remains available, if the pilot pushes the stick forward.

Note: *At takeoff, the αPROT is equal to the αMAX for 5 s.*

This High AOA protection has priority over all other protections.
The aircraft can also enter αPROT at a high flight level, where it protects the aircraft from the buffet boundary. As at a low speed or low flight level, if the sidestick is merely released to neutral, the aircraft maintains the alpha for αPROT . This value of alpha is not the same as the value used at the low speed. Alpha for αPROT is reduced as a function of Mach, so that a typical cruise value is about 3.5 ° for the A318 and A321 aircraft, or 4.5 ° for the A319 and A320 aircraft. Therefore, the aircraft may climb with the sidestick free, when leaving a turn after entering αPROT.

If the pilot flies into αPROT , he should leave it as soon as other considerations allow, by easing forward on the sidestick to reduce alpha below the value of αPROT, while simultaneously adding power (if the αfloor has not yet been activated, or cancelled).

To deactivate the angle of attack protection, the pilot must push the sidestick:
- Greater than 8 ° forward, or,
- Greater than 0.5 ° for at least 0.5 s when α < αMAX.

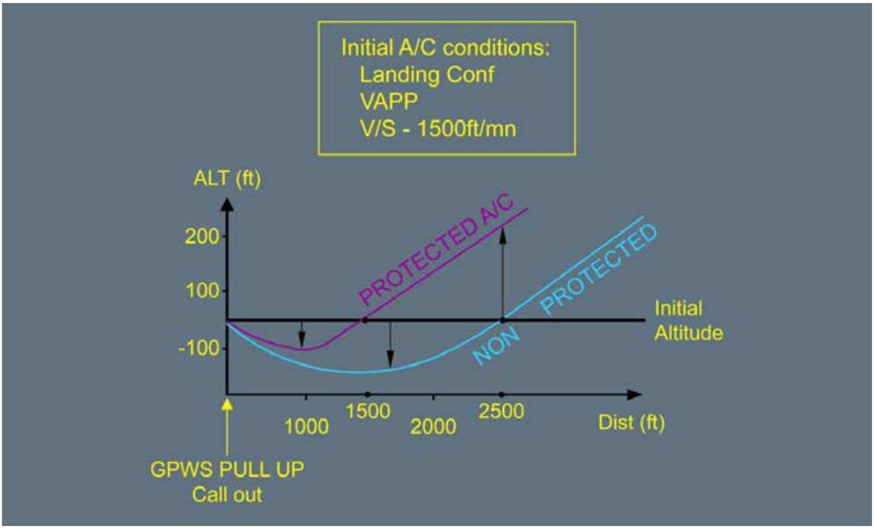
In addition, below 200 ft, the angle of attack protection is also deactivated, when:
- Sidestick deflection is less than half nose-up, and
- Actual α is less than αPROT – 2 °.

Between the αPROT and αMAX , αfloor protection may automatically set the go-around thrust. The αfloor will usually be triggered just after entering αPROT , and the go-around thrust will automatically be applied. Therefore, if the sidestick is held aft, either inadvertently or deliberately, the aircraft will start to climb at a relatively constant low airspeed. To recover a normal flight condition, the αPROT should be exited by easing forward on the sidestick, as described above, and the αfloor should be cancelled by using the disconnect pushbutton on either thrust lever as soon as a safe speed is regained. *Refer to DSC-22_40-30 Alpha-Floor Protection*for more information.

GPWS / WINDSHEAR CASE:

In the case of application of GPWS or windshear procedures, aircraft protections provide maximum lift / maximum thrust / minimum drag. Therefore, CFIT escape manoeuvres will be much more efficient.

Protected A/C Versus Non-protected A/C Go-around Trajectory



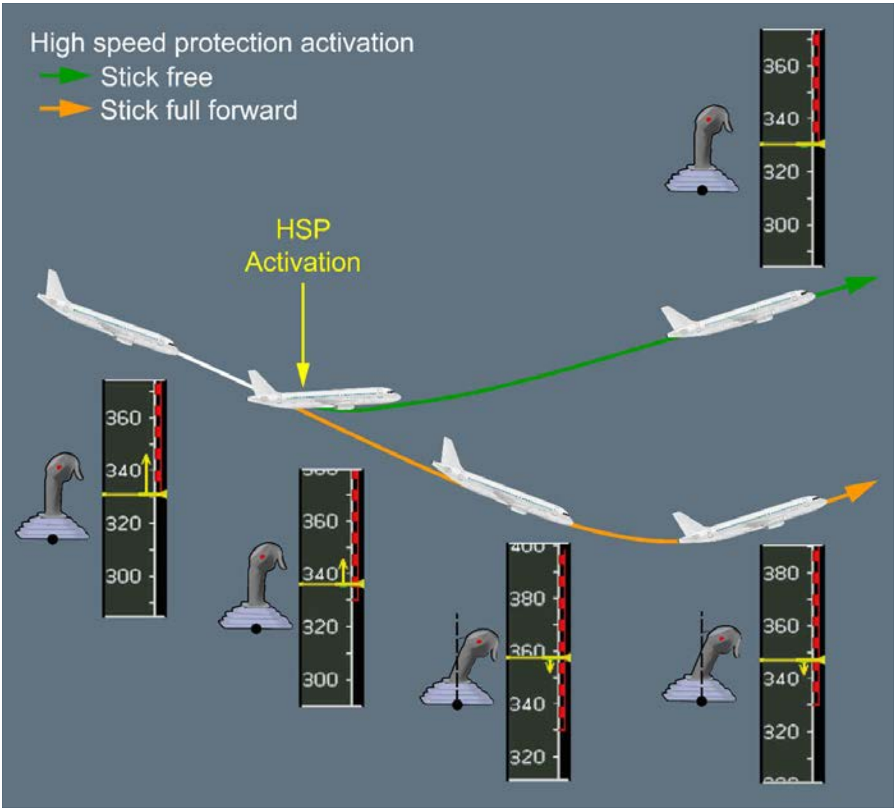
The above-illustrated are typical trajectories flown by protected or not protected aircraft, when the PF applies the escape procedure after an aural “ GPWS PULL UP” alert.
The graph demonstrates the efficiency of the protection, to ensure a duck-under that is 50 % lower, a bucket-distance that is 50 % shorter, a safety margin that more than doubles (due to a quicker reaction time), and a significant altitude gain (± 250 ft). These characteristics are common to all protected aircraft, because the escape procedure is easy to achieve, and enables the PF to fly the aircraft at a constant AOA , close to the max AOA . It is much more difficult to fly the stick shaker AOA on an aircraft that is not protected.

Ident.: DSC-27-20-10-20-A-00001076.0001001 / 17 MAR 17

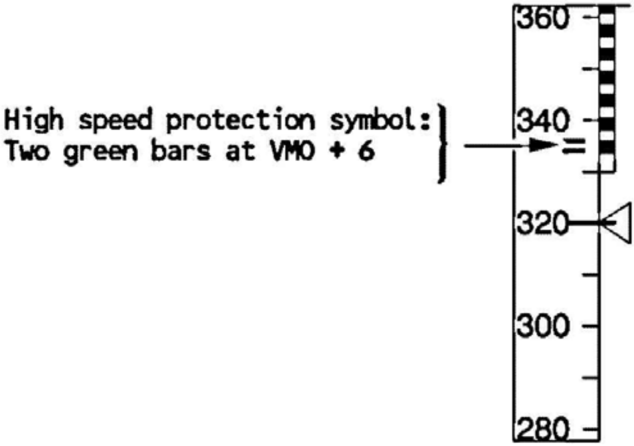
HIGH SPEED PROTECTION

The aircraft automatically recovers, following a high speed upset. Depending on the flight conditions (high acceleration, low pitch attitude), High Speed Protection is activated at/or above VMO /MMO.
When it is activated, the pitch trim is frozen. Positive spiral static stability is introduced to 0 ° bank angle (instead of 33 ° in normal law), so that with the sidestick released, the aircraft always returns to a bank angle of 0 °. The bank angle limit is reduced from 67 ° to 40 °.
As the speed increases above VMO /MMO, the sidestick nose-down authority is progressively reduced, and a permanent nose-up order is applied to aid recovery to normal flight conditions.

Therefore, in a dive situation:
- If there is no sidestick input on the sidestick, the aircraft will slightly overshoot VMO /MMO and fly back towards the envelope.
- If the sidestick is maintained full forward, the aircraft will significantly overshoot VMO /MMO . At approximately VMO +16 / MMO +0.04, the pitch nose-down authority smoothly reduces to zero (which does not mean that the aircraft stabilizes at that speed).



The PF, therefore, has full authority to perform a high speed/steep dive escape maneuver, when required, via a reflex action on the sidestick.
High Speed Protection is deactivated, when the aircraft speed decreases below VMO /MMO, where the usual normal control laws are recovered.
The autopilot disconnects at VMO + 15 kt and MMO + 0.04.



Note: 1. *The ECAM displays an "O/SPEED" warning at VMO + 4 kt and MMO + 0.006.*
2. *At high altitude, this may result in activation of the angle of attack protection. Depending on the ELAC standard, the crew may have to push on the stick to get out of this protection law.*

Ident.: DSC-27-20-10-20-A-00001077.0001001 / 21 MAR 16

LOW ENERGY AURAL ALERT (IF INSTALLED)

The low energy aural alert is computed by the FAC (*Refer to DSC-22_40-10 General*).

Lateral Control

NORMAL LAW

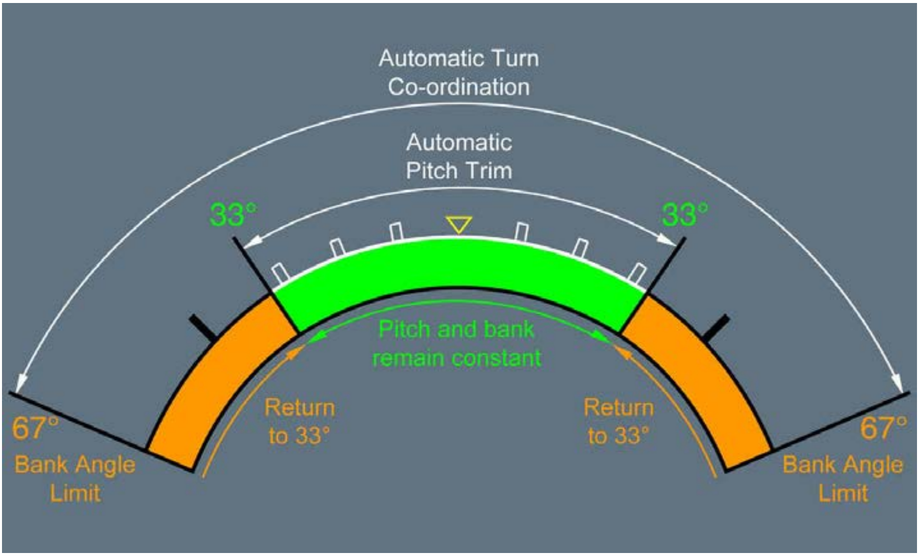
Ident.: DSC-27-20-10-30-00001078.0001001 / 17 MAR 17
Applicable to: ALL

When the aircraft is on the ground (in “on ground” mode), the sidestick commands the aileron and roll spoiler surface deflection. The amount of control surface deflection that results from a given amount of sidestick deflection depends upon aircraft speed. The pedals control rudder deflection through a direct mechanical linkage. The aircraft smoothly transitions to “in flight” mode shortly after liftoff.
When the aircraft is in the “in flight” mode, normal law combines control of the ailerons, spoilers (except N° 1 spoilers), and rudder (for turn coordination) in the sidestick. The pilot does not need to use the rudder for turn coordination. While the system thereby gives the pilot control of the roll and heading, it also limits the roll rate and bank angle, coordinates the turns, and damps the dutch roll.
The roll rate requested by the pilot during flight is proportional to the sidestick deflection, with a maximum rate of 15 °/s when the sidestick is at the stop.
When the aircraft is in “flare” mode, the lateral control is the same as in “in flight” mode.
After touchdown, the aircraft smoothly transitions from “in flight” mode to “ground” mode.

BANK ANGLE PROTECTION

Ident.: DSC-27-20-10-30-00001079.0001001 / 17 MAR 17
Applicable to: ALL

Inside the normal flight envelope, the system maintains positive spiral static stability for bank angles above 33 °. If the pilot releases the sidestick at a bank angle greater than 33 °, the bank angle automatically reduces to 33 °. Up to 33 °, the system holds the roll attitude constant when the sidestick is at neutral. If the pilot holds full lateral sidestick deflection, the bank angle goes to 67 ° and no further.
If Angle-of-Attack protection is active, and the pilot maintains full lateral deflection on the sidestick, the bank angle will not go beyond 45 °. If High Speed Protection is active, and the pilot maintains full lateral deflection on the sidestick, the bank angle will not go beyond 40 °. If high speed protection is operative, the system maintains positive spiral static stability from a bank angle of 0 °, so that with the sidestick released, the aircraft always returns to a bank angle of 0 °.
When bank angle protection is active, auto trim is inoperative.
If the bank angle exceeds 45 °, the autopilot disconnects and the FD bars disappear. The FD bars return when the bank angle decreases to less than 40 °.



During a normal turn (bank angle less than 33 °), in level flight:

- The PF moves the sidestick laterally (the more the sidestick is moved laterally, the greater the resulting roll rate - e.g. 15 °/s at max deflection)
- It is not necessary to make a pitch correction
- It is not necessary to use the rudder.

In the case of steep turns (bank angle greater than 33 °), the PF must apply:

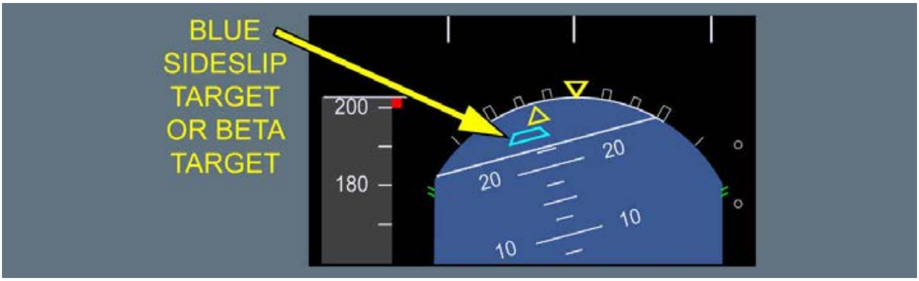
- Lateral pressure on the sidestick to maintain bank
- Aft pressure on the sidestick to maintain level flight.

Sideslip Target

SIDESLIP TARGET

Ident.: DSC-27-20-10-50-00001081.0001001 / 17 MAR 17
Applicable to: ALL

If one engine fails, the FAC modifies the sideslip indication slightly to show the pilot how much rudder to use to get the best climb performance (ailerons to neutral and spoilers retracted).
In the case of an engine failure at takeoff, or at go-around, the sideslip index on the PFD changes from yellow to blue (to provide the conditions for the blue display of the sideslip target, *Refer to DSC-31-40 Attitude Data*).



In flight, the lateral normal law commands some rudder surface deflection to minimize the sideslip. The pilot's response is normal and instinctive: zero the slip indication by applying the right amount of rudder to get the best climb performance.

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Aircraft Trimming

AIRCRAFT TRIMMING

Ident.: DSC-27-20-10-70-00002179.0001001 / 09 DEC 09
Applicable to: ALL

When the aircraft is :
- In normal cruise range (around M .77),
- In straight flight,
- With the autopilot engaged,
- With symmetrical engine thrust, and
- With fuel in the wing tanks distributed symmetrically,

the rudder trim should stay between 1 ° right and 2.3 ° left.

Note: *This indication corresponds to a true rudder deflection within ± 1.5 °, taking into account the permanent offset of rudder trim indication, when the aircraft is in cruise conditions. (average 0.5 ° right, 0.8 ° left).*
An indicated, rudder trim above 1 ° right or 2.3 ° left is acceptable, if maintenance personnel establishes that the corresponding real rudder position is within 1.5 ° left, and 1.5 ° right.

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GENERAL

Ident.: DSC-27-20-20-00001082.0001001 / 17 MAR 17
Applicable to: ALL

Depending on the failures occuring to the flight control system, or on its peripherals, there are 3 levels of reconfiguration :

- Alternate law
  They are two levels of alternate law : with and without reduced protections.
- Direct law
- Mechanical

The ECAM and PFD indicate any control law degradation.

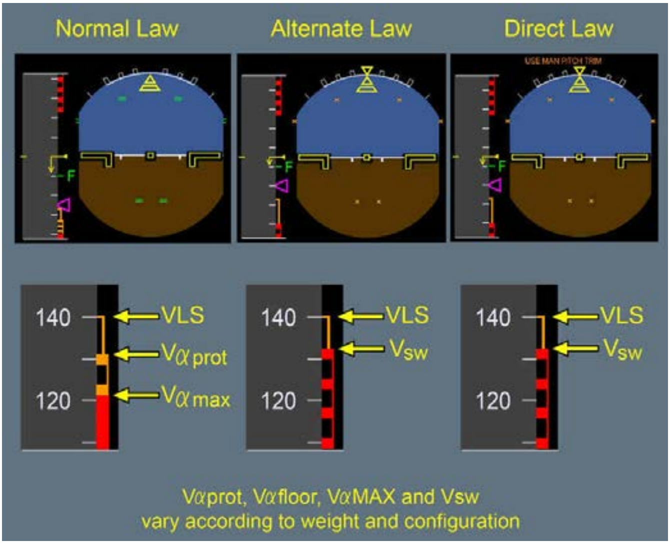
ON THE ECAM

- **In ALTN Law:**
  FLT CTL ALTN LAW (PROT LOST)
  MAX SPEED 320 kt (320 kt/M 0.77 on A318)
- **In Direct Law:**
  FLT CTL DIRECT LAW (PROT LOST)
  MAX SPEED 320 kt/M 0.77
  MAN PITCH TRIM USE

ON THE PFD

The PFD enhances the PF's awarness of the status of flight controls.
Specific symbols (= in green), and specific formatting of low speed information on the speed scale in normal law, indicate which protections are available.
When protections are lost, amber crosses (X) appear, instead of the green protection symbols (=).
When automatic pitch trim is no longer available, the PFD indicates this with an amber "USE MAN PITCH TRIM" message below the FMA.

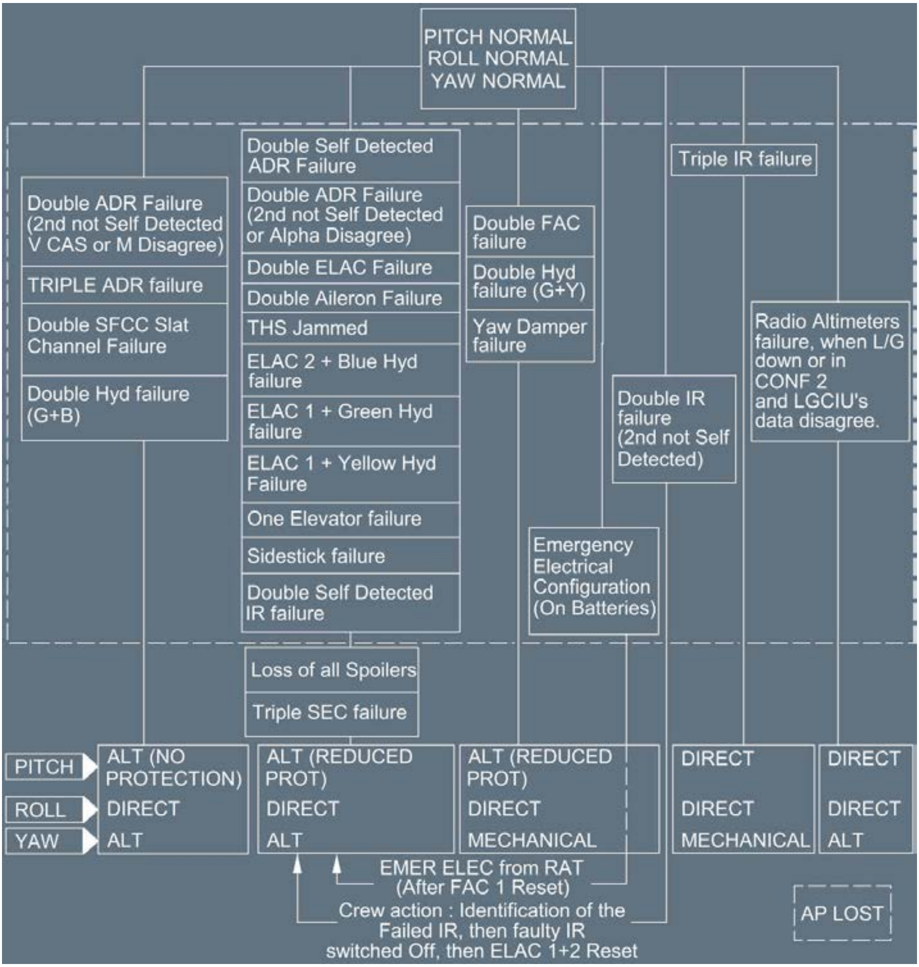
Fly-by-Wire Status Awareness via the PFD



Therefore, by simply looking at this main instrument (PFD), the flight crew is immediately aware of the status of flight controls, and the operational consequences.

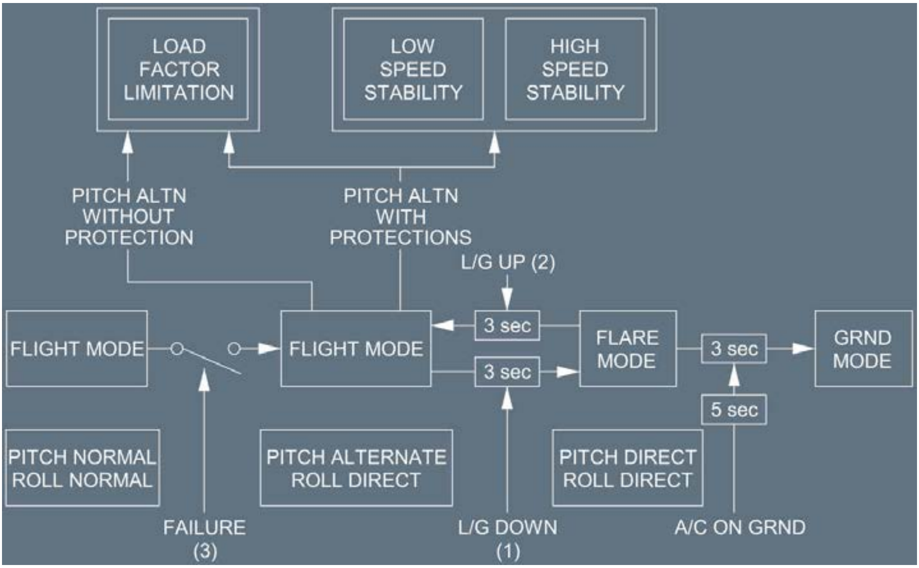
FLIGHT CONTROLS LAW RECONFIGURATION

Ident.: DSC-27-20-20-00001083.0002001 / 22 MAY 12
Applicable to: ALL



ALTERNATE LAW

Ident.: DSC-27-20-20-00001084.0001001 / 21 AUG 15
Applicable to: ALL



(1) OR SLATS OR FLAPS ≥ 2 IF L/G INFORMATION NO LONGER AVAILABLE (LGCIU 1+2 FAULT OR SEC 1+2+3 FAULT)

(2) OR SLATS OR FLAPS < 2 IF L/G INFORMATION NO LONGER AVAILABLE (LGCIU 1+2 FAULT OR SEC 1+2+3 FAULT)

(3) *Refer to DSC-27-20-20 Flight Controls Law Reconfiguration*.

PITCH CONTROL

GROUND MODE

Under alternate law the ground mode becomes active on the ground 5 s after touchdown.
It is identical to the ground mode of the normal law.

FLIGHT MODE

In flight, the alternate law pitch mode follows a load-factor demand law much as the normal law pitch mode does, but it has less built-in protection (reduced protections).

FLARE MODE

In pitch alternate law the flight mode changes to the flare mode when the pilot selects landing gear down. The flare mode is a direct stick-to-elevator relationship. (*Refer to DSC-27-20-20 Direct Law*).

LATERAL CONTROL

When the aircraft flying in pitch alternate law, lateral control follows the roll direct law associated with yaw alternate or mechanical.

ROLL DIRECT LAW

Refer to DSC-27-20-20 Direct Law.

YAW ALTERNATE LAW

Only the yaw damping function is available. Damper authority is limited to ±5 ° of rudder deflection.

REDUCED PROTECTIONS

LOAD FACTOR LIMITATION

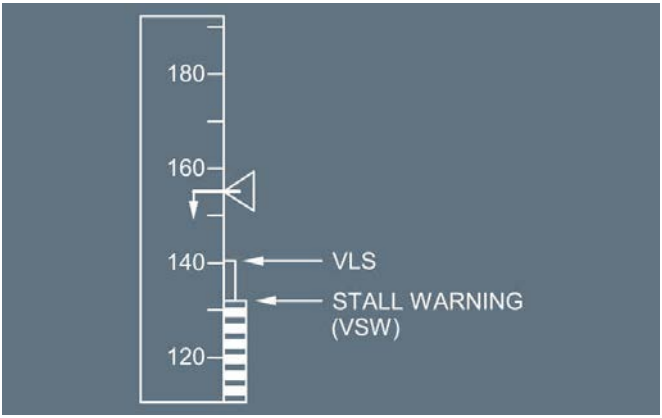
The load factor limitation is similar to that under normal law.

PITCH ATTITUDE PROTECTION

There is no pitch attitude protection. Amber Xs replace the green double bars "=" on the PFD.

LOW SPEED STABILITY

An artificial low speed stability replaces the normal angle-of-attack protection. It is available for all slat/flap configurations, and the low speed stability is active from about 5 kt up to about 10 kt above stall warning speed, depending on the aircraft's gross weight and slats/flaps configuration.
A gentle progressive nose down signal is introduced, which tends to keep the speed from falling below these values. The pilot can override this demand.
The system also injects bank-angle compensation, so that operation effectively maintains a constant angle of attack.
In addition, audio stall warnings (crickets + "STALL" synthetic voice message) is activated at an appropriate margin from the stall condition.
The PFD speed scale is modified to show a black/red barber pole below the stall warning.
The α floor protection is inoperative.



HIGH SPEED STABILITY

Above VMO or MMO, a nose up demand is introduced to avoid an excessive increase in speed.
The pilot can override this demand.
In addition, the aural overspeed warning (VMO + 4 or MMO + 0.006) remains available.

BANK ANGLE PROTECTION

Not provided.

Note: *The AP will disconnect, if speed exceeds VMO /MMO, or if the bank angle exceeds 45 °.*

ALTERNATE LAW WITHOUT REDUCED PROTECTION

Ident.: DSC-27-20-20-00001085.0001001 / 21 MAR 16
Applicable to: ALL

This is identical to alternate law except that it does not include the low-speed stability or the high-speed stability. It includes only the load factor limitation.

DIRECT LAW

Ident.: DSC-27-20-20-00001086.0001001 / 21 MAR 16
Applicable to: ALL

PITCH CONTROL

The pitch direct law is a direct stick-to-elevator relationship (elevator deflection is proportional to stick deflection).
In all configurations the maximum elevator deflection varies as a function of CG.

It is a compromise between adequate controllability with the CG forward, and not-too-sensitive control with the CG aft.
There is no automatic trim : the pilot must trim manually.
The PFD displays in amber the message “USE MAN PITCH TRIM”.
No protections are operative.
The α floor function is inoperative.
Overspeed and stall warnings are available as for alternate law.

LATERAL CONTROL

When flying in “direct law”, the roll direct law associated with mechanical yaw control governs lateral control.

ROLL DIRECT LAW

The roll direct law is a direct stick-to-surface-position relationship. System gains are set automatically to correspond to slat/flap configuration.
With the aircraft in the clean configuration, the maximum roll rate is about 30 °/s.
With slats extended, it is about 25 °/s.
To limit roll rate, the roll direct law uses only ailerons and spoilers N° 4 and 5.
If spoiler N° 4 has failed, spoiler N° 3 replaces it.
If the ailerons have failed, all roll spoilers become active.

YAW MECHANICAL CONTROL

The pilot controls yaw with the rudder pedals.
The yaw damping and turn coordination functions are lost.

ABNORMAL ATTITUDE LAWS

Ident.: DSC-27-20-20-00001087.0002001 / 18 JAN 17
Applicable to: ALL

If for any reason the aircraft goes far outside the normal flight envelope and reaches an extreme attitude, the flight control law will be modified.
The abnormal attitude law will engage and will provide the PF with maximum efficiency to recover normal attitude.

L2 The abnormal attitude law engages when one of the following values is reached:
- Bank angle above 125 °
- Pitch attitude above 50 ° nose up or below 30 ° nose down
- Speed below 60 to 90 kt (depending on the aircraft pitch attitude), or above 440 kt
- Mach above 0.91
- Angle of attack above 30 ° to 40 °, or below -10 °

L1 When the abnormal attitude law engages:
- The pitch alternate law is active with no protection, except load–factor protection and without autotrim.
- The roll direct law is active
- The yaw mechanical law is active.

When the aircraft returns within the normal flight envelope, the abnormal attitude law disengages and the following conditions remains for the remainder of the flight:
- The pitch alternate law is active with no protection and with autotrim.
- The roll direct law is active
- The yaw alternate law is active.

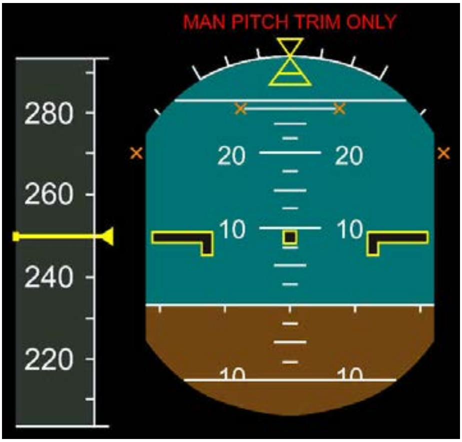
MECHANICAL BACK-UP

Ident.: DSC-27-20-20-00001088.0001001 / 17 MAR 17
Applicable to: ALL

The purpose of the mechanical backup is to achieve all safety objectives in MMEL dispatch condition: to manage a temporary and total electrical loss, the temporary loss of five fly-by-wire computers, the loss of both elevators, or the total loss of ailerons and spoilers.

PITCH

The pilot manually applies trim to the THS to control the aircraft in pitch.
The PFDs display “MAN PITCH TRIM ONLY” in red.



LATERAL

The pilot uses the rudder pedals as the mechanical backup to laterally control the aircraft .

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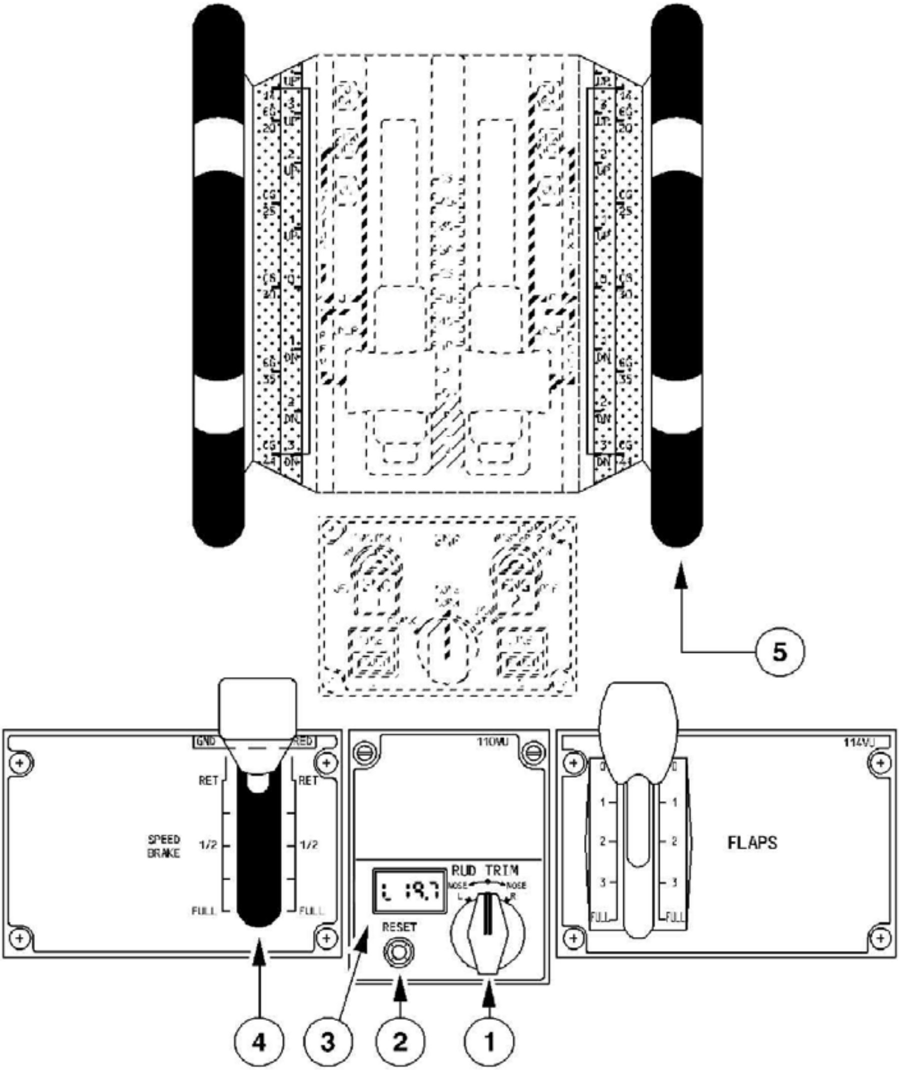
PEDESTAL

Ident.: DSC-27-20-30-00001090.0002001 / 08 JUL 15
Applicable to: ALL



(1) RUD TRIM rotary selector
Controls the rudder trim actuator, which moves the neutral point of the artificial feel by the equivalent of one degree of rudder travel per second.

Note: *The rudder trim rotary selector has no effect, when the autopilot is engaged.*

(2) RESET pb
By pushing the RESET pb, the zero trim position is ordered at 1.5 °/s.
After the reset, an indication of up to 0.3° (L or R) may be observed in the rudder trim position indication.

Note: *The RESET pb is not active, when the autopilot is engaged.*

(3) Position Indicator
Displays the rudder trim direction (L or R) and value.

(4) SPEEDBRAKE lever

The lever controls:
- The position of the speedbrake surfaces.
  To set speedbrake surfaces to a required position, the lever has to be pushed down and set to the required position. A “hardpoint” is provided at “½” SPEEDBRAKE position.
- The manual preselection of the ground spoilers.
  To arm the ground spoilers, the lever must be pulled up when in the RET position.
  When the lever is armed (or reverse thrust is selected), all spoiler's surfaces will automatically extend at landing, or in case of a rejected takeoff.

(5) PITCH TRIM Wheel
Both pitch trim wheels provide mechanical control of the THS and have priority over electrical control. A pilot action on the pitch trim wheel disconnects the autopilot.

Note: *Crew action on the pitch trim wheel does not disconnect the ELACs (micro-switches, actuated by the override mechanism, ensure that the computers remain synchronized with the manually-selected position).*

The THS is manually-controlled on ground for the THS setting, before takeoff and in flight, when in direct law.
- Before takeoff, the pilot sets the THS to the angular value, determined as a function of the aircraft CG , using the CG scale on the wheel. The relationship between the aircraft CG and the THS setting shown on the trim wheel is only applicable for takeoff. The limits of the THS normal setting range for takeoff are indicated by a green band on the pitch trim wheel.
- In flight, when in direct law, the pilot uses the THS conventionally to fly in trim. In flight, the aircraft pitch trim setting depends on aircraft CG , weight, altitude and speed. Consequently, the relation between the aircraft CG , and the THS setting displayed on the pitch trim wheel, does not apply in flight.

Following nosewheel touchdown, as the pitch attitude becomes less than 2.5 ° for more than 5 s, pitch trim is automatically reset to zero.

Note: *This function is inoperative, when the green or yellow hydraulic system is not pressurized.*

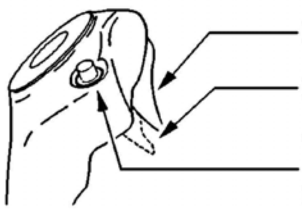
LATERAL CONSOLES

Ident.: DSC-27-20-30-00001091.0004001 / 17 MAR 17
Applicable to: ALL

SIDESTICKS

Each pilot has on his lateral console a sidestick he can use to control pitch and roll manually. Each sidestick is springloaded to neutral.
When the autopilot is engaged, a solenoid-operated detent locks both sidesticks in the neutral position. If the pilot applies a force above a given threshold (5 daN in pitch, 3.5 daN in roll) the stick becomes free and the autopilot disengages.

The hand grip has two switches:
- Autopilot disconnect and sidestick takeover pushbutton.
- Push-to-talk button.



Sidestick priority logic

- When only one pilot operates the sidestick, it sends his control signals to the computers.
- When the pilots move both side stick simultaneously in the same or opposite direction and neither takes priority, the system adds the signals of both pilots algebraically. The total is limited to the signal that would result from the maximum deflection of a single sidestick.

  Note: *In the event of simultaneous input on both sidesticks (2 ° deflection off the neutral position in any direction) the two green SIDE STICK PRIORITY lights on the glareshield come on and “DUAL INPUT” voice message is activated.*

A pilot can deactivate the other stick and take full control by pressing and keeping pressed his priority takeover pushbutton.
For latching the priority condition, it is recommended to press the takeover push button for more than 40 s.
This allows the pilot to release his takeover push button without losing priority.
However, a pilot can at any time reactivate a deactivated stick by momentarily pressing the takeover push button on either stick.
If both pilots press their takeover pushbuttons, the pilot that presses last gets priority.
In case of a "SIDE STICK FAULT" ECAM warning, due to an electrical failure, the affected sidestick order (sent to the computer) is forced to zero. This automatically deactivates the affected sidestick. This explains why there is no procedure associated with this warning.

Note: *If an autopilot is engaged, any action on a takeover pushbutton disengages it.*

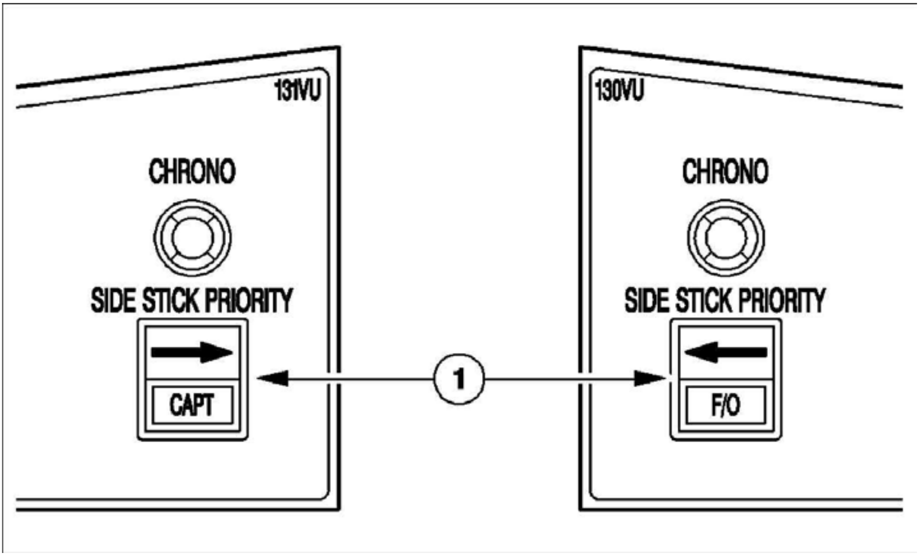
In a priority situation

- A red light comes on in front of the pilot whose stick is deactivated.
- A green light comes on in front of the pilot who has taken control, if the other stick is not in the neutral position (to indicate a potential and unwanted control demand).

Note: *If the aircraft is on the ground and commencing its takeoff run and one stick is deactivated, this triggers the takeoff “CONFIG” warning.*

GLARESHIELD

Ident.: DSC-27-20-30-00001092.0002001 / 21 MAR 16
Applicable to: ALL



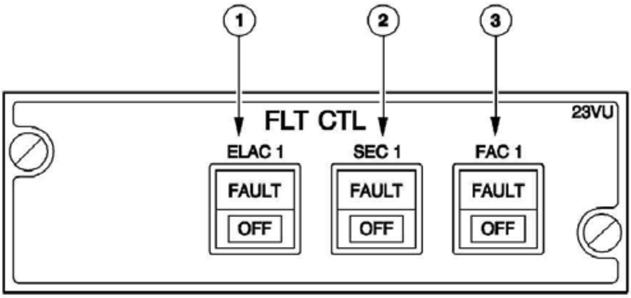
(1) SIDE STICK PRIORITY lt

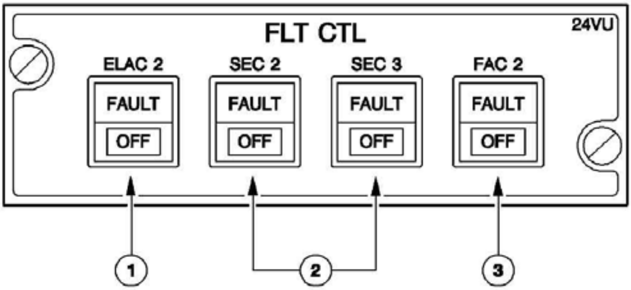
Red arrow light :
- comes on in front of the pilot losing authority.
- goes out if he has recovered his authority
  - if the other pilot releases his TAKEOVER pushbutton prior the priority condition is latched.
    or
  - If he has used his takeover push button to cancel a latched priority situation.
    Sidestick priority audio : A “PRIORITY LEFT” or “PRIORITY RIGHT” audio voice message is given each time priority is taken.

Green CAPT and F/O lights :
- Both lights flash when the pilots move both sidesticks simultaneously and neither takes priority.
- When a pilot has taken priority by pressing the takeover pushbutton and the other pilot's sidestick is not at neutral, the light in front of the pilot with priority lights up. It goes out when the other pilot returns his stick to the neutral position.

OVERHEAD PANEL

Ident.: DSC-27-20-30-00017869.0001001 / 19 SEP 16
Applicable to: ALL





(1) <u>ELAC 1(2) pushbutton</u>
Controls the Elevator and Aileron Computer (ELAC) 1(2).

ON : ELAC 1(2) performs the following functions :
- Normal pitch and roll, normal LAF
- Alternate pitch, alternate LAF
- Direct pitch and roll
- Abnormal attitude
- Aileron droop
- Acquisition of autopilot orders.

OFF : The corresponding computer is not active. Switching it OFF, then ON, resets the computer.

FAULT : Comes on amber, along with an ECAM caution:
- When a failure is detected
- During ELAC power-up test (eight seconds).

Note: *The ELAC power-up test occurs when electrical power is turned on, or after the occurrence of an electrical transient lasting longer than 25 ms.*

The FAULT light goes off, when the pilot selects OFF, or at the end of the ELAC power-up test, if its results are satisfactory.

(2) SEC 1(2)(3) pushbutton
Controls the Spoiler and Elevator Computer (SEC) 1(2)(3).

ON : SEC 1(2)(3) performs the following functions:
- Normal roll (by controlling the spoilers)
- Speed brakes and ground spoilers
- Alternate pitch (SEC 1 and SEC 2 only)
- Direct pitch (SEC 1 and SEC 2 only)
- Direct roll
- Alternate LAF
- Abnormal attitude.

OFF : The corresponding computer is not active. Switching it OFF, then ON, resets the computer.

FAULT : Comes on amber, along with an ECAM caution, when a failure is detected.
The FAULT light goes off, when the pilot selects OFF.

(3) FAC 1(2) pushbutton
Controls the Flight Augmentation Computer (FAC) 1(2).

ON : Both FACs perform the following functions:
- Normal roll (coordinating turns and damping dutch roll)
- Rudder trim
- Rudder travel limit
- Alternate yaw

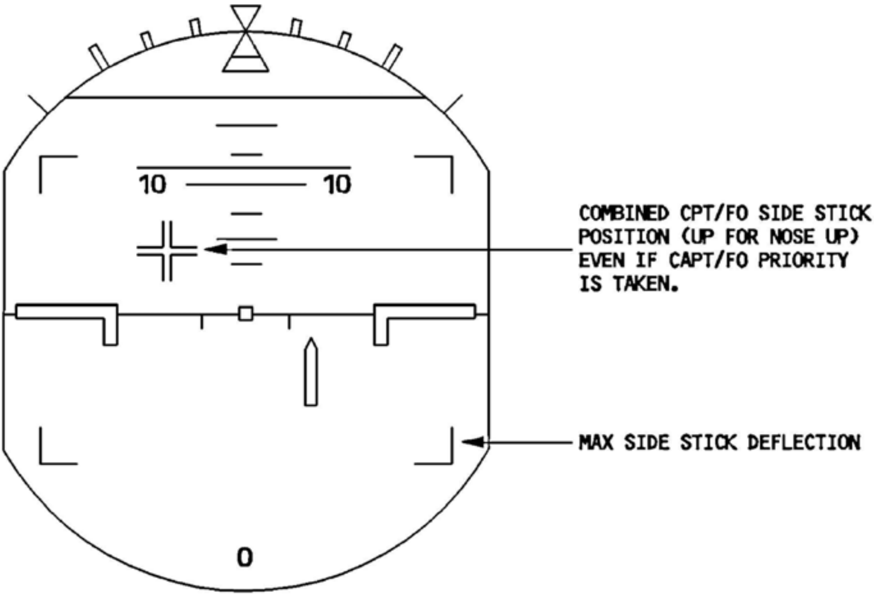
OFF : The corresponding computer is not active. Switching it OFF, and then ON, resets the computer.

FAULT : Comes on amber, along with an ECAM caution, when a failure is detected. The FAULT light goes off, when the pilot selects OFF.

SIDE STICK INDICATIONS ON PFD

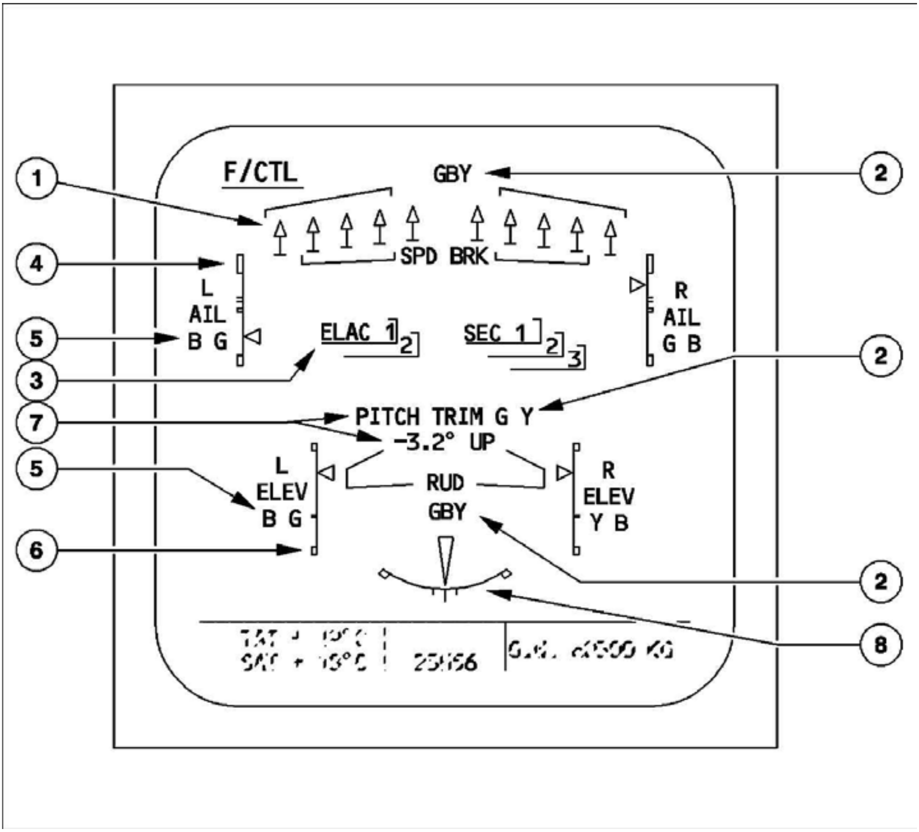
Ident.: DSC-27-20-30-00001094.0001001 / 21 MAR 16
Applicable to: ALL

On the ground, after the first engine start, sidestick position indications appear white on both PFDs. The indications disappear when the aircraft goes from the ground into flight.



ECAM F/CTL PAGE

Ident.: DSC-27-20-30-00001095.0002001 / 15 OCT 12
Applicable to: ALL



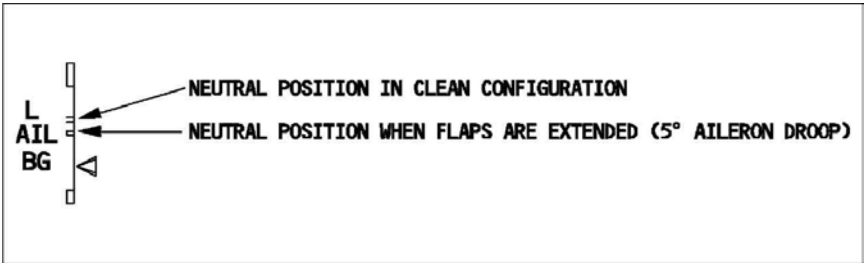
(1) Spoilers/Speed brakes Indication

Δ	:	Spoiler deflected by more than 2.5 ° (green)
–	:	Spoiler retracted (green)
Δ	:	Spoiler fault deflected (amber)
1	:	Spoiler fault retracted (amber)
×	:	Spoiler position not valid (amber)

(2) Hydraulic System Pressure Indication
It is normally green. It becomes amber, if the hydraulic system's pressure decreases.

(3) ELAC /SEC Indication
Normally green. Changes to amber if there is a failure in the ELAC or the SEC , or if ELAC or SEC pushbutton is off, or if both flight control data concentrators (FCDCs) fail.
The surrounding box is normally grey. It changes to amber if the ELAC or SEC indication does.

(4) Aileron position indication
It is indicated with a white scale and green index. It changes to amber, when neither (green nor blue) servojack is available.

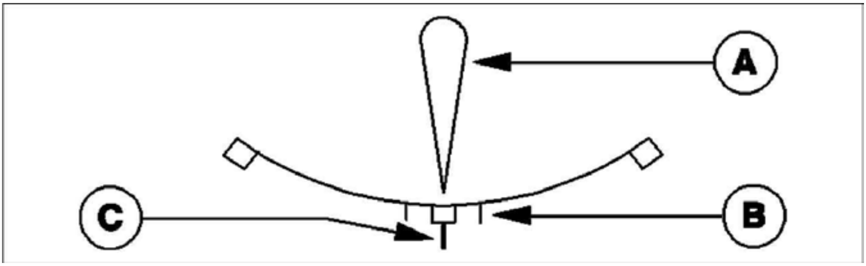


(5) Aileron and elevator actuator indication
"G" and "B" are normally displayed in green.
The color changes to amber, in case of a green or blue hydraulic system low pressure.
The partial box also changes to amber, if the associated computer or actuator fails.

(6) Elevator position indication
It is indicated with a white scale and green index. The index becomes amber, when both associated actuators are not available.

(7) Pitch trim position indication
The pitch trim numbers are in green. They become amber, if green and yellow hydraulic system pressure decreases.
The "PITCH TRIM" legend is in white. It becomes amber, if the pitch trim jams.

(8) Yaw control indications



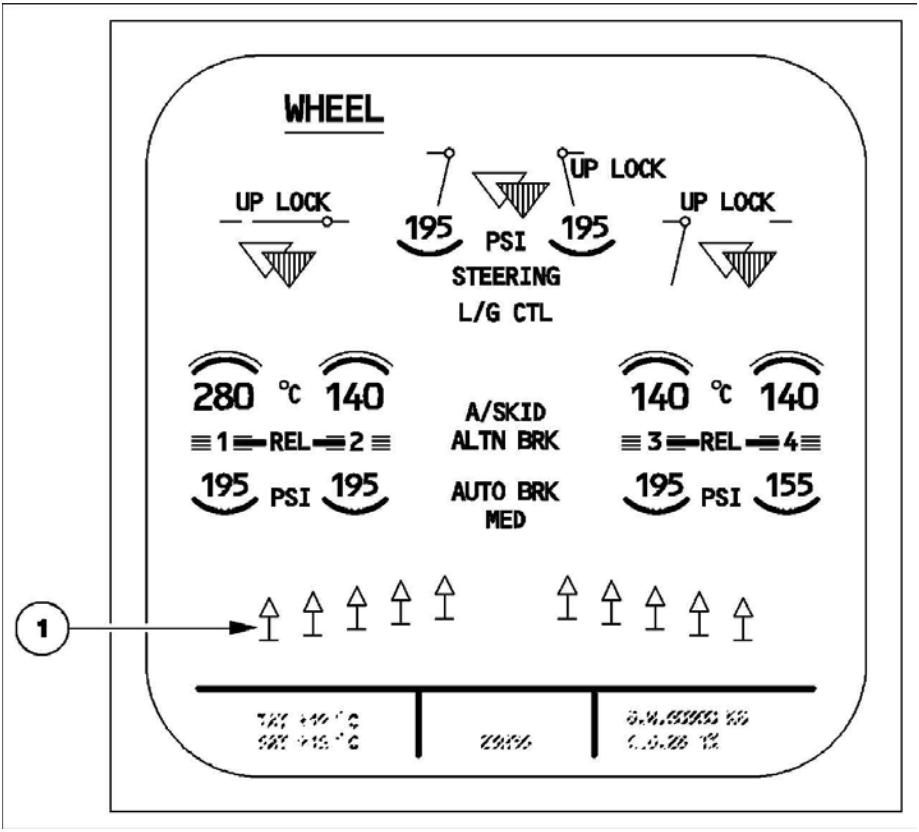
(A) Rudder position indication
It is normally in green. The rudder symbol becomes amber, if the blue, green, and yellow hydraulic pressures are low.

(B) Rudder travel limiter
It is normally in green. It becomes amber when travel limiter 1 and 2 are faulty.

(C) Rudder trim position
It is normally in blue. It becomes amber, if the rudder trim reset fails.

ECAM WHEEL PAGE

Ident.: DSC-27-20-30-00001096.0001001 / 15 FEB 11
Applicable to: ALL



(1) Spoilers/Speedbrakes' Indication
These indications are identical to those displayed on the FLT CTL page.

MEMO DISPLAY

Applicable to: ALL
Ident.: DSC-27-20-30-A-00016860.0001001 / 21 MAR 16

GND SPLRS ARMED : This memo appears in green when the ground spoilers are armed.

Ident.: DSC-27-20-30-A-00016859.0001001 / 21 MAR 16

SPEED BRK : This memo appears in green when the speedbrakes are extended.

SPEED BRK : This memo appears in amber when the speedbrakes should be retracted.

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GENERAL

Ident.: DSC-27-30-10-00001097.0001001 / 21 MAR 16
Applicable to: ALL

Each wing has the following lift augmentation devices :
- Two flap surfaces.
- Five slat surfaces.

These surfaces are electrically controlled and hydraulically operated.
The pilot extends slats and flaps by moving the FLAPS lever on the center pedestal.
It has five positions.

MAIN COMPONENTS

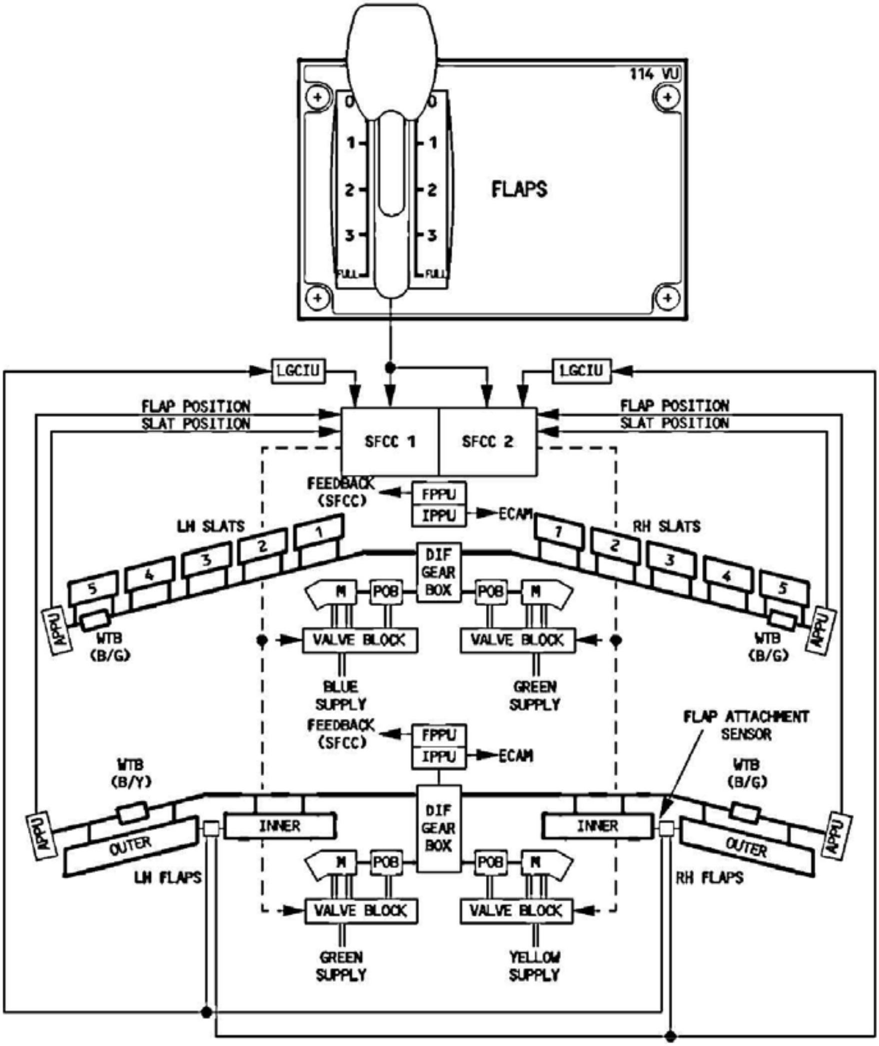
Ident.: DSC-27-30-10-00001098.0001001 / 21 MAR 16
Applicable to: ALL

The slat and flap systems are similar, comprising :
- Two slat flap control computers (SFCCs), each containing one slat channel and one flap channel.
- A power control unit (PCU) consisting of two independent hydraulic motors coupled by a differential gearbox.
  The motors use green and blue hydraulic power for the slats and yellow and green power for the flaps.
  Pressure-off brakes (POBs) lock the transmission when the slat or flap surfaces have reached the selected position or if hydraulic power fails.
- Five slat surfaces and two flap surfaces per wing.
- An assymetry position pick-off unit (APPU) that measures the assymetry between the left and right wings.
- A flap disconnect detection system, which detects attachment failure and inhibits flap operation in order to prevent further damage. A sensor detects the failure by measuring excessive differential movement between the inner and the outer flaps.
- Wingtip brakes (WTBs), activated in case of assymetry, mechanism overspeed, symmetrical runaway, or uncommanded movement of the surfaces. They cannot be released in flight.
  They use blue and green hydraulic power for the slats and for the right wing flaps, and blue and yellow hydraulic power for the left wing flaps.
- Feedback position pick-off units (FPPU s) that feed back position information to the SFCCs.
- An instrumentation position pick-off unit (IPPU) that sends position data to the ECAM.

Note: *If the flap wingtip brakes are on, the pilot can still operate the slats, and if the slat wingtip brakes are on, he can still operate the flaps.*
If one SFCC is inoperative, slats and flaps both operate at half speed.
If one hydraulic system is inoperative, the corresponding surfaces (slats or flaps) operate at half speed.

ARCHITECTURE

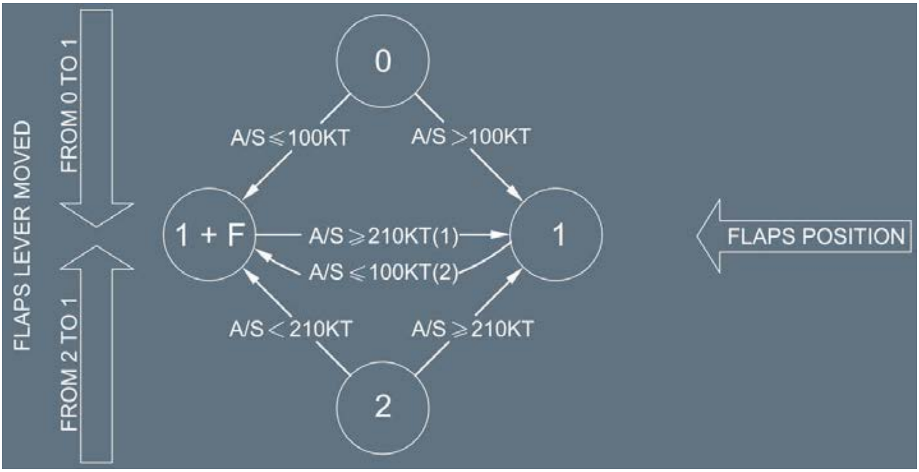
Ident.: DSC-27-30-10-00001099.0001001 / 21 MAR 16
Applicable to: ALL



CONFIGURATIONS

Ident.: DSC-27-30-10-00001100.0001001 / 09 OCT 12
Applicable to: ALL

The FLAPS lever has five positions: 0, 1, 2, 3 and FULL.
Two configurations correspond to position 1: Configuration 1 and Configuration 1 + F.
The pilot selects these as follows:



(1) When in Configuration 1 + F, the flaps retract to 0 ° automatically at 210 kt (before the airspeed reaches VFE).

(2) When in configuration 1, the flaps extend to 10 ° automatically at 100 kt.

ALPHA/SPEED LOCK FUNCTION (SLATS)

Ident.: DSC-27-30-10-00001101.0001001 / 13 SEP 16
Applicable to: ALL

This function inhibits slat retraction at high angles-of-attack and low speeds.
The SFCC s use corrected angle-of-attack (alpha) or airspeed information from the ADIRUs to inhibit slat retraction.

When the FLAPS lever is set to 0, the slats alpha/speed lock function activates and inhibits slats retraction, if:
- The AOA is above 8.5 °, or
- The speed is less than 148 kt.

Note: *If the FLAPS lever is already set to 0, when either of the above conditions occurs, the function will not activate therefore the slats will continue to retract or will remain at 0.*

Once the slats alpha/speed lock function is active, the slats retract to 0 when:
- The AOA is less than 7.6 ° and
- The speed is above 154 kt.

Note: *When the aircraft is on ground and its speed is less than 60 kt, then the function will not activate.*

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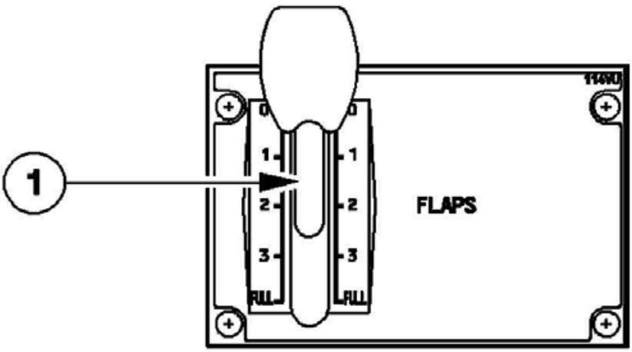
PEDESTAL

Ident.: DSC-27-30-20-00001102.0002001 / 18 MAR 11
Applicable to: ALL



(1) FLAPS lever
The FLAPS lever selects simultaneous operation of the slats and flaps.

The five lever positions correspond to the following surface positions:

<table>
<tr><th>Position</th><th>SLATS</th><th>FLAPS</th><th>Indications on ECAM</th><th colspan="3"></th></tr>
<tr><td>0</td><td>0</td><td>0</td><td></td><td rowspan="2"></td><td>CRUISE</td><td rowspan="2">HOLD</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">18</td><td>0</td><td>1</td><td rowspan="3"></td></tr>
<tr><td>10</td><td>1 + F</td><td rowspan="3">TAKEOFF</td><td></td></tr>
<tr><td>2</td><td>22</td><td>15</td><td>2</td><td rowspan="2">APPR</td></tr>
<tr><td>3</td><td>22</td><td>20</td><td>3</td><td rowspan="2">LDG</td></tr>
<tr><td>FULL</td><td>27</td><td>40</td><td>FULL</td><td></td><td></td></tr>
</table>

Before selecting any position, the pilot must pull the lever out of the detent. Balks at positions 1 and 3 prevent the pilot from calling for excessive flap/slat travel with a single action.

Note: The pilot cannot select an intermediate lever position.

TAKEOFF IN CONFIGURATION 1

1 + F (18 °/10 °) is selected. If the pilot does not select configuration 0 after takeoff, the flaps retract automatically at 210 kt.

TAKEOFF OR GO-AROUND IN CONFIGURATION 2 OR 3

If the pilot selects configuration 1, he gets 1 + F (18 °/10 °) if airspeed is under 210 kt.
If the pilot does not select configuration 0 after takeoff, the flaps retract automatically at 210 kt.

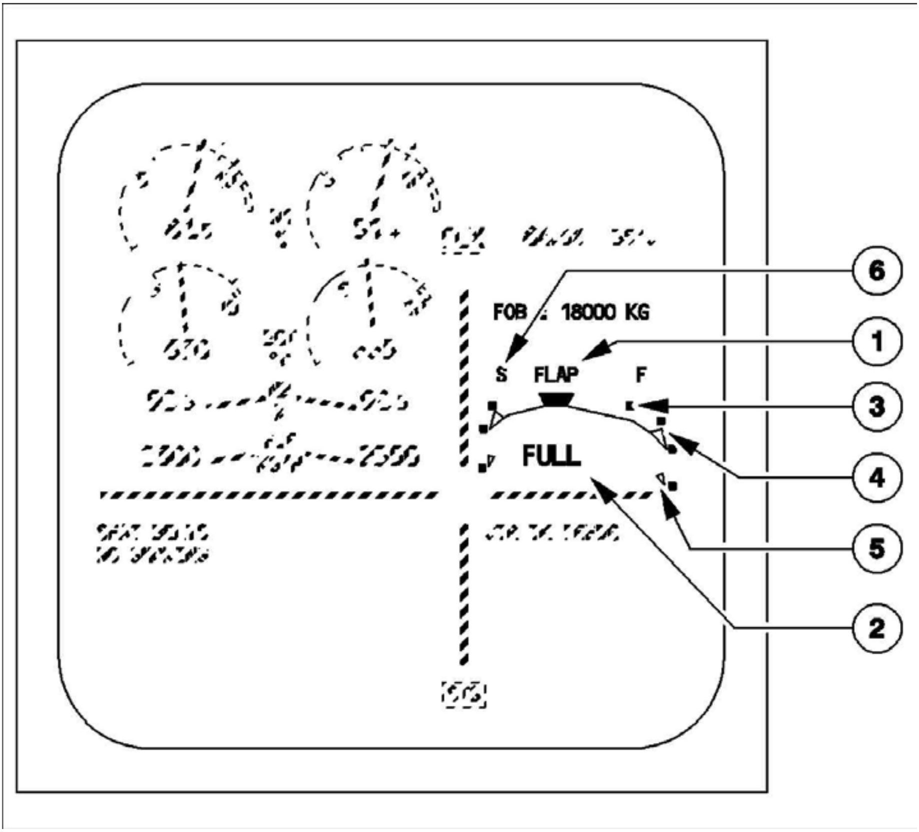
CONFIGURATION 0 TO CONFIGURATION 1 IN FLIGHT

Configuration 1 (18 °/0 °) is selected.

Note: *After flap retraction, configuration 1 + F is no longer available until the airspeed is 100 kt or less, unless configuration 2, 3, or FULL has been selected previously.*

ECAM UPPER DISPLAY

Ident.: DSC-27-30-20-00001103.0001001 / 18 MAR 11
Applicable to: ALL



(1) FLAP indication

The “FLAP” legend appears when the slats or the flaps are not fully retracted.
- The legend is white when the slats and flaps are in the selected position.
- The legend is cyan when the slats and flaps are in transit.
- The legend is amber if:
  - Both relevant hydraulic systems go down (except on the ground with engines stopped).
  - The wingtip brakes are on.
  - There is a fault in the slats or flaps.

(2) Flap lever position

The “0”, “1 + F”, “1”, “2”, “3”, or “FULL” appears.
- It is green, when the slats and flaps are in the selected position. “0” is not displayed, when the aircraft attains clean configuration.
- The legend is cyan when the slats and flaps are in transit.
  The legend “S (F) LOCKED” appears in amber, associated with an ECAM caution, when the wingtip brakes are applied or when the system detects a non-alignment between two flaps.
  The legend “A-LOCK” pulses in cyan when the slat alpha/speed-lock function is active.

(3) Position indexes
These white points indicate that the slats and flaps are in a selectable position. They do not appear when the aircraft is in the clean configuration.

(4) Slat and flap position
These green triangles indicate the actual position of the slats and flaps.

They change to amber if:
- Both relevant hydraulic systems go down, unless the aircraft is on the ground with both engines stopped.
- The wingtip brakes are on.
- There is a fault in the slats or flaps.

(5) Selected surface position
These blue triangles indicate the position the pilot has selected.
(With the current standard display management computer, the blue triangles may disappear before the slats and flaps are all completely in the selected position).

(6) S and F indications

The “S” and “F” normally appear in green. They become amber if:

- Both relevant hydraulic systems go down, unless the aircraft is on the ground with both engines stopped.
- The wingtip brakes are on.
- There is a fault in the slats or flaps.

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AIRCRAFT SYSTEMS

FUEL

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GENERAL

Ident.: DSC-28-10-10-00001107.0001001 / 13 NOV 13
Applicable to: ALL

The fuel system :
- Stores fuel in the tanks.
- Supplies fuel, in the correct quantities, to the fuel tanks during refueling.
- Supplies fuel to the engines and the Auxiliary Power Unit (APU).
- Circulates fuel to cool the Integrated Drive Generator (IDG).
- Keeps fuel in the outer tanks for wing bending and flutter relief.

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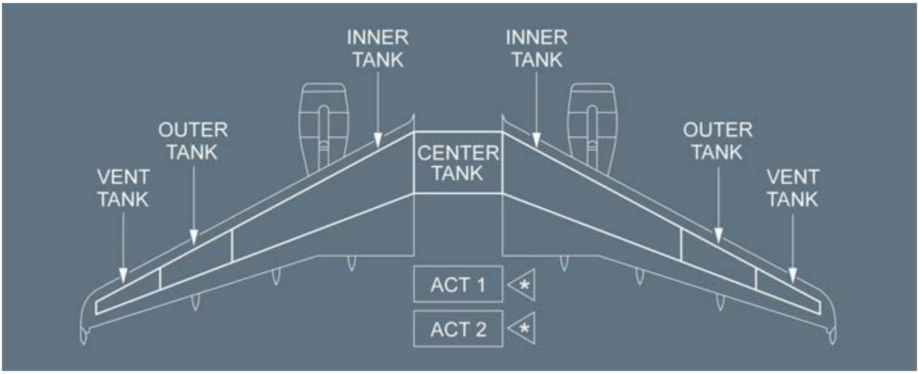
TANKS

Applicable to: ALL

Ident.: DSC-28-10-20-A-00020195.0001001 / 17 MAR 17

The fuel is stored in the wings, in the center tank, and in the Additional Center Tank (ACT).
The wings have inner and outer tanks.
There is a vent surge tank outboard of the outer tank in each wing.
When the aircraft has been refueled to maximum capacity, the fuel can expand by 2 % (20 °C temperature rise) without spilling.
There is an overpressure protector in each vent, outer and inner tank and between the center tank and the left inner tank.



Ident.: DSC-28-10-20-A-00020196.0001001 / 17 MAR 17

USABLE FUEL								
		OUTER TANKS	INNER TANKS	CENTER TANK	ACT	TOTAL WITH NO ACT	TOTAL WITH 1 ACT	TOTAL WITH 2 ACTs
VOLUME	(liters)	880 x 2	6 924 x 2	8 250	2 992	23 859	26 851	29 843
	(US gallons)	232 x 2	1 829 x 2	2 179	790	6 303	7 093	7 883
WEIGHT (1)	(KG)	691 x 2	5 435 x 2	6 476	2 349	18 729	21 078	23 427
	(LB)	1 523 x 2	11 983 x 2	14 278	5 175	41 289	46 464	51 639

(1) *Fuel density : 0.785 kg/l or 6.551 lb/US Gal.*

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GENERAL

Ident.: DSC-28-10-30-00001109.0002001 / 10 DEC 09
Applicable to: ALL

The main fuel pump system supplies fuel from the center tank or the inner wing tanks to the engines. The system has six main fuel pumps.

MAIN COMPONENTS

Applicable to: ALL

Ident.: DSC-28-10-30-A-00001110.0002001 / 01 FEB 13

TANK PUMPS

In normal operation each engine is supplied by one pump in the center tank or two pumps in its own side inner tank.
All wing tank pumps remain on throughout the flight. They are fitted with pressure relief sequence valves which ensure that, when all pumps are running, the center tank pumps will deliver fuel preferentially.

Ident.: DSC-28-10-30-A-00001111.0001001 / 31 JAN 13

INTERTANK TRANSFER VALVES

Two electrical transfer valves are mounted in each wing to permit fuel transfer from outer to inner tank.

Ident.: DSC-28-10-30-A-00001112.0001001 / 10 DEC 09

CROSS FEED VALVE

A cross feed valve controlled by a double motor allows both engines to be fed from one side or one engine to be fed from both sides.

Ident.: DSC-28-10-30-A-00001113.0001001 / 20 MAR 17

ENGINE LP VALVES

The engine fuel flow can be stopped by its low pressure (LP) fuel valve. The LP fuel valve is closed by either :
- The engine master switch, or
- The ENG FIRE PUSH pushbutton.

Ident.: DSC-28-10-30-A-00001114.0002001 / 29 MAR 12

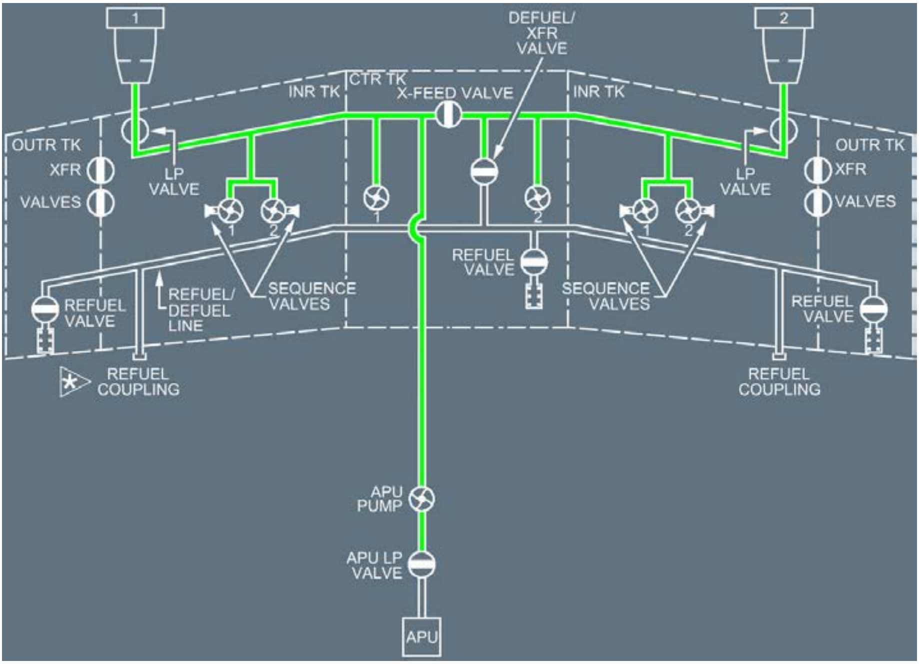
SUCTION VALVES

Closed by pumps pressure in normal operation, they allow engines to be fed by gravity if the inner tank pumps fail.

Note: Center tank pumps are not fitted with suction valves. Therefore, gravity feeding is not possible from the center tank.

ENGINE FEED

Ident.: DSC-28-10-30-00001115.0002001 / 18 MAR 14
Applicable to: ALL



FUEL FEED SEQUENCE

Ident.: DSC-28-10-30-00021263.0001001 / 21 MAR 17
Applicable to: ALL

The tanks empty in the following sequence :

1. The ACT2 : Fuel transfers into the center tank.
2. The ACT1 : Fuel transfers into the center tank.
3. The center tank.
4. The inner tanks: Each inner tank empties down to 750 kg (1 650 lb).
5. The outer tanks: Fuel transfers into the inner tanks.

CENTER TANK FUEL TRANSFER

The center tank feeds fuel to the engines, when the center tank pumps are not stopped by the control logic described below. The inner tanks feed the engines when the center tank pumps are stopped.

CENTER TANK TRANSFER VALVE CONTROL LOGIC

Each center tank pump stops, until approximately 500 kg (1 100 lb) of the fuel in its associated inner tank fuel has been used (when the fuel level reaches the underfull sensors).
With the MODE SEL in the MAN position, the center tank pumps will run. In manual mode, the CTR TK PUMP pb-sw must be selected OFF, when the center tank is empty.

FUEL TRANSFER FROM OUTER TO INNER TANKS

The transfer valves automatically open, when the inner tank fuel reaches the low level (about 750 kg/1 650 lb), thus enabling the fuel to drain from the outer to inner tanks.
When open, the valves are latched open. They will automatically close at the next refueling operation.

Note: *1. Two level sensors are installed in each inner tank. Each sensor controls two transfer valves, one in each wing, ensuring simultaneous transfer to both wings.*
2. The 750 kg/1 650 lb value is based on a level aircraft attitude, with no acceleration. During steep descent or accelerations/decelerations, the transfer valves may open with more than 750 kg/1 650 lb of fuel in each inner tank, and the low level warning may be triggered.

IF THE AIRCRAFT HAS ONE ACT ⊲ : ACT TO CENTER TANK TRANSFER

ACT transfer automatically starts after takeoff at slats' retraction, if the center tank high-level sensor has been dry for 10 min, and the ACT is not empty.
Fuel transfers from the ACT to the center tank via pressurization of the tank, by closing the ACT vent valve and opening the air shutoff valve.
When the ACT is empty, the ACT transfer valve, the air shutoff valve and inlet valve close, and the ACT vent valve opens.

Note: *ACT transfer stops, if the center tank high level becomes wet, by closing the ACTs transfer valve. The transfer valve reopens when the center tank high-level sensor becomes dry for 10 min.*

Selecting the ACT pb-sw to FWD opens the ACT transfer valve, the ACT inlet valve, and starts the ACT transfer pump. It must be returned to AUTO, when the ACT is empty.
Center tank overflow is prevented, by returning the ACT pb-sw to AUTO, when the center tank is full.

IF THE AIRCRAFT HAS TWO ACTS : ACT 1 + 2 TO CENTER TANK TRANSFER

ACT transfer automatically starts after takeoff at slats' retraction, if the center tank high-level sensor has been dry for 10 min, and the ACT is not empty.
Fuel transfers from the ACT to the center tank via pressurization of the tank, by closing the ACT vent valve and opening the air shutoff valve.
ACT2 transfers first, via the ACT transfer valve and the ACT2 inlet valve.
When ACT2 is empty, the ACT2 inlet valve shuts, and the ACT1 inlet valve opens.
When ACT1 is empty, the ACT transfer valve and ACT1 inlet valve close.
When the aircraft is on ground after landing, the air shutoff valve closes and both ACT vent valves open, depressurizing the ACTs.

Note: *ACT transfer stop, if the center tank high level becomes wet, by closing the ACT transfer valve. The transfer valve reopens when the center tank high-level sensor becomes dry for 10 min.*

Selecting the ACT pb-sw to FWD opens the ACT transfer valve and starts the ACT transfer pump. ACT2 empties first, then ACT1. It must be returned to AUTO, when the ACT is empty.
Center tank overflow is prevented, by returning the ACT pb-sw to AUTO, when the center tank is full.

APU FEED

Ident.: DSC-28-10-50-00001120.0001001 / 10 DEC 09
Applicable to: ALL

A special fuel pump supplies fuel for APU startup when fuel feed pressure is low (due to loss of tank pumps or loss of normal AC electrical supply). This pump normally runs off the AC ESS SHED, but runs off the AC STAT INV BUS if the AC ESS SHED fails.

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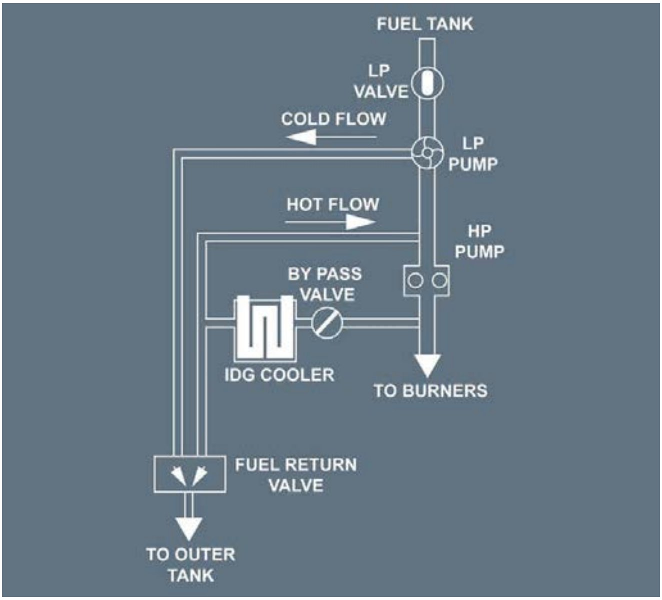
FUEL RECIRCULATION SYSTEM

Applicable to: ALL

Ident.: DSC-28-10-60-B-00020316.0001001 / 17 MAR 17

Illustration - For information only



Ident.: DSC-28-10-60-B-00020317.0004001 / 17 MAR 17

Refer to DSC-70-40 IDG Cooling System.
Some of the fuel supplied to each engine goes from the high-pressure fuel line in that engine, through the integrated drive generator (IDG) heat exchanger (where it absorbs heat), to the fuel return valve and back to the outer fuel tank.
This operation ensures the IDG cooling when the oil temperature is high or when at low engine power.
The FADEC controls the fuel return valve.
If the outer tank is already full, the fuel overflows to the inner tank through a spill pipe. On ground, the fuel recirculation is not inhibited if there is an overflow in the surge tanks (*Refer to DSC-70-40 IDG Cooling System*).

- **If the FUEL MODE SEL pb-sw is in AUTO mode:**
  If center tank is feeding, the wing tank will tend to overfill and the system automatically selects the CTR TK PUMP off when the inner tank is full. The wing tank pumps will feed until the engine

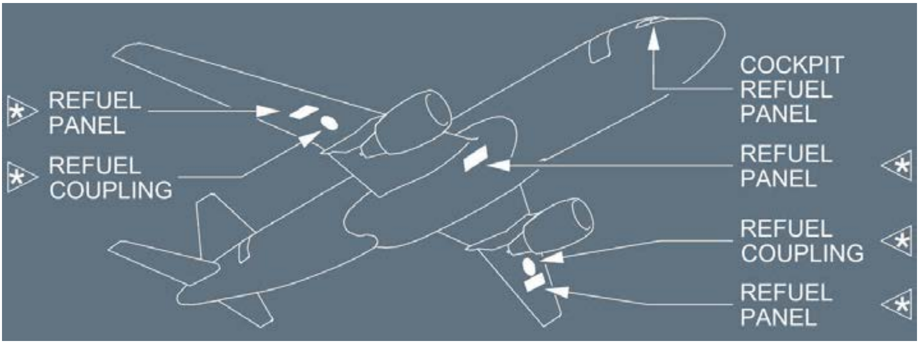
have used approximately 500 kg (1 100 lb) of fuel when the fuel level reaches the underfull sensors. The logic circuits then restart the center tank pumps.

- **If the FUEL MODE SEL pb-sw is in MAN mode:**
  If center tank is feeding, the wing tanks will tend to overfill but the system does not automatically select the CTR TK PUMPs OFF when the inner tank is full. Therefore, an overflow of the wing tanks can occur on ground if the CTR TK PUMPs are not switched OFF.

REFUELING - DEFUELING

Ident.: DSC-28-10-70-00021235.0002001 / 21 MAR 17
Applicable to: ALL

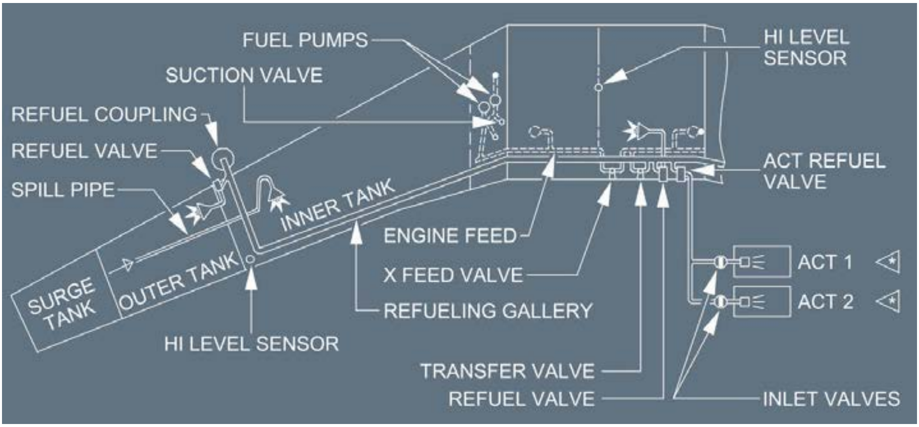
- During automatic refueling, fuel goes into the ACTs , the center tank and the outer cell of the wing tanks simultaneously. When the outer cell of the wing tank is full, fuel overflows into the inner cell. During manual refueling, fill the wing tanks first, then the center tank, then the ACTs .
- Electrical transients (caused by switching among the APU, the external and the engine electrical supply) during automatic refueling may stop the process. If the automatic refueling process is stopped, it is necessary to re-enter the Preselected Fuel Quantity.
- One (two) refueling point(s) is (are) installed under the wings, enabling the aircraft to be refueled from either the right or left (if installed) side.
- A refuel panel is located on the fuselage side beneath the right wing, or under the right or left wing adjacent to the refuel coupling.
- Another refuel panel is located on the cockpit overhead maintenance panel.
- A "READY FOR FUELING" green light is installed adjacent to the refuel coupling.



A gallery connects the refuel coupling to each tank's refuel valve.
Refueling is normally automatic, the required fuel load being set on the preselector.
Manual control is also available.
Automatic refueling starts with the outer tanks. If the selected fuel load exceeds the wing tank capacity, the center tank is simultaneously refueled.
When an outer tank is full, the fuel overflows into the inner tank through a spill pipe.
Refuel valves close automatically, when the tanks contain the preselected load, or when sensors detect a high fuel level.
The aircraft can be refueled, when only battery power is available.
The wing tanks can be refueled by gravity, through refueling points on top of the wings.

A transfer valve, between the engine feed system and the refueling gallery, allows :
- The tank pumps to transfer fuel from one tank to another
- Defueling through the refuel coupling.

Approximate refueling time at nominal pressure is:
- 17 min for wing tanks
- 20 min for all tanks (without ACT)
- 25 min for all tanks (with one ACT)
- 27 min for all tanks (with two ACTs).



FUEL QUANTITY INDICATION (FQI) SYSTEM

Ident.: DSC-28-10-80-00001123.0001001 / 10 DEC 09
Applicable to: ALL

The FQI is a computerized system that :
- transmits the actual total fuel mass, as well as the quantity and temperature of fuel in the tanks, to the ECAM.
- controls automatic refueling.

Two channels perform fuel computations : channel 2 activates automatically if channel 1 fails.

The FQI system has :
- an FQI computer.
- a set of capacitance probes in each tank to measure fuel level and temperature.
- one densitometer (cadensicon) sensor in each wing inner tank permitting the calculation of the fuel quantity.
- one Capacitance Index Compensator (CIC) in each inner tank giving the dielectric constant of the fuel in case of cadensicon failure.
- a quantity indicator for each tank installed on the refuel/defuel panel.
- a preselector on the refuel/defuel panel that shows the preselected and actual total fuel quantity.

FUEL LEVEL SENSING CONTROL UNIT (FLSCU)

Ident.: DSC-28-10-80-00001124.0001001 / 16 MAR 15
Applicable to: ALL

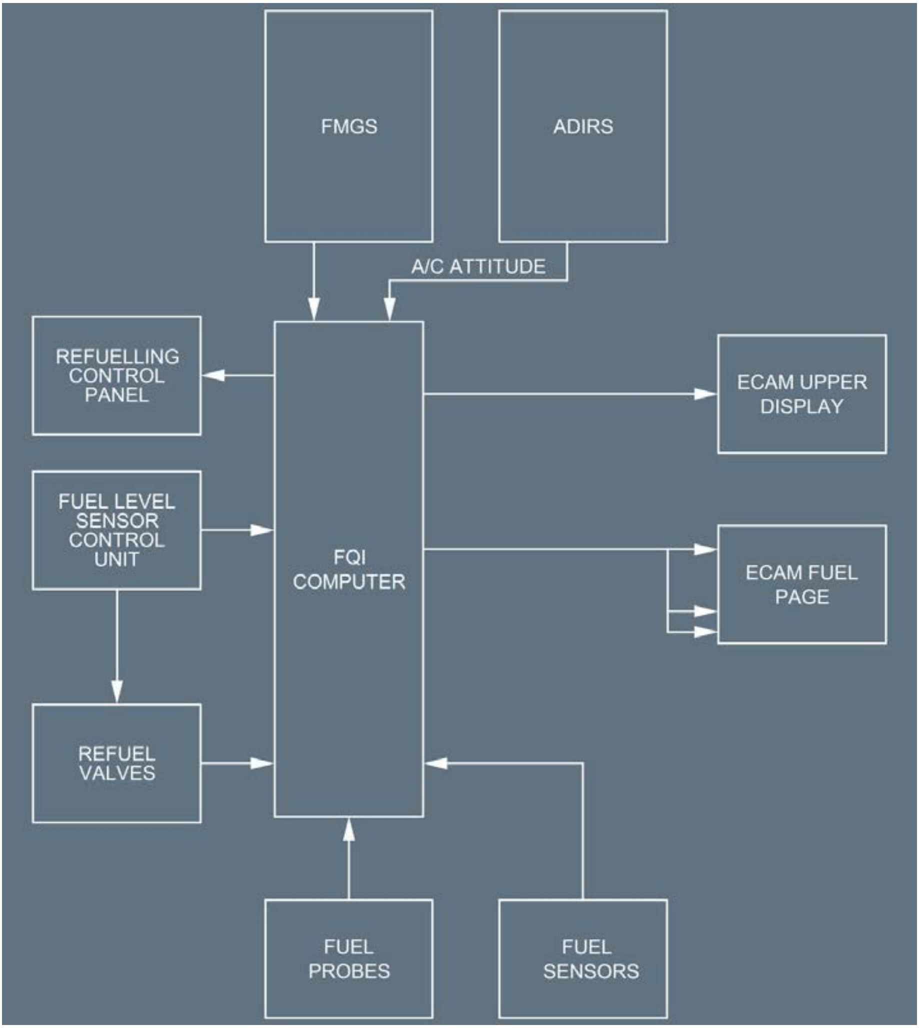
The fuel level system generates fuel-level and fuel-temperature signals in order to operate the appropriate switching functions for refueling and defueling and control the IDG cooling recirculation system and the center-tank-to-wing-tank fuel transfer system.

The FLSCU comprises :
- fuel level sensors in the tanks to sense high, low, and overflow levels.
- a fuel temperature sensor to control the IDG cooling recirculation.

When fuel quantity in one wing tank goes below 750 kg (1 650 lb), the low-level sensor triggers the LO LVL warning on ECAM. The LO LVL warning is totally independent from the displayed fuel quantity indication of the tank.

FUEL SYSTEM ARCHITECTURE

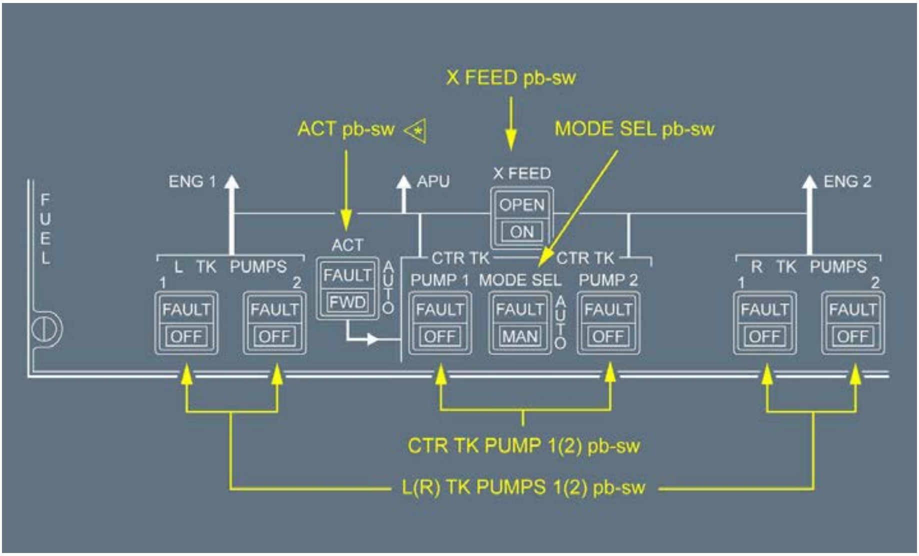
Ident.: DSC-28-10-80-00001125.0001001 / 22 MAY 12
Applicable to: ALL



OVERHEAD PANEL

Applicable to: ALL

Ident.: DSC-28-20-G-00020183.0001001 / 17 MAR 17



Ident.: DSC-28-20-G-00020239.0001001 / 17 MAR 17

L(R) TK PUMPS 1(2) pb-sw

On	:	Pump is on (but only fuel feeds) when the delivery pressure of the center tank pumps drops below the threshold.
OFF	:	Pump is off, and the OFF button comes on white.
FAULT light	:	Amber light and ECAM caution come on, when the delivery pressure drops. It does not come on when OFF is selected.

Ident.: DSC-28-20-G-00020240.0001001 / 17 MAR 17

MODE SEL pb-sw

AUTO : Control of center tank pumps is automatic:
- They run at engine start for 2 min,
- Before or after the engine start sequence, the pumps run if the slats are retracted,
- They stop automatically 5 min after center tank low level is reached.

MAN	:	Flight crew manually controls the center tank pumps with the center tank pumps' pushbutton.
FAULT light	:	Amber light comes on, and ECAM caution comes on when center tank has more than 250 kg (550 lb) of fuel and the left or right wing tank has less than 5 000 kg (11 000 lb).

Ident.: DSC-28-20-G-00020256.0001001 / 17 MAR 17

CTR TK PUMP 1(2) pb-sw

On	:	Pump runs, if MAN mode is selected on the MODE SEL pb-sw. Pump is automatically controlled when AUTO mode is selected.
OFF	:	Pump is off and OFF button comes on white.
FAULT light	:	Amber light and associated ECAM caution come on, when the pump is in operation and the delivery pressure drops.

Ident.: DSC-28-20-G-00020257.0001001 / 17 MAR 17

X FEED pb-sw

ON	:	The valve opens, and the ON pushbutton comes on in white.
OFF	:	The valve closes, and the pushbutton does not come on.
OPEN light	:	This green light comes on, when the valve is fully open.

Ident.: DSC-28-20-G-00020258.0001001 / 17 MAR 17

ACT pb-sw ⧏

AUTO : Control of the ACT transfer is automatic.
- The automatic forward transfer occurs, if:
  - The aircraft is in flight, and
  - The slats are retracted, and
  - At least one ACT low-level sensor is wet, and
  - The center tank high-level sensor has been dry for at least 10 min.
- The automatic forward transfer stops, as soon as one of the above conditions is not met.

FWD : The manual transfer to the center tank is initiated by opening:
- The ACT transfer valve,
- The ACT 1 or ACT 2 (if available) inlet valve.

The ACT transfer pump is then commanded on.

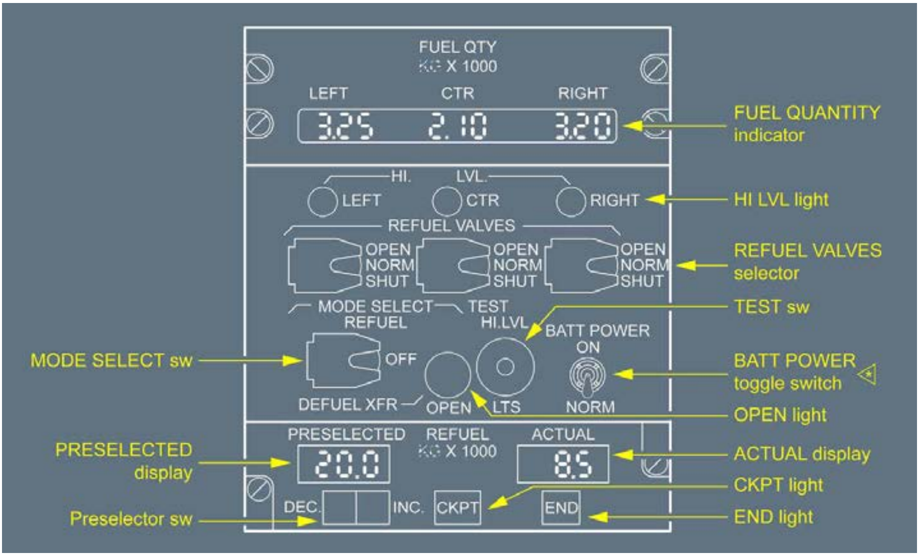
FAULT light : Amber light and associated ECAM caution come on, when:
- The center tank has less than 3 000 kg (6 614 lb) of fuel, and 1 ACT has more than 250 kg (550 lb) of fuel, and
- The ACT pb-sw is on AUTO.

Note: *When no ACT is installed, the pushbutton is inoperative.*

REFUELING CONTROL PANEL

Applicable to: ALL

Ident.: DSC-28-20-C-00020185.0001001 / 17 MAR 17



Ident.: DSC-28-20-C-00020265.0001001 / 21 MAR 17

FUEL QUANTITY INDICATOR

The number shows the quantity of fuel in each tank.
Units may either be in kg × 1 000 or lb × 1 000 depending on the aircraft configuration.

Ident.: DSC-28-20-C-00020266.0001001 / 21 MAR 17

HI LVL light

This blue light comes on, when the system detects a high fuel level.
The corresponding refuel valve closes automatically.

Ident.: DSC-28-20-C-00020267.0001001 / 21 MAR 17

REFUEL VALVES selector (GUARDED IN NORM)

NORM : Automatic refueling logic controls the refuel valves.

OPEN : Valves open when the MODE SELECT sw is set to the REFUEL or DEFUEL XFR position. Each refuel valve closes, when the system detects a high level in the associated tank.

SHUT : Valves close.

Ident.: DSC-28-20-C-00020268.0001001 / 17 MAR 17

MODE SELECT sw (GUARDED AT OFF)

OFF : Refuel system is de-energized. Refuel valves are closed.

REFUEL : Refuel valves operate in automatic or in manual mode depending on the position of REFUEL VALVES sw.

DEFUEL XFR : Refuel/Defuel transfer valve opens.
Refuel valve opens if the associated REFUEL VALVE sw is at OPEN.

Ident.: DSC-28-20-C-00020270.0001001 / 21 MAR 17

OPEN light

This amber light comes on when the defuel transfer valve is open.

Ident.: DSC-28-20-C-00020271.0001001 / 17 MAR 17

TEST sw

HI LVL : The HI LVL lights come on if high level sensors and associated circuits are serviceable.

Note: *If tanks are full (HI LVL lights on) during this test, the HI LVL lights go out if high level sensors and associated circuits are serviceable.*

LTS : Lights on panel and all 8's on FQI and preselector come on.

Ident.: DSC-28-20-C-00020272.0001001 / 21 MAR 17

PRESELECTED DISPLAY

This display shows the preselected total fuel quantity in kg (lb) × 1 000 (multiply by 1 000 to get actual amount).

Ident.: DSC-28-20-C-00020273.0001001 / 17 MAR 17

Preselector sw

Pressing the left or right side of the switch decreases or increases the preselected quantity.

Ident.: DSC-28-20-C-00020274.0001001 / 21 MAR 17

ACTUAL DISPLAY

This display shows the total fuel on board.

Ident.: DSC-28-20-C-00020275.0001001 / 21 MAR 17

END light

This green light comes on steady when automatic refueling is completed.
It flashes green if refueling is aborted.

Ident.: DSC-28-20-C-00020276.0002001 / 21 MAR 17

CKPT light

Indicates that cockpit refuel panel has priority.
Illuminates when electrical PWR pb-sw on cockpit refuel is pressed.

Ident.: DSC-28-20-C-00020277.0001001 / 21 MAR 17

BATT POWER TOGGLE SWITCH

ON : When the flight crew momentarily switches this to ON position and releases it, HOT BUS 1 supplies the FQI.
After completion of the FQI tests (about 40 s), the fuel quantity indications appear and refuel operation can be selected.

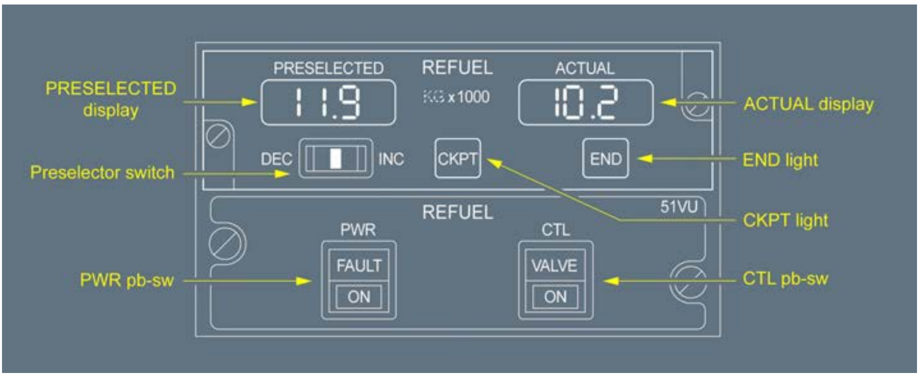
The electrical supply is automatically cut off:
- After 10 min, if no refuel operation is selected, or
- At the end of refueling.

NORM : The FQI is not supplied by batteries.

MAINTENANCE PANEL

Applicable to: ALL

Ident.: DSC-28-20-D-00020187.0007001 / 17 MAR 17



Ident.: DSC-28-20-D-00020286.0001001 / 21 MAR 17

PRESELECTED DISPLAY

This display shows the preselected total fuel quantity in KG (or in LB depending on aircraft configuration) × 1 000 (multiply by 1 000 to get actual amount).

Ident.: DSC-28-20-D-00020287.0001001 / 21 MAR 17

ACTUAL DISPLAY

This display shows the total fuel on board.

Ident.: DSC-28-20-D-00020288.0001001 / 17 MAR 17

Preselector sw

Pressing the left or the right side of the switch decreases or increases the preselected quantity.

Ident.: DSC-28-20-D-00020289.0001001 / 21 MAR 17

END light

This green light comes on steady when automatic refueling is achieved (associated with the green refuel light on wing extinguishing ⧏).
It flashes green if refueling is aborted.

Ident.: DSC-28-20-D-00020290.0001001 / 17 MAR 17

PWR pb-sw

ON :
- Refuel system is energized
- Cockpit refuel control/preselector panels takes priority (cockpit lights illuminate on cockpit and external refuel control panels)
- Automatic high level test
- REFUEL caption is displayed on ECAM.

OFF :
- Refuel system is deenergized
- ECAM “REFUEL” caption is cleared
- Priority is cleared.

FAULT : This amber light comes on when auto high level test not satisfied.

Ident.: DSC-28-20-D-00020291.0001001 / 17 MAR 17

CTL pb-sw

ON :
- Start of refuel, (associated with refuel green light illumination on wing ⧏)
- Auto shut off occurs when the selected load is reached or in case of HI level detection
- VALVE light comes amber if REFUEL VALVE CTL switch are not at NORM position (on refueling control panel).

Off : Refuel stops. The selected load can be reset.

Ident.: DSC-28-20-D-00020294.0001001 / 21 MAR 17

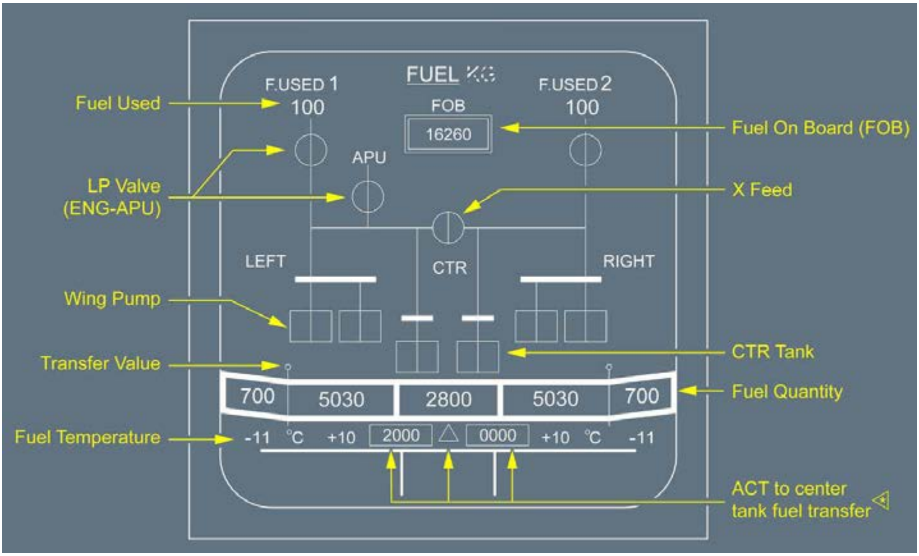
CKPT light

Comes on when PWR pb-sw switch is ON associated with the CKPT light on the external refuel control panel.

ECAM FUEL PAGE

Applicable to: ALL

Ident.: DSC-28-20-F-00020188.0001001 / 17 MAR 17



Ident.: DSC-28-20-F-00020213.0001001 / 17 MAR 17

WING PUMP INDICATIONS

Inline - Green : Pump pressure is normal (pump contactor on).

"LO" - Amber : Pump pressure is low (pump contactor on).

Crossline - Amber : Pump contactor is off.

Ident.: DSC-28-20-F-00020214.0002001 / 17 MAR 17

CTR TANKS PUMPS INDICATIONS

Inline - Green	:	Pump pressure is normal (pump contactor on).
“LO” - Amber	:	Pump pressure is low (pump contactor on).
Crossline - Green	:	Pump contactor is off, and auto shut-off is required.
Crossline - Amber	:	Pump contactor is off, and auto shut-off is not required.

Ident.: DSC-28-20-F-00020216.0002001 / 17 MAR 17

LP VALVE (ENG-APU) INDICATIONS

Inline - Green	:	The valve is open.
Inline - Amber	:	The valve is open, with the ENG (APU) MASTER switch OFF or FIRE pb out.
Crossline - Green	:	The APU valve is closed.
Crossline - Amber	:	The ENG valve is fully closed or APU valve is closed with master switch ON.
Transit - Amber	:	The valve is in transit.

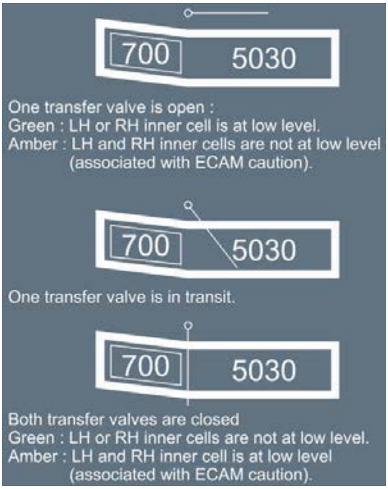
Ident.: DSC-28-20-F-00020217.0001001 / 17 MAR 17

X FEED INDICATIONS

Inline - Green	:	The valve is open.
Inline - Amber	:	The valve is open, with X Feed pb off.
Crossline - Green	:	The valve is closed.
Crossline - Amber	:	The valve is closed with X feed pb ON.
Transit - Amber	:	The valve is in transit.

Ident.: DSC-28-20-F-00020218.0001001 / 17 MAR 17

TRANSFER VALVE INDICATIONS



Ident.: DSC-28-20-F-00020220.0001001 / 17 MAR 17

FUEL TEMPERATURE INDICATION

This appears when its associated temperature sensor is wet. It is normally in green.

An advisory only appears in phases 2 and 6, when the fuel temperature is:
- Above 45 °C for the inner cell, or 55 °C for the outer cell.
- Below -40 °C.

It becomes amber, and the ECAM displays a caution, if the temperature goes above the high limit or below the low limit.

Ident.: DSC-28-20-F-00020221.0001001 / 17 MAR 17

FUEL QUANTITY INDICATION

- It is normally in green.
- The units may either be in KG or LB, depending on the DMC pin program.
- Two dashes appear across the last two digits when the FQI is inaccurate (*Refer to DSC-28-20 Total Fuel Indication*).

Ident.: DSC-28-20-F-00020340.0001001 / 17 MAR 17

FUEL QUANTITY - BOXED INDICATIONS

- The outer indication is boxed amber, if both transfer valves fail to open when the inner is at low level.
- The center tank indication is boxed amber, if both center tank pumps are failed, or are switched OFF.

Ident.: DSC-28-20-F-00020345.0001001 / 17 MAR 17

FUEL QUANTITY - ADVISORY

An advisory appears in flight phases 2 and 6, when the difference between the fuel quantities in the two wings is greater than 1 500 kg (3 300 lb). The wing inner and outer tank indications pulse with the highest fuel level.

Ident.: DSC-28-20-F-00020346.0001001 / 17 MAR 17

FUEL ON BOARD (FOB) INDICATION

It is normally in green. It indicates the total of all tanks (Including the ACTs ◁)
Two dashes appear across the last two digits when the FQI is inaccurate (*Refer to DSC-28-20 Total Fuel Indication*).
Units may either be in KG or LB, depending on the DMC pin program.

The indication is boxed in amber, if:
- Center tank pumps fail, or are switched OFF.
- Both transfer valves fail to open, when the inner tank is at low level.
- Any ACT ◁ is not usable.

Ident.: DSC-28-20-F-00020347.0001001 / 17 MAR 17

FUEL USED INDICATION

- The engine identification number is in amber, when the engine is below idle. It is in white color, when it is at, or above, idle.
- The fuel used indication is green from flight phase 2, until electrical power is cut off at the end of the flight. It is automatically reset, when the engine is started on ground.
- Units may either be in KG or LB, depending on the DMC pin program.

Ident.: DSC-28-20-F-00020348.0001001 / 17 MAR 17

ACT TO CENTER TANK FUEL TRANSFER INDICATION

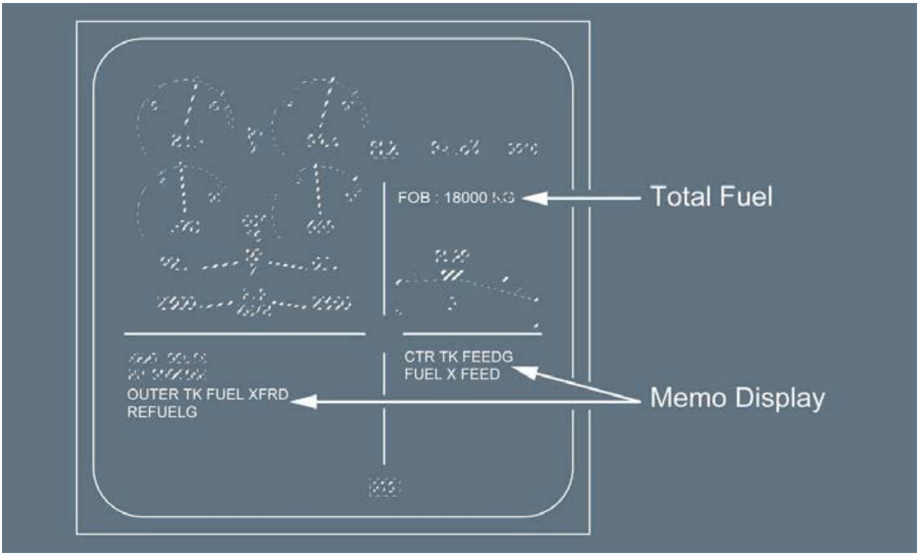
It is normally in green.
A triangle indicates that the ACT fuel transfer to the center tank has started.
The ACT quantity is normally green. It shows the total fuel quantity of ACT(s) installed.
Units may either be in KG or LB, depending on the DMC pin program.

ACT 1 is indicated on the left and ACT2 is indicated on the right.

ECAM UPPER DISPLAY

Applicable to: ALL

Ident.: DSC-28-20-E-00020189.0001001 / 17 MAR 17



Ident.: DSC-28-20-E-00020193.0001001 / 17 MAR 17

TOTAL FUEL INDICATION

An amber half box appears around FOB, when the displayed quantity is not all usable (intercell transfer valve failure or loss of center tank pumps).
Units may either be in KG or LB, depending on the DMC pin program.
If the FOB indication is displayed with two dashes across the two least significant digits, the FQI is in degraded mode. In this case, the ECAM FUEL page can be called on ECAM lower display to determine which tank is affected.

The loss of accuracy resulting from the loss of FQI normal mode is as follows :

Wing outer tank affected	:	+20 kg (+44 lb), –200 kg (–440 lb).
Wing inner tank affected	:	±110 kg (240 lb).
Center tank affected	:	±130 kg (290 lb).
All tanks affected	:	+390 kg (+860 lb), –750 kg (–1660 lb).

Ident.: DSC-28-20-E-00020194.0001001 / 17 MAR 17

MEMO DISPLAY

Memos are normally in green color, but they may be in amber color in abnormal situations.

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-28-20-A-00016777.0001001 / 21 MAR 16

CTR TK FEEDG : This memo appears in green, if at least one center tank pump is energized.

Ident.: DSC-28-20-A-00016778.0001001 / 21 MAR 16

FUEL X FEED : This memo appears in green, if the fuel X FEED pb-sw is ON, and the X FEED valve is not fully closed. It appears in amber in flight phases 3,4, or 5.

Ident.: DSC-28-20-A-00016776.0001001 / 21 MAR 16

OUTR TK FUEL XFRD : This memo appears in green, if at least one transfer valve is open in one wing tank.

Ident.: DSC-28-20-A-00016779.0001001 / 21 MAR 16

REFUELG : This memo appears in green, when :

- The door of the refuel control panel on the fuselage or on the wing is open, or
- The PWR pb-sw of the refuel control panel in the cockpit is ON.

AIRCRAFT SYSTEMS

HYDRAULIC

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DSC-29-10 Description

DSC-29-10-10 General

DSC-29-10-20 Generation

DSC-29-10-30 Distribution

DSC-29-20 Controls and Indicators

Intentionally left blank

GENERAL

Ident.: DSC-29-10-10-00001133.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft has three continuously operating hydraulic systems : blue, green, and yellow. Each system has its own hydraulic reservoir. Normal system operating pressure is 3 000 PSI (2 500 PSI when powered by the RAT). Hydraulic fluid cannot be transferred from one system to another.

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GREEN SYSTEM PUMP

Ident.: DSC-29-10-20-00001134.0001001 / 21 MAR 16
Applicable to: ALL

A pump driven by engine 1 pressurizes the green system.

BLUE SYSTEM PUMPS

Ident.: DSC-29-10-20-00001135.0001001 / 21 MAR 16
Applicable to: ALL

An electric pump pressurizes the blue system. A pump driven by a ram air turbine (RAT) pressurizes this system in an emergency.

YELLOW SYSTEM PUMPS

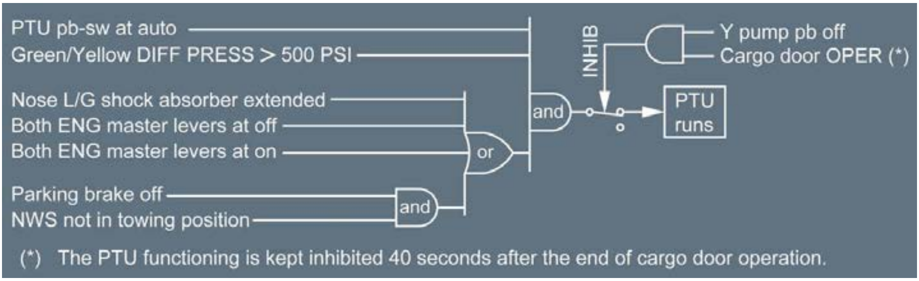
Ident.: DSC-29-10-20-00001136.0001001 / 21 MAR 16
Applicable to: ALL

A pump driven by engine 2 pressurizes the yellow system.
An electric pump can also pressurize the yellow system, which allows yellow hydraulics to be used on the ground when the engines are stopped.
Crew members can also use a hand pump to pressurize the yellow system in order to operate the cargo doors when no electrical power is available.

POWER TRANSFER UNIT (PTU)

Ident.: DSC-29-10-20-00001137.0001001 / 21 MAR 16
Applicable to: ALL

A bidirectional power transfer unit enables the yellow system to pressurize the green system and vice versa.
The power transfer unit comes into action automatically when the differential pressure between the green and the yellow systems is greater than 500 PSI.
The PTU therefore allows the green system to be pressurized on the ground when the engines are stopped.



RAM AIR TURBINE (RAT)

Ident.: DSC-29-10-20-00001138.0001001 / 21 MAR 16
Applicable to: ALL

A drop-out RAT coupled to a hydraulic pump allows the blue system to function if electrical power is lost or both engines fail. The RAT deploys automatically if AC BUS 1 and AC BUS 2 are both lost. It can be deployed manually from the overhead panel. It can be stowed only when the aircraft is on the ground.

SYSTEM ACCUMULATORS

Ident.: DSC-29-10-20-00001139.0001001 / 21 MAR 16
Applicable to: ALL

An accumulator in each system helps to maintain a constant pressure by covering transient demands during normal operation.

PRIORITY VALVES

Ident.: DSC-29-10-20-00001141.0001001 / 21 MAR 16
Applicable to: ALL

Priority valves cut off hydraulic power to heavy load users if hydraulic pressure in a system gets low.

FIRE SHUTOFF VALVES

Ident.: DSC-29-10-20-00001142.0001001 / 21 MAR 16
Applicable to: ALL

Each of the green and yellow systems has a fire shutoff valve in its line upstream of its engine-driven pump. The flight crew can close it by pushing the ENG 1(2) FIRE pushbutton.

LEAK MEASUREMENT VALVES

Ident.: DSC-29-10-20-00001143.0001001 / 21 MAR 16
Applicable to: ALL

Each system has a leak measurement valve upstream of the primary flight controls.
These valves, which measure the leakage in each circuit, are closed by operation of the LEAK MEASUREMENT VALVES pushbutton switch on the maintenance panel.

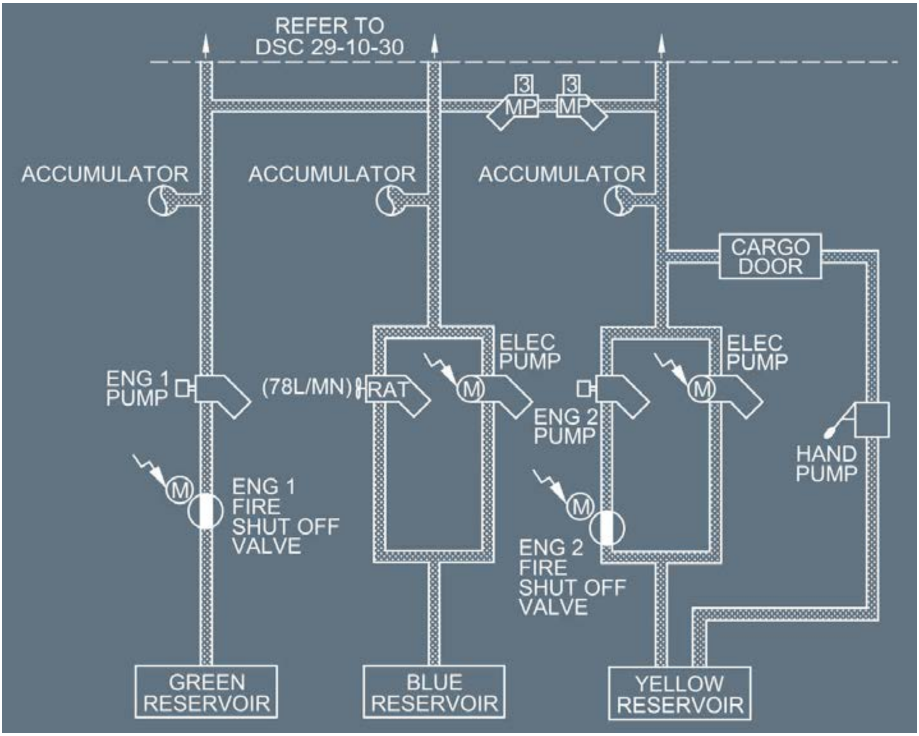
FILTERS

Ident.: DSC-29-10-20-00001144.0001001 / 21 MAR 16
Applicable to: ALL

L3 Filters clean the hydraulic fluid as follows :
- HP filters on each system and on the reservoir filling system and the normal braking system
- return line filters on each line
- case drain filters on engine pumps and the blue electric pump (which permit maintenance crew to monitor pump wear by inspecting the filters for the presence of metallic particles).

GENERATION

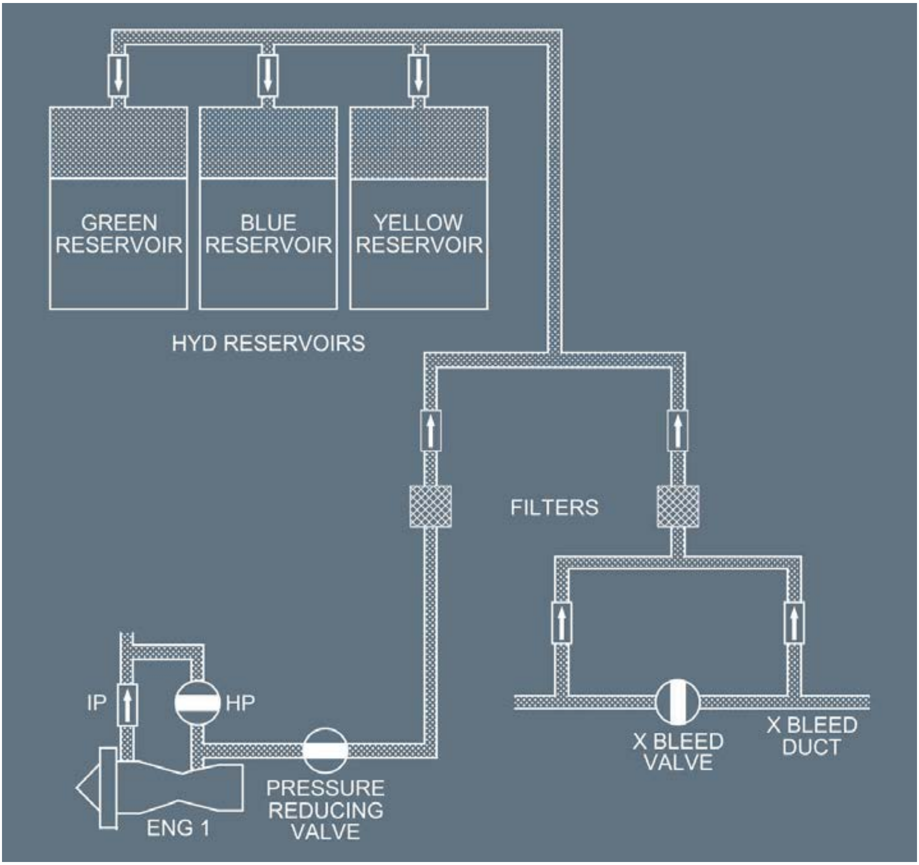
Ident.: DSC-29-10-20-00001145.0001001 / 08 FEB 13
Applicable to: ALL



RESERVOIR PRESSURIZATION

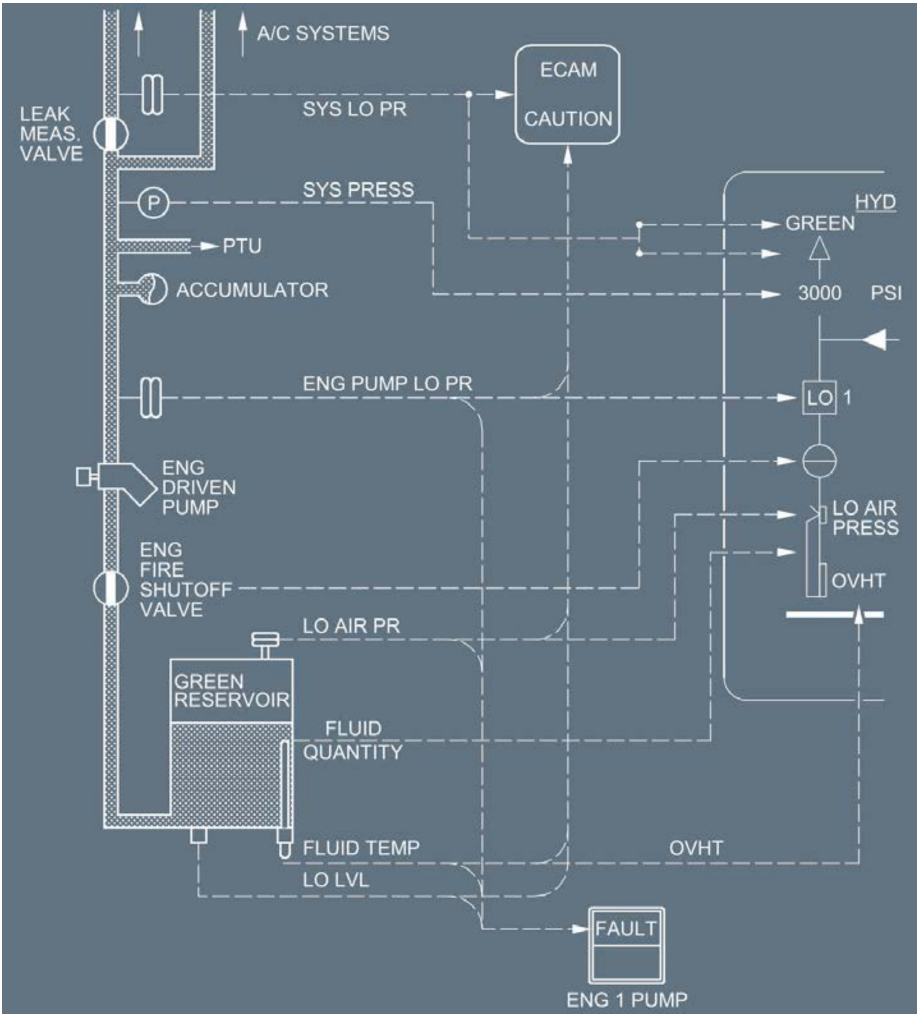
Ident.: DSC-29-10-20-00001146.0001001 / 08 FEB 13
Applicable to: ALL

Normally, HP bleed air from engine 1 pressurizes the hydraulic reservoirs automatically.
If the bleed air pressure is too low, the system takes bleed air pressure from the crossbleed duct.
The systems maintain a high enough pressure to prevent their pumps from cavitating.


GREEN
RESERVOIR
BLUE
RESERVOIR
YELLOW
RESERVOIR
HYD RESERVOIRS
FILTERS
IP
HP
ENG 1
PRESSURE
REDUCING
VALVE
X BLEED
VALVE
X BLEED
DUCT

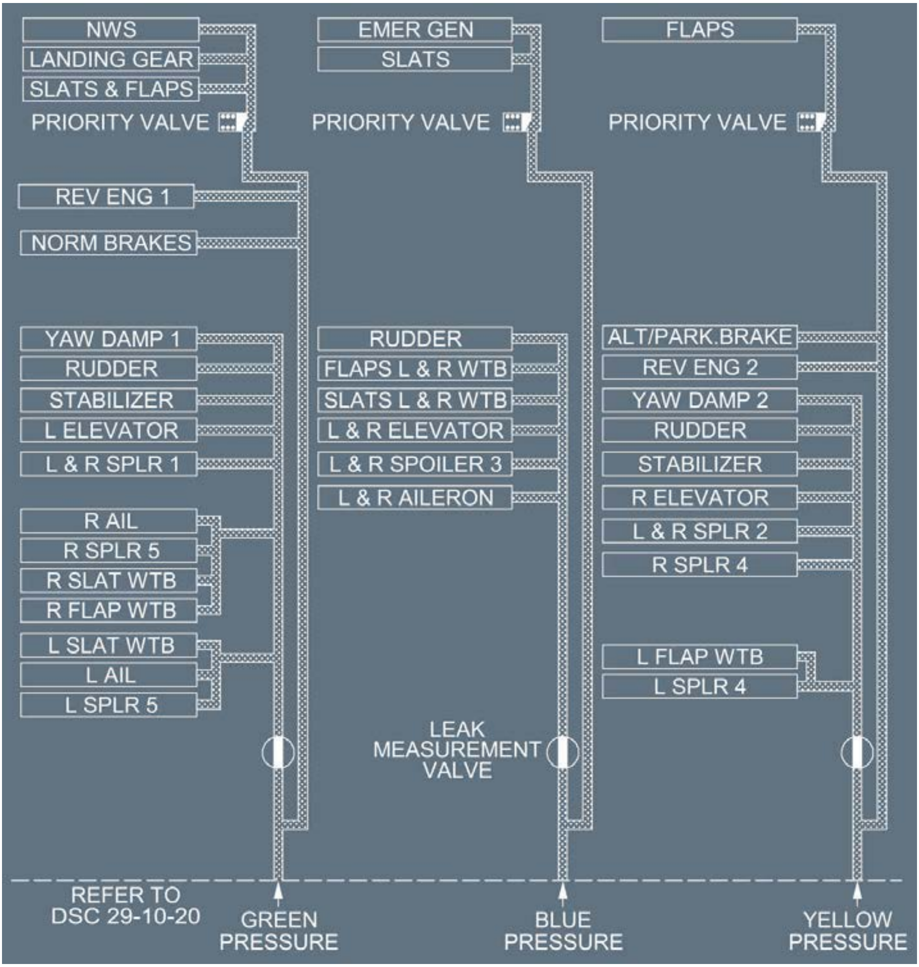
INDICATIONS

Ident.: DSC-29-10-20-00001147.0002001 / 09 OCT 12
Applicable to: ALL



DISTRIBUTION

Ident.: DSC-29-10-30-00001148.0002001 / 08 FEB 13
Applicable to: ALL



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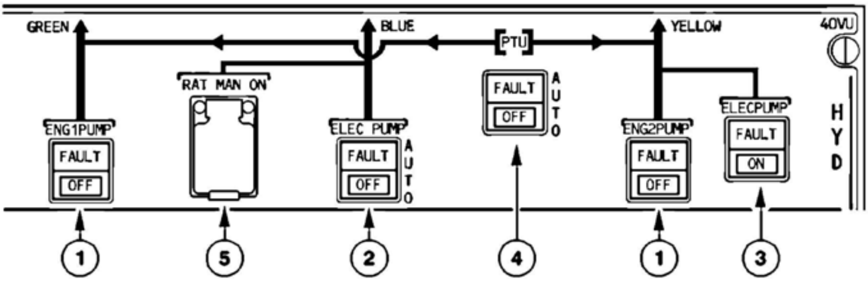
OVERHEAD PANEL

Ident.: DSC-29-20-00001149.0001001 / 21 MAR 16
Applicable to: ALL



(1) ENG 1 (2) PUMP pb

On : The pump pressurizes the system when the engine is running.

OFF : The pump is depressurized. The generation of hydraulic power stops.

FAULT lt : This amber light comes on, and the ECAM caution appears, if :
- The reservoir level is low
- The reservoir overheats
- The reservoir air pressure is low
- The pump pressure is low (inhibited on the ground, when the engine is stopped).

This light goes out, when the crew selects OFF, except during an overheat. (The light stays on as long as the overheat lasts).

(2) BLUE ELEC PUMP pb (guarded)

AUTO : If AC power is available, the electric pump operates :
- In flight
- On the ground, if one engine is running or if the crew has pressed the BLUE PUMP OVRD pushbutton on the maintenance panel.

OFF : The pump is de-energized.

FAULT lt : This amber light comes on, and a caution appears on the ECAM, if :
- The reservoir level is low
- The reservoir overheats
- The air pressure in the reservoir is low
- The pump is delivering low pressure (inhibited on the ground, when the engines are stopped)
- The pump overheats.

The light goes out, when the crew selects OFF, except during an overheat. (The light stays on as long as the overheat lasts).

(3) <u>YELLOW ELEC PUMP pb sw (springloaded)</u>

ON : The electric pump is ON.
If the electrical power supply is removed, the pump will remain off when electrical power is applied again.

Off : The pump is off.
It comes on automatically when a crewman sets the lever of the cargo door manual selector valve to OPEN or CLOSE.
This inhibits the operation of other yellow system functions (except alternate braking and engine 2 reverse).

FAULT lt : This amber light, accompanied by an ECAM caution, comes on if :
- the reservoir level is low
- air pressure in the reservoir is low
- the reservoir overheats
- pump pressure is low
- the pump overheats.

The light goes out when the crew selects OFF, except during an overheat. (The light stays on as long as the overheat lasts).

(4) <u>PTU pb sw</u>

AUTO : The bidirectional power transfer unit is armed and both the yellow and the green electrohydraulic valves are open.
The power transfer unit runs automatically when the differential pressure between the green and yellow systems is more than 500 PSI.

<u>Note:</u> *The PTU is inhibited during the first engine start and automatically tested during the second engine start.*

OFF : Both the green and the yellow PTU electrohydraulic valves close. Power transfer stops.

FAULT lt : This amber light comes on, and a caution appears on the ECAM, if :
- the green or the yellow reservoir overheats
- the green or the yellow reservoir has low air pressure
- the green or the yellow reservoir has a low flluid level.

The light goes out when the crew selects OFF, except during an overheat. (The light stays on as long as the overheat lasts).

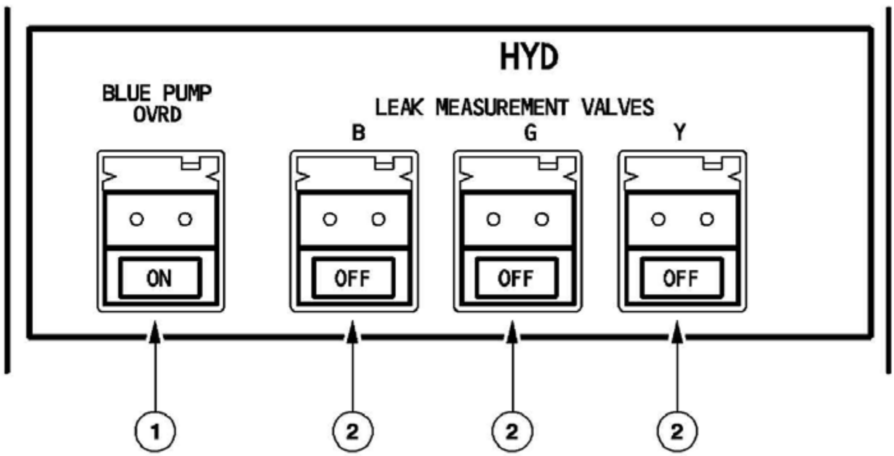
(5) RAT MAN ON pb

The flight crew may extend the RAT at any time by pressing the RAT MAN ON pushbutton.

Note: The RAT extends automatically if AC BUS 1 and AC BUS 2 are lost. *(Refer to DSC-24-20 Overhead Panel (Cont'd)).*

MAINTENANCE PANEL

Ident.: DSC-29-20-00001150.0001001 / 21 MAR 16
Applicable to: ALL



(1) BLUE PUMP OVRD pb sw (guarded)

ON : The blue electric pump is on if the ELEC PUMP pushbutton switch on the HYD panel is at AUTO.

Off : The blue electric pump is off.

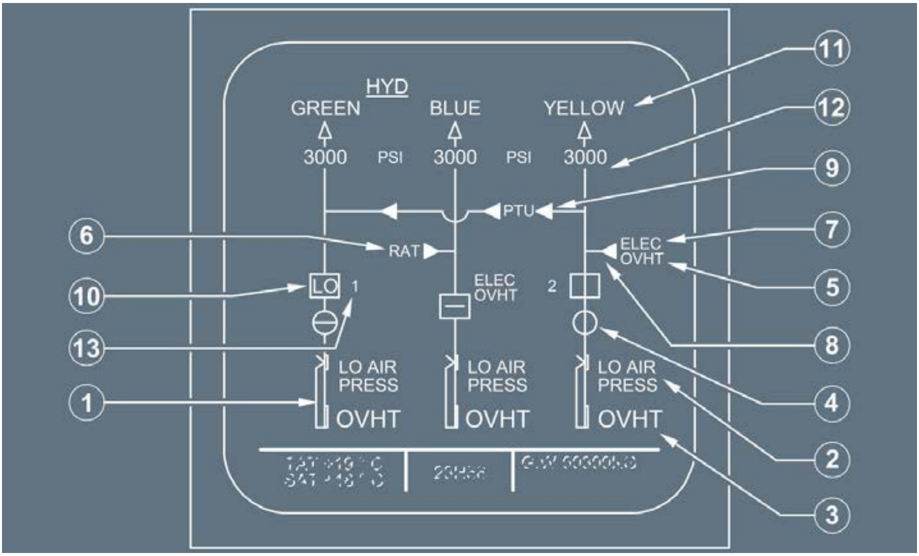
(2) LEAK MEASUREMENT VALVES pb sw (guarded)

OFF: The corresponding electrohydraulic valve closes and shuts off hydraulic supply to the primary flight controls.

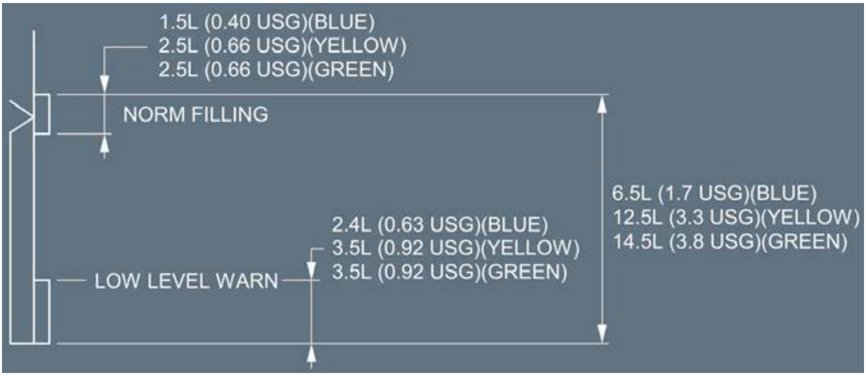
On : The corresponding electrohydraulic valve opens to go back to normal hydraulic supply.

ECAM HYD PAGE

Ident.: DSC-29-20-00001151.0001001 / 23 JUN 15
Applicable to: ALL



(1) Reservoir quantity
It is in green, unless the fluid level goes below the warning level, in which case it becomes amber.



(2) Reservoir LO AIR PRESS
This appears in amber, and a caution appears on ECAM, if the air pressure for the indicated reservoir drops below normal.

(3) Reservoir OVHT
This appears in amber, and a caution appears on ECAM, if the temperature of returning hydraulic fluid temperature at the inlet to its reservoir is above normal.

(4) FIRE VALVE

Cross line - Amber	:	The valve is fully closed.
In line - Green	:	The valve is not fully closed.

(5) OVHT
This appears in amber if the electric pump for that system (blue or yellow) overheats.

(6) RAT

RAT ▹ White	:	The RAT is stowed.
RAT Green	:	The RAT is not stowed.
RAT ▸ Amber	:	Pressure for stowing the RAT has been applied, or the RAT pump is not available.

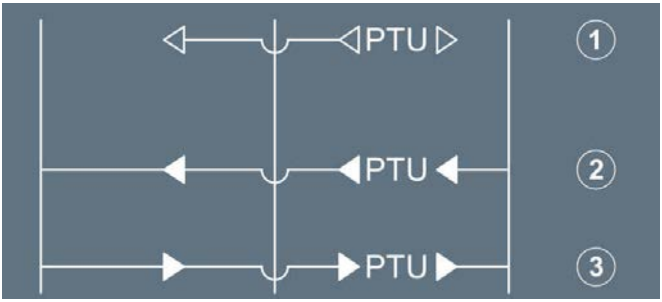
(7) ELEC
This legend, normally white, becomes amber if the associated power supply fails.

(8) YELLOW ELEC PUMP control

◃ White	:	The electric pump is off.
Green	:	The electric pump is ON.

◄ Amber : The electric pump is ON and the yellow system has low pressure.

(9) PTU control



(1)

Green : The power transfer unit (PTU) pushbutton switch is in AUTO and the PTU is not transferring pressure.

Amber : The PTU pb-sw is OFF.

(2)

Green : The PTU is supplying the green hydraulic system.

(3)

Green : The PTU is supplying the yellow hydraulic system.

(10) ENG PUMP control and low pressure indication

In line (Green) : The pushbutton switch for the designated PUMP is on and hydraulic pressure is normal.

Cross line (Amber) : The pushbutton switch for the designated PUMP is OFF.

"LO" (Amber) : The pushbutton switch for the designated PUMP is on and hydraulic pressure is low.

(11) System label

	pressure > 1 450 PSI	pressure < 1 450 PSI
YELLOW	white	amber
Δ	green	amber

(12) System pressure
This legend, normally green, becomes amber when system pressure is below 1 450 PSI.

(13) PUMP
This legend, normally white, becomes amber when N2 is below idle.

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-29-20-A-00016787.0001001 / 21 MAR 16

HYD PTU : This memo appears in green, when the power transfer unit is running.

Ident.: DSC-29-20-A-00016786.0001001 / 21 MAR 16

RAT OUT : This memo appears in green, if the Ram Air Turbine is not fully stowed. The color changes to amber during flight phases 1 and 2.

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AIRCRAFT SYSTEMS

ICE AND RAIN PROTECTION

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Continued on the following page

Continued from the previous page

DSC-30-60 Rain Removal

DSC-30-60-10 Description

DSC-30-60-20 Controls and Indicators

DSC-30-70 Ice Detection System

DSC-30-70-10 Description

GENERAL

Ident.: DSC-30-10-10-00001154.0001001 / 16 MAR 11
Applicable to: ALL

The ice and rain protection system allows unrestricted operation of the aircraft in icing conditions and heavy rain.

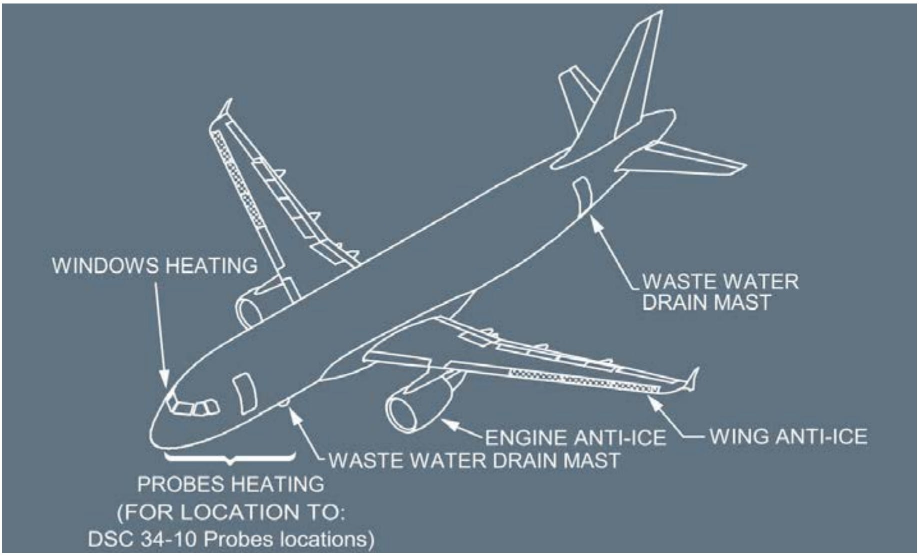
ANTI-ICE

Ident.: DSC-30-10-10-00001155.0001001 / 29 MAR 12
Applicable to: ALL

Either hot air or electrical heating protects critical areas of the aircraft as follows:

HOT AIR
- Three outboard leading-edge slats of each wing
- Engine air intakes.

ELECTRICAL HEATING
- Flight compartment windows
- Sensors, pitot probes and static ports
- Waste-water drain mast.



RAIN REMOVAL

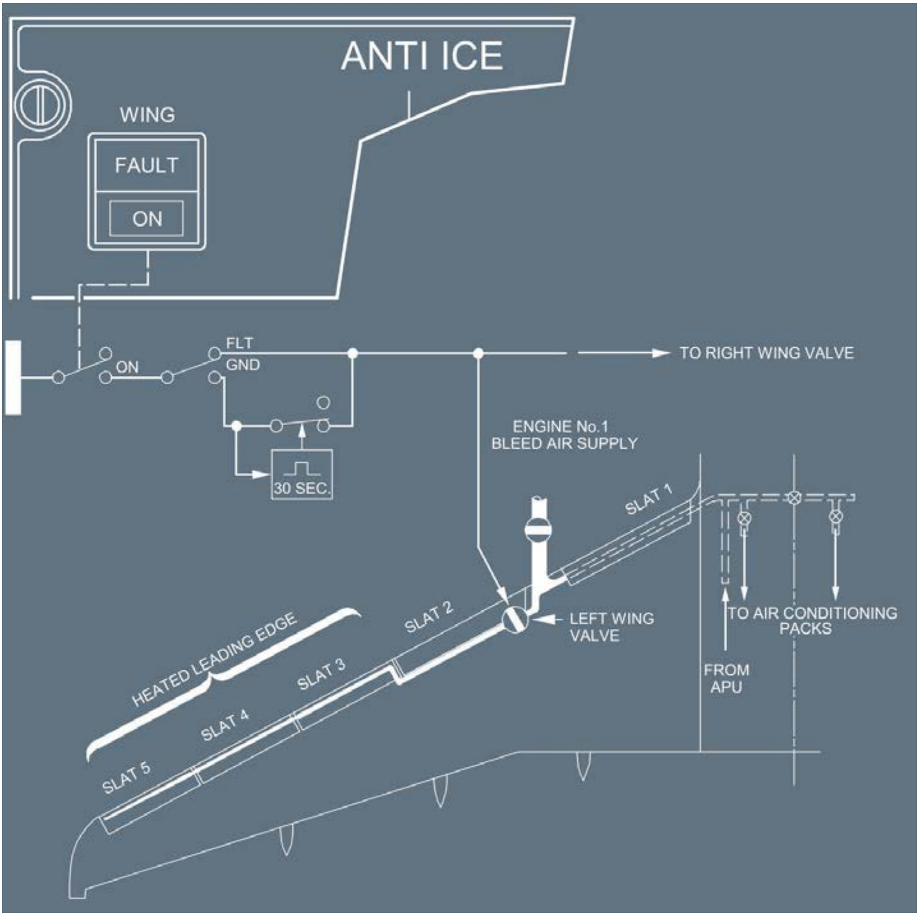
Ident.: DSC-30-10-10-00017416.0001001 / 21 MAR 16
Applicable to: ALL

Wipers and fluid rain repellent ⊲ , remove rain from the front windshield panels.

DESCRIPTION

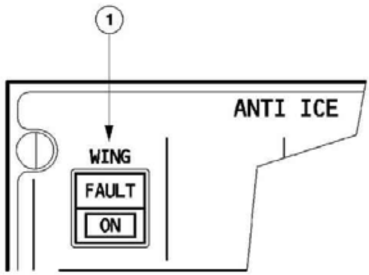
Ident.: DSC-30-20-10-00017417.0001001 / 21 MAR 16
Applicable to: ALL

In flight, hot air from the pneumatic system heats the three outboard slats (3-4-5) of each wing.
Air is supplied through one valve in each wing.
The WING pushbutton on the ANTI ICE panel controls the valves.
When the aircraft is on ground, the flight crew can initiate a 30 s test sequence by turning the system ON.
If the system detects a leak during normal operation, the affected side's wing anti-ice valve automatically closes (*Refer to DSC-36-10-50 Leak Detection*).
When wing anti-ice is selected, the N1 or EPR limit is automatically reduced, and the idle N1 or EPR is automatically increased.
If the electrical power supply fails, the valves close.


ANTI ICE
WING
FAULT
ON
ON
FLT
GND
30 SEC.
TO RIGHT WING VALVE
ENGINE No.1
BLEED AIR SUPPLY
SLAT 1
SLAT 2
SLAT 3
SLAT 4
SLAT 5
HEATED LEADING EDGE
LEFT WING
VALVE
TO AIR CONDITIONING
PACKS
FROM
APU

OVERHEAD PANEL

Ident.: DSC-30-20-20-00017418.0001001 / 21 MAR 16
Applicable to: ALL



(1) <u>WING ANTI ICE pb sw</u>
This switch controls the wing anti ice system on the left and right sides simultaneously.

Off : ON light goes off.
Wing anti-icing control valves close.

FAULT : Light comes on amber, and caution appears on ECAM, if:
- The position of the anti-icing control valve is not the required position, or
- Low pressure is detected.

<u>Note:</u> The amber FAULT light comes on briefly as the valves transit.

ON : Light comes on blue.
WING A. ICE appears on the ECAM MEMO page.
Wing anti ice control valves open if a pneumatic supply is available.
On the ground the wing anti-icing control valves open for 30 s only (test sequence).

ECAM BLEED PAGE

Ident.: DSC-30-20-20-00001159.0001001 / 21 MAR 16
Applicable to: ALL

Refer to DSC-36-20 ECAM Bleed Page

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-30-20-20-A-00016939.0001001 / 21 MAR 16

WING A.ICE : This memo appears in green, if the WING ANTI ICE pb-sw is ON.

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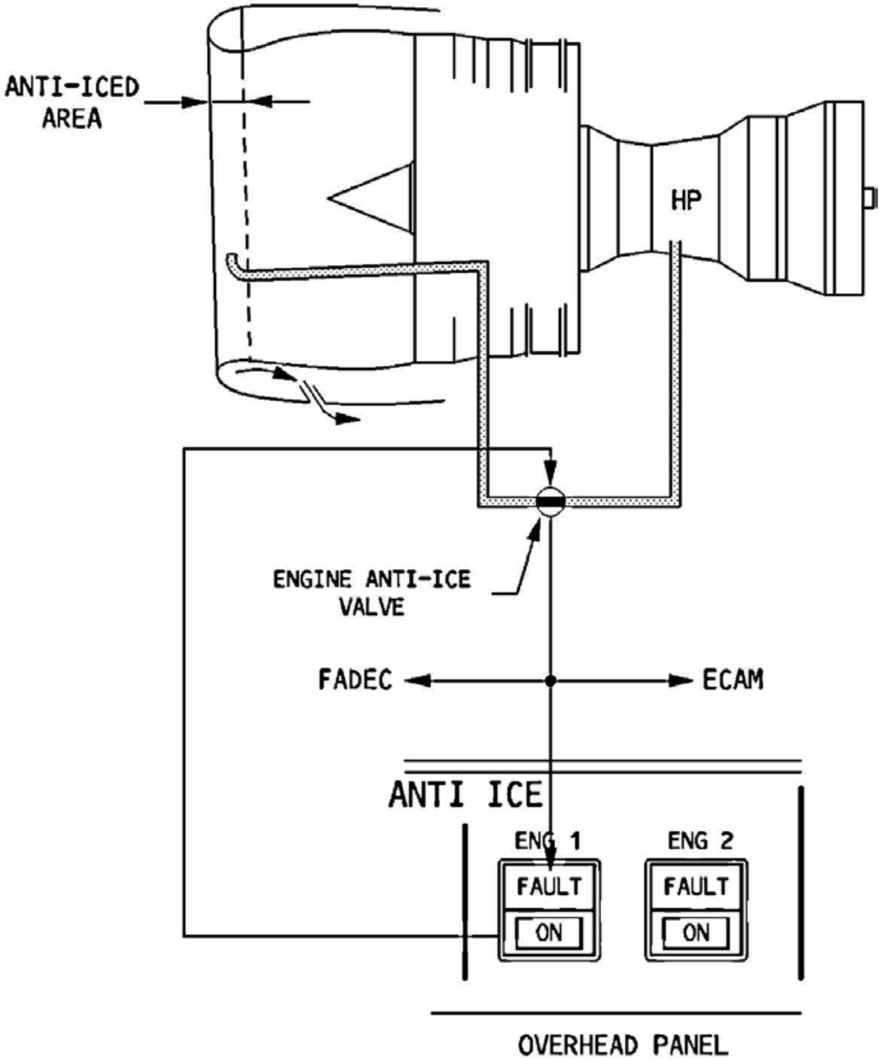
DESCRIPTION

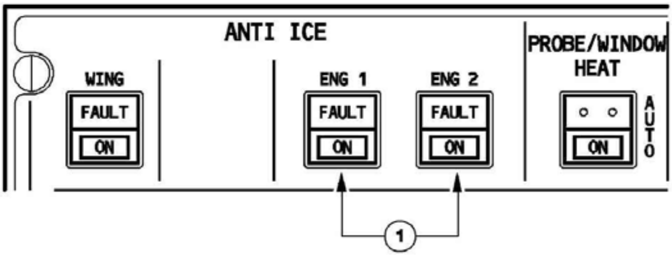
Ident.: DSC-30-30-10-00017422.0001001 / 21 MAR 16
Applicable to: ALL

An independent air bleed from the high pressure compressor protects each engine nacelle from ice.
Air is supplied through a two-position (open and closed) valve that the flight crew controls with two pushbuttons, one for each engine.
The valve automatically closes, if air is unavailable (engine not running).
When an engine anti-ice valve is open, the N1 or EPR limit is automatically reduced and, if necessary, the idle N1 or EPR is automatically increased for both engines in order to provide the required pressure.
If electrical power fails, the valves open.


ANTI-ICED AREA
HP
ENGINE ANTI-ICE VALVE
FADEC
ECAM
ANTI ICE
ENG 1
FAULT
ON
ENG 2
FAULT
ON
OVERHEAD PANEL

OVERHEAD PANEL

Ident.: DSC-30-30-20-00017425.0003001 / 21 MAR 16
Applicable to: ALL



(1) ENG 1 (2) ANTI ICE pb-sw

Off : ON light goes off.
Engine anti-ice valve closes.

FAULT : Light comes on amber, and caution message appears on ECAM, if the position of the anti-ice valve disagrees with the ENG 1 (2) pushbutton selection.

Note: The amber FAULT light comes on briefly as valve transits.

ON : Light comes on blue.
ECAM MEMO displays “ENG A. ICE”.
Engine anti-icing valve opens if bleed air is available from the engine.

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-30-30-20-A-00016945.0001001 / 21 MAR 16

ENG A.ICE : This memo appears in green, if one or both ENG ANTI ICE pb-sw are ON.

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DESCRIPTION

Ident.: DSC-30-40-10-00017458.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft uses electrical heating for anti-icing each windshield and defogging the cockpit side windows.
Two independent Window Heat Computers (WHCs), one on each side, automatically regulate the system, protect it against overheating, and indicate faults.

Window heating comes on:
- automatically when at least one engine is running, or when the aircraft is in flight.
- manually, before engine start, when the flight crew switches ON the PROBE/WINDOW HEAT pushbutton switch.

Windshield heating operates at low power on the ground and at normal power in flight. The changeover is automatic.
Only one heating level exists for the windows.

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OVERHEAD PANEL

Ident.: DSC-30-40-20-00001165.0001001 / 21 MAR 16
Applicable to: ALL

Refer to DSC-30-50-20 Overhead Panel

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DESCRIPTION

Ident.: DSC-30-50-10-00017459.0001001 / 21 MAR 16
Applicable to: ALL

Electrical heating protects:
- Pitot probes
- Static ports
- Angle-Of-Attack (AOAs) probes
- Total Air Temperature (TAT) probes.

Three independent Probe Heat Computers (PHCs) automatically control and monitor:
- Captain probes
- F/O probes
- STBY probes.

They protect against overheating and indicate faults.

The probes are heated:
- Automatically when at least one engine is running, or when the aircraft is in flight.
- Manually, when the flight crew switches ON the PROBE/WINDOW HEAT pb.

On the ground, the TAT probes are not heated and pitot heating operates at a low level (the changeover to normal power in flight is automatic).

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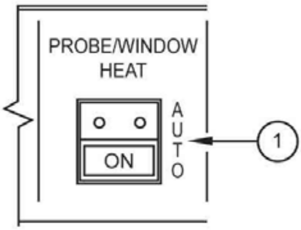
OVERHEAD PANEL

Ident.: DSC-30-50-20-00017460.0001001 / 21 MAR 16
Applicable to: ALL



(1) PROBE/WINDOW HEAT pb

AUTO : Probes/Windows are heated automatically :
- In flight, or
- On the ground (except TAT probes) provided one engine is running.

ON : Light comes on blue. Probes and windows are heated permanently.

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WIPERS

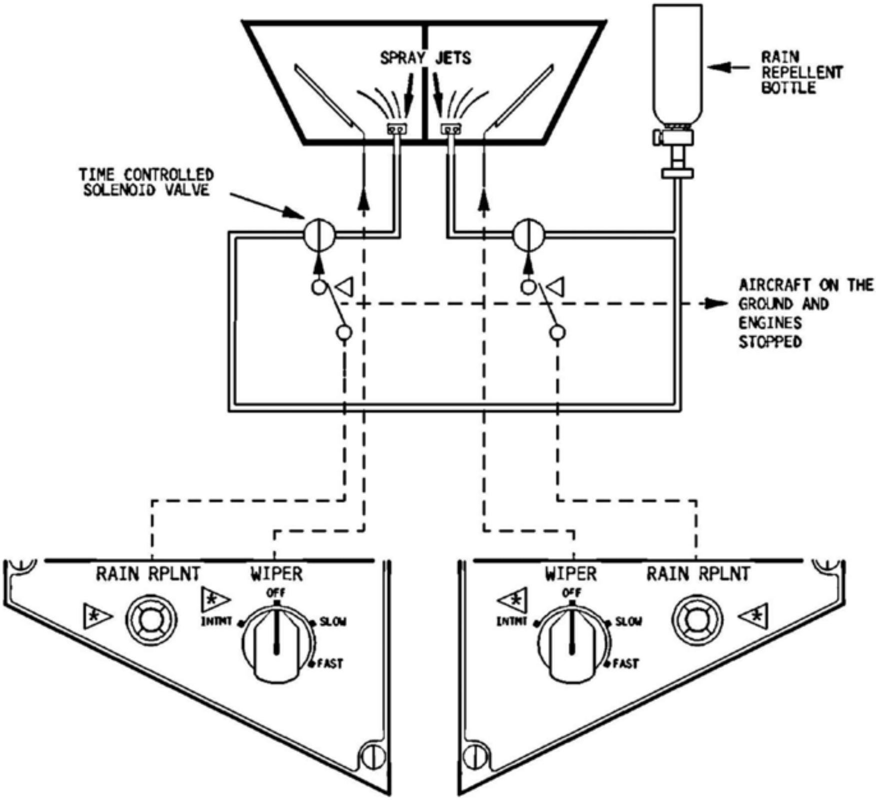
Ident.: DSC-30-60-10-00017461.0001001 / 21 MAR 16
Applicable to: ALL

Each front windshield has an electrical wiper with two speeds, and with an intermittent sweep function. A rotary selector controls each wiper.

RAIN REPELLENT

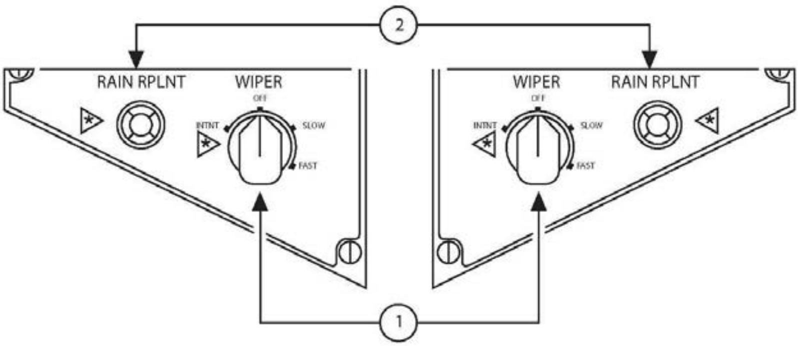
Ident.: DSC-30-60-10-00017462.0001001 / 01 JUN 17
Applicable to: ALL

In moderate to heavy rain, the flight crew can spray a rain repellent liquid on the windshield to improve visibility.
After about 30 s, the windows are covered with spray.
Separate pushbuttons control rain repellent application on each side of the windshield.


SPRAY JETS
RAIN REPELLENT BOTTLE
TIME CONTROLLED SOLENOID VALVE
AIRCRAFT ON THE GROUND AND ENGINES STOPPED
RAIN RPLNT
WIPER
OFF
INTMT
SLOW
FAST
WIPER
OFF
INTMT
SLOW
FAST
RAIN RPLNT

OVERHEAD PANEL

Ident.: DSC-30-60-20-00017466.0001001 / 21 MAR 16
Applicable to: ALL

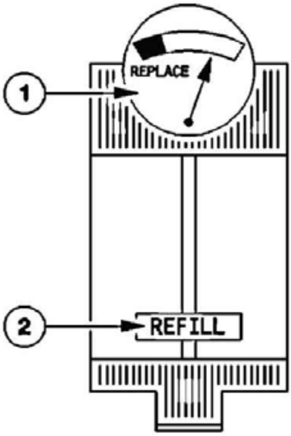


(1) WIPER rotary selector
Each rotary selector controls its wiper at low speed, high speed, or intermittent sweeping.
When turned off, the wiper stops out of view.

(2) RAIN RPLNT pb-sw
Each of these buttons controls the application of rain repellent fluid to the corresponding side of the front windshield.
When the flight crew pushes the button, the timer applies a measured quantity of rain repellent to the windshield. To repeat the cycle, the flight crew must push the button again.
This function is inhibited when the aircraft is on the ground and the engines are stopped.

RAIN REPELLENT ⧏ SYSTEM INDICATORS

Ident.: DSC-30-60-20-00017587.0001001 / 21 MAR 16
Applicable to: ALL



(1) Rain Repellent pressure indicator
This gauge shows the nitrogen pressure and therefore the remaining fluid in the rain repellent bottle. When the needle is in the yellow sector the bottle should be replaced.

(2) Rain Repellent low level indicator (depending on aircraft configuration)
When the REFILL float is in view the bottle should be replaced.

VISUAL ICE INDICATOR

Ident.: DSC-30-70-10-00017471.0001001 / 21 MAR 16
Applicable to: ALL

An external visual ice indicator is installed between the two windshields.
There can be also an external ice detector light ⊲

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AIRCRAFT SYSTEMS

INDICATING/RECORDING SYSTEMS

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DSC-31-05 EIS General

DSC-31-05-10 Introduction

DSC-31-05-20 Cockpit Arrangement

DSC-31-05-30 Architecture

DSC-31-05-40 Controls and Switching

DSC-31-05-50 Reconfiguring the DMC

DSC-31-05-60 Reconfiguring DUs

DSC-31-10 ECAM Description

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DSC-31-15 Indications on E/WD

DSC-31-20 Indications on SD

DSC-31-25 ECAM Sequence

DSC-31-25-10 General

DSC-31-25-20 Example

DSC-31-27 OEB Reminder

DSC-31-30 ECAM Controls

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DSC-31-40 Indications on PFD

DSC-31-45 Indications on ND

DSC-31-50 EFIS Controls

DSC-31-55 Clock

DSC-31-55-10 General

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DSC-31-55-20 Controls and Indicators

DSC-31-60 FLT Recorders

DSC-31-60-10 Flight Data Recording System

DSC-31-60-20 Controls and Indicators

DSC-31-60-30 Aircraft Integrated Data System

INTRODUCTION

Ident.: DSC-31-05-10-00001182.0001001 / 21 MAR 16
Applicable to: ALL

The Electronic Instrument System (EIS) presents data on six identical Display Units (DUs):
- The Electronic Flight Instrument System (EFIS) displays mostly flight parameters and navigation data on the Primary Flight Displays (PFD s) and Navigation Displays (NDs).
- The Electronic Centralized Aircraft Monitor (ECAM) presents data on the Engine/Warning Display (E/WD) and System Display (SD) :
  - Primary engine indications, fuel quantity, flap and slat position
  - Warning and caution alerts, or memos
  - Synoptic diagrams of aircraft systems, and status messages
  - Permanent flight data

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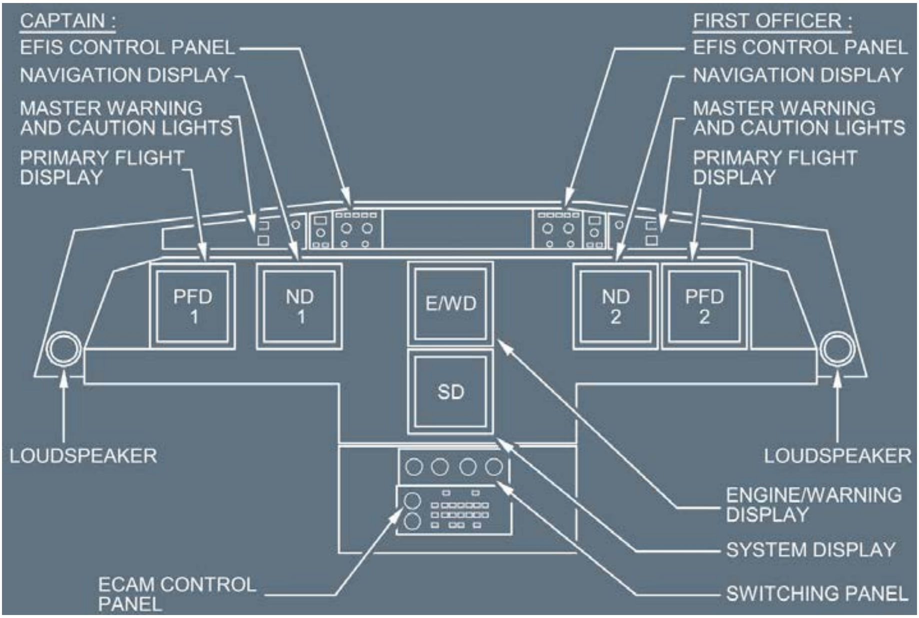
COCKPIT ARRANGEMENT

Ident.: DSC-31-05-20-00001183.0001001 / 09 OCT 12
Applicable to: ALL



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DISPLAY UNIT (DU)

Ident.: DSC-31-05-30-00001184.0001001 / 21 MAR 16
Applicable to: ALL

The instrument panels have six identical units.
These DUs are full-color cathode ray tubes.

DISPLAY MANAGEMENT COMPUTER (DMC)

Ident.: DSC-31-05-30-00001185.0001001 / 21 MAR 16
Applicable to: ALL

Three identical Display Management Computers acquire and process all the signals received from sensors and other computers to generate the images to be displayed on the primary flight displays, navigation displays, engine/warning display, and system display.
Each DMC has two independent channels : An EFIS channel and an ECAM channel. Each DMC is able to simultaneously drive one PFD , one ND , and either one of the ECAMs in its engine warning or system status mode.

SYSTEM DATA ACQUISITION CONCENTRATOR (SDAC)

Ident.: DSC-31-05-30-00001186.0001001 / 21 MAR 16
Applicable to: ALL

The two identical SDAC s acquire data, then generate signals. Some of these signals go to the three DMC s, which use them to generate displays of system pages and engines parameters. Others go to the flight warning computers, which use them to generate ECAM messages and aural alerts.

FLIGHT WARNING COMPUTER (FWC)

Ident.: DSC-31-05-30-00001187.0001001 / 13 JAN 14
Applicable to: ALL

The two identical FWCs generate alert messages, memos, aural alerts, and synthetic voice messages. For this purpose they acquire data:
- Directly from aircraft sensors, or systems, to generate red warnings
- Through the SDACs to generate amber cautions.

The ECAM display units display the alert messages generated by the FWCs.

The FWCs also generate:
- Radio height callouts
- Decision height callouts
- Landing distance and landing speed increments.

ATTENTION - GETTERS

Ident.: DSC-31-05-30-00001188.0001001 / 21 MAR 16
Applicable to: ALL

The FWCs also drive the attention-getters. Each pilot has a set of these on the panel under the glareshield. They are :

- A master warning light, that flashes “MASTER WARN” in red, for red warnings.
- A master caution light, that illuminates “MASTER CAUT” in amber, for amber cautions.

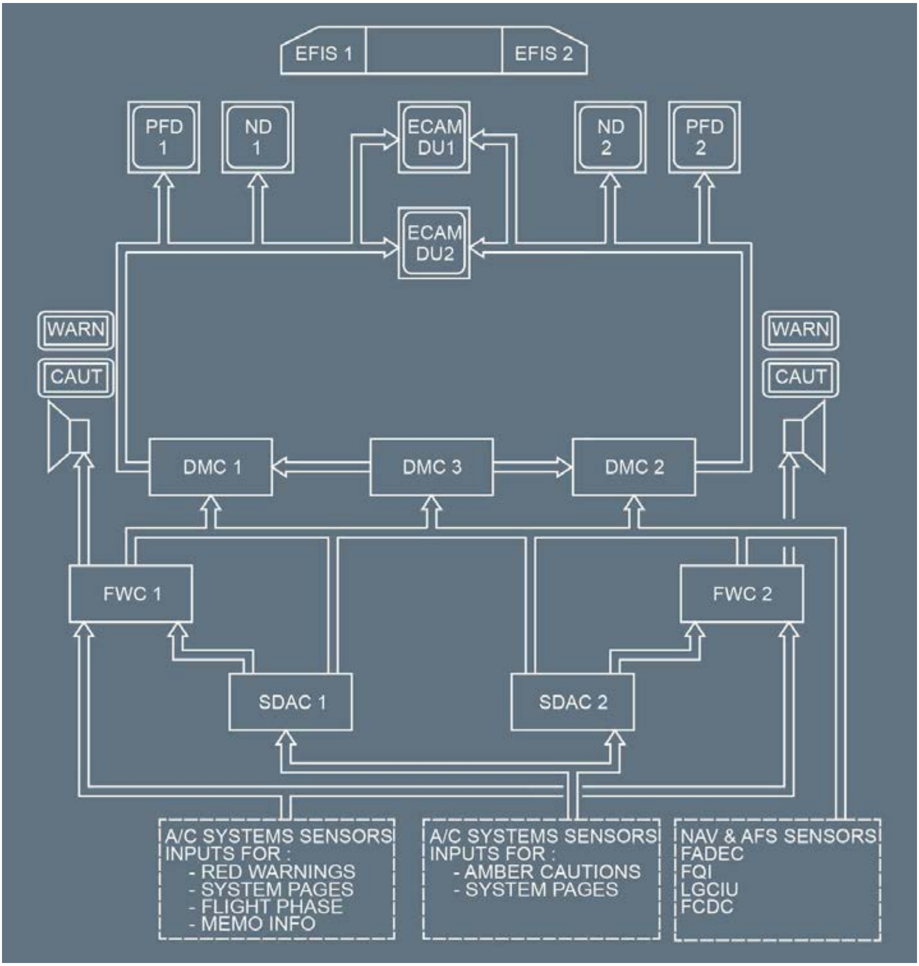
LOUDSPEAKER

Ident.: DSC-31-05-30-00001189.0001001 / 21 MAR 16
Applicable to: ALL

The communications loudspeakers announce aural alerts and voice messages, and do so even when they are turned off.

EIS BLOCK DIAGRAM

Ident.: DSC-31-05-30-00001190.0001001 / 06 JUL 17
Applicable to: ALL



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ECAM CONTROL PANEL (ECP)

Ident.: DSC-31-05-40-00001191.0001001 / 21 MAR 16
Applicable to: ALL

The ECAM Control Panel, located on the pedestal, includes :
- Such E/WD controls, as CLR , STS, and the brightness control knob.
- Such SD controls, as ENG, BLEED, PRESS..., system page selector, and the brightness control knob.

EIS DMC SWITCHING SELECTOR

Ident.: DSC-31-05-40-00001192.0001001 / 22 MAR 16
Applicable to: ALL

A switch near the center of the SWITCHING panel which is located just above the ECAM control panel, enables the flight crew to replace the Captain or First Officer's Display Management Computer (DMC 1, or DMC 2) by DMC 3.

ECAM/ND SWITCHING

Ident.: DSC-31-05-40-00001193.0001001 / 21 MAR 16
Applicable to: ALL

A switch on the right-hand side of the SWITCHING panel enables the flight crew to transfer the ECAM System Display to either the Captain or First Officer's Navigation Display.

EFIS SWITCHING

Ident.: DSC-31-05-40-00001194.0001001 / 21 MAR 16
Applicable to: ALL

A PFD/ND XFR pushbutton on each side console enables the pilot to swap displays to the respective onside DUs.

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RECONFIGURING THE DISPLAY MANAGEMENT COMPUTER (DMC)

Ident.: DSC-31-05-50-00001195.0001001 / 21 MAR 16
Applicable to: ALL

In normal operation, each DMC drives the following Display Units :
- DMC 1 drives the CAPT PFD, CAPT ND and the upper ECAM DUs.
- DMC 2 drives the F/O PFD and F/O ND, and the lower ECAM DU.
- DMC 3 is on standby.

If a DMC fails (corresponding DU shows a diagonal line), the flight crew can replace DMC 1 or 2 with DMC 3 by turning the EIS DMC switch on the SWITCHING panel to “CAPT 3” or “F/O 3”.

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FAILURE OF UPPER ECAM DU (OR CTL/BRIGHTNESS KNOB TURNED TO OFF)

Ident.: DSC-31-05-60-00001196.0001001 / 21 MAR 16
Applicable to: ALL

If the upper ECAM display fails, or is switched off :
- The engine/warning page automatically replaces the system/status page on the lower ECAM DU.

The flight crew can display the system/status page by :
- Using the “ECAM/ND XFR“ switch, on the SWITCHING panel, to move it to a Navigation Display Unit (NDU), or
- Pushing and holding (for a maximum of 3 min) the related system page pushbutton, on the ECAM control panel, to temporarily display it on the lower ECAM DU (instead of the engine/warning page).

FAILURE OF LOWER ECAM DU (OR CTL/BRIGHTNESS KNOB TURNED TO OFF)

Ident.: DSC-31-05-60-00001197.0001001 / 21 MAR 16
Applicable to: ALL

If the lower ECAM display fails, or is switched off, the flight crew can display the system/status page by :
- Using the "ECAM/ND XFR" switch, on the SWITCHING panel, to display it on the NDU, or
- Pushing and holding (for a maximum of 3 min) the related system page pushbutton, on the ECAM control panel, to temporarily display it on the upper ECAM DU (instead of the engine/warning page).

FAILURE OF BOTH ECAM DUs

Ident.: DSC-31-05-60-00001198.0001001 / 21 MAR 16
Applicable to: ALL

If both ECAM displays fail, the flight crew may :
- Use the "ECAM/ND XFR", on the SWITCHING panel, to display the engine/warning page on a navigation display and, if needed,
- Push and hold (for a maximum of 3 min) the related system page pushbutton, on the ECAM control panel, to temporarily display the system/status page on an ND.

PFDU/NDU RECONFIGURATION

Ident.: DSC-31-05-60-00001199.0001001 / 21 MAR 16
Applicable to: ALL

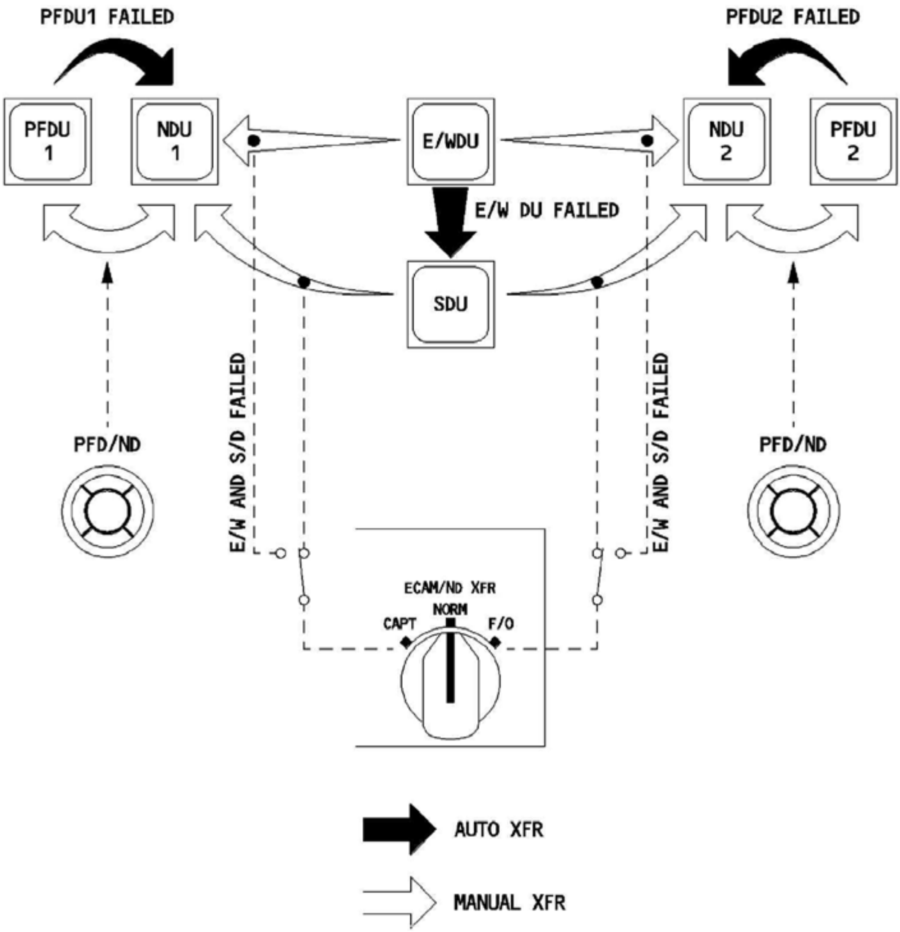
If a PFDU fails, the system automatically transfers the PFD image to the NDU.

The pilot can also make this transfer manually by :
- turning the PFD ON-OFF/brightness control OFF, or
- pressing the PFD/ND/XFR pushbutton, which cross-changes the images between the PFDU and the NDU.

If an NDU fails, the pilot can use the PFD/ND/XFR pushbutton to transfer the ND image to the PFDU.

DU RECONFIGURATION

Ident.: DSC-31-05-60-00001200.0001001 / 21 MAR 16
Applicable to: ALL



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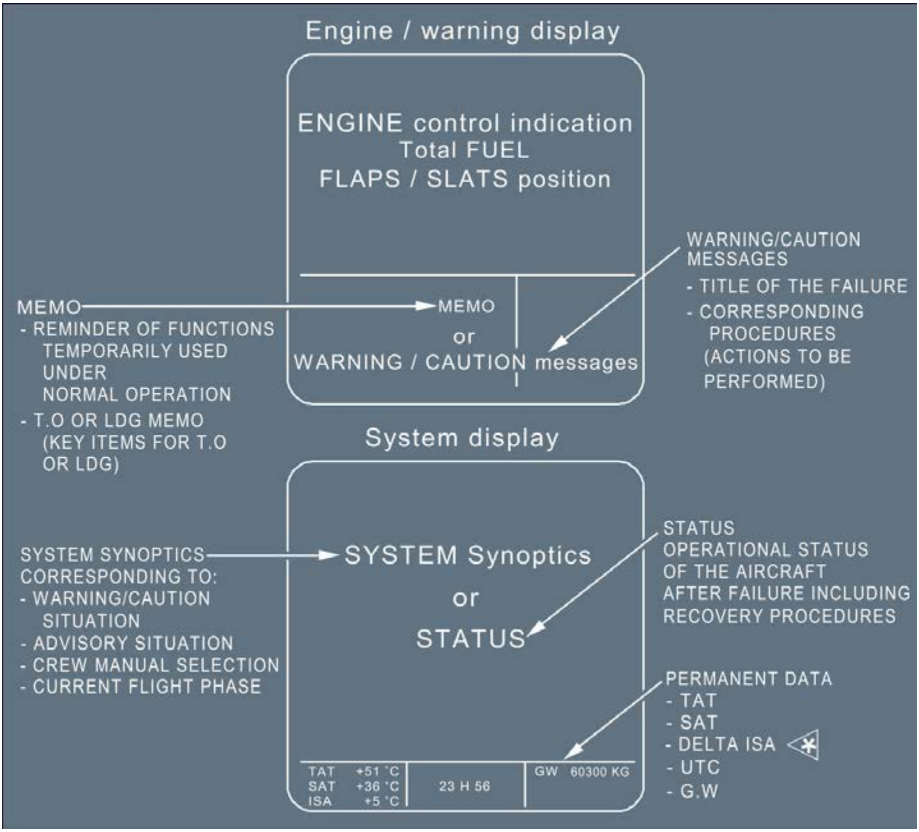
ECAM DU ARRANGEMENT

Ident.: DSC-31-10-00017519.0001001 / 21 MAR 16
Applicable to: ALL

The ECAM has two display units:
- One for the engine/warning display (E/WD).
- One for the system/status display (SD).



COLOR CODE

Ident.: DSC-31-10-00001202.0001001 / 21 MAR 16
Applicable to: ALL

The ECAM display uses a color code that indicates the importance of the failure or the indication.

RED	:	The configuration or failure requires immediate action.
AMBER	:	The flight crew should be aware of the configuration or failure, but need not take immediate action.
GREEN	:	The item is operating normally.
WHITE	:	These titles and remarks guide the flight crew, as they execute various procedures.
BLUE	:	These are actions to be carried out, or limitations.
MAGENTA	:	These are particular messages that apply to particular pieces of equipment or situations (inhibition messages, for example).

WARNING/CAUTION CLASSIFICATION

Ident.: DSC-31-10-00001203.0001001 / 21 MAR 16
Applicable to: ALL

	LEVEL	SIGNIFICATION	AURAL	VISUAL
FAILURE MODE	Level 3	Red warning : The configuration, or failure requires immediate action : - Aircraft in dangerous configuration, or limit flight conditions (eg: stall, o/speed) - System failure altering flight safety (eg : Eng fire, excess cab alt)	Continuous Repetitive Chime (CRC) or specific sound or synthetic voice	- MASTER WARN light red flashing or specific red light - Warning message (red) on E/WD - Automatic call of the relevant system page on the S/D (1).
	Level 2	Amber caution : The flight crew should be aware of the configuration or failure, but does not need to take any immediate action. However, time and situation permitting, these cautions should be considered without delay to prevent any further degradation of the affected system : - System failure without any direct consequence on the flight safety (eg: HYD G SYS LO PR)	Single Chime (SC)	- MASTER CAUT light amber steady - Caution message (amber) on E/WD - Automatic call of the relevant system page on the S/D (1).
	Level 1	Amber caution : Requires crew monitoring : - Failures leading to a loss of redundancy or system degradation (eg : FCDC fault)	NONE	- Caution message (amber) on E/WD generally without procedure.
INFORMATION	ADVISORY	System parameters monitoring	NONE	- Automatic call of the relevant system page on the S/D. The affected parameter pulses green.
	MEMO	Information : Recalls normal or automatic selection of functions which are temporarily used	NONE	- Green, Amber, or Magenta message on E/WD

(1) *except in some cases*

PRIORITY RULES

Ident.: DSC-31-10-00001204.0001001 / 17 MAR 17
Applicable to: ALL

There are three priority levels for warnings and cautions :
- A level 3 warning has priority over a level 2 caution which has priority over a level 1 caution.
The FWC observes these priorities.

INFORMATION PROVIDED WHEN NEEDED

One of the main advantages of the ECAM is that it displays applicable information to the flight crew, on an "as needed" basis. The following outlines the ECAM's operating modes:

- **Normal Mode**:
  Automatically displays systems and memos, in accordance with the flight phase.
- **Failure Mode**:
  Automatically displays the appropriate emergency/abnormal procedures, in addition to their associated system synoptic.
- **Advisory Mode**:
  Automatically displays the appropriate system synoptic, associated with a drifting parameter.
- **Manual Mode**:
  Enables the flight crew to manually select any system synoptic via the ECAM Control Panel (ECP).

Most warnings and cautions are inhibited during critical phases of flight (T/O INHIBIT – LDG INHIBIT), because most system failures will not affect the aircraft's ability to continue a takeoff or landing.

TYPES OF FAILURES

Ident.: DSC-31-10-00001205.0001001 / 21 MAR 16
Applicable to: ALL

Independent	:	a failure that affects an isolated system or item of equipment without degrading the performance of others in the aircraft.
Primary	:	a failure of a system or an item of equipment that costs the aircraft the use of other systems or items of equipment.
Secondary	:	the loss of a system or an item of equipment resulting from a primary failure.

AUDIO INDICATORS

Applicable to: ALL

AUDIO INDICATORS	MEANING	DURATION	AUDIO INDICATOR CANCELLATION [(a)]

Ident.: DSC-31-10-A-00015446.0001001 / 22 JUL 16

CONTINUOUS REPETITIVE CHIME	RED WARNINGS	PERMANENT	Press MASTER WARN lt

Ident.: DSC-31-10-A-00015447.0001001 / 22 JUL 16

SINGLE CHIME	AMBER CAUTION	0.5 s	

Ident.: DSC-31-10-A-00015448.0001001 / 04 FEB 14

CAVALRY CHARGE	A/P DISCONNECTION BY TAKE OVER pb	1.5 s	Second push on TAKE OVER pb
	A/P DISCONNECTION DUE TO FAILURE	PERMANENT	Press MASTER WARN lt or TAKE OVER pb

Ident.: DSC-31-10-A-00015449.0006001 / 22 JUL 16

TRIPLE CLICK	Landing capability downgrade or some cases of mode reversion	0.5 s (3 pulses)	

Ident.: DSC-31-10-A-00015450.0001001 / 04 FEB 14

CRICKET + “STALL” message (synthetic voice)	STALL	PERMANENT	NIL

Ident.: DSC-31-10-A-00015451.0001001 / 23 JUN 15

BUZZER	CABIN CALL	3 s	NIL
	EMER CABIN CALL	3 s REPEATED 3 TIMES	NIL
	MECH CALL	As long as outside pb pressed	Press MASTER CAUT pb

Ident.: DSC-31-10-A-00015452.0001001 / 23 JUN 15

CONTINUOUS BUZZER	SELCAL CALL	PERMANENT	Press RESET key on ACP or press MASTER CAUT pb

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AUDIO INDICATORS	MEANING	DURATION	AUDIO INDICATOR CANCELLATION [(a)]

Ident.: DSC-31-10-A-00015453.0002001 / 06 APR 17

"WINDSHEAR" (synthetic voice)	WINDSHEAR	REPEATED 3 TIMES	NIL
"GO AROUND WINDSHEAR AHEAD" (synthetic voice)	Windshear ahead detected during the landing phase	PERMANENT	NIL
"WINDSHEAR AHEAD" (twice) (synthetic voice)	Windshear ahead detected during the takeoff phase	PERMANENT	NIL
"MONITOR RADAR DISPLAY" (synthetic voice)	Windshear ahead detected caution message	PERMANENT	NIL

Ident.: DSC-31-10-A-00015454.0001001 / 04 FEB 14

C CHORD	ALTITUDE ALERT (*Refer to DSC-31-40 Altitude Alert*)	1.5 s or PERMANENT	new ALTITUDE selection or press MASTER WARN pb

Ident.: DSC-31-10-A-00015455.0001001 / 21 MAR 16

AUTO CALL OUT (synthetic voice)	HEIGHT ANNOUNCEMENT BELOW 2 500 ft (*Refer to DSC-34-NAV-40-10 Automatic Callout*)	PERMANENT	NIL

Ident.: DSC-31-10-A-00015456.0001001 / 21 MAR 17

GROUND PROXIMITY WARNING (synthetic voice)	(*Refer to DSC-34-SURV-40-10 Overview*)	PERMANENT	NIL

Ident.: DSC-31-10-A-00015457.0001001 / 04 FEB 14

“PRIORITY LEFT” ”PRIORITY RIGHT“ (synthetic voice)	A/P TAKE OVER pb	1 s	NIL

Ident.: DSC-31-10-A-00015458.0001001 / 04 FEB 14

“RETARD" (synthetic voice)	Thrust levers not in IDLE or REVERSE position for landing	ONE TIME at 20 ft (10 ft in autoland with A/THR ON), Then PERMANENT	All Thrust levers are set to IDLE or REVERSE

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AUDIO INDICATORS	MEANING	DURATION	AUDIO INDICATOR CANCELLATION [a]
Ident.: DSC-31-10-A-00015459.0001001 / 04 FEB 14			
"RETARD-RETARD" (synthetic voice)	At least one Thrust Lever above IDLE after touchdown	Above 40 kt, PERMANENT	All Thrust levers are set to IDLE or REVERSE
Ident.: DSC-31-10-A-00015460.0001001 / 04 FEB 14			
TCAS (synthetic voice)	(*Refer to DSC-34-SURV-60-20 Aural Messages*)	PERMANENT	NIL
Ident.: DSC-31-10-A-00015461.0001001 / 04 FEB 14			
″SPEED, SPEED, SPEED″ (Synthetic voice)	Current thrust is not sufficient to recover a positive flight through pitch control	Every 5 s until thrust is increased	THRUST LEVER(s)
Ident.: DSC-31-10-A-00015463.0001001 / 04 FEB 14			
"DUAL INPUT" (synthetic voice)	Both sidesticks are moved simultaneously	Every 5 s	One sidestick deactivated
Ident.: DSC-31-10-A-00015466.0001001 / 04 FEB 14			
"STOP RUDDER INPUT" (synthetic voice)	Inappropriate rudder pedal inputs detected in cruise at high speed.	Message repeated at least TWO TIMES	NIL

(a) *The pilot can cancel any audio indicator, by pressing:*
- *The EMER CANC pb on the ECAM control panel, or*
- *The MASTER WARN pushbutton, except for OVERSPEED or L/G NOT DOWN warnings.*

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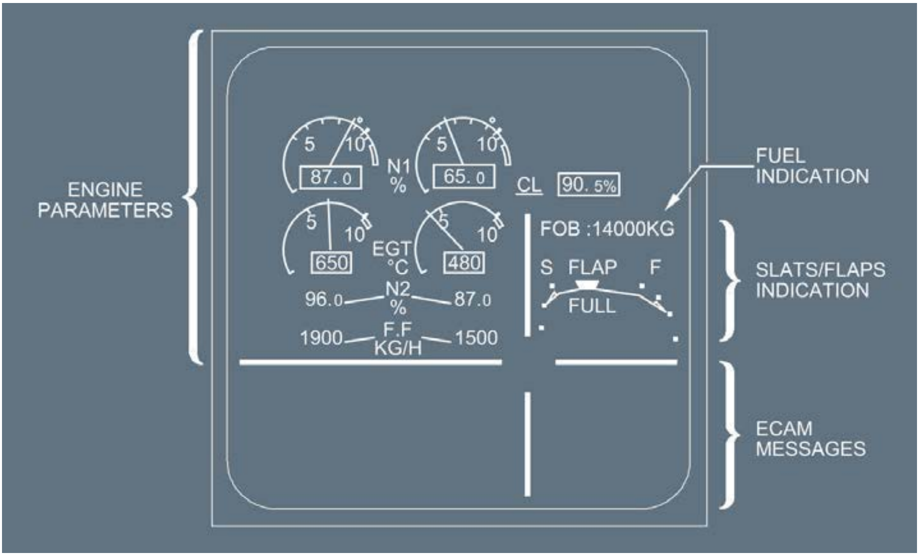
GENERAL

Ident.: DSC-31-15-00001207.0001001 / 21 MAR 17
Applicable to: ALL

The Engine Warning Display (E/WD) appears on the ECAM 's upper Display Unit (DU).
- The upper part of this DU displays :
  - Engine parameters (*Refer to DSC-70-90-40 Engine Warning Display*)
  - Fuel On Board (FOB) (*Refer to DSC-28-20 ECAM Upper Display*)
  - Slats/Flaps' position (*Refer to DSC-27-20-30 ECAM F/CTL Page*)
- The lower part of this DU displays messages generated by the FWC :
  - Warning and caution messages, when a failure occurs.
  - Memos, when there is no failure.



The lower part, dedicated to ECAM messages, is divided into two sections of several lines each.

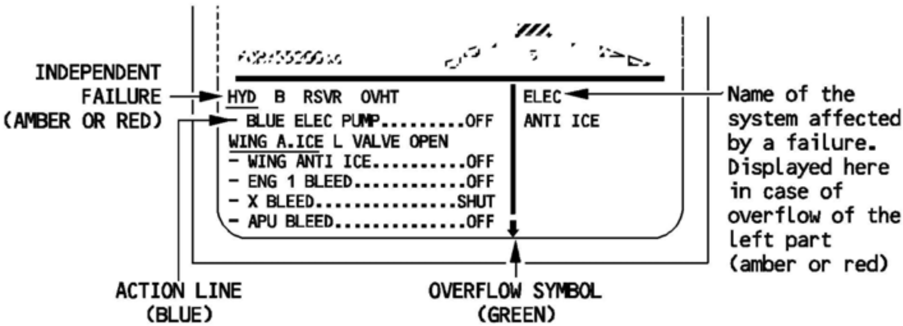
Bottom left	:	- Primary or independent warnings and cautions, or - Memo information.
Bottom right	:	- Title of the system affected by a primary or independent warning or caution, in case of overflow on the bottom left part, or - Secondary failure, or - Memo, or - Special lines (such as “AP OFF”, “LAND ASAP”).

As soon as the FWC detects a failure, and if there is no flight phase inhibition active, the E/WD displays the title of the failure and actions to be taken.
The action line automatically clears, when the flight crew has performed the required action.

Note: *Certain actions lines will not disappear after being done.*

INDEPENDENT FAILURE

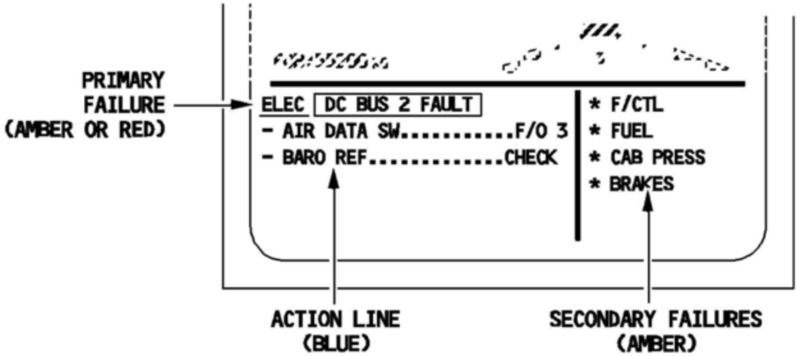
Ident.: DSC-31-15-00001208.0001001 / 03 FEB 11
Applicable to: ALL



If there are too many ECAM messages for the amount of space available in the lower part of the E/WD, a green arrow appears at the bottom of the display, pointing down to show that the information has overflowed off the screen. The pilot can scroll down to view additional messages by pushing the CLR pushbutton on the ECAM control panel (on the pedestal, just below the lower ECAM DU).

PRIMARY AND SECONDARY FAILURE

Ident.: DSC-31-15-00001209.0001001 / 03 FEB 11
Applicable to: ALL



The ECAM DU displays a primary failure as a boxed title.
It identifies a secondary failure by putting a star in front of the title of the affected system.

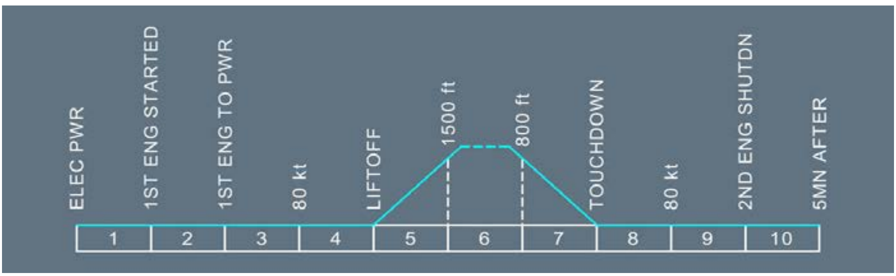
Note: *The DU displays the overflow symbol, if primary or secondary failures overflow. In case of ELEC EMER CONFIG, the secondary failures are inhibited.*

FLIGHT PHASES

Ident.: DSC-31-15-00001210.0001001 / 21 MAR 16
Applicable to: ALL

GENERAL

The FWC divides its functions according to these ten flight phases :

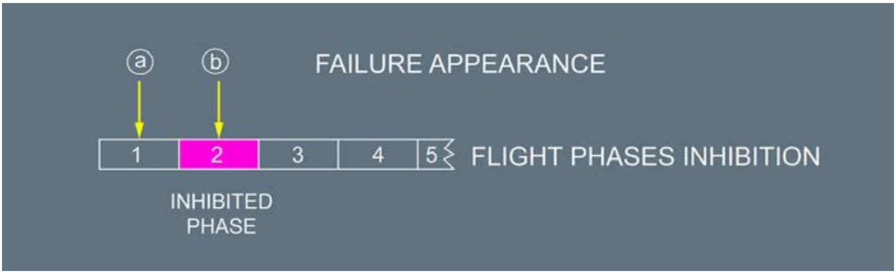


To improve its operational efficacy, the computer inhibits some warnings and cautions for certain flight phases. It does so to avoid alerting the pilots unnecessarily at times when they have high workloads, such as during takeoff or landing. In these two phases, the DU displays magenta memos : “T.O. INHIBIT” (flight phases 3, 4, and 5), and “LDG INHIBIT” (flight phases 7 and 8).

Note: *These flight phases are different from and independent of the ones that the FMGC uses.*

FLIGHT PHASE INHIBITION

Two cases are possible (for instance) :



Effect on E/WD :

(a) The failure occurs during phase 1. The E/WD displays the warning immediately and continues to display it as long as the failure is present, even in phase 2.

(b) The failure occurs during phase 2. The E/WD displays the warning only when the aircraft has entered phase 3, where it is not inhibited. Then the warning remains displayed as long as the failure is present.

MEMOS

Applicable to: ALL

Ident.: DSC-31-15-A-00001211.0001001 / 21 MAR 16

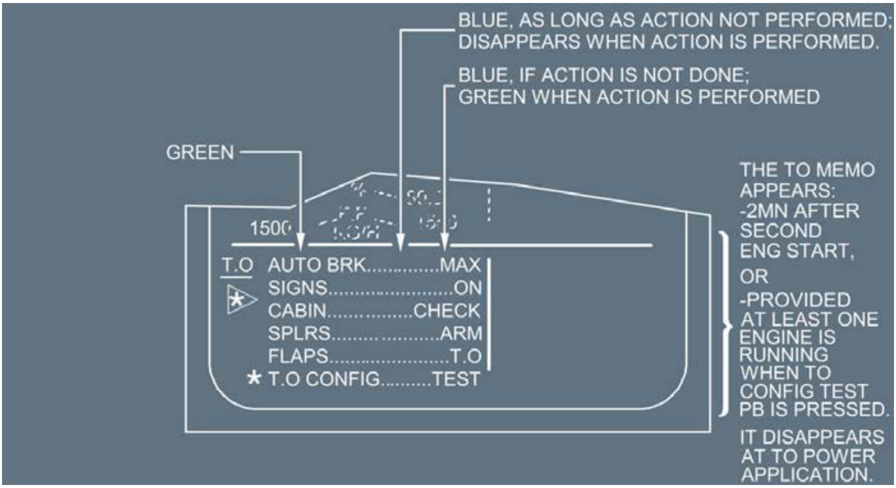
DISPLAY

Memos appear in the lower part of the E/WD. They are normally in green, but may be amber in abnormal situations.
Memos list functions or systems that are temporarily used in normal operations.

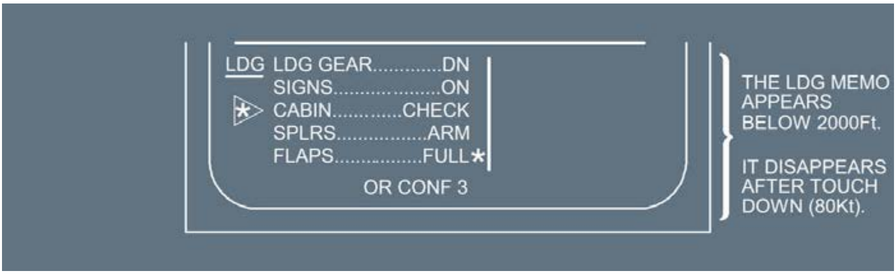
Ident.: DSC-31-15-A-00001212.0002001 / 22 APR 16

TO AND LDG MEMOS

During the takeoff and landing phases, the right side of the memo area displays specific TO INHIBIT or LDG INHIBIT (magenta) memos.
Takeoff and landing memos are displayed, as follows, during the related flight phases:



(*) This line disappears when the test is completed. It is replaced by “TO CONFIG NORMAL”, if aircraft configuration is correct.
The test is requested again, if the configuration becomes abnormal.



(*) “CONF 3” is displayed in alternate or direct law, or if the GPWS LDG FLAP 3 pushbutton is ON.

Note: *After a go-around, if the aircraft does not climb above 2 200 ft RA, the landing memo appears only below 800 ft RA during the subsequent approach.*

CONFIGURATION WARNINGS

Ident.: DSC-31-15-00001214.0015001 / 16 MAR 11
Applicable to: ALL

The following warnings and cautions appear in the lower part of the E/WD if the aircraft is not in takeoff configuration when the flight crew presses the TO CONFIG pushbutton on the ECAM control panel or applies takeoff power.

<table>
<tr><th>WARNINGS/CAUTIONS</th><th>TO CONFIG TEST</th><th>TO POWER</th></tr>
<tr><td>CONFIG RUD TRIM NOT IN TO RANGE (R)</td><td rowspan="13">TRIGGERED</td><td rowspan="10">TRIGGERED</td></tr>
<tr><td>CONFIG PITCH TRIM NOT IN TO RANGE (R)</td></tr>
<tr><td>CONFIG FLAPS NOT IN TO CONFIG (R)</td></tr>
<tr><td>CONFIG SPD BRK NOT RETRACTED (R)</td></tr>
<tr><td>CONFIG SLATS NOT IN TO CONFIG (R)</td></tr>
<tr><td>CONFIG L SIDESTICK FAULT (R)</td></tr>
<tr><td>CONFIG R SIDESTICK FAULT (R)</td></tr>
<tr><td>DOOR (A)</td></tr>
<tr><td>FWS OEB /FWC DISCREPANCY (A)</td></tr>
<tr><td>BRAKES HOT (A)</td></tr>
<tr><td>FUEL R(L) TK PUMP 1+2 LO PR (A)</td><td rowspan="6">NOT TRIGGERED</td></tr>
<tr><td>HYD G(Y) ENG 1(2) PUMP LO PR (A)</td></tr>
<tr><td>HYD G(Y)(B) SYS LO PR (A)</td></tr>
<tr><td>ELEC IDG 1(2) DISCONNECTED (A)</td><td rowspan="3">TRIGGERED if the two GENs are inop.</td></tr>
<tr><td>ELEC GEN 1(2) FAULT (A)</td></tr>
<tr><td>ELEC GEN 1(2) OFF (A)</td></tr>
<tr><td>CONFIG PARK BRK ON (R)</td><td rowspan="2">NOT TRIGGERED</td><td rowspan="2">TRIGGERED</td></tr>
<tr><td>ENG THR LEVERS NOT SET (A)</td></tr>
</table>

(R) Red warning

(A) Amber caution

GENERAL

Ident.: DSC-31-20-00001215.0001001 / 21 MAR 16
Applicable to: ALL

The system/status display (SD) uses the lower ECAM DU to display :
- pages showing synoptic diagrams of the aircraft systems, or
- the status page.

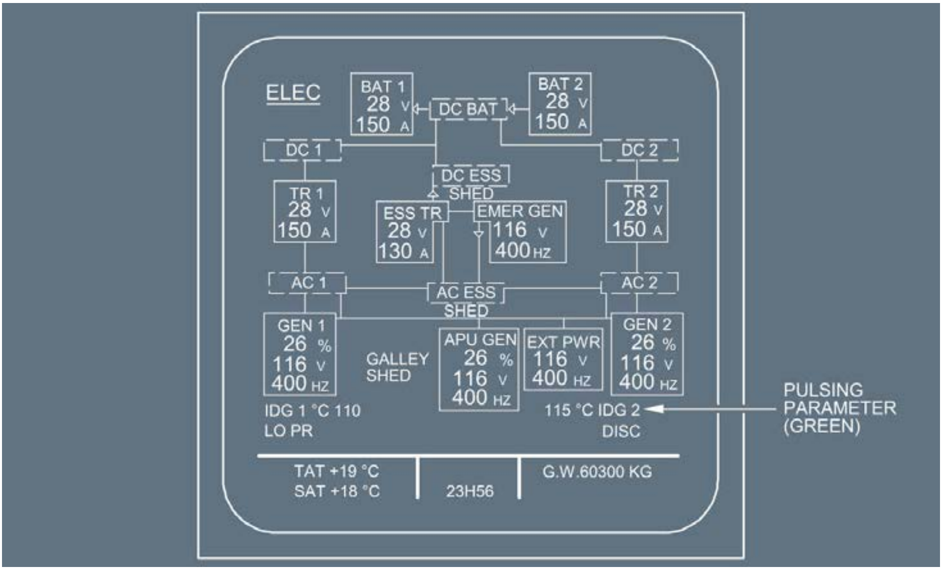
SYSTEM PAGES

Ident.: DSC-31-20-00001216.0001001 / 21 MAR 16
Applicable to: ALL

The lower ECAM DU can display 12 system pages (For description see relevant FCOM chapter):
- ENGINE (secondary engine parameters)
- BLEED (air bleed)
- CAB PRESS (cabin pressurization)
- ELEC (electric power)
- HYD (hydraulic)
- FUEL (fuel)
- APU (auxiliary power unit)
- COND (air conditioning)
- DOOR/OXY (doors/oxygen)
- WHEEL (landing gear, braking, ground spoilers, etc.)
- F/CTL (flight controls)
- CRUISE (cruise)

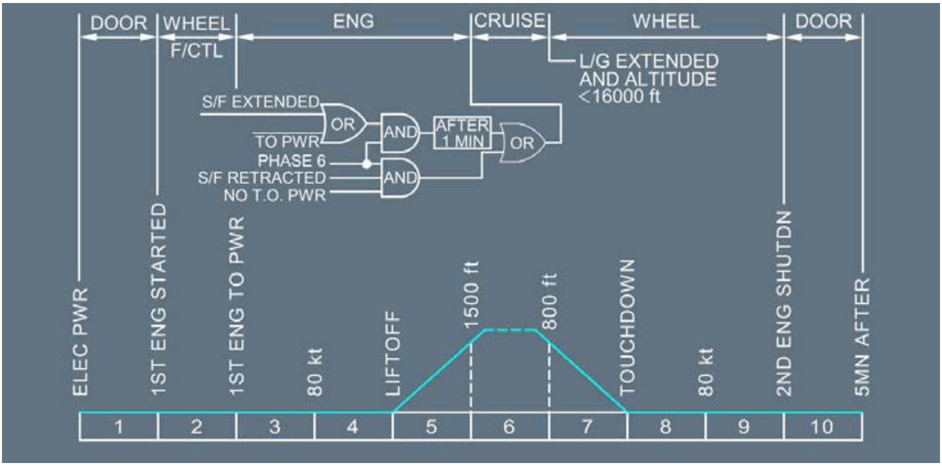
The pilot may manually call up a system page for display on the lower ECAM DU, or the system may automatically display a page.
- Manual:
  - The pilot can, at any time, use the pushbutton on the ECAM's control panel to call up and display any system page, except the CRUISE page.
  - The corresponding pushbutton on the ECAM control panel lights up.
  - A failure-related or advisory display automatically replaces a page the pilot has manually called up.
- Automatic, related to a failure:
  - The relevant system page automatically appears, as soon as any fault or malfunction triggers a caution or warning message.

- Automatic, advisory:
  - The relevant system page automatically appears, when a parameter drifts out of its normal range.
  - The value (shown in green) pulses, as long as it is outside its limits.
  - The advisory mode is inhibited in some flight phases.



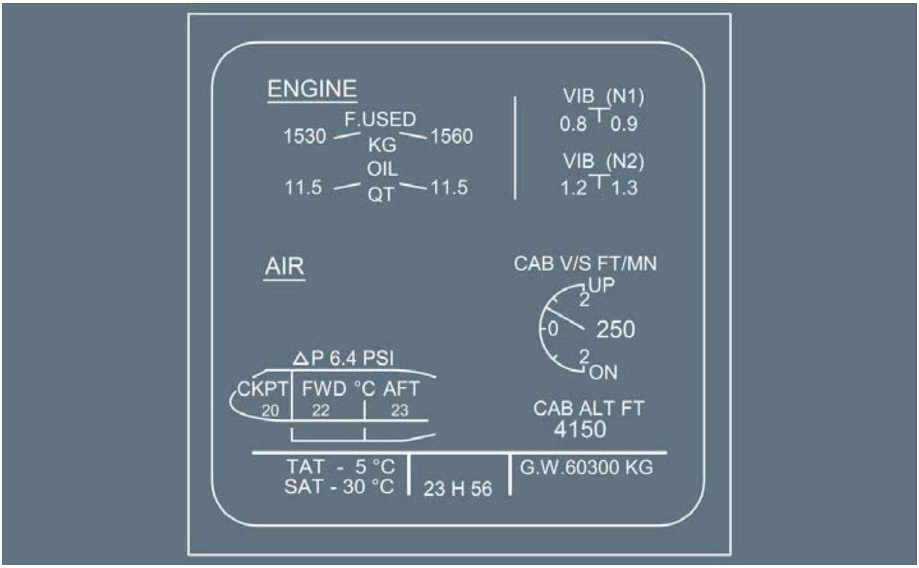
Note: *If an advisory is triggered, when the ECAM is in the single-display configuration, an advisory message appears on the upper part of the E/WD , and the associated key on the ECAM control panel flashes to identify the appropriate system page.*

- Automatic, flight phase mode
  - If no other mode is engaged, the SD displays the system page related to the present flight phase, as shown in the following diagram.



- Phase 2 : The F/CTL page replaces the WHEEL page for 20 s when either pilot moves his sidestick (more than 3 ° in pitch or roll) or when the rudder pedal deflection is more than 22 °.
- The APU page appears when the APU MASTER switch is ON. It disappears when APU RPM has been above 95 % for 10 s, or when the APU MASTER switch is switched OFF.
- The ENGINE page appears at the beginning of start sequence or when a pilot selects “CRANK”. It disappears 10 s after the end of the start sequence, when the ENG MODE sel is set to NORM.

For a description of the ENGINE and AIR indications that appear when the SD is displaying the CRUISE page, see the relevant FCOM chapter.

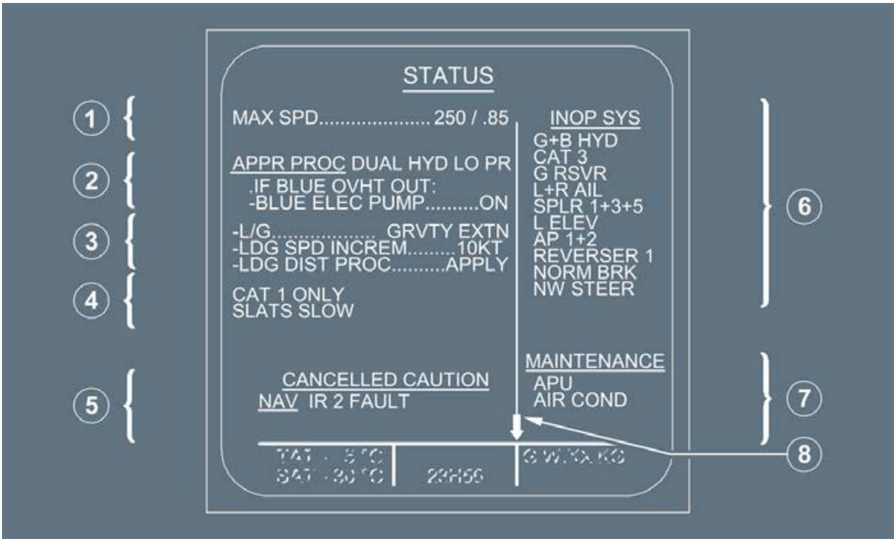


STATUS PAGE

Ident.: DSC-31-20-00001217.0001001 / 12 APR 16
Applicable to: ALL

PURPOSE

The STATUS page provides an operational summary of the state of the aircraft. As illustrated in the following image, this operational summary includes all of the following:



(1) Limitations (speed, flight level): Blue

(2) Approach procedures: White (Red) (Amber)

(3) Procedures (corrections to apply for landing): Blue

(4) Information: Green

(5) Cancelled caution: White

(6) Inoperative system: Amber

(7) Maintenance status: White

(8) The arrow appears if the data on the STATUS page overflows the left or right area of the page.

The flight crew can press the CLR pb, in order to scroll the display to view the overflow.

Note: *The titles of the different parts of the display appear in white and underlined.*

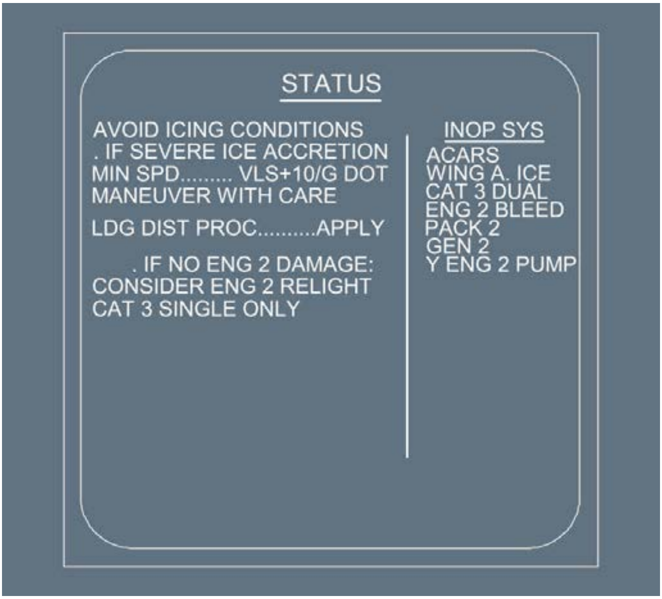
STATUS PAGE DISPLAY

The STATUS page appears when the flight crew presses the STS pb on the ECAM Control Panel (ECP).

The STATUS page automatically appears in abnormal operations if one of the following applies:
- The STATUS page is not empty, and the flight crew clears the last alert on the E/WD, or
- The STATUS page is not empty, and the flight crew selects the CONF1 for approach.

BLANK LINES

Each block that is described above (limitation block (1), approach procedure block (2), etc.) is separated by a blank line.
Therefore, a condition that is included in a limitation block (1) and the associated action line that is included in the procedure block (3) are separated by a blank line.
Example : Illustration with the ECAM alert ENG 1(2) SHUTDOWN.



In this example, the action line “LDG DIST PROC … APPLY” applies only in the case of severe ice accretion.

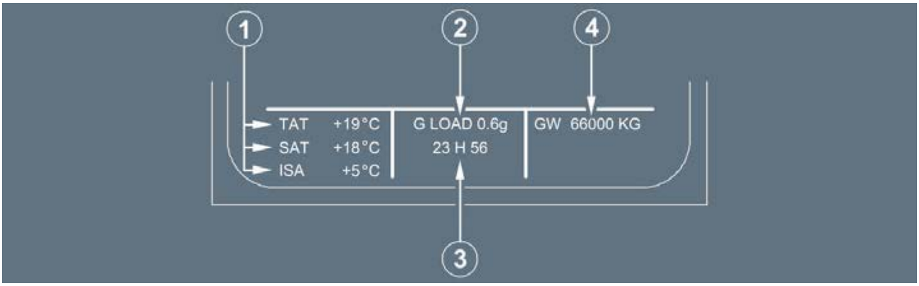
STS REMINDER

The STS reminder appears on the E/WD if both the following conditions apply:
- The STATUS page is not empty: The STATUS page displays message other than “CANCELLED CAUTION” or MAINTENANCE status.
- There is a MAINTENANCE status at engines shutdown.

The MAINTENANCE status can appear only when the aircraft is on the ground, before engine start or after engine shutdown.

PERMANENT DATA

Ident.: DSC-31-20-00017520.0014001 / 25 JUL 16
Applicable to: ALL



(1) <u>Temperature</u>
The screen displays the Total Air Temperature (TAT) and Static Air Temperature (SAT) in green.
The difference between the SAT and the International Standard Atmosphere (ISA) temperature (Delta ISA ⊲)is displayed in green, in standard altitude mode and when the SAT is valid.

(2) <u>G LOAD</u>
The screen displays the load factor (G LOAD) in amber, when the value is above 1.4 g or below 0.7 g for more than 2 s. The G LOAD amber indication remains displayed 5 s after the excessive load occurrence. The display of the load factor is inhibited during flight phases 1, 2 and 3.

(3) <u>UTC</u>
The screen displays the Universal Time Coordinated (UTC), synchronized with the cockpit clock, in green.

(4) <u>GW</u>
The screen displays the Gross Weight (GW) in green, as soon as the flight crew starts the first engine. The last two digits are dashed, if accuracy is degraded. On ground, blue dashes are displayed instead of the indication, if no computed data is available.

AMBER CROSSES "XX" ON THE SD

Ident.: DSC-31-20-00013602.0001001 / 18 MAR 11
Applicable to: ALL

If a parameter value on any SD page is not available for display, amber crosses "XX" appear instead of the value.

AMBER DASHES ON THE SD

Ident.: DSC-31-20-00015526.0001001 / 01 APR 14
Applicable to: ALL

If the accuracy of a parameter value on any SD page is degraded, amber dashes are displayed over the last digits.

GENERAL

Ident.: DSC-31-25-10-00001219.0001001 / 22 MAR 16
Applicable to: ALL

If ECAM detects a failure :
- The E/WD displays warning or caution messages.
- The master warning or master caution lights light up (except in the case of a level 1 caution).
- The system sounds an aural signal (except in the case of a level 1 caution).
- The system display (SD) shows the system page for the affected system.
- The CLR pushbutton on the ECAM control panel lights up.

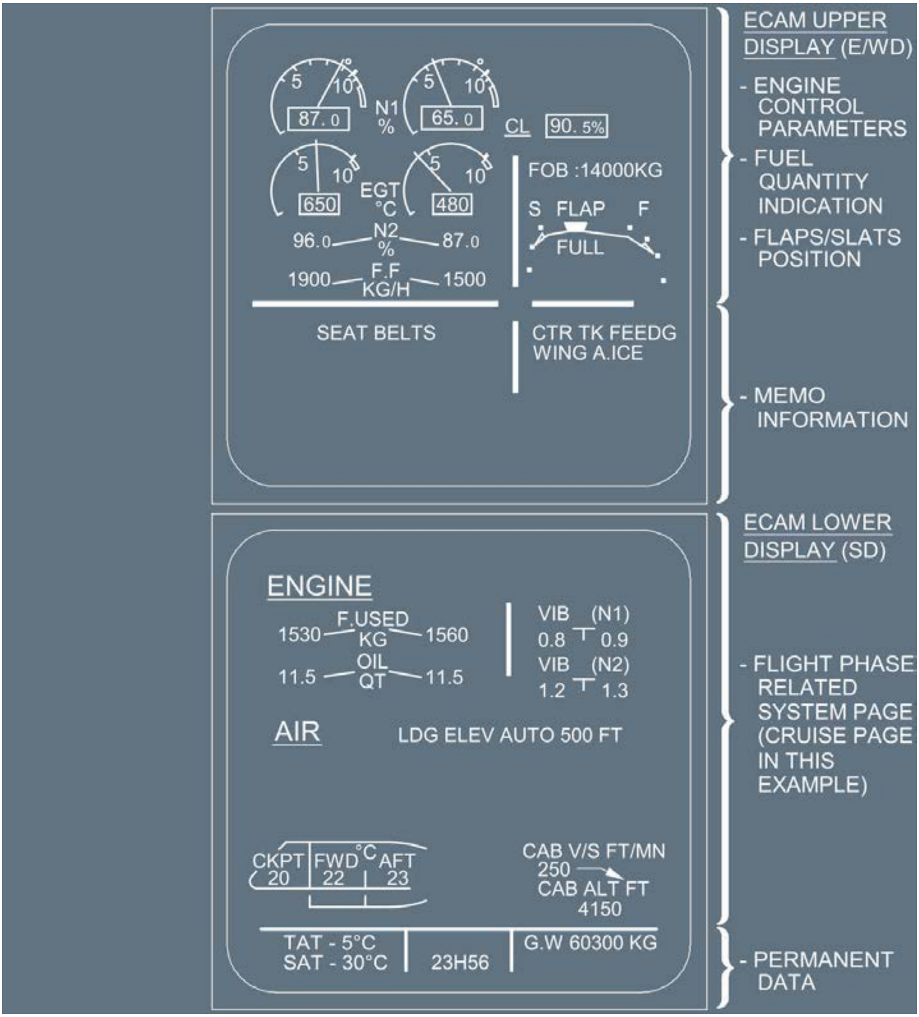
In addition, a local warning light controlled directly by the affected system can light up.

After completing remedial procedures, the flight crew must push the CLR pushbutton repeatedly until the displays return to their normal configurations :
- MEMO messages on the E/WD
- The system page related to the present flight phase on the SD.
- The CLR light on the ECAM control panel turned off.

Intentionally left blank

1 - THE ECAM DETECTS NO FAILURE

Ident.: DSC-31-25-20-00001220.0001001 / 09 OCT 12
Applicable to: ALL



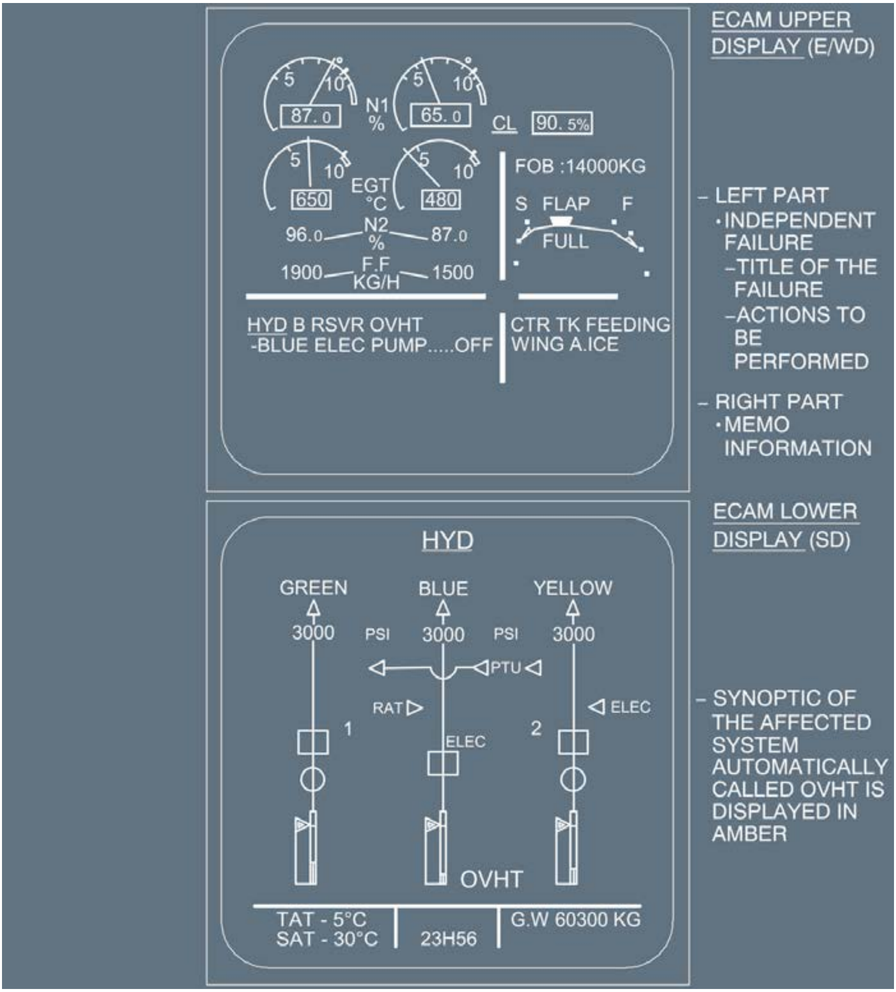
2 - THE ECAM DETECTS A FAILURE

Ident.: DSC-31-25-20-00001221.0001001 / 09 OCT 12
Applicable to: ALL

For example, a hydraulic reservoir is overheat.

COCKPIT INDICATIONS

- A single chime sounds
- Both MASTER CAUTION lights come on, and stay on
- A FAULT light, on the overhead HYD panel, comes on
- The memo space on the E/WD displays the “HYD B RSVR OVHT ” message, and the “BLUE ELEC PUMP . . . . . OFF” instruction
- The lower ECAM display (SD) automatically calls up the hydraulic system's diagram, and displays “OVHT” in amber next to the blue system
- The ECAM 's CLR pushbutton lights up.



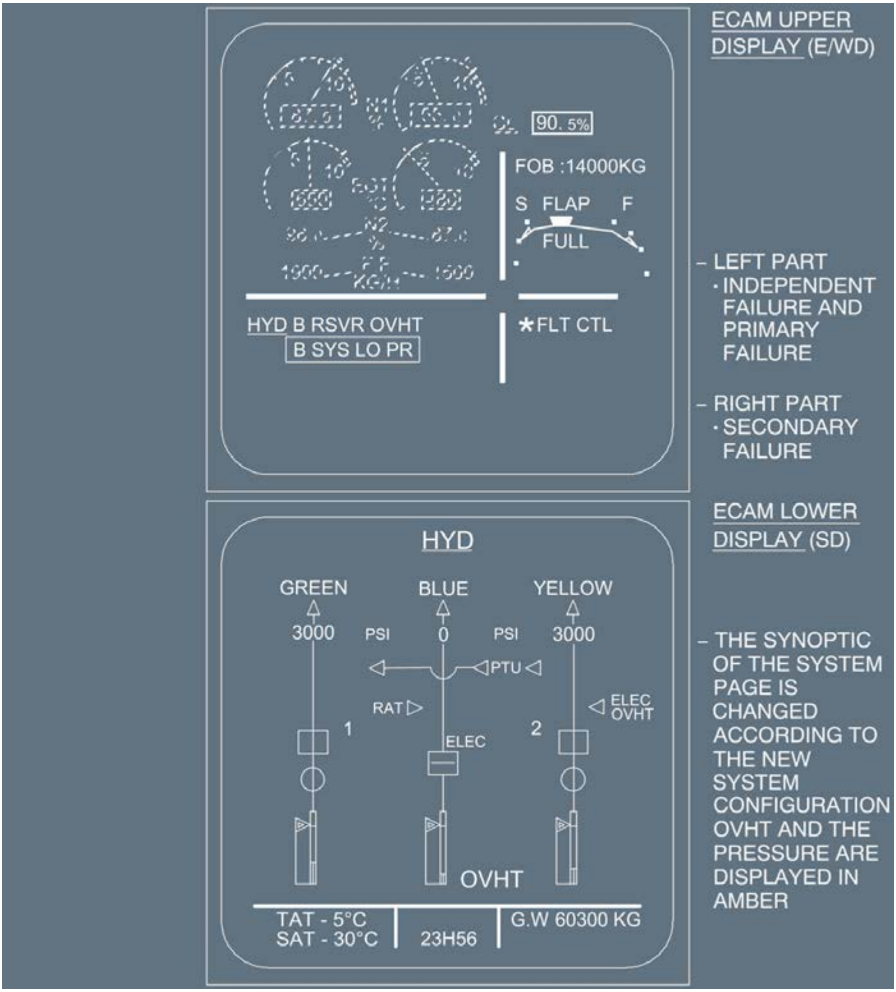
3 - THE FLIGHT CREW FOLLOWS THE INSTRUCTION DISPLAYED ON THE E/WD

Ident.: DSC-31-25-20-00001222.0001001 / 09 OCT 12
Applicable to: ALL

The flight crew switches off the BLUE ELEC PUMP pushbutton, depressurizing the blue hydraulic circuit.

COCKPIT INDICATIONS

- A single chime sounds.
- Both MASTER CAUTION lights stay on.
- A FAULT/OFF light, on the overhead panel, comes on.
- The second part of the message on the E/WD changes to “B SYS LO PR”.
- The SD 's system diagram shows an amber zero for the pressure in the blue system, along with the amber “OVHT”.
- The right side of the memo area indicates a secondary failure in the flight control system.
- The ECAM control panel's CLR pushbutton remains on.


ECAM UPPER DISPLAY (E/WD)
90.5%
FOB :14000KG
S FLAP F
FULL
HYD B RSVR OVHT
B SYS LO PR
*FLT CTL
– LEFT PART
· INDEPENDENT FAILURE AND PRIMARY FAILURE
– RIGHT PART
· SECONDARY FAILURE
ECAM LOWER DISPLAY (SD)
HYD
GREEN
BLUE
YELLOW
3000
PSI
0
PSI
3000
PTU
RAT
ELEC
OVHT
1
ELEC
2
OVHT
TAT - 5°C
SAT - 30°C
23H56
G.W 60300 KG
– THE SYNOPTIC OF THE SYSTEM PAGE IS CHANGED ACCORDING TO THE NEW SYSTEM CONFIGURATION OVHT AND THE PRESSURE ARE DISPLAYED IN AMBER

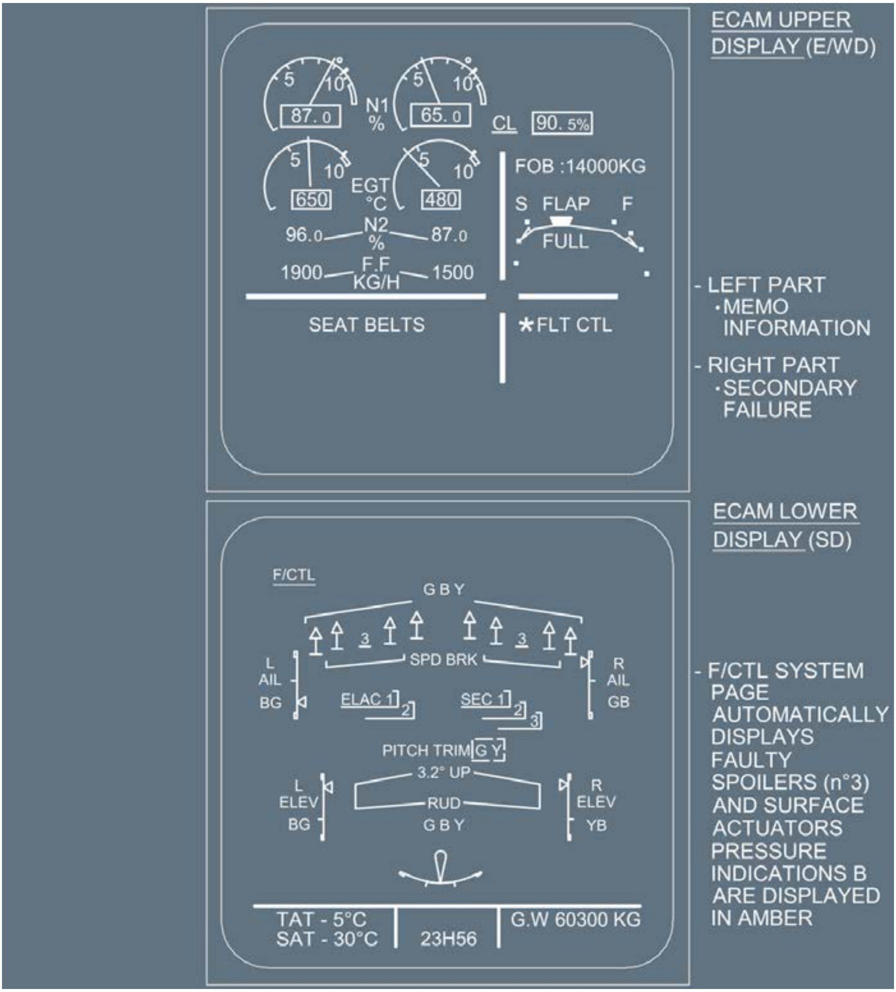
4 - ONE OF THE PILOTS PUSHES THE CLR PUSHBUTTON ON THE ECP

Ident.: DSC-31-25-20-00001223.0001001 / 09 OCT 12
Applicable to: ALL

COCKPIT INDICATIONS

- The CLR pushbutton stays on.
- The FAULT/OFF light stays on.
- Hydraulic system messages disappear from the E/WD, and the right side of the memo area indicates a secondary failure in the flight control system.
- The SD automatically calls up the flight control system page, with surface actuator indications (associated with the blue hydraulic system) shown in amber.

ECAM SEQUENCE - EXAMPLE



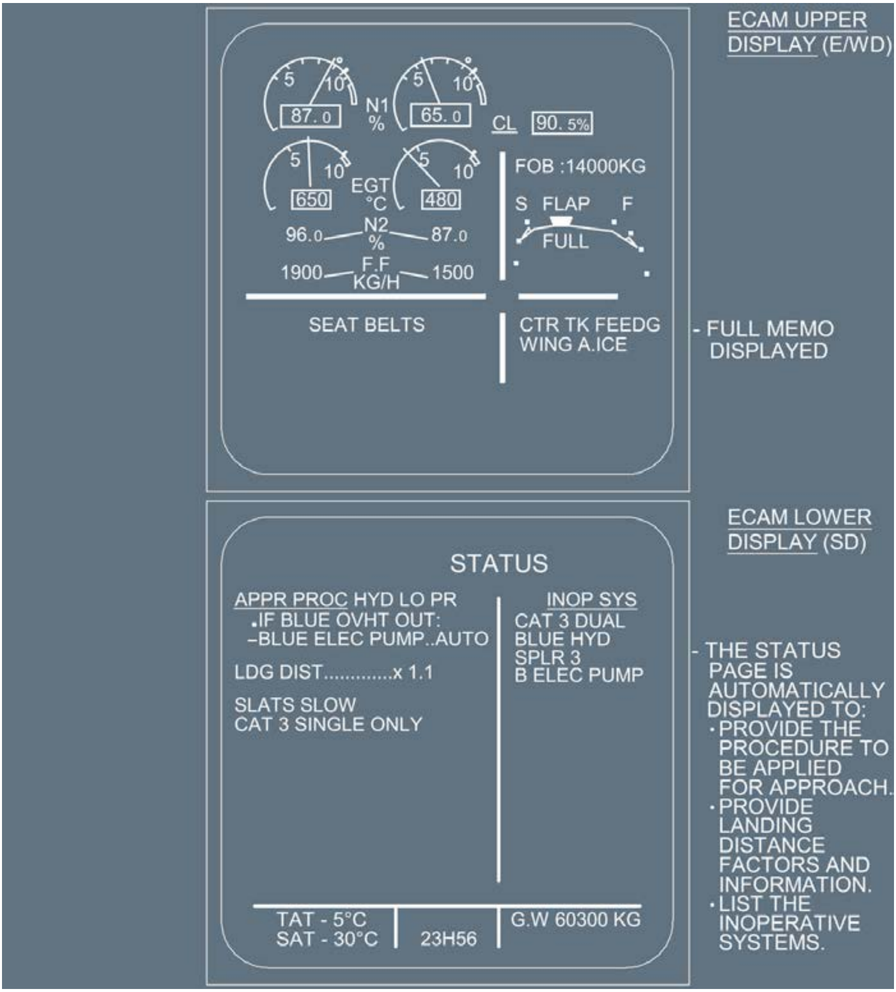
5 - ONE OF THE PILOTS PUSHES THE CLR PUSHBUTTON A SECOND TIME

Ident.: DSC-31-25-20-00001224.0001001 / 09 OCT 12
Applicable to: ALL

COCKPIT INDICATIONS

- The ECP 's CLR and STS pushbuttons light up.
- The FAULT/OFF lights stay on.
- The E/WD's memo area returns to normal.
- The STATUS page automatically appears on the SD, displaying the procedures for completing the flight with a faulty blue system.

ECAM SEQUENCE - EXAMPLE

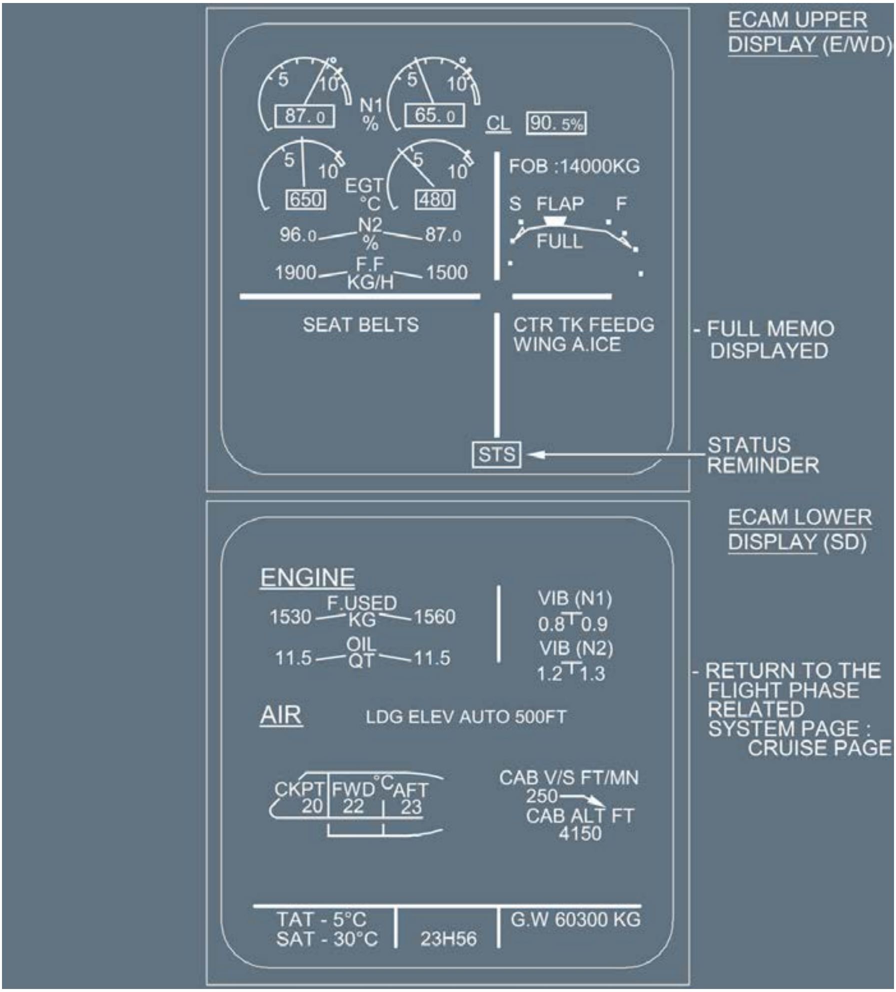


6 - ONE OF THE PILOTS PUSHES THE CLR PUSHBUTTON A THIRD TIME

Ident.: DSC-31-25-20-00001225.0001001 / 09 OCT 12
Applicable to: ALL

COCKPIT INDICATIONS

- The CLR pushbutton light goes off.
- The FAULT/OFF lights stay on.
- A status reminder appears at the bottom of the E/WD.
- The SD automatically displays the system page corresponding to the flight phase.


ECAM UPPER DISPLAY (E/WD)
N1 %
87.0
65.0
CL 90.5%
EGT °C
650
480
FOB :14000KG
S FLAP F
FULL
96.0 N2 % 87.0
1900 F.F KG/H 1500
SEAT BELTS
CTR TK FEEDG
WING A.ICE
- FULL MEMO DISPLAYED
STS
STATUS REMINDER
ECAM LOWER DISPLAY (SD)
ENGINE
1530 F.USED KG 1560
11.5 OIL QT 11.5
VIB (N1)
0.8 0.9
VIB (N2)
1.2 1.3
- RETURN TO THE FLIGHT PHASE RELATED SYSTEM PAGE : CRUISE PAGE
AIR
LDG ELEV AUTO 500FT
CKPT FWD °C AFT
20 22 23
CAB V/S FT/MN
250
CAB ALT FT
4150
TAT - 5°C
SAT - 30°C
23H56
G.W 60300 KG

Intentionally left blank

GENERAL

Ident.: DSC-31-27-00001226.0001001 / 21 MAR 16
Applicable to: ALL

The OEB reminder function provides operational help to the crew by enabling them to clearly identify (on the ECAM) all procedures and status messages affected by an OEB.
When a situation leading to a warning/caution occurs, a message informs the crew in real time that an OEB exists for the displayed warning and/or status and, consequently, that the procedure and/or status presented on the ECAM is not applicable.
Then the crew must refer to the QRH where the correct information is provided.

DESCRIPTION

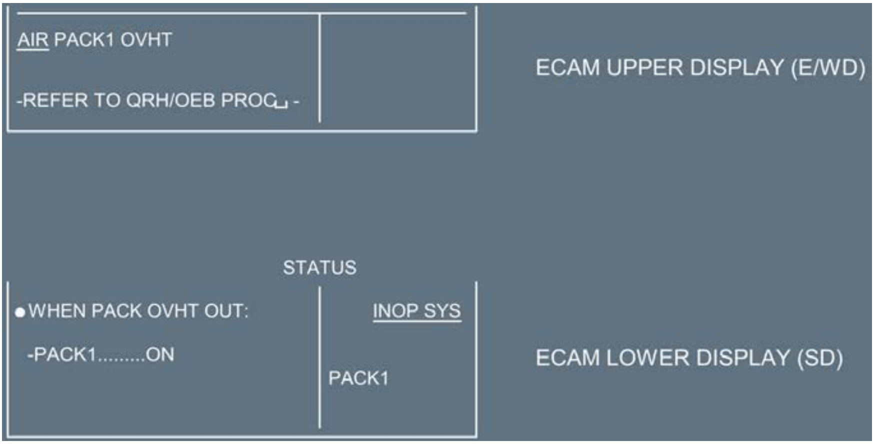
Ident.: DSC-31-27-00001227.0003001 / 22 MAY 12
Applicable to: ALL

The OEB reminder flag may apply to the:
- ECAM procedure only,
- ECAM procedure and corresponding status messages,
- Status message only.

PROCEDURE ONLY AFFECTED

- The ECAM warning title remains unaltered,
- All corresponding actions are suppressed and replaced by the “REFER TO QRH /OEB PROC” message,
- The related status messages on the ECAM system display remains unaltered.

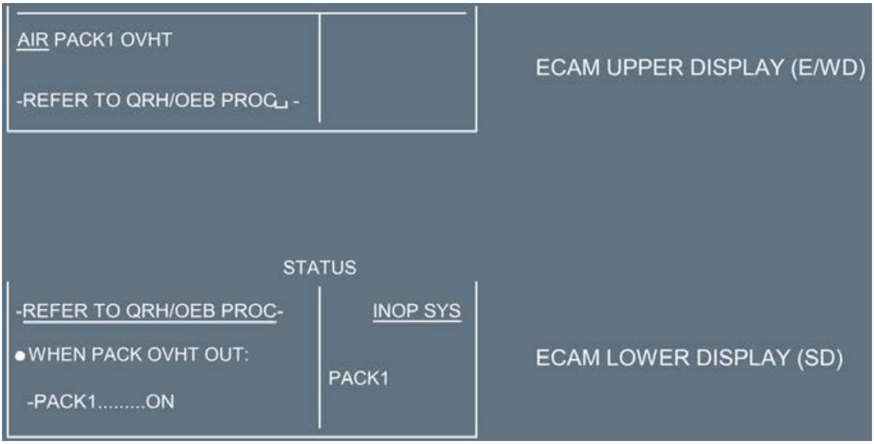
COCKPIT INDICATION



PROCEDURE AND STATUS AFFECTED

- The ECAM warning title remains unaltered,
- All corresponding actions are suppressed and replaced by the “REFER TO QRH /OEB PROC” message,
- The related status messages on the ECAM system display remains unchanged, except for the additional “REFER TO QRH /OEB PROC” title.

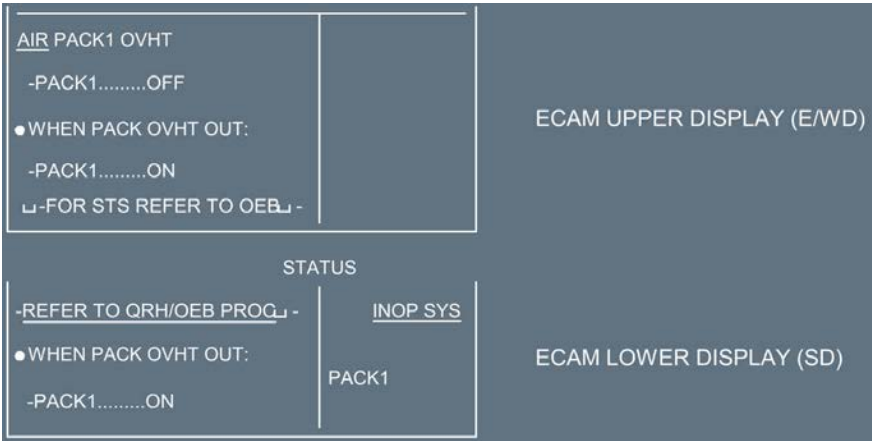
COCKPIT INDICATION



STATUS MESSAGE ONLY AFFECTED

- The ECAM warning title remains unaltered,
- The corresponding procedure remains unchanged, except for the additional “FOR STS REFER TO OEB" line.
- The related status messages on the ECAM system display remains unchanged, except for the additional " REFER TO QRH /OEB PROC" title.

COCKPIT INDICATION



OEB DATABASE

Ident.: DSC-31-27-00001228.0001001 / 21 MAR 16
Applicable to: ALL

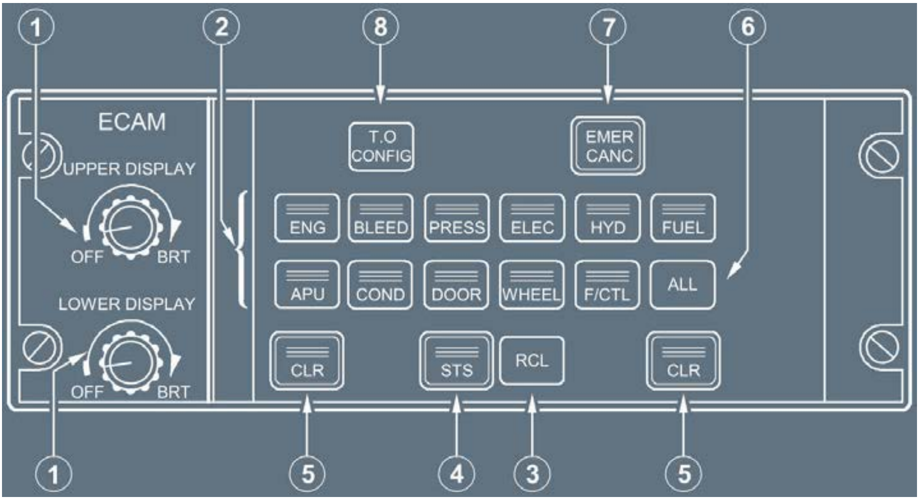
The OEB database lists the warnings and cautions affected by an OEB.

The OEB database can be :
- Loaded manually on the aircraft via the MCDU , and stored in both FWCs.
- Crossloaded from one FWC to the other FWC.
- Updated by entering a code via the MCDU.
- Checked via the MCDU.

<u>*Note:*</u> *The code provided on the OEB is designed to ensure that the OEB database is not updated before the OEB is available.*

ECAM CONTROL PANEL

Ident.: DSC-31-30-00001229.0001001 / 26 JUL 17
Applicable to: ALL



(1) OFF / BRT knobs
Used to turn the ECAM DUs on and off, and to control their brightness (automatic adjustment of brightness for ambient light conditions is superimposed on this manual control).

Note: When the pilot turns the UPPER DISPLAY knob to OFF, the engine/warning (E/W) display appears on the lower display unit (automatic transfer).

(2) System page pushbuttons

- Call up the corresponding system pages on the SD
- Light up, when pushed for manual selection, or when an advisory is detected
- Call up the aircraft system page corresponding to the present flight phase or the current warning when pushed a second time.

When only one ECAM display is on, the pilot can display a system page for up to 3 min by pushing and holding the system page pushbutton.
- If an advisory condition arises, the relevant system page is not automatically displayed, but the pushbutton light pulses
- If an ECAM warning is triggered, the relevant system page is not automatically displayed, and the system page pushbutton does not light up.

(3) RCL pb

- When pressed, the E/WD displays all alerts previously cleared via the CLR pb that are still active.
- When pressed for more than 3 s, the E/WD displays:
  - All alerts previously cleared via the CLR pb that are still active
  - All alerts previously cancelled via the EMER CANC pb.

Note: *1. If there is no alert to recall, the "NORMAL" message appears for 3 s on the E/WD.*
2. This action on the RCL pb also suppresses the flight phase inhibition function until the next flight phase. As a consequence, all new alerts that should normally be inhibited will be displayed.

(4) STS pb

The pilot pushes this pushbutton to display the STATUS page on the lower SD . The pushbutton remains lit, as long as the SD displays the STS page. If the system has no status messages, the status page displays "NORMAL" for 3 s.
The pilot can clear the STATUS page by pushing the CLR pb, or by pushing the STS pb a second time.

When only one ECAM display is on :
- It displays the STATUS page only when the pilot pushes the STATUS pushbutton and holds it. He can display the next STATUS page, if any, by releasing the pushbutton and pushing it again (before 2 s have elapsed). The new page then appears after a short delay.
- The pilot can keep the STS pb pressed to display the STATUS page for a maximum of 3 min, after which the ECAM automatically displays the engine/warning page.

(5) CLR pb

This pushbutton remains lit as long as the E/WD is displaying a warning or caution message, or a status message on the SD.
If it is lit, pressing it changes the ECAM display.

(6) ALL pb

When this pushbutton is pressed and held down, the SD successively displays all the system pages at one-second intervals.
If the ECAM control panel fails, the pilot can use this pushbutton to page through the system pages until he comes to the one he wants to look at. He then releases the pushbutton to select that page.

(7) EMER CANC pb

This pushbutton affects the following :

- Warnings :
  - Cancels (stops) an aural warning for as long as the failure condition continues
  - Extinguishes the MASTER WARNINGS lights
  - Does not affect the ECAM message display.
- Cautions :
  - Cancels any present caution (single chime, MASTER CAUTION lights, ECAM message) for the rest of the flight.

The flight crew can press the RCL pb for more than 3 s in order to restore all the alerts previously canceled via the EMER CANC pb.
All the alerts previously canceled via the EMER CANC pb automatically reappear on the E/WD in flight phase 1 or 2, immediately after the alignment of IRs 1 and 2.

Note: *This pushbutton should only be used to suppress spurious MASTER CAUTIONS.*

(8) T.O CONFIG pb

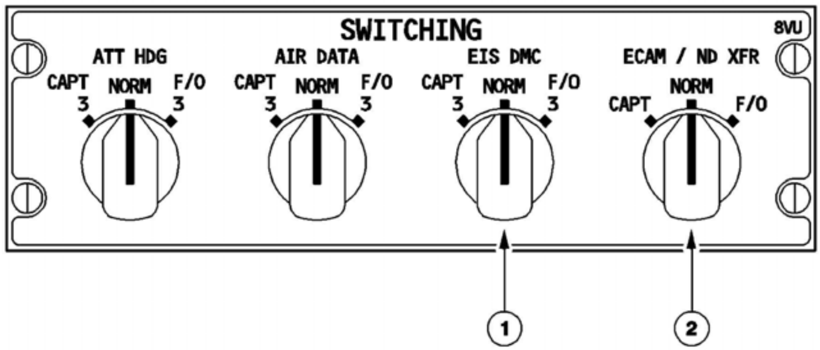
This pushbutton simulates the application of takeoff power. This is a test that triggers a warning, if the aircraft is not in takeoff configuration. (*Refer to DSC-31-15 Configuration Warnings*).
If the configuration is correct, the E/WD displays the “TO CONFIG NORMAL” message in the TO MEMO section.

Note: *If the ECAM control panel fails, the CLR, RCL, STS, EMER CANC, and ALL pushbuttons remain operative, because their contacts are directly wired to the flight warning and display management computers.*

SWITCHING PANEL

Ident.: DSC-31-30-00001230.0001001 / 17 MAR 11
Applicable to: ALL

ON PEDESTAL



(1) EIS DMC rotsel

NORM : DMC 1 drives the CAPT 's PFD , the CAPT 's ND, and the upper ECAM DU.
DMC 2 drives the F/O 's PFD and the F/O 's ND, .and the lower ECAM DU

CAPT 3 : DMC 3 replaces DMC 1.

F/O 3 : DMC 3 replaces DMC 2.

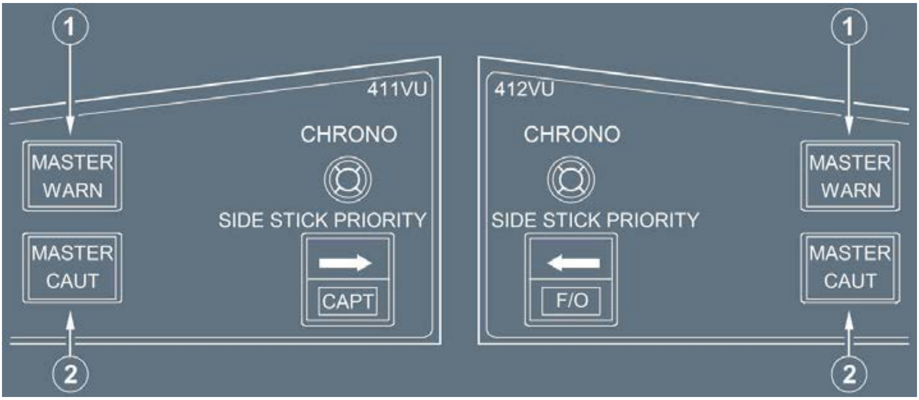
Note: If a DMC fails, each of its associated DUs displays a diagonal line.

(2) ECAM/ND XFR rostel
Transfers the system/status display to either the Captain's or the First Officer's ND.

Note: If both ECAM DUs (E/WD and SD) fail, the flight crew can use this switch to transfer the E/WD display to either navigation display.

ATTENTION GETTERS

Ident.: DSC-31-30-00001231.0001001 / 09 OCT 12
Applicable to: ALL



(1) MASTER WARN lights

- Flash red for level 3 warning
- Accompanied by an aural warning (continuous repetitive chime, specific sounds or synthetic voice).

(2) MASTER CAUT lights

- Light up steady amber for a level 2 caution
- Accompanied by a single chime.

These lights go out when :
- One pilot presses the light (except for some red warnings, such as the overspeed and stall warnings)
- The warning/caution situation is over
- The pilot presses the CLR pb on the ECAM control panel (except for some red warnings, such as the overspeed and stall warnings).
- The pilot presses the EMER CANC pb on the ECAM control panel.

The aural warnings cease when :
- One pilot presses the MASTER WARN light (except for some red warnings, such as the overspeed and stall warnings)
- The warning situation is over
- The pilot presses the EMER CANC pb on the ECAM control panel.

MEMO DISPLAY

Ident.: DSC-31-30-00018053.0001001 / 21 MAR 16
Applicable to: ALL

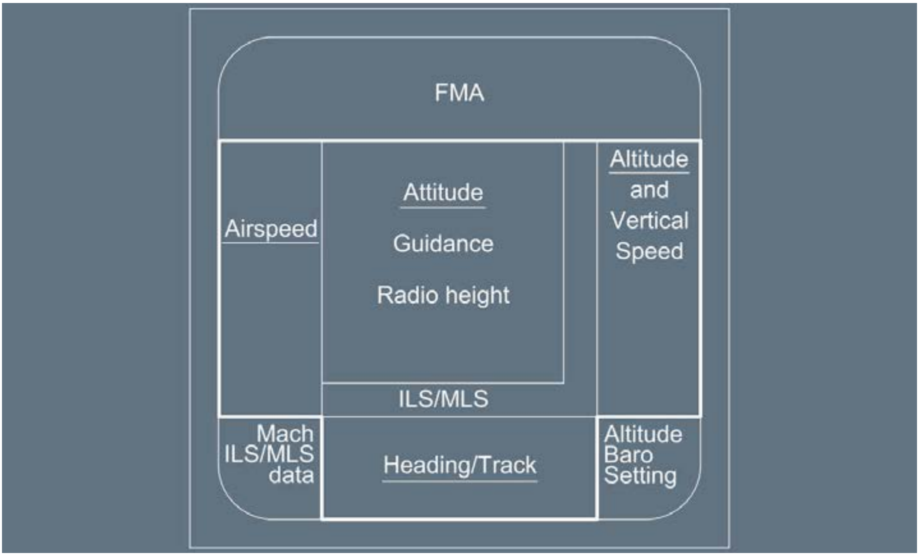
SWITCHING PNL : This memo appears in green, when:

1. PFD/ND XFR pb is pressed and ECAM/ND XFR rotary selector is selected at CAPT or F/O side simultaneously, or
2. ATT HDG rotary selector is selected at CAPT or F/O side, or
3. AIR DATA rotary selector is selected at CAPT or F/O side, or
4. EIS DMC rotary selector is selected at CAPT or F/O side.

GENERAL

Ident.: DSC-31-40-00017531.0001001 / 21 MAR 16
Applicable to: ALL

The Primary Flight Display (PFD) provides the following information to the flight crew:
- Attitude and guidance
- Airspeed
- Altitude (BARO and radio) and vertical speed
- Heading and track
- FMGS modes (Flight Mode Annunciator)
- Vertical and lateral deviations
- Radio navigation information (ILS , MLS ⊲ , DME).

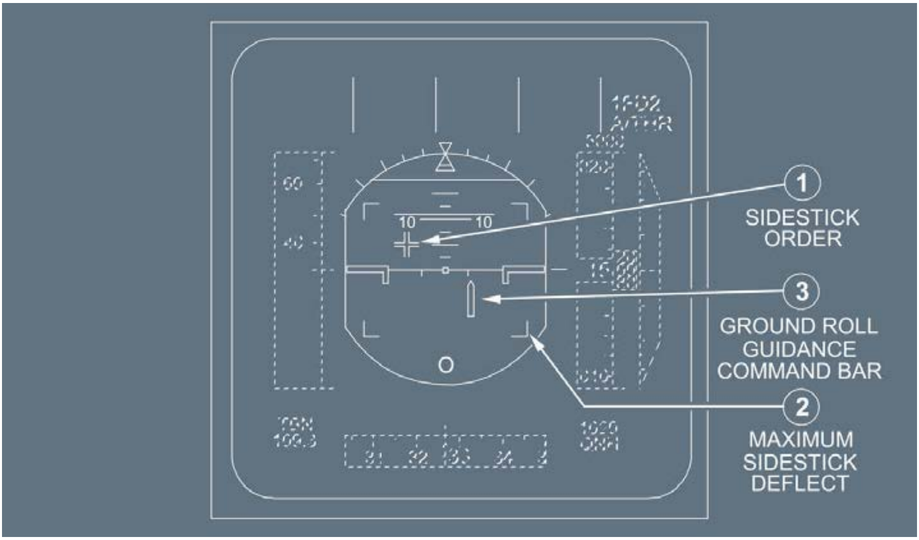


The FWC monitors main parameters such as attitude, heading, and altitude. For more information, *Refer to DSC-31-40 Flags and Messages Displayed on PFD*.

Note: *A grey background appears on the speed, the heading vertical speed, and the altitude speed scales of the PFD . If the Primary Flight Display (PFD) Unit temperature exceeds a defined threshold, the grey background disappears, in order to limit power consumption and prevent a DU overheat. Any additional increase in temperature will lead to a complete cut off of the power supply to this display unit.*

SPECIFIC GROUND INDICATIONS

Ident.: DSC-31-40-00001233.0001001 / 13 JAN 14
Applicable to: ALL



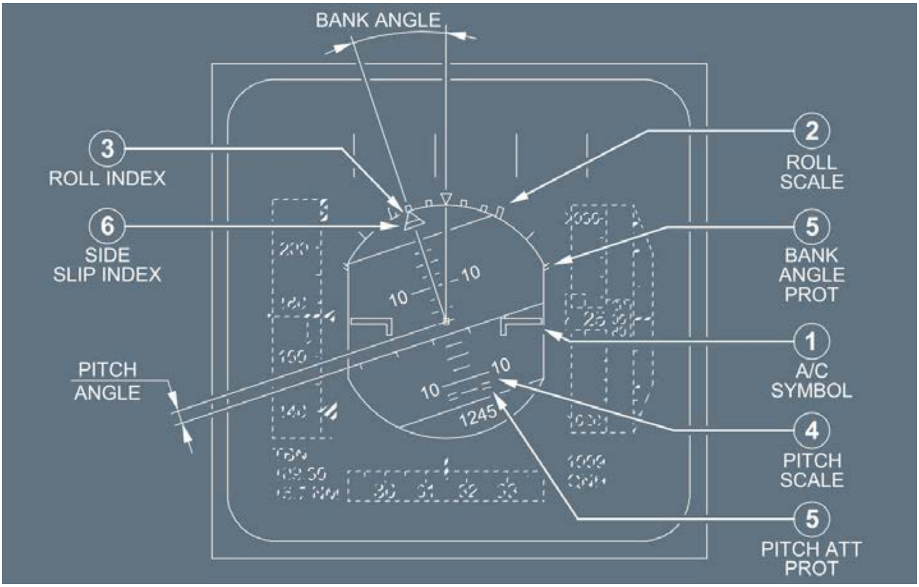
(1) Sidestick order indication
This symbol is in white, and appears as soon as one engine is started.
It indicates the total of the Captain's and First Officer's sidestick orders (shown here as left wing down, pitch up).

(2) Max Sidestick Deflection
This symbol is in white, and appears as soon as one engine is started.

(3) Ground Roll Guidance Command Bar
This symbol is in green, and appears when the aircraft is on ground, or below 30 ft radio height, provided that a localizer signal is available. It indicates the Flight Director yaw orders, to maintain the aircraft on the runway centerline.

ATTITUDE DATA

Ident.: DSC-31-40-00001234.0003001 / 09 OCT 12
Applicable to: ALL



(1) Fixed Aircraft Symbol
This symbol is in black, and outlined in yellow. The yellow outline is dimmed if the crew selects TRK -FPA , unless the FMA is in the TOGA or FLX mode.

(2) Roll Scale
This scale is in white, and has markers at 0, 10, 20, 30, and 45 ° of bank.

(3) Roll Index (yellow)
This pointer indicates the bank angle. When the bank angle exceeds 45 °, all the PFD symbols, except those for attitude, speed, heading, altitude, and vertical speed, disappear. The display returns to normal when the bank angle decreases below 40 °.

(4) Pitch Scale (white)
This scale has markers every 10 ° between 80 ° nose up and 80 ° nose down (every 2.5 ° between 10 ° nose down and 30 ° nose up). When pitch angle exceeds 25 ° nose up or 13 ° nose down, all the PFD displays except attitude, speed, speed trend, heading, altitude, and vertical speed disappear. Beyond 30 °, large red arrowheads indicate that the attitude has

become excessive and show the direction to move the nose in order to reduce it. The display returns to normal when pitch angle becomes less than 22 ° nose up or 10 ° nose down.

(5) Flight Control Protection Symbols

The display shows these symbols (=) in green:
- On the roll scale to mark the bank angle protection availability.
- On the pitch scale at 15 ° nose down or 30 ° nose up to mark the pitch limits.

An amber x replaces these symbols if the corresponding protection is lost.
(*Refer to DSC-27-20-10-20 Protections - General*)

(6) Sideslip Index (yellow)
This trapezoidal index moves beneath the roll index. On ground, it represents the lateral acceleration of the aircraft. In flight, it shows sideslip (as computed by the FAC). One centimeter of displacement indicates 0.2 g. The sideslip index is against its stop at 0.3 g.

In case of engine failure at takeoff or go around, the sideslip index changes from yellow to blue.

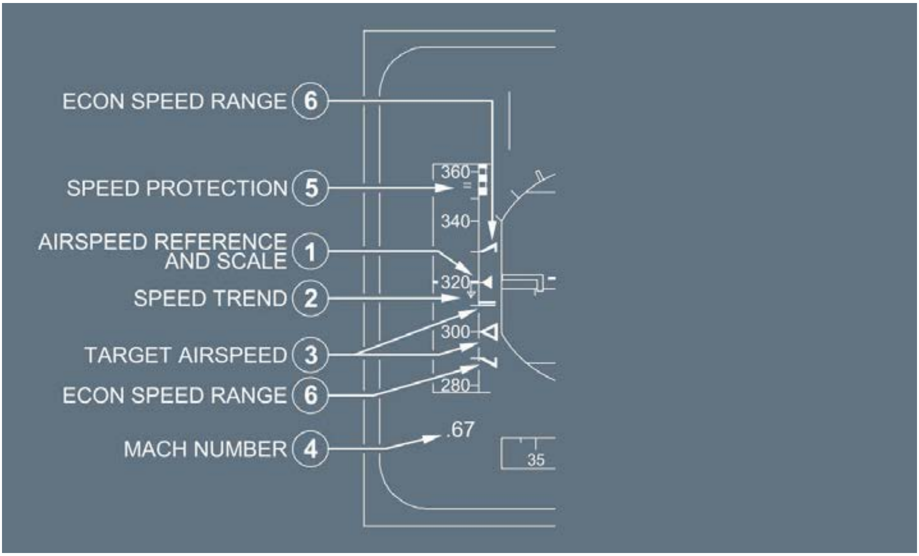
Note: *The sideslip target is blue, if:*
- *CONF 1, 2, or 3 is selected, and*
- *Any ENG N1 > 80 %or one Thrust Lever > MCT (≥ FLX if FLX or DERATED TO), and*
- *The difference between the ENG N1's exceeds 35 %.*

In this case, the sideslip index is called β target.

When this index is centered with the roll index, the sideslip equals the sideslip target for optimum aircraft performance.

AIRSPEED

Ident.: DSC-31-40-00001235.0002001 / 21 MAR 17
Applicable to: ALL



(1) Actual Airspeed Reference Line and Scale
A white scale on a grey background moves in front of a fixed yellow reference line next to a yellow triangle to show airspeed. The minimum airspeed indication is 30 kt.

(2) Speed Trend (yellow)
This pointer starts at the speed symbol. The tip shows the speed the aircraft will reach in 10 s if its acceleration remains constant. The pointer appears only when it is greater than 2 kt and disappears when it is less than 1 kt.
It also disappears, if the FACs fail.

(3) Target Airspeed (magenta or blue)
This symbol gives the target airspeed or the airspeed corresponding to the target Mach number.
The target airspeed is the airspeed computed by FMGC in managed speed mode (magenta) or entered manually on the FCU for selected speed mode (blue). The target speed is a magenta double bar (=) when associated with the ECON speed range.
Otherwise it is a triangle (magenta or blue).

When the target speed is off the speed scale, its value is displayed as numbers below or above the speed scale.

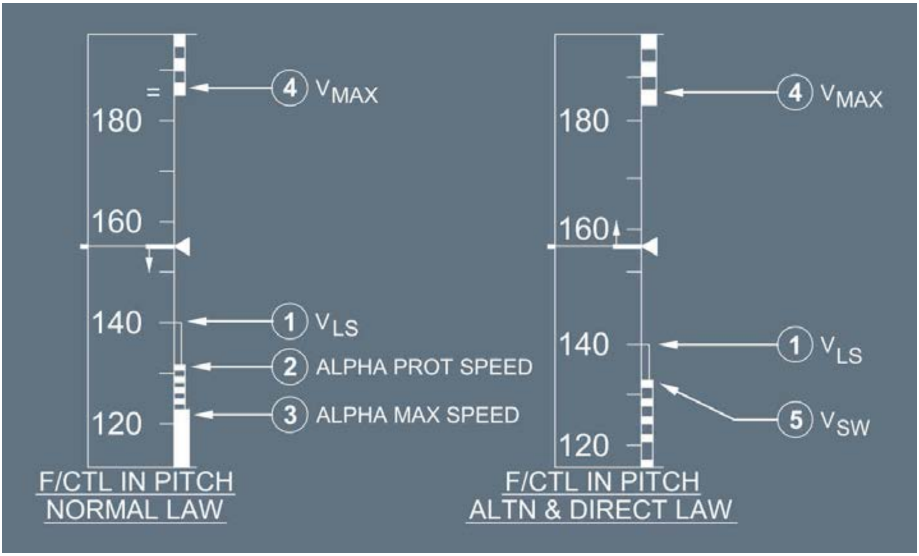
(4) Mach Number (green)
This is displayed when it is greater than 0.5.

(5) Speed Protection (green)
This symbol indicates the speed (VMO +6 kt or MMO +0.01) at which overspeed protection becomes active (*Refer to DSC-27-20-10-20 Protections - General*).

(6) ECON Speed Range (magenta)

In descent mode with the ECON /AUTO SPD mode active, these two half triangles replace the selected speed symbol. It shows the upper and lower limits calculated by the FMGC:

- The upper speed is target speed +20 kt, limited to VMAX or VMO -3 kt or MMO -0.006, whichever is lowest.
  If a speed limit or a speed constraint applies, the upper margin is limited to ECON SPD +5 kt
- The lower speed margin is the target speed -20 kt, limited to green dot, F, S, or VLS, whichever is higher.



(1) Minimum Selectable Speed (VLS)
The top of the amber strip along the speed scale indicates this speed. It represents the lowest selectable speed providing an appropriate margin to the stall speed. (*Refer to DSC-27-20-10-20 Protections - High Speed Protection*)
VLS information is inhibited from touchdown until 10 s after liftoff.

(2) Alpha Protection Speed
The top of a black and amber strip along the speed scale indicates this speed.
It represents the speed corresponding to the angle of attack at which alpha protection becomes active (*Refer to DSC-27-20-10-20 Protections - General*).
It is displayed when in pitch normal law.

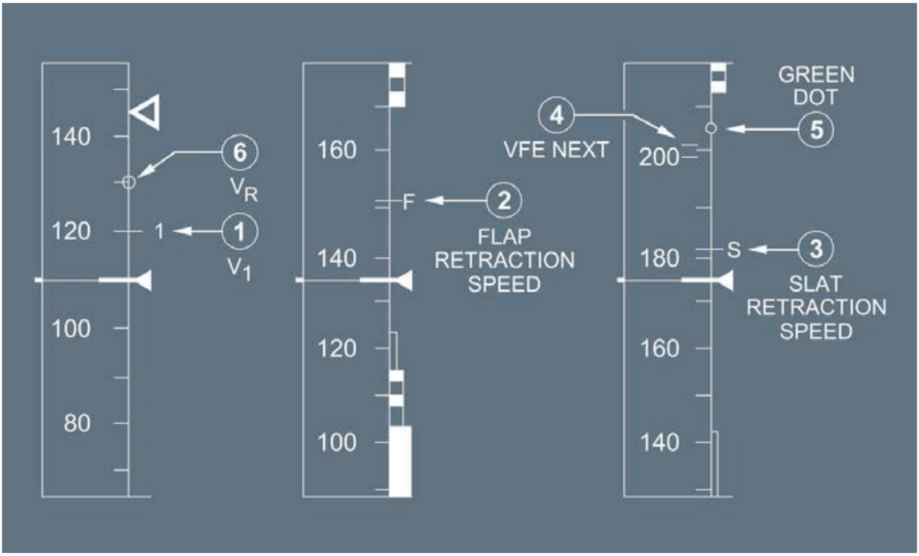
(3) Alpha MAX Speed
The top of a red strip along the speed scale indicates this speed. It represents the speed corresponding to the maximum angle of attack that the aircraft can attain in pitch normal law (*Refer to DSC-27-20-10-20 Protections - General*).
It is displayed when in pitch normal law.

(4) VMAX
The lower end of a red and black strip along the speed scale defines this speed.

It is the lowest of the following:
- VMO or the speed corresponding to MMO
- VLE
- VFE

(*Refer to DSC-27-20-10-20 Protections - High Speed Protection*)

(5) Stall Warning Speed (VSW)
The top of a red and black strip along the speed scale defines this speed.
It is the speed corresponding to the stall warning. (*Refer to DSC-27-20-10-20 Protections - General*).
VSW information is inhibited from touchdown until 5 s after liftoff.
It is displayed when operating in pitch alternate or pitch direct law.



(1) Decision Speed (V1)
This is a blue symbol (numeral one) that the crew manually inserts via the MCDU. When it is off the scale, the upper part of the scale shows it in numbers.
It disappears after liftoff (*Refer to DSC-22_10-50-50 Other Speeds*).

(2) Minimum Flap Retraction Speed
This is a green symbol (letter F).
It appears when the flap selector is in position 3 or 2. (*Refer to DSC-27-20-10-20 Protections - High Speed Protection*).

(3) Minimum Slat Retraction Speed
This is a green symbol (letter S).
It appears when the flap selector is in position 1. (*Refer to DSC-27-20-10-20 Protections - High Speed Protection*).

(4) VFE NEXT
The VFE next symbol is an amber equal sign showing the VFE corresponding to the next flap lever position.
It appears when the aircraft altitude is below 15 000 ft or 20 000 ft, depending upon the FAC standard (*Refer to DSC-22_10-50-30 Limit Speeds*).

(5) Green Dot (Engine-out operating speed in clean configuration)
This green dot appears, when the aircraft is flying in the clean configuration.

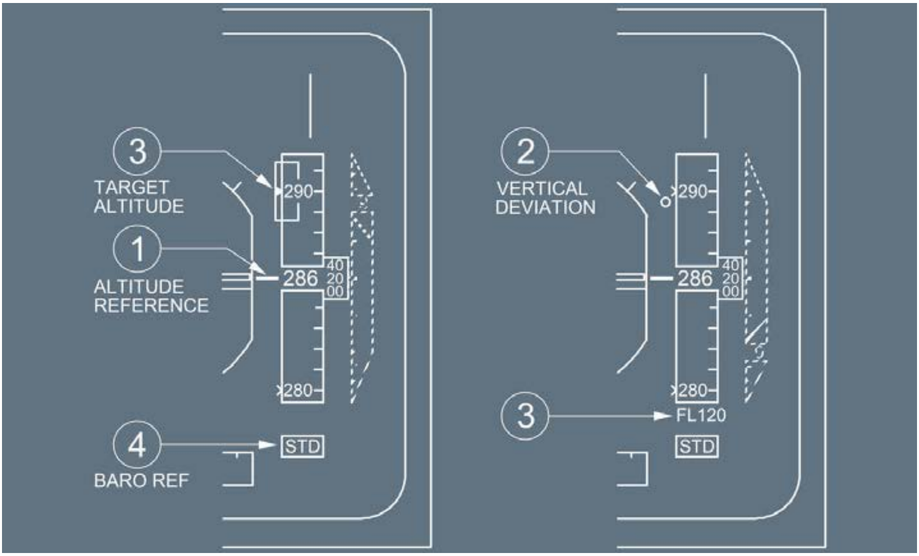
It shows the speed corresponding to the best lift-to-drag ratio.

(6) Rotation speed: (VR)
VR is entered on the PERF takeoff page of the MCDU, and is indicated by a cyan circle. This cyan circle is visible during takeoff.

Note: *V2 is represented by the target speed index during takeoff. V2 is manually inserted by the crew via the MCDU.*

ALTITUDE

Ident.: DSC-31-40-00001237.0003001 / 27 JUN 12
Applicable to: ALL



(1) Altitude Indication
This appears both as a white moving scale, and as a green digital readout on a grey background. Small white marks are positioned on the scale against the round values (e.g. 280, 290...). "NEG" appears in the window in white for negative values. The altitude window changes from yellow to amber, if the aircraft deviates from the FCU-selected altitude or flight level.
On any approach for which an MDA (MDH) is entered in the FMGS , the altitude numbers change from green to amber, when the aircraft goes below the MDA (MDH).

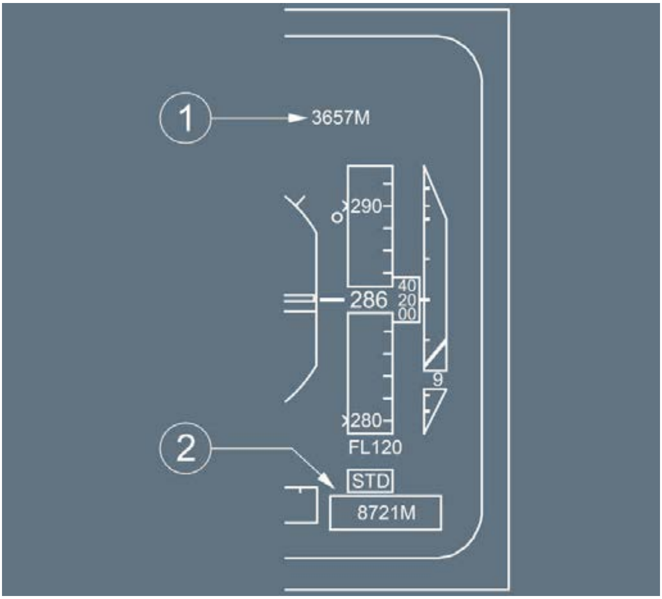
(2) Vertical Deviation (magenta)
This symbol appears next to the altitude corresponding to the theoretical vertical profile computed by the FMGC . It is displayed from the top of descent down to the MAP altitude.
The pilot can read the VDEV directly from the altitude scale. The range is ±500 ft. When the VDEV value exceeds ±500 ft, the symbol stays at the range limit and the PROG page displays the exact value.

(3) Target Altitude or Selected Flight Level Symbol (blue)
This symbol shows the FCU selected altitude (if QNH BARO reference is selected) or the selected flight level (if STD BARO reference is selected.)
When the FMGC operates in the vertical managed mode, this symbol is magenta if it represents a flight plan altitude constraint that the FMGC will follow. If the target altitude or flight level is on the scale, the symbol is displayed and the numerical value appears inside the symbol.
If it is off the scale, the symbol is not displayed, and the numerical value appears above or underneath the scale.

(4) Barometric Reference
The display shows “STD ” or it shows “QNH” and the numerical setting in hectoPascals or inches of mercury.
It pulses when the selection made by the pilot is not correct (STD not selected above transition altitude in climb or STD still selected in approach below transition level).

METRIC ALTITUDE INDICATION

If metric reference is selected on the FCU two additional symbols are displayed on PFD.

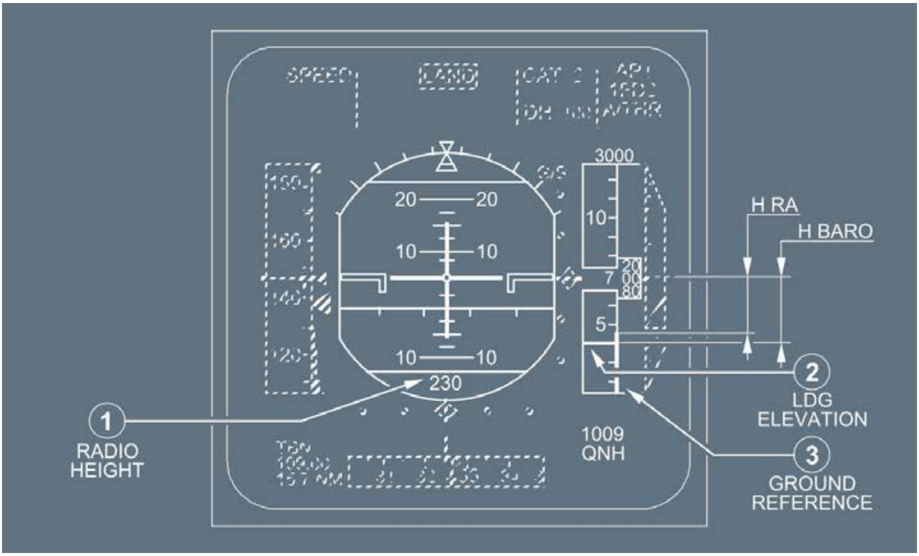


(1) Target altitude or selected flight level (magenta or blue)
The display shows the selected altitude value in meters.

(2) Altitude indication (green)
The display shows the actual aircraft altitude value in meters.

ALTITUDE (CONT'D)

Ident.: DSC-31-40-00006121.0001001 / 13 JAN 14
Applicable to: ALL



(1) Radio Height

This quantity appears when it is less than 2 500 ft.

- If a DH has been entered, the radio height appears:
  - In green, when DH +100 ft < RA < 2 500 ft
  - In amber, when RA < DH +100 ft

  If “NO” is entered as the DH on the MCDU APPROACH page, 0 ft becomes a default value.
  When the aircraft reaches the decision height selected on the MCDU , DH letters flash amber for 3 s, then remain amber above the radio height indication.
- If no DH has been entered, or if both FMGCs fail, the radio height appears:
  - In green, when 400 ft < RA < 2 500 ft
  - In amber, when RA ≤ 400 ft

The radio height indication changes every 10 ft down to 50 ft, then every 5 ft down to 10 ft, then every foot.

(2) Landing Elevation (blue)

The horizontal bar on the altitude scale shows the landing elevation at the flight-planned destination.

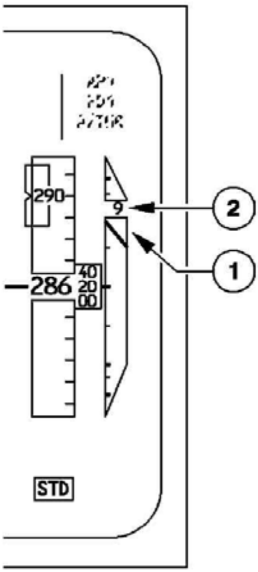
It is displayed:
- during flight phases 7 and 8 and
- if the QNH reference mode is selected.

(3) Ground reference
A red ribbon on the right of the altitude scale represents the field elevation. This ribbon, which is driven by the radio altimeter signal, is displayed below 570 ft.
It moves up, as does the lower line of the attitude sphere, with the altitude scale as the aircraft descends. When the aircraft has touched down, the top of this ribbon is at the middle of the altitude window.

VERTICAL SPEED

Ident.: DSC-31-40-00001239.0001001 / 21 MAR 17
Applicable to: ALL

The displayed vertical speed information is normally based on both inertial and barometric data. If inertial data is not available, it is automatically replaced by barometric information.
In this case, the window around the numerical value becomes amber.



(1) Analog pointer
This pointer, which is normally in green, points to a white vertical speed scale, displayed on a grey background and graduated at intervals of 500 ft/min.
If the V/S is greater than 6 000 ft/min, the pointer stays at the end of the scale.

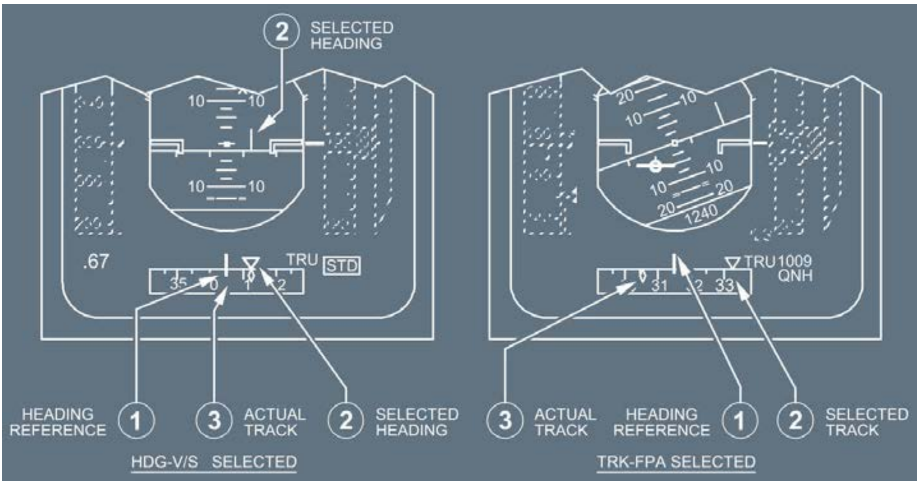
(2) Digital indication
This number, normally in green, is the vertical speed in hundreds of feet per minute.
It disappears, if the vertical speed is less than 200 ft/min.

The analog pointer and the digital indication become amber, if:
- V/S is greater than 6 000 ft/min, (climb or descent)
- V/S is greater than 2 000 ft/min, during descent when 1 000 ft < RA < 2 500 ft, or
- V/S is greater than 1 200 ft/min, during descent and RA < 1 000 ft.

Note: *For TCAS, Refer to DSC-34-SURV-60-20 TCAS Messages.*

HEADING

Ident.: DSC-31-40-00001240.0001001 / 22 MAY 12
Applicable to: ALL



(1) Heading Reference Line and Scale
A white scale on a grey background moves in front of a fixed yellow reference line to indicate the actual magnetic heading.
“TRU” appears, when the display indicates the true heading, rather than the magnetic heading (latitude above 73 ° North or below 60 ° South).

(2) Selected Heading or Track Index (blue)
The pointer indicates the heading or track displayed on the FCU HDG -TRK window.
The index is replaced by digits on the right or left side of the scale, when the selected value is off the scale.
If the FD pushbutton is OFF, a second heading/track symbol appears on the horizon line, and markers are displayed every 10 °.

(3) Actual Track Symbol
This symbol is a small green diamond.

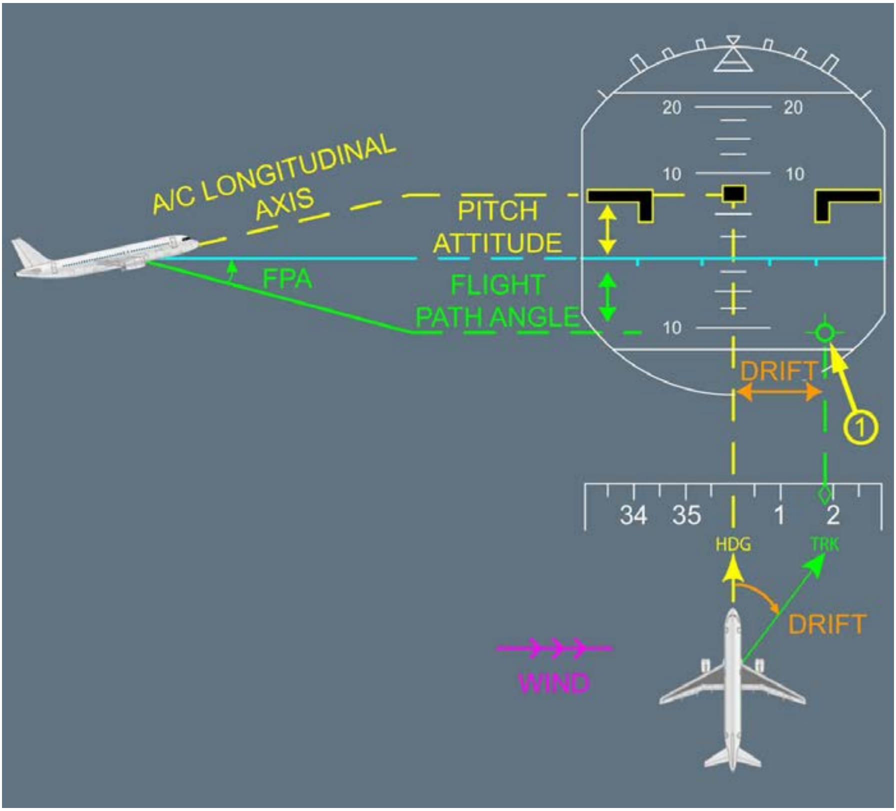
FLIGHT PATH VECTOR

Ident.: DSC-31-40-00001241.0001001 / 17 MAR 17
Applicable to: ALL

The Flight Path Vector (FPV) is the flight reference with the TRK and FPA as basic guidance parameters. When the TRK /FPA is selected on the FCU , the FPV appears on the PFD.

INFORMATION PRESENTATION

The FPV appears on the PFD as a symbol, known as the "bird". The bird indicates the track and flight patch angle in relation to the ground.
The track is indicated on the PFD by a green diamond on the compass, in addition to the lateral movement of the bird in relation to the fixed aircraft symbol. On the ND, the track is indicated by a green diamond on the compass scale. The difference in angle between track and heading indicates the drift.
The flight path angle is indicated on the PFD by the vertical movement of the bird in relation to the pitch scale.
With the flight directors (FD) ON, the Flight Path Director (FPD) replaces the HDG -VS Flight Director (FD). With both FD pb set to OFF, the blue track index appears on the PFD horizon.



(1) <u>Flight Path Vector (FPV)</u>
This symbol appears, when the pilot selects TRK /FPA on the FCU.

The flight path vector represents the lateral and vertical trajectory of the aircraft with respect to the ground.
- On the lateral scale, it indicates the aircraft's track.
- On the vertical scale, it indicates the aircraft's flight path angle.

Example : The aircraft flies a track of 009 ° (heading 360 °, wind from west) and descends with a flight path angle of minus 7.5 °.

USE OF FPV

The bird is the flying reference that should be used when flying a stabilized segment of trajectory, e.g.: non-precision approach when the FLS function is not used or visual circuit.

In dynamic manoeuvres, the bird is directly affected by the aircraft inertia and has a delayed reaction. As a result, the bird should not be used as a flight reference in dynamic manoeuvres.
Refer to FCTM/AS-BIRD Introduction for more information.

GUIDANCE

Ident.: DSC-31-40-00001242.0001001 / 13 JAN 14
Applicable to: ALL

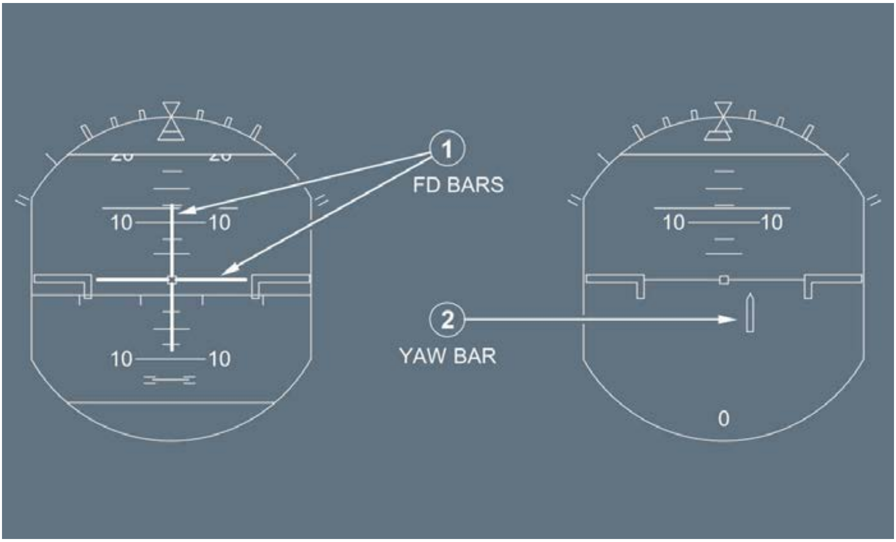
Two completely different flight director modes are available, each with its own characteristic symbols. The symbol displayed corresponds to the basic operating reference the pilot has selected – either HDG V/S or TRK FPA.
In normal operation, PFD 1 displays FD1 orders.
If FD 1 fails, PFD 1 automatically displays FD 2 orders on PFD 1, the FD 2 indication in the right column of the FMA flashes for a few seconds.
This is also applicable to FD 2 orders, that are displayed on PFD2.

IF THE CREW HAS SELECTED HDG V/S TO BE THE BASIC REFERENCE:

The PFD displays FD bars in green. They automatically move out of view at touchdown in ROLL OUT mode.

They flash for 10 s, and then remain steady, if the following occur:
- A reversion to the HDG V/S basic mode (manual or automatic), or
- The selected flight level is changed, when ALT CAPTURE mode is engaged, or
- The loss of LOC or G/S in LAND mode or loss of LAND mode, or
- At the first AP or FD engagement.

The PFD displays a yaw bar in green below 30 ft radio height, if a localizer signal is available:
- During takeoff (in RWY mode)
- Upon landing (in FLARE and ROLL OUT mode).

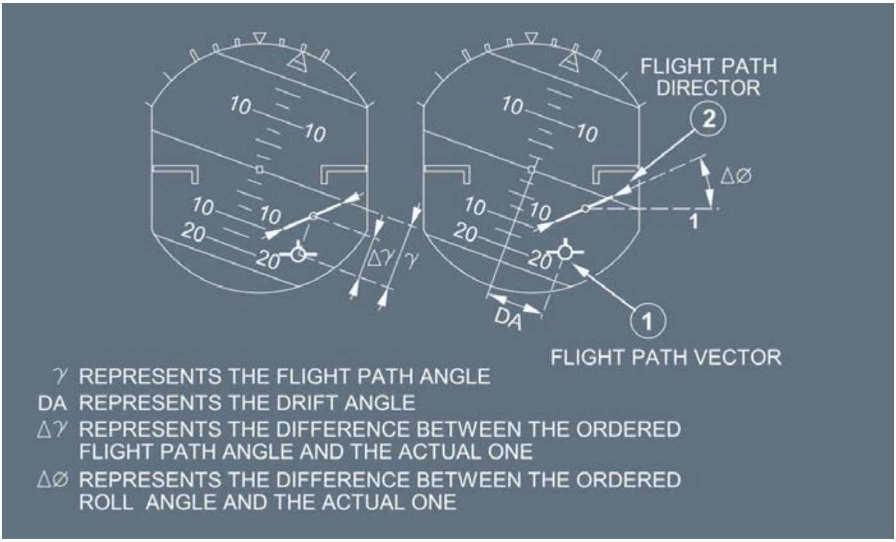


(1) FD Crossed Bars (green)

(2) Yaw Bar (green)

THE CREW HAS SELECTED TRK FPA AS THE BASIC REFERENCE:

An inertial flight path vector defines the aircraft's horizontal and vertical track, taking wind effect into account.
An associated flight path director symbol guides the flight crew onto the vertical and horizontal flight path targets.



(1) Flight Path Vector (green)

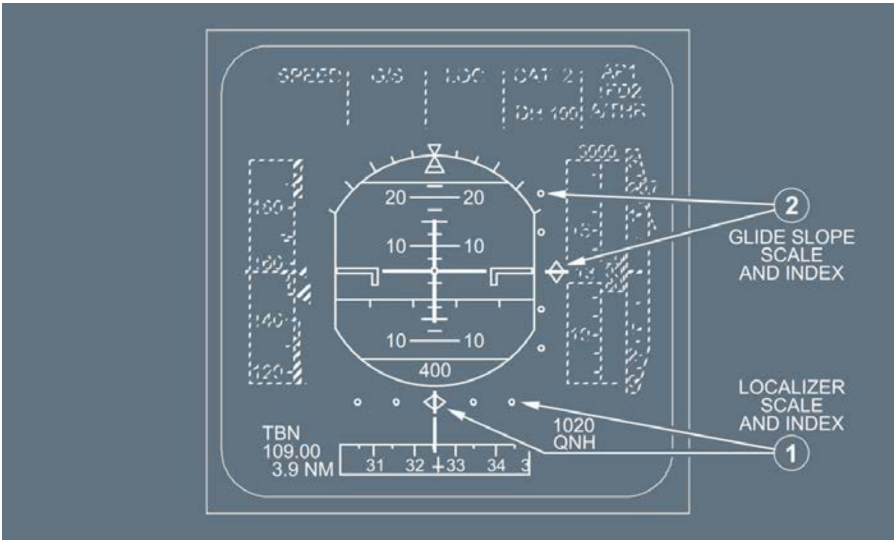
(2) Flight Path Director (green)

TRAJECTORY DEVIATION

Applicable to: ALL

Ident.: DSC-31-40-A-00017532.0001001 / 21 MAR 16

ILS/GLS /MLS APPROACH



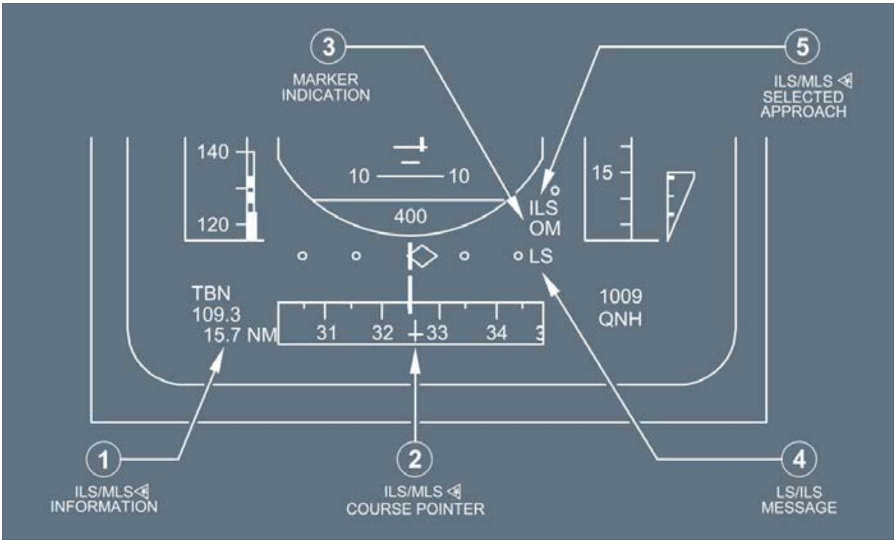
(1) Localizer Deviation Scale and Index

(2) Glide slope Deviation Scale and Index
Deviation scales appear as soon as the flight crew presses an LS/ILS pb on the EFIS control panel. Deviation indexes appear when the glide slope and localizer signals of the ILS/GLS (or the elevation and azimuth signals of the MLS) are valid, if deviation scales are displayed.
When a deviation index is out of the displayed range, only half a symbol appears at the end of the scale.
The LOC scale flashes and continues to flash if the deviation exceeds 1/4 dot for two seconds while the aircraft is between 15 ft and 1 000 ft, and CAT 2 or CAT 3 capability displayed on the FMA , and either LOC , LAND, or FLARE is engaged. The glideslope scale flashes and continues to flash if the deviation exceeds one dot for two seconds (above 100 ft RA).
“LOC” and the glideslope scale half index symbols flash, and continue to flash, when the deviation exceeds two dots for two seconds.

One dot represents a deviation of ± 0.8 ° on the localizer scale, and ± 0.4 ° on the glideslope scale.

Ident.: DSC-31-40-A-00017533.0001001 / 21 MAR 16

ILS/MLS APPROACH (CONT'D)



(1) ILS/MLS information (magenta)

The following information appears on the PFD , when the crew has selected an ILS frequency/MLS channel and course, and pressed the LS pb:
- ILS /MLS identification, as decoded by the ILS /MLS receiver;
- ILS frequency/MLS channel;
- DME distance, if the ILS /MLS has a DME

(2) ILS/MLS course Pointer (magenta)
This pointer appears on the PFD , when the crew has selected an ILS frequency/MLS channel and course, and pressed the LS pb.
It is a dagger-shaped symbol on the heading scale.
The ILS /MLS course pointer is replaced by digits on the right or left hand of the heading scale (in a white box) when the ILS /MLS course value is outside the displayed portion of the heading scale.

(3) Marker Indications
OM appears in blue, when the aircraft flies over the outer marker.

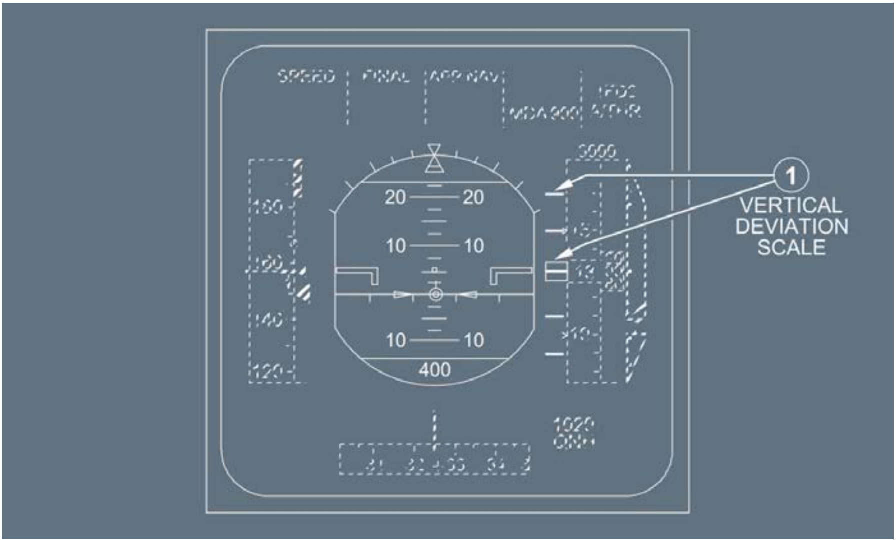
MM appears in amber, when it flies over the middle marker.
AWY appears in white, when it flies over an airways marker beacon or the ILS /MLS inner marker.

(4) LS/ILS Message
This flashes amber, when the APPR mode is armed, but the LS pb has not been selected.

(5) Selected approach
The ILS or MLS indication is displayed in magenta according to the approach selected by the crew.

Ident.: DSC-31-40-A-00001245.0021001 / 09 OCT 12

NON PRECISION APPROACH

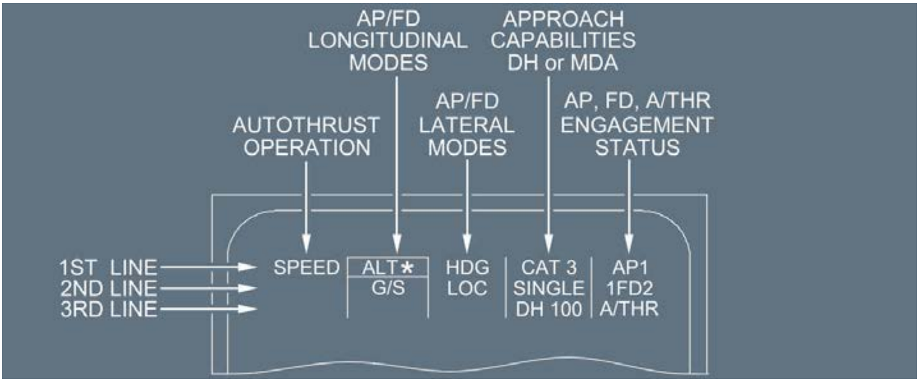


(1) Vertical Deviation Scale and Index
These symbols appear when in the approach phase and, when either FINAL is armed/engaged or a non-LS approach has been entered. They are displayed in the approach or go-around phase, until the MDA has been reached, or the MAP or the runway has been sequenced. They give the vertical deviation from the trajectory defined by the FMGC. Each index scale graduation represents 100 ft. The range is ± 200 ft.

Note: *If the LS pb is pressed, glide deviation has priority over vertical deviation information. As long as VDEV display conditions are met, and the LS pb is selected, an amber VDEV message flashes above the glide scale.*

FLIGHT MODE ANNUNCIATOR

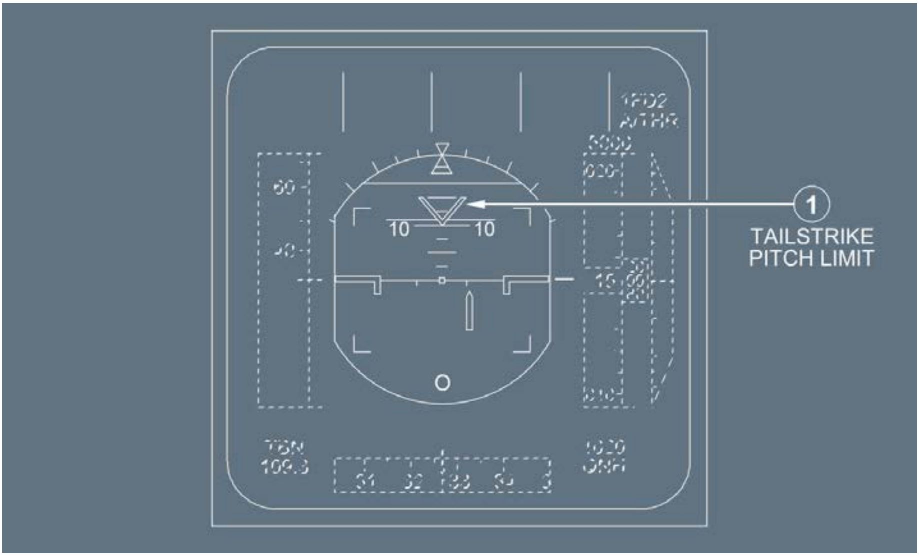
Ident.: DSC-31-40-00001246.0002001 / 09 OCT 12
Applicable to: ALL



For a detailed discussion of legends and messages that may appear during FMGS operations, see FLIGHT GUIDANCE chapter (*Refer to DSC-22_30-100 Flight Mode Annunciator (FMA) - General*).

TAILSTRIKE PITCH LIMIT INDICATOR

Ident.: DSC-31-40-00017534.0003001 / 21 MAR 16
Applicable to: ALL

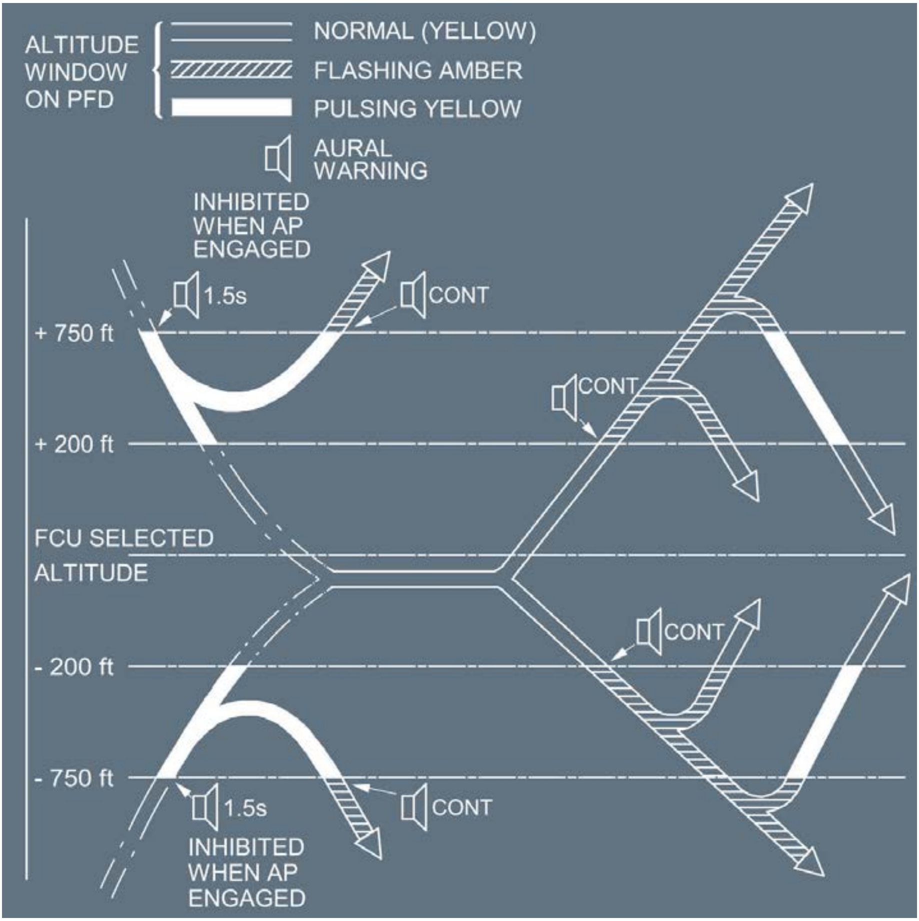


(1) Tailstrike Pitch Limit
The pitch limit indicates the maximum pitch attitude to avoid the tailstrike risk at landing. The indication is a fixed value corresponding to the main landing gear compressed. The indication appears at 400 ft radio height. The indication disappears, when there is no longer a risk of tailstrike.

ALTITUDE ALERT

Ident.: DSC-31-40-00001247.0002001 / 22 MAY 12
Applicable to: ALL

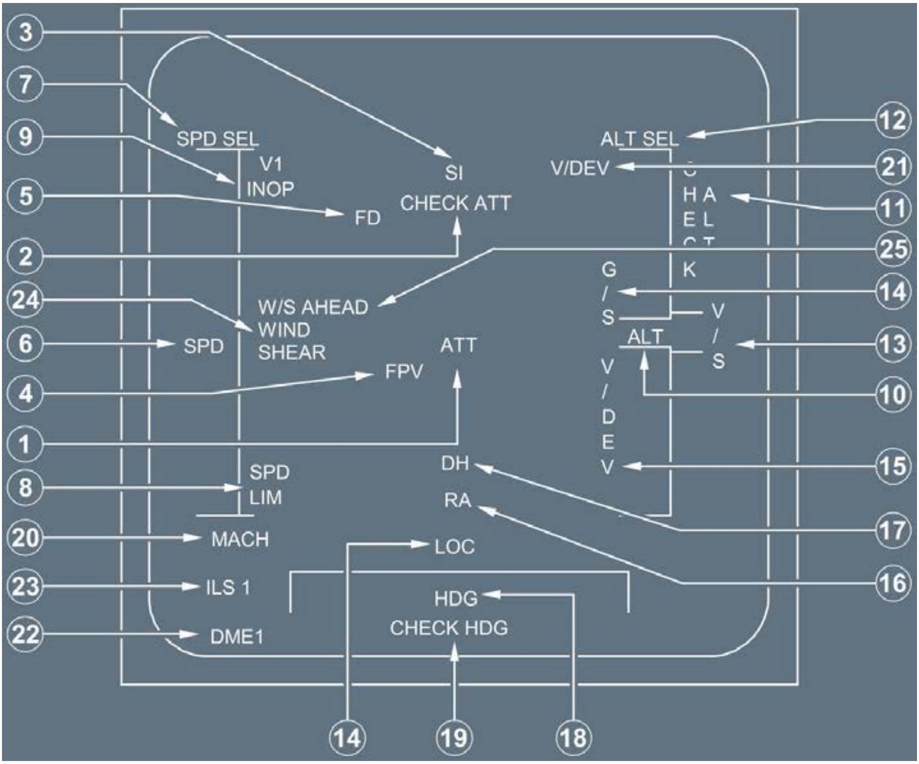
The FWC generates an altitude warning (C chord sound and PFD's altitude window pulses in yellow or flashes in amber), when the aircraft approaches a preselected altitude or flight level, or when it deviates from its selected altitude or flight level.
This warning results from a comparison between the altitude (ADIRS) and the preselected altitude displayed on FCU.



- Selecting a new altitude, or pushing the ECAM's EMER CANC pushbutton, or pressing either MASTER WARN pushbutton, cancels the continuous C chord.
- Selecting a new altitude stops the flashing of the altitude window.
- The altitude alert is inhibited:
  - When the slats are out, with the landing gear is selected down, or
  - In approach after the aircraft captures the glideslope, or
  - When the landing gear is locked down.

FLAGS AND MESSAGES DISPLAYED ON PFD

Ident.: DSC-31-40-00001248.0009001 / 21 MAR 17
Applicable to: ALL



(1) ATT flag (red)
If the PFD loses all attitude data, its entire sphere is cleared to display the ATT flag.

(2) CHECK ATT (amber)
“CHECK ATT ” appears, when there is a disagreement (of a least 5 °) between the attitude information displayed by the two PFD s. The CHECK ATT flag appears on both PFD s, and a caution appears on the ECAM.

(3) SI flag (red)
If the sideslip information is lost or any reverse is deployed in flight, the index disappears and a red SI flag appears.

(4) FPV flag (red)
In the TRK FPA mode, when the drift angle or flight path angle is not valid, an FPV flag appears.

(5) FD flag (red)
If both FMGC s fail, or if both FD s are disengaged and the FD pushbutton is on and the attitude is valid, a red FD flag appears.

(6) SPD flag (red)
If the speed information fails, a SPD flag replaces the speed scale.

(7) SPD SEL flag (red)
If the selected speed information fails, a SPD SEL flag appears.

(8) SPD LIM flag (red)
This flag appears when both FAC s are inoperative, or in case of SFCC dual flap/slat channel failure.
In this case, the following PFD information is lost : VLS , S, F, Green Dot, Vtrend, VMAX , VFE next, VSW.

(9) V1 INOP flag (red)
When the V1 signal is not valid, a V1 INOP flag replaces the digital value.

(10) ALT flag (red)
If the altitude information fails, the ALT flag replaces the altitude scale.

(11) CHECK ALT flag (amber)
The CHECK ALT flag appears, as does an ECAM caution, if the disagree between the two PFD altitude indications is greater than 250 ft when QNH is selected, or 500 ft when STD is selected.
The caution and the flag disappear, when the Pilot's and the Co-pilot's barometer references disagree.

(12) ALT SEL flag (red)
If the selected altitude information fails, an ALT SEL flag appears.

(13) V/S flag (red)
If the vertical speed information fails, the V/S flag replaces the vertical speed scale.

(14) LOC and G/S flags (red)
If the localizer or glideslope receiver fails, a LOC or G/S flag appears on the deviation scale.

(15) VDEV flag (red)
If the vertical deviation information fails, and the LS pb is not pressed, a VDEV flag replaces the VDEV scale.

(16) RA flag (red)
If both radio altimeters fail, this flag appears in place of the radio height indication.

(17) DH flag (amber)
A DH flag appears, when the aircraft reaches the selected DH.

(18) HDG flag (red)
If the heading information fails, the HDG flag replaces the heading scale.

(19) CHECK HDG flag (amber)
The CHECK HDG flag appears, as does an ECAM caution, if there is a discrepancy (5 °) between pilots's, and copilot's heading indications.

(20) MACH flag (red)
This flag appears, if the Mach data fails.

(21) VDEV (amber)
At the top of the glide scale, this message flashes in approach phase and, when either the FINAL mode is armed/engaged, or a non-LS approach has been selected, and the LS pushbutton is selected.

(22) DME 1 flag (red)
When the DME distance is not valid, a DME 1 (on PFD 1) or DME 2 (on PFD 2) flag replaces the DME distance indication.

(23) ILS1 flag (red)
If an ILS frequency fails, or if either the LOC or G/S signals fail, an ILS 1 (on PFD 1) or ILS 2 (on PFD 2) flag replaces the ILS frequency indication.

(24) WINDSHEAR warning (red)
This message is displayed, when windshear is detected (reactive windshear warning) by the FAC.
Refer to DSC-22_40-40 Windshear Detection Function

(25) W/S AHEAD
This message is displayed, when the predictive windshear system has detected windshear ahead of the aircraft.
The message is in amber or red, depending on the alert level.
Refer to DSC-34-SURV-30-20 Windshear Alerts Inhibition

Note: 1. *All flags, except SI, V1 INOP and DME 1 which are steady, flash for 9 s, then remain steady.*
The DH flag flashes for 3 s, then remains steady.
2. *For information on the TCAS flag, Refer to DSC-34-SURV-60-10 TCAS Modes.*

GENERAL

Ident.: DSC-31-45-00001249.0002001 / 24 FEB 11
Applicable to: ALL

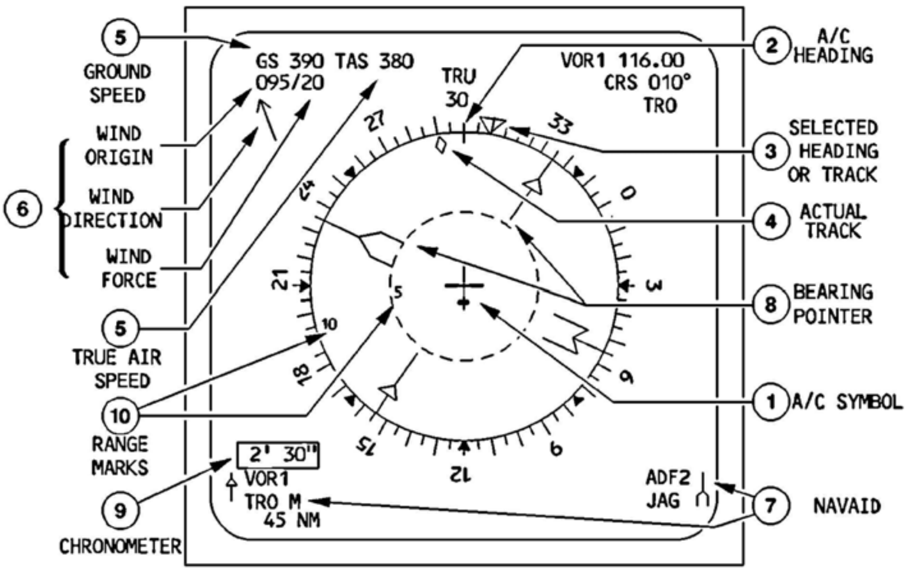
There are five different displays (five modes to display navigation information):
- ROSE LS
- ROSE VOR
- ROSE NAV
- ARC
- PLAN

The Navigation Display (ND) can provide a weather radar image in all modes, except PLAN.

Note: *In case avionics ventilation is not sufficient (e.g. due to a blower and extract fan failure), and the Navigation Display (ND) Unit temperature exceeds a defined threshold, the ND will not display the weather radar image, in order to limit power consumption and prevent a DU overheat. Any additional increase in temperature will lead to a complete cut off of the power supply to this display unit.*

ROSE MODES

Ident.: DSC-31-45-00001250.0001001 / 19 MAY 14
Applicable to: ALL



(1) Aircraft symbol (yellow)
Fixed and centered in the display, this symbol points to the yellow lubber line.

(2) Aircraft heading
The fixed yellow lubber line points to the aircraft magnetic heading on the moving white compass rose. Small white triangles are fixed at 45 ° intervals on the circumference of the compass rose.
"TRU" appears at the top of the compass rose, when it is displaying true heading instead of magnetic heading (latitude above 73 ° North or 60 ° South).

(3) Selected heading or track (blue)
This pointer shows the heading or track indicated on the FCU 's HDG TRK counter.

(4) Actual aircraft track (green)
This symbol is a small green diamond.

(5) Ground speed and true air speed (green)
ADIRS furnishes these speeds.

(6) Wind direction and speed
ADIRS provides the wind direction and speed. The digital direction reflects the true north reference, and the analog direction (indicated by the green arrow) reflects the magnetic north reference. The green arrow only appears, if the wind speed is above two knots.
If the display does not receive either wind speed or direction, dashes replace the numbers on the display.

(7) NAVAIDs

When the ADF -OFF-VOR selector switch on either the pilot's or copilot's EFIS control panel is set to ADF or VOR , the onside ND displays the following characteristics of the corresponding NAVAID in white for VOR or in green for ADF (left side for receiver 1 and right side for receiver 2):
- Type of NAVAID (ADF or VOR)
- Shape and color of the associated bearing pointer (if the bearing pointer is in view).
- NAVAID identification (or frequency by default)
- DME distance if a DME is collocated with the selected VOR . ADF and DME distance are never displayed at the same time.
- Mode of tuning
  - M for a NAVAID tuned manually by the pilot through the MCDU (underlined and dimmed),
  - R for a NAVAID tuned from an RMP (Radio Management Panel) (underlined and dimmed),
  - Nothing for a NAVAID tuned automatically by the FMGC.

If reception fails, the ND stops displaying the associated data (except for the identification or frequency).

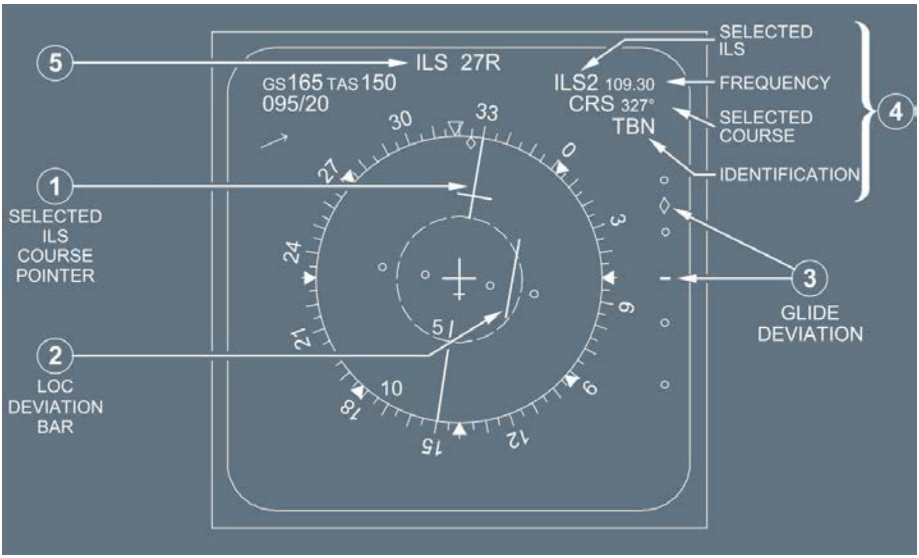
(8) Bearing pointer (green for ADF , white for VOR)
This pointer appears when bearing data is available.
If the aircraft is not receiving the beacon or if a receiver fails, the associated bearing pointer disappears.

(9) Chronometer Indication (white)
These numbers appear when the onside chronometer is started.
They display the elapsed time.
The indication is in minutes and seconds from 0 to 59 min 59 s, and in hours and minutes from 1 h to 99 h 59 min (Seconds are not displayed beyond 59 min 59 s.).

(10) Range marks
The range scale value selected on the EFIS control panel (10 to 320 NM) governs the scale of the ND.

ROSE LS MODE

Ident.: DSC-31-45-00009584.0065001 / 24 NOV 15
Applicable to: ALL



(1) ILS Course Pointer (Magenta)
This symbol points at the selected ILS course.
The ILS is either selected by the FMGC (autotuned or manually) or manually selected by the flight crew via the RMP backup mode. If no course has been entered, the default value is 360 °.

(2) Localizer Deviation Bar (Magenta)
This bar moves laterally with respect to the course pointer. Its scale has two white dots on each side of the zero deviation. Each dot corresponds to a deviation of approximately ±0.8 °.
If the lateral deviation exceeds 1/4 dot (0.2 °) above 15 ft RA, both the bar and the scale flash.

(3) Glide Deviation (Magenta)
This diamond moves on a vertical scale that has two white dots on each side of the yellow reference line. Each dot corresponds to a deviation of approximately ±0.4 °.
If the deviation exceeds one dot above 100 ft RA, both the scale and the diamond flash.

(4) Selected ILS Information
This area displays the ILS frequency (magenta), selected course (magenta), and identification (magenta).

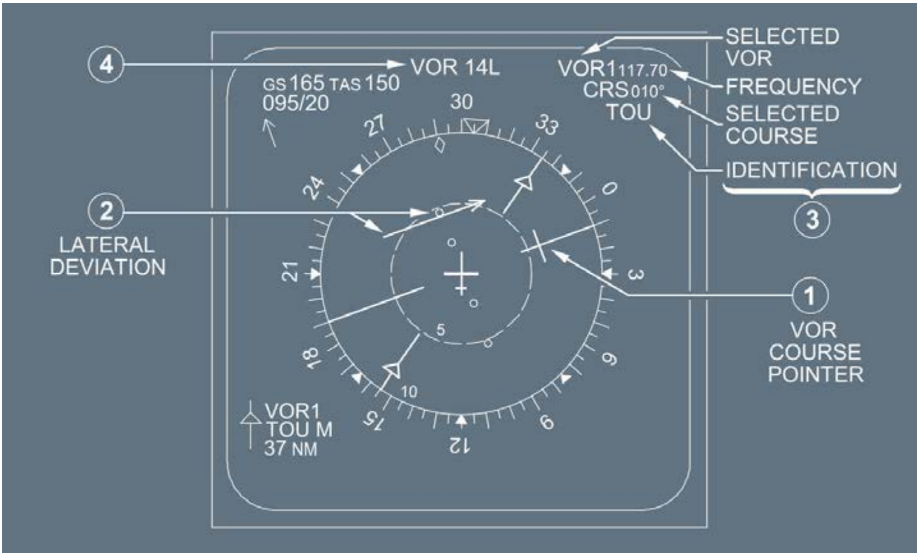
(5) ILS Message (Green)

This message indicates the full runway name of the selected approach. This message appears:
- The flight crew selects an ILS approach on the MCDU, and
- The FMS flight phase is DES , APP or GA , or the FMS phase is CRZ and the along track distance to destination is less than 250 NM.

Note: ILS 1 information appears on PFD 1 and ND 2.
ILS 2 information appears on PFD 2 and ND 1.

ROSE VOR MODE

Ident.: DSC-31-45-00001252.0029001 / 05 NOV 15
Applicable to: ALL



(1) VOR Course Pointer (Cyan)
This symbol points at the selected VOR course.
The VOR course is either automatically selected by the FMGC or manually selected by the flight crew via the MCDU pages or the RMP backup mode.

(2) Lateral Deviation Bar (Cyan)
This bar indicates the VOR deviation on a lateral scale.
Each dot corresponds to 5 ° of lateral deviation. When the lateral deviation exceeds 10 °, the bar remains displayed on the outer dot.
The arrow on the bar provides the TO/FROM indication.

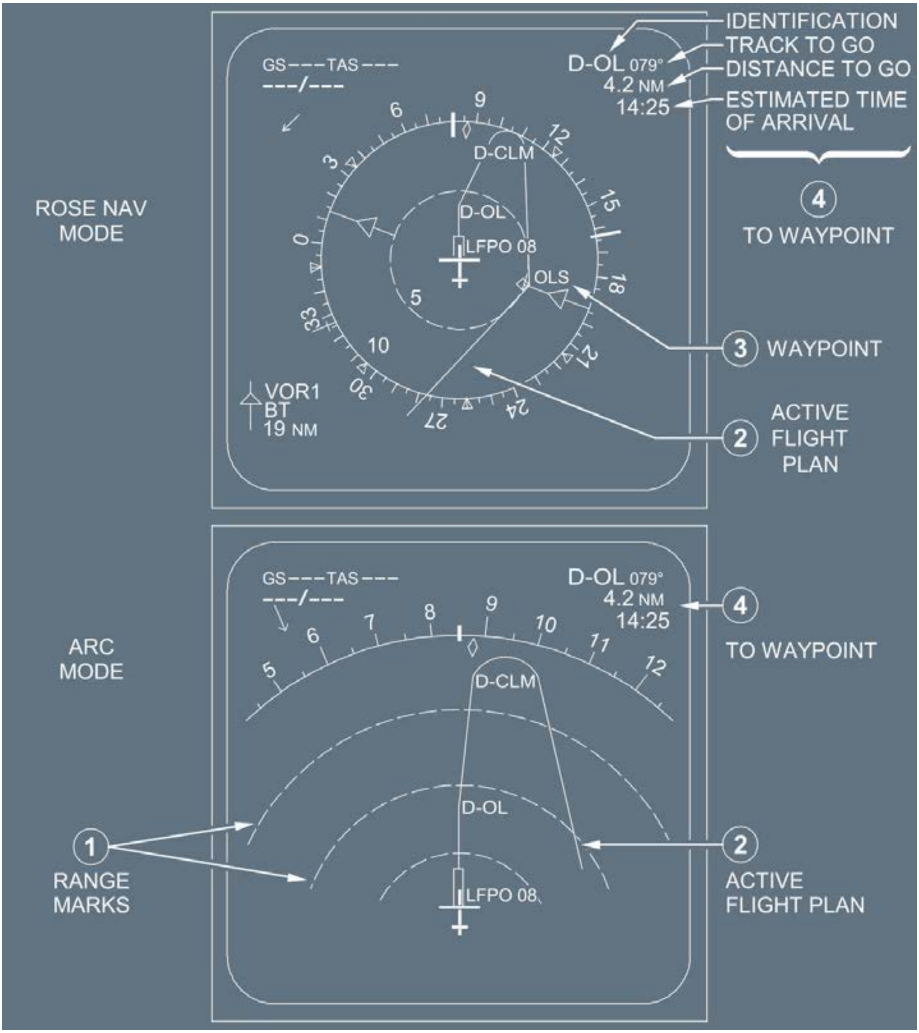
(3) VOR Information (White and cyan)
This area displays the frequency and identification (if decoded by the receiver) of the selected VOR in white, the selected course in cyan, and the tuning mode in white.

(4) VOR or GPS Message (Green)
VOR 14L appears when the flight crew selects a VOR approach on the MCDU.
GPS 14L appears when the flight crew selects a GPS approach.

ROSE NAV MODE/ARC MODE

Ident.: DSC-31-45-00001253.0017001 / 08 FEB 13
Applicable to: ALL

ROSE NAV and ARC modes give the pilot the same information, but ARC mode limits it to the forward 90 ° sector.



(1) Range Marks and Values

The values displayed on the ND are:

In ROSE NAV mode	1/4 of the selected range for the inner circle.
	1/2 of the selected range for the heading scale circle.
In ARC mode	1/4 of the selected range for the first inner arc.
	1/2 of the selected range for the second inner arc.
	3/4 of the selected range for the third inner arc.

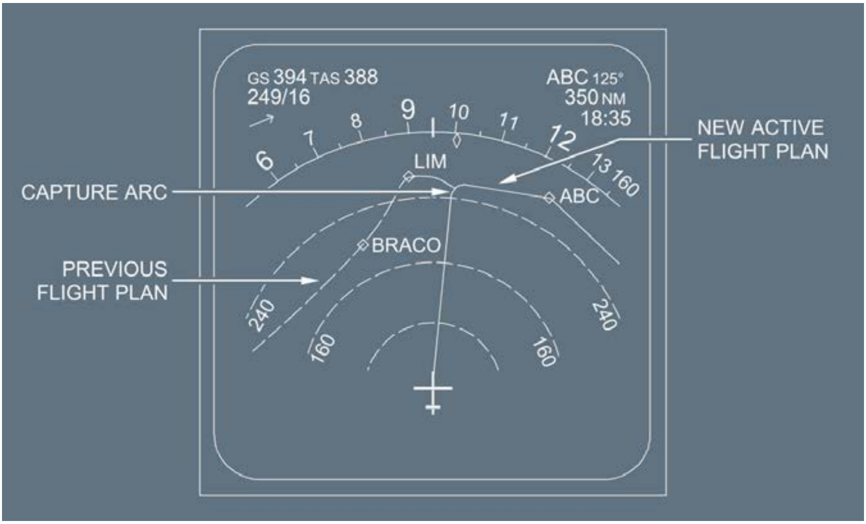
(2) Flight Plan

The crew can use the MCDU to select various types of flight plan:

- The active flight plan (the flight plan the aircraft is actually following when the NAV mode is engaged) is represented by a continuous green line. The ND shows only the part of the flight plan that is ahead of the aircraft, as well as the waypoints that are still to be overflown and the waypoint from which the aircraft is coming.
  The ND does not show a SID or a STAR , except for the last waypoint of the SID and the first waypoint of the STAR, when the selected range is 160 or 320 NM.
  If the primary flight plan is not active, it is represented by a dotted green line.
- A continuous blue line portrays the missed approach procedure , and a dashed blue line portrays the flight plan to the alternate.

  The missed approach and the alternate flight plan are displayed when:
  - In ARC or ROSE NAV mode, a missed approach waypoint or an alternate flight plan waypoint is displayed on the onside MCDU.
  - In PLAN mode a missed approach or alternate waypoint is displayed in the 2L field of the onside MCDU.

- The secondary flight plan is represented by a continuous white line. The ND continues to display the active flight plan
- Temporary flight plan
  The revised portion of the flight plan is represented by a dotted yellow line
- Flight plan capture
  When the aircraft is off the primary flight plan and is flying toward it in HDG mode with the NAV mode armed, the ND shows the new active flight plan as a continuous green line if the FMGC has computed the intercept path.
  The part of the flight plan before the interception point shows as a dotted green line.

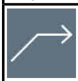


(3) Waypoint

The ND can display various kinds of waypoints:

Flight plan waypoints
The ND displays these as green diamonds (white, for TO waypoints). When the flight crew selects the WPT option on his EFIS control panel, all waypoints other than flight plan waypoints are displayed in magenta.

Pseudo waypoint
Point of the flight path where the aircraft is predicted to reach a selected altitude or speed.

Pseudo waypoint	**Definition**
 	Level symbol (top of climb or level-off position), when the aircraft reaches: - The FCU-selected altitude (blue arrow), or - The constrained altitude, if it is more restrictive than the FCU altitude and if appropriate modes are engaged (magenta) - It does not appear when the aircraft is within 100 ft above, or below, the selected altitude.
	Top of descent symbol, or continue descent symbol: - White, if DES is not armed - Blue, if DES is armed.

Continued on the following page

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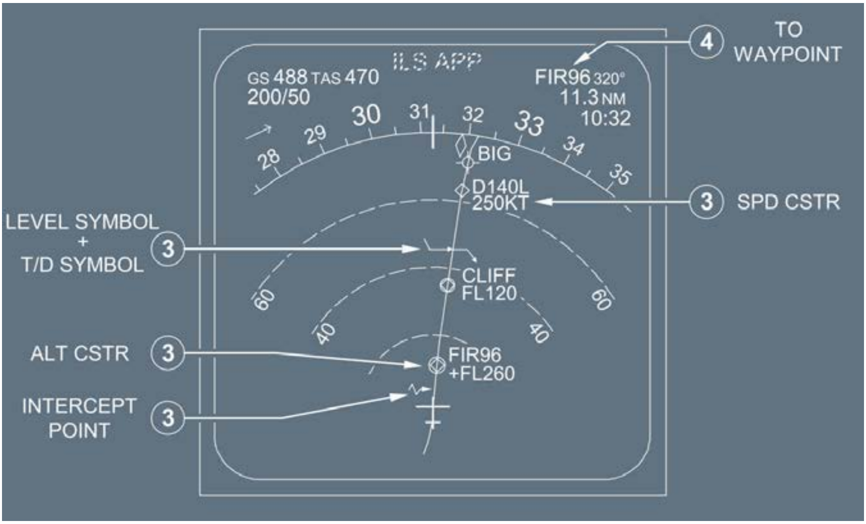
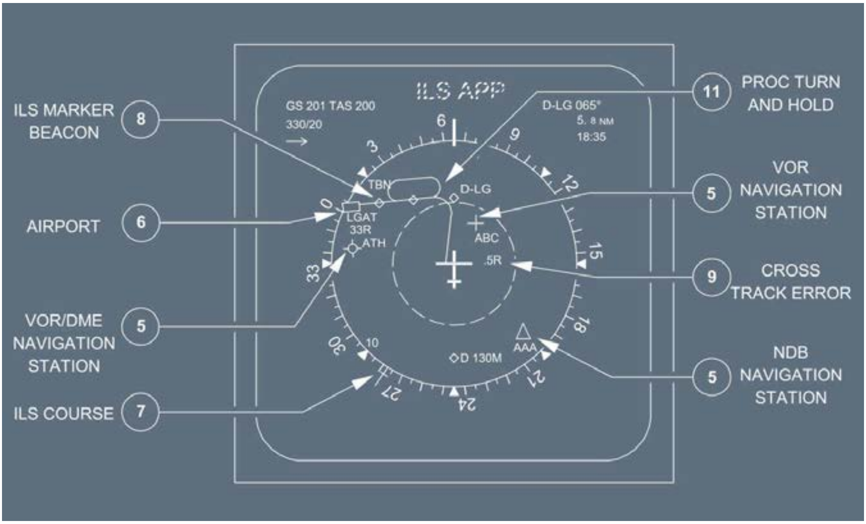
Pseudo waypoint	**Definition**
	Start of CLIMB symbol: - White, if CLB is not armed - Blue, if CLB is armed.
	Intercept point symbol: - White, if only the NAV mode is engaged - Blue, if DES mode is engaged - Indicates the point at which the aircraft is predicted to intercept the descent path, if there is any vertical deviation while the aircraft is in DES mode.
	Speed change symbol (magenta): Indicates the point at which the aircraft will start an automatic acceleration or deceleration from the current speed to a new computed speed for SPD LIM , SPD CSTR , or HOLDING SPD.
	Decelerate point symbol: - Indicates the point at which the aircraft is predicted to decelerate for approach (and thus switch to the approach phase) - Magenta, if in managed speed and NAV or approach mode is engaged - White, if in selected speed or HDG /TRK mode - Automatic decelerations only occur when displayed in magenta.
	ALT CSTR symbol set around the constrained waypoint: - Magenta, when the ALT CSTR is predicted to be met - Amber, when the ALT CSTR is predicted to be missed - White, when the ALT CSTR is not taken into account by the FMGS , and NAV mode is engaged.
	Energy circle symbol (green arc) centered on the aircraft position and oriented to the current track line. Represents the Required Distance to Land. Only displayed if the lateral guidance mode is heading or track, and the current FMS flight phase is in cruise, descent or approach, and the aircraft is within 180 NM of the destination.



(4) TO waypoint
This is the next waypoint to be overflown.

This area of the screen also shows:
- Waypoint identification (white)
- Track to go (green)
- Distance to go (green)
- Estimated time of arrival (green), assuming the aircraft will fly directly from its present position to the TO waypoint at the current ground speed.



(5) NAVAIDs

The display uses specific symbols for NAVAIDs:


DME or TACAN


VOR


VOR /DME


NDB

The symbol appears:
- In green if the NAVAID is a current waypoint of the flight plan
- In white if it is the TO waypoint
- In blue when the NAVAID is tuned for display either automatically by the FMGC or manually through the MCDU
- In magenta when the NAVAID is not part of the flight plan and is called for display as an option (corresponding option pushbutton pressed on the FCU EFIS control panel).

(6) Airport

Airport included in the flight plan:

- If the runway is not specified, the airport is represented by a star and the identification is displayed in white.
  Example: * LSGG
- If the runway is specified, it is represented by an oriented runway symbol in white.

The runway is drawn to scale (paved length) if the selected range is 10, 20 or 40 NM.

Optional airport information
The airports that are not displayed as part of the flight plan may be called for display (ARPT pb on the EFIS control panel).
They are represented by a star and the identification in magenta.

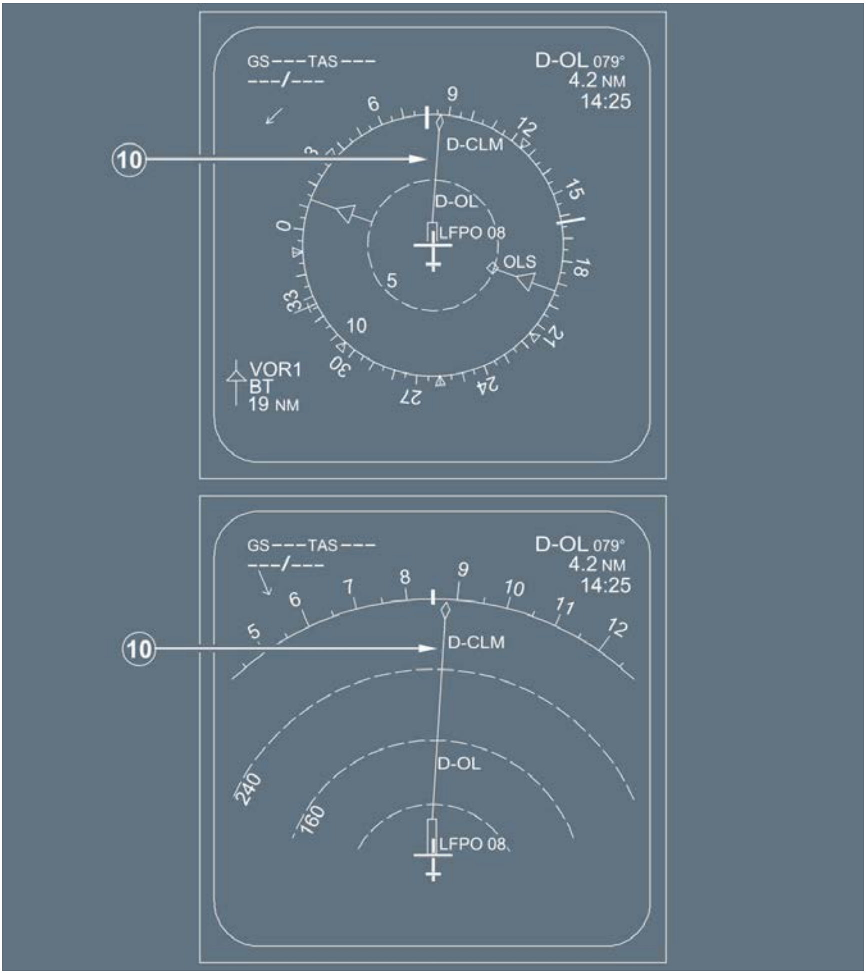
(7) ILS Course (Magenta)
When the pilot pushes the LS pb-sw on the EFIS control panel, and if an ILS station has been selected, the display shows an ILS course symbol.

(8) ILS Marker Beacons
The screen shows these as waypoints (diamonds).

When the aircraft overflies a marker beacon, the corresponding symbol flashes:
Blue for the outer marker.
Amber for the middle marker.
White for the inner marker.

(9) Cross Track Error
This is the aircraft's lateral deviation from the active leg of the flight plan (related to the great circle route). It is indicated in nautical miles (NM), with the letter R (right) or L (left), according to the position of the aircraft with respect to the flight plan.

(10) Track Line
This line appears in green only in the ROSE NAV or ARC mode when HDG or TRK has been selected on the FCU.



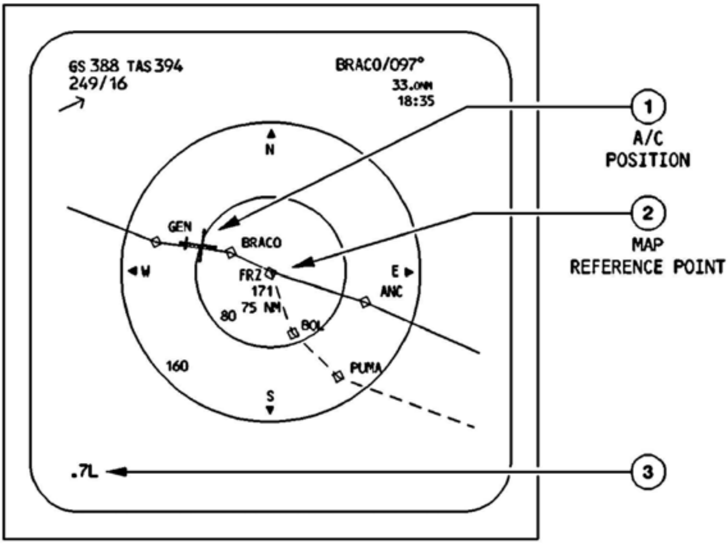
(11) Procedure turns and holding patterns
These only appear when they are part of the flight plan. For the 160 and 320 NM range scales, each one is represented by a white arrow that originates at the associated fix and indicates the direction of the turn.

For shorter range scales, and if the procedure turn or the holding pattern is in the next or the active leg, the display shows the full circuit or pattern.

PLAN MODE

Ident.: DSC-31-45-00001254.0002001 / 24 FEB 11
Applicable to: ALL

This mode statically displays the flight plan legs on a map oriented to true north. The map is centered on a map reference point, that the pilot selects by scrolling to it on his MCDU.
The map reference point is the waypoint displayed on the second line of the MCDU 's F-PLN page. It can either be the active waypoint (next waypoint to be overflown), or any other waypoint of the flight plan.
The pilot can scroll through the overall flight plan, and display it in PLAN mode.
The pilot chooses the scale of the map with the range selector (the diameter of the outer circle corresponds to the selected range).
Data on NAVAIDs and on their characteristics and associated bearing pointers are not available in this mode.



(1) Aircraft Position and True Track
The orientation of the yellow aircraft symbol always indicates the true track of the aircraft. Its position represents the aircraft position given by the FMGS.

(2) Map Reference Point
If the CSTR option is not selected, the track and distance from the map reference point to the next F-PLN waypoint is displayed in magenta.

(3) Cross Track Error
Refer to DSC-31-45 ROSE NAV Mode/ARC Mode.

WEATHER RADAR INDICATIONS

Ident.: DSC-31-45-00015503.0001001 / 21 MAR 17
Applicable to: ALL

Refer to DSC-34-SURV-30-30 Weather Radar indication on ND.

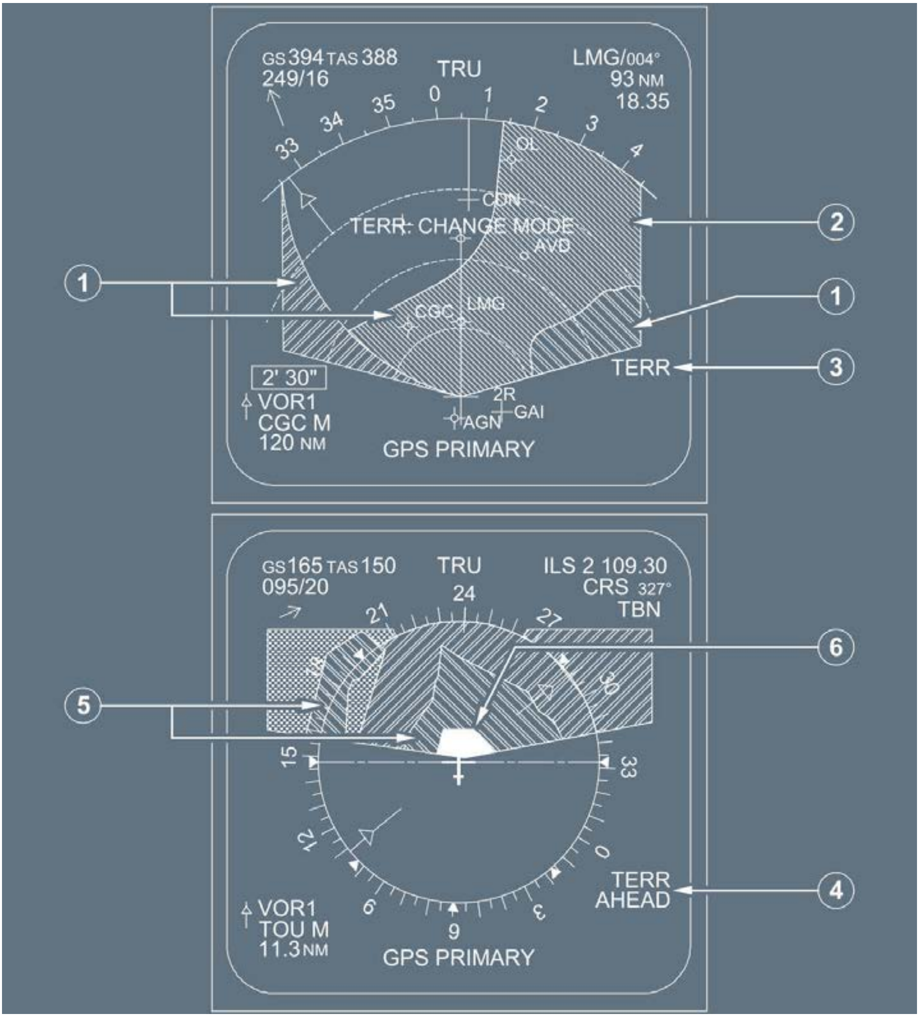
PWS ⩤ INDICATIONS

Ident.: DSC-31-45-00015504.0001001 / 21 MAR 17
Applicable to: ALL

Refer to DSC-34-SURV-30-30 PWS (if installed) indication on PFD and ND

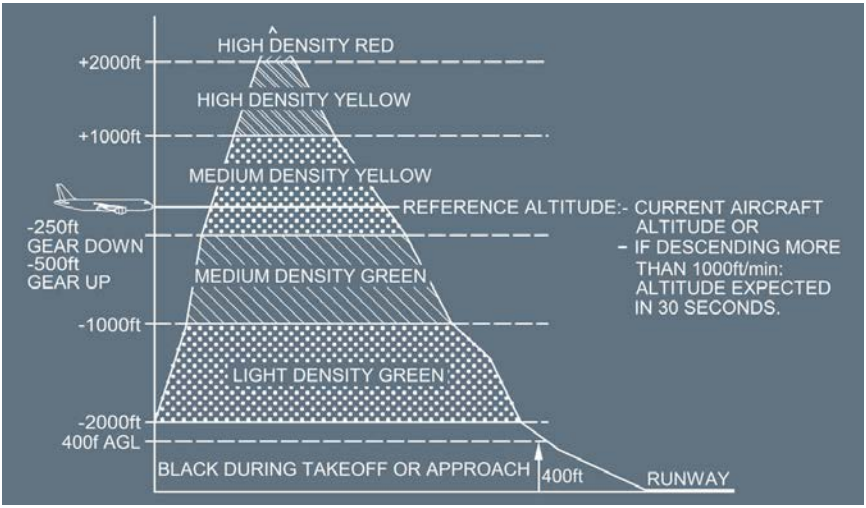
EGPWS

Ident.: DSC-31-45-00009586.0001001 / 22 MAY 12
Applicable to: ALL



(1) EGPWS terrain picture

The ND displays the EGPWS terrain picture, when the TERR ON ND switch is selected ON, and the ND is not in PLAN mode. The terrain picture replaces the weather radar image. The terrain appears in different colors and densities, in accordance with its relative height:



Note: Areas without available terrain data in the EGPWS database appear in magenta.

(2) Center Part Messages

- The “TERR CHANGE MODE” indication is displayed in red (or amber), in the case of a Terrain Awareness Display (TAD) warning (or caution) alert, if the current selected display mode is PLAN
- The “TERR REDUCE RANGE” indication is displayed in red (or amber), in the case of a Terrain Awareness Display (TAD) warning (or caution) alert, if the selected range is 160 NM or 320 NM.

(3) TERR indication

To differentiate between the terrain and the weather display, the weather radar TILT is replaced by a blue TERR, and the terrain display sweeps from the center outward to both ND sides.

(4) Warning and caution messages

TERR AHEAD (amber) : For a caution.

TERR AHEAD (red) : For a warning.

When triggered, these messages flash for 9 s, then remain steady until the caution or warning alert condition disappears.

TERR RNG (red)	:	For a RANGE error warning.
TERR TST (amber)	:	Appears during the EGPWS test, when the terrain pattern is displayed, and there is no failure.

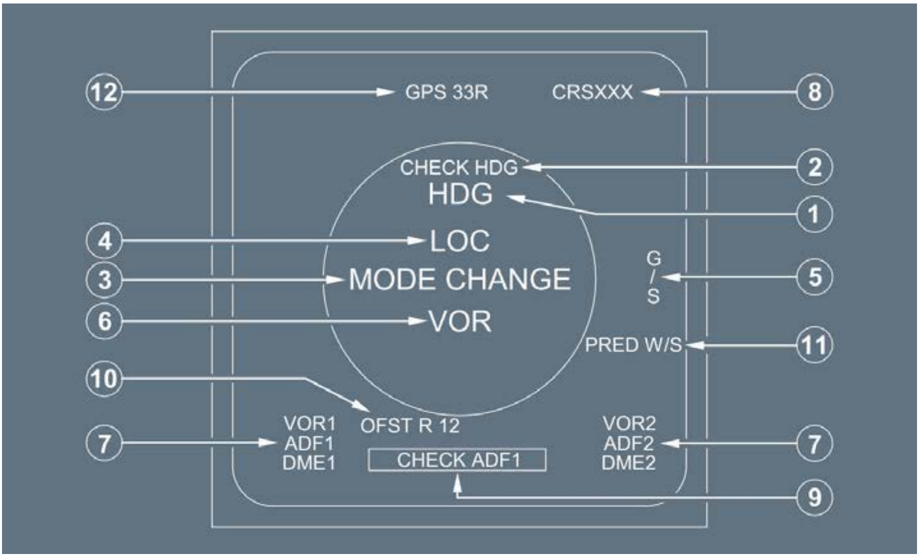
(5) Terrain caution alert
Generated when a conflict exists between the terrain caution envelope, ahead of the aircraft, and the terrain data stored in the database. The conflict area is shown in solid yellow.

(6) Terrain warning alert
Generated when a conflict exists between the terrain warning envelope, ahead of the aircraft, and the terrain data stored in the database. The conflict area is shown in solid red.

Note: *When an alert is generated (either caution or warning) and TERR ON ND is not selected, the terrain is automatically displayed and the TERR ON ND's pushbutton ON light comes on.*

FLAGS AND MESSAGES DISPLAYED ON ND

Ident.: DSC-31-45-00001256.0349001 / 21 MAR 17
Applicable to: ALL



(1) HDG Flag (red)
If the heading data fails, the rose, arc and associated symbols disappear.
A HDG flag flashes for 9 s, then remains steady in the upper part of the ND.

(2) CHECK HDG Flag (amber)
When the flight warning computer detects a disagree (5 °) between sides 1 and 2, a CHECK HDG flag appears on both ND s, and a caution appears on the ECAM.

(3) Center Part Messages

- The screen displays a MODE CHANGE message in green if there is a discrepancy between the selected mode on the EFIS control panel and the mode sent from the onside FMGC , or while the DMC is preparing a new page for display
- The screen displays a RANGE CHANGE message in green if there is a discrepancy between the range selected on the EFIS control panel and the range sent from the onside FMGC. A MODE CHANGE message has priority over a RANGE CHANGE message
- The screen displays a MAP NOT AVAIL message in red for several reasons:
  - The MODE CHANGE or RANGE CHANGE message has been displayed more than 6 s, or
  - The FMGC has failed, or
  - The FMGC has delivered an invalid aircraft position.
- The screen displays a W/S SET RNG 10 NM message if a predictive windshear alert is triggered and the range is above 10 NM.
  The message is displayed in the color corresponding to the windshear alert: red for a warning, amber for a caution
- The screen displays a W/S CHANGE MODE message if a predictive windshear alert is triggered and the ND is not in ARC or ROSE mode. The message appears in red for a warning, or amber for a caution.

(4) LOC Flag (red)
If LOC data fails, this flag flashes for 9 s, then remains steady.

(5) G/S Flag (red)
If G/S data fails, this flag flashes for 9 s, then remains steady.

(6) VOR Flag (red)
In ROSE VOR mode, when the VOR bearing is not valid, this flag flashes for 9 s, then remains steady.

(7) VOR 1(2) or ADF 1(2) or DME 1(2) Flag (red)
If a navigation receiver fails, the appropriate one of these flags flashes for 9 s, then remains steady.

(8) VOR Course Flag
If the VOR course fails, a red CRSXXX flag appears.
If there is non-computed data (NCD), a blue CRS - - - flag appears.

(9) Other messages

MAP PARTLY DISPLAYED (amber)	:	In case of incomplete data transmission between the FMGC (priority criteria) and the DMC , or if the DMC cannot draw the complete MAP. This message is also displayed when a very long leg exists in the flight plan. A leg is considered as “very long” when the starting point (or endpoint) is located at more than 45 ° from the aircraft location (45 ° of longitude or latitude). This DMC limitation results from a compromise between accurate drawing precision and maximum leg length that can be displayed.
NAV ACCUR UPGRAD, or (white) NAV ACCUR DOWNGRAD (amber)	:	Signals a change in navigation accuracy.
SPECIFIC VOR/D UNAVAIL (amber)	:	If the NAVAID, that is tuned for the selected approach or departure, is not available.
SET OFFSIDE RNG/MODE (amber)	:	Displayed on ND 1(2), in case of an FMGC 1(2) failure when the two ND ranges or modes selected on the EFIS control panels are different.
GPS PRIMARY (white, boxed white)	:	This message appears when GPS PRIMARY mode is available, or has been recovered. The pilot can clear this message by pressing the CLR key on the MCDU.
GPS PRIMARY LOST (amber, boxed white)	:	This message appears when GPS PRIMARY is not available, and not clearable by pilot action.
↓ (green)	:	Overflow arrow, displayed when more than one of the following messages are present at the same time: - NAV ACCUR DOWNGRAD (inhibited when the navigation mode is IRS /GPS) - NAV ACCUR UPGRAD (inhibited when the navigation mode is IRS /GPS) - SPECIF VOR-D UNAVAIL - MAP PARTLY DISPLAYED - SET OFFSIDE RNG/MODE - GPS PRIMARY - GPS PRIMARY LOST.

Note: *For information about the TCAS messages: Refer to DSC-34-SURV-60-20 TCAS Messages.*

(10) OFST R(L) XX message (yellow)
The screen displays this message, when a temporary or an offset flight plan is entered.
The offset value is given in NM.

Note: *For information about the TCAS messages: Refer to DSC-34-SURV-60-20 TCAS Messages.*

(11) PRED W/S flag (amber)
The WINDSHEAR sw on the weather radar panel is set to AUTO, and a Predictive Windshear System fault is detected. This message appears on ground, or when flaps and slats are extended.
It is associated with a single chime. The radar image remains available, provided that the fault does not affect the radar mode.

(12) GPS message (green)
This message shows the full runway name of the selected approach. It is displayed, when a GPS approach has been selected.

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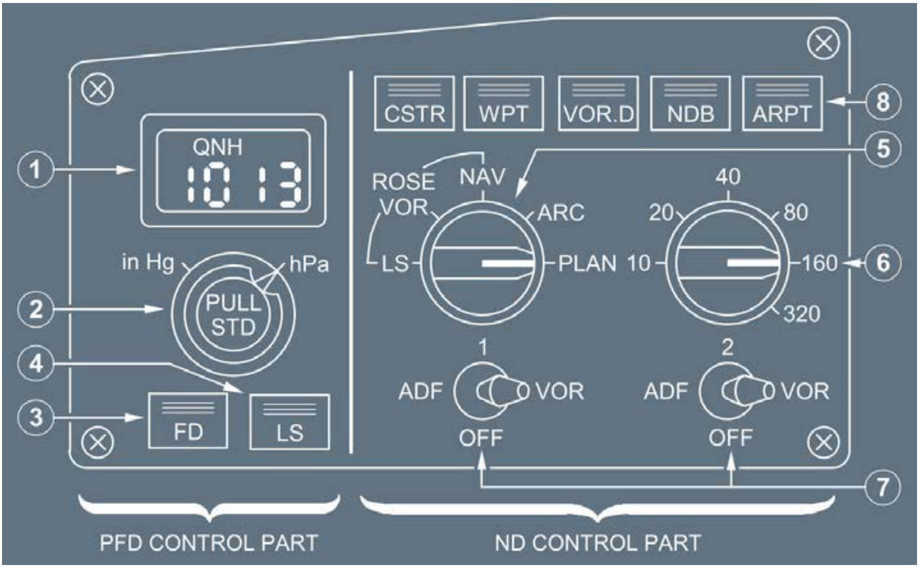
EFIS CONTROL PANEL

Ident.: DSC-31-50-00001257.0003001 / 09 OCT 12
Applicable to: ALL



(1) <u>Barometer Reference Display Window</u>

Range : 745 hPa to 1 100 hPa.

(2) <u>Barometer Reference Selector</u>

a. Outer ring : For selection of the units for the barometer reference-either hectoPascals or inches of mercury.

<u>Note:</u> The unit selected does not appear on the PFD.

b. Inner knob : For selection of the reference value displayed in the barometer reference display window and on the PFD below the altitude scale.

At FCU initialization, the window displays 1 013 or 29.92, depending on the unit selected.

- Pulling the knob selects the standard BARO reference setting. The PFD then displays “STD.” (Rotating the knob has no effect.)
- Pushing the knob from the STD position makes the last selected QNH BARO setting available.

(3) FD pb
Pushing this button removes the FD bars from the associated PFD (or removes the flight path director symbol if the TRK FPA reference is selected).
The pushbutton light goes out.
Pushing it again restores the FD bars (or the FPD symbol) and the green pushbutton light comes on.

(4) LS pb
Pushing this button displays the localizer and glide slope scales on the PFD.
Deviation symbols appear if there is a valid ILS signal.
The green pushbutton light comes on.

(5) Mode Select Switch
This switch selects a navigation display for the onside ND.

(6) Range Select Switch
This switch selects a range scale for the onside ND.

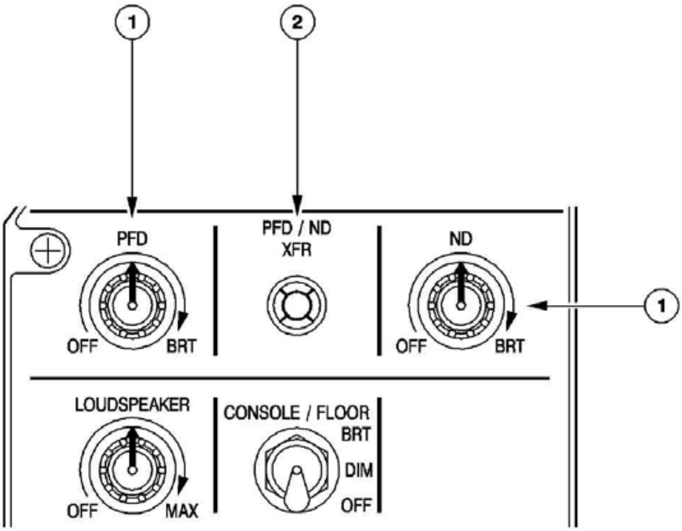
Note: *If the mode or the range data fails, the default selection is the ROSE NAV mode and 80 NM range.*

(7) ADF -VOR Select Switches
These switches select ADF or VOR bearing pointers and DME distance on the onside ND , as well as the corresponding NAVAID data characteristics in any mode except PLAN mode.

(8) Optional Data Display Pushbutton
Pushing this button displays optional data in addition to the data permanently displayed in PLAN, ARC, or ROSE NAV modes. The green pushbutton light comes on.
Only one option can be activated at a time.

OTHER EFIS CONTROLS

Ident.: DSC-31-50-00001258.0002001 / 15 FEB 11
Applicable to: ALL



(1) OFF/BRT knobs

- These knobs turn the PFD and ND display units on and off, and control their brightness.
- The display brightness adjusts automatically for changing light conditions, and is also adjusted manually.

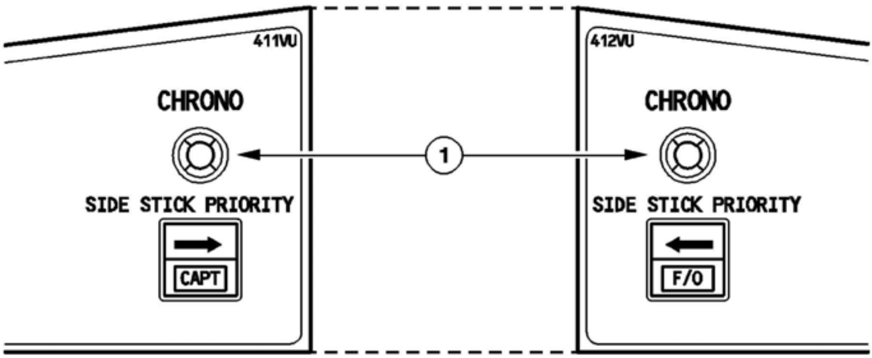
PFD Brightness Control Knob
Rotating this knob all the way counterclockwise switches off the PFD . In this case, the PFD image is automatically displayed on the NDU, but the pilot may recover the ND by means of the PFD -ND XFR pushbutton .
ND Brightness Control Knob
The outer knob controls the brightness of both the weather radar image and EGPWS terrain display.
The inner knob controls the general brightness of the ND symbols.
Rotating this knob all the way counterclockwise switches off the NDU.

(2) PFD /ND Pushbutton
Pushing this button interchanges the PFD and the ND.

If the PFDU fails, the PFD automatically transfers to the NDU.

CHRONOMETER

Ident.: DSC-31-50-00001259.0001001 / 15 FEB 11
Applicable to: ALL



(1) CHRONO Pushbutton
Pushing this button displays chronometer time on the onside ND.
Pushing it again freezes the displayed value.
Pushing it a third time resets the chronometer, and the chronometer time disappears from the display.

GENERAL

Ident.: DSC-31-55-10-00001260.0002001 / 21 MAR 16
Applicable to: ALL

A fully independent clock is on the right side of the control panel.
It sends time to the centralized fault data interface unit, the flight data interface unit, and the flight management and guidance computer.
The clock has two electrical supplies, one of which is a direct connection to the aircraft battery hot bus.

The clock performs four functions :
- It displays “UTC” (GMT) time in hours, minutes and seconds on the center counter.
- It displays elapsed time (ET) (from engine startup) in hours and minutes on the lower counter.
- It drives the chronometer (CHR), which measures a time interval (from the pushing of the CHRONO button) in minutes and seconds.
- It can replace the UTC with the date.

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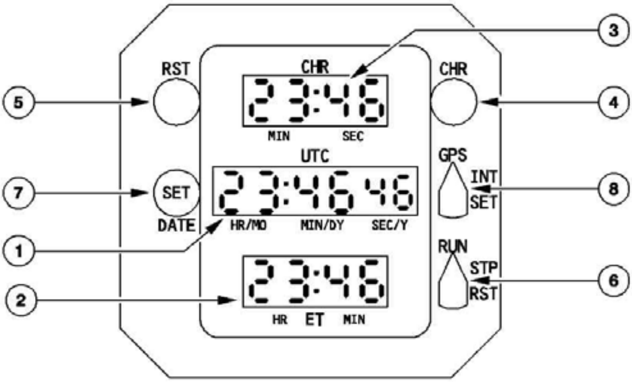
GENERAL

Ident.: DSC-31-55-20-00001261.0003001 / 16 MAR 11
Applicable to: ALL



(1) <u>UTC (GMT) counter</u>
This counter displays the present time in 24 h format from 0 to 23 h 59 min 59 s.

(2) <u>Elapsed Time (ET)</u>
This counter registers the elapsed time up to 99 h and 59 min.

(3) <u>Chrono (CHR) counter</u>
This Counter registers elapsed time from 0 to 99 min 59 s. It is controlled by the CHR pushbutton.

(4) <u>CHR pushbutton</u>

First push : starts the CHR counter

Second push : stops the CHR counter, keeps the display at its last indication.

(5) <u>Reset (RST) pushbutton</u>
When pressed, the CHR counter restarts from 0 if the chrono is running.

(6) ET selector

"RUN"	:	the ET counter starts
"STP"	:	the ET counter stops counting
spring loaded "RST"	:	the ET counter is blanked. The selector returns to its STP position when the selector is released.

Note: *A cumulative elapsed time can be realized by alternatively setting this switch in "RUN" and "STP" position.*

(7) DATE/SET pushbutton

First push	:	sets the clock to date mode. The UTC time display is replaced by the date (day month year).
Second push	:	sets the clock to time mode. The date display disappears.

Note: *in order to select the date mode, the UTC selector must be set on "GPS" or "INT" position.*

(8) UTC selector

"GPS" : Time (or date, if selected) is displayed, and this data is synchronized on GPS information.

Note:
- *If the signal between the GPS and the clock is not detected, dashes are displayed. Only the "INT" and "SET" positions are then available.*
- *If the signal is detected, but GPS data is invalid, the clock automatically runs on its internal time.*
- *The clock will automatically resynchronize on the GPS information, as soon as the GPS data becomes available.*

"INT" : Internal time (or date, if selected) is displayed.

Note:
- *The clock's internal time is initialized with the latest valid GPS information.*
- *If there is no valid GPS information at power up, the internal time will be 00:00:00, until the clock is initialized.*

"SET" : Allows the internal time and date to be initialized.

OPERATION IN INTERNAL MODE

Ident.: DSC-31-55-20-00007126.0001001 / 21 MAR 17
Applicable to: ALL

DATE INITIALIZATION

Set the UTC selector on "SET". The minute digits flash, and the seconds' digits are blank.
To increase data, turn the DATE/SET button clockwise.

To decrease data, turn the DATE/SET button counterclockwise.

- First, push on DATE/SET : To set the hour.
- Second, push on DATE/SET : To set the year.
- Third, push on DATE/SET : To set the month.
- Fourth, push on DATE/SET : To set the day.

Switch the UTC selector to the "INT" position, and the clock starts with the seconds' digits at 00.

Note: *This process must be completed in less than one minute. Otherwise, it will be necessary to reset the CFDS in order to synchronize the lower ECAM time display with the cockpit clock display. Resetting the CFDS is a maintenance operation.*

PRECAUTION IN CASE OF ATC DATALINK COMMUNICATION

If the clock is set to internal (INT) mode and the flight crew manually sets the time and date, the clock does not comply with the time precision required for ATC datalink communication (+/-1 s UTC). This may lead to the rejection of messages, or to the acceptance of obsolete messages:

- The CPDLC function will send CPDLC messages with an erroneous date/time
- The CPDLC function will accept obsolete uplink messages and may reject uplink messages with a correct date/time
- The uplink messages for oceanic and departure clearance will be displayed in the Datalink Control and Display Unit (DCDU) with an erroneous time
- The ADS-C function will continue to operate, but in a degraded mode.

To comply with the time precision requirement for ATC datalink communication, the flight crew must either:

- Use the clock in GPS mode, or
- Use the clock in INT mode and synchronize the clock with the GPS at least one time per day. This synchronization ensures that the UTC time drift is below +/- 1 s UTC.

GPS SYNCHRONIZATION IN INTERNAL MODE

When the clock is set to INT mode, the UTC time is only based on the internal clock and is not synchronized with the GPS. To reset the drift that results from the UTC internal time, the flight crew must perform the following actions:

- Set the UTC selector of the clock to the GPS mode and keep this setting during at least 10 seconds
- Then reset the UTC selector of the clock to INT mode.

These actions result in a resynchronization of the internal clock with the GPS.

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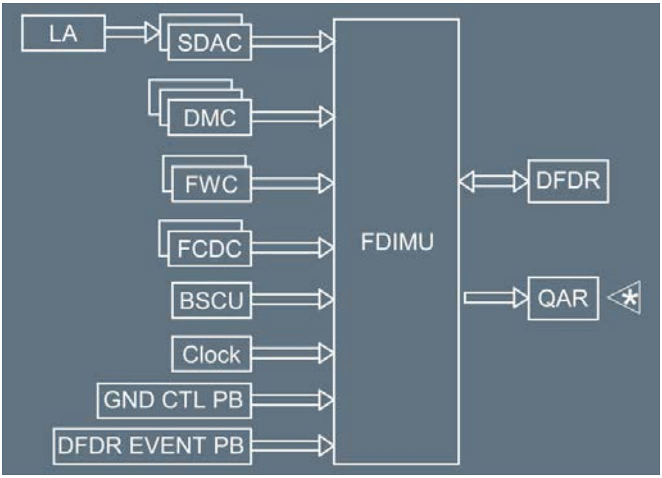
DESCRIPTION

Ident.: DSC-31-60-10-00001262.0002001 / 09 OCT 12
Applicable to: ALL

The Flight Data Recording System, which records the mandatory parameters, consists of the following components:
- A Flight Data Interface and Management Unit (FDIMU)
- A Digital Flight Data Recorder (DFDR)
- A three-axis Linear Accelerometer (LA)

The FDIMU collects and processes parameters from the SDAC s, DMC s, FWC s, FCDC s, BSCU , the DFDR event pushbutton, the GND CTL pushbutton and the Clock.
It stores the mandatory flight parameters in the DFDR.
The DFDR can store the last 25 h data, at least. It stores this data on a fireproof and shockproof device. An underwater locator beacon is attached to the DFDR.
The linear accelerometer measures the acceleration of the aircraft along each of the three axes.
The QAR is an operational recorder that stores the same data as the DFDR . However the QAR is more accessible for the maintenance crew.



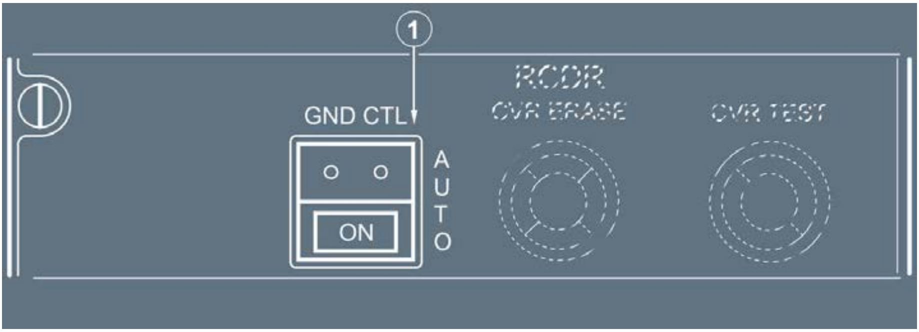
The recording system is automatically active:
- On the ground, during the first five minutes after the aircraft electric network is energized.
- On the ground, after the first engine start.
- In flight (whether the engines are running or not).

On the ground, the recording system stops automatically five minutes after the second engine shuts down.

On the ground, the crew can start the recording system manually by pressing the GND CTL pushbutton.

OVERHEAD PANEL

Ident.: DSC-31-60-20-00001263.0001001 / 09 OCT 12
Applicable to: ALL



(1) GND CTL pushbutton (springloaded)

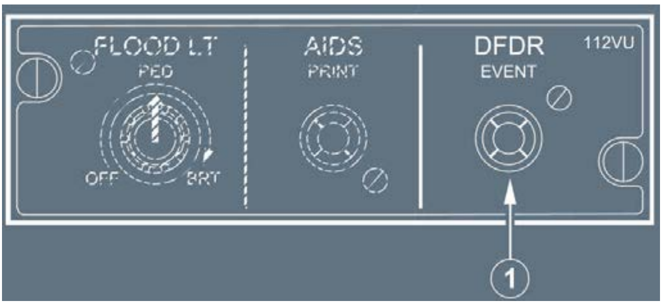
ON : The Cockpit Voice Recorder (CVR) and the Flight Data Recorders are active. The ON light is on.

AUTO : The Cockpit Voice Recorder (CVR) and the Flight Data Recorders are active, according to the logic.

The system automatically switches from ON to AUTO at the first engine start, and also in case of an electrical transient.

PEDESTAL

Ident.: DSC-31-60-20-00001264.0001001 / 22 MAY 12
Applicable to: ALL

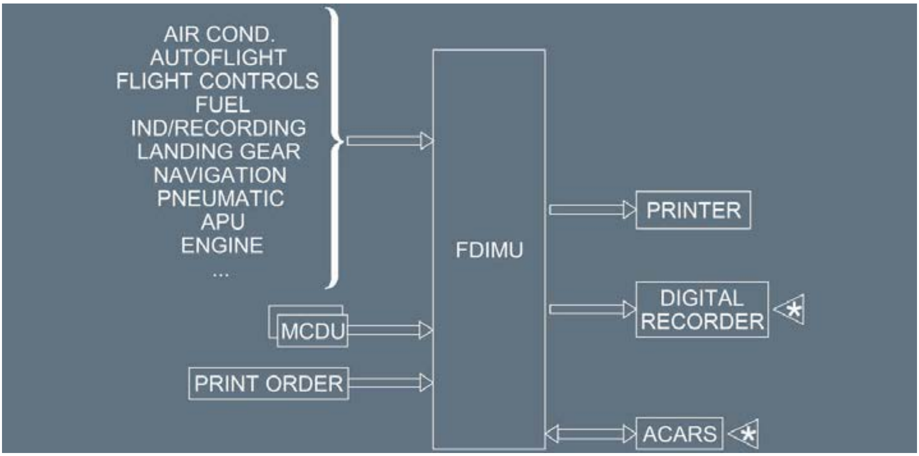


(1) DFDR EVENT pushbutton
Pressing this button (briefly) sets an event mark on the Flight Data records.

DESCRIPTION

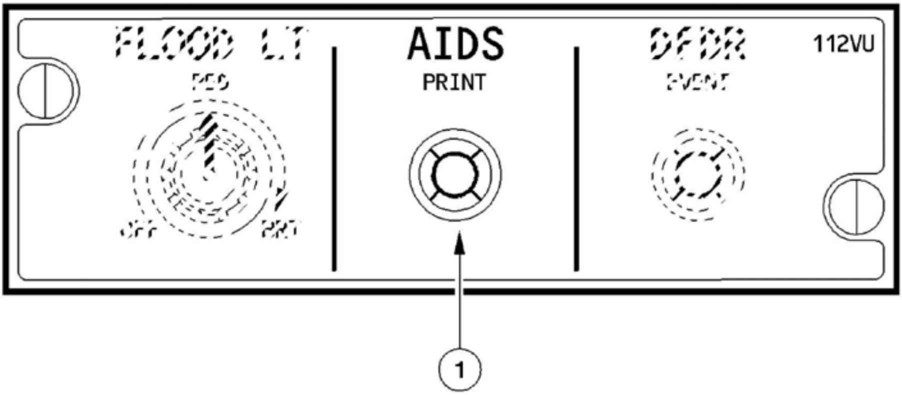
Ident.: DSC-31-60-30-00005369.0002001 / 09 OCT 12
Applicable to: ALL

The AIDS is used to monitor various aircraft system parameters in order to make maintenance easier and to allow formulating operational recommendations.
The AIDS can generate system reports. The Airbus Standard Reports are preprogrammed reports available at aircraft delivery. The operator can create its own reports.
The AIDS uses the Flight Data Interface and Management Unit (FDIMU) to acquire the relevant aircraft system parameters. The FDIMU is connected to the rest of the AIDS as shown below.
The system may be programmed using the MCDU s. The crew can select any report to be displayed on the MCDUs.
The Printer prints the flight phase programmed reports or any report selected on the MCDU.
This printing may be automatic or in response to the AIDS PRINT pushbutton.
The AIDS may send automatic reports via ACARS.
An optional Digital Recorder may be installed to extend the recording capacity.



CONTROLS ON PEDESTAL

Ident.: DSC-31-60-30-00005370.0001001 / 20 DEC 10
Applicable to: ALL



(1) AIDS PRINT pushbutton
Pushing this pushbutton causes the immediate printing of a specific report, depending on the flight phase. The crew may then use the MCDU to select another report for immediate printing.

AIRCRAFT SYSTEMS

LANDING GEAR

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DSC-32-10 Gears and Doors

DSC-32-10-10 Description

DSC-32-10-20 Landing Gear System/Interface

DSC-32-10-30 Interactions between Landing Gear and Aircraft Systems

DSC-32-10-40 Controls and Indicators

DSC-32-20 Nose Wheel Steering

DSC-32-20-10 Description

DSC-32-20-20 Controls and Indicators

Continued on the following page

Continued from the previous page

DSC-32-30 Brakes and Antiskid

DSC-32-30-10 Description

DSC-32-30-20 Controls and Indicators

GENERAL

Ident.: DSC-32-10-10-00018598.0001001 / 21 MAR 16
Applicable to: ALL

The landing gear consists of :
- Two main landing gears that retract inboard
- One nose landing gear that retracts forward.

Doors enclose the landing gear bays. Gear and doors are electrically controlled and hydraulically operated.
The doors, which are fitted to the landing gear struts, are operated mechanically by the gear and close at the end of gear retraction.
All gear doors open while the gear is retracting or extending.
Two Landing Gear Control and Interface Units (LGCIU s) control the extension and retraction of the gear and the operation of the doors. They also supply information about the landing gear to ECAM for display, and send signals indicating whether the aircraft is in flight or on the ground to other aircraft systems.
A hand crank on the center pedestal allows the flight crew to extend the landing gear if the aircraft loses hydraulic systems or electrical power.

MAIN LANDING GEAR (MLG)

Ident.: DSC-32-10-10-00018599.0001001 / 21 MAR 16
Applicable to: ALL

Each main gear has twin wheels and an oleopneumatic shock absorber.
Each main wheel has an antiskid brake.

NOSE LANDING GEAR (NLG)

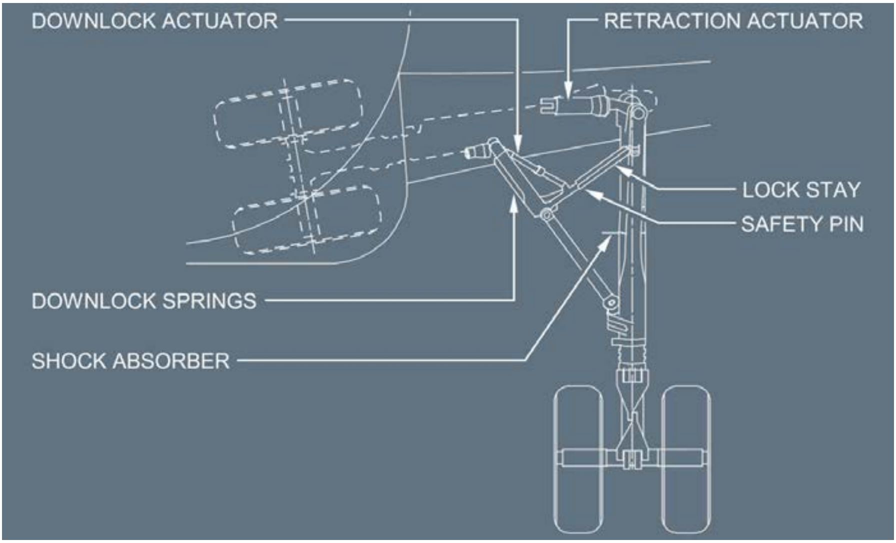
Ident.: DSC-32-10-10-00018600.0001001 / 21 MAR 16
Applicable to: ALL

The two-wheeled nose gear has an oleopneumatic shock strut and a nose wheel steering system.

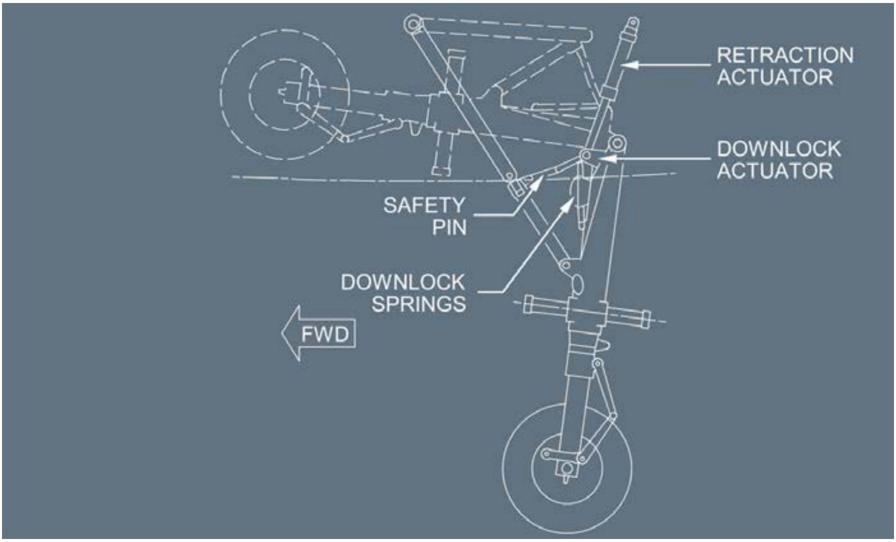
LANDING GEAR EXTENSION AND RETRACTION EQUIPMENT

Ident.: DSC-32-10-10-00018601.0001001 / 21 MAR 16
Applicable to: ALL

MAIN LANDING GEAR



NOSE LANDING GEAR



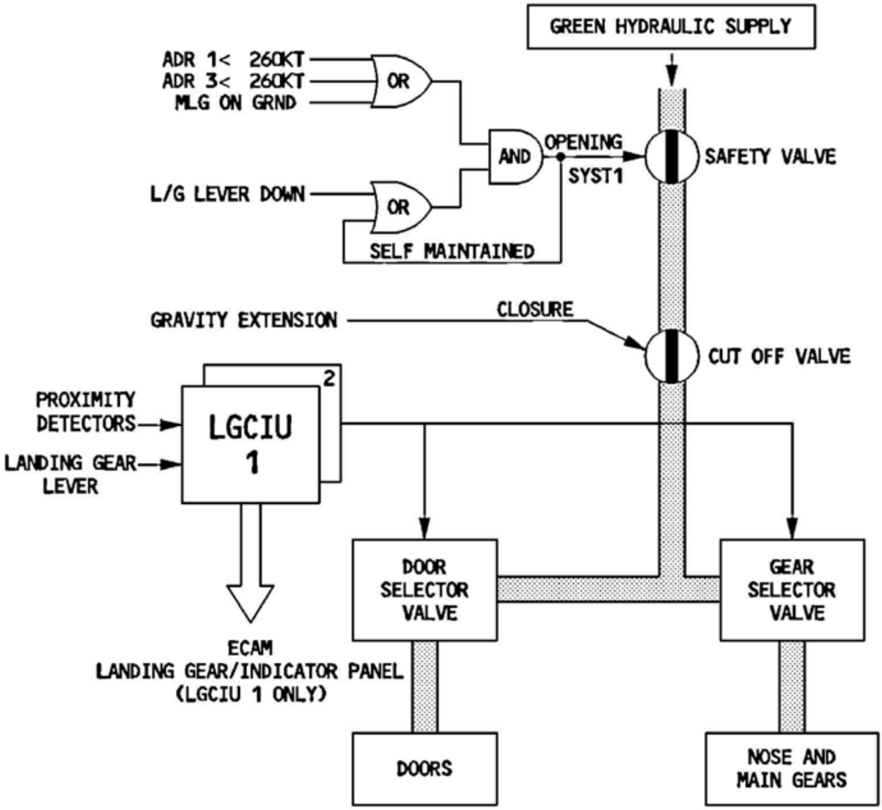
LANDING GEARS AND DOORS OPERATION

Applicable to: ALL

Ident.: DSC-32-10-10-A-00018602.0001001 / 21 MAR 16

NORMAL OPERATION

The flight crew normally operates the landing gear by means of the lever on the center instrument panel.
The LGCIU s control the sequencing of gear and doors electrically. One LGCIU controls one complete gear cycle, then switches over automatically to the other LGCIU at the completion of the retraction cycle. It also switches over in case of failure.
The green hydraulic system actuates all gear and doors. When the aircraft is flying faster than 260 kt, a safety valve automatically cuts off hydraulic supply to the landing gear system. Below 260 kt, the hydraulic supply remains cut off as long as the landing gear lever is up.



Ident.: DSC-32-10-10-A-00018603.0001001 / 21 MAR 16

LANDING GEAR GRAVITY EXTENSION

If the normal system fails to extend the landing gear hydraulically, the flight crew can use a crank to extend it mechanically.

When a crew member turns the crank, it :
- Isolates the landing gear hydraulics from the green hydraulic system
- Unlocks the landing gear doors and the main and nose main gear
- Allows gravity to drop the gear into the extended position.

Locking springs help the crew to crank the main gear into the locked condition, and aerodynamic forces assist in the locking of the nose gear.

The gear doors remain open.
The flight crew can reset the emergency extension system in flight after using it for training (if green hydraulic pressure is available).

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LANDING GEAR CONTROL INTERFACE UNIT (LGCIU)

Applicable to: ALL

Ident.: DSC-32-10-20-A-00018604.0001001 / 21 MAR 16

GENERAL

The LGCIUs receive position information from the landing gear, cargo door, and landing flap systems.

Ident.: DSC-32-10-20-A-00018605.0001001 / 21 MAR 16

LANDING GEAR INFORMATION

The LGCIUs receive landing gear position information from proximity detectors when:
- The landing gears are locked down or up, or
- The shock absorbers are compressed or extended, or
- The landing gear doors are open, or closed, or
- The bogie are aligned or not.

The LGCIUs send the landing gear position data to other aircraft systems.
In case of a LGCIU failure, the landing gear is controlled by the remaining healthy LGCIU.

Ident.: DSC-32-10-20-A-00018606.0001001 / 21 MAR 16

CARGO DOORS INFORMATION

Sensors send to the LGCIUs the position of the following components :
- Manuel selector valves
- Locking shaft
- Locking handle
- Safety shaft
- Door sills ❄ .

The LGCIUs detect electrical failures only in certain proximity switches in the cargo door system :
- Locking shaft
- Locking handle
- Safety shaft.

When an LGCIU makes such a detection, it indicates the NON LOCKED condition for that component.

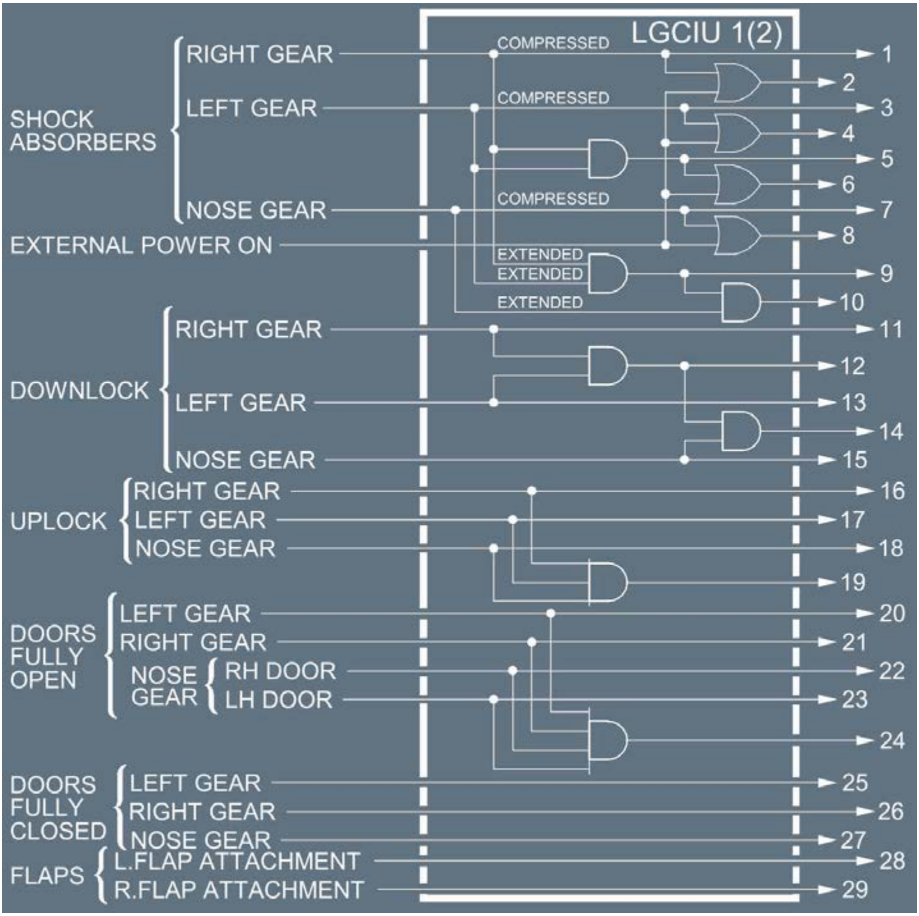
Ident.: DSC-32-10-20-A-00018607.0001001 / 21 MAR 16

LANDING FLAPS INFORMATION

The LGCIU s process the signals from four flap disconnect proximity switches, then send them to the Slat/Flap Control Computers (SFCCs).
The LGCIU s do not monitor failures in the SFCC system.

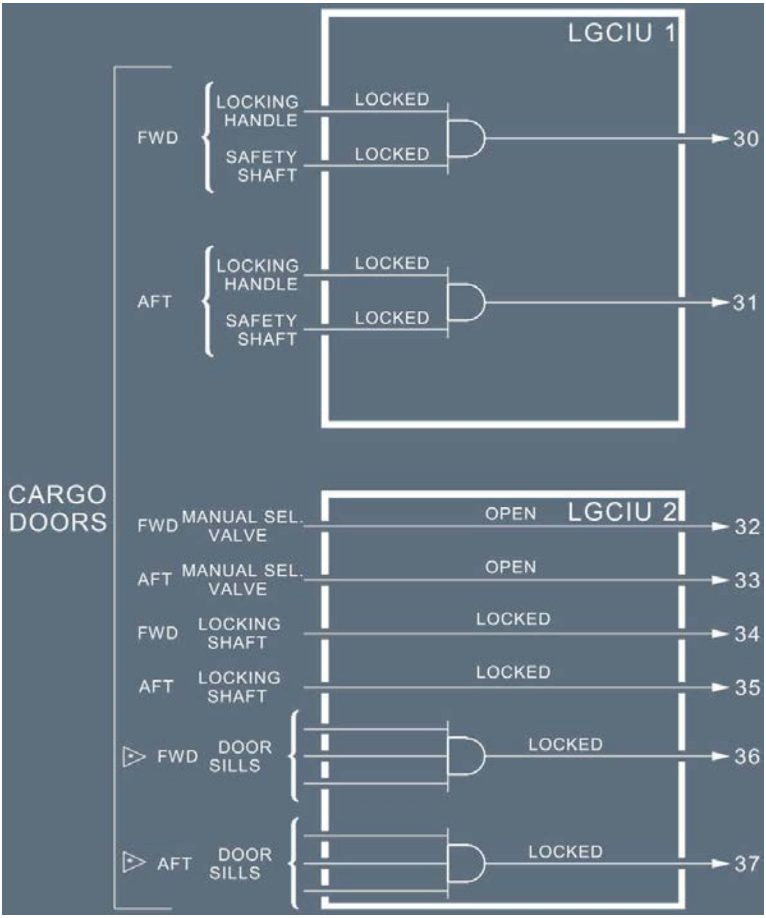
PROXIMITY DETECTOR OUTPUT SIGNALS

Ident.: DSC-32-10-20-00001278.0001001 / 22 MAY 12
Applicable to: ALL



PROXIMITY DETECTOR OUTPUT SIGNALS (CONT'D)

Ident.: DSC-32-10-20-00001279.0001001 / 21 MAR 16
Applicable to: ALL



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GENERAL

Ident.: DSC-32-10-30-00001285.0001001 / 10 DEC 09
Applicable to: ALL

The following tables present the operational effects of the proximity detectors on aircraft systems.
How to read the tables :

SYSTEM	LGCIU 1	LGCIU 2	A/C IN FLT	A/C ON GROUND
SERVICE INTERPHONE	**6**	**6**	....	....
SFCC 1(2)	**5**	**(5)**	....	....

The above lines mean that the service interphone receives the output n° 6 from both LGCIU s, while SFCC 1 receive the output 5 from LGCIU 1 and SFCC 2 the output 5 from LGCIU 2.
The two additional columns give the system functioning when the aircraft is in flight and on the ground.

PROXIMITY DETECTORS ON SHOCK ABSORBERS

Ident.: DSC-32-10-30-00018608.0001001 / 06 SEP 16
Applicable to: ALL

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
GENERAL	STROBE lts		**5**	On when AUTO selected	Off when AUTO selected
	LOGO lts		**5**	Off when flaps retracted	On
	AIRSTAIRS ◁✻	**3**	**1**	Control inhibited(1)	Control not inhibited(2)
	CARGO DOOR(5)		**5**	Normal control not available	Normal control available
	WATER FILLING		**5**	Preselect water servicing inhibited	Preselect water servicing available

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	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
AIR COND	AVNCS COOLING	**5**	**5**	• Skin temp. < 35 °C : The system is in closed conf.[1] • Skin temp. > 35 °C : The system is in intermediate conf.[1]	• Skin temp. < 5 °C : The system is in closed conf.[2] • Skin temp. > 5 °C : The system is in open conf.[2]
	GRND COOLING	**1** **3**	**1** **3**	Inhibited[1]	Not inhibited[2]
	FWD CARGO VENT		**5**	Extract fan stopped when ΔP > 1 PSI	Extract fan on
	CAB PRESS	**5**	**5**	Climb mode active[4]	- Prepressurization active before TO [3] - Depressurization active after LDG [3]
	PACK 1(2) TEMP CONTROL		**3** **(1)**	Pack air inlet flaps opened.	Pack air inlet flap fully closed at TO and LDG
APU	APU AUTO SHUTDOWN	**5**		In case of oil low press, automatic shutdown is delayed by 15.5 s	In case of oil low press, the automatic shutdown is delayed by: • 15.5 s if the oil temp < -4 °C • 0.05 s if oil temp > -4 °C
	APU SPEED CONTROL			Speed is controlled at 100 %	Speed is controlled at 99 % (100 % for ENG start or when ambient temp is below -18 °C or above 35 °C)

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	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
	SERVICE INTERPHONE	**6**	**6**	Inhibited(6)	Available(7)
	PUBLIC ADDRESS	**1** **3**	**1** **3**	P.A. increased level(6)	P.A. low level(7)
	ADIRU and AVIONICS ground warning	**1** **3**	**1** **3**	External horn and light inhibited(6)	External horn and light not inhibited(7)
	FLT INTERPHONE	**9**		Communication with ground mechanic inhibited	Communication with ground mechanic available
COMMUNICATIONS	COCKPIT CALL LIGHT	**9**		Inhibited	Not inhibited
	ACARS (ACARS MU or ATSU)	**7**		Available	Available
	CVR	**1** **3** **7**	**1** **3**	Runs(6)	<u>Runs</u> : (7) - During the first 5 min following energization - With at least one engine running <u>Stops</u> : (7) 5 min after second engine shutdown
	CVR		**5**	• ERASE function inhibited • No low frequency signal in the loudspeakers if test performed	• ERASE function not inhibited • Low frequency signal in the loudspeakers if test performed
ELEC	DC generation	**5**		APU start on batteries only, is delayed by 45 s	No APU start delay when on batteries only
	GALLEY supply		**5**	Main galley not supplied when APU GEN only is supplying	Main galley supplied when APU GEN only is supplying
EIS	EIS	**5**		Display test inhibited when ANN LT TEST is selected	Display test not inhibited
FIRE	APU	**5**		No APU fire automatic extinguishing	Automatic extinguishing not inhibited

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	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
FLT CTL	SFCC 1(2)	**5**	**(5)**	• For SFCC 1(2): Slats alpha/speed lock function active • For SFCC (2): No flaps movement inhibition if the cargo door is opened	• For SFCC 1(2): Slats alpha/speed lock function active if speed > 60 kt • For SFCC (2): Flaps movement inhibition if cargo door is opened
FLT INST	• DFDR • QAR	**1** **3** **7**	**1** **3**	Runs(6)	Runs: (7) • During the first 5 min following energization • With one engine running Stops: (7) 5 min after second engine shut down
FUEL	FQI	**5**		FQI uses flight attitude correction due to wing bending	FQI uses ground attitude correction

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	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
HYD	BLUE and GREEN pumps	**1** **3**		Blue or green pump "FAULT" light not inhibited when related pump is stopped(6)	Blue or green pump "FAULT" light inhibited when related pump is stopped(7)
	BLUE pump	**7**		Runs when electrical power is available	Runs when at least one engine is running
	BLUE and YELLOW pumps		**1** **3**	Blue or yellow pump "FAULT" light not inhibited when related pump is stopped(6)	Blue or yellow pump "FAULT" light inhibited when related pump is stopped(8)
	PTU		**7**	PTU runs if green/yellow diff. press > 500 PSI	PTU runs if green/yellow diff. press > 500 PSI and • Both MASTER LEVERS are at OFF or • Both MASTER LEVERS are at ON or • Nose wheel steering is not in towing position with parking brake released. PTU is inhibited during the use of the cargo door hand pump and for 40 s after its use.
ICE RAIN PROT	CAPT , (F/O), ((STBY)) probes and CAPT , (F/O) windows heating	**4,** **(2)** **((8))**	**4,** **(2)** **((8))**	• CAPT , (F/O), ((STBY)) pitots and CAPT , (F/O) windows : high heating level applied • All other probes and windows are heated(6)	• <u>With engines stopped</u>: no heating(8) • <u>With at least one engine running</u>: CAPT , (F/O), ((STBY)) pitots and CAPT , (F/O) windows are heated at low level(8)
	WING ANTI ICE	**3**	**1**	Wing anti ice valves open when the WING ANTI ICE pb is at ON(6)	Wing anti ice valves open for 30 s when the WING ANTI ICE pb is at ON(8)
	RAIN REPELLENT	**1** **3**	**1** **3**	Not inhibited(6)	Inhibited if engines are stopped(7)
	DRAIN MAST(10)		**9**	High heating level is applied	Low heating level is applied

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	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
LANDING GEAR	L/G SAFETY VALVE	**6**		Safety valve closes if aircraft speed > 260 kt	Safety valve opened
	L/G control	**10**	**10**	Retraction not inhibited(9)	Retraction inhibited(9)
	TIRE PRESS		**5**	"TYRE LO PRESS" warning threshold set to its flight level	"TYRE LO PRESS" warning threshold set to its ground level
NAVIGATION	STAND BY ALTI	**5**		VIBRATION function active	VIBRATION function inhibited
	ATC 1(2)	**3**	**(1)**	ATC 1(2) available in AUTO mode	ATC 1(2) inhibited in AUTO mode
	ADIRU 1(10)	**7**		No external horn when ADIRU supplied from batteries only	External horn not inhibited

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	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
POWER PLANT	FADEC 1(2)	**1 3 8**	**(1) (3) (8)**	On ENG 1(2): (6) • Reverse inhibited • No automatic start abort • FADEC always supplied • FLEX not available • If installed, BUMP not selectable	On ENG 1(2): (8) • Reverse available • Automatic start abort available • 5 min after eng-shut down FADEC 1(2) no more supplied • FLEX available • If installed, BUMP selectable
		1 3 8	**(1) (3) (8)**	Modulated idle and approach idle are available(6)	Modulated idle only available(7)

(1) *When either LGCIU indicates flight.*

(2) *When both LGCIU indicate ground.*

(3) *When either LGCIU indicates ground.*

(4) *When both LGCIU indicate flight.*

(5) *Valid from MSN 44.*

(6) *When either output indicates flight.*

(7) *When all outputs indicate ground.*

(8) *When both outputs indicate ground.*

(9) *One valid output is sufficient.*

(10) *Valid from MSN 22.*

PROXIMITY DETECTORS ON UPLOCKS

Ident.: DSC-32-10-30-00018610.0002001 / 21 MAR 16
Applicable to: ALL

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	L/G UPLOCKED	L/G NOT UPLOCKED
LANDING GEAR	L/G control	**19**	**19**	If UP selected :(1) L/G doors will close	If UP selected :(1) L/G doors will not close
	ECAM WHEEL page	**16** **17** **18**	**16** **17** **18**	If UP selected :(2) L/G uplocked indications	If UP selected :(2) L/G in transit indications
	L/G indicator panel	**16** **17** **18**		If UP selected :(2) no indication	If UP selected :(2) "UNLK" red indications

(1) *One valid output is sufficient.*

(2) *When all outputs indicate the same position.*

PROXIMITY DETECTORS ON DOORS

Ident.: DSC-32-10-30-00018611.0001001 / 21 MAR 16
Applicable to: ALL

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	DOORS FULLY OPENED	DOORS CLOSED
LANDING GEAR	L/G control	**24**	**24**	L/G extension or retraction possible (1)	L/G extension or retraction inhibited (1)
	ECAM WHEEL page	**20** **21** **22** **23**	**20** **21** **22** **23**	Doors fully opened indication	Doors closed indication

(1) *One valid output is sufficient.*

PROXIMITY DETECTORS ON DOWNLOCKS

Ident.: DSC-32-10-30-00018613.0001001 / 21 MAR 16
Applicable to: ALL

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	L/G DOWNLOCKED	L/G NOT DOWNLOCKED
GEN	TAXI/T.O lights		**15**	Lights not inhibited	Lights inhibited
COMM	SIGNS	**12**	**12**	"NO SMOKING" (1)and "EXIT" signs on when AUTO selected(2)	"NO SMOKING" (1)and EXIT" signs inhibited when AUTO selected(3)

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	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	L/G DOWNLOCKED	L/G NOT DOWNLOCKED
FLT INST	WBS	**15**	**15**	Active (4)	Inhibited (5)
FMGS	FAC 1(2)	**12**	**12**	VLE indication displayed on PFD 1(2)	No VLE indication
LANDING GEAR	L/G control	**14**	**14**	If DOWN selected : (6) L/G doors will close	If DOWN selected : (6) L/G doors will not close
	ECAM WHEEL page	**11** **13** **15**	**11** **13** **15**	If DOWN selected : (7) L/G down indications	If DOWN selected : (7) L/G in transit indications
	L/G INDIC panel	**11** **13** **15**		If DOWN selected :(7) L/G down indications	If DOWN selected : (7) L/G in transit indications
	BRAKING STEERING	**15**	**15**	BSCU test operative(2)	BSCU test inhibited(3)
	BRAKE COOLING FANS		**13**	Cooling available when ON selected	Cooling inhibited when ON selected
NAV	GPWS	**13**		"TOO LOW-FLAPS" or "TOO LOW TERRAIN" warning operative	"TOO LOW-GEAR" or "TOO LOW TERRAIN" warning operative

(1) *For cabin not configured for non smoking flight*

(2) *When either output indicates DOWNLOCK.*

(3) *When both outputs indicate NOT DOWNLOCK.*

(4) *When both outputs indicate DOWNLOCK.*

(5) *When either output indicates NOT DOWNLOCK.*

(6) *One valid output is sufficient.*

(7) *When all outputs indicate the same position.*

PROXIMITY DETECTORS ON CARGO DOORS

Ident.: DSC-32-10-30-00018614.0001001 / 21 MAR 16
Applicable to: ALL

LOCKING HANDLE OR SHAFT, DOOR SILLS

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	LOCKED	UNLOCKED
CRG DOORS	ECAM DOOR PAGE	**30 (31)**		Forward (aft) door symbol appears green	Forward (aft) door symbol appears amber, associated with "CARGO" amber
	CARGO DOOR OPERATION		**34 (35)**	Forward (aft) door normal opening inhibition	Forward (aft) door normal opening possible
			36 (37)	Forward (aft) door normal operation possible	Forward (aft) door normal operation inhibited

MANUAL SELECTOR VALVE

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	CLOSE	OPEN
CRG DOORS	CARGO DOOR OPERATION		**32 (33)**	Forward (aft) door normal opening inhibition	Forward (aft) door normal opening possible

PROXIMITY DETECTORS ON FLAPS ATTACHMENTS

Ident.: DSC-32-10-30-00001291.0001001 / 22 MAR 16
Applicable to: ALL

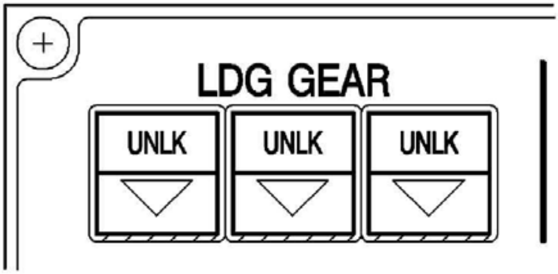
	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	FLAP ATTACHMENT	FLAP ATTACHMENT FAILURE
FLT CTL	SFCC	**28 (29)**	**28 (29)**	L(R) FLAPS normal operation (1)	"FLAPS LOCKED" warning (2)

(1) *When at least one SFCC detects normal operation*

(2) *When both SFCCs detect attachment failure*

LANDING GEAR INDICATOR PANEL

Ident.: DSC-32-10-40-00018615.0001001 / 21 MAR 16
Applicable to: ALL



This panel is connected to LGCIU1, which receives signals from proximity detectors.

▿ light: comes on green if the gear is locked down.

UNLK: light comes on red if the gear is not locked in the selected position.

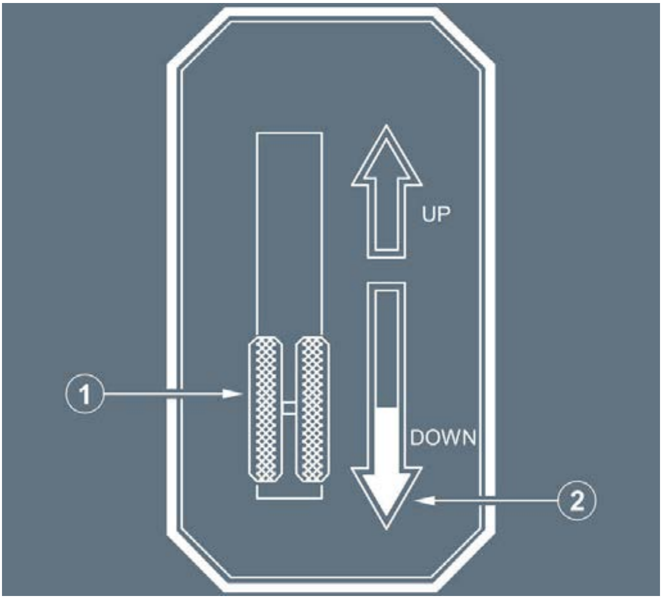
Note: *This panel is connected to the LGCIU1 only, therefore, the lights on the LDG GEAR indicator panel come on as long as the LGCIU1 is electrically supplied.*
If one UNLK indication remains on, the landing gear position can be confirmed using the WHEEL SD page (information from LGCIU 1 & 2). Only one green triangle on each landing gear is sufficient to confirm that the landing gear is downlocked.

LANDING GEAR SELECTOR LEVER

Ident.: DSC-32-10-40-00018616.0001001 / 20 MAY 16
Applicable to: ALL

A two-position selector lever sends electrical signals to the two LGCIUs. These control the green hydraulic supply to the landing gear system by means of selector valves.
The flight crew must always move the L/G lever in one continuous movement (i.e. with no stop between both positions).

When the flight crew selects UP or DOWN (and if the airspeed is below 260 kt):
- All landing gear doors open
- Each landing gear moves to the selected position
- All landing gear doors close.



(1) L/G LEVER

UP : This position selects landing gear retraction.
While the landing gear doors are opening, the normal brake system brakes the wheels of the main landing gear automatically.
A brake band in the nose landing gear well brakes the nose landing gear wheels as the doors close (for aircraft equipped with nose landing gear rubbing strips).

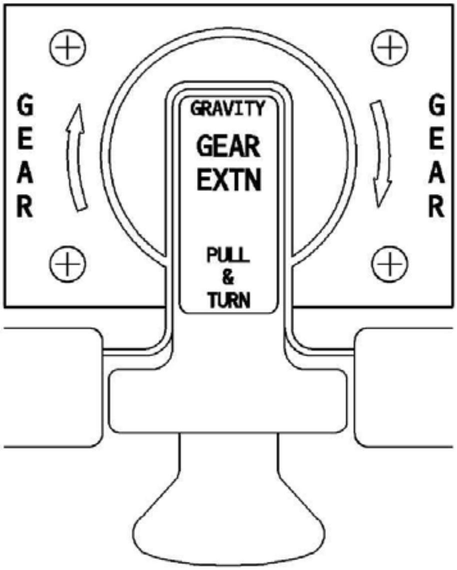
DOWN : This position selects landing gear extension.
An interlock mechanism prevents anyone from accidentally retracting the gear while the aircraft is on the ground. It does so by locking the lever in DOWN position when the shock absorber on either main gear is compressed (aircraft on ground) or the nose wheel steering is not centered.
The landing gear hydraulic system remains pressurized as long as the landing gear is extended (if green hydraulic pressure is available).

(2) RED ARROW

This red arrow lights up if the landing gear is not locked down when the aircraft is in the landing configuration, and a red warning appears on ECAM.

LANDING GEAR GRAVITY EXTENSION

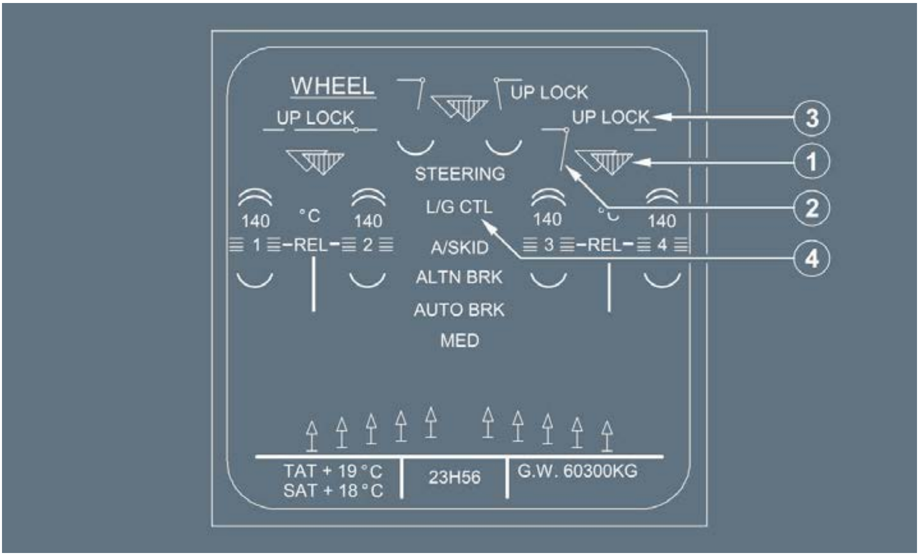
Ident.: DSC-32-10-40-00018617.0001001 / 21 MAR 16
Applicable to: ALL



To put the landing gear down by gravity, the flight crew must pull the gear crank out, then turn it clockwise for 3 turns.
When the flight crew operates the crank handle, the cutout valve shuts off hydraulic pressure to the landing gear system and depressurizes it.

WHEEL SD PAGE

Ident.: DSC-32-10-40-00018618.0001001 / 21 MAR 16
Applicable to: ALL



(1) Landing gear position indication
The landing gear positions are indicated by 2 triangles for each gear. The indications are as follow:

- Green triangle indicates that one LGCIU detects a landing gear downlocked
- Red triangle indicates that one LGCIU detects a landing gear in transit
- No triangle indicates that one LGCIU detects a landing gear uplocked
- Amber crosses indicate that one LGCIU is failed.

Note: *Only one green triangle on each landing gear strut is sufficient to confirm that the landing gear is downlocked.*

(2) Landing gear door position indication

(3) UP LOCK
This legend appears amber along with a caution on the ECAM if the landing gear uplock is engaged when the landing gear is down locked.

(4) L/G CTL
This legend appears amber along with an ECAM caution if the landing gear lever and the landing gear position do not agree. This legend only appears when the landing gear is moving to the selected position.

MEMO DISPLAY

Ident.: DSC-32-10-40-00018778.0001001 / 22 MAR 16
Applicable to: ALL

FLT L/G DOWN : This memo appears in green if the aircraft is operated in ferry flight conditions with landing gear down.

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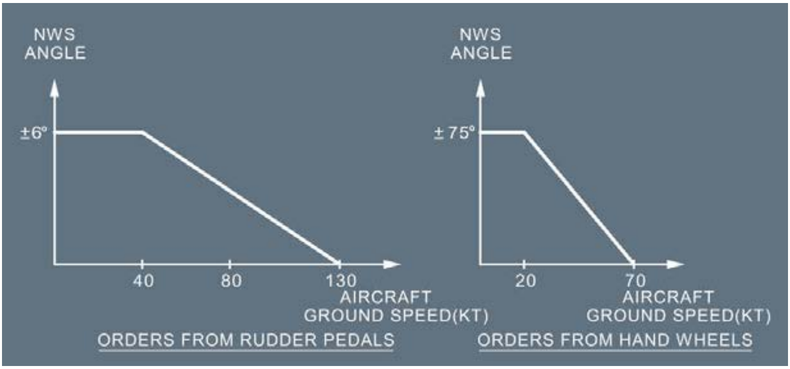
DESCRIPTION

Ident.: DSC-32-20-10-00018619.0001001 / 21 MAR 16
Applicable to: ALL

A hydraulic actuating cylinder steers the nose wheel. The green hydraulic system supplies pressure to the cylinder, and electric signals from the Brake and Steering Control Unit (BSCU) control it.

The BSCU receives orders from:
- Captain's, and the First Officer's steering hand wheels (orders added algebraically), or
- Rudder pedals, or
- Autopilot.

The BSCU transforms these orders into nose wheel steering angle. That angle has the following limits, which depend on ground speed and the origin of the orders.

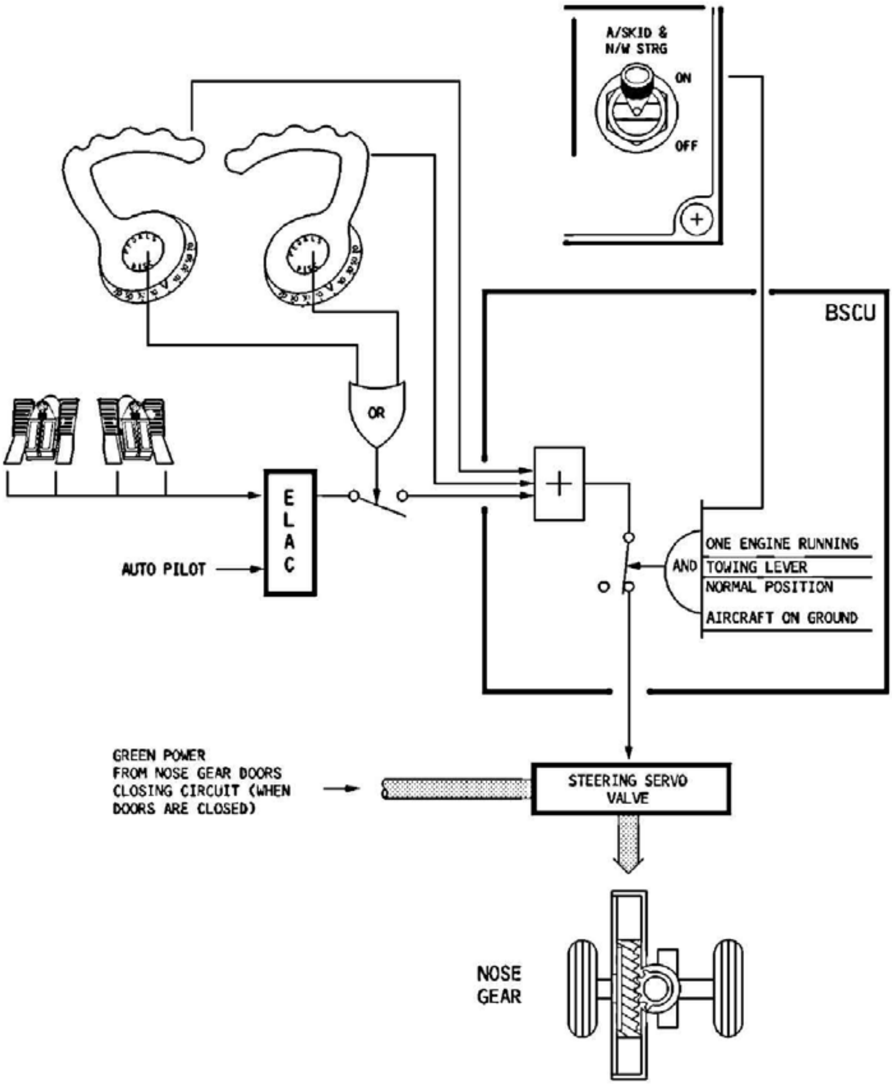


The steering system receives actuating hydraulic pressure when:
- A/SKID & N/W STRG switch is ON
- Towing control lever is in normal position
- At least one engine is running
- Aircraft is on ground.

The nose landing gear doors must be closed in order for the green hydraulic system to apply pressure to the actuating cylinder.
The handwheel can turn the nose wheel up to 75 ° in either direction. A lever on the towing electrical box (on nose landing gear) allows ground crew to deactivate the steering system for towing. This then allows the wheel to be turned 95 ° in either direction.
The pilots can use a pushbutton on either steering handwheel to prevent rudder pedal orders or autopilot orders from going to the BSCU.
An internal cam mechanism returns the nose wheel to the centered position after takeoff.

ARCHITECTURE

Ident.: DSC-32-20-10-00001298.0001001 / 21 MAR 16


A/SKID &
N/W STRG
ON
OFF
BSCU
OR
E
L
A
C
AUTO PILOT
ONE ENGINE RUNNING
AND
TOWING LEVER
NORMAL POSITION
AIRCRAFT ON GROUND
GREEN POWER
FROM NOSE GEAR DOORS
CLOSING CIRCUIT (WHEN
DOORS ARE CLOSED)
STEERING SERVO
VALVE
NOSE
GEAR

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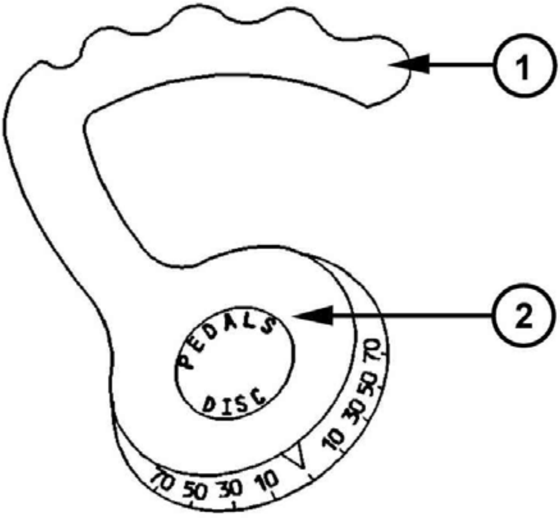
SIDE CONSOLES

Ident.: DSC-32-20-20-00018620.0001001 / 21 MAR 16
Applicable to: ALL



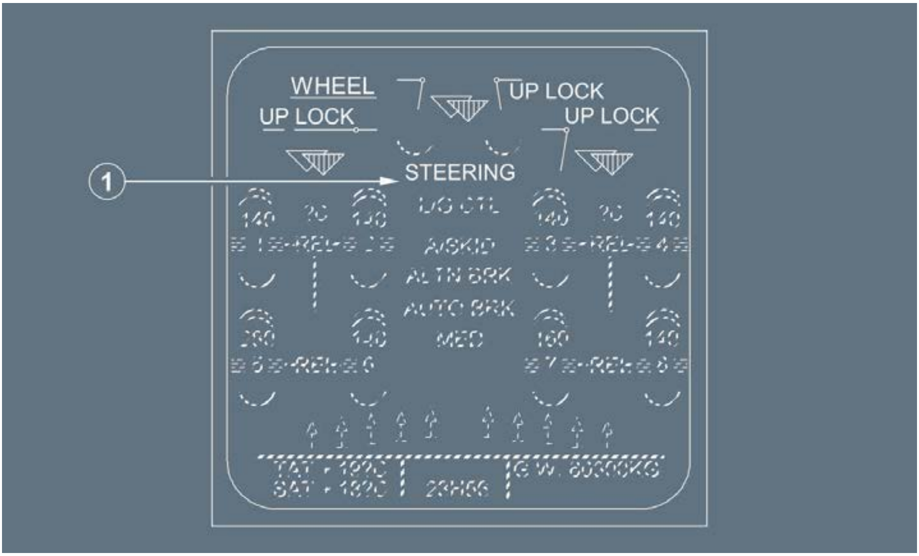
(1) Steering handwheels
The steering handwheels, which are interconnected, can steer the nose wheel up to 75 ° in either direction.

Note: *The steering system centers the nose wheel automatically after liftoff.*

(2) Rudder PEDALS DISC pb
Pressing this button on either handwheel removes control of nose wheel steering from the rudder pedals until the button is released.

WHEEL SD PAGE

Ident.: DSC-32-20-20-00018622.0001001 / 21 MAR 16
Applicable to: ALL



(1) STEERING indication
It appears along with an ECAM caution if either the nose wheel steering or the anti-skid feature fails.

MEMO DISPLAY

Ident.: DSC-32-20-20-00016853.0001001 / 10 AUG 15
Applicable to: ALL

NW STRG DISC : This memo appears in green, when the nose wheel steering selector is in the towing position.

NW STRG DISC : This memo appears in amber, if one engine is running.

GENERAL

Ident.: DSC-32-30-10-00018623.0001001 / 21 MAR 16
Applicable to: ALL

The main wheels are equipped with carbon multidisc brakes, which can be actuated by either of two independent brake systems.
The normal system uses green hydraulic pressure, whereas the alternate system uses the yellow hydraulic system backed up by the hydraulic accumulator.
An anti-skid and autobrake system is also provided.
Braking commands come from either the brake pedals (pilot action), or the autobrake system (deceleration rate selected by the crew).
Two units on each main gear monitor the temperature of the brakes.
All braking functions (normal and alternate braking control, anti-skid control, autobraking, brake temperature indication) are controlled by a two-channel Brake and Steering Control Unit (BSCU).
The main gear wheels are fitted with fusible plugs which protect against tire burst, in the event of overheat.
Main gear wheels are also equipped with brake cooling fans , which permit a high speed cooling of brakes.

ANTI-SKID SYSTEM

Ident.: DSC-32-30-10-00018624.0001001 / 21 MAR 16
Applicable to: ALL

The antiskid system provides maximum braking efficiency by maintaining the wheels at the limit of an impending skid.
At skid onset, brake release orders are sent to the normal and alternate servovalves, as well as to the ECAM system which displays the released brakes.
Without using autobrake, full braking performance is achieved only with brake pedals at full deflection.
The antiskid system is deactivated below 20 kt (ground speed).
An ON/OFF switch activates, or deactivates, the antiskid and nosewheel steering systems.

PRINCIPLE

The speed of each main gear wheel (given by a tachometer) is compared to the aircraft speed (reference speed). When the speed of a wheel decreases below approximately 0.87 times (depending on conditions) reference speed, brake release orders are given to maintain the wheel slip at that value (best braking efficiency).
In normal operation, the reference speed is determined by the BSCU from the horizontal acceleration of ADIRU 1, or ADIRU 2, or ADIRU 3.

In case all ADIRUs fail, reference speed equals the maximum of either main landing gear wheel speeds.

AUTO BRAKE

Applicable to: ALL

Ident.: DSC-32-30-10-A-00018625.0001001 / 21 MAR 16

GENERAL

The purposes of the autobrake system are the following:
- Reduce the braking distance in case of an aborted takeoff
- Establish and maintain a selected deceleration rate during landing, thereby improving passenger comfort and reducing crew workload.

Ident.: DSC-32-30-10-A-00018626.0002001 / 21 MAR 16

SYSTEM ARMING

The crew may arm the system by pressing the LO, MED , or MAX pushbutton provided all the following arming conditions are met :
- Green pressure available
- Anti-skid electrically-powered
- No failure in the braking system
- At least one ADIRU is available.

Note: *1. Auto brake may be armed with the parking brake on.*
2. MAX autobrake mode cannot be armed in flight.

Ident.: DSC-32-30-10-A-00018627.0002001 / 21 MAR 16

SYSTEM ACTIVATION

Automatic braking is activated when:
- The command for ground spoilers extension is detected (*Refer to DSC-27-10-20 Speed Brakes and Ground Spoilers - Speed Brake Control*), for LO and MED mode, or
- The command for ground spoilers extension is detected, and the aircraft speed is above 40 kt, for MAX mode.

Therefore, if the aircraft makes an acceleration stop and begins to decelerate when its speed is under 72 kt, the automatic braking will not activate because the ground spoilers will not extend. For autobrake to activate, at least two SEC's must be operative.

Ident.: DSC-32-30-10-A-00018628.0001001 / 21 MAR 16

SYSTEM DEACTIVATION

The system deactivates when:
- The system disarmed (*Refer to DSC-32-30-10 Auto Brake - System Disarming*), or
- The ground spoilers retract. In this case it remains armed.

Ident.: DSC-32-30-10-A-00018629.0002001 / 21 MAR 16

The system disarms when:
- Flight crew presses the pushbutton switch, or
- One or more arming conditions is lost, or
- After take-off/touch and go, or
- Flight crew applies enough deflection to at least one brake pedal when autobrake is active in MAX , MED or LO mode.

BRAKING MODES

Applicable to: ALL

Ident.: DSC-32-30-10-B-00018630.0001001 / 21 MAR 16

GENERAL

There are four modes of operation:
- Normal braking
- Alternate braking with antiskid
- Alternate braking without antiskid
- Parking brake.

Ident.: DSC-32-30-10-B-00018631.0001001 / 21 MAR 16

NORMAL BRAKING

Normal braking is operative when:
- Green hydraulic pressure is available
- A/SKID & N/W STRG switch is ON.

During normal braking, antiskid is operative and autobrake is available.

Braking is electrically-controlled through the BSCU from:
- Pilot's pedals, or
- Automatically activates when:
  - On ground by the autobrake system, or
  - In flight when the landing gear lever is up.

The antiskid system is controlled by the BSCU via the normal servo valves.

There is no brake pressure indication in the cockpit.

Ident.: DSC-32-30-10-B-00018632.0001001 / 17 MAR 17

ALTERNATE BRAKING WITH ANTI-SKID

Autobrake is inoperative.

Braking uses this mode when green hydraulic pressure is insufficient, and :
- Yellow hydraulic pressure is available
- A/SKID & N/W STRG switch is ON
- Parking brake is not ON.

An automatic hydraulic selector changes from the green to the yellow system.
The pedals brake through the auxiliary low-pressure hydraulic distribution line acting on the dual valves. The BSCU controls the anti-skid system via the alternate servo valves.
A triple indicator on the center instrument panel indicates the pressure delivered to the left and right brakes, as well as the accumulator pressure.

Note: *Initial pedal force or displacement produces more braking action in alternate mode than in normal mode.*

Ident.: DSC-32-30-10-B-00018633.0001001 / 17 MAR 17

ALTERNATE BRAKING WITHOUT ANTI-SKID

The anti-skid system can be deactivated:
- Electrically (A/SKID & N/W STRG sw OFF, or power failure or BSCU failure), or
- Hydraulically (low pressure in both green and yellow systems, brakes being supplied by the brake accumulator only).

The pilot controls the braking with the pedals (acting on the dual valves).
Alternate servo valves are fully open.
Brake pressure and accumulator pressure are indicated on a triple indicator, located on the center instrument panel. The pilot must modulate brake pressure at, or below, 1 000 PSI in order to avoid wheel locking.
The accumulator can supply at least 7 full brake applications.

Note: *Initial pedal force or displacement produces more braking action in alternate mode than in normal mode.*

Ident.: DSC-32-30-10-B-00018634.0001001 / 21 MAR 16

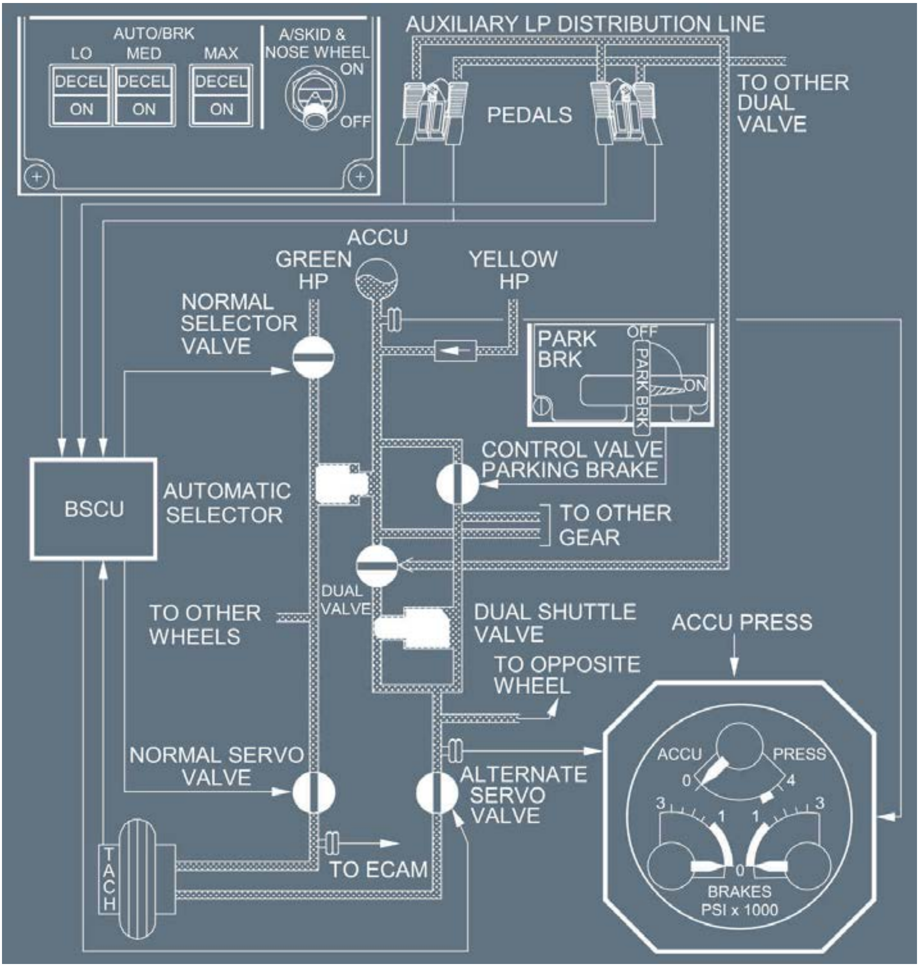
PARKING BRAKE

Brakes are supplied by the yellow hydraulic system, or by accumulator via the dual shuttle valves.
Alternate servo valves open allowing full pressure application.
The accumulator maintains the parking pressure for at least 12 h.

If the parking brake is activated and no yellow hydraulic or accumulator brake pressure is available, then the normal braking system can be applied via the brake pedals.
Yellow accumulators can be pressurized by pressing the yellow electrical pump switch.
A triple indicator on the center instrument panel indicates the pressure delivered to the left and right brakes, as well as the accumulator pressure.

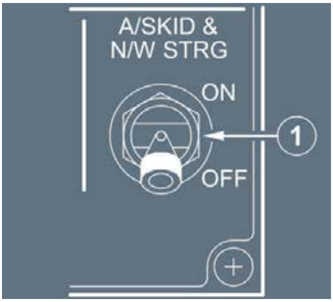
BRAKING SCHEMATIC

Ident.: DSC-32-30-10-00001316.0004001 / 09 OCT 12
Applicable to: ALL



CENTER INSTRUMENT PANEL

Ident.: DSC-32-30-20-00018635.0001001 / 21 MAR 16
Applicable to: ALL

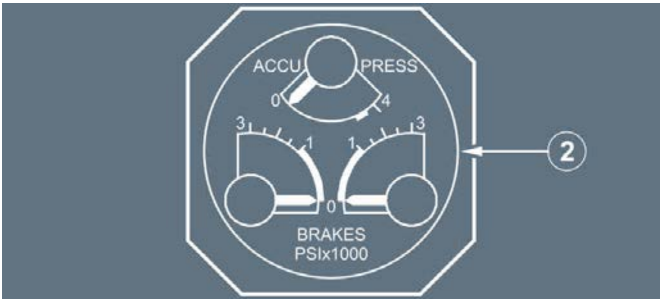


(1) A/SKID & N/W STRG sw

ON : If green hydraulic pressure is available:
- Antiskid is available
- Nosewheel steering is available.

If green hydraulic pressure is lost, then:
- Yellow hydraulic pressure automatically takes over to supply the brakes
- Antiskid remains available
- Nosewheel steering is lost
- Triple indicator displays yellow system brake pressure.

OFF : The yellow hydraulic system supplies pressure to the brakes.
- Antiskid is deactivated. The pilot must refer to the triple indicator to limit brake pressure and avoid locking a wheel
- Nosewheel steering is lost
- Differential braking remains available through the pedals
- Triple indicator displays yellow system brake pressure.



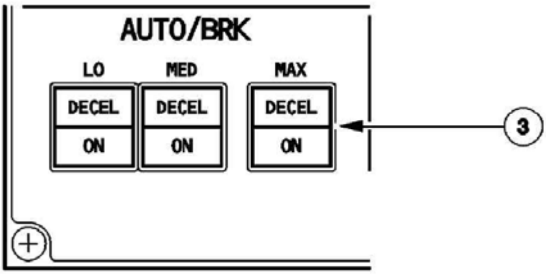
(2) BRAKES and ACCU PRESS indicator

ACCU PRESS : Indicates the pressure in the yellow brake accumulator.

BRAKES : Indicates the yellow pressure delivered to the left and right brakes, as measured upstream of the alternate servovalves.

AUTO BRK PANEL

Ident.: DSC-32-30-20-00018636.0002001 / 21 MAR 16
Applicable to: ALL



(3) AUTO/BRK panel

The springloaded MAX , MED , and LO pushbutton switches arm the appropriate deceleration rate. The usage for each mode are as follow:
- MAX mode is normally selected for takeoff.
  In the case of an aborted takeoff, maximum pressure goes to the brakes, as soon as the system generates the ground spoiler deployment order
- MED or LO mode is normally selected for landing:
  - MED mode sends progressive pressure to the brakes 2 s after the ground spoilers deploy in order to decelerate the aircraft at 3 m/s² (9.8 ft/s²)
  - LO mode sends progressive pressure to the brakes 4 s after the ground spoilers deploy, in order to decelerate the aircraft at 1.7 m/s² (5.6 ft/s²).

The lighting on the pushbutton switches are as follow:

ON light : comes on blue to indicate positive arming

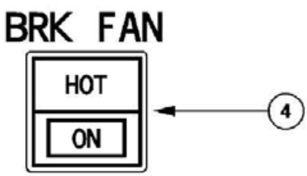
DECEL light : comes on green when the actual deceleration is 80 % of the selected rate

Note: *On slippery runways, the predetermined deceleration may not be reached, due to antiskid operation. In this case, the DECEL light will not come on. This does not mean that autobrake is not working.*

Off : The corresponding autobrake mode is not armed

BRAKE FAN

Ident.: DSC-32-30-20-00018637.0001001 / 21 MAR 16
Applicable to: ALL



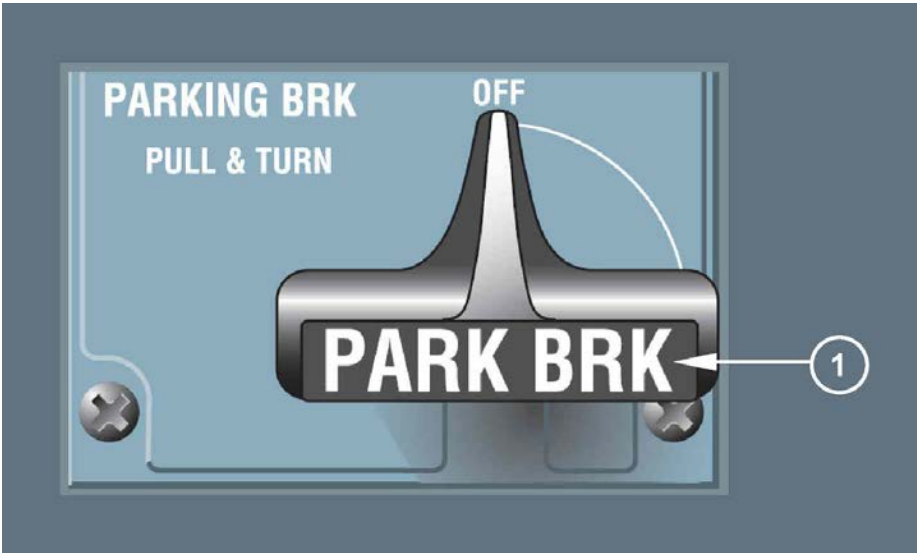
(4) BRK FAN pb-sw

ON light : The brake fans run if the lefthand main landing gear is down and locked

Off	:	The brake fans stop
HOT light	:	This amber light comes on when the brakes get too hot (A caution appears on ECAM, also)

PEDESTAL

Ident.: DSC-32-30-20-00018638.0001001 / 21 MAR 16
Applicable to: ALL

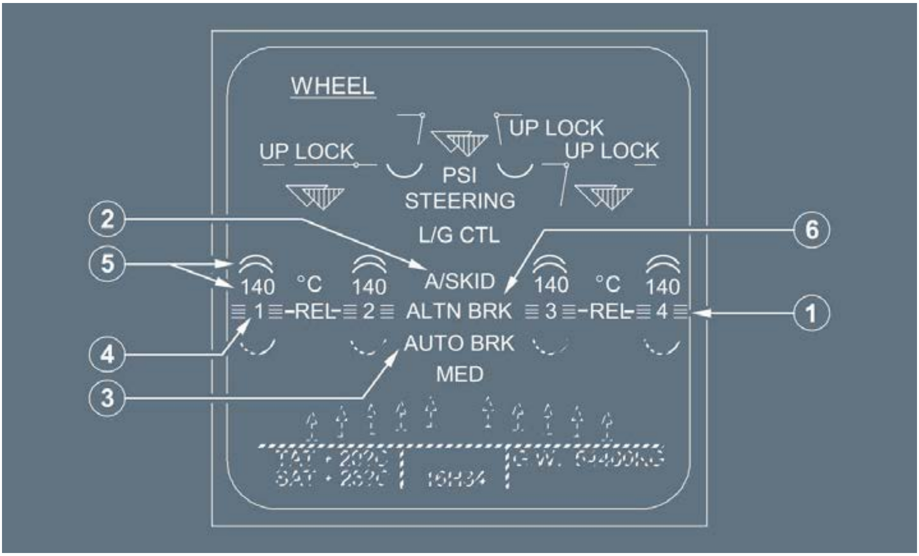


(1) PARKING BRK handle
Flight crew pulls this handle, then turns it clockwise, to apply the parking brake.
The ECAM memo page displays “PARK BRK”.

CAUTION	If the pointer is not at ON, the parking brake is not on.

WHEEL SD PAGE

Ident.: DSC-32-30-20-00018639.0001001 / 21 MAR 16
Applicable to: ALL



(1) Release indicators

These green lines appear temporarily after the landing gear has been lowered to indicate that the anti-skid function is ready.
They reappear after touchdown, along with REL (blue), when the anti-skid is active.

(2) A/SKID

This legend appears in amber, along with an ECAM caution, in case of total BSCU failure, or when the A/SKID & N/W STRG sw is OFF, or if the BSCU detects an ANTI-SKID failure.

(3) AUTO BRK

This legend appears:
- In green when auto brake is armed, or
- Flashing green for 10 s after autobrake disengagement, or
- In amber, along with an ECAM caution, to indicate a system failure.

MED , LO, or MAX appears underneath in green to show which rate has been selected.

(4) Wheel number

This white number identifies individual wheels of the main landing gear.

(5) Brake temperature

- Temperature normally appears in green.
- Green arc appears on the hottest wheel when one brake temperature exceeds 100 °C.
- Green arc becomes amber, and an ECAM caution appears, when the corresponding brake temperature exceeds 300 °C.

(6) ALTN BRK
This legend appears in green if the braking system is in alternate mode.

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-32-30-20-A-00016854.0001001 / 22 MAR 16

AUTO BRK LO/MED/MAX : This memo appears in green, depending on the selection of the AUTO BRK pb.

Ident.: DSC-32-30-20-A-00016855.0001001 / 22 MAR 16

AUTO BRK OFF : This memo appears in green if the auto brake is failed.

Ident.: DSC-32-30-20-A-00016856.0001001 / 22 MAR 16

BRK FAN : This memo appears in green if the BRK FAN pb is ON.

Ident.: DSC-32-30-20-A-00016857.0001001 / 22 MAR 16

PARK BRK : This memo appears in green, if the parking brake is ON, during flight phases 1, 2, 9 and 10.

AIRCRAFT SYSTEMS

LIGHTS

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GENERAL

Ident.: DSC-33-10-10-00017615.0001001 / 21 MAR 16
Applicable to: ALL

The instrument panel has both integral instrument lighting and flood lighting.
The brightness of all panel lighting is adjustable.
Spot lights and flood lights provide lighting for all work surfaces and the side consoles.
Two dimmable dome lights provide lighting for the overall cockpit. When the batteries are supplying electrical power, only the right-hand dome light is on line.

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DESCRIPTION

Ident.: DSC-33-10-20-00017616.0001001 / 21 MAR 16
Applicable to: ALL

INTEGRATED LIGHTING FOR INSTRUMENTS AND PANELS

All instruments and panels in the cockpit (other than display units) have integral lighting.
The flight crew can adjust the brightness of all integral lighting.

ANNUNCIATOR LIGHTS

The ANN LT sw on the overhead panel controls the brightness of all the annunciator lights in the cockpit.
The ANN LT sw sets the brightness of all annunciator lights at the same level.
The flight crew can test the annunciator lights with the following procedure: Set the ANN LT sw to the TEST position, and check to see that all the annunciator lights come on.

DOME LIGHTS

Two dome lights provide the cockpit with shadow-free lighting.

MAP HOLDER LIGHTING

Each flight crewmember has a map holder that can be lighted.

CONSOLE AND BRIEFCASE LIGHTING

Each flight crewmember has lighting for briefcase stowage, the side console, and the floor.

CENTER INSTRUMENT PANEL

Lights under the glareshield provide lighting for the center instrument panel.

STANDBY COMPASS

The standby compass has integral lighting.

READING LIGHTS

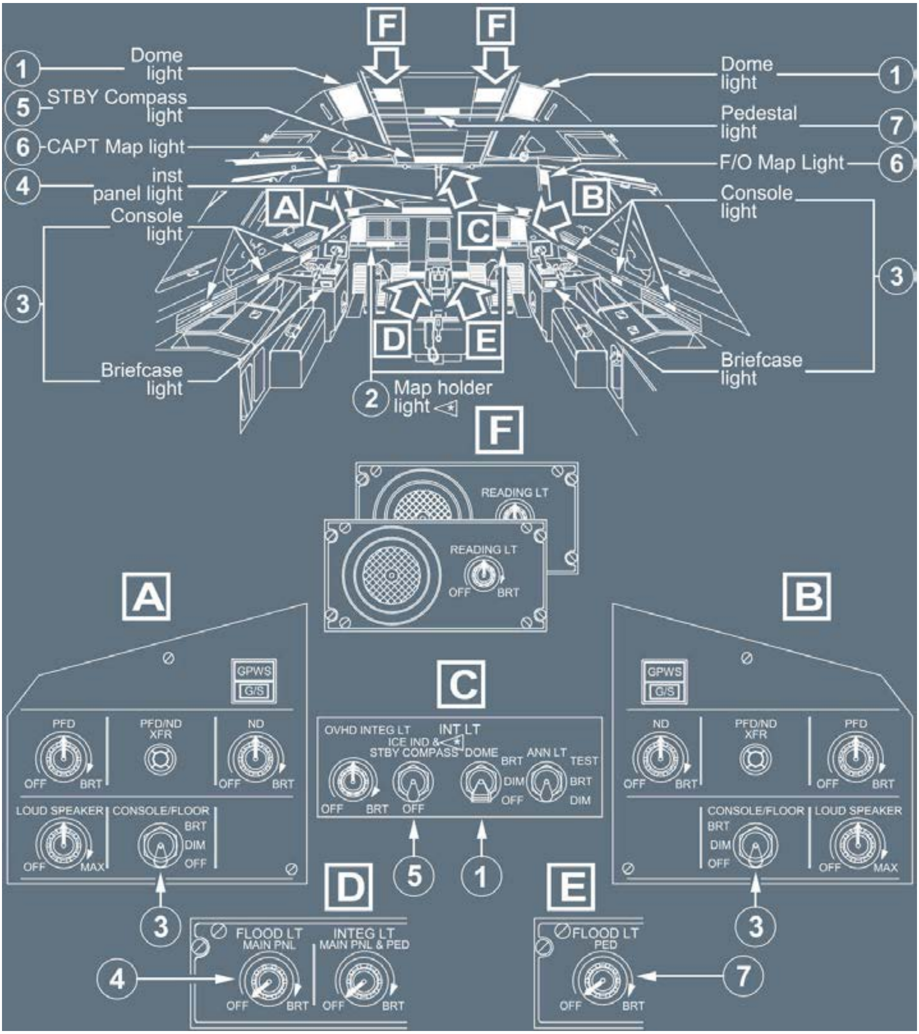
Each flight crewmember has a reading light.

PEDESTAL LIGHTING

A flood light in the middle of the overhead panel provides lighting for the center pedestal.

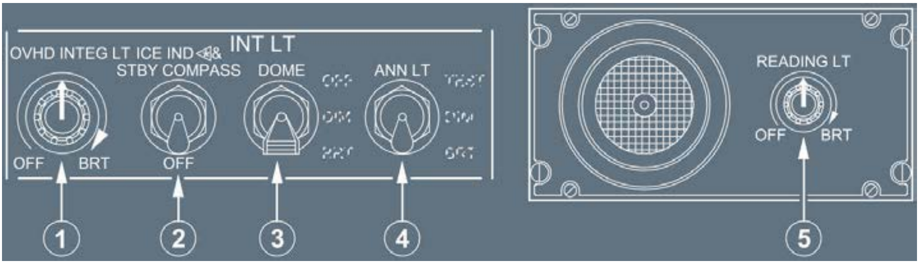
SCHEMATIC

Ident.: DSC-33-10-20-00001336.0002001 / 05 FEB 14
Applicable to: ALL



OVERHEAD PANEL

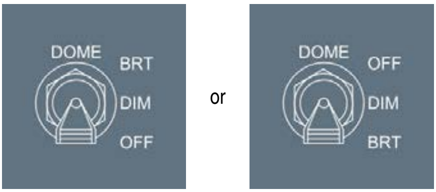
Ident.: DSC-33-10-30-00017617.0001001 / 21 MAR 16
Applicable to: ALL



(1) OVHD INTEG LT knob
This knob turns the overhead panel's integral lighting on and off, and adjusts its brightness.

(2) ICE IND & STBY COMPASS sw
This switch turns the standby compass light and the external ice detector light on and off.

(3) DOME sw
The DOME sw controls both dome lights.
The DOME sw can have one of the two following configurations:



BRT : Both dome lights are on and bright.
DIM : Both dome lights are on and dim.
OFF : Both dome lights are off.

(4) ANN LT sw
The ANN LT sw controls all the flight deck annunciator lights.
The ANN LT sw can have one of the two following configurations:

or

TEST : All flight deck annunciator lights turn On.
The figure '8' is displayed on all Liquid Crystal Display (LCD) of the FCU.

DIM : Reduces the brightness of all flight deck annunciator lights.

BRT : All flight deck annunciator lights operate normally.

Note: When the ANN LT sw is set to TEST, do not reconfigure the DU (ECAM /ND transfer) or the DMC (DMC switching).

(5) READING LT knob
The reading light on each side of the overhead panel has its own control knob that turns it on and off and adjusts its brightness.

MAINTENANCE PANEL

Ident.: DSC-33-10-30-00001338.0001001 / 22 MAY 12
Applicable to: ALL

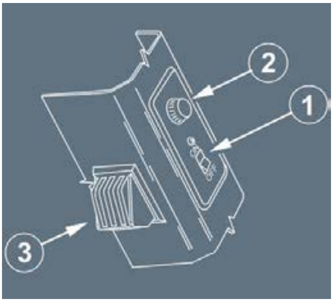
(1) AVIONICS COMPT LT pushbutton switch

AUTO : avionic compartment lighting is automatically controlled by door opening.

ON : avionic compartment lighting is on.

LATERAL WINDOW

Ident.: DSC-33-10-30-00001339.0002001 / 05 FEB 14
Applicable to: ALL



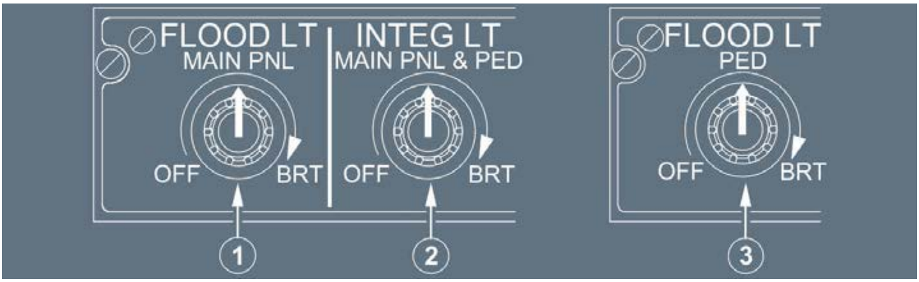
(1) Map light sw (Captain and F/O)

(2) Brightness adjustment knob

(3) Light

PEDESTAL

Ident.: DSC-33-10-30-00017619.0001001 / 21 MAR 16
Applicable to: ALL



(1) FLOOD LT MAIN PNL knob
Turns on or off, and adjusts the brightness of the main instrument panel.

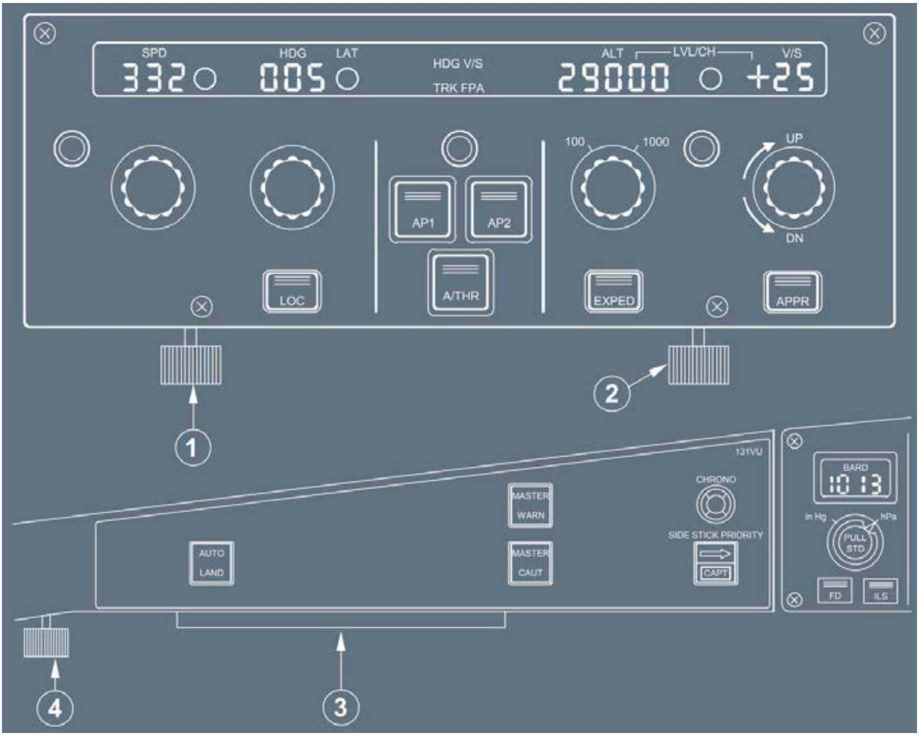
(2) INTEG LT MAIN PNL & PED knob
Turns on or off, and adjusts the brightness of the integral lights of:

- The main instrument panel
- The center pedestal.

(3) FLOOD LT PED knob
Turns on or off, and adjusts the brightness of the pedestal lights.

GLARESHIELD

Ident.: DSC-33-10-30-00001341.0002001 / 21 JAN 14
Applicable to: ALL



(1) This knob adjusts the brightness of the integral lighting on the glareshield.

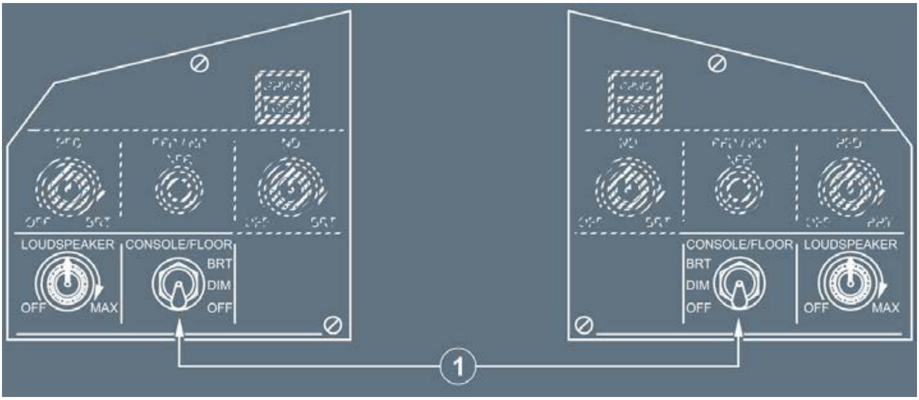
(2) This knob adjusts the brightness of the FCU displays.

(3) This lighting illuminates the sliding table and map holder.

(4) This knob adjusts the brightness of the sliding table and map holder lighting.

MAIN INST PANEL

Ident.: DSC-33-10-30-00017620.0001001 / 21 MAR 16
Applicable to: ALL



(1) <u>CONSOLE/FLOOR sw</u>
Each switch controls the lights of the side console and of the briefcase on each side of the cockpit. In addition, each switch controls the lighting of the floor around each flight crew member's seat. The lights can either be bright, dim, or off.

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GENERAL

Ident.: DSC-33-20-10-00017621.0001001 / 21 MAR 16
Applicable to: ALL

Exterior lighting includes the following lights:
- The navigation lights
- The landing lights
- The runway turn off lights
- The TO and TAXI lights
- The logo lights ◁
- The anticollision lights
- The wing and engine scan lights.

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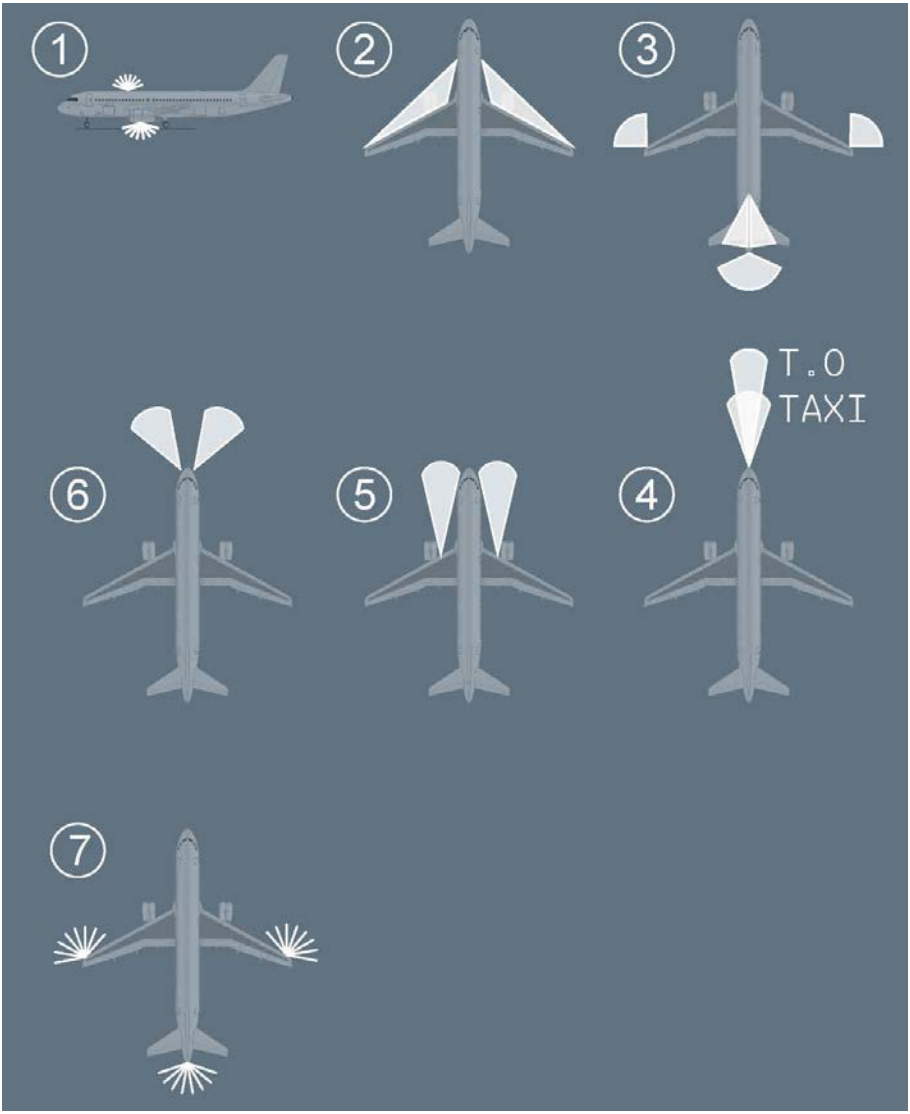
SCHEMATIC

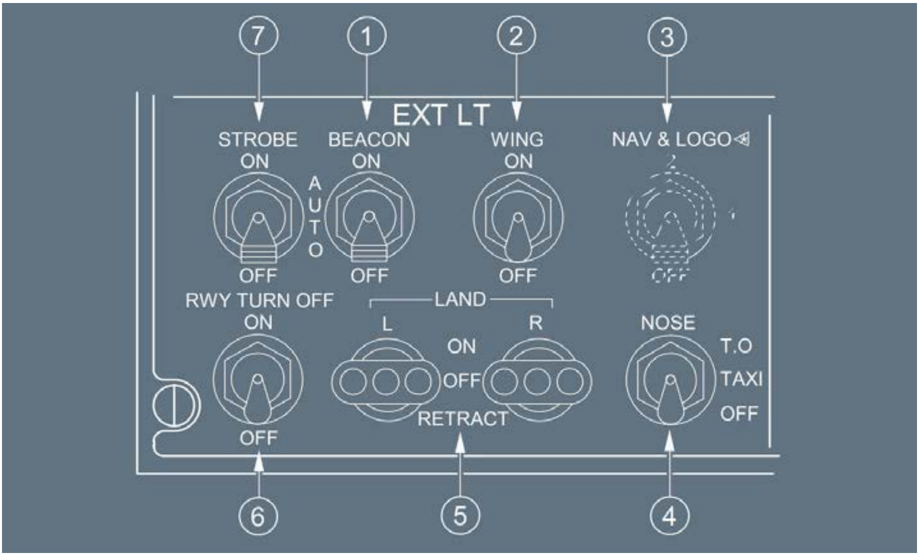
Ident.: DSC-33-20-20-00017622.0001001 / 21 MAR 16

Applicable to: ALL



OVERHEAD PANEL

Ident.: DSC-33-20-20-00017623.0001001 / 21 MAR 16
Applicable to: ALL



(1) BEACON sw
This switch turns on and off the two flashing red lights, one on top and one on the bottom of the fuselage.

(2) WING sw
This switch turns on and off two beam lights on each side of the fuselage. These lights provide lighting on the wing leading edge and on the engine air intake to detect ice accretion.

(3) NAV & LOGO sw
There are single navigation light, or dual navigation lights on each wing and in the APU tail cone.
A blue light below each navigation light allows to monitor the navigation light wear (LED technology). When NAV & LOGO sw is ON, this light flashes in blue if the navigation light replacement should be planned.
There are logo lights in the upper surface of each horizontal stabilizer. These lights provide lighting for the company logo on the vertical stabilizer provided the main landing gear is compressed, or depending on the aircraft configuration, when flaps are extended (at least 15 ° on some aircraft) or slats are extended.

The NAV & LOGO sw can have one of the following configuration:

ON	:	Turns on the NAV and the LOGO lights .
OFF	:	The NAV and the LOGO lights are off.

or

2	:	Turns on NAV 2 and the LOGO lights .
1	:	Turns on NAV 1 and the LOGO lights .
OFF	:	The NAV and the LOGO lights are off.

(4) NOSE sw

This switch turns the taxi and takeoff lights on and off.

TO	:	Turns on both taxi and takeoff lights.
TAXI	:	Turns on only taxi light.
OFF	:	Taxi and takeoff lights off.

Note: *These two lights, attached to the nose gear strut, go off automatically when landing gear is retracted.*

(5) L and R LAND sel

These selectors control the landing lights.

ON	:	Extends the (left or right) landing lights which come on automatically when fully extended.
OFF	:	Shuts off the landing lights which remain extended.
RETRACT	:	Shuts off and retracts the landing lights.

(6) RWY TURN OFF sw

This switch turns the runway turn-off lights on and off.

Note: *These lights go off automatically when landing gear is retracted.*

(7) STROBE sw

This switch turns on and off the three synchronized strobe lights, one on each wing and one below the tail cone.

A blue light below each strobe light allows to monitor the strobe light wear (LED technology). When STROBE sw is OFF or BEACON sw is ON, this light flashes in blue if the strobe light replacement should be planned.

ON : The strobe lights flash white.

AUTO : The strobe lights come on automatically when the main landing gear is not compressed.

OFF : The strobe lights are off.

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-33-20-20-M-00016785.0001001 / 21 MAR 16

LDG LT : The message is displayed in green, if one landing light is extended.

Ident.: DSC-33-20-20-M-00016784.0001001 / 21 MAR 16

STROBE LT OFF : The message is displayed in green, if the STROBE sw is OFF in flight.

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GENERAL

Ident.: DSC-33-30-10-00017632.0002001 / 21 MAR 16
Applicable to: ALL

The emergency lighting system consists of the following:
- Proximity emergency escape path marking systems (escape path and exit markers)
- Overhead emergency lights
- EXIT signs
- Lavatory auxiliary lights
- Overwing escape route lighting
- Escape slide lighting.

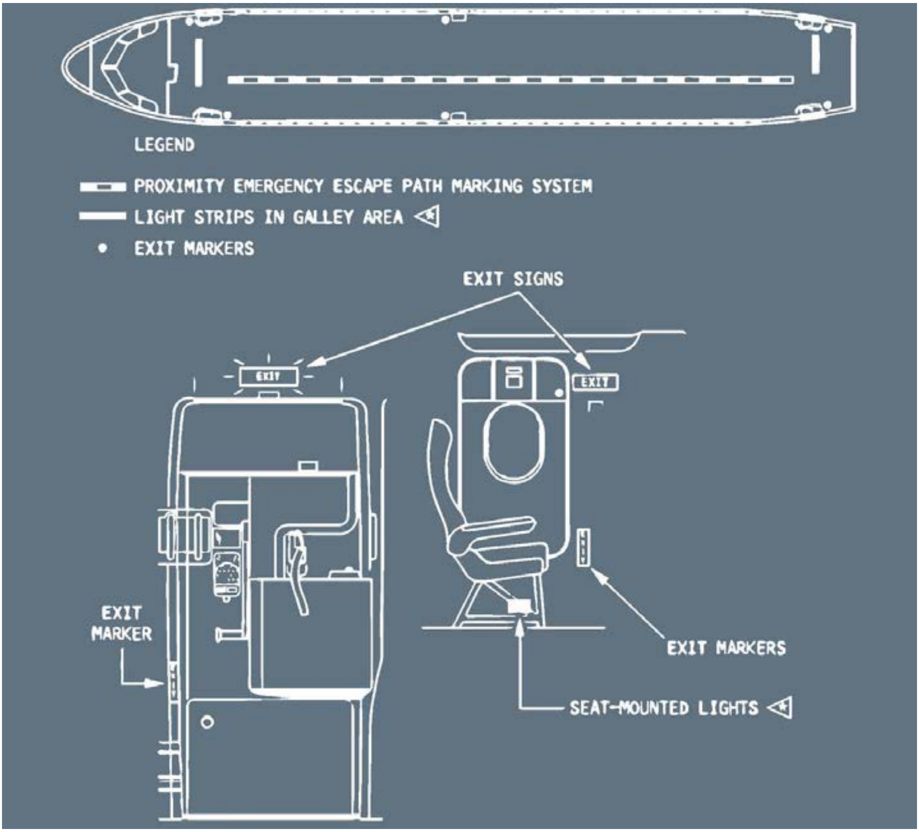
The floor proximity emergency escape path marking is a self-luminescent system.

When in operation:
- The exit markers of the proximity emergency escape path marking system are powered by internal batteries for at least 12 min.
- The DC SHED ESS BUS supplies the cabin emergency lighting.
- If DC SHED ESS BUS fails, batteries inside the light provides power to cabin emergency lighting.
- In nominal case, the DC SHED ESS BUS charges these internal batteries if:
  - The EMER LT sw is not at ON
  - The EMER pb on the Purser's panel is not pressed
  - The DC BUS 1 is supplied
  - Depending on the CIDS/CAM programming, when:
    - The NO SMOKING sw , or
    - The NO PORTABLE ELEC DEVICE sw , or
    - The EXIT sw is set to OFF or AUTO when the landing gear is retracted.

Lavatory auxiliary lights are always on. They are supplied by 28 V DC ESS BUS.
The escape slides have an integral lighting system. The escape slide lights and overwing escape route lights come on automatically, when the slide is armed and the door or emergency exit is open. They are supplied by internal batteries.

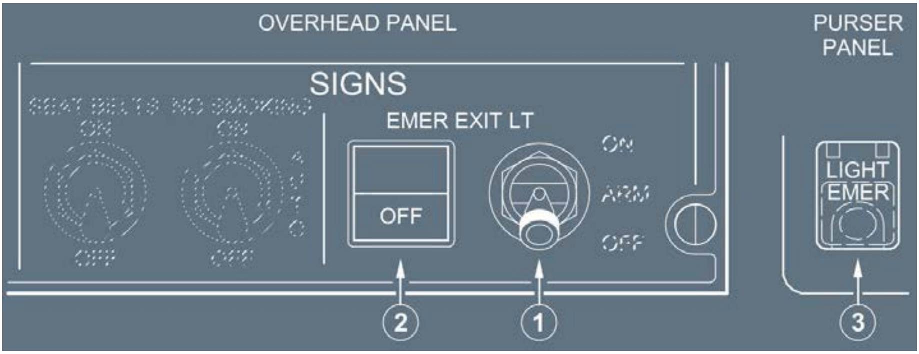
PROXIMITY EMERGENCY ESCAPE PATH MARKING SYSTEM/EXIT SIGNS

Ident.: DSC-33-30-10-00017646.0012001 / 21 MAR 16
Applicable to: ALL

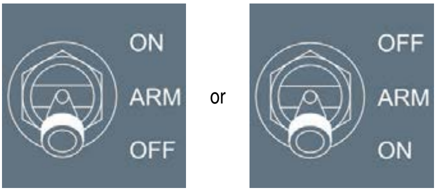


CONTROLS AND INDICATORS

Ident.: DSC-33-30-20-00017708.0003001 / 21 MAR 16
Applicable to: ALL



(1) EMER EXIT LT sw
The EMER EXIT LT sw can have one of the following configuration:



ON : Overhead emergency lights, EXIT signs and proximity marking system come on.
OFF : Above lights are off.

ARM : - The proximity emergency escape path marking system comes on when the normal aircraft electrical power or DC SHED ESS BUS is lost
- The overhead emergency lights come on if:
  - Normal aircraft electrical power system fails or
  - DC SHED ESS BUS fails or
  - AC BUS 1 fails.
- Exit signs come on if:
  - Normal aircraft electrical power system fails or
  - DC SHED ESS BUS fails or

Note: The LIGHT EMER pb on the Purser's panel can turn on the emergency lighting regardless of the position of the EMER EXIT LT sw.

(2) EMER EXIT LT-OFF lt

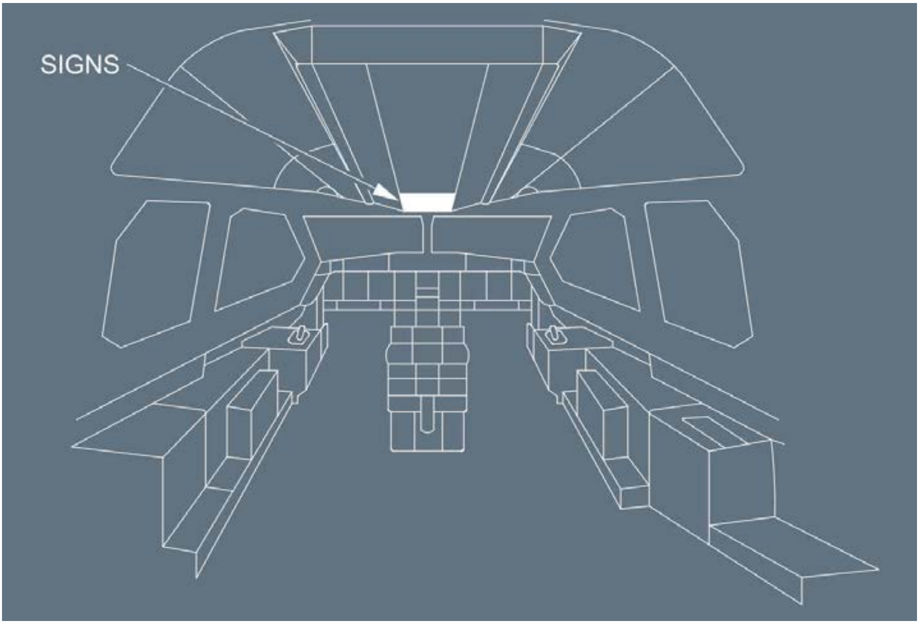
OFF : The amber EMER EXIT LT-OFF lt comes on when the EMER EXIT LT sw is set to OFF.

(3) LIGHT EMER pb

When pressed, this button performs the same function as the EMER EXIT LT sw when it is set to ON.

OVERHEAD PANEL

Ident.: DSC-33-40-10-00017709.0001001 / 21 MAR 16
Applicable to: ALL



The switches described below are installed on the SIGNS panel on the overhead panel.

The cabin signs consist of the following:
- A SEAT BELTS sw, and
- A NO SMOKING sw , or
- An EXIT sw , or
- A NO PORTABLE ELEC DEVICE sw .

The SEAT BELTS sw activates the FASTEN SEAT BELT and RETURN TO YOUR SEAT signs.
The NO SMOKING sw or EXIT sw activate the EXIT and NO SMOKING signs.
The NO PORTABLE ELEC DEVICE sw activates the EXIT and NO MOBILE signs.
A low tone chime sounds (depending on CIDS/CAM programming) each time a sign goes on or off.
Each switch has 3 positions:

ON : Signs are on in the cabin

AUTO : Signs are on in the cabin when either landing gear is extended or flaps/slats are extended (position 1, 2, 3, or FULL)

OFF : Signs are off in the cabin

Example of switches layout:

Note:
1. *If the cabin altitude goes above 11 300 ft (± 350 ft), the cabin lights (depending on CIDS/CAM programming) and all the cabin signs, except the NO PORTABLE ELEC DEVICE signs come on regardless of switches position.*
2. *For NON SMOKER , the NO SMOKING signs are always on.*

MEMO DISPLAY

Ident.: DSC-33-40-10-00016783.0001001 / 21 MAR 16
Applicable to: ALL

When the corresponding signs are on, the ECAM displays in green the SEAT BELTS message, the NO SMOKING message or the NO PED, depending on aircraft customization.

AIRCRAFT SYSTEMS

NAVIGATION

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Continued on the following page

Continued from the previous page

DSC-34-NAV-40 Radio Altimeter

DSC-34-NAV-40-10 Description

GENERAL

Ident.: DSC-34-NAV-10-10-00018524.0001001 / 21 MAR 16
Applicable to: ALL

The Air Data and Inertial Reference System (ADIRS) supplies temperature, anemometric, barometric and inertial parameters to the EFIS system (PFD and ND) and to other user systems (FMGC , FADEC , ELAC , SEC , FAC , FWC , SFCC , ATC , GPWS , CFDIU , CPC).

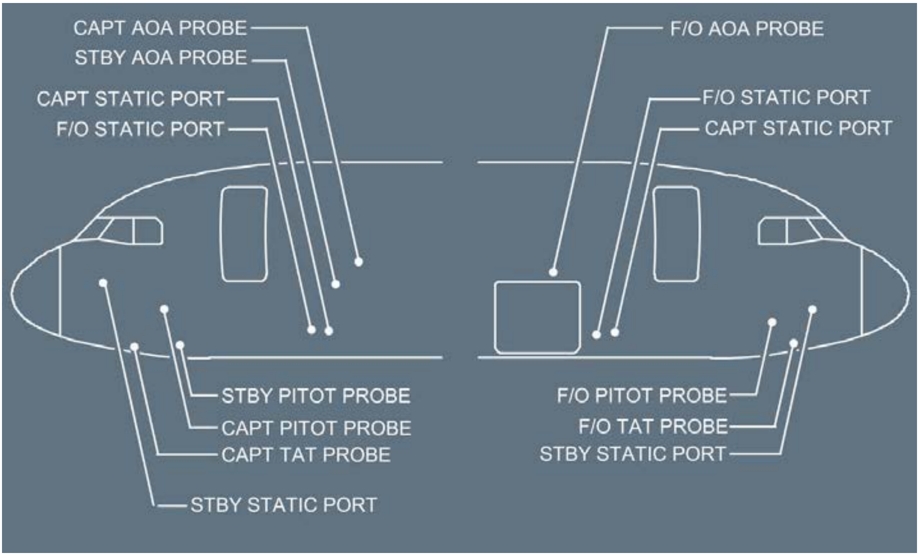
The system includes:
- Three identical ADIRUs (Air Data and Inertial Reference Units).

  Each ADIRU is divided in two parts, either of which can work separately in case of failure in the other:
  - The ADR part (Air Data Reference) which supplies barometric altitude, airspeed, Mach, angle of attack, temperature and overspeed warnings.
  - The IR part (Inertial Reference) which supplies attitude, flight path vector, track, heading, accelerations, angular rates, ground speed and aircraft position.
- One ADIRS control panel on the overhead panel for selection of modes (NAV , ATT, OFF) and indications of failures.
- Four types of sensors:
  - Pitot probes (3)
  - Static pressure probes (STAT) (6)
  - Angle of attack sensors (AOA) (3)
  - Total air temperature probes (TAT) (2)

  These sensors are electrically heated to prevent from icing up.
- Eight ADM s (Air Data Modules) which convert pneumatic data from PITOT and STAT probes into numerical data for the ADIRUs.
- A switching facility for selecting ADR 3 or IR 3 for instrument displays in case of ADIRU1 or 2 failure.

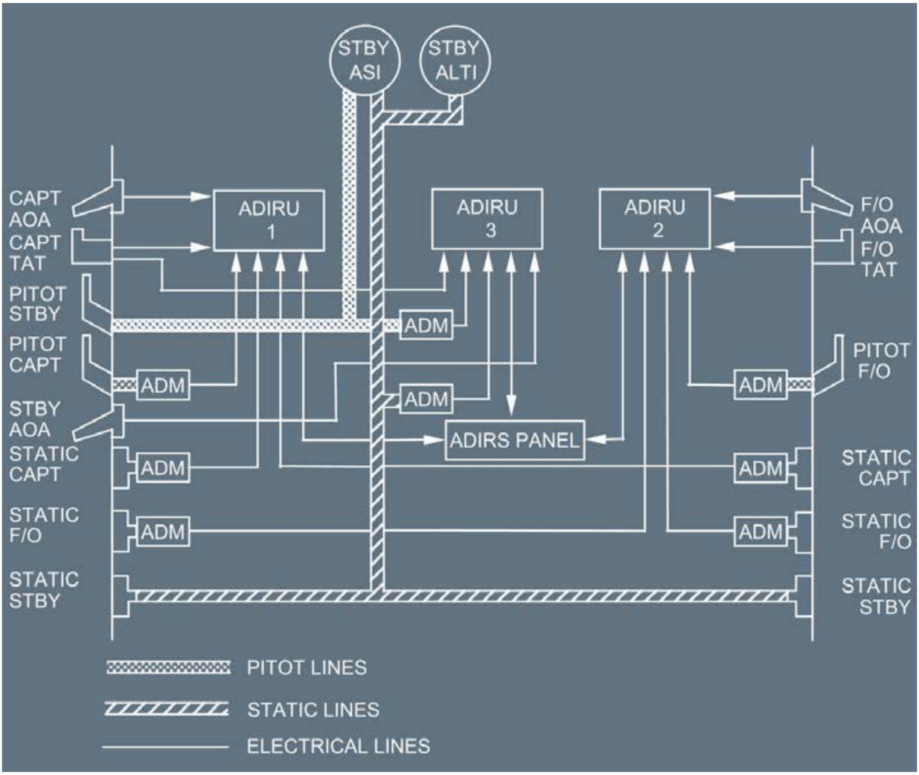
PROBES LOCATION

Ident.: DSC-34-NAV-10-10-00018525.0001001 / 21 MAR 16
Applicable to: ALL



PROBES SCHEMATIC

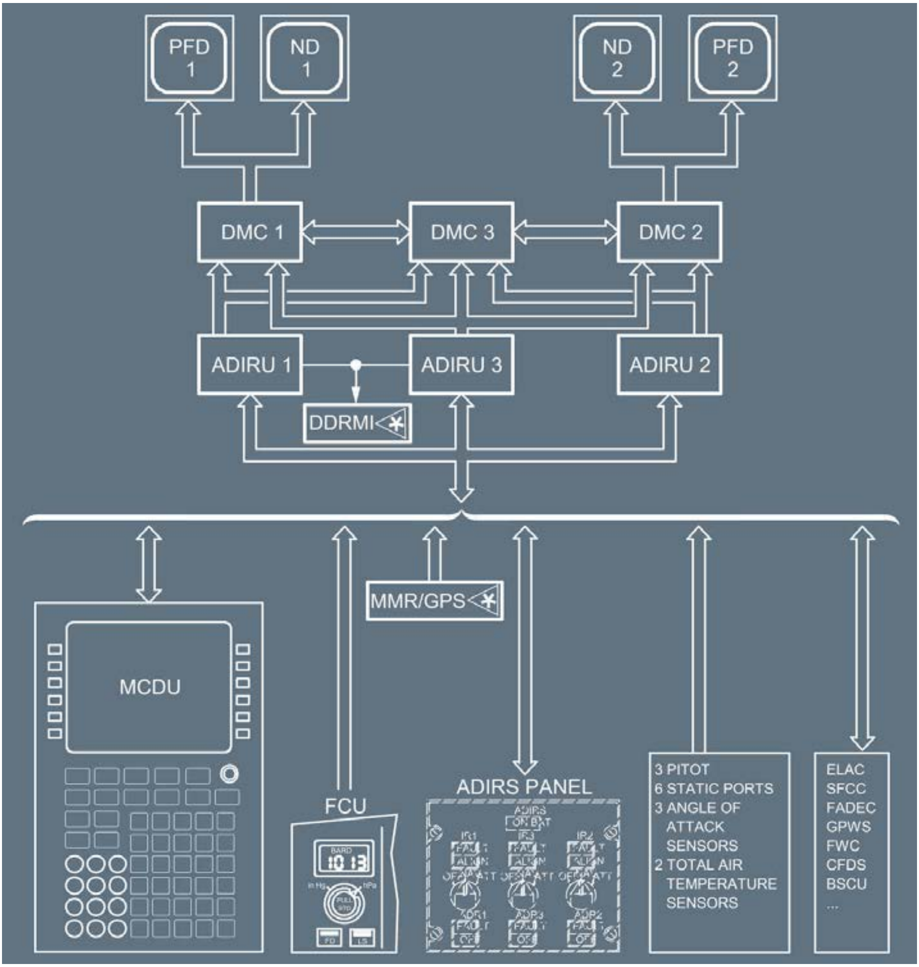
Ident.: DSC-34-NAV-10-10-00018526.0001001 / 21 MAR 16
Applicable to: ALL



Note: *ADIRU (1) is supplied by CAPT probes,*
ADIRU (2) is supplied by F/O probes,
ADIRU (3) is supplied by STBY probes and CAPT TAT.

ADIRS SCHEMATIC

Ident.: DSC-34-NAV-10-10-00018527.0001001 / 21 MAR 16
Applicable to: ALL

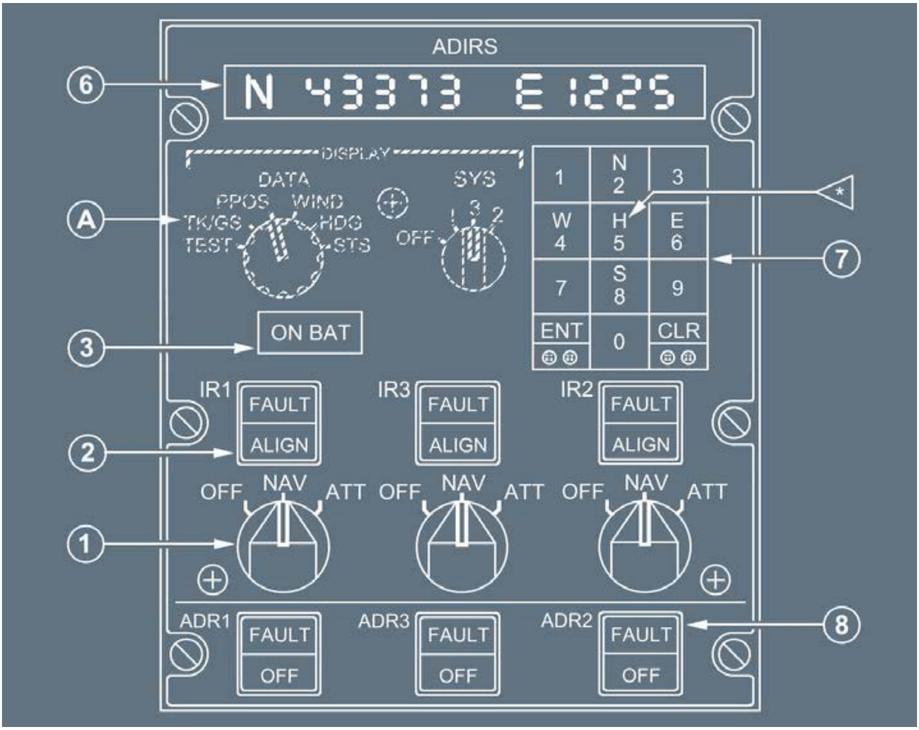


OVERHEAD PANEL

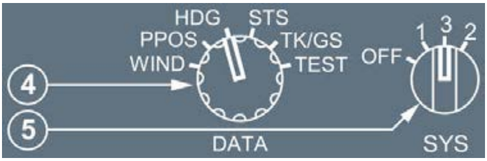
Ident.: DSC-34-NAV-10-20-00018528.0001001 / 21 MAR 16
Applicable to: ALL

The ADIRS CDU on the overhead panel provides the controls and indicators to permit:
- Selection of power supplies to the ADR and IRS systems
- Selection and display of navigation data
- Status and fault indication of IRS or ADRs.
- Manual initialization of IRS

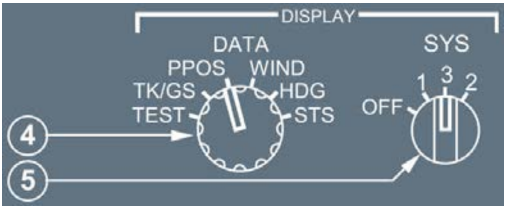
Note: *IRS are normally initialized with the FMGC , but IRS may be initialized with the ADIRS CDU as a backup.*



(A) Depending of aircraft configuration,



or



(1) IR 1(2)(3) Mode rotary sel

OFF : The ADIRU is not energized.
ADR and IR data are not available.

NAV : Normal mode of operation.
Supplies full inertial data to aircraft systems.

ATT : IR mode supplying only attitude and heading information, if the system loses its ability to navigate.

The heading must be entered using:
- The CDU keyboard, or
- The MCDU (if the entry field is available).

The heading has to be reset frequently (about every 10 min).

(2) IR 1(2)(3) lt

FAULT light : This amber light comes on with an ECAM caution when a fault affects the respective IR.
Steady : The respective IR is lost.
Flashing : The attitude and heading information may be recovered in ATT mode.

ALIGN light :	Steady :	The respective IR is operating normally in align mode.
	Flashing :	IR alignment fault, or no present position entry after 10 min, or difference between position at shutdown and entered position exceeds 1 ° of latitude or longitude.
	Extinguished:	Alignment has been completed.

(3) ON BAT lt
The ON BAT light comes on in amber when the aircraft battery supplies at least one IRS . The ON BAT light also comes on for a few seconds at the beginning of a complete IRS alignment.

Note: *When the aircraft is on ground and if at least one ADIRU is supplied by aircraft batteries:*
- *An external horn sounds*
- *The ADIRU and AVNCS light comes on amber on the EXTERNAL POWER panel.*

(4) DATA selector knob
This knob selects the information to be displayed in the ADIRS display window.

TEST The ENT and CLR buttons on the keyboard come on, and the display shows all 8's.

TK/GS The display shows true track and ground speed.

PPOS The display shows present latitude and longitude

WIND The display shows true wind direction and speed.

HDG The display shows true heading and the minutes remaining until alignment is completed.

STS The display shows an action code.

(5) SYS selector knob

OFF : The CDU display is not energized. ADIRS are still energized if the associated IR mode rotary selectors are not at OFF.

1.2.3 : System selected for data display.

(6) Display
The display presents the data selected by the DATA selector.
A keyboard entry overrides the selected display.

(7) Keyboard
The flight crew can use the keyboard to enter the present position, or the heading in ATT mode, into the selected system.

Letter keys : Used to enter N, S, E, or W for position, or entering H ⩤ for heading (ATT mode).

Number keys : Used to enter the present position (or the present magnetic heading in ATT mode).

CLR key : The integral cue light comes on after an entry operation, if the data has an unreasonable value.
Pressing this key clears the data display, that has been keyed in but not yet entered.

ENT Key : The integral cue light comes on when a crew member has keyed in a number for N, S, W, E or H ⧏ .
Pressing the key enters data into the ADIRS.

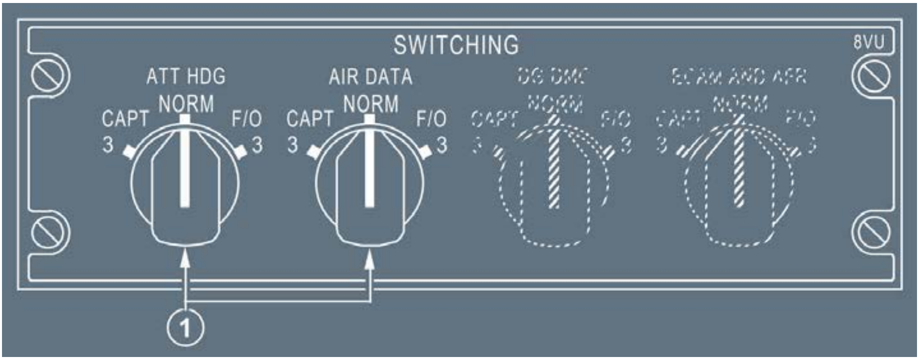
(8) ADR 1(2)(3) pb (momentary action)

OFF light Air data output disconnected.

FAULT light This amber light comes on with an ECAM caution, if a fault is detected in the air data reference part.

PEDESTAL

Ident.: DSC-34-NAV-10-20-00018529.0001001 / 21 MAR 16
Applicable to: ALL



(1) ATT HDG and AIR DATA sel

NORM : ADIRU 1 supplies data to PFD 1, ND 1, DDRMI ⧏ and VOR /DME.
ADIRU 2 supplies data to PFD 2, and ND2.

CAPT 3 : ADR 3 or IR 3 replaces ADR 1 or IR1.

F/O 3 : ADR 3 or IR 3 replaces ADR 2 or IR2.

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-34-NAV-10-20-A-00017042.0001001 / 21 MAR 16

IRS IN ALIGN : This memo appears in green if one of the 3 IRS is still in alignment and both engines are stopped.

IRS IN ALIGN : This memo appears in amber if one of the 3 IRS is still in alignment and one engine is running.

Ident.: DSC-34-NAV-10-20-A-00017041.0001001 / 21 MAR 16

IRS IN ALIGN X MN : This memo appears in green, if both engines are stopped. The memo "IRS IN ALIGN X MN" appears during flight phase 1 or 2, if:

- At least one active IRS is in ALIGN submode
- The remaining time until NAV mode is obtained in X minutes (1 < X < 10).

IRS IN ALIGN X MN : This memo appears in amber, if one engine is running. The memo "IRS IN ALIGN X MN" appears during flight phase 1 or 2, if:

- At least one active IRS is in ALIGN submode
- The remaining time until NAV mode is obtained in X minutes (1 < X<10).

MAXIMUM DIFFERENCES BETWEEN SPEED/MACH INDICATIONS

Ident.: DSC-34-NAV-10-20-00021130.0002001 / 17 MAR 17
Applicable to: ALL

FL	SPEED	SPEED/MACH COMPARISON BETWEEN					
		ADR 1 and ADR 2 (on PFD)		ADR 3 and ADR 1, or ADR 3 and ADR2		Standby Airspeed Indicator and any ADR 1, or 2, or 3	
		kt	Mach	kt	Mach	kt	Mach on ISIS (1)
GND CHECK	-	6 kt	M 0.008	6 kt	M 0.008	6 kt	-
FL 50	250 kt	4 kt	M 0.005	4 kt	M 0.007	7 kt	-
FL 100	250 kt	4 kt	M 0.005	5 kt	M 0.008	8 kt	M 0.032
FL 200	300 kt	3 kt	M 0.007	5 kt	M 0.011	9 kt	M 0.033
FL 300	M 0.78	3 kt	M 0.010	5 kt	M 0.014	9 kt	M 0.025
FL 390	M 0.78	3 kt	M 0.010	4 kt	M 0.014	8 kt	M 0.025

(1) *Mach values lower than M 0.50 in climb, and M 0.45 in descent, are not displayed on ISIS .*

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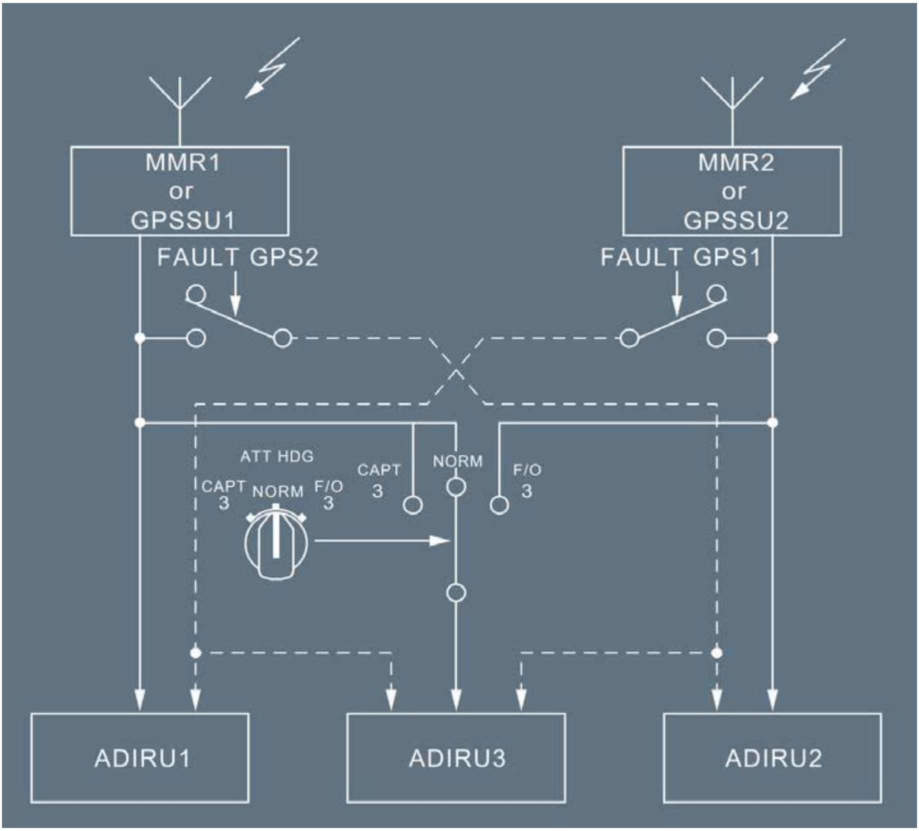
DESCRIPTION

Ident.: DSC-34-NAV-15-10-00018530.0001001 / 21 MAR 16
Applicable to: ALL

The Global Positioning System (GPS) is a satellite-based radio navigation aid.
Worldwide, 24 satellites broadcast accurate navigation data that the aircraft use for precise determination of its position.

The aircraft has two independent GPS receivers. Depending of the aircraft configuration, each receiver consists:
- Of a GPS Sensor Unit (GPSSU), or
- Is integrated in the Multi Mode Receiver (MMR). The GPS 1 receiver in MMR 1, and the GPS 2 receiver in MMR2.

The GPSSU or the MMR processes the received data, and transfers them to the ADIRU s. Then each ADIRU performs the GP-IRS hybrid position calculation. FMGCs use this hybrid position.


MMR1
or
GPSSU1
MMR2
or
GPSSU2
FAULT GPS2
FAULT GPS1
ATT HDG
CAPT
3
NORM
F/O
3
CAPT
3
NORM
F/O
3
ADIRU1
ADIRU3
ADIRU2

OPERATIONS

GPS information are available on the FMS – GPS Monitor Page. *Refer to DSC-22_20-50-10 Pages descriptions*.

- During normal operations
  The GPS receiver 1 supplies the ADIRU 1 and the ADIRU 3, and the GPS receiver 2 supplies the ADIRU 2.
- In case of failure of one GPS receiver
  All ADIRU s use the operative GPS receiver.
- In case of failure of ADIRUs
  - If the ADIRU 1 fails, ADIRU 3 is supplied by the GPS receiver 1, and ADIRU 2 is supplied by the GPS receiver 2.
  - If the ADIRU 2 fails, the ATT HDG selector has to be set to F/O 3 in order to maintain Side 1 and Side 2 segregation. In this case, the ADIRU 3 will be supplied with GPS receiver 2.
  - If two ADIRU s fail, the remaining ADIRU is supplied by its own side GPS receiver.

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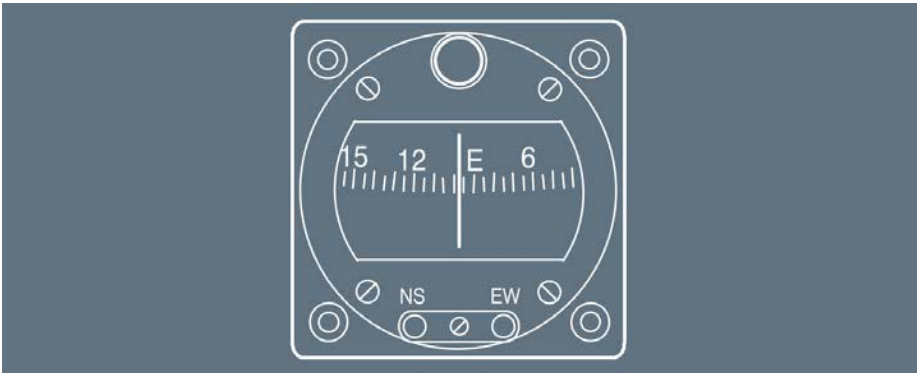
COMPASS

Ident.: DSC-34-NAV-20-00001367.0001001 / 19 DEC 12
Applicable to: ALL

There is a compass located on top of the windshield center post.
The deviation card is located above the compass.

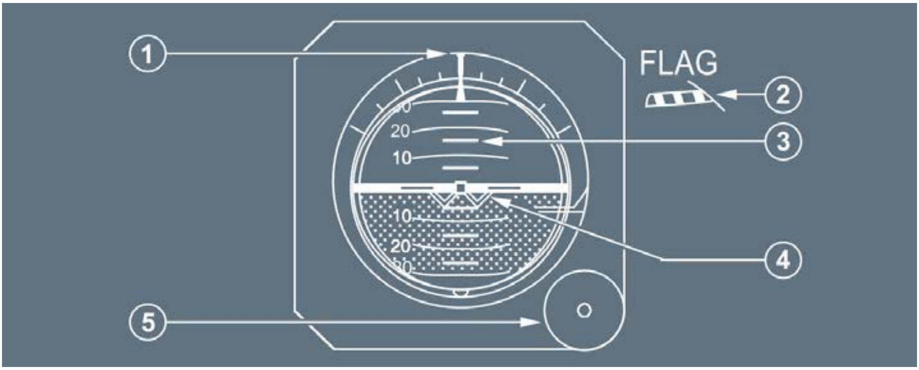
<u>Note:</u> *Because of the location of the APU power on contactor in the cockpit, the APU start sequence may disturb the compass reading.*



ATTITUDE

Ident.: DSC-34-NAV-20-00018575.0001001 / 21 MAR 16
Applicable to: ALL

<u>Note:</u> *When leveling the wings, after performing a small turn of a small bank angle, the displayed roll attitude may temporarily be incorrect by a few degrees.*



(1) Roll scale
The roll scale indicates the bank angle. It has bank angle graduations up to 60 °. There is no rotation limit.

(2) Flag
The flag appears if the instrument fails or if power supply fails.

(3) Pitch scale
The pitch scale indicates the pitch attitude. It can show pitch angle up to ± 85 °.

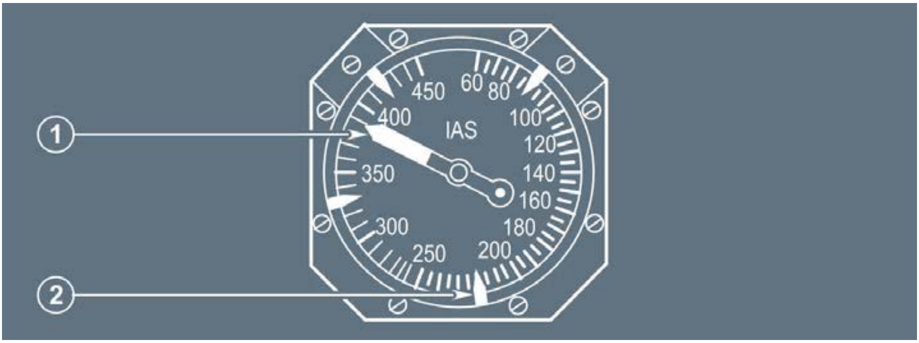
(4) Aircraft reference
Fixed symbol.

(5) Caging knob
The flight crew pulls it out to reinitialize the gyro, and to level and center the horizon. (The airplane should be level during this procedure).

Note: After low-rate turns, the standby horizon may not give accurate indications. To correct this behavior, use the caging knob when the aircraft is level.

AIRSPEED

Ident.: DSC-34-NAV-20-00018576.0001001 / 21 MAR 16
Applicable to: ALL

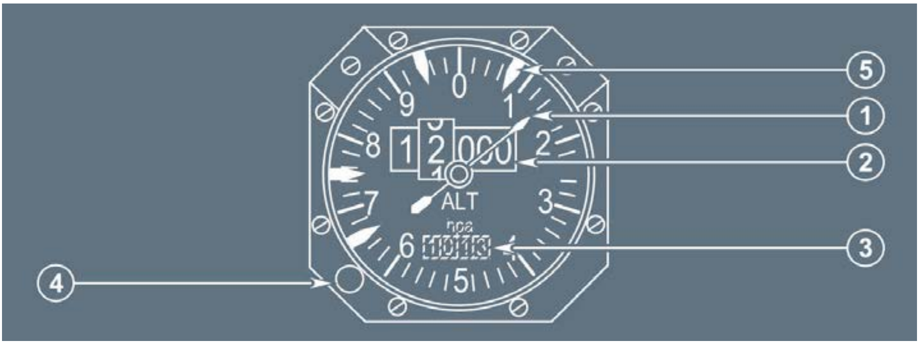


(1) Airspeed pointer

(2) Airspeed bugs (4)
For marking airspeed references.

ALTIMETER

Ident.: DSC-34-NAV-20-00018577.0001001 / 21 MAR 16
Applicable to: ALL



(1) Altitude pointer

(2) Altitude counter
Depending of the aircraft configuration, the unit is "feet" or "meter".

(3) Altimeter setting
Depending of the aircraft configuration, the unit is "hPa" or "inHg".

(4) Altimeter setting knob

(5) Altitude bugs (4)
For marking of altitude references.

GENERAL

Ident.: DSC-34-NAV-30-10-00018581.0001001 / 21 MAR 16
Applicable to: ALL

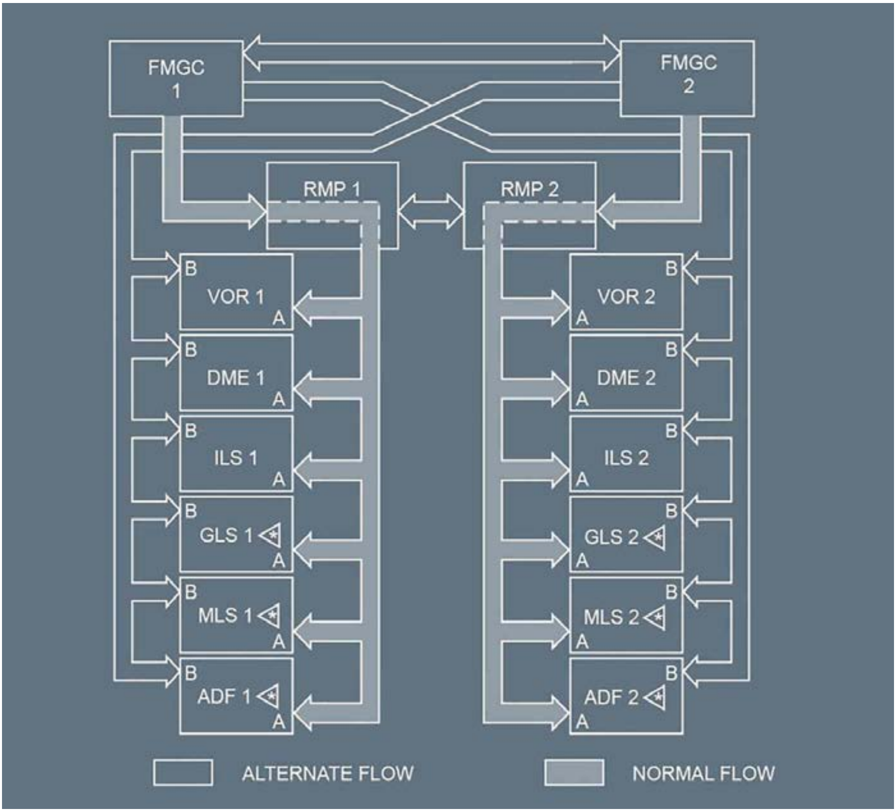
Three modes of tuning are available.

1. **Automatic Tuning**
   This is the basic means for tuning navaids.
   In normal operation, the FMGC tunes navaids automatically, with each FMGC controlling its own receivers.
   If one FMGC fails, the remaining FMGC controls both sides receivers.
2. **Manual Tuning**
   The flight crew can use the MCDU to override the automatic tuning of navaids by FMGC in order to select a specific navaid for visual display.
   This does not affect the automatic function of the FMGC.
   Any entry on one MCDU is sent to both FMGC in dual mode, or the remaining FMGC in single mode.
3. **Back Up Tuning**
   If both FMGC s fail, the flight crew can use the RMPs (Radio Management Panels 1 and 2) on the pedestal for back up tuning.
   The CAPT RMP controls VOR1 and ADF 1 .
   The F/O RMP controls VOR2 and ADF 2 .
   Either RMP controls ILS /GLS / MLS , provided “STBY NAV” is selected on RMP 1 and RMP2. RMP3 is not used for navaids tuning.

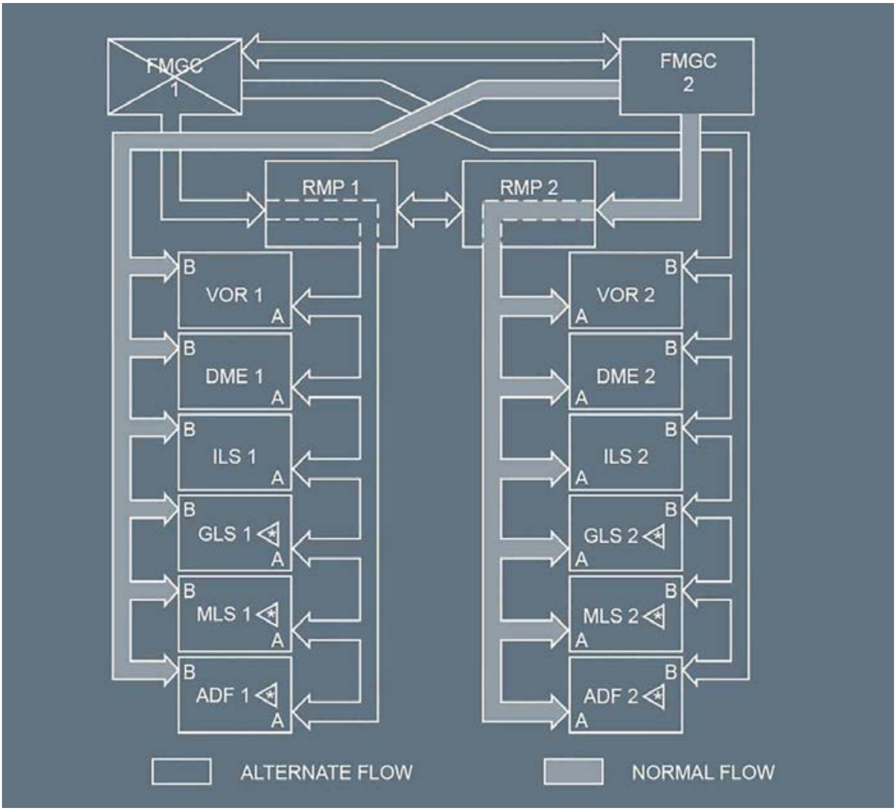
ARCHITECTURE

Ident.: DSC-34-NAV-30-10-00018582.0001001 / 21 MAR 16
Applicable to: ALL

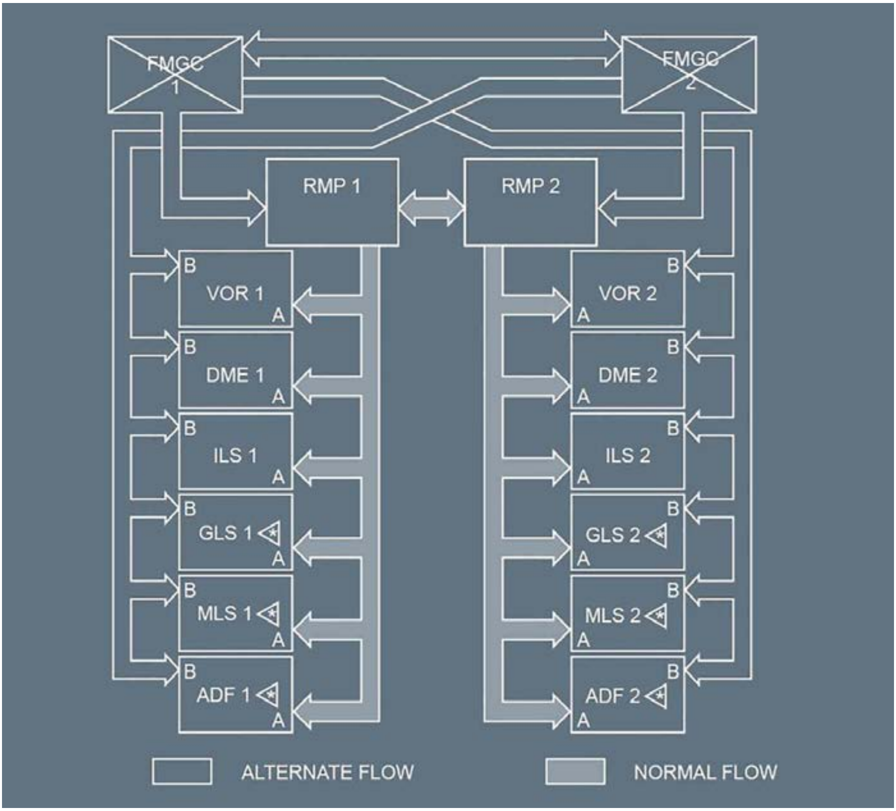
NORMAL OPERATION



FMGC 1 FAILURE



BACK UP TUNING



VOR

Ident.: DSC-34-NAV-30-20-00018657.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft has two VOR receivers.

- The Navigation Displays (ND s) display VOR 1 and VOR 2 information, in accordance with the position of the ADF /VOR selectors on the EFIS control panel (*Refer to DSC-31-45 ROSE Modes*).
- The DDRMI also displays VOR 1 and VOR2 bearings, if the heading signal is valid.

ILS/GLS /MLS

Ident.: DSC-34-NAV-30-20-00018658.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft has two ILS /GLS /MLS receivers.

Note: *When the aircraft is equipped with MMR s, ILS and GLS and MLS receivers are in the MMR s (ILS 1/GLS1 /MLS1 in the MMR 1 and the ILS 2/GLS2 /MLS2 in the MMR2)*

- PFD 1 and ND 2 display ILS1/GLS1 /MLS1 information.
- PFD 2 and ND 1 display ILS2/GLS2 /MLS2 information.
- The PFD display the ILS /GLS /MLS information if the flight crew press the LS pb or ILS pb (depending of the aircraft configuration) on the EFIS control panel (*Refer to DSC-31-50 EFIS Control Panel*).
- The ND s display the ILS /GLS /MLS information if the flight crew selects the ROSE LS mode or the ROSE ILS mode (depending of the aircraft configuration) on the EFIS control panel (*Refer to DSC-31-50 EFIS Control Panel*).

ADF

Ident.: DSC-34-NAV-30-20-00018659.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft may be fitted with 1 ADF or 2 ADF .
The ND s display ADF information, depending on the position of the ADF /VOR selectors on the EFIS control panel (*Refer to DSC-31-45 ROSE Modes*).
The DDRMI also displays ADF 1 and ADF 2 bearings, depending on the position of the ADF /VOR selector on the DDRMI .

DME

Ident.: DSC-34-NAV-30-20-00018660.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft has two DMEs.
The frequency that is automatically set on the DME corresponds to the frequency/channel that is set on the VOR , or ILS, or GLS , or MLS .
The ND s and the DDRMI can display DME information associated with VOR.
The PFD s can display DME information associated with ILS/GLS /MLS (*Refer to DSC-31-40 Trajectory Deviation - ILS Approach*).

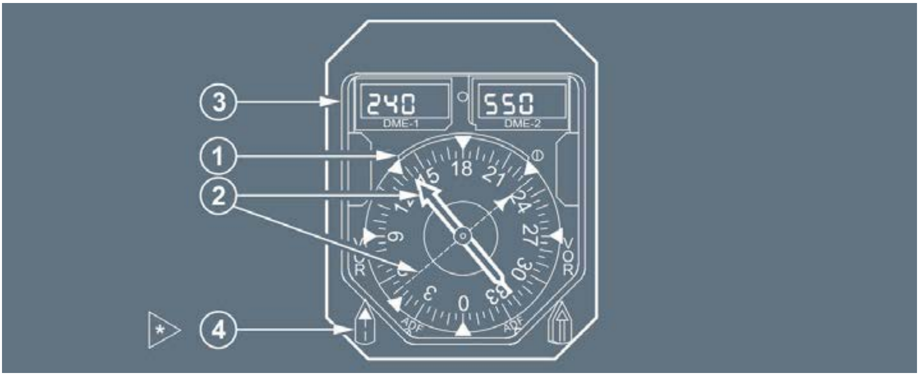
MARKER BEACON

Ident.: DSC-34-NAV-30-20-00001389.0001001 / 21 MAR 16
Applicable to: ALL

One marker beacon system is included in VOR receiver 1.
The PFD displays the outer, middle, and inner marker signals (*Refer to DSC-31-40 Trajectory Deviation - ILS Approach*).

DIGITAL DISTANCE AND RADIO MAGNETIC INDICATOR ⧏ (DDRMI)

Ident.: DSC-34-NAV-30-30-00018583.0001001 / 21 MAR 16
Applicable to: ALL



(1) <u>Compass card</u>
ADIRU1 normally supplies the signal that positions the compass card.
ADIRU 3 supplies this signal when selected by the ATT HDG SWITCHING selector.

(2) <u>Bearings pointers</u>
Indicate the magnetic bearing to the station received by VOR 1 or ADF 1 ⧏ (dashed pointer) and VOR2 or ADF 2 ⧏ (double pointer).

<u>*Note:*</u> *Depending on the quality of the VOR beacon's signal, and mainly at distances greater than 25 NM from the station, the processing of the signal, on aircraft equipped with COLLINS or BENDIX VOR may lead to bearing pointer oscillations.*

(3) <u>DME1(2) counters</u>
Indicates distance in nautical miles to/from DME station.

The counters indicate distances:
- in NM when the station is at more than 20 NM
- 1/10th of NM when the station is at less than 20 NM.

When the station is at less than 1 NM, 0 is shown.
The DME 1 and DME2 display are blanked or dashed when a fault is detected or data invalid.

(4) VOR/ADF selector

- VOR1 or ADF 1 on the dashed pointer.
- VOR 2 or ADF 2 on the double pointer (if ADF 2 is not installed, then ADF1 may be selected).

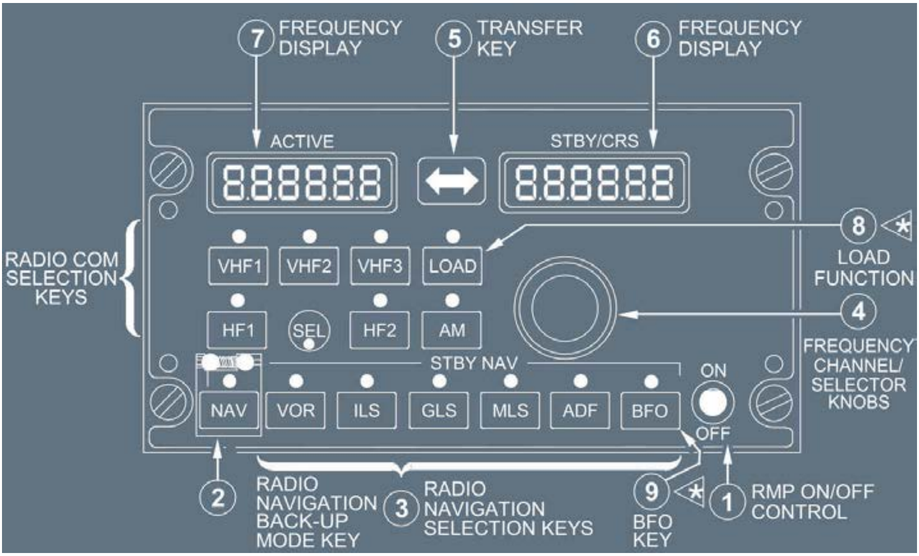
The DDRMI has also VOR /ADF flags and HDG flags when the associated information is not available.

The indicators display these flags if:
- The VOR or ADF receiver fails (associated to the VOR /ADF flag only)
- The DDRMI has an internal failure
- The heading signal from ADIRS is not valid
- The power supply fails.

As long as the VOR /ADF flag is shown, and depending of the aircraft configuration, the associated bearing pointer remains:
- At the last valid position, or
- Into the horizontal line.

RADIO MANAGEMENT PANEL (RMP)

Ident.: DSC-34-NAV-30-30-00018584.0001001 / 21 MAR 16
Applicable to: ALL



(1) ON/OFF sw
This switch controls the power supply to the panel.

(2) NAV key (transparent switchguard)

- Pressing this key engages the radio navigation backup mode. It takes control of the VOR , ILS , GLS , MLS and ADF receivers away from the FMGC and gives it to the RMP.
- The green monitor light comes on.
- Pressing the NAV key a second time returns control of the navigation radios to the FMGC.

Note:
- *The flight crew must select this backup tuning mode on both RMP 1 and RMP 2 if both FMGC s or both MCDU s fail. In the emergency electrical configuration, only RMP1 receives power*
- *Pressing the NAV key on RMP3 has no effect*
- *In the NAV backup mode, the flight crew can select radio communication systems as it would in the normal mode.*
  Setting one RMP to NAV backup mode removes navaids tuning from both FMGCs.
- *When the flight crew uses an RMP to tune an ILS /DME or GLS /DME or MLS /DME , the PFD s do not display the DME distance.*

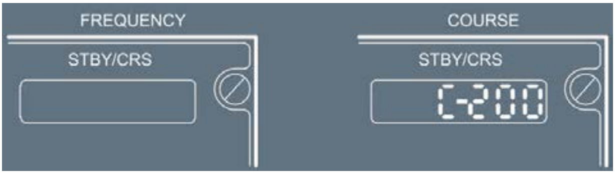
(3) STBY NAV keys
When the NAV key is on and the flight crew presses one of these STBY NAV keys, the ACTIVE window displays the frequency/channel to which that receiver is tuned. The green monitor light on the selected key comes on, and the one on the previously selected STBY NAV or COM key goes out.

(4) Frequency/channel selector knob
Two concentric knobs allow the flight crew to preselect frequencies/channels for communication radios and stand-by navigation systems and select courses for VOR , ILS , GLS and MLS .
The desired frequency, channel or course is set in the STBY/CRS window.
The outer and the inner knobs set a frequency/channel: the outer knob controls the most significant digits, the inner knob controls the least significant digits. A rate multiplier speeds up the tuning when the knob is rotated quickly.
The inner knob only sets a course.

(5) Transfer key
The flight crew presses this key to interchange ACTIVE and STBY frequencies/channels. This action tunes the selected receiver to the new ACTIVE frequency/channel.

(6) STBY /CRS window
The flight crew can make the displayed frequency /channel by rotating the tuning knob.
The frequency/channel displayed in the window becomes the active frequency/channel when the flight crew presses the Transfer Key.
If this window displays a course, then the ACTIVE window displays the associated frequency/channel.

Note: If the STBY /CRS window is displaying a course, then pressing the transfer key displays the active frequency/channel in both windows.



(7) ACTIVE window
This window displays the frequency/channel of the selected navaid, which is identified by a green monitor light on the selection key.

(8) LOAD FUNCTION
The flight crew can load the VHF frequency from the CPDLC CONTACT/MONITOR messages to the STBY/CRS window.

(9) BFO key
If the ADF is selected, rressing this key activates the BFO (Beat Frequency Oscillator).
For most ADF , with BFO activated, the audio identification is heard. However there are some ADF where the BFO must be deactivated in order to hear the audio identification.

GENERAL

Ident.: DSC-34-NAV-40-10-00018585.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft has two radio altimeters (RA).
CAPT PFD displays the RA 1 height, and the F/Os PFD displays the RA2 height.
If one RA fails, both PFD s display the height from the remaining RA.
For indication on the PFD, *Refer to DSC-31-40 Altitude (CONT'D)*.

AUTOMATIC CALLOUT

Ident.: DSC-34-NAV-40-10-00018656.0001001 / 21 MAR 16
Applicable to: ALL

GENERAL

The FWC generates a synthetic voice for radio height announcement below 2 500 ft. These announcements come through the cockpit loudspeakers, even if the speakers are turned off.

PREDETERMINED CALL OUT

The altitude call out uses the following predetermined threshold:

Height (feet)	Call out
2 500	TWO THOUSAND FIVE HUNDRED OR TWENTY FIVE HUNDRED
2 000	TWO THOUSAND
1 000	ONE THOUSAND
500	FIVE HUNDRED
400	FOUR HUNDRED
300	THREE HUNDRED
200	TWO HUNDRED
115	STANDBY (1)
100	ONE HUNDRED
90	STANDBY (1)
65	FLARE (1)
50	FIFTY
40	FORTY
30	THIRTY
20	TWENTY
10	TEN
5	FIVE
DH (or MDA /MDH) + 100	HUNDRED ABOVE
DH (or MDA /MDH)	MINIMUM

(1) *These callouts are triggered only if the Steep Approach and Landing function is active. In this case, the "ONE HUNDRED" callout is inhibited.*

Note: The reference altitude for callouts is the radio height for precision approaches (DH), and baro altitude (MDA /MDH) for non precision approaches.

Pin programming enables Operators to select the required callouts. If the aircraft remains at a height that is in the detection zone for a height callout, the corresponding message is repeated at regular intervals.

INTERMEDIATE CALL OUT

If time between two consecutive predetermined call outs exceeds a certain threshold, the present height is repeated at regular intervals.

The threshold is:
- 11 s above 50 ft
- 4 s below 50 ft

The repeating interval is 4 s.

RETARD ANNOUNCEMENT

The loudspeaker announces RETARD at:

- 20 ft, or
- at 10 ft if autothrust is active and one autopilot is in LAND mode.

AIRCRAFT SYSTEMS

SURVEILLANCE

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Continued on the following page

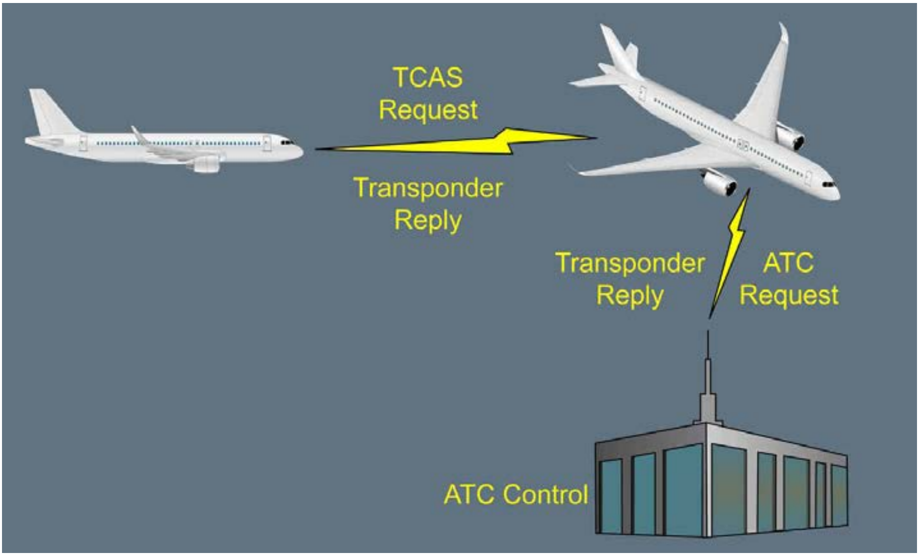
Continued from the previous page

PRINCIPLE

Ident.: DSC-34-SURV-10-10-00020602.0001001 / 17 MAR 17
Applicable to: ALL

The aircraft has two ATC transponders (XPDR) which are controlled by a control panel (ATC /TCAS) on the center pedestal.
Only the selected XPDR operates.

The XPDR automatically responds to requests:
- From the ATC, to ensure effective air traffic surveillance
- From other aircraft that have a TCAS, to ensure that traffic alerts are triggered.



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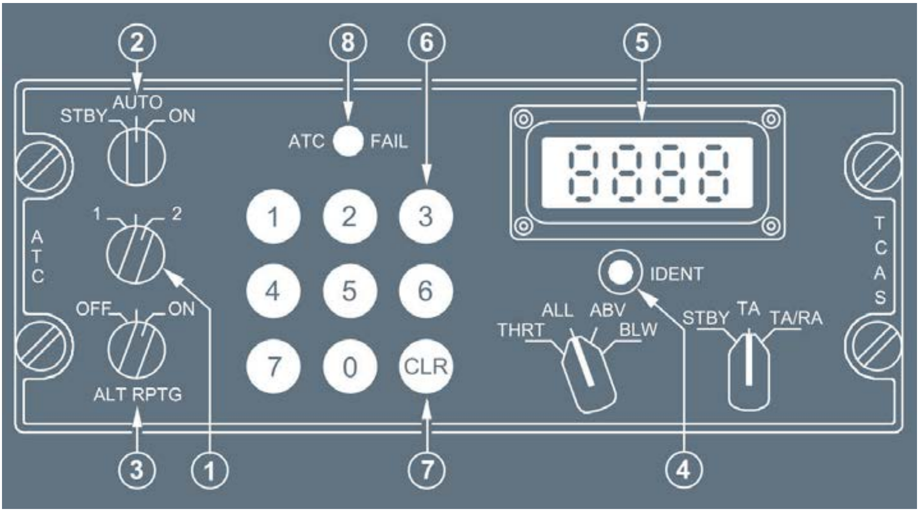
CONTROL PANELS

Ident.: DSC-34-SURV-10-20-00020607.0009001 / 17 MAR 17
Applicable to: ALL



(1) XPDR Selector
This switch selects XPDR 1 or 2.

(2) Mode Selector

STBY	:	Both XPDR are electrically supplied but do not operate.
ON	:	Selected XPDR operates.
AUTO	:	In flight : Selected XPDR operates.
AUTO	:	On ground : Selected XPDR only operates in mode S (Selective aircraft interrogation mode).

(3) ALT RPTG Switch

ON	:	The XPDR sends barometric standard altitude data.
OFF	:	No altitude data transmission. If the TCAS is installed, the upper ECAM displays "TCAS STBY" in green.

(4) IDNT Switch
The flight crew presses this button to send the aircraft identification signal.

(5) Code Display
The window displays the selected code.

(6) Keypad
The flight crew uses the keypad to set the code assigned by ATC.

(7) CLR Key
The flight crew uses this key to clear the code display.

Note: As long as the four figures of the new code are not entirely written, the previous code remains.

(8) ATC FAIL Light
This light comes on if the selected XPDR fails.

DESCRIPTION

Ident.: DSC-34-SURV-30-10-00014867.0001001 / 21 MAR 17
Applicable to: ALL

The aircraft is fitted with one (or two ⊲) weather radar system(s) with a Predictive WindShear (PWS ⊲) function.
If two weather radar systems are installed, only one system is active at a time. The flight crew can display weather data on the CAPT and/or F/O NDs in either ARC or ROSE mode.
The flight crew can adjust the brightness of the weather image on the ND thanks the outer knob of the ND Brightness Control knob (*Refer to DSC-31-50 Other EFIS Controls*).

Note: *A low brightness setting of the weather display may reduce the visibility of weather data, and therefore reduce crew awareness of the weather situation.*

The flight crew can adjust manually the antenna tilt settings, and can adjust gain either automatically or manually using knobs located on the radar control panel.

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GENERAL

Ident.: DSC-34-SURV-30-20-00020942.0001001 / 17 MAR 17
Applicable to: ALL

The weather radars have a Predictive Windshear System (PWS) that operates when:
- The PWS switch is in the AUTO position (Even if the weather radar is OFF), and
- The aircraft is below 2 300 ft AGL, and
- The ATC is switched to the ON, or AUTO, or XPDR , or XPNDR, position (depending on the ATC panel), and
- Either engine is running.

Note: *When two weather radars are installed, if the selected weather radar fails, the PWS function is recovered by selecting the non-failed weather radar on the control panel.*

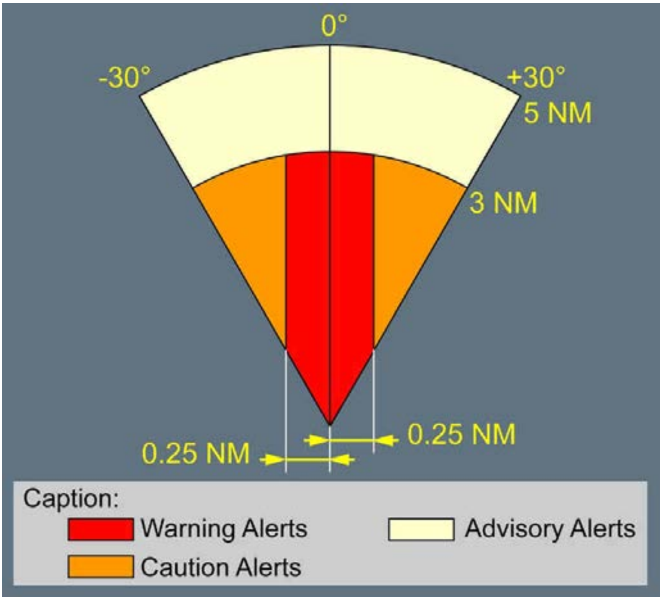
The system scans the airspace, within a range of 5 NM ahead of the aircraft, for windshears. When the system detects windshear, depending on the range selected on the ND , a warning, caution, or advisory message appears on the ND. Predictive windshear warnings and cautions are associated with an aural warning.
Predictive windshear warnings and cautions are associated to an aural alert and to a red (warning) or amber (caution) "W/S AHEAD" message on the PFD , whereas windshear advisories are only displayed on the ND (*Refer to DSC-34-SURV-30-30 PWS (if installed) indication on PFD and ND*) without message on the PFD.

Alert Level	**Aural Warning**	**PFD**	**ND (*Refer to DSC-34-SURV-30-30 PWS (if installed) indication on PFD and ND*)**
Warning (Approach)	«GO AROUND WINDSHEAR AHEAD»	W/S AHEAD (red)	Windshear icon
Warning (Takeoff)	«WINDSHEAR AHEAD» (twice)	W/S AHEAD (red)	Windshear icon
Caution	«MONITOR RADAR DISPLAY»	W/S AHEAD (amber)	Windshear icon
Advisory	Nil	Nil	Windshear icon

WINDSHEAR ALERTS DURING TAKEOFF ROLL, UP TO 100 KNOTS

Ident.: DSC-34-SURV-30-20-00020944.0001001 / 17 MAR 17
Applicable to: ALL

Windshear Alerts During Takeoff Roll, Up to 100 knots



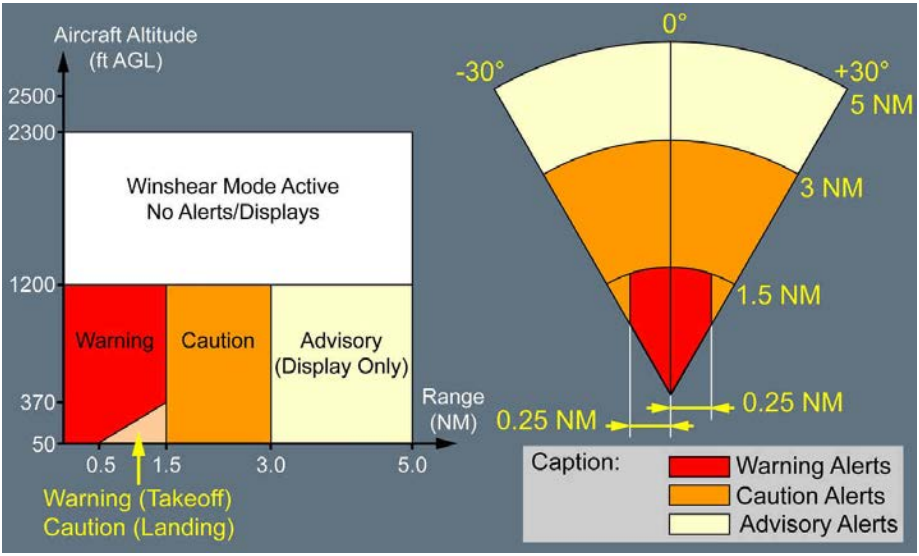
During the takeoff roll, up to 100 kt, both warnings and cautions are available within a range of 3 NM.

Note: *This is also applicable during taxi when weather radar is set to ON.*

WINDSHEAR ALERTS ABOVE 50 FEET

Ident.: DSC-34-SURV-30-20-00006422.0001001 / 12 APR 16
Applicable to: ALL

Windshear Alerts Above 50 feet



During final approach, the visual and aural warning alerts are downgraded to caution alerts between 370 ft AGL and 50 ft AGL, and range between 1.5 NM and 0.5 NM.

WINDSHEAR ALERTS INHIBITION

Ident.: DSC-34-SURV-30-20-00006426.0002001 / 20 JUL 15
Applicable to: ALL

At takeoff, alerts are inhibited above 100 kt and up to 50 ft.
During landing, alerts are inhibited below 50 ft.

The aural alerts of the Predictive WindShear system (PWS):
- Have priority over TCAS , GPWS , and other FWC aural warnings
- Are inhibited by reactive windshear detection and aural messages of stall warnings.

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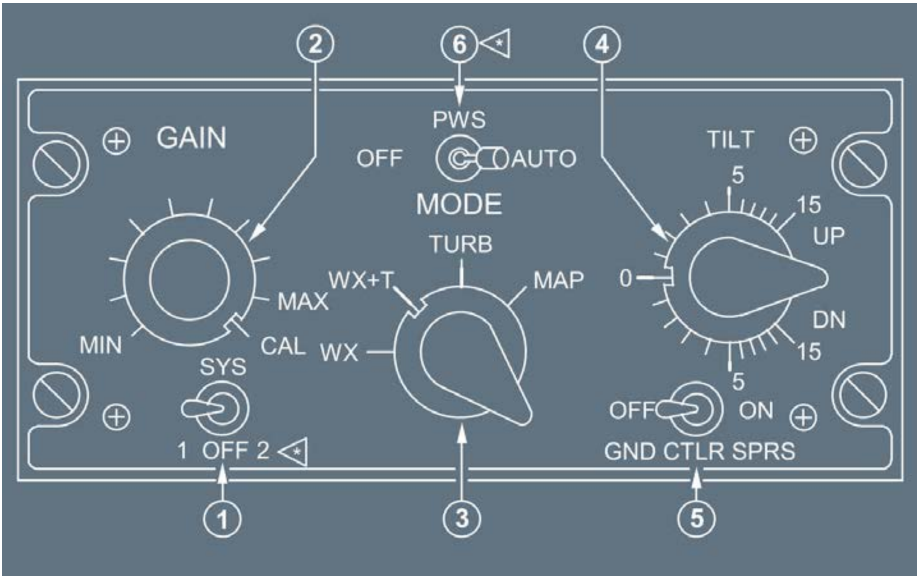
CONTROL PANEL

Ident.: DSC-34-SURV-30-30-00001402.0010001 / 21 MAR 17
Applicable to: ALL



(1) Radar sw

Note: *If only one radar is installed on the aircraft, either:*
- *a "INOP" or "DEACT" sticker replaces the "2", or*
- *a "ON/OFF" Radar sw replaces the "1/OFF/2" Radar sw.*

This switch sets:
- the radar to ON or OFF (if only one radar is installed on the aircraft), or
- one radar to ON or turns off both radars (if two radars are installed on the aircraft).

Note: *If only one radar is installed on the aircraft, no weather image is displayed on the Navigation Dislplay (ND) when the "1/OFF/2" Radar sw is set to "2".*

(2) GAIN knob
This knob adjusts the sensitivity of the radar.
“CAL” is the normal position; it adjusts the gain to a calibrated setting.

(3) Display mode selector

WX : Weather mode :
Colors indicate the intensity of precipitation (black for the lowest intensity, green, amber and red indicate progressively higher intensity).

WX+T : Weather and Turbulence mode :
The ND indicates precipitation and turbulence areas. Turbulence areas are displayed in magenta (within 40 NM).

TURB ⊲ : Turbulence mode :
The ND only displays turbulence areas in magenta (within 40 NM).

MAP : Map mode :
The radar operates in ground mapping mode: black indicates water, green indicates the ground, and amber indicates cities and mountains.

(4) TILT knob
This knob adjusts antenna tilt above and below the horizon.
Zero indicates the horizon reference, as provided by the ADIRS.

(5) GND CLTR SPRS sw

ON : Suppresses the ground echo on the screen.

OFF : Normal use of the radar.

(6) PWS sw ⊲

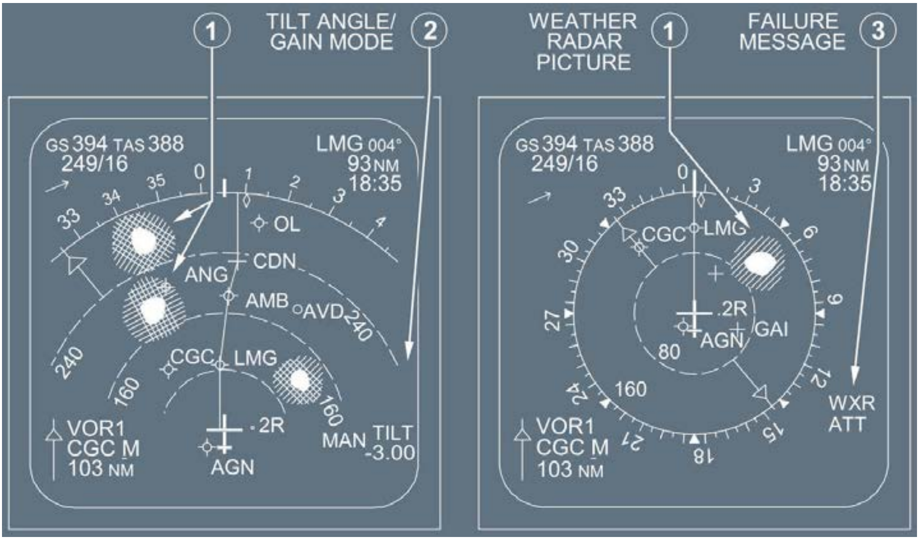
Note: If the PWS function is not installed on the aircraft, a "INOP" sticker can replace the PWS sw.

AUTO : Activates the Predictive WindShear function in accordance with activation conditions (*Refer to DSC-34-SURV-30-20 Windshear Alerts Above 50 feet*).

OFF : Turns off the predictive windshear function.

WEATHER RADAR INDICATION ON ND

Ident.: DSC-34-SURV-30-30-00001255.0001001 / 28 FEB 14
Applicable to: ALL



(1) <u>Weather Radar Picture</u>

- When the radar is operating, and when the ND is not in PLAN mode, the ND displays the weather radar picture.
- The echoes appear in different colors, depending on the precipitation rates (black, green, yellow, red or magenta).
- The selected ND range will determine how often the image is refreshed.

(2) <u>Tilt Angle and Gain Mode</u>

- The value of the tilt angle is in degrees, and quarters of a degree. It appears in blue in the lower right-hand corner of the screen. This angle is the angle between the horizon and the radar beam axis.
- ”MAN” appears in white, when the manual gain mode is selected.

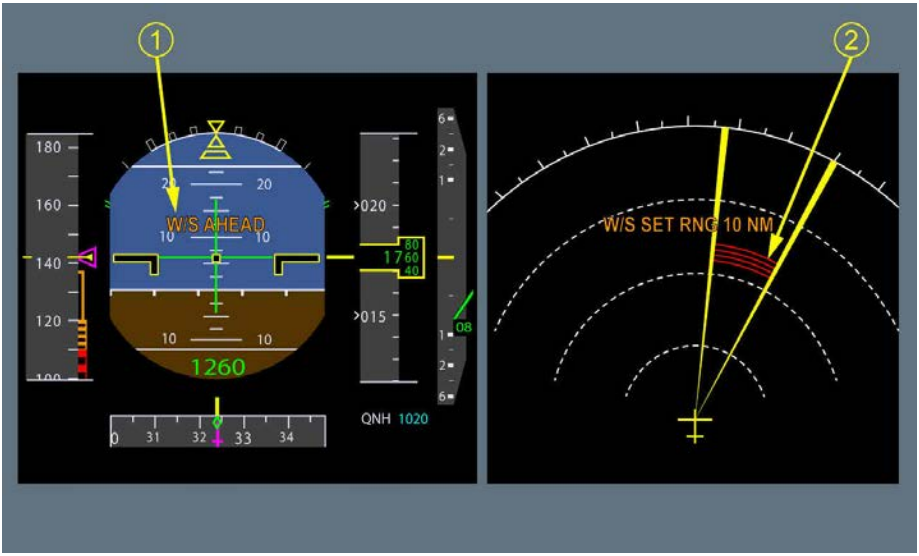
(3) <u>Failure Messages</u>
The ND lists the detected failures.
If the message is in “red”, the ND does not display a radar image.
If the message is in “amber”, the image is not affected.

WXR RT (red) : Radar transceiver failure.

WXR ANT (red)	:	Radar antenna failure.
WXR CTL (red)	:	Radar control unit failure.
WXR RNG (red)	:	Range error.
WXR WEAK (amber)	:	Calibration failure.
WXR ATT (amber)	:	Attitude control failure.
WXR STAB (amber)	:	Antenna stabilization failure.

PWS INDICATION ON PFD AND ND

Ident.: DSC-34-SURV-30-30-00020941.0001001 / 17 MAR 17
Applicable to: ALL



(1) W/S AHEAD message on the PFD
This message is displayed, when the Predictive WindShear system detects windshear ahead of the aircraft.
The message is in amber or red, depending on the level of the alert. *Refer to DSC-34-SURV-30-20 General*.

(2) Predictive WindShear area indication
A red and black symbol and two yellow radial lines indicate the predicted windshear area.
Windshear indication is available in ARC and ROSE ND modes.

When the radar detects a windshear event and the ND range is set above 10 NM, a W/S SET RNG 10 NM (Windshear, set range to 10 NM) message appears. This message requests the flight crew to adjust the range on the corresponding ND.
Depending on the windshear alert level, ND indication may be associated with an aural message and a PFD message. *Refer to DSC-34-SURV-30-20 General*.

MEMO DISPLAY

Ident.: DSC-34-SURV-30-30-00017051.0001001 / 21 MAR 16
Applicable to: ALL

The "PRED W/S OFF" message appears when windshear is set to OFF on the weather radar panel.

PRED W/S OFF	:	This memo appears in green during flight phases 2 and 6.
PRED W/S OFF	:	This memo appears in amber when: - The aircraft is in flight phases 3, 4, 5, 7, 8, and 9. - The T.O. CONFIG pb is pressed during flight phase 2.

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OVERVIEW

Ident.: DSC-34-SURV-40-10-00021292.0001001 / 17 MAR 17
Applicable to: ALL

The purpose of the Ground Proximity Warning System (GPWS) is to warn the flight crew of potentially hazardous situations, such as a collision with terrain. It detects terrain collision threats and triggers applicable aural and visual indications.

The GPWS includes:
- Five basic modes active up to radio height of 2 500 ft.
  - Excessive rate of descent (Mode 1)
  - Excessive terrain closure rate (Mode 2)
  - Altitude loss after takeoff or go-around (Mode 3)
  - Terrain clearance not sufficient, if not in landing configuration (Mode 4)
  - Excessive descent below the glide slope (Mode 5).
- A predictive GPWS function, based on a GPWS database, to display terrain information. It can be provided:
  - By Honeywell through Enhanced GPWS (EGPWS)
  - By ACSS as Ground Collision Avoidance System (GCAS), through T2CAS or T3CAS.

  The predictive GPWS is composed of:
  - Mandatory functions such as the Forward Looking Terrain Alerting function
  - Optional functions such as the obstacle database.

  Note: *The terrain data are displayed on the ND and the brightness is controlled via the weather radar brightness control knob. If the weather radar brightness was set to low (due to bad weather) and a terrain alert occurs, then the brightness of the terrain display will also be low.*

PRINCIPLE

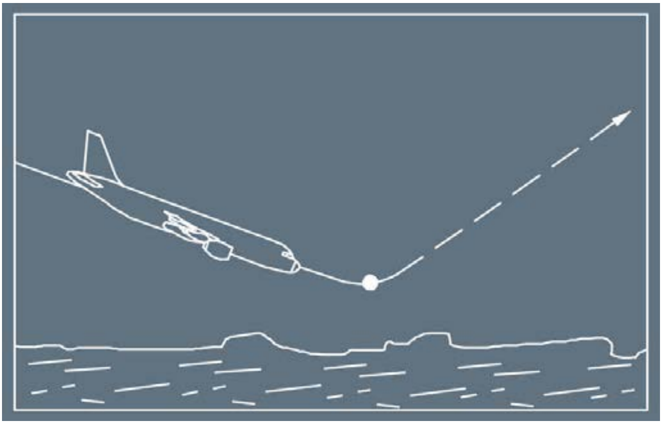
Ident.: DSC-34-SURV-40-10-00021293.0001001 / 17 MAR 17
Applicable to: ALL

The GPWS computes the geometric altitude of the aircraft by using:
- Pressure altitude
- Radio altitude
- Temperature
- Barometric references

- GPS altitude for predictive GPWS ⊲
- Data from the GPWS database for predictive GPWS ⊲ .

MODE 1 : EXCESSIVE RATE OF DESCENT

Ident.: DSC-34-SURV-40-20-00015115.0001001 / 13 JAN 14
Applicable to: ALL

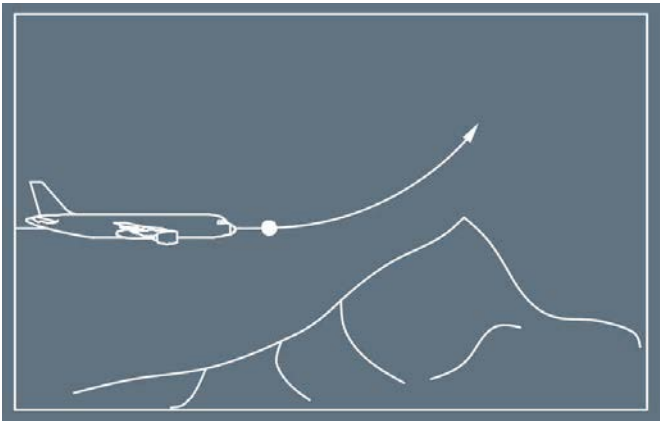


Mode 1 triggers aural and visual alerts about excessive rates of descent, based on the radio height, and the rate of descent of the aircraft.
Mode 1 is active for all phases of the flight.

	CAUTION	**WARNING**
AURAL ALERT	"SINK RATE, SINK RATE"	"PULL UP" (repeated as long as MODE 1 is triggered)
VISUAL ALERT	 The GPWS red lights come on	 The GPWS red lights come on

MODE 2 : EXCESSIVE TERRAIN CLOSURE RATE

Ident.: DSC-34-SURV-40-20-00015116.0001001 / 23 JUN 15
Applicable to: ALL



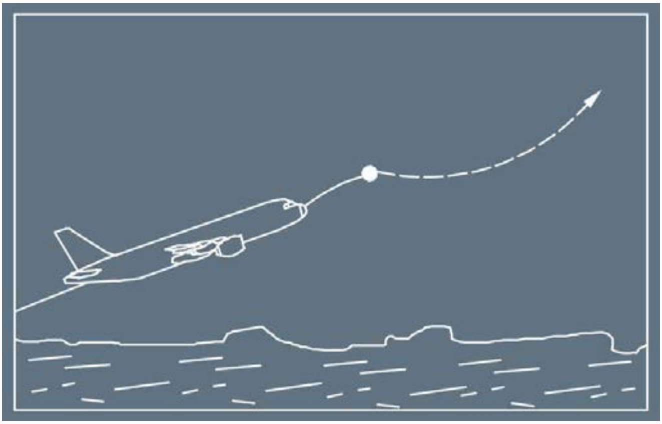
Mode 2 triggers two types of aural and visual alerts, based on the landing gear/flaps configuration of the aircraft, the radio height, and the RA rate of change.
There are two types of Mode 2 alerts, Mode 2A (active during climb, cruise, and initial approach), and Mode 2B (active during approach and 60 s after takeoff).

CONFIGURATION	**Flaps not in Landing Position + Landing Gear Up (Mode 2A)** **Flaps Down + Landing Gear Up (Mode 2B)**		
	CAUTION	**WARNING**	
AURAL ALERT	"TERRAIN, TERRAIN"	"PULL UP" (repeated as long as MODE 2 is triggered in the warning conditions)	"TERRAIN" (repeated as long as MODE 2 is triggered after leaving the warning conditions)
VISUAL ALERT	 The GPWS red lights come on	 The GPWS red lights come on	 The GPWS red lights come on

CONFIGURATION	Flaps Down + Landing Gear Down (Mode 2B)	
AURAL ALERT	CAUTION	
	"TERRAIN" (repeated as long as MODE 2 is triggered)	
VISUAL ALERT		The GPWS red lights come on

MODE 3 : ALTITUDE LOSS AFTER TAKEOFF

Ident.: DSC-34-SURV-40-20-00015117.0001001 / 19 SEP 13
Applicable to: ALL

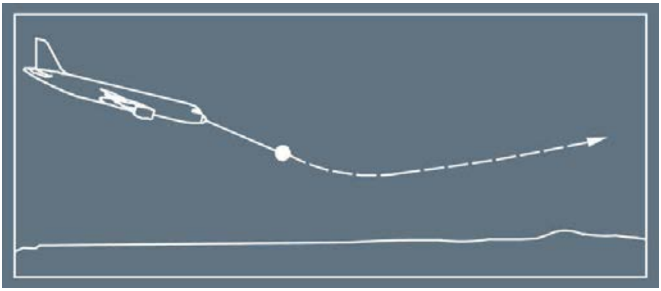


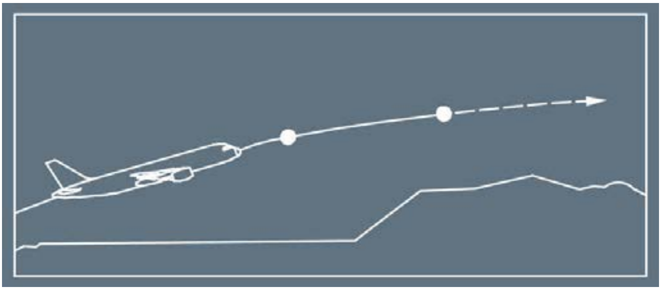
Mode 3 triggers aural and visual alerts when the altitude significantly decreases after takeoff, and go-arounds with landing gear or flaps not in landing configuration.

	CAUTION	
AURAL ALERT	"DON'T SINK, DON'T SINK" (repeated as long as MODE 3 is triggered)	
VISUAL ALERT		The GPWS red lights come on

MODE 4 : UNSAFE TERRAIN CLEARANCE WHEN NOT IN LANDING CONFIGURATION

Ident.: DSC-34-SURV-40-20-00015118.0005001 / 13 JAN 14
Applicable to: ALL



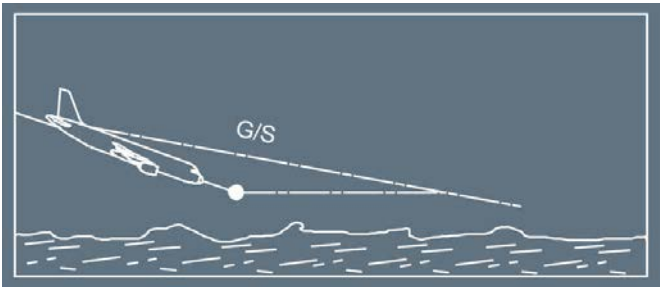


There are three types of Mode 4 alerts, Mode 4A and Mode 4B (both active during cruise and approach), and Mode 4C (active during takeoff*).
Mode 4A and Mode 4B trigger aural and visual alerts when terrain clearance is not sufficient based on the phase of flight, the configuration of the landing gear and the flaps, and the speed. Mode 4C triggers aural and visual alerts based on the minimum terrain clearance and the radio height of the aircraft. *(Only EGPWS not T2CAS)

CONFIGURATION	Landing gear Up (Mode 4A)		Flaps not in landing position + Landing gear down (Mode 4B)		Flaps not in landing position OR Landing Gear Up (Mode 4C)
AURAL ALERT	CAUTION				
	"TOO LOW TERRAIN"	"TOO LOW GEAR"	"TOO LOW TERRAIN"	"TOO LOW FLAPS"	"TOO LOW TERRAIN"
VISUAL ALERT		The GPWS amber lights come on			

MODE 5 : DESCENT BELOW GLIDESLOPE

Ident.: DSC-34-SURV-40-20-00015119.0001001 / 19 SEP 13
Applicable to: ALL



Mode 5 triggers aural and visual alerts, when the aircraft descends below the glide slope.

	CAUTION	
AURAL ALERT	"GLIDESLOPE" (repeated as long as MODE 5 is triggered)	
VISUAL ALERT		The G/S amber lights come on

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TERRAIN AWARENESS AND DISPLAY

Ident.: DSC-34-SURV-40-35-00001417.0002001 / 17 MAR 11
Applicable to: ALL

The Terrain Awareness and Display (TAD) function computes a caution and a warning envelope in front of the aircraft, which varies according to aircraft altitude, nearest runway altitude, distance to the nearest runway threshold, ground speed, and turn rate. When the boundary of these envelopes conflicts with the terrain, memorized in the database, the system generates the relevant alert:

Alert Level	Aural Warning	ND (*Refer to DSC-31-45 Flags and Messages Displayed on ND*)	Local Warning
Warning	**TERRAIN AHEAD, PULL UP**	- Automatic terrain display See * - Solid red areas - TERR AHEAD (red)	The pb light comes on, on each pilot's instrument panel.
Caution	**TERRAIN AHEAD**	- Automatic terrain display pop up See * - Solid yellow areas - TERR AHEAD (amber)	

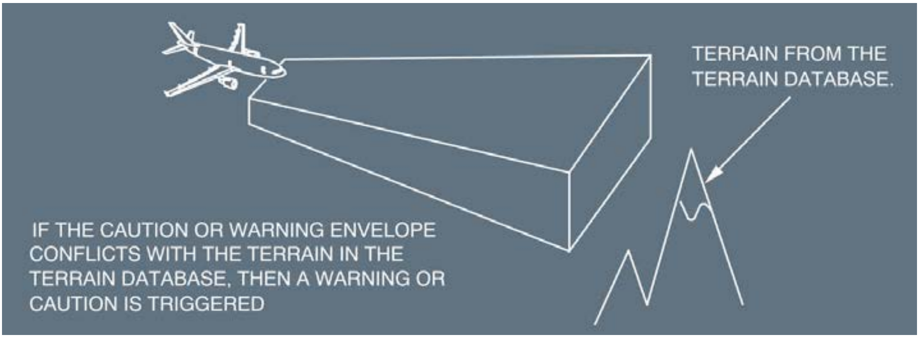
* When the TERR pb-sw ON, ND is selected ON, and ARC or ROSE mode is selected, the terrain is displayed on the ND . The terrain is displayed in various densities of green, yellow, red, or magenta, depending on the threat. (*Refer to DSC-31-45 Flags and Messages Displayed on ND*). If an alert is generated (caution or warning) when TERR pb-sw ON ND is not selected, the terrain will be automatically displayed and the ON light of the TERR pb-sw ON ND will come on.

Note: 1. *When TERR pb-sw ON ND is selected, the weather radar image is not displayed*
2. *The relative height of the aircraft is computed using the Captain's BARO setting. Thus, the Terrain Awareness Display (TAD) does not protect against BARO setting errors.*
3. *The TAD and Terrain Clearance Floor (TCF) functions operate using the FMS 1 position. Thus, the system does not protect against FMS 1 position error.*

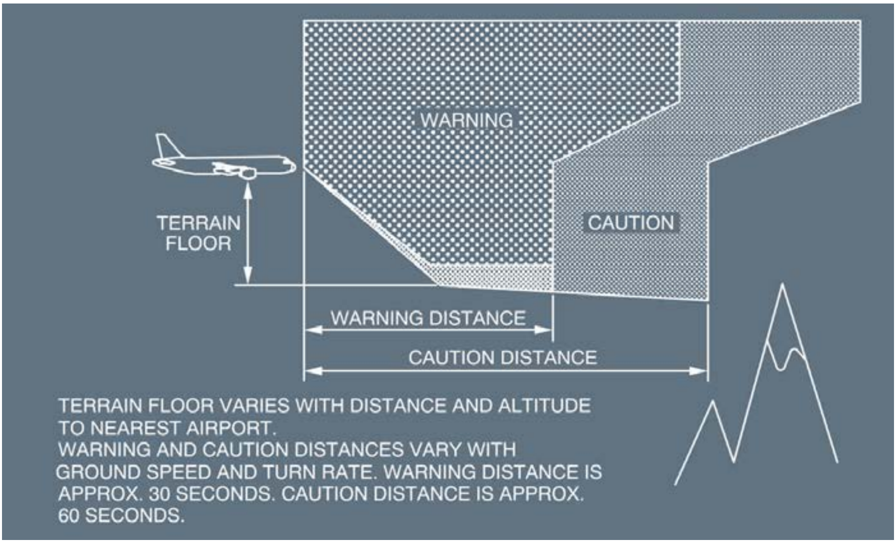
If the crew identifies that navigation accuracy is low, it must set the enhanced modes to off, via the TERR pb-sw. The 5 GPWS modes remain active.

TERRAIN CAUTION AND WARNING ENVELOPE

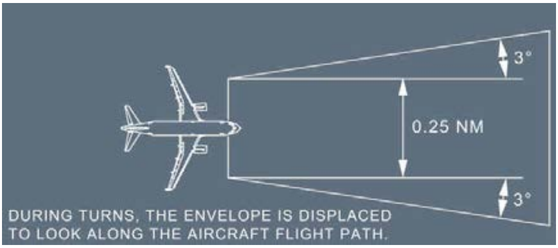
Ident.: DSC-34-SURV-40-35-00006161.0002001 / 19 DEC 12
Applicable to: ALL



VERTICAL ENVELOPE



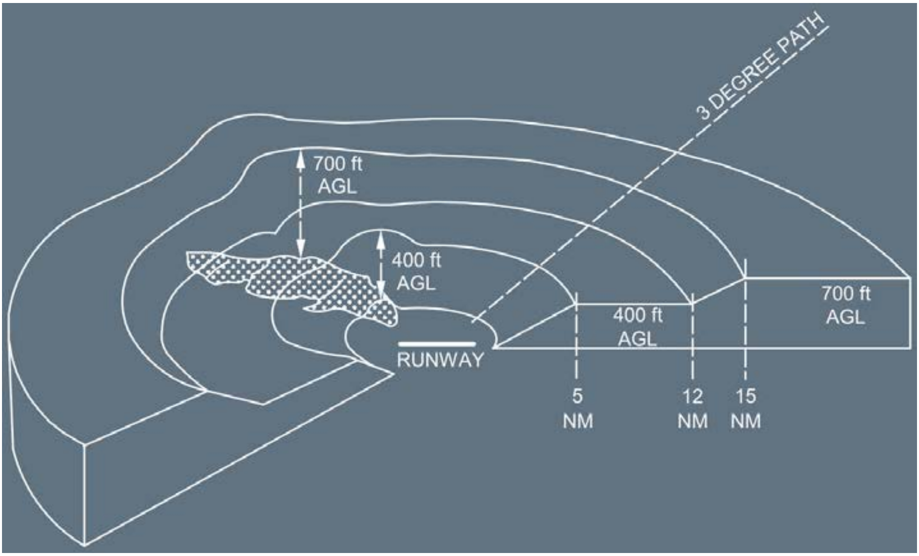
HORIZONTAL ENVELOPE



TERRAIN CLEARANCE FLOOR

Ident.: DSC-34-SURV-40-35-00006162.0002001 / 03 JUN 14
Applicable to: ALL

A terrain clearance floor envelope is stored in the database for each runway for which terrain data exist. The Terrain Clearance Floor (TCF) function warns of a premature descent below this floor, regardless of aircraft configuration.



If the airplane descends below this floor, a TOO LOW TERRAIN aural warning is announciated, and the pushbutton light comes on, on the glareshield.

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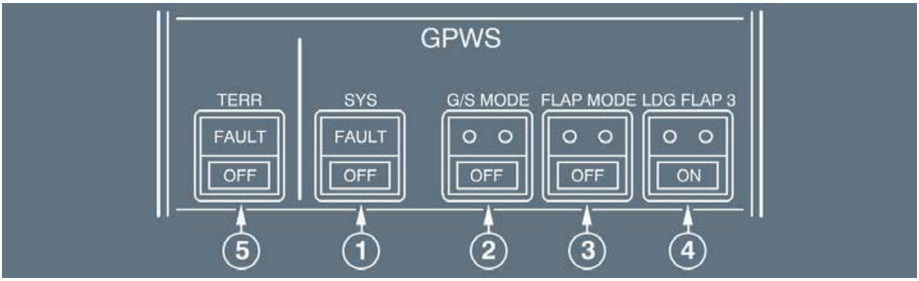
OVERHEAD PANEL

Ident.: DSC-34-SURV-40-40-00001418.0002001 / 21 MAR 17
Applicable to: ALL



(1) SYS pushbutton

OFF : All basic GPWS alerts (Mode 1 to 5) are inhibited.

FAULT light : This amber light comes on, along with an ECAM caution, if the basic GPWS mode 1 to 5 malfunction.

Note: *If ILS 1 fails, only mode 5 is inhibited. Consequently, the FAULT light does not come on and the GPWS FAULT warning is not triggered.*

(2) G / S MODE pushbutton

OFF : Glideslope mode (mode 5) is inhibited.

(3) FLAP MODE pusbutton

OFF : Flap mode ("TOO LOW FLAPS" mode 4) is inhibited.
(To avoid nuisance warning in case of landing with flaps setting reduced).

(4) LDG FLAP 3 pushbutton

ON : Flap mode is inhibited when FLAPS CONF 3 is selected (to avoid nuisance warning in case of landing in CONF 3).
In this case, LDG MEMO displays "FLAPS ... 3" instead of "CONF ... FULL".

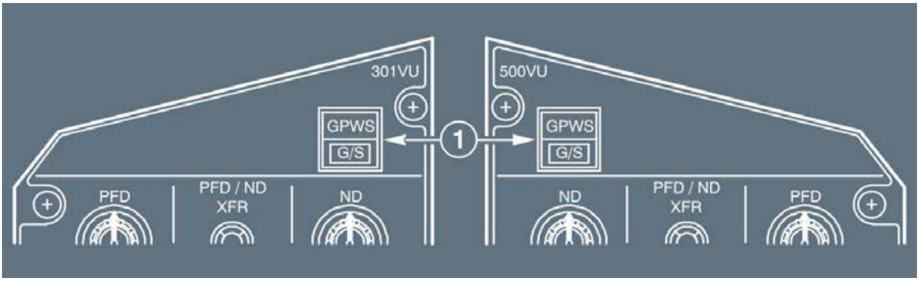
(5) TERR pushbutton

OFF : Inhibits the Terrain Awareness Display (TAD) and Terrain Clearance Floor (TCF) modes, and does not affect the basic GPWS mode 1 to 5. If OFF is selected the ECAM caution NAV GPWS TERR DET FAULT is displayed.

FAULT light : This amber light comes on, along with an ECAM caution, if the TAD or TCF mode fails. The terrain is not shown on the ND . The basic GPWS mode 1 to mode 5 are still operative if the SYS pushbutton OFF or FAULT lights are not illuminated.

INSTRUMENT PANELS

Ident.: DSC-34-SURV-40-40-00001419.0003001 / 19 DEC 12
Applicable to: ALL

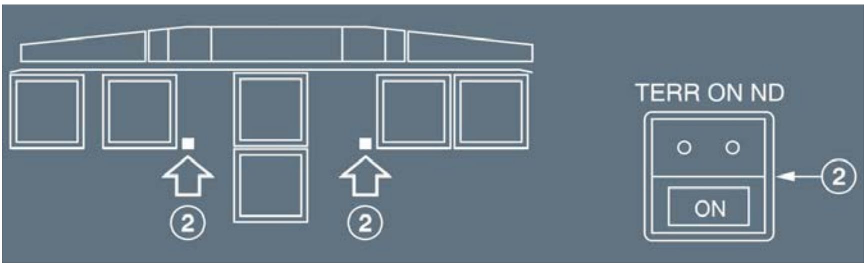


(1) GPWS – G/S pushbutton

GPWS : This red light comes on when any mode from 1 to 4, or any TAD or TCF alert is activated. A specific voice alert accompanies it.

G/S : Comes on amber when Mode 5 is activated. It is accompanied by the aural "GLIDE SLOPE" warning.

Note: *1. If the flight crew presses this button briefly when a glide slope warning is on, the G/S light goes out and the "GLIDE SLOPE" aural warning (soft or loud) stops.*
2. On ground, the GPWS can be tested by pressing this pushbutton. If the pushbutton is pressed briefly, some of the aural warnings sound and pushbutton captions, related to the GPWS, come on. If the pushbutton is pressed continuously, then all the aural warnings sound.



(2) TERR ON ND pushbutton

These pushbuttons are located on either side of the ECAM. Each pushbutton controls the onside terrain display.

ON : The terrain is displayed on the ND if the:
- TERR pb-sw is selected ON, and
- TERR FAULT light is not on.

The ON light comes on.

OFF : The terrain data is not displayed on the ND.

Note:
- *If the Terrain Awareness Display (TAD) mode generates a caution or a warning, while the TERR ON ND is not switched ON, the terrain is automatically displayed on the ND s (see EGPWS specific caution and warning due to TAD mode) and the ON light of the TERR ON ND pushbutton come on.*
- *To differenciate between the terrain and the weather display, the terrain display sweeps from the center outward to both sides of the ND.*

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-34-SURV-40-40-A-00017057.0001001 / 21 MAR 16

GPWS FLAP 3 : This memo appears in green when GPWS LDG FLAP 3 pb-sw is ON.

Ident.: DSC-34-SURV-40-40-A-00017058.0001001 / 21 MAR 16

GPWS FLAP MODE OFF : This memo appears in green when GPWS FLAP MODE pb-sw is OFF.

Ident.: DSC-34-SURV-40-40-A-00017060.0004001 / 21 MAR 16

The TERR OFF memo appears when the TERR pb-sw is OFF.

TERR OFF : This memo appears in green when:
- The aircraft is in flight phase 2, before the Take Off Configuration test is launched.
- The aircraft is in flight phase 6.

TERR OFF : This memo appears in amber when:
- The aircraft is in flight phase 2, after the Take Off Configuration test.
- The aircraft is in flight phases 3, 4, 5, 7, 8 and 9.

Ident.: DSC-34-SURV-40-40-A-00017059.0003001 / 21 MAR 16

TERR STBY : Airborne TERR STBY memo appears in green when the aircraft position accuracy (provided by the FMS) is not sufficient to allow the enhanced TCF and TAD modes to operate. These modes are not available until the TERR STBY memo disappears. If selected, the terrain data display on ND is automatically deselected when the TERR STBY memo is triggered.

OVERVIEW

Ident.: DSC-34-SURV-60-10-00020407.0001001 / 21 MAR 17
Applicable to: ALL

The Traffic alert and Collision Avoidance System (TCAS):

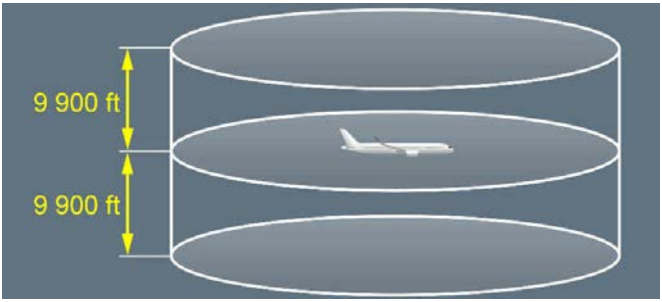
- Detects and displays surrounding aircraft that have a transponder
- Calculates and display possible collision threats
- Triggers vertical speed orders, in order to avoid collisions.

PRINCIPLE

Ident.: DSC-34-SURV-60-10-00020408.0001001 / 21 MAR 17
Applicable to: ALL

The TCAS detection capability is limited to intruders flying within a maximum range of 30 NM on either sides and approximately 30 NM to 80 NM longitudinally (depending on aircraft configuration and external conditions), and within a maximum altitude range of 9 900 ft above and below the aircraft.

TCAS Range

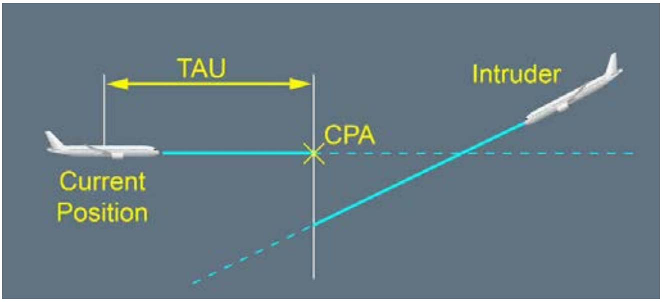


The TCAS obtains data transmitted by the transponders of nearby aircraft, and uses this data to evaluate possible collision threats.

The TCAS determines:
- The bearing of intruders, in relation to the bearing of the aircraft.
- The distance between the aircraft and intruders, and the rate of separation or closure.
- The relative altitude of intruders, if intruders have a Mode-C or Mode-S transponder.

The TCAS then calculates the intruder trajectory, the Closest Point of Approach (CPA), and the estimated time (TAU) before reaching the CPA.
The TAU is the ratio between the distance that separates both aircraft, and the sum of their speed.

TAU Definition



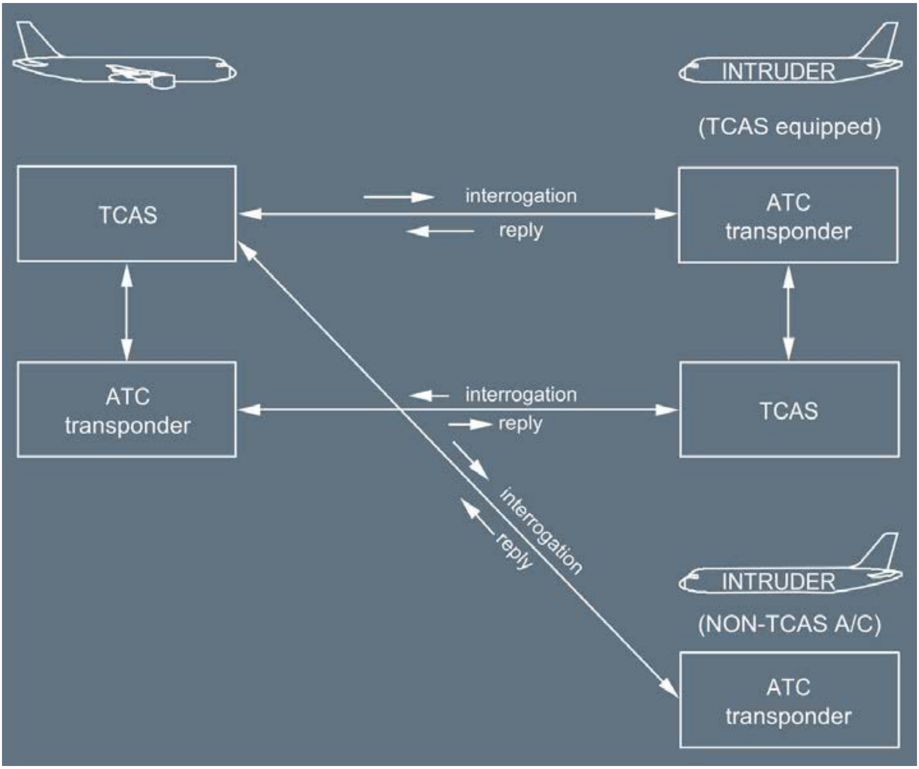
If the TCAS detects that the trajectory of an intruder may be a collision threat, it triggers:
- Audio and visual indicators
- Vertical speed orders, to ensure a sufficient trajectory separation and a minimal vertical speed variation considering all intruders.

MAIN COMPONENTS

Ident.: DSC-34-SURV-60-10-00020409.0001001 / 21 MAR 17
Applicable to: ALL

The system includes:
- A single channel TCAS computer
- Two TCAS antennas
- Two mode S ATC transponders, one active the other in standby

  These transponders allow:
  - Interface between the ATC /TCAS control panel and the TCAS computer
  - Communication between the aircraft and intruders equipped with a TCAS system.
- An ATC /TCAS control panel.

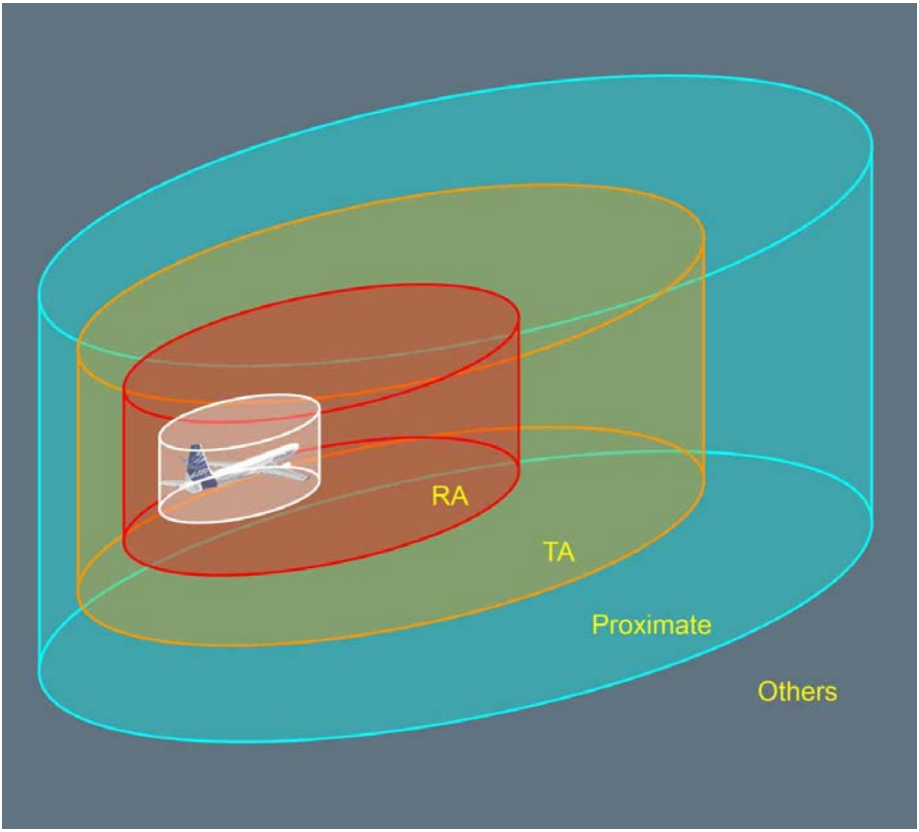


INTRUDER DETECTION CATEGORIES

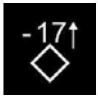
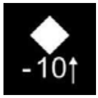
Ident.: DSC-34-SURV-60-10-00020410.0001001 / 21 MAR 17
Applicable to: ALL

The TCAS divides the space surrounding the aircraft into the following four zones, in order to evaluate and categorize possible collision threats:
- Resolution Advisory (RA)
- Traffic Advisory (TA)
- Proximate intruders
- Other intruders.

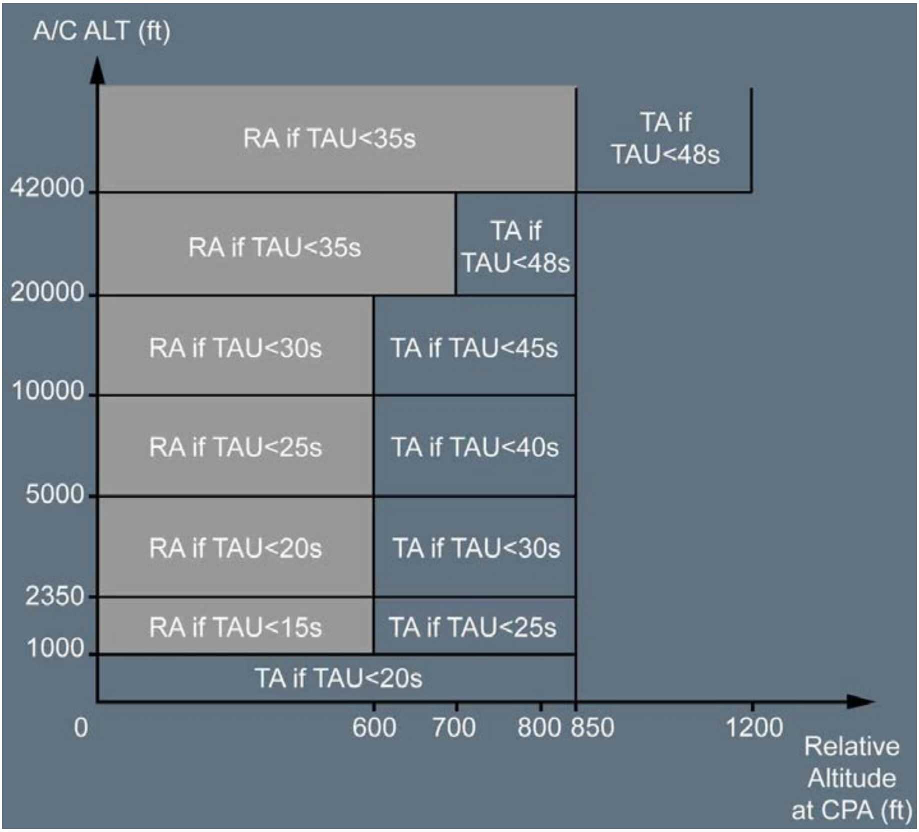
TCAS Envelopes



Depending on the level of the collision threat, the TCAS triggers audio and visual indicators::

LEVEL	INTRUDER POSITION	DISPLAYED INFORMATION AND MESSAGE	
Other intruders	- No collision threat - Any non proximate, TA , RA within the surveillance envelope (lateral range: Closer than 30 NM)	- ND: Intruder position	
Proximate	- No collision threat - Intruder in the vicinity of the A/C (closer than 6 NM laterally and ±1200 ft vertically)	- ND: Intruder position	
Traffic Advisory (TA)	- Potential collision threat - TAU is about 40 s	- ND: Intruder position - Aural messages	
Resolution Advisory (RA)	- Real collision threat - TAU is about 25 s	- ND: Intruder position - Aural messages - PFD: Vertical orders • Maintain actual V/S (Preventive Advisory) or • Modify V/S (Corrective Advisory)	

TA /RA thresholds



TCAS MODES

Applicable to: ALL

Ident.: DSC-34-SURV-60-10-10-00020411.0001001 / 21 MAR 17

TCAS MODES

The TCAS has three different modes of operations that can be selected on the ATC / TCAS control panel:
- The Traffic Advisory/Resolution Advisory (TA/RA) mode
- The Traffic Advisory Only (TA ONLY) mode
- The standby (STBY) mode.

Ident.: DSC-34-SURV-60-10-10-00020412.0001001 / 21 MAR 17

TRAFFIC ADVISORY/RESOLUTION ADVISORY (TA/RA) MODE

The TA/RA mode is the normal TCAS operating mode that enables:
- The ND to display all intruders
- The PFD to display the vertical speed orders that indicate the vertical direction that the aircraft should take, in order to avoid a collision.

Ident.: DSC-34-SURV-60-10-10-00020413.0001001 / 21 MAR 17

TRAFFIC ADVISORY ONLY (TA ONLY) MODE

The TA ONLY mode can be selected:
- Manually in case of aircraft degraded performance (engine failure, landing gear extended), or in specific airports, and for specific procedures (identified by operators) that may provide RA that are neither wanted nor appropriate (e.g. closely-spaced parallel or converging runways)
- Automatically, if TA/RA mode is previously selected and:
  - The windshear alert is triggered
  - The stall warning is triggered
  - GPWS alerts are triggered
  - Aircraft is below 1 000 ft AGL.

When the TCAS is operating in TA ONLY mode:
- All RA s are inhibited and converted into TAs
- TA threshold is set to TAU ≤20 s, irrespective of the aircraft altitude
- No vertical speed advisories are indicated on the PFDs
- “TA ONLY” is displayed on the NDs

Ident.: DSC-34-SURV-60-10-10-00020414.0001001 / 21 MAR 17

STANDBY MODE

In the standby mode, the advisory generation and surveillance functions are not active. The TCAS does not trigger any alert. No TCAS information can be displayed on the PFD s and NDs.

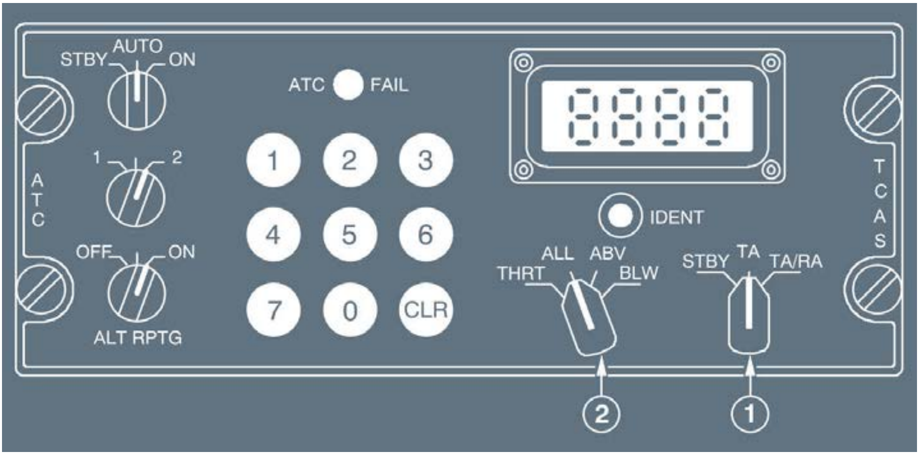
ADVISORY INHIBITION

Ident.: DSC-34-SURV-60-10-00020416.0007001 / 17 MAR 17
Applicable to: ALL

Some advisories are inhibited depending on the aircraft altitude:
- All intruders flying below 380 ft AGL when the own aircraft altitude is below 1 700 ft AGL
- All RA below 1 100 ft in climb and 900 ft in descent. In this case, the RA s are converted into TAs
- “Descend” RA below 1 100 ft AGL
- “Increase Descent” RA below 1 550 ft AGL
- All TA aural messages below 600 ft AGL in climb and below 400 ft AGL in descent
- The AP/FD TCAS ⧼ flight guidance mode is inhibited below 900 ft.

ATC/TCAS PANEL

Ident.: DSC-34-SURV-60-20-00001429.0004001 / 01 OCT 12
Applicable to: ALL



(1) Mode sel

TA/RA : Normal position.
The RA s, TA s and proximate intruders are displayed if the ALT RPTG switch is ON and the transponder is not on STBY.

TA : The TCAS does not generate any vertical orders. This mode should be used, in case of degraded aircraft performance (engine failure, landing gear extended, or approach on parallel runways).
All RA s are converted into TA s. TA s, proximate and intruders are displayed if the ALT RPTG switch is ON and the transponder is not on STBY
The "TA ONLY" white memo is displayed on the NDs.

STBY : The TCAS is on standby.

(2) TRAFFIC sel

THRT : Proximate and other intruders are displayed only if a TA or RA is present, and they are within 2 700 ft above and 2 700 ft below the aircraft.

ALL : Proximate and other intruders are displayed even if no TA or RA is present (full time function). The altitude range is –2700 ft to +2 700 ft.

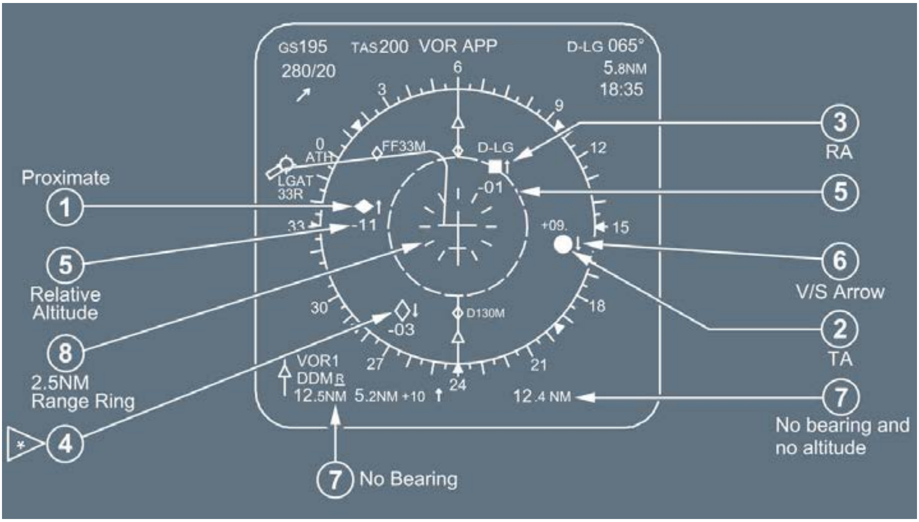
ABV : The same as ALL, except that the other intruders are displayed if within 9 900 ft above the aircraft and 2 700 ft below.

BLW : The same as ALL, except that the other intruders are displayed if within 9 900 ft below the aircraft and 2 700 ft above.

ND INDICATIONS

Ident.: DSC-34-SURV-60-20-00020418.0002001 / 17 MAR 17
Applicable to: ALL

The traffic is displayed in all ROSE modes and ARC mode when 10, 20 or 40 NM range is selected. Only the 8 most threatening intruders are displayed.



(1) Proximate intruder
Indicated by a white filled diamond.

(2) TA intruder
Indicated by an amber circle.
Associated with the TRAFFIC-TRAFFIC aural message.

(3) RA intruder
Indicated by a red square.
Associated with vertical orders displayed on the PFD and aural messages.

(4) Other intruders
Indicated by a white empty diamond.

Note: *If the range of an intruder is not available, the intruder is not displayed. An intruder may be partially displayed when its range is out of scale.*

(5) Relative altitude
Indicated in hundred of feet above or below the symbol depending on the intruder position.

(6) Vertical speed arrow
Displayed only if the intruder V/S > 500 ft/min.
Relative altitude and vertical speed arrow are displayed in the same color as the associated intruder symbol.

Note: *If the altitude of an intruder is not available, neither altitude nor vertical speed indications are displayed.*

(7) No bearing intruder

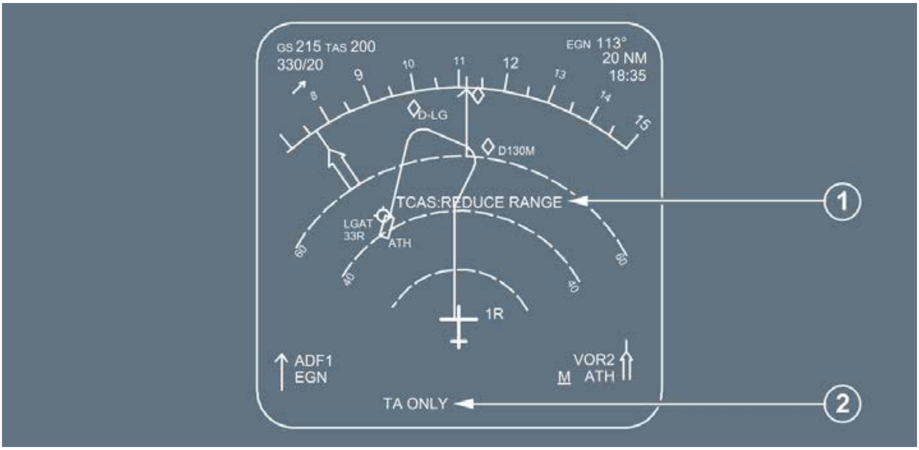
If the bearing of TA or RA intruder is not available the following data is presented in digital form at the bottom of the ND:
- range
- relative altitude and vertical speed arrow if available.

Displayed amber or red according to threat level.

(8) Range ring
A 2.5 NM white range ring is displayed when a 10 NM or 20 NM range is selected.

TCAS MESSAGES

Ident.: DSC-34-SURV-60-20-00020419.0001001 / 17 MAR 17
Applicable to: ALL



(1) Mode and range messages

Following messages can be displayed to draw pilot's attention:

TCAS : REDUCE RANGE	:	Displayed when a TA or RA is detected and ND range above 40 NM.
TCAS : CHANGE MODE	:	Displayed when a TA or RA is detected and ND mode is PLAN.

Displayed amber or red depending on the advisory level (TA or RA).

(2) TCAS operation messages

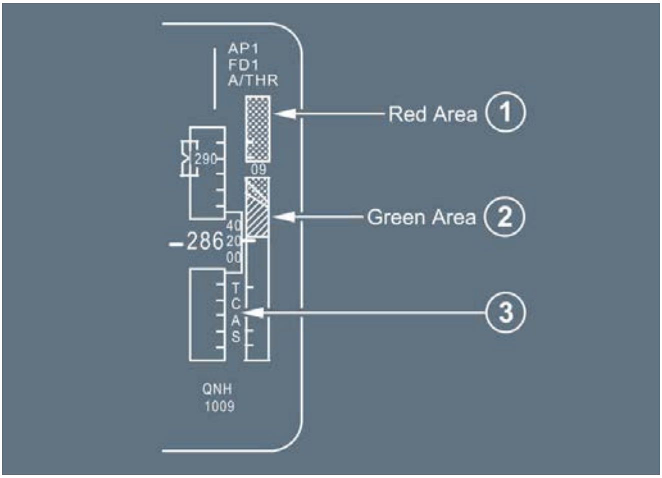
TCAS : Displayed in case of TCAS internal failure.

TA ONLY : Displayed white when the TA mode is selected automatically, or manually by the flight crew.

PFD INDICATIONS

Ident.: DSC-34-SURV-60-20-00020420.0003001 / 17 MAR 17
Applicable to: ALL

In case of RA detection, the PFD presents vertical orders on the vertical speed scale. The vertical speed scale background is normally grey, but may be partially replaced by green and/or red areas.



(1) Red area
Indicates the vertical speed range, when there is a high risk of conflict.

(2) Green area
Indicates the recommended vertical speed range. It is wider than the red area.

Note: - *The aircraft can also fly in the grey vertical speed range, without the risk of conflict (preventive RA).*
- *The color of the digits corresponds to the appropriate area.*
- *In case of RA detection, the vertical speed needle that is normally green, becomes white.*

(3) TCAS message
It is displayed when the TCAS cannot deliver RA data, or in case of an internal TCAS failure, provided that the TCAS is not in standby.

AURAL MESSAGES

Ident.: DSC-34-SURV-60-20-00001433.0018001 / 08 FEB 13
Applicable to: ALL

TA /RA detection is associated with the following messages:

"TRAFFIC TRAFFIC"	:	Only in case of TA detection.
"CLIMB CLIMB"	:	Climb at the vertical speed indicated by the green area on the PFD.

"CLIMB, CROSSING CLIMB" (twice)	:	Same as above. Indicates that you will cross through the intruder altitude.
"INCREASE CLIMB" (twice)	:	Triggered after the CLIMB message, if vertical speed is insufficient to achieve safe vertical separation.
"DESCEND DESCEND"	:	Descend at the vertical speed indicated by the green area on the PFD.
"DESCEND, CROSSING DESCEND" (twice)	:	Same as above. Indicates that you will cross through the intruder altitude.
"INCREASE DESCEND" (twice)	:	Triggered after the DESCEND message, if the vertical speed is insufficient to achieve safe vertical separation.
"LEVEL OFF, LEVEL OFF"	:	Set the Vertical Speed to 0.
"CLIMB CLIMB NOW" (twice)	:	Triggered after the DESCEND message, if the intruder trajectory has changed.
"DESCEND DESCEND NOW" (twice)	:	Triggered after the CLIMB message, if the intruder trajectory has changed.
"MONITOR VERTICAL SPEED"	:	Ensure that the vertical speed remains outside the red area. Triggered only once, in case of preventive RA.
"MAINTAIN VERTICAL SPEED, MAINTAIN"	:	Maintain the vertical speed indicated on the green area of the PFD.
"MAINTAIN VERTICAL SPEED, CROSSING MAINTAIN"	:	Maintain the vertical speed indicated on the green area of the PFD. Indicates that you will cross through the intruder altitude.
"CLEAR OF CONFLICT"	:	The range increases and separation is adequate. Return to assigned clearance.

MEMO DISPLAY

Ident.: DSC-34-SURV-60-20-00020422.0002001 / 17 MAR 17
Applicable to: ALL

TCAS STBY : This memo appears in green when:

- ATC STBY is selected by the crew, or
- TCAS STBY is selected by the crew during flight phases other than 6, or
- ALT RPTG sw is OFF, or
- both ATC s or both RAs are failed.

TCAS STBY : This memo appears in amber when the flight crew sets the TCAS on STBY in flight phase 6.

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AIRCRAFT SYSTEMS

OXYGEN

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DSC-35-10 General

DSC-35-20 Fixed Oxygen System for Cockpit

DSC-35-20-10 Description

DSC-35-20-20 Controls and Indicators

DSC-35-30 Fixed Oxygen System for Cabin

DSC-35-30-10 Description

DSC-35-30-20 Controls and Indicators

DSC-35-40 Portable Oxygen System

DSC-35-40-10 Description

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DESCRIPTION

Ident.: DSC-35-10-00001448.0001001 / 20 DEC 10
Applicable to: ALL

The oxygen system consists of:
- A cockpit-fixed oxygen system, which supplies adequate breathing oxygen to the cockpit occupants in case of depressurization, or emission of smoke and noxious gases.
- A cabin-fixed oxygen system, which supplies oxygen for cabin occupants (passengers and cabin crew) in case of depressurization.
- A portable oxygen system, which is provided in both the cockpit and cabin and is to be used:
  - As PROTECTION for the crew during on board emergencies.
  - For FIRST AID purposes.

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GENERAL

Ident.: DSC-35-20-10-00017801.0001001 / 21 MAR 16
Applicable to: ALL

The cockpit's fixed oxygen system consists of :
- A high-pressure cylinder, located in the left-hand lower fuselage.
- A pressure regulator, connected directly to the cylinder that delivers oxygen, at a pressure suitable for users.
- Two overpressure safety systems to vent oxygen overboard, through a safety port, if the pressure becomes too high.
- A supply solenoid valve that allows the crew to shut off the distribution system.
- Three (or four ⊲✳) full-face quick-donning masks, stowed in readily-accessible boxes adjacent to the crewmembers' seats (one at each seat).

OPERATION

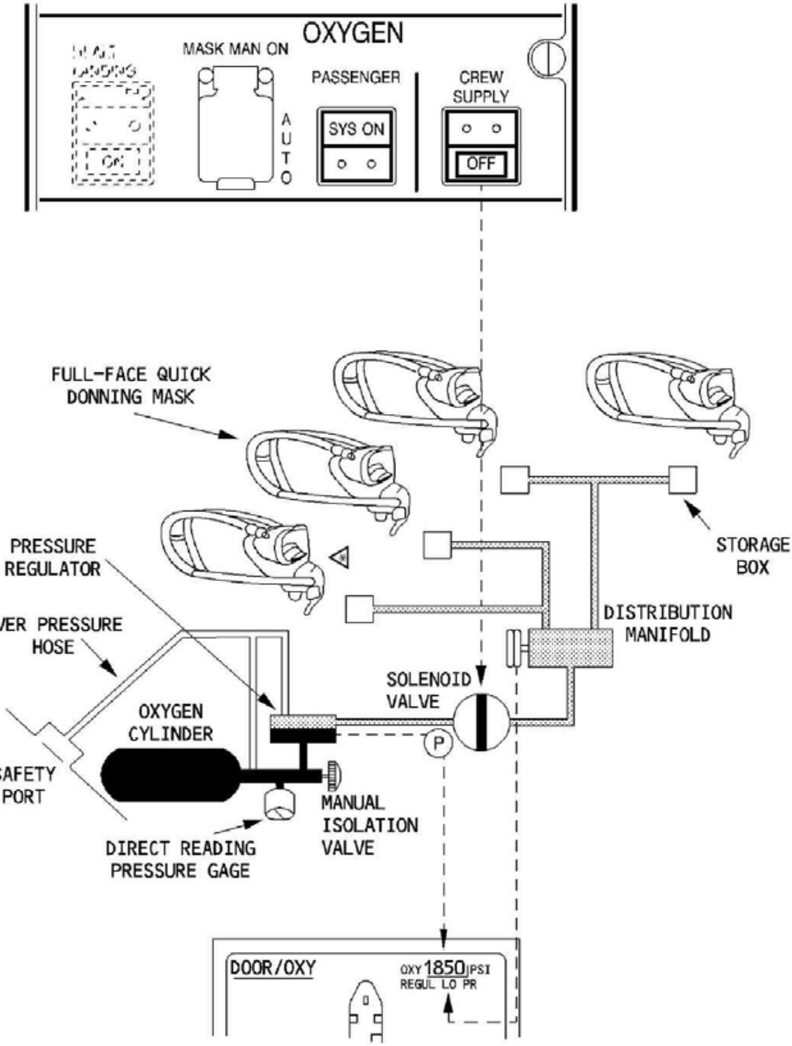
Ident.: DSC-35-20-10-00001450.0001001 / 21 MAR 16
Applicable to: ALL

The crewmember squeezes the red grips to pull the mask out of its box, and this action causes the mask harness to inflate.
A mask-mounted regulator supplies a mixture of air and oxygen or pure oxygen, or performs emergency pressure control. With the regulator set to NORMAL, the user breathes a mixture of cabin air and oxygen up to the cabin altitude at which the regulator supplies 100 % oxygen. The user can select 100 %, in which case the regulator supplies pure oxygen at all cabin altitudes.
If the situation calls for it, the user can use the emergency overpressure rotating knob and receive pure oxygen at positive pressure.
The storage box contains a microphone lead, with a quick-disconnect, for connection to the appropriate mask microphone cable.

<u>Note:</u> *Each mask may have a removable film that protects the visor against scratches. This strip is optional and may be removed from the mask at any time.*

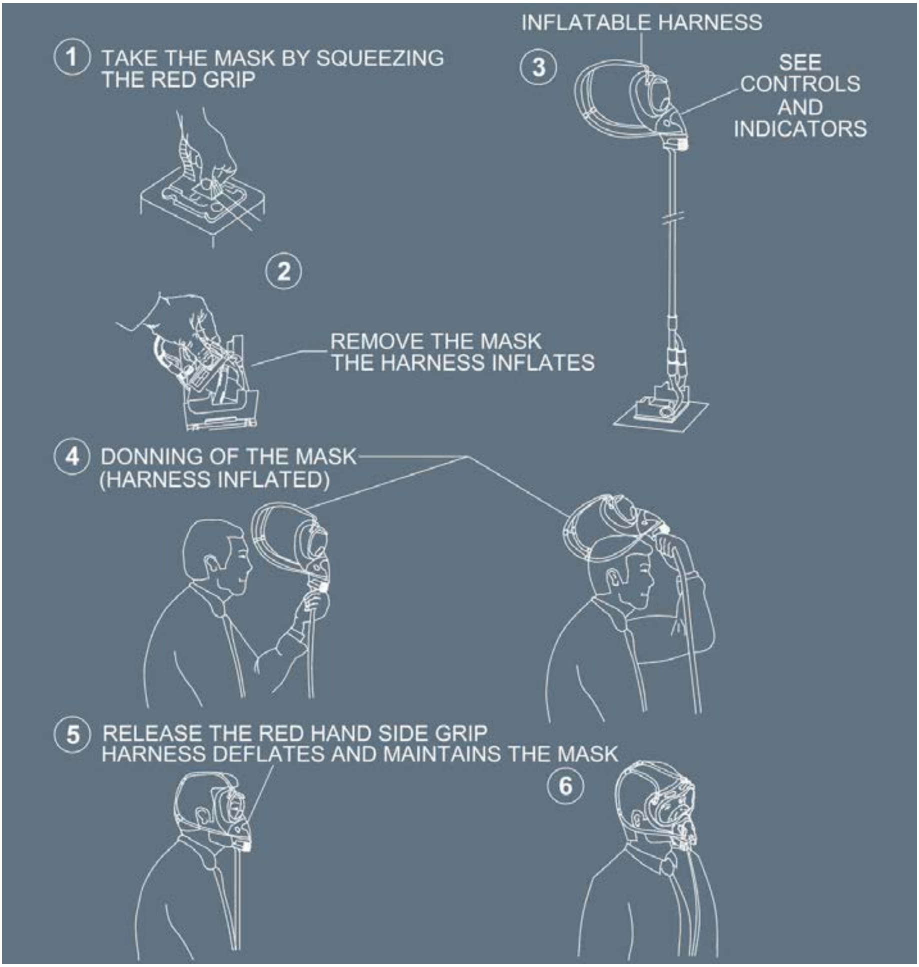
SCHEMATIC

Ident.: DSC-35-20-10-00017802.0001001 / 21 MAR 16
Applicable to: ALL



MASK SETTING

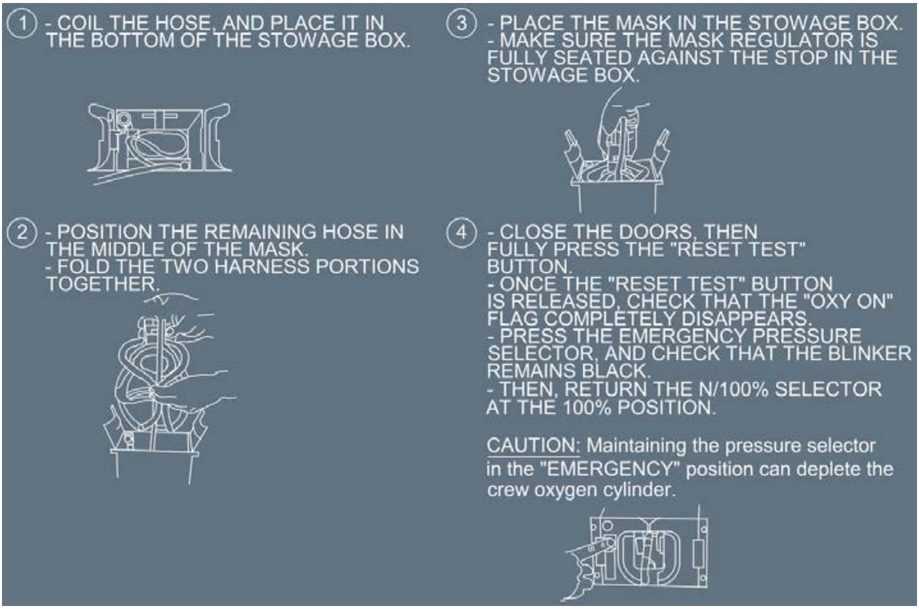
Ident.: DSC-35-20-10-00016919.0001001 / 21 MAR 16
Applicable to: ALL



Note: *The captain (first officer) must exercise caution and turn the head to the right (left) in the direction of the first officer (captain) in order to ensure fast donning of the mask when the HUD on the captain (first officer) side is deployed.*

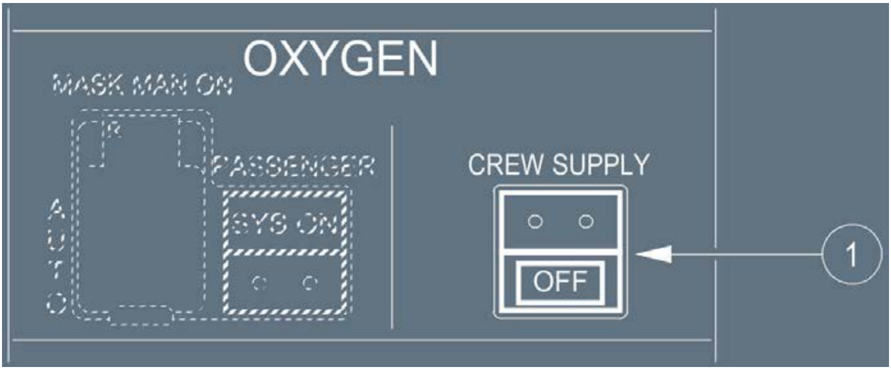
MASK STOWAGE

Ident.: DSC-35-20-10-00001453.0001001 / 21 MAR 16
Applicable to: ALL



OVERHEAD PANEL

Ident.: DSC-35-20-20-00017803.0001001 / 21 MAR 16
Applicable to: ALL



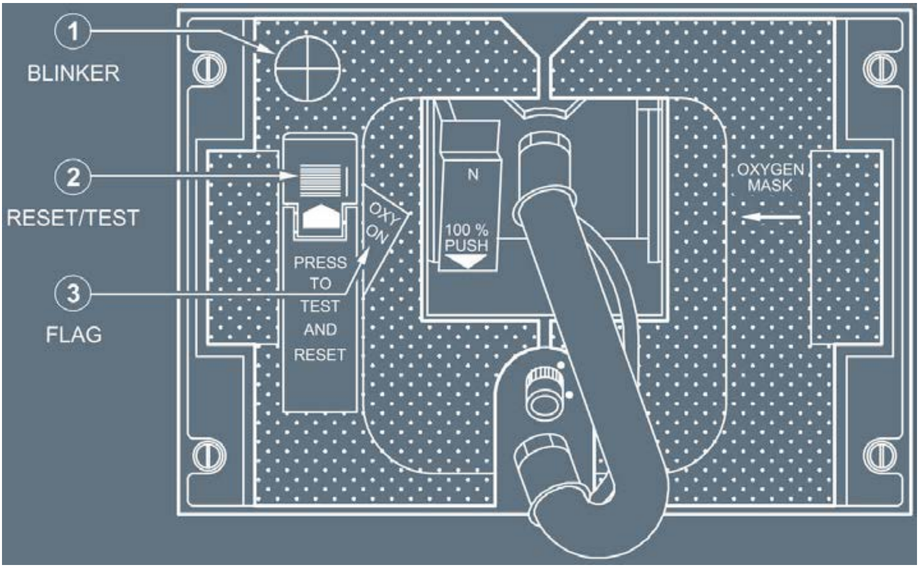
(1) CREW SUPPLY pb
This pushbutton controls the solenoid valve.

On : The valve is open, and supplies low pressure oxygen to the masks (normal position in flight).

OFF: The valve is closed, and the white light comes on.

STOWAGE BOX

Ident.: DSC-35-20-20-00001455.0001001 / 22 MAY 12
Applicable to: ALL



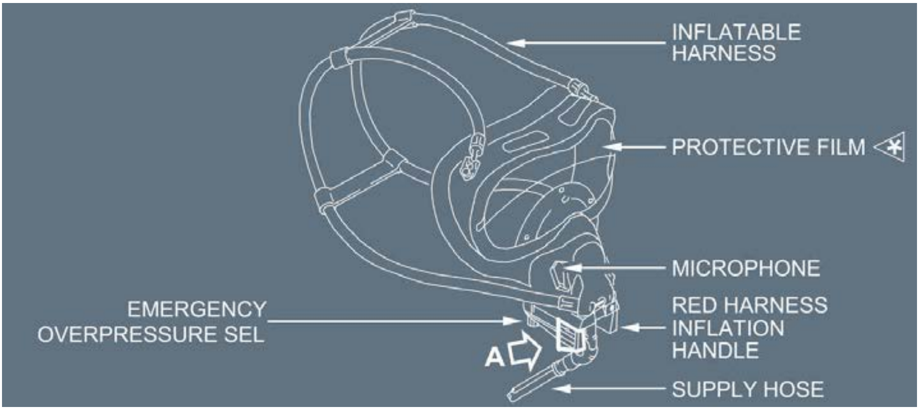
(1) Blinker flowmeter (yellow)
This indicator flashes when oxygen is flowing.

(2) RESET/TEST control slide
The crewmember presses the slide, and pushes it in the direction of the arrow to test: the operation of the blinker; the regulator supply; system sealing downstream of the valve; and the regulator sealing and system operation. Pressing the RESET control slide, after the oxygen mask has been used, cuts off the oxygen, and the mask microphone.

(3) OXY ON flag
As soon as the left flap door opens, the mask is supplied with oxygen and, once it closes (mask still supplied with oxygen), the “OXY ON” flag appears.

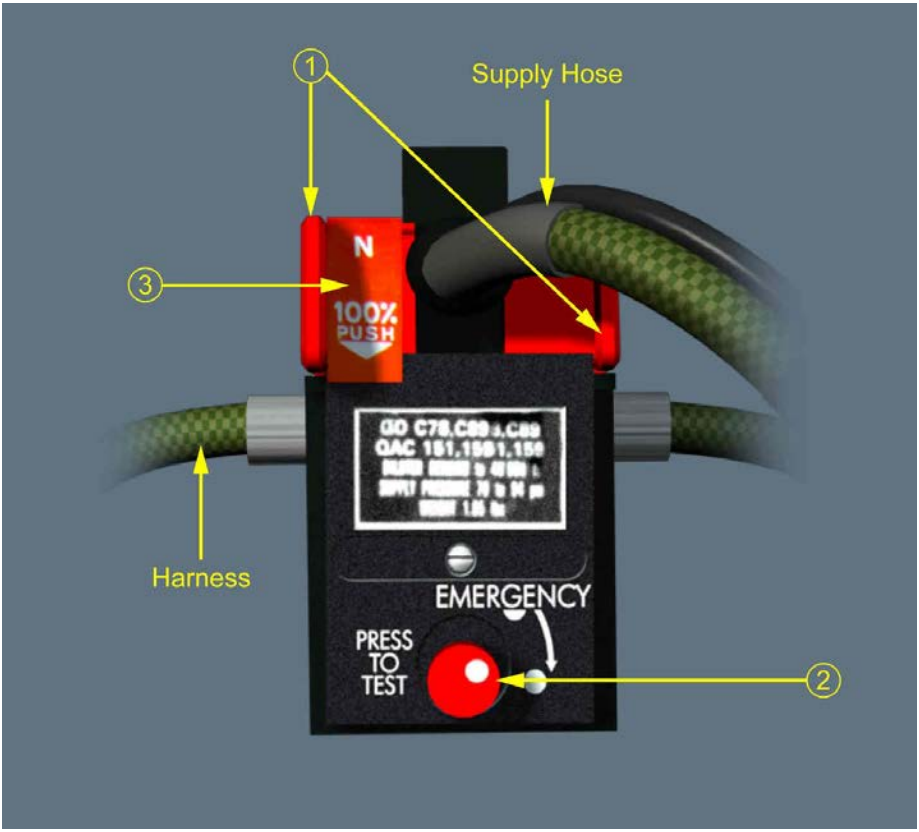
CREW OXYGEN MASK

Ident.: DSC-35-20-20-00001456.0001001 / 21 MAR 16
Applicable to: ALL



PRESSURE REGULATOR

Ident.: DSC-35-20-20-00001457.0001001 / 24 NOV 15
Applicable to: ALL



(1) Red grips
Squeezing the right-hand side grip unlocks the two-flap door, and permits the harness to inflate.

(2) EMERGENCY pressure selector

Use of this selector creates on overpressure which eliminates condensation or fogging of the mask, and prevents smoke, smell or ashes from entering the mask.
- Pressing this knob generates an overpressure for a few seconds.
- Turning the knob, in the direction of the arrow, generates a permanent overpressure.

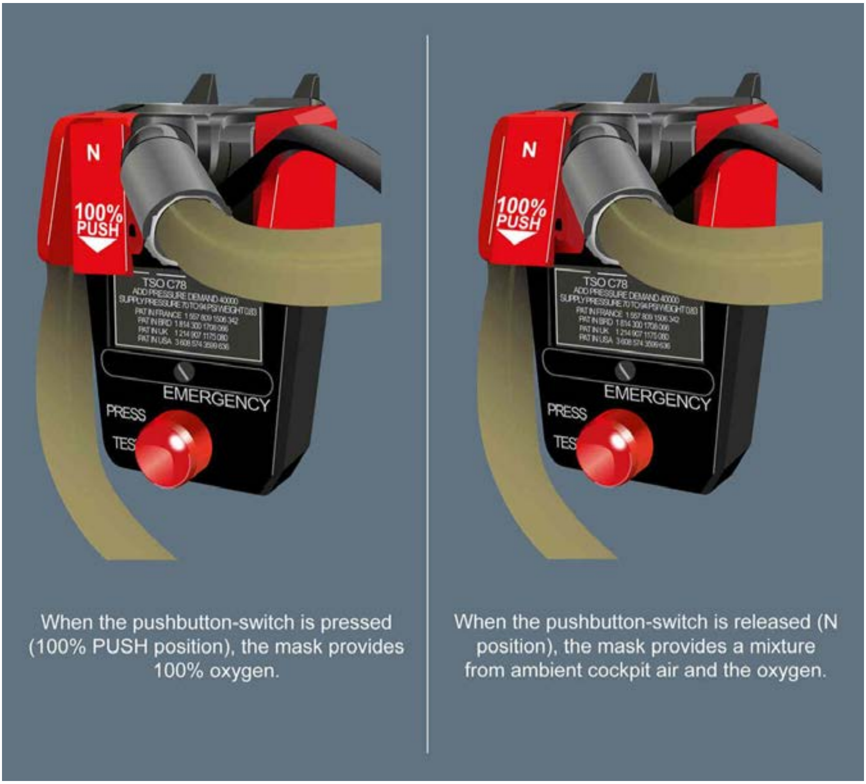
Note: *1. Overpressure supply is automatically started, when cabin altitude exceeds 30 000 ft.*
2. Overpressure supply is available only when the N/100% selector is set on the on the 100 % position.

(3) N/100 % selector

This two-position button is locked down (100% position) when the crewmember pulls the mask out of the stowage.Pushing the button up from underneath releases it, and it pops up to the N (normal) position. Pressing it again returns it to 100 %.

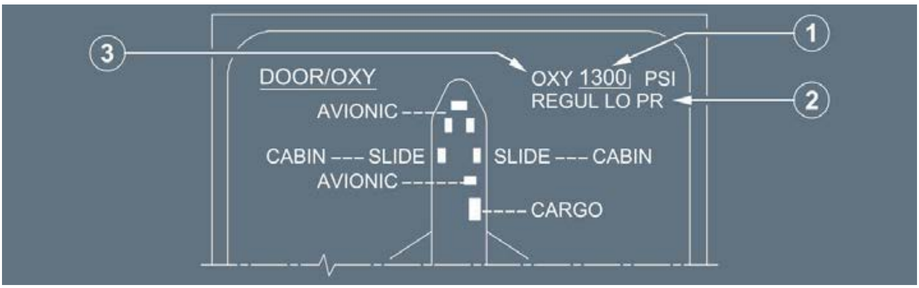
100 % : The mask delivers 100 % oxygen.

N : The mask provides the flight crew with a mixture of air and oxygen. This mixture changes with cabin altitude. The higher the cabin altitude, the more oxygen the mask provides, until the mask supplies 100 % oxygen.



ECAM DOOR/OXY PAGE

Ident.: DSC-35-20-20-00001458.0001001 / 21 MAR 17
Applicable to: ALL



(1) OXY pressure indication
It is in green, when the pressure is ≥ 400 PSI.
It is in amber, when the pressure is < 400 PSI.
On ground, an amber half frame appears when oxygen pressure is < 1 500 PSI.
In this case, the flight crew must check that the remaining quantity is not below the minimum (*Refer to LIM-OXY Minimum Flight Crew Oxygen Pressure*).

(2) REGUL LO PR indication
It is in amber, if oxygen pressure on the low-pressure circuit is low (50 PSI).

(3) OXY indication
It is normally in green.

It becomes amber, when:
- Pressure goes below 400 PSI
- Low oxygen pressure is detected
- The OXYGEN CREW SUPPLY pushbutton switch on the overhead panel is OFF.

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GENERAL

Ident.: DSC-35-30-10-00017804.0001001 / 13 MAY 16
Applicable to: ALL

In the case of depressurization, the fixed oxygen system in the cabin supplies oxygen to the cabin occupants.
Chemical generators produce the oxygen. Each generator feeds a group of 2, 3, or 4 masks.
Oxygen masks are located in containers above the passenger seats, in the lavatories, in each galley , and at each cabin crew station.

Note: *Gaseous generators replace chemical generators in the lavatories.*

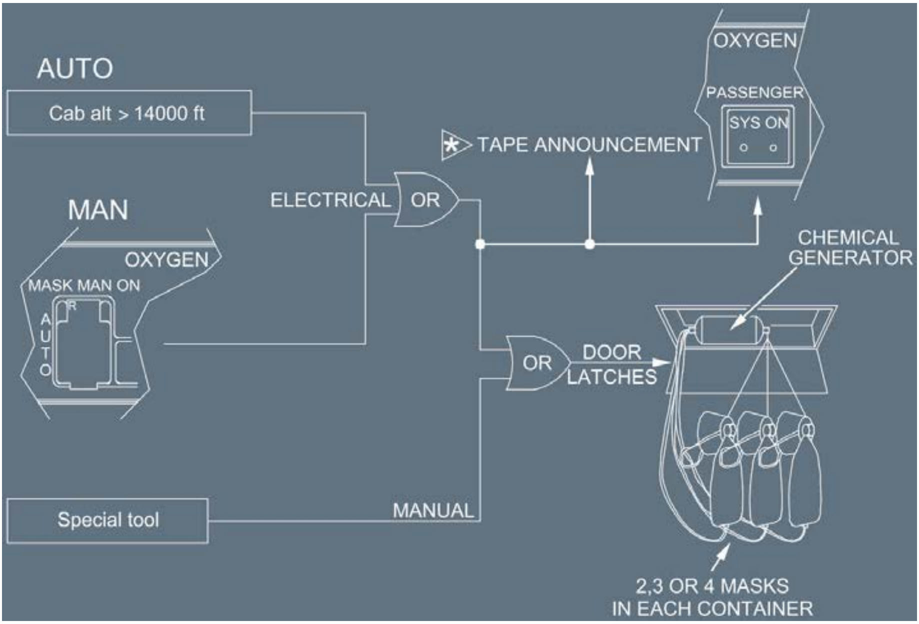
OPERATION

Ident.: DSC-35-30-10-00016920.0001001 / 21 MAR 16
Applicable to: ALL

Each container has an electrical latching mechanism that opens automatically to allow the masks to drop, if the cabin pressure altitude exceeds 14 000 ft (+250, -750 ft), or 16 000 ft (+250, -750 ft) for the operation on high altitude airfields .
Members of the flight crew can override the automatic control.
When the masks are released, the passenger address system automatically broadcasts prerecorded instructions .
The generation of oxygen begins when the passenger pulls the mask towards the passenger seat.
The chemical reaction used for oxygen generation creates heat. Therefore, the smell of burning, smokes and cabin temperature increase may be associated with the normal operation of the oxygen generators. The mask receives pure oxygen under positive pressure for about 13 min , 15 min , or up to 22 min , until the generator is exhausted.
A reset is available for the rearming of the system after the masks are restowed. A manual release tool allows crew members to open the doors manually in case of electrical failure.

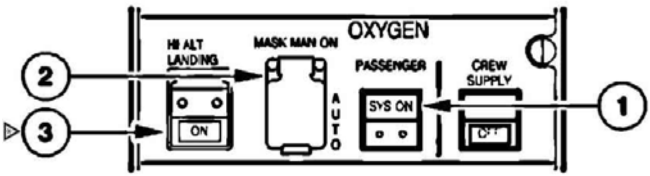
SCHEMATIC

Ident.: DSC-35-30-10-00001461.0001001 / 16 MAY 12
Applicable to: ALL



OVERHEAD PANEL

Ident.: DSC-35-30-20-00017805.0001001 / 21 MAR 16
Applicable to: ALL



(1) PASSENGER SYS ON light
This light comes on in white, when the control for the oxygen mask doors is activated, and it remains on until the TMR RESET pb is pressed (*Refer to DSC-35-30-20 Overhead Maintenance Panel*).

(2) MASK MAN ON pb
The guard keeps this button in the AUTO position.

AUTO : The mask doors open automatically, when the cabin altitude exceeds 14 000 ft, or 16 000 ft if the HI ALT LANDING pb-sw is set to ON.

Pressed : The mask doors open.

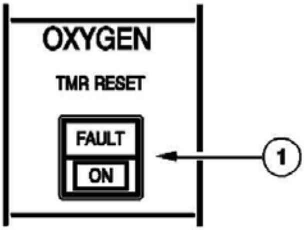
(3) HI ALT LANDING pb-sw
This pushbutton-switch changes the altitude threshold for the deployment of the passenger oxygen masks.

OFF : The masks drop, if the cabin pressure exceeds 14 000 ft (+250, -750 ft).

ON : The masks drop, if the cabin pressure exceeds 16 000 ft (+250, -750 ft).

OVERHEAD MAINTENANCE PANEL

Ident.: DSC-35-30-20-00001463.0001001 / 11 FEB 11
Applicable to: ALL



(1) TMR RESET pushbutton
The maintenance crew uses this pushbutton to reset the control circuit, after the system has operated.

ON : The PASSENGER SYS ON light goes off.

FAULT : This light comes on in white, when the door latch solenoids are energized for more than 30 s.

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-35-30-20-A-00016865.0001001 / 21 MAR 16

HI ALT SET : This memo appears in green if the crew sets the HI ALT LANDING pb-sw to ON. In this case, the passenger mask release altitude is 16 000 ft (+250 ft, -750 ft).

FLIGHT CREWS PORTABLE OXYGEN SYSTEM

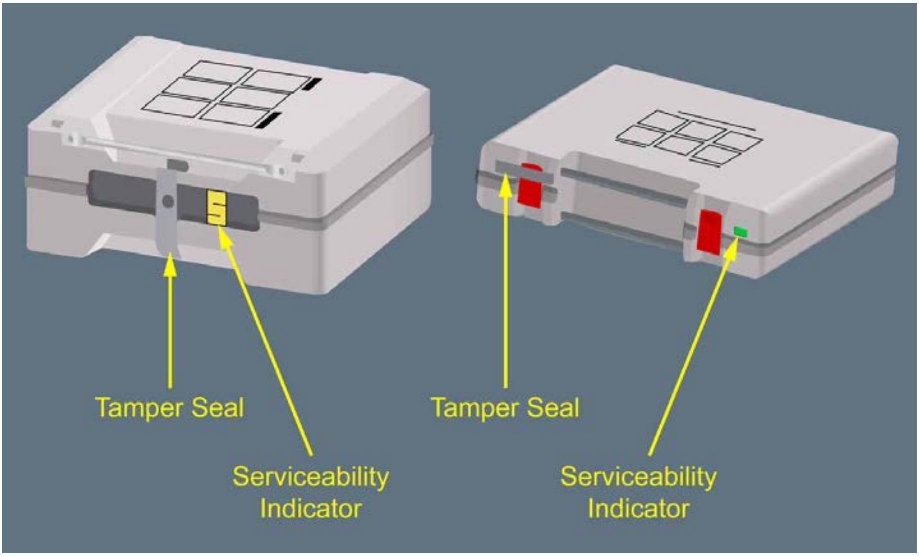
Ident.: DSC-35-40-10-00001465.0005001 / 20 DEC 16
Applicable to: ALL

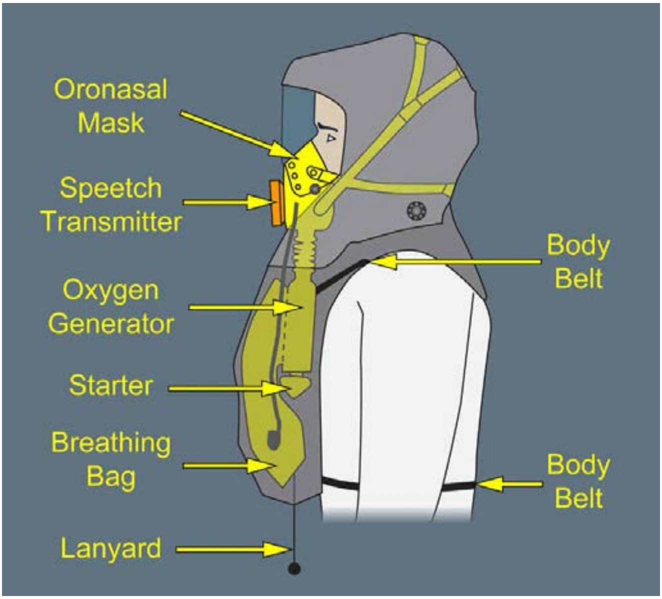
There is one Portable Breathing Equipment (PBE) in the cockpit. The PBE is a hood, located in a container. The PBE is stored on the right aft side of the cockpit. It ensures the eyes and respiratory system protection of one flight crew member when fighting a fire and in case of smoke or noxious gas emissions or cabin depressurization.
The PBE uses a chemical air regeneration system, which is in the breathing key. An oronasal mask allows the user to inhale regenerated air, and it returns the exhaled breath to the regeneration system.

If the container is equipped with a yellow serviceability indicator:
- When the indicator is cracked, the breathing protection can be insufficient and therefore the PBE cannot be used.

If the container is equipped with a red/green serviceability indicator:
- When the indicator is green, the hood can be used.
- When the indicator is red, the breathing protection can be insufficient and therefore the PBE cannot be used.

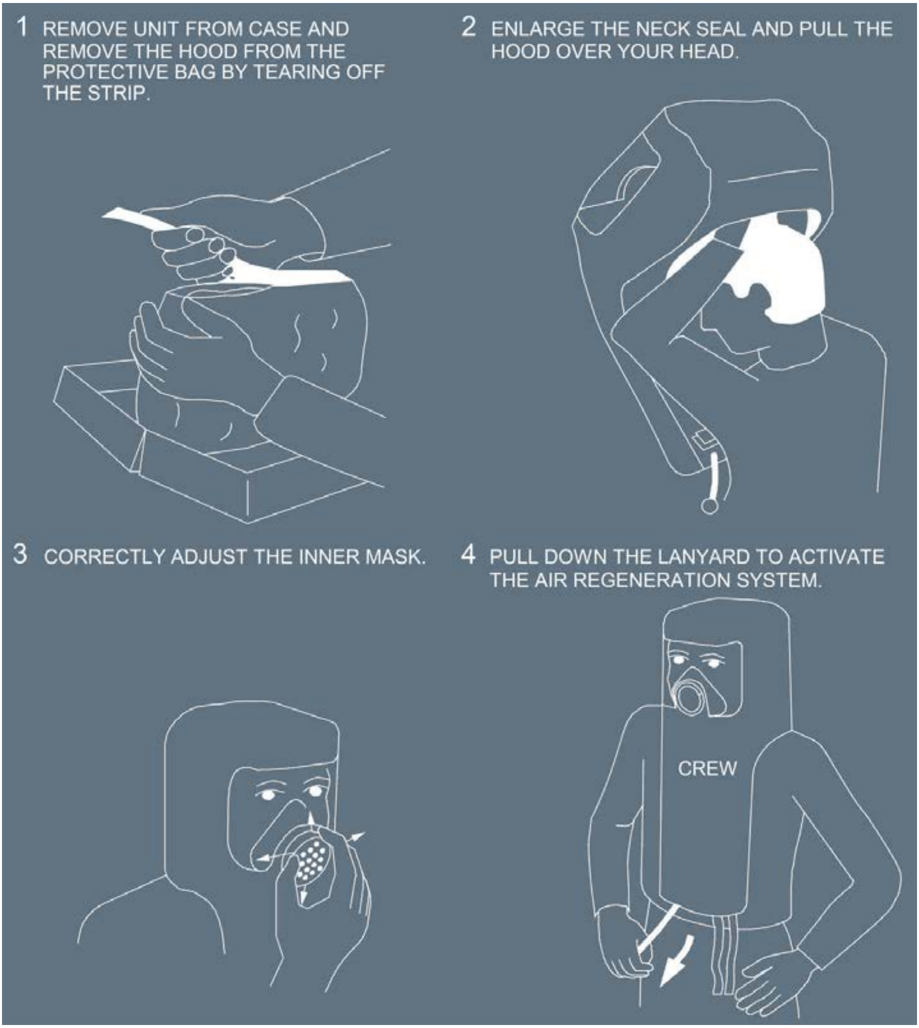
The hood operates for at least 15 min.




Oronasal Mask
Speetch Transmitter
Oxygen Generator
Starter
Breathing Bag
Lanyard
Body Belt
Body Belt

USING THE HOOD

Ident.: DSC-35-40-10-00006226.0005001 / 03 MAR 17
Applicable to: ALL



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AIRCRAFT SYSTEMS

PNEUMATIC

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GENERAL

Ident.: DSC-36-10-10-00020804.0001001 / 17 MAR 17
Applicable to: ALL

The pneumatic system supplies high-pressure air for :
- Air conditioning
- Engine starting
- Wing anti-icing
- Water pressurization
- Hydraulic reservoir pressurization
- FWD cargo heating
- AFT cargo heating
- Fuel Tank Inerting System (FTIS) .

High-pressure air has three sources :
- Engine bleed systems
- APU load compressor
- HP ground connection

Note: An external HP source may be used for air conditioning.

A crossbleed duct interconnects the engine bleed systems and receives air from the APU and ground sources when appropriate.
A valve mounted on the crossbleed duct allows the left side (engine 1) and right side (engine 2) to be interconnected.
Two Bleed Monitoring Computers (BMC 1 and BMC 2), the overhead control panel, and the ECAM control and monitor the operation of the pneumatic system.
A leak detection system detects any overheating in the vicinity of hot air ducts.

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GENERAL

Ident.: DSC-36-10-20-00001469.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft has two similar engine bleed air systems.

Each system is designed to :
- select the compressor stage to use as a source of air
- regulate the bleed air temperature
- regulate the bleed air pressure.

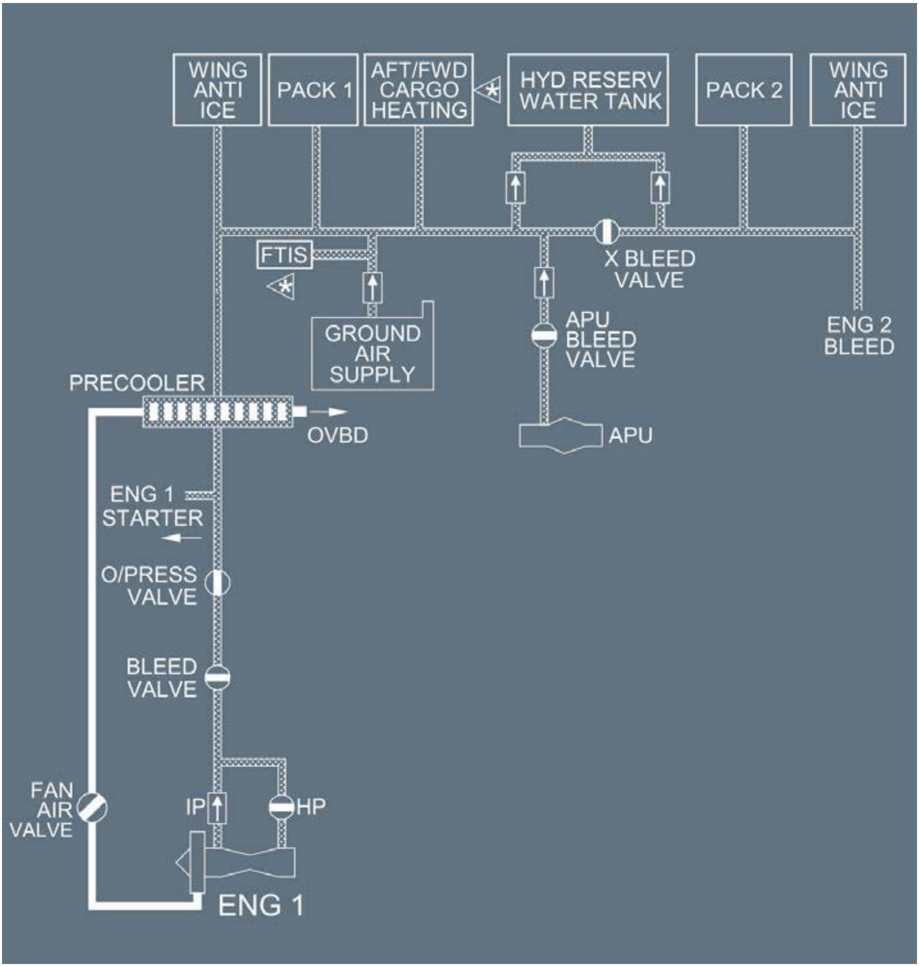
A Bleed Monitoring Computer (BMC) controls and monitors each system.
Each BMC receives information about bleed pressure and temperature and valve position.

Each is connected with :
- other systems using air or information from the bleed system
- the other BMC.

Each supplies indications and warnings to the ECAM and CFDS.
If one BMC fails, the other one takes over most of the monitoring functions.
Each bleed valve is pneumatically operated and controlled electrically by its associated BMC.

ARCHITECTURE

Ident.: DSC-36-10-20-00001470.0005001 / 15 MAR 17
Applicable to: ALL



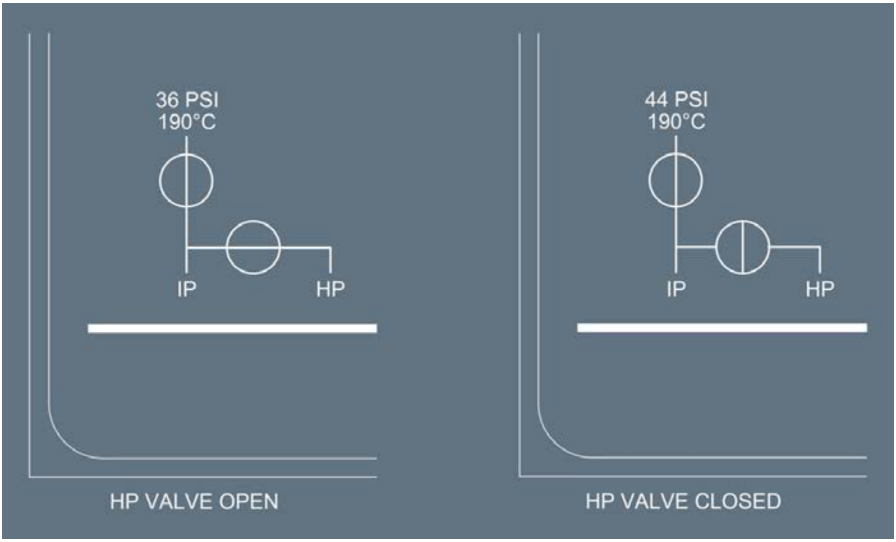
AIR BLEED SELECTION

Ident.: DSC-36-10-20-00001471.0002001 / 09 OCT 12
Applicable to: ALL

Air is normally bled from the intermediate pressure stage (IP) of engine's high-pressure (HP) compressor to minimize fuel penalty.
At low engine speed, when the pressure and temperature of the IP air are too low, the system bleeds air from the HP stage and maintains it at 36 ± 4 PSI.
An intermediate pressure check valve downstream of the IP port closes to prevent air from the HP stage from being circulated to the IP stage.

L3 The HP valve closes automatically:
- Pneumatically:
  - In case of low upstream pressure
  - in case of excessive upstream pressure
- Electrically:
  - When the bleed valve is closed electrically
  - In case of overpressure upstream of the HP valve with wing anti-ice off, two packs on and aircraft altitude above 15 000 ft.

ECAM INDICATION



PRESSURE REGULATION AND LIMITATION

Ident.: DSC-36-10-20-00001472.0001001 / 21 MAR 16
Applicable to: ALL

The bleed valve, which is downstream of the junction of HP and IP ducting, acts as a shut-off and pressure regulating valve.
It maintains delivery pressure at 45 ± 5 PSI.

Note: *Bleed pressure may fluctuate between 38 and 56 PSI (with a maximum peak to peak pressure of 16 PSI) particularly at high engine power (takeoff or climb) up to FL 100.*

The bleed valve is fully closed:
- Pneumatically:
  - If upstream pressure goes below 8 PSI
  - If there is return flow
- Electrically by means of:
  - The BLEED pushbutton switch (switched OFF)
  - The ENG FIRE pushbutton (pushed)
  - The Bleed air Monitoring Computer (BMC) in the following cases:
    - Overtemperature
    - Overpressure
    - Leak
    - Open starter valve
    - APU bleed being ON.

If pressure regulation fails, the overpressure valve closes when the pressure goes over 85 PSI.

Note: *If APU Bleed is ON and the crossbleed valve is SHUT, the Engine bleed valve 2, remains open.*

TEMPERATURE REGULATION AND LIMITATION

Ident.: DSC-36-10-20-00001473.0001001 / 21 MAR 16
Applicable to: ALL

A precooler downstream of the bleed valve regulates the temperature of the bleed air.
The precooler is an air-to-air heat exchanger that uses cooling air bleed from the engine fan to regulate the temperature to approximately 200 °C.
The fan air valve controls fan air flow.
A spring keeps the fan air valve closed in the absence of pressure.

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GENERAL

Ident.: DSC-36-10-30-00001474.0001001 / 15 MAR 17
Applicable to: ALL

Air from the APU load compressor is available on ground and in flight.
The APU bleed valve operates as a shut-off valve to control APU bleed air.
The APU BLEED pb-sw, on the AIR COND panel, controls the APU bleed valve. When the flight crew selects ON with the pushbutton, APU bleed air supplies the pneumatic system, if the APU speed is above 95 %. This opens the crossbleed valve and closes the engine bleed automatically.
If the APU bleed valve is opened, it automatically closes in the case of APU leak, left wing leak, or engine 1 leak (except during engine start). *Refer to DSC-36-10-50 Leak Detection*.
A check valve near the crossbleed duct protects the APU, when bleed air comes from another source.

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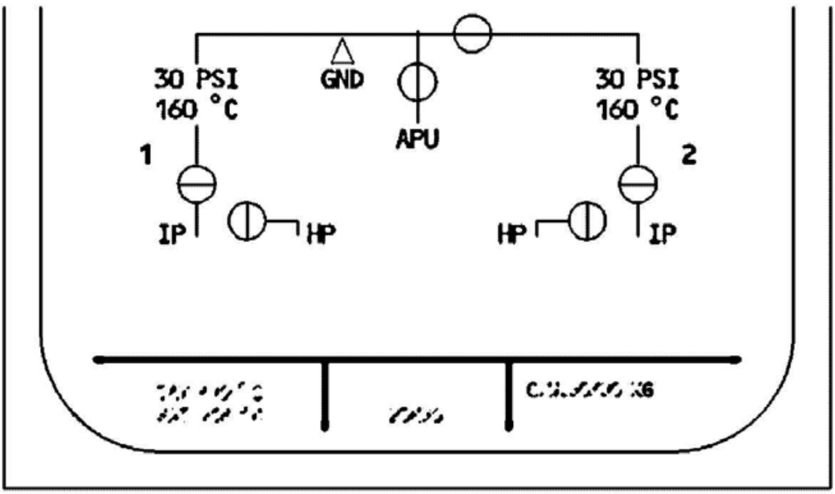
GENERAL

Ident.: DSC-36-10-40-00001476.0001001 / 21 MAR 16
Applicable to: ALL

A crossbleed valve on the crossbleed duct allows the air supply systems of the two engines to be isolated or interconnected.
On the AIR COND panel, a rotary selector controls the crossbleed valve electrically.
Two electric motors, one for automatic mode and one for manual mode, control the valve.
In automatic mode, the crossbleed valve opens when the system uses APU bleed air. It closes, if the system detects an air leak (except during engine start).

ECAM INDICATION

Ident.: DSC-36-10-40-00001478.0001001 / 17 MAR 11
Applicable to: ALL



X-BLEED VALVE OPEN-AIR SUPPLIED FROM APU

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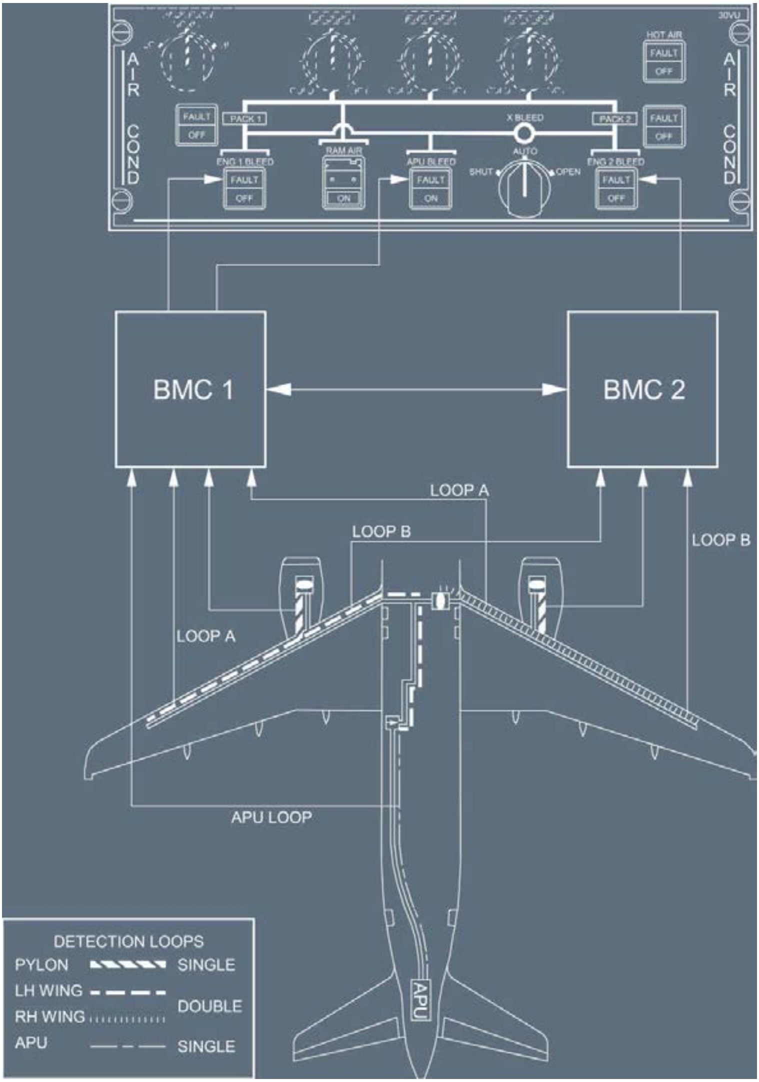
LEAK DETECTION

Ident.: DSC-36-10-50-00001479.0001001 / 15 MAR 17
Applicable to: ALL

Leak detection loops detect any overheating near the hot air ducts in the fuselage, pylons, and wings.
For the pylon and APU, the sensing elements are tied to form a single loop and for the wing, a double loop.
When the two wing loops detect a leak, or when one loop detects the leak and the other one is inoperative, they activate a wing leak signal.
BMC 1 and BMC2 each contain identical control logic for the system.

- A wing leak signal causes :
  - the bleed valve on the related side to close automatically
  - the associated FAULT light on the AIR COND panel to come on
  - the x-bleed valve to close automatically (except during an engine start)
  - the APU bleed valve to close automatically if the APU bleed valve is open and if the leak concerns the left wing (except during engine start).
- A pylon leak signal causes :
  - the bleed valve on the related side to close automatically
  - the FAULT light for the related engine on the AIR COND panel to come on
  - the x-bleed valve to close automatically (except during an engine start).
  - the APU bleed valve to close automatically if the APU bleed valve is open and if the leak concerns the pylon 1 (except during engine start).
- An APU leak signal causes :
  - the APU bleed valve to close automatically (except during engine start).
  - the FAULT light the APU BLEED pushbutton switch on the AIR COND panel to come on
  - the x-bleed valve to close automatically (except during an engine start).


AIR COND
HOT AIR
FAULT
OFF
PACK 1
PACK 2
X BLEED
RAM AIR
ON
ENG 1 BLEED
APU BLEED
ENG 2 BLEED
SHUT
AUTO
OPEN
BMC 1
BMC 2
LOOP A
LOOP B
LOOP A
LOOP B
APU LOOP
APU
DETECTION LOOPS
PYLON
SINGLE
LH WING
RH WING
DOUBLE
APU
SINGLE

BMC FAILURE

Ident.: DSC-36-10-60-00001480.0001001 / 21 MAR 16
Applicable to: ALL

If one BMC fails, the adjacent BMC takes over the monitoring of the bleed system to issue the following ECAM warnings if necessary :
- overpressure
- overtemperature
- wing leak.

Nevertheless, the associated FAULT light on the AIR COND panel is lost, and the associated bleed valve does not close automatically.
ENG BLEED LEAK warning is lost for the associated engine, as is also the APU BLEED LEAK warning if BMC1 has failed.

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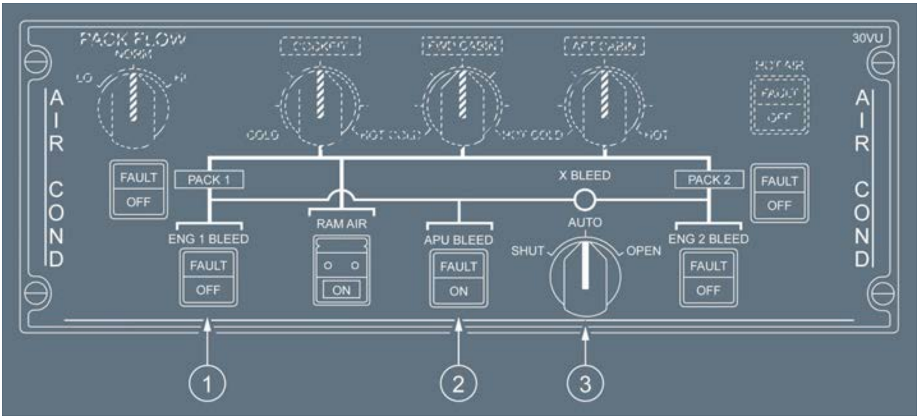
OVERHEAD PANEL

Ident.: DSC-36-20-00001481.0001001 / 20 DEC 16
Applicable to: ALL



(1) ENG 1 and ENG 2 BLEED pb sw

On : Bleed valve opens if :
- Upstream pressure is above 8 PSI.
- APU BLEED pushbutton switch is off or APU bleed valve is closed.
- There is no onside wing or pylon leak, and no overpressure or overtemperature has been detected.
- The ENG FIRE pushbutton has not been popped out.
- The engine start valve is closed.

FAULT lt : This amber light comes on, and an ECAM caution appears, if :
- There is an overpressure downstream of the bleed valve.
- There is a bleed air overheat.
- There is a wing or engine leak on the related side.
- The bleed valve is not closed during engine start.
- The bleed valve is not closed with APU bleed ON.

It goes out when the ENG BLEED pushbutton switch is OFF if the fault has disappeared.

OFF : The bleed valve and HP valve close. The white OFF light comes on.

(2) APU BLEED pb sw

ON : The APU valve opens if N > 95 % and there is no leak in the APU or in the left side bleed. (If there is a leak on the right side, the x-bleed valve closes.)
The blue ON light comes on.

Off : The APU valve closes.

FAULT light : This amber light comes on, and an ECAM caution appears, when the system detects an APU leak.

(3) X-BLEED selector sw

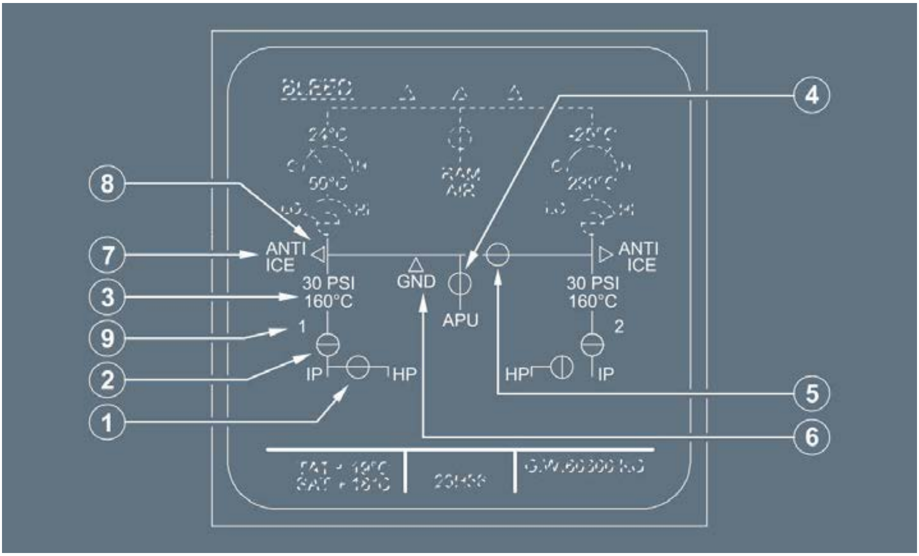
AUTO : The crossbleed valve is open if the APU bleed valve is open.
The crossbleed valve is closed if the APU bleed valve is closed or, in case of a wing, pylon, or APU leak (except during engine start).

OPEN : The crossbleed valve is open.

SHUT : The crossbleed valve is closed.

ECAM BLEED PAGE

Ident.: DSC-36-20-00001482.0003001 / 09 OCT 12
Applicable to: ALL



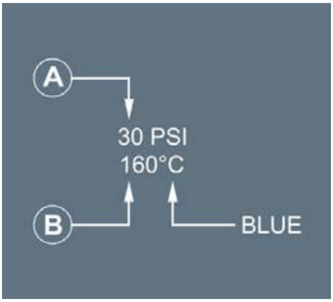
(1) HP VALVES

Crossline - Green	:	HP valve normally fully closed
In line - Green	:	HP valve not fully closed
Crossline - Amber	:	HP valve not in commanded (closed) position

(2) ENGINE BLEED VALVES

In line - Green	:	BLEED valve normally open
Crossline - Green	:	BLEED valve normally fully closed
In line - Amber	:	BLEED valve not in commanded (open) position
Crossline - Amber	:	BLEED valve not in commanded (closed) position

(3) ENGINE BLEED INDICATIONS



(A) Precooler inlet pressure
It is normally in green.
It becomes amber, if under 4 PSI, or if overpressure is detected by the BMC (threshold between 57 and 60 PSI).

(B) Precooler outlet temperature
It is normally in green.
It becomes amber, if the BMC detects an overheat or low temperature.

Overheat: Temperature exceeds:
- 290 °C for more than 5 s, or
- 270 °C for more than 15 s, or
- 257 °C for more than 55 s

Low temperature is detected, if the temperature is lower than 150 °C.

Note: *When the engines are at idle, and depending on the ambient temperature, the precooler outlet temperature may be below 150 °C (displayed amber).*

(4) APU BLEED VALVE

Crossline - Green	:	The APU valve is not fully open, and the APU master switch is ON.
In line - Green	:	The APU valve is fully open, and the APU master switch is ON.
Crossline - Amber	:	The APU valve is fully closed, the APU master switch is ON, and the APU bleed switch is ON for more than 10 s.

(5) CROSSBLEED VALVE

Crossline - Green	:	The crossbleed valve is normally closed.
In line - Green	:	The crossbleed valve is normally open.
Crossline - Amber	:	The crossbleed valve is not in the commanded (closed) position.
In line - Amber	:	The crossbleed valve is not in the commanded (open) position.
Transit - Amber	:	The crossbleed valve is in transit.

(6) GND HP ground connection indication

: On ground, it is displayed in green.

(7) ANTI ICE indication
It is displayed in white, when the WING pushbutton on the ANTI-ICE panel is ON.

(8) Arrow


:
- It is normally not displayed, when the corresponding valve is closed.
- It is normally displayed in green, when the corresponding valve is open.
- It becomes amber, when the
  - Valve is open and air pressure is low or high, or
  - Valve is open on ground for more than 10 s.

(9) Engine identification (1-2)
It is normally in white.
It becomes amber, when engine N2 is below idle.

MEMO DISPLAY

Ident.: DSC-36-20-00016746.0001001 / 21 MAR 16
Applicable to: ALL

APU BLEED : This memo appears in green, if the APU is available and the APU BLEED pb-sw is ON.

AIRCRAFT SYSTEMS

WATER / WASTE

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DSC-38-10 Description

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GENERAL

Ident.: DSC-38-10-00017274.0001001 / 21 MAR 16
Applicable to: ALL

The water and waste systems :
- Distribute potable water to the toilets and the galleys
- Dispose waste water
- Store toilet wastes.

The systems are insulated to prevent water leaks and ice build up.
Controls of the water and waste systems are located on the Forward Attendant Panel (FAP).

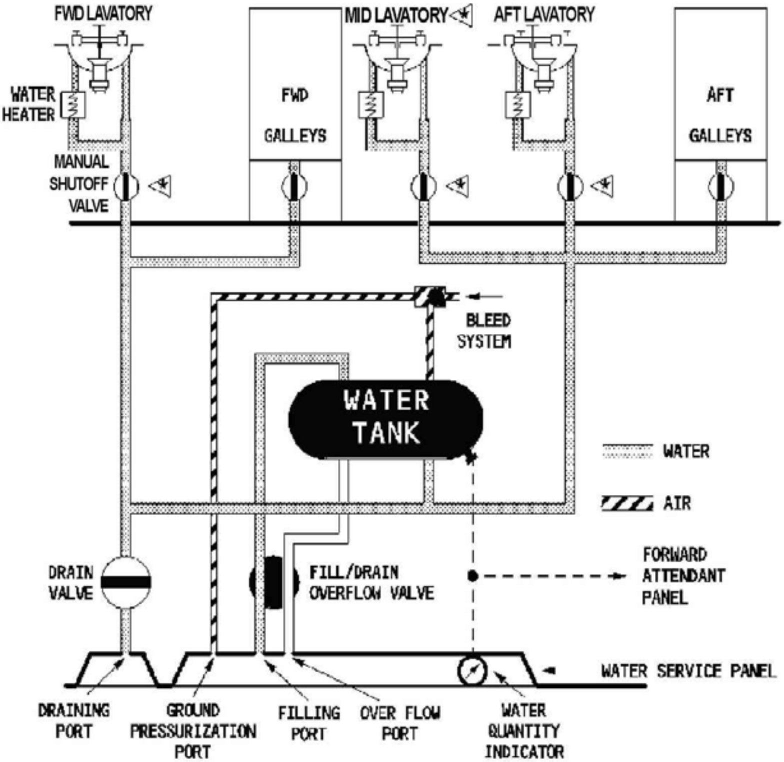
POTABLE WATER

Applicable to: ALL

Ident.: DSC-38-10-A-00017286.0001001 / 21 MAR 16

Potable water is stored in a 200 l water tank (or 135 l water tank ⊲) located in the AFT cargo compartment, in the wall on the left side.
On ground, the water system is pressurized by the air from the service panel pressure port. In flight, the water system is pressurized by the bleed air.
Potable water is piped to the galleys and lavatories. Manual shutoff valves ⊲ isolate wet galleys, the FWD lavatory, the MID lavatory ⊲ and the AFT lavatory from the water system. Manual shutoff valves are located under the washbasins or toilet bowls. The position of each valve is indicated by OPEN and SHUT legend.
The system can be filled or drained from the service panel at the bottom of the fuselage. The indication of the water quantity in the water tank is displayed on the FAP and the aft service panel.

Ident.: DSC-38-10-A-00017435.0001001 / 21 MAR 16

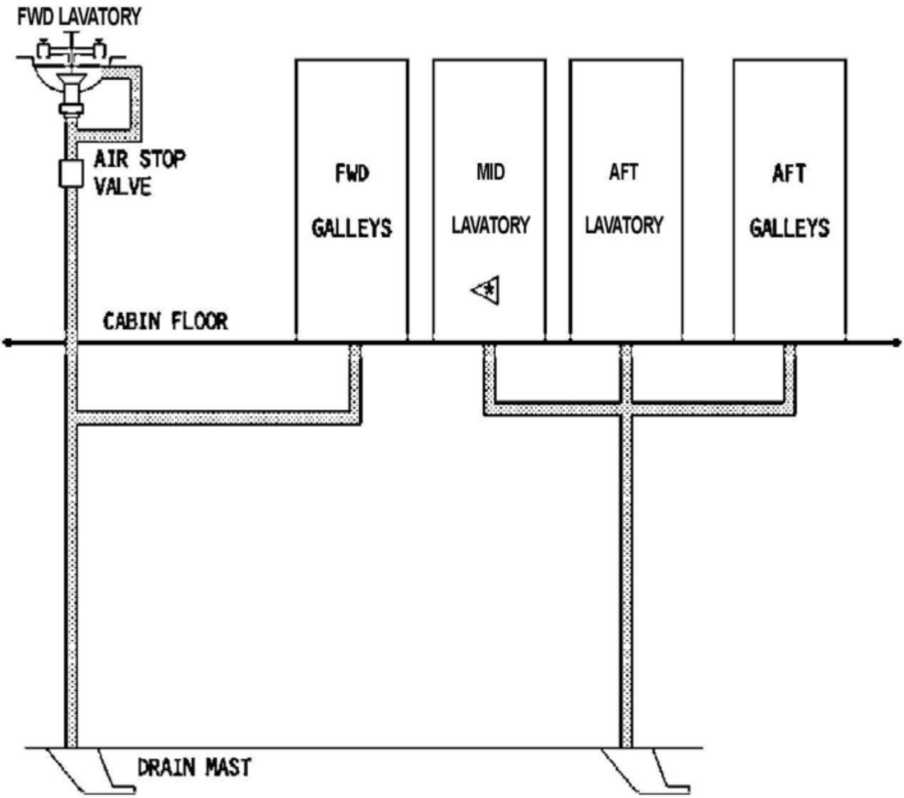


WASTEWATER SYSTEM

Ident.: DSC-38-10-00017287.0001001 / 21 MAR 16
Applicable to: ALL

The waste/water (from galleys and lavatories) drains overboard through two heated drain masts. The forward mast drains the waste/water from the forward cabin. The aft mast drains the waste/water from the aft cabin.

The waste and water are discharged by:
- Gravity, on ground
- Differential pressure, in flight.



TOILET SYSTEM

Ident.: DSC-38-10-00017288.0002001 / 21 MAR 16
Applicable to: ALL

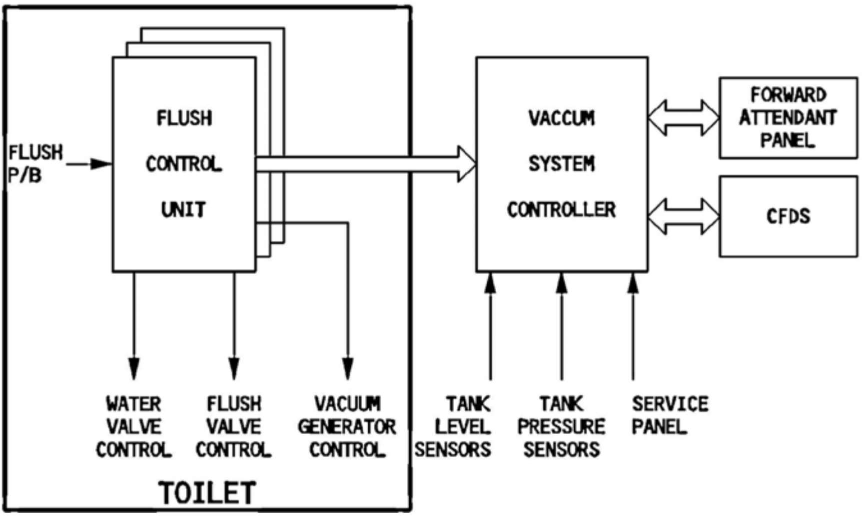
Differential pressure forces the waste from the toilet bowls into the waste tank. The waste tank has a usable capacity of 170 l. On ground, and in flight below 16 000 ft , the differential pressure is generated by the vacuum generator.
Clean water from the potable water system flushes toilets.

A flush control unit controls the flush sequence in each toilet.
The Vacuum System Controller (VSC) ensures system control, monitoring and fault reporting.

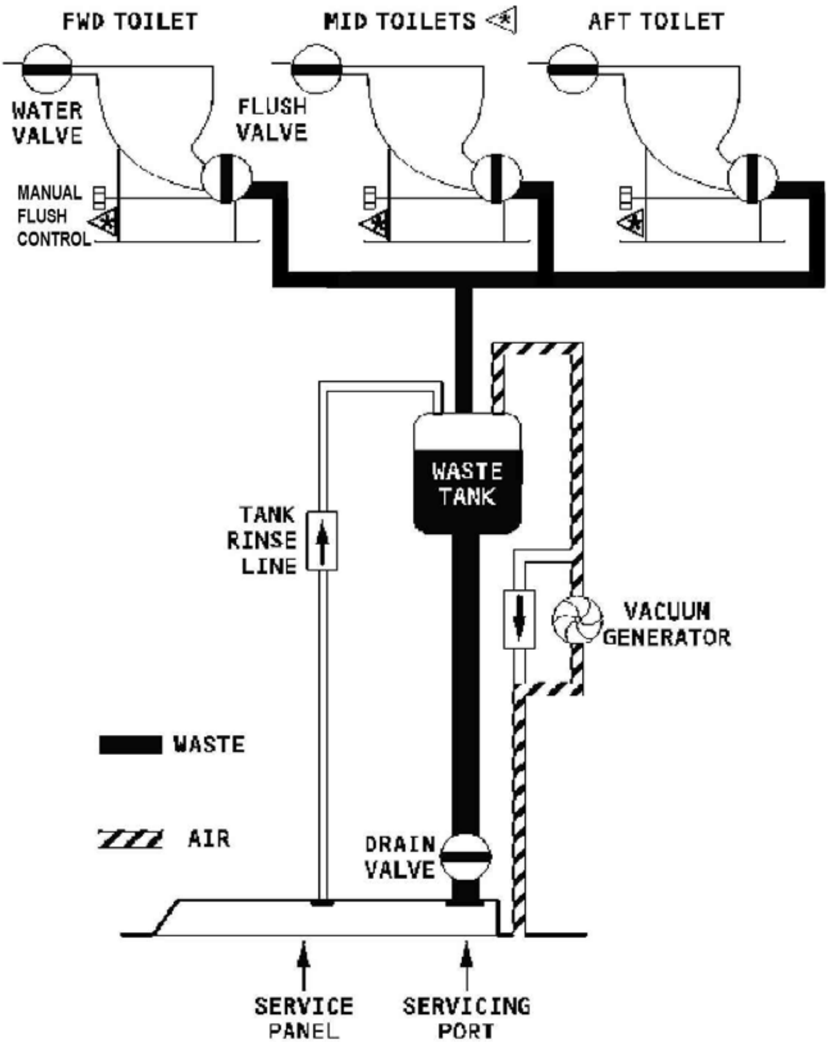
The VSC transmits information to:
- Flight attendant panel to indicate the waste tank levels and report system defects
- Centralized Fault Display System (CFDS) to signal the system defects to the maintenance.

Ground personnel services the waste tank via a service panel, located under the fuselage.
A manual shutoff valve isolates an inoperative toilet. In the case of an electrical failure of flush valve, the manual flush control can be used. The manual flush control is located under each toilet bowl.

ARCHITECTURE



SCHEMATIC


FWD TOILET
MID TOILETS
AFT TOILET
WATER VALVE
FLUSH VALVE
MANUAL FLUSH CONTROL
WASTE TANK
TANK RINSE LINE
VACUUM GENERATOR
WASTE
AIR
DRAIN VALVE
SERVICE PANEL
SERVICING PORT

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AIRCRAFT SYSTEMS

MAINTENANCE SYSTEM

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DSC-45-10 Description

DSC-45-20 System Operation

DSC-45-25 Data Loading

DSC-45-30 Printer

Intentionally left blank

GENERAL

Ident.: DSC-45-10-00001490.0001001 / 21 MAR 16
Applicable to: ALL

The purpose of the Centralized Fault Display System (CFDS) is to make the maintenance task easier by displaying fault messages in the cockpit and permitting the flight crew to make some specific tests.

There are two levels of maintenance :

at the line stop	:	removal and replacement of equipment
at the main base	:	troubleshooting

COMPONENTS

Ident.: DSC-45-10-00001491.0001001 / 21 MAR 16
Applicable to: ALL

The CFDS includes :
- the BITE (Built-In Test Equipment) for each electronic system
- a central computer, the Centralized Fault Display Interface Unit (CFDIU)
- two MCDU s (Multipurpose Control and Display Units), used also for FMGS (Flight Management and Guidance System), AIDS (Aircraft Integrated Data System), and ACARS (Aircraft Communication And Reporting System, if installed), which work with the CFDIU to display information or initiate tests
- one printer.

If a main channel of the CFDIU fails, the backup channel takes over.

MODES OF OPERATION

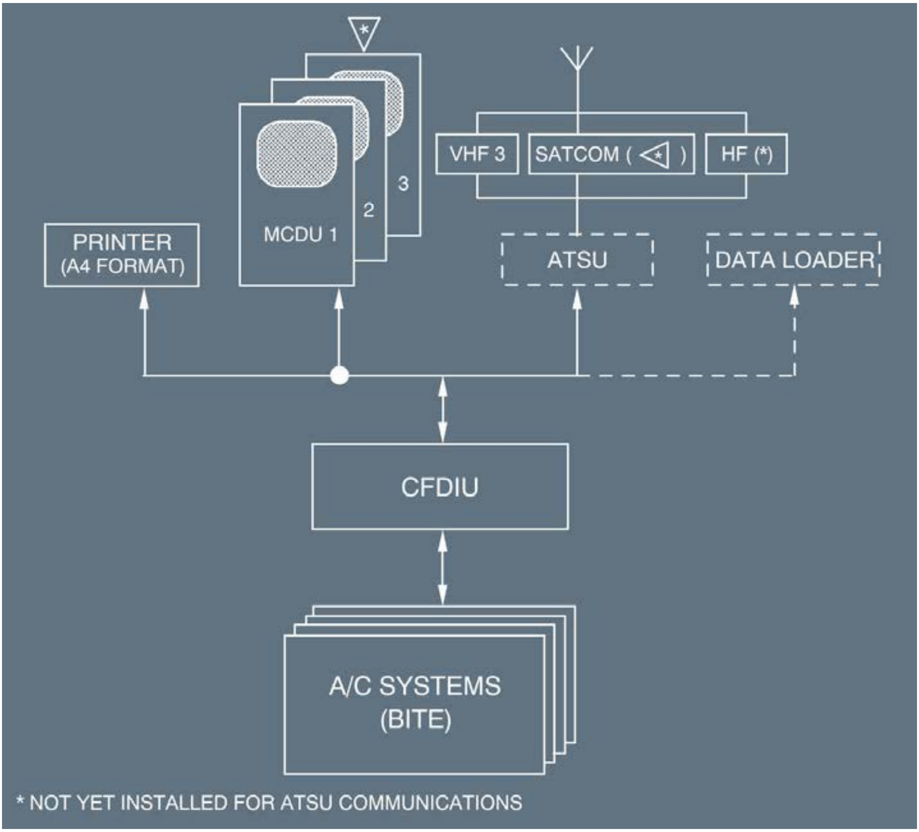
Ident.: DSC-45-10-00001492.0001001 / 22 MAR 16
Applicable to: ALL

The CFDS operates in two main modes :
- the NORMAL mode or REPORTING mode (in flight)
- the INTERACTIVE mode or MENU mode (on ground).

In NORMAL mode, the CFDS records and displays the failure messages transmitted by each system BITE.
In INTERACTIVE mode, the CFDS allows any BITE to be connected with the MCDU in order to display the maintenance data stored and formatted by the BITE or to initiate a test.

ARCHITECTURE

Ident.: DSC-45-10-00001493.0002001 / 19 DEC 12
Applicable to: ALL



FAILURE/FAULT CLASSIFICATION

Ident.: DSC-45-10-00017082.0001001 / 21 MAR 16
Applicable to: ALL

The Centralized Fault Display System (CFDS) identifies the faulty system and puts any failures or faults into one of three classes :

Class 1 : Failures indicated to the flight crew by means of the ECAM , or other flight deck effect. They must be repaired or entered in the MEL (Minimum Equipment List) before the aircraft can depart.

Class 2 : Faults indicated to maintenance personnel by the CFDS and which trigger a MAINT status entry on the maintenance part of the ECAM status page. The aircraft can operate with these faults, but they must be rectified within the timescale defined in the Trouble Shooting Manual (TSM).

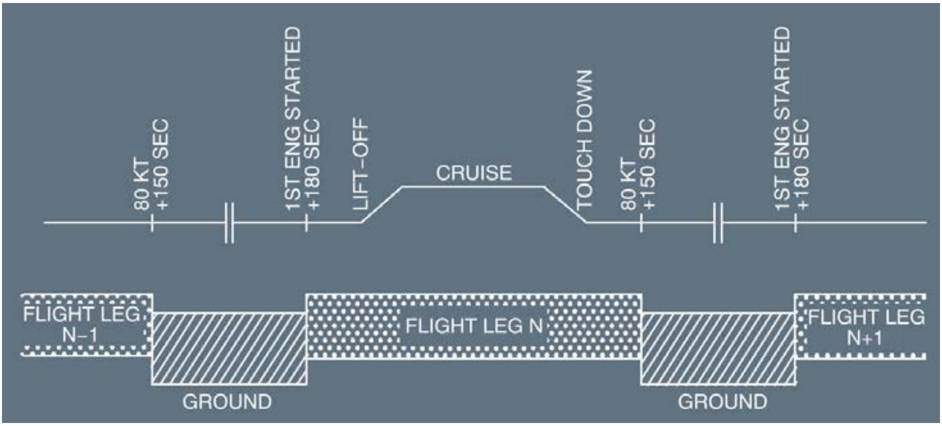
Class 3 : Faults indicated to maintenance personnel by the CFDS , but which do not trigger a MAINT status. The operator may have these faults corrected at his convenience.

Failure/fault classes	Class 1	Class 2	Class 3
Operational consequences	YES	NO	NO
Indication to the flight crew	YES Automatically displayed - Warning or caution messages on Engine Warning Display - Flag or indication in the flight deck.	YES Available on ECAM status page.	NO
Dispatch consequences	Refer to MEL may be : "GO" "GO IF" "NO GO"	*Refer to MMEL/MI-00-08 ECAM and MAINTENANCE STATUS*	MEL not applicable
Indication to the maintenance team	YES Automatically print out at the end of each flight : Fault messages on the CFDS Post Flight Report.		YES Available on request through system report/Test

FUNCTIONS OF THE CENTRALIZED FAULT DISPLAY SYSTEM (CFDS)

Ident.: DSC-45-10-00001495.0002001 / 21 MAR 16
Applicable to: ALL

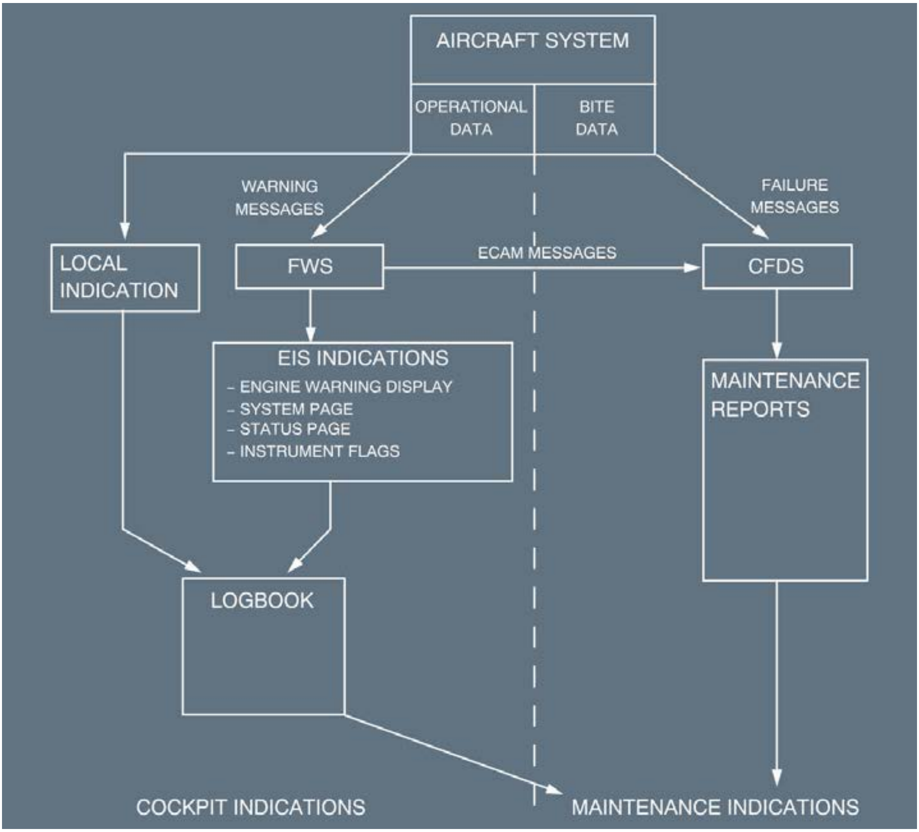
The main functions of the CFDS are :
- obtaining and storing messages transmitted by the connected system BITEs, or by the Flight Warning Computer (Warning and Caution titles)
- Detailing the maintenance phases.



- Presenting maintenance reports :
  - Last leg report
  - Last leg ECAM report
  - Previous leg report
  - Avionics status
  - System report test
  - Post-flight report.

COCKPIT/CFDS INTERFACE

Ident.: DSC-45-10-00001496.0001001 / 22 MAR 16
Applicable to: ALL



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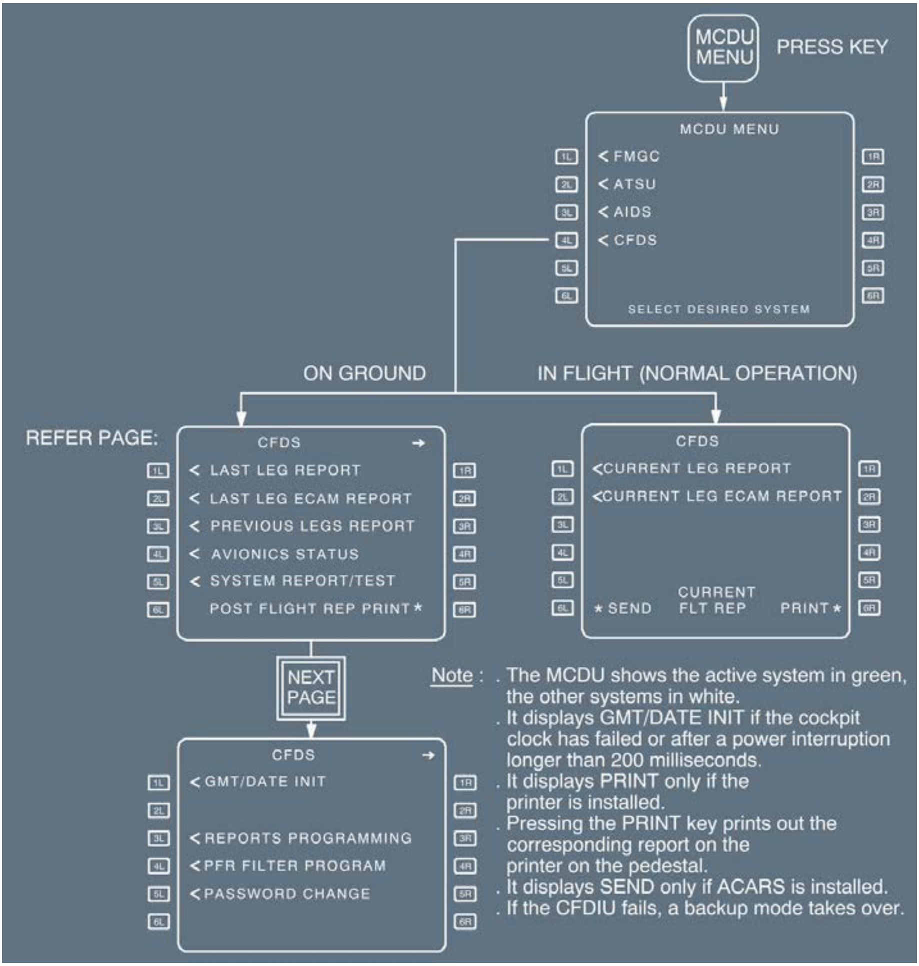
MAINTENANCE MENU

Ident.: DSC-45-20-00001497.0002001 / 14 MAY 12
Applicable to: ALL

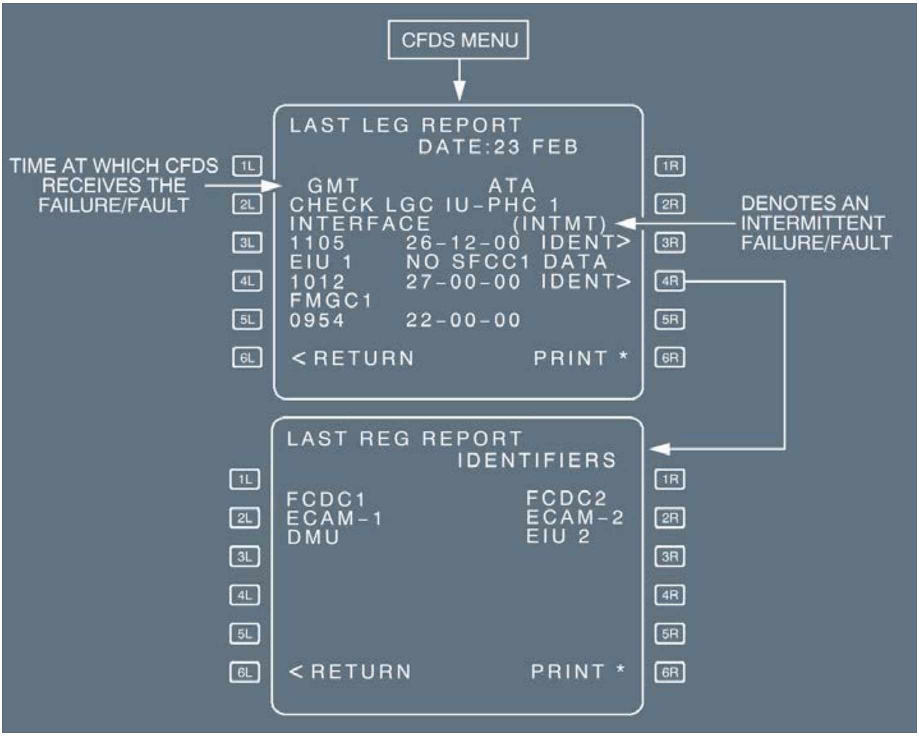
The CFDS uses menus displayed on the MCDU. The operator selects functions or reports from these menus.
Pressing the MCDU MENU key and then selecting CFDS brings up the MAINTENANCE MENU page (different pages for the aircraft in flight and the aircraft on the ground).



LAST (OR CURRENT) LEG REPORT

Ident.: DSC-45-20-00001498.0001001 / 21 MAR 16
Applicable to: ALL

The LAST LEG REPORT (on the ground) or the CURRENT LEG REPORT (in flight), list all class 1 failures and class 2 faults and all system failure and system fault messages received by the CFDS during the last flight leg or the current flight leg. Pressing the IDENT key displays a list of the systems (called identifiers) affected by the failure or fault, which helps the pilot or maintenance person to identify the failure or fault.



LAST (OR CURRENT) LEG ECAM REPORT

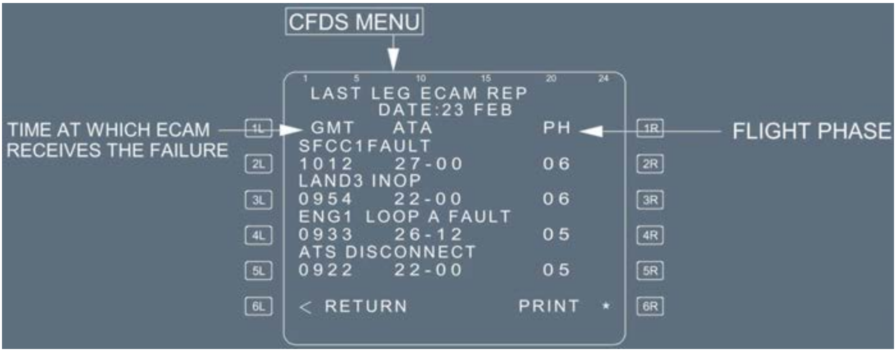
Applicable to: ALL

Ident.: DSC-45-20-A-00001499.0001001 / 21 MAR 16

GENERAL

In flight : The CURRENT LEG ECAM REPORT displays the primary and independent warning (class I) messages and MAINTENANCE STATUS (class II) messages of the current flight leg.

On the ground : The LAST LEG ECAM REPORT displays the primary and independent warning (class I) messages plus MAINTENANCE STATUS (class II) messages of the last flight leg.

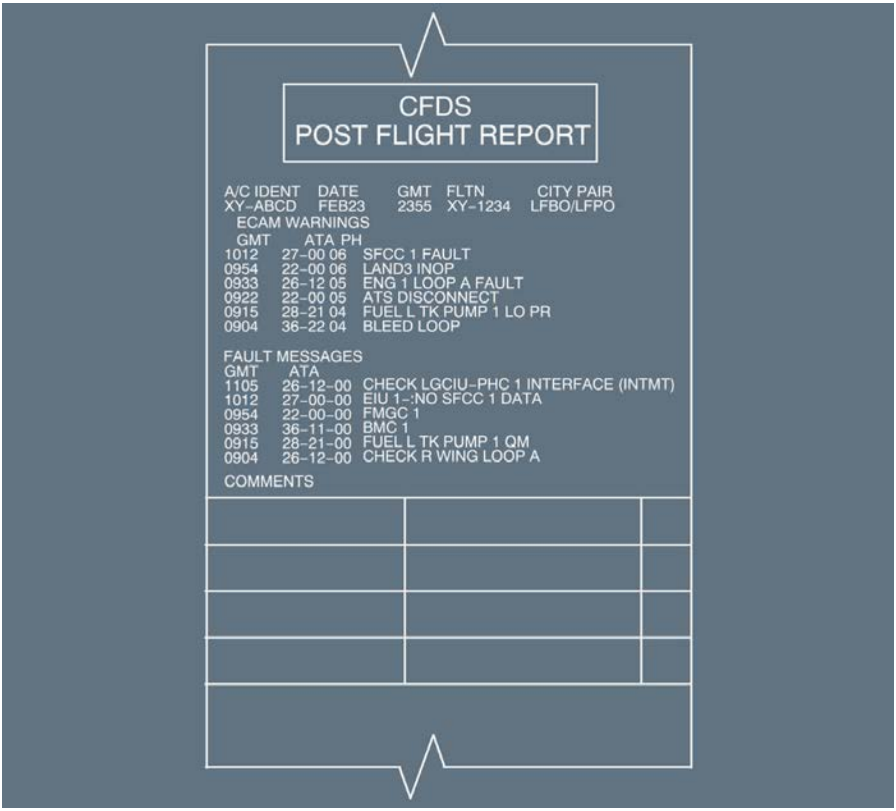


Note: *This screen displays PRINT only if the printer is installed.*

Ident.: DSC-45-20-A-00001500.0001001 / 14 MAY 12

POST FLIGHT REPORT PRINT

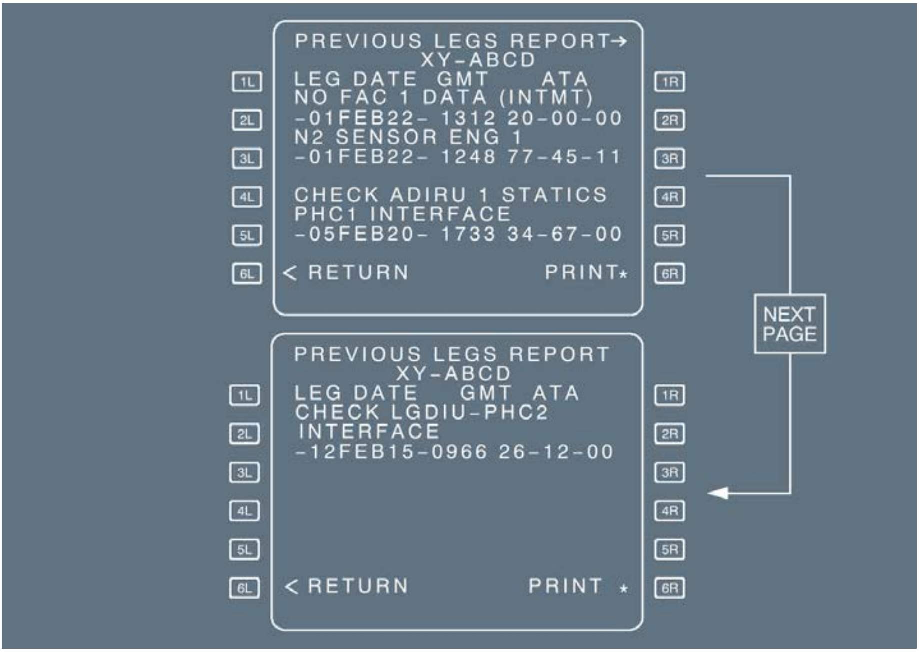
At the end of a flight, LAST LEG and LAST LEG ECAM REPORTS are printed out automatically after the last engine shutdown. The flight or ground crew can also print them out by selecting POST FLIGHT REP PRINT.
The report first lists the ECAM warnings, then the FAULT messages.



PREVIOUS LEG REPORT

Ident.: DSC-45-20-00001501.0001001 / 21 MAR 16
Applicable to: ALL

This report gives access to the POST FLIGHT REPORTS of the previous 63 flight legs.

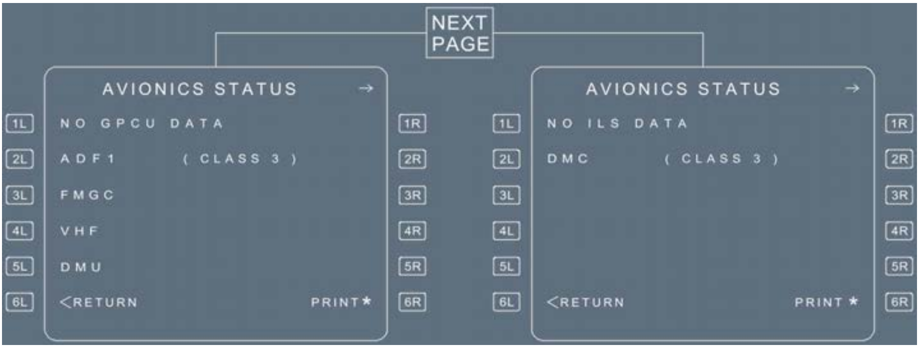


On ground, the Operator can print copies of the screen. If ACARS is installed, the Operator can send the flight report (*Refer to DSC-45-20 Last (or Current) Leg ECAM Report - Post Flight Report Print*).

AVIONICS STATUS

Ident.: DSC-45-20-00001502.0001001 / 21 MAR 16
Applicable to: ALL

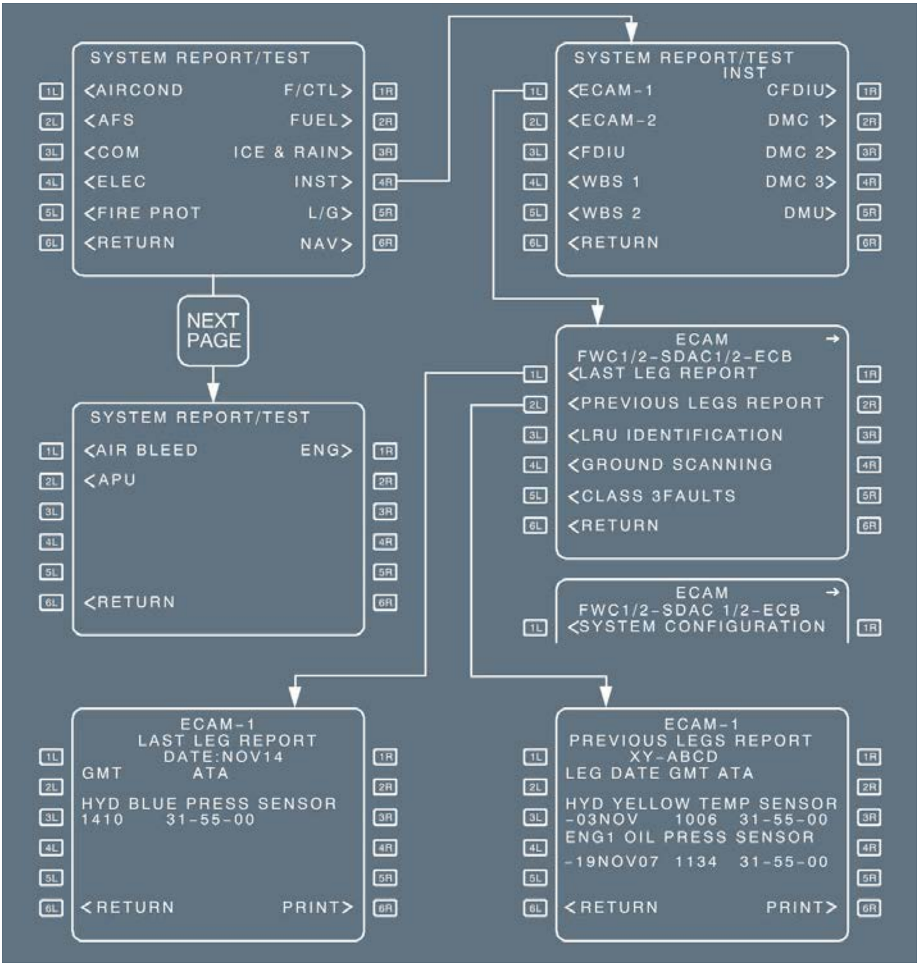
This screen displays the list of systems affected by a failure or fault. If a system is affected by at least a Class 3 fault, CLASS 3 appears beside it. The display is continuously updated.



SYSTEM REPORT/TEST

Ident.: DSC-45-20-00001503.0001001 / 21 MAR 16
Applicable to: ALL

This screen gives the operator access to all electronic systems. The CFDIU enters into interactive dialogue with the selected system.



In the above example, the operator has called up menus of the selected systems :

- LAST or PREVIOUS LEG REPORT presents the list of Line-Replaceable Units (LRUs) affected by a failure.
- LRU IDENTIFICATION contains the part numbers of all LRUs in the system.
- GND SCANNING runs the flight monitoring on the ground and indicates the faulty LRU.
- CLASS 3 FAULTS lists class 3 faults detected by the system during the last flight leg.
- SYSTEM CONFIGURATION presents the system configuration in a digital form.

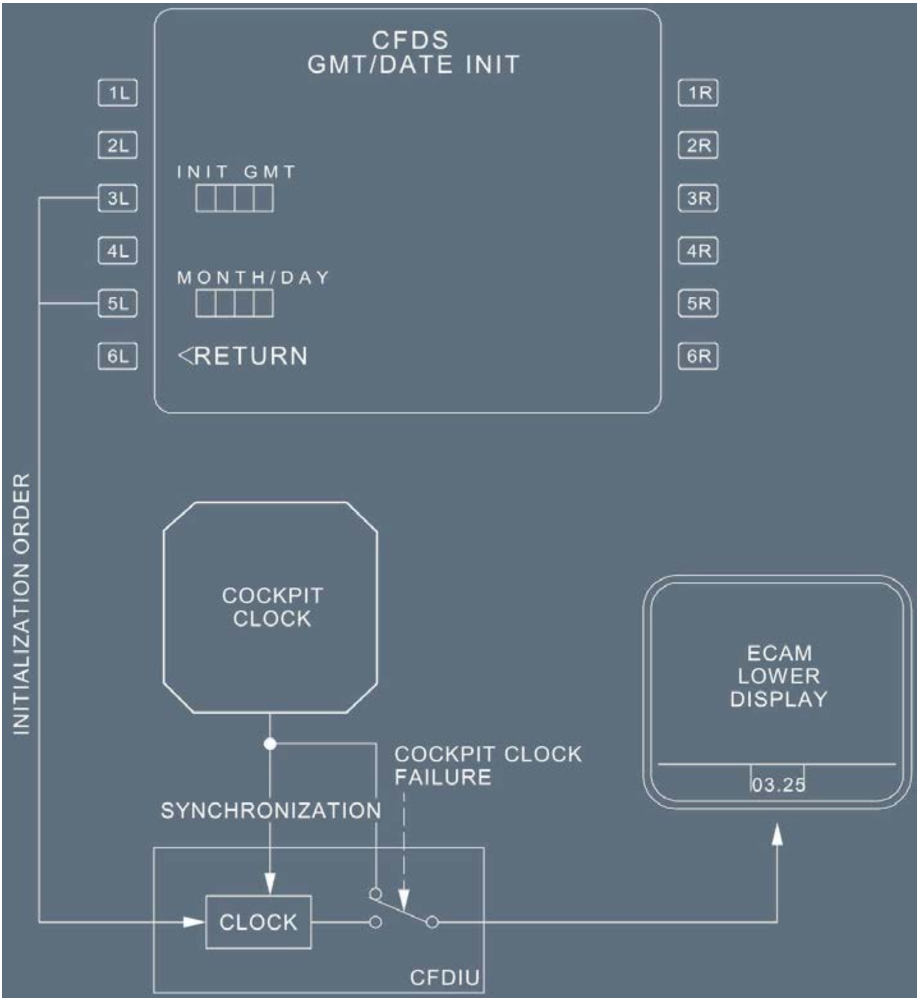
Note: *These screens (except LAST or PREVIOUS LEG REPORT) are not shown above.*

GMT/DATE INITIALIZATION

Ident.: DSC-45-20-00001504.0001001 / 21 MAR 16
Applicable to: ALL

A CFDIU clock is synchronized with the cockpit clock in order to keep GMT (UTC) displayed on the ECAM lower display (except in flight Phases 1 and 2, if the weight and balance system is installed). If the cockpit clock fails, the CFDIU clock continues to display GMT (UTC) on the ECAM lower display.

If electrical power is interrupted for more than 200 ms, the crew initializes GMT (UTC) and the DATE via the MCDU :
- Write GMT (UTC) in the scratchpad, then press the “INIT GMT” key.
- Do the same for the month and day.

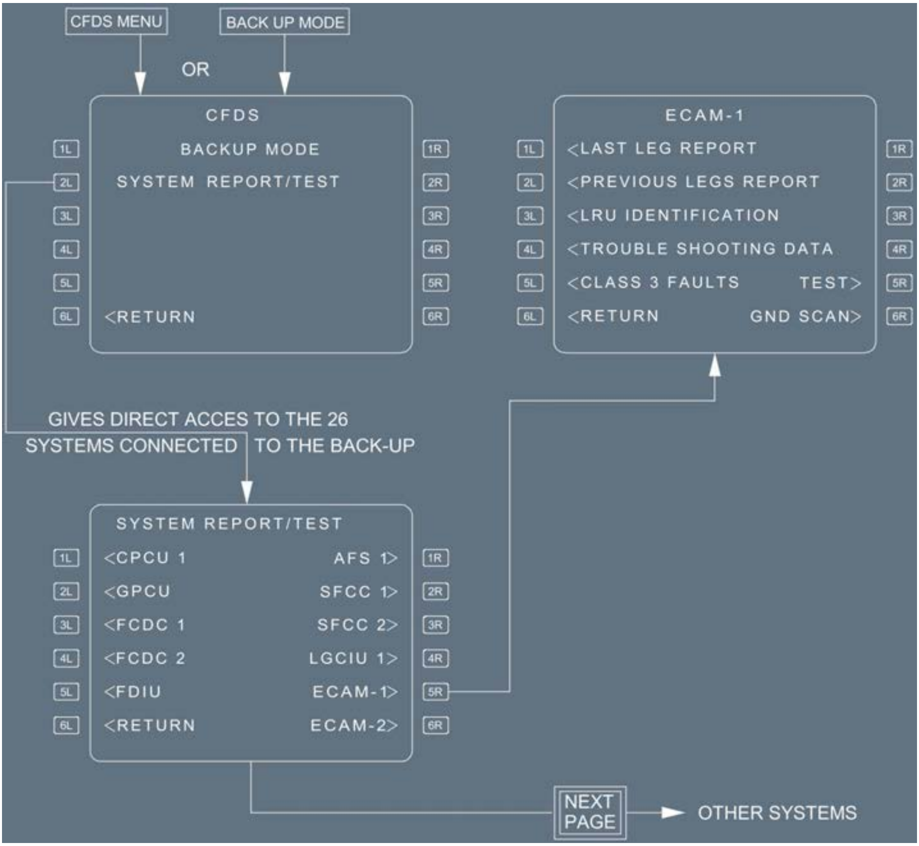

CFDS
GMT/DATE INIT
1L
2L
3L
4L
5L
6L
1R
2R
3R
4R
5R
6R
INIT GMT
MONTH/DAY
<RETURN
INITIALIZATION ORDER
COCKPIT CLOCK
ECAM LOWER DISPLAY
03.25
COCKPIT CLOCK FAILURE
SYNCHRONIZATION
CLOCK
CFDIU

BACKUP MODE

Ident.: DSC-45-20-00017066.0001001 / 21 MAR 16
Applicable to: ALL

If the main channel of the CFDIU fails, the backup channel allows the CFDS to operate in backup mode :
- On the ground only
- Through MCDU1 or MCDU3
- In one mode of operation only : SYSTEM REPORT/TEST
- Without the PRINTER or ACARS.

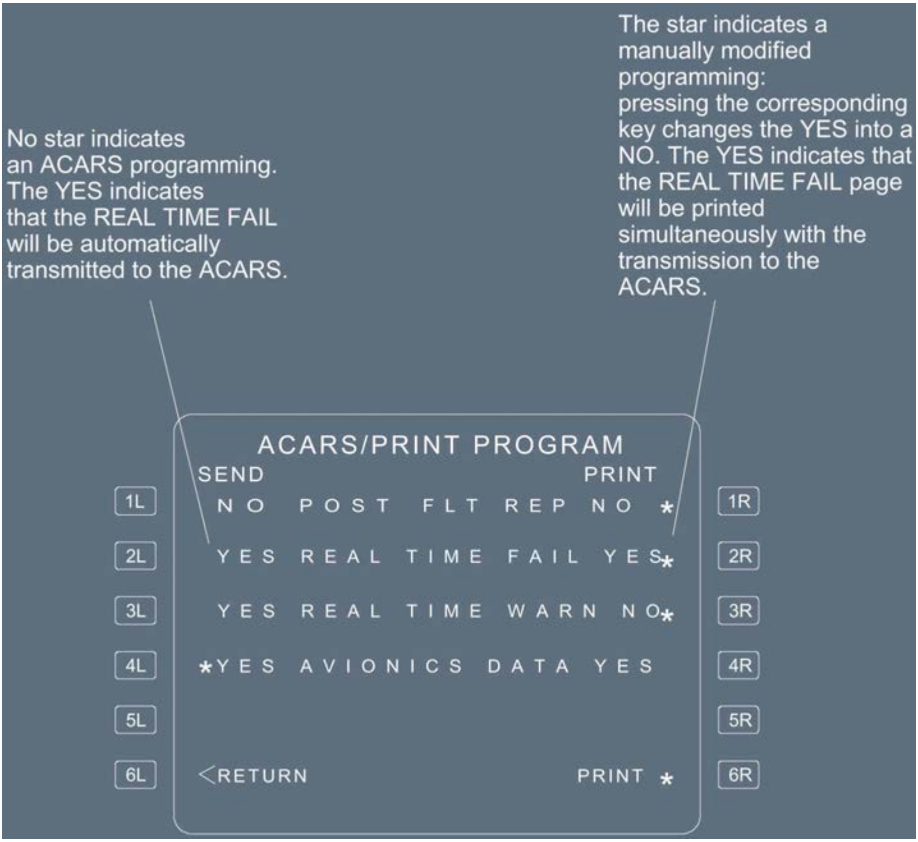
The system changes over from main channel to backup channel :
- Automatically in case of an important failure (power supply, for example). In this case, when the operator selects CFDS on the MCDU MENU, it displays the BACKUP MODE page.
- Manually if the operator selects BACKUP MODE on the CFDS menu after a minor failure.



ACARS PRINT PROGRAM

Ident.: DSC-45-20-00005361.0001001 / 14 FEB 11
Applicable to: ALL

This function gives access to reprogramming page.
The programming is provided by the ACARS or manually (on the ground or in flight) :



<u>Note:</u> *The CFDIU memorizes all manual programming so that at initialisation the last configuration will be retained.*

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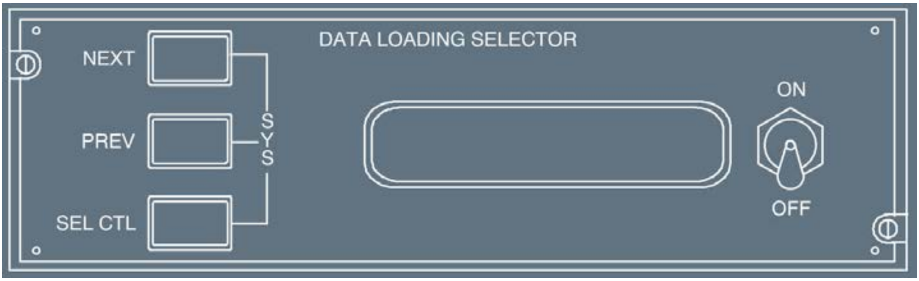
GENERAL

Ident.: DSC-45-25-00001506.0001001 / 10 JAN 11
Applicable to: ALL

With the data loading system, it is possible to upload databases and operational software, or to download system reports from various onboard computers.
The data transfer is performed via 3.5 in disks and a portable data loader, or the aircraft fixed Multipurpose Disk Drive Unit ⊲ (MDDU).

DATA LOADING SELECTOR ON THE OVERHEAD PANEL

Ident.: DSC-45-25-00001507.0001001 / 19 DEC 12
Applicable to: ALL



When the data loading selector is ON, the 3 keys (NEXT, PREV, SEL CTRL) enable the display and selection of various applicable aircraft systems (FMGC , TCAS ⊲ etc...).

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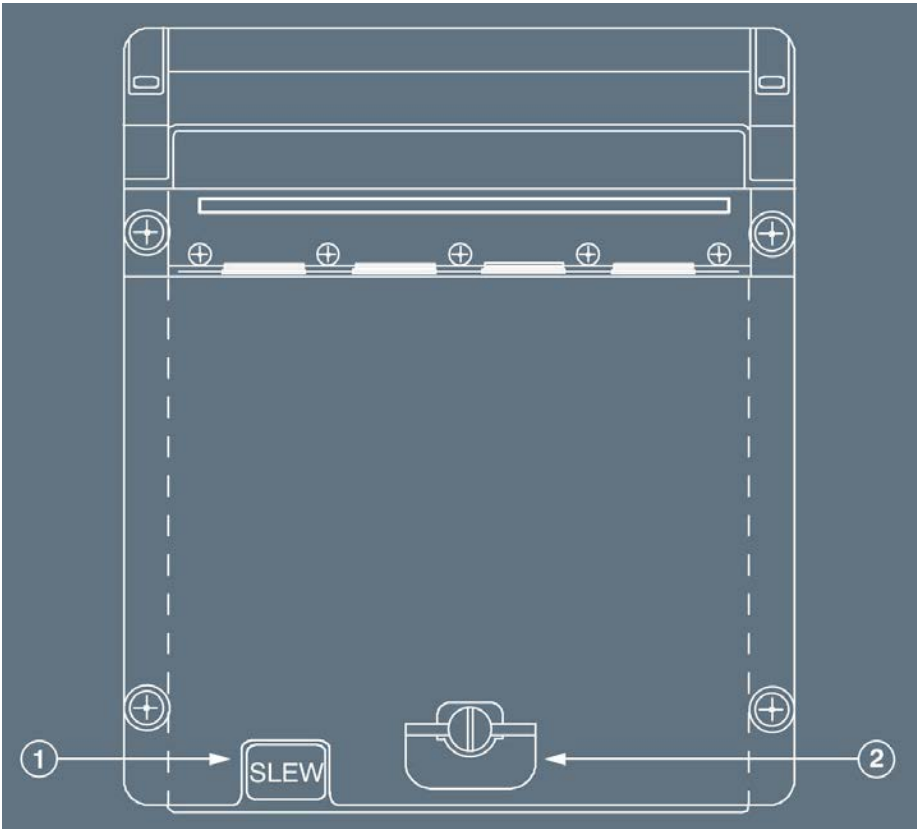
GENERAL

Ident.: DSC-45-30-00001508.0001001 / 21 MAR 16
Applicable to: ALL

The printer prints reports from the following systems (if installed) : ACARS , AIDS , FMGC , CFDIU and EVMU. It prints these on paper, and does so either on the ground or in flight.
The printer is installed at the rear of the pedestal on the right side.

SYSTEM DESCRIPTION

Ident.: DSC-45-30-00001509.0001001 / 21 MAR 16
Applicable to: ALL



(1) SLEW sw :
The SLEW switch is used to feed paper after having loaded a new roll.

(2) PRINTER DOOR LATCH :
The printer door latch locks the door used for loading paper.

AIRCRAFT SYSTEMS

INFORMATION SYSTEMS

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Continued from the previous page

OVERVIEW

Ident.: DSC-46-10-10-00020333.0001001 / 17 MAR 17
Applicable to: ALL

The datalink has:
- AOC applications

L2 The flight crew uses the AOC applications to communicate with Airline Operational Center (AOC).

L1 - ATC applications

L2 The flight crew uses the ATC applications to communicate with Air Traffic Control (ATC) centers.

L1 The ATC datalink provides communication, navigation, and surveillance for Air Traffic Management (ATM) services.
The ATC datalink applications enable air traffic controllers to follow the aircraft navigation, and enhance the air traffic flow.

The datalink communication (messages exchange) between the aircraft and the ground is achieved:
- Automatically (without a flight crew action)
- Manually (with a flight crew action via the DCDU /MCDU and/or RMP).

The datalink messages are:
- Uplink (from a ground facilities to the flight crew), or
- Downlink (from the flight crew to an ground facilities).

COMMUNICATION AND NAVIGATION FOR AIR TRAFFIC MANAGEMENT

At the beginning of the flight, the flight crew sends a notification message to the ATC center, via the MCDU, notification application .

L2 *Refer to DSC-46-10-30-10 Notification* for more information.

L1 Then, an air traffic controller will establish a connection between the aircraft and the ATC center. As a result, the flight crew can exchange messages with the ATC center, via the DCDU (CPDLC application). The messages that the flight crew sends to the ATC center can be built with present frames and modified via the MCDU.

Depending on the type of datalink exchange, the datalink uses one of the following communication networks:
- ACARS (*Refer to DSC-23-30-30-10 Introduction*) for FANS A / FANS A+ applications
- ACARS Air Traffic Services (ATS 623) for optional applications
- Aeronautical Telecommunication Network (ATN) for FANS B / FANS B+ applications

L2 The ATN supports increasing volume of ATC and AOC communication.

L1 **FUTURE AIR NAVIGATION SYSTEM (FANS)**

The ATC datalink provides:
- FANS A applications, for operations in remote and in oceanic areas:
  - Notification
  - Controller-Pilot Data Link Communication (CPDLC)
  - Automatic Dependent Surveillance Contract (ADS-C).
- FANS B applications, for operations in high-density continental areas:
  - Notification
  - Controller-Pilot Data Link Communication (CPDLC).
- Optional applications (compatible only with FANS A+ or FANS B+):
  - Departure Clearance
  - Oceanic Clearance
  - Digital - Automatic Terminal Information Service (D-ATIS).

NAVIGATION AND SURVEILLANCE FOR AIR TRAFFIC MANAGEMENT

The Automatic Dependent Surveillance (ADS) system sends aircraft position and aircraft navigation data to ATC centers and other aircraft.

There are two different ADS applications:
- ADS-Contract (ADS-C)
  The ADS-C automatically sends aircraft surveillance data to connected ATC centers via ATC Datalink in remote or oceanic areas.

L2 *Refer to DSC-46-10-30-30 ADS-C* for more information, about ADS-C application.

L1
- ADS-Broadcast (ADS-B)
  The ADS-B automatically broadcasts the aircraft position and navigation data to other users (ATC centers or other aircraft) equipped with a Mode S transponder. The ATC Datalink does not host the ADS-B .

L2 *Refer to DSC-34-SURV-10-10 ADS-B OUT* for more information, about the ADS-B.

L1 **SERVICE PROVIDERS**

The role of a communication service provider is to deliver a message from the A/C to a ground end system and vice versa.
A datalink service provider ensures routing of datalink messages between the aircraft and ATC center.

L2 For VHF communication, the two main providers are ARINC and SITA that operate worldwide networks.

L1 REVERSION TO VOICE COMMUNICATION

Voice communication is a primary means of communication on board.

The flight crew must revert from datalink communication to voice communication, if:
- There is an emergency situation (exchange of a critical or urgent message)
- There is a doubt about a datalink message, the voice should be used for clarification
- An operational timer of datalink message exchange times out
- A response to an ATC message was not correctly transmitted via datalink.

CLOCK ACCURACY

The required time precision for ATC datalink communications is +/-1 s UTC. If this constraint is not respected, a rejection of datalink message or acceptance of obsolete datalink message may occur.
Not respecting this constraint may lead to the rejection of messages or to the acceptance of obsolete messages.
For FANS operations, the flight crew should not manually set the clock during cockpit preparation.

ARCHITECTURE

Applicable to: ALL

Ident.: DSC-46-10-10-10-00020329.0001001 / 17 MAR 17

AIR TRAFFIC SERVICE UNIT (ATSU)

The ATSU controls all datalink communication and automatically selects the best available communication media:
- VHF
- HF ⊲
- SATCOM ⊲ .

The ATSU hosts:
- AOC applications ⊲
- ATC applications ⊲
- Router services
  The ATSU routers automatically select VHF frequency, depending on the aircraft position, in accordance with an entered scan mask (airline policy).
  The scan mask means that a list of VHF datalink service providers, selected via the VHF3 SCAN SELECT page, is scanned, in accordance with their priority level. The VHF scan mask is compulsory for correct router operation. If there is no scan mask, the ECAM displays DATALINK ATSU FAULT – ATSU INIT FAULT.
  Refer to DSC-46-10-40-30 VHF3 SCAN SELECT for more information about the VHF3 SCAN SELECT page.

Ident.: DSC-46-10-10-10-00020319.0001001 / 17 MAR 17

SATELLITE COMMUNICATIONS (SATCOM)

The SATCOM system provides voice and data services. The voice/data are transmitted via satellite, from the aircraft to the ground earth stations, and then switched through international telecommunications networks (ARINC, SITA, etc.) to anywhere in the world (airline operational centers, ATC centers, etc).
The ATSU (router) manages switching to/from SATCOM (ACARS environments only).

Ident.: DSC-46-10-10-10-00020321.0002001 / 17 MAR 17

VERY HIGH FREQUENCY (VHF)

The communication between the aircraft and VHF ground stations is established on a VHF frequency. The datalink system primarily uses the VHF 3 radio communication system. The ATSU router automatically selects a VHF frequency, depending on entered configuration, the scan mask for VHF DataLink (VDL), and the aircraft position.
VHF data link service providers are available in each geographical area. *Refer to DSC-23-30-30-40 World Map ACARS Frequencies* for a world map of VHF ACARS frequencies.

The VHF3 radio communication system has:
- Data mode
- Voice mode.

DATALINK/VOICE SWITCHING

The VHF 3 can be used in the voice mode, in case of:
- VHF 1 failure
- VHF 2 failure
- Specific AOC functions (operator's customization).

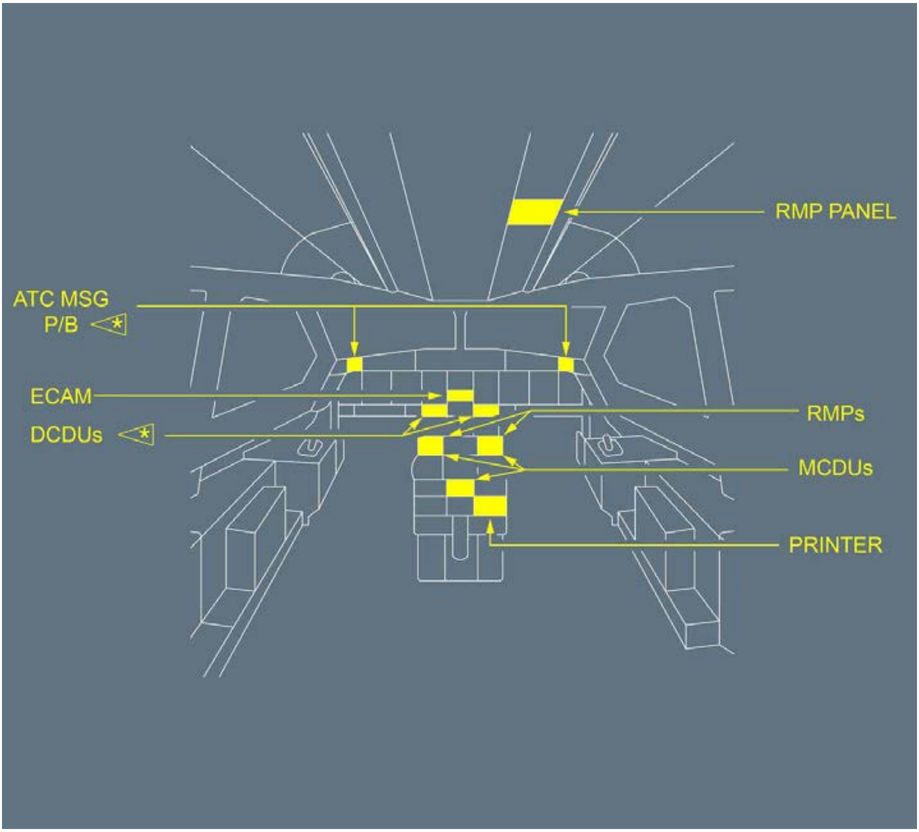
The flight crew can switch datalink/voice via the RMP , or via VHF3 VOICE DIRECTORY page of the MCDU.

The voice frequency can be tuned by:
- ATSU automatically
- Fight crew, via the RMP.

Green HF VOICE memo indicates that VHF 3 datalink communication is interrupted, when the VHF 3 transceiver operates in the voice mode.

COCKPIT INTERFACE

Ident.: DSC-46-10-10-00020373.0001001 / 17 MAR 17
Applicable to: ALL



The cockpit interface of the datalink system has:

- Datalink Control and Display Unit (DCDU) on the CAPT and F/O side
  The DCDU displays the uplink and downlink messages and enable the flight crew to control the datalink message exchange.
- ATC MSG pb-sw on the CAPT and F/O side of the glareshield
  The ATC MSG pb-sw alerts when an uplink message is received and enables the flight crew to cancel the alert.

- Multipurpose Control and Display Unit (MCDU)
  The MCDU enables to manage AOC and ATC functions and data transfer to the DCDU ⊲
- Printer
  Datalink messages can be printed, when displayed on the DCDU.
- RMP
  The RMP enables frequency tuning.
- ECAM
  The ECAM informs about the abnormal operation.

General

GENERAL

Ident.: DSC-46-10-20-10-00020385.0001001 / 17 MAR 17
Applicable to: ALL

The AOC applications are datalink applications. The AOC applications enable an exchange of specific messages between the flight crew and the Airline Operational Control (AOC).
The AOC applications are customized by each operator and depend on operator's choices and the datalink service provider.

Note: *Details about AOC applications cannot be provided due to the wide range of customization by the operator.*
Airbus does not supervise customization of AOC applications. It is recommended to insert AOC application description into this chapter in accordance with AOC applications installed on the aircraft.

The AOC applications can offer the following functions:

EXAMPLE	- Preflight Functions:
	  - Flight log
	  - Departure Delay Message
	  - Takeoff Delay Message
	  - Weather Request
	  - NOTAM Request
	  - Loadsheet Request
	  - Others
	- En-Route Functions:
	  - Flight log
	  - Diversion Message
	  - En-route Delay
	  - Estimated Time of Arrival (ETA) Message
	  - Weather Request
	  - NOTAM Request
	  - Others
	- Postflight Functions:
	  - Flight log
	  - Flight summary
	  - Gate delay
	  - Others

The flight crew uses the datalink cockpit interface for the AOC applications.

EXAMPLE	**Flight Plan Modification** This flight plan modification example is based on following assumptions: - The AOC sends a flight plan modification message to the flight crew. - The flight crew loads the fight plan modification in the FMGS , into the secondary F-PLN. - The crew obtains ATC clearance before activating the modified flight plan. - *Refer to DSC-46-10-50 How to Modify FLT Plan* for the flight plan modification based on an AOC request.

MCDU Datalink Pages

ATSU DATALINK

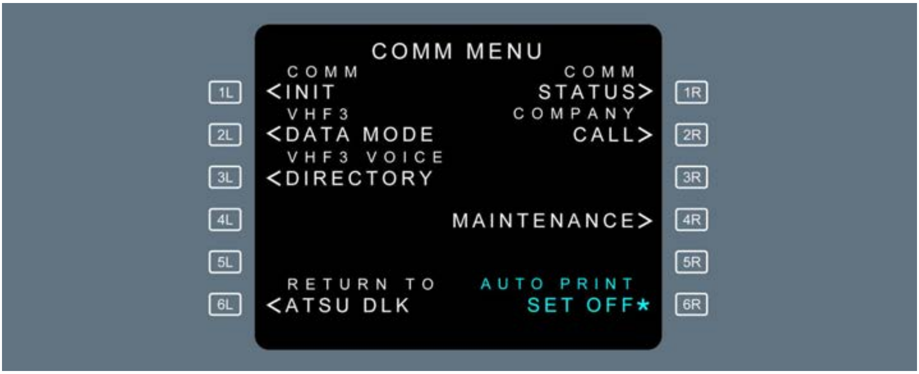
Ident.: DSC-46-10-40-30-00021081.0003001 / 17 MAR 17
Applicable to: ALL

[1R] AOC MENU	When selected, the MCDU displays the AOC MENU page.
[6R] COMM	When selected, the MCDU displays the COMM MENU page.

COMM MENU

Ident.: DSC-46-10-40-30-00021090.0003001 / 17 MAR 17
Applicable to: ALL

EXAMPLE	This is an example of the COMM MENU page. Information, that are displayed on the COMM MENU page and subsequent pages, accessible via the COMM MENU page, depend on datalink customization, selected by each operator for AOC applications.



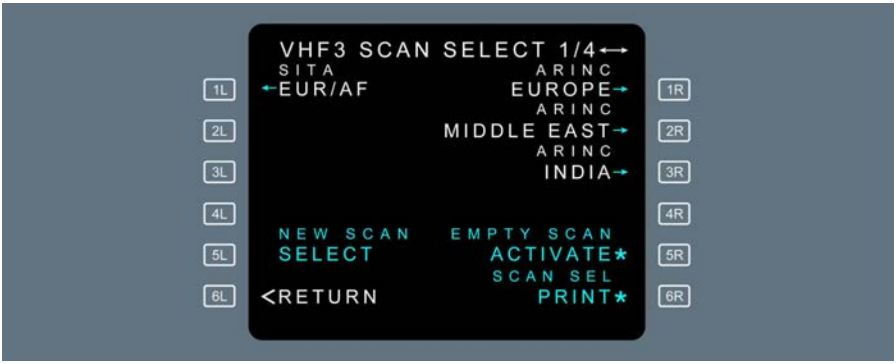
EXAMPLE	[1L] COMM INIT	When selected, the DCDU displays the COMM INIT page.
	[2L] VHF3 DATA MODE	When selected, the DCDU displays the VHF3 DATA MODE page.
	[3L] VHF3 VOICE DIRECTORY	When selected, the DCDU displays the VHF3 VOICE DIRECTORY page.
	[6L] RETURN TO ATSU DLK	When selected, the MCDU displays the ATSU DATALINK page.
	[1R] COMM STATUS	When selected, the DCDU displays the COMM STATUS page.
	[2R] COMPANY CALL	When selected, the DCDU displays the COMM CONFIG page.
	[4R] MAINTENANCE	When selected, the MCDU displays the MAINTENANCE page.
	[6R] AUTO PRINT	Sets the auto-print on or off.

VHF3 SCAN SELECT

Ident.: DSC-46-10-40-30-00021254.0001001 / 17 MAR 17
Applicable to: ALL

EXAMPLE	This is an example of VHF3 SCAN SELECT pages. Information, that are displayed on the VHF3 SCAN SELECT pages, depend on datalink customization, selected by each operator.

THE VHF 3 SCAN SELECT PAGE 1/4



EXAMPLE	[1L] SITA EUR/AF	Selects the SITA Europe/Africa (datalink service provider).
	[5L]: NEW SCAN SELECT : ACTIVE SEL DISPLAY :	 Selects the scan mask. Displays the scan mask used by ATSU.
	[6L] RETURN	When selected, the MCDU displays the COMM CONFIG page.
	[1R] ARINC EUROPE	Selects the ARINC Europe (datalink service provider).
	[2R] ARINC MIDDLE EAST	Selects the ARINC Eiddle East (datalink service provider).
	[3R] ARINC INDIA	Selects the ARINC India (datalink service provider).
	[5R] EMPTY SCAN ACTIVATE	Activates an emprty scan mask to inhibit VHF datalink communication.
	[6R] SCAN SEL PRINT	When selected, the printer prints information.

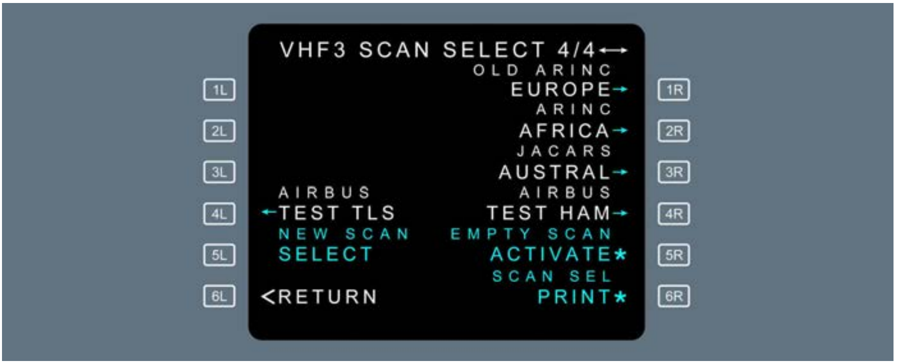
THE VHF 3 SCAN SELECT PAGE 2/4

EXAMPLE	[1L] SITA PACIFIC	Selects the SITA Pacific (datalink service provider).
	[4L] AVICOM JAPAN	Selects the AVCOM Japan (datalink service provider).
	[5L]: NEW SCAN SELECT : ACTIVE SEL DISPLAY :	 Selects the scan mask. Displays the scan mask used by ATSU.
	[6L] RETURN	When selected, the MCDU displays the COMM CONFIG page.
	[1R] ARINC RUSSIA	Selects the ARINC Russia (datalink service provider).
	[2R] ARINC ASIA	Selects the ARINC Asia (datalink service provider).
	[3R] ARINC AUSTRAL	Selects the ARINC Australia (datalink service provider).
	[4R] ARINC KOREA	Selects the ARINC Korea (datalink service provider).
	[5R] EMPTY SCAN ACTIVATE	Activates an emprty scan mask, in order to inhibit VHF datalink communication.
	[6R] SCAN SEL PRINT	When selected, the printer prints information.

THE VHF 3 SCAN SELECT PAGE 3/4

EXAMPLE	[1L] SITA NORTH AM	Selects the SITA North America (datalink service provider).
	[2L] SITA SOUTH AM	Selects the SITA South America (datalink service provider).
	[3L] DEPV BRASIL	Selects the DEPV Brasil (datalink service provider).
	[5L]: NEW SCAN SELECT : ACTIVE SEL DISPLAY :	 Selects the scan mask. Displays the scan mask used by ATSU.
	[6L] RETURN	When selected, the MCDU displays the COMM CONFIG page.
	[1R] ARINC AMERICA	Selects the ARINC America (datalink service provider).
	[5R] EMPTY SCAN ACTIVATE	Activates an emprty scan mask, in order to inhibit VHF datalink communication.
	[6R] SCAN SEL PRINT	When selected, the printer prints information.

THE VHF 3 SCAN SELECT PAGE 4/4



EXAMPLE	[5L]: NEW SCAN SELECT : ACTIVE SEL DISPLAY :	 Selects the scan mask. Displays the scan mask used by ATSU.
	[6L] RETURN	When selected, the MCDU displays the COMM CONFIG page.
	[1R] OLD ARINC EUROPE	Selects the OLD ARINC Europe (datalink service provider).
	[2R] ARINC AFRICA	Selects the ARINC Africa (datalink service provider).
	[3R] JACARS AUSTRAL	Selects the JACARS Australia (datalink service provider).
	[5R] EMPTY SCAN ACTIVATE	Activates an emprty scan mask, in order to inhibit VHF datalink communication.
	[6R] SCAN SEL PRINT	When selected, the printer prints information.

MCDU Scratchpad Messages

MCDU SCRATCHPAD MESSAGES

Applicable to: ALL

Ident.: DSC-46-10-40-40-10-00021338.0001001 / 17 MAR 17

SCRATCHPAD MESSAGES ON THE COMM MENU PAGE

MESSAGE	CONDITIONS
COMMAND NOT AVAIL	The command is not available.
DEFAULT VHF SP LIST	The new SCAN MASK is not available. The system displays the default SCAN MASK instead.
ENTER A/C REGISTR	The aircraft registration number is not valid. To enter this parameter, *Refer to DSC-46-10-50 How to Initialize*.
ENTER A/L ID	The airline identification number is not valid. To enter this parameter, *Refer to DSC-46-10-50 How to Initialize*.
ENTER VHF 3 SCAN MASK	No service provider has been selected.
FAILED COMMAND	The command, selected by the flight crew, cannot currently be performed.
FORMAT ERROR	The message was entered in an inappropriate format.
NOT ALLOWED	It is not permitted to press this key.
PRINT FAILED	A print command is not successful.
PRT MSG PRINT FAIL	Automatic print of an AOC uplink message was not successful.
VHF 3 CAN BE SET IN VOICE	VHF 3 datalink communications are lost. However, VHF 3 can be used in voice mode.
VHF 3 SWITCH IMPOSSIBLE	It is not possible to switch from VHF 3 voice mode to VHF 3 data mode.

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ECAM

MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-46-10-40-60-A-00016906.0001001 / 21 MAR 16

COMPANY ALERT : This memo appears in green when the aircraft receives an uplink alert message, or when an AOC special condition requires a pilot action on the MCDU (depends on AOC programming). This memo pulses green for 180 s, then remains steady. It is associated with a buzzer for 1 s.

Ident.: DSC-46-10-40-60-A-00016904.0001001 / 21 MAR 16

COMPANY CALL : This memo appears in green when the aircraft receives a message from the ground requesting voice communication on VHF.

Ident.: DSC-46-10-40-60-A-00016903.0001001 / 21 MAR 16

COMPANY DATALINK STBY : This memo appears in green when AOC datalink air-ground communication is temporarily unavailable, but not lost.

Ident.: DSC-46-10-40-60-A-00016905.0001001 / 21 MAR 16

COMPANY MSG : This memo appears in green when the aircraft receives a message from the ground.

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INTRODUCTION

Ident.: DSC-46-10-50-00021191.0002001 / 17 MAR 17
Applicable to: ALL

How To chapter contains examples of:
- How to initialize the datalink
- How to modify the flight plan.

Illustrations in How To are generic and do not reflect differences depending on the datalink standard installed in the aircraft.

HOW TO INITIALIZE

Ident.: DSC-46-10-50-00021142.0002001 / 17 MAR 17
Applicable to: ALL

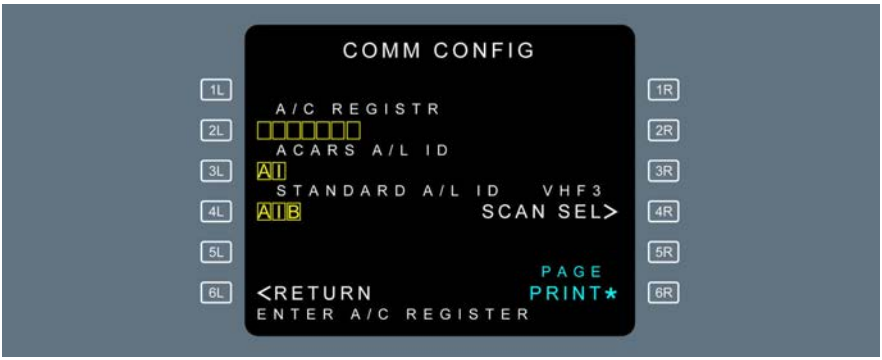
Datalink may be initialized:
- Automatically
  Datalink initializes automatically, provided that a list of service providers is scanned, and all required parameters are received, and validated by the ATSU.
- Manually
  Datalink may be initialized manually, when the system is not correctly initialized automatically.

The VHF3 SCAN SELECT page of the MCDU displays the list of service providers.
The COMM CONFIG / COMM INIT page, on the MCDU displays required parameters.

MANUAL INITIALIZATION

If one of required parameters is not valid, one or more manual entries may be required:

- **If ARN is not valid:**
  The MCDU scratchpad displays ENTER A/C REGISTER:



The flight crew clears the scratchpad, and inserts the A/C registration via the MCDU scratchpad.

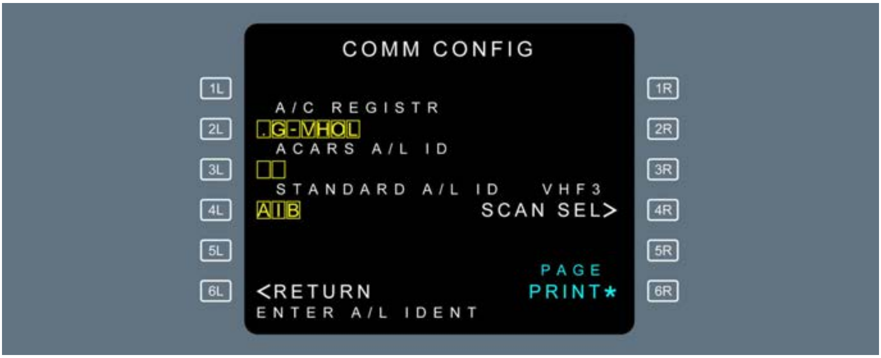
A/C REGISTR.. INSERT

The flight crew inserts A/C ICAO registration via the MCDU scratchpad to A/C REGISTR.

CONFIG ACTIVATE.. SELECT

The flight crew selects 1R/CONFIG ACTIVATE to activate manual entry of the A/C registration.

- **<u>If the A/L ID is not valid</u>:**
  The MCDU scratchpad displays ENTER A/L IDENT:



The flight crew clears the scratchpad, and inserts the two-letter A/L ID code via the MCDU scratchpad.

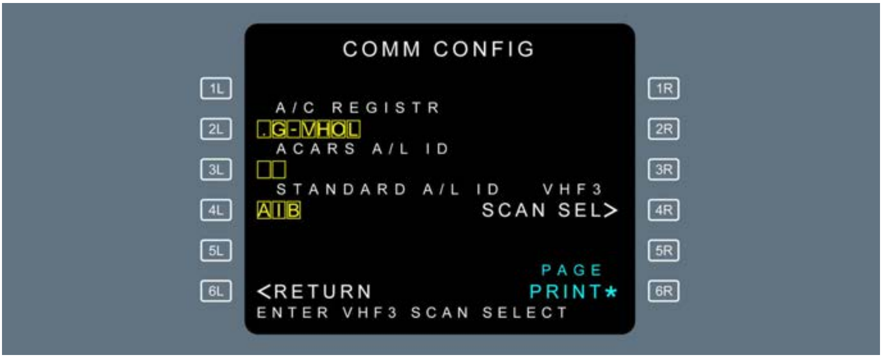
A/L ID.. INSERT

The flight crew inserts A/L ID code via the MCDU scratchpad to A/L ID.

CONFIG ACTIVATE.. SELECT

The flight crew selects 1R/CONFIG ACTIVATE to activate manual entry of the A/C registration.

- **<u>If VHF service provider is not selected</u>**
  and
  <u>if the VHF3 SCAN/MASK SELECT menu can be accessed:</u>
  The MCDU scratchpad displays ENTER VHF3 SCAN SELECT:



On the VHF3 SCAN SELECT page, select service providers, in the airline priority order, and activate the VHF SCAN SELECT function.

<u>EXAMPLE OF SELECTION OF DATALINK SERVICE PROVIDERS:</u>

Selection of SITA 725 and ARINC service providers :

1. Press 5L key: The asterisk next to SELECT indication disappears, then reappears.
2. Press 1L key to select SITA 725: SELECT indication goes off, and the priority number of selection 1 appears.
3. Press 1R key to select ARINC: SELECT indication goes off, and the priority number of selection 2 appears.
4. Press 5R key to activate the VHF SCAN SELECT function: The star next to SCAN SELECT ACTIVATE indication disappears, then reappears.

<u>Note:</u> *Modification of the SCAN SELECT setting may result in the loss of air-ground VHF datalink communication, and the increase of datalink service provider charges. Therefore, the SCAN SELECT setting should not be modified by the flight crew, unless the flight crew is instructed to do so.*

HOW TO MODIFY FLT PLAN

Ident.: DSC-46-10-50-00021153.0001001 / 21 MAR 17
Applicable to: ALL

- **When the scratchpad (1) displays the AOC SEC F-PLN UPLINK message:**
  - **On the MCDU:**
    <u>SEC INDEX Page</u>:

    AOC F-PLN INSERT....................SELECT See (2)

    The flight plan is inserted in the secondary F-PLN See (3).
    The flight can review and modify the flight plan.

    SEC F-PLN REQ DISPLAY....................SELECT See (4)

L2 *The DCDU automatically displays a datalink message See (5).*
L1 *The flight crew sends the message to the ATC from the DCDU.*

(3)

(5)

- **When ATC clearance is received:**
  - **On the glareshield:**

    ATC MSG pb...PRESS

    The aural and visual alerts stop.

  - **On the DCDU:**

    STBY...SELECT See (1)

    L2 *The message status changes to STBY on a blue background See (2).*

    L1 SEND...SELECT See (3)

    L2 *The background color of the STBY message status changes to green.*

    L1 LOAD...SELECT See (4)

    LOAD must be selected. Other selection may prevent loading of the clearance.
    The LOAD SEC OK displays in the information field of the DCDU, if loading is successful.

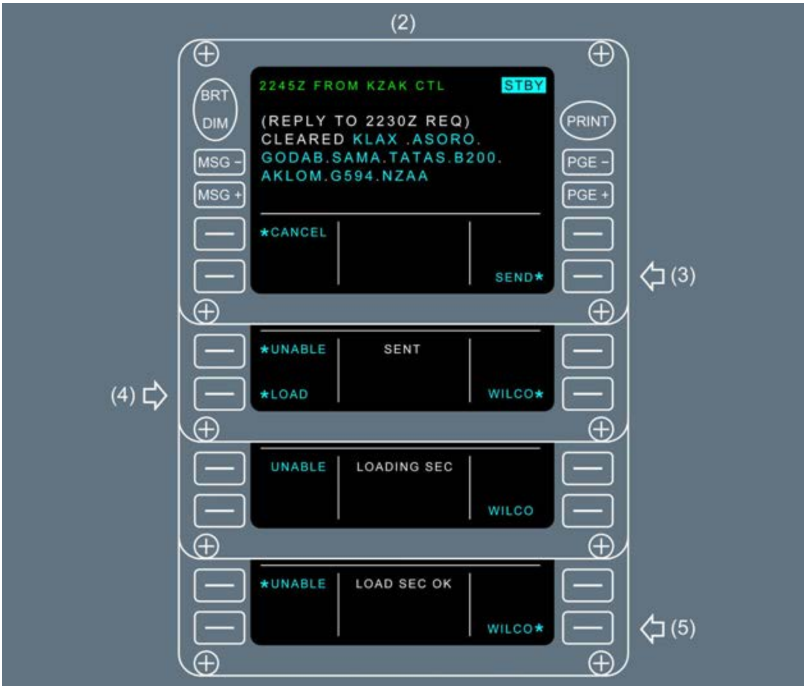
    L2 *The flight crew can review the clearance on the MCDU , in SEC F-PLN pages.*

L1

- **If the flight crew accepts the clearance:**

  WILCO..SELECT See (5)

  The flight crew can activate the secondary F-PLN.



■ **If the flight crew decides to modify the clearance:**

- The flight crew loads the clearance into the SEC F-PLN , on the MCDU and modifies it.
- The flight crew rejects the clearance by selecting UNABLE on the DCDU.
- The flight crew sends a new request (with the modified F-PLN) to the ATC.

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INTRODUCTION

Ident.: DSC-46-20-20-00021223.0001001 / 25 JUL 17
Applicable to: ALL

The FlySmart with Airbus application suite is composed of:
- TAKEOFF application
- LANDING application
- LOADSHEET application
- IN–FLIGHT application (available on the latest FlySmart with Airbus applications for Windows version)
- Operational Documentation applications (OLB)
- Manager application (available for iPad version).

The FlySmart with Airbus application suite is designed to:
- Improve access to flight crew's operational information
- Reduce the quantity of paper documents in the cockpit by replacing them with electronic documents
- Enable reduced revision and distribution cycles to ensure better technical data accuracy
- Ease and improve the operational data updating process
- Provide an accurate and optimized computation of performance.

The FlySmart with Airbus application suite can be used by the flight crew on a Portable Electronic Device (PED). The flight crew can use the power outlets ⊲ (110 VAC / 60 Hz) installed on each lateral console to plug their PED.

<u>Note:</u> *The power outlets (115 VAC / 400 Hz) located on the rear of the cockpit are for maintenance use only.*

GENERAL

Ident.: DSC-46-20-20-00021224.0001001 / 20 MAR 17
Applicable to: ALL

The My Flight page enables:
- To check that FlySmart with Airbus applications are up to date. The My Flight page provides the version of the installed applications and data (EFB version)
- To start the Manager application, that enables to update the operational data (performance, manuals)
- To initialize the applications with the applicable aircraft tail number, flight number and citypair. This avoids multiple entries of the same data in the different applications.

There is one My Flight page per application. All the inputs that the user has entered on one My Flight page are retrieved by the other applications.

Note: On the My Flight page of OLB application, the user can only enter the a/c type and a/c registration.

LANDING APPLICATION

Ident.: DSC-46-20-20-00021225.0001001 / 20 MAR 17
Applicable to: ALL

The Landing application aims at computing the landing performance data (maximum landing weight, approach speed) according to the aircraft configuration and external conditions (runway, surrounding obstacles, weather).
The Landing application allows straightforward computations and provides the optimized landing performance for the given conditions.

TAKEOFF APPLICATION

Ident.: DSC-46-20-20-00021226.0001001 / 20 MAR 17
Applicable to: ALL

The Takeoff application aims at computing the takeoff performance data (maximum takeoff weight, takeoff speeds, flexible temperature) according to the aircraft configuration and external conditions (runway, surrounding obstacles, weather).
The Takeoff application allows straightforward computations and provides the optimized takeoff performance for the given conditions.

LOADSHEET APPLICATION

Ident.: DSC-46-20-20-00021227.0001001 / 20 MAR 17
Applicable to: ALL

The Loadsheet application allows the flight crew users to prepare the aircraft loading and to check that all weights and CG remain within the loading operational envelope. This eases the computation of the ZFWCG , ZFW , TOW and TOCG, and enables last–minute changes to the passenger/cargo/fuel distribution.
Depending on airline's authority requirements, the Loadsheet application can also generate a load and trim sheet.

OPS LIBRARY APPLICATION

Ident.: DSC-46-20-20-00021228.0001001 / 20 MAR 17
Applicable to: ALL

The OLB application enables the onboard consultation of any flight operations document published in the relevant format (e.g. airline's manuals), including the ones delivered by Airbus (FCOM , MEL , AFM , CDL , FCTM).

MEL and CDL items (including missing items) selected on OLB application are automatically transferred to Takeoff and Landing applications.

MANAGER APPLICATION

Ident.: DSC-46-20-20-00021229.0001001 / 20 MAR 17
Applicable to: ALL

The Manager application aims at updating on the iPad the operational data used by FlySmart with Airbus applications for iPad: performance data and operational manuals.

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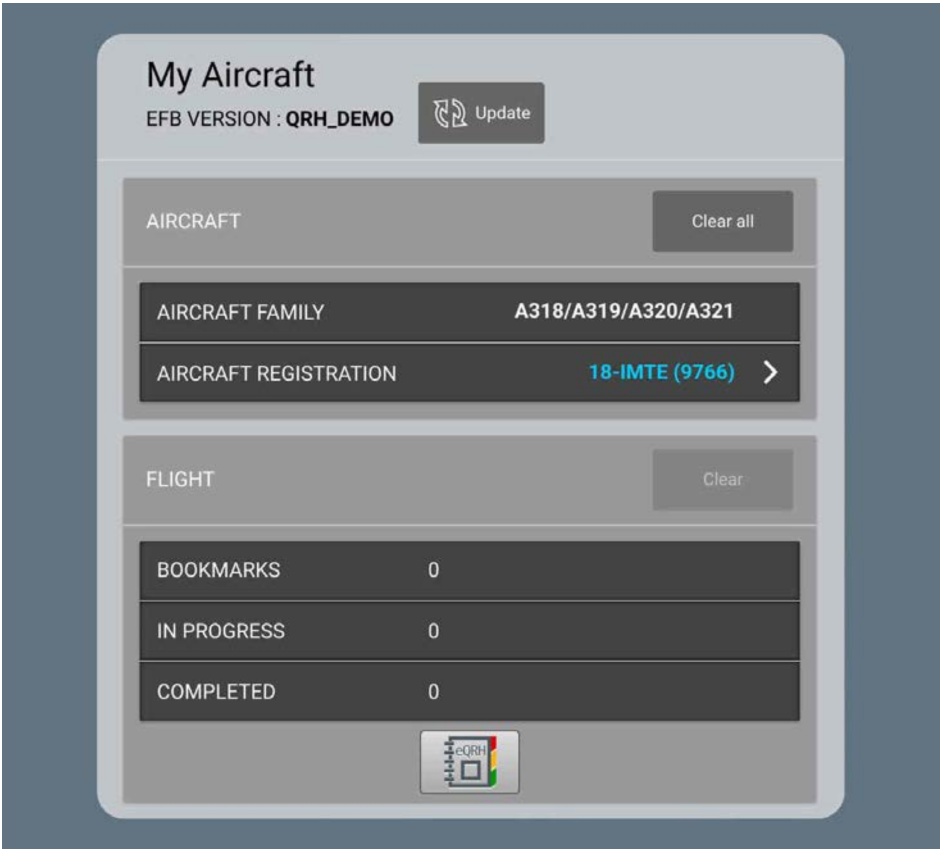
GENERAL

Ident.: DSC-46-30-00021515.0001001 / 17 MAR 17
Applicable to: ALL

The electronic QRH (eQRH) is an EFB application that enables the flight crew to:
- Manage the Normal Checklists and some Abnormal Procedures
- Access to some important operational data (OEBs, system architectures, performance…)

The eQRH has several main interfaces:
- My Aircraft page:

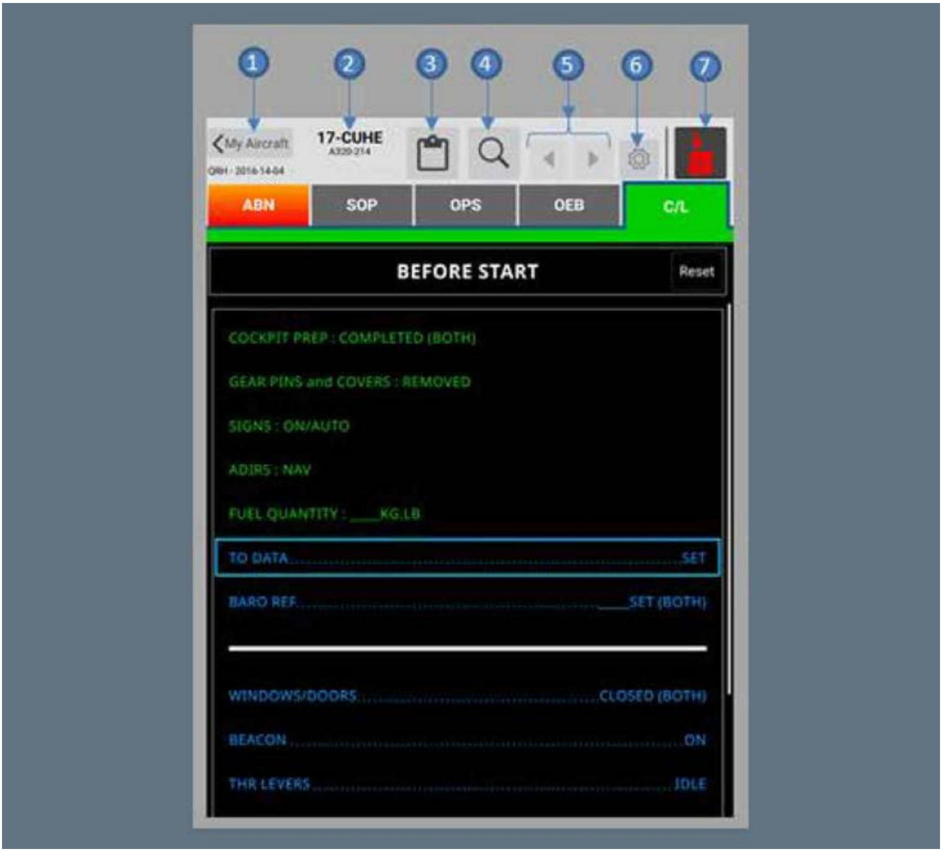
  The My Aircraft page enables:
  - To check that the eQRH application is up to date. The My Aircraft page provides the version of the installed application and data (EFB version)
  - To initialize the eQRH application with the applicable aircraft tail number. The My Aircraft page retrieves automatically the aircraft tail number when defined in other FlySmart with Airbus applications



- EFB version:

If required, each flight crew member compares the EFB version with the valid version information that is given as reference by the airline. This ensures that the eQRH application and the data installed on their devices correspond to the latest updated version, provided by their airline's flight operations.

- eQRH application:
  The eQRH application enables the pilot to manage the normal checklists and non-sensed Abnormal Procedures. It also gives access to some important operational data that may be required during the flight.



(1) Access to My Aircraft page
(2) Aircraft tail number and type
(3) Working list

(4) Search
(5) Previous/Next Navigation
(6) eQRH options
(7) Rapid Access

GENERAL

Ident.: DSC-46-40-10-00017604.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft is equipped with cabin connectivity systems which enable passengers to use:
- Mobile phones for voice and data services, and/or
- Internet wireless connection for access to the World Wide Web

The use of mobile phones is prohibited in cockpit and lavatories.
The following table provides the list of controls dedicated to Pax Entertainment & Connectivity Systems:

P/B	**EQUIPMENTS (FUNCTIONS)**	**DESCRIPTIONS**
GALLEY	Mobile, Wifi, IFE	*Refer to DSC-24-20 Overhead Panel*
COMMERCIAL	Mobile, Wifi, IFE	*Refer to DSC-24-20 Overhead Panel*
NO PED	Signs	*Refer to DSC-33-40-10 Overhead Panel*
PAX SYS	Mobile, Wifi, IFE, Seat actuators, PED	*Refer to DSC-46-40-30 PAX SYS PB-SW*
PAX PERSONAL ELEC SPLY	Mobile, Wifi, IFE, Seat actuators, PED	*Refer to DSC-46-40-30 PAX PERSONAL ELEC SPLY PB-SW*
MOBILE COM	Mobile, Wifi	*Refer to DSC-46-40-30 MOBILE COM PB-SW*
CINS reset	Mobile, Wifi	*Refer to DSC-46-40-30 CINS RESET PB*

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IN SEAT POWER SUPPLY SYSTEM

Ident.: DSC-46-40-20-00017606.0001001 / 10 NOV 15
Applicable to: ALL

The In-Seat Power Supply System (ISPSS) provides electrical power to the In-Seat Power Supply Unit (ISPSU) outlets, and enables passengers to use Portable Electronic Devices (PED) and the In-Flight Entertainment (IFE) system.
It is possible for the flight crew to simultaneously disconnect power from all ISPSUs, In-Flight Entertainment (IFE) and Cabin Connectivity systems, via the PAX SYS pb-sw or the PAX PERSONAL ELEC SPLY pb-sw.
In the case of rapid cabin decompression, both the ISPSS and IFE system are automatically disconnected.

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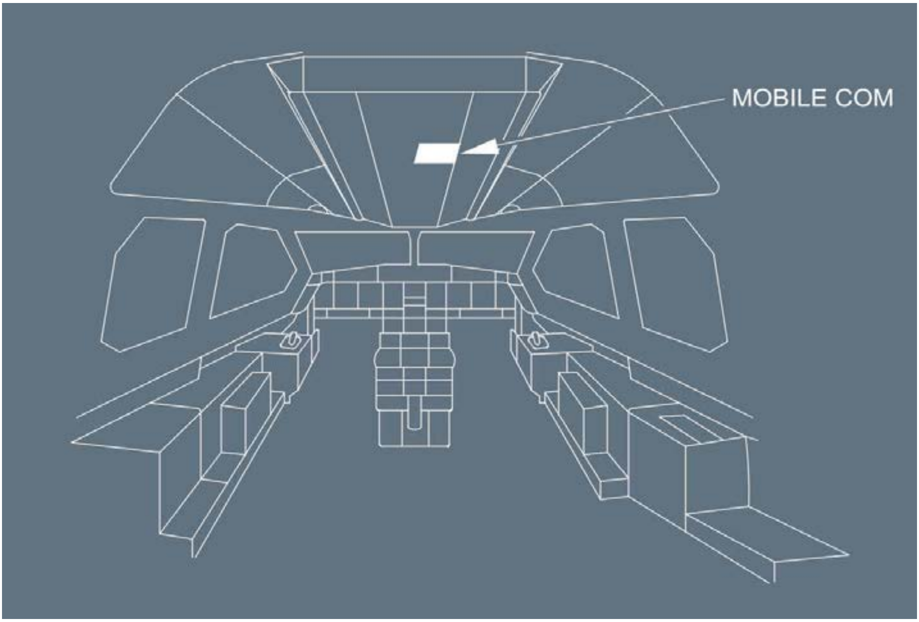
MOBILE COM PB-SW

Ident.: DSC-46-40-30-00017631.0001001 / 19 APR 16
Applicable to: ALL



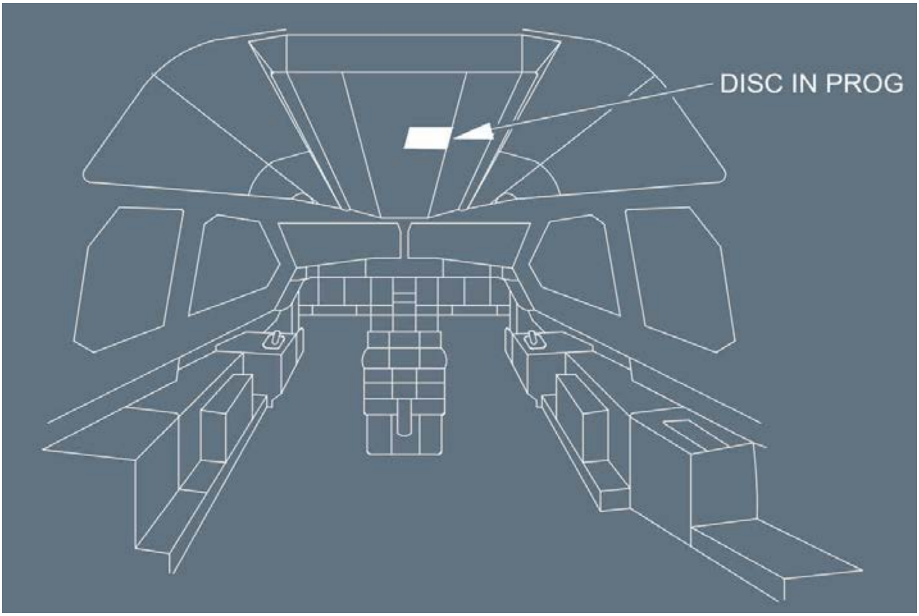
The pushbutton-switch described here below is installed on the 45 VU panel on the overhead panel.

ON	:	The mobile phone system is activated.
OFF	:	The mobile phone system is deactivated.

<u>*Note:*</u> *When the pushbutton is released, the OFF light comes on in white however the system takes approximately 4 min to disconnect. During this disconnection process, the passengers can use their mobile phones.*

DISC IN PROG LIGHT

Ident.: DSC-46-40-30-00019278.0001001 / 21 MAR 17
Applicable to: ALL

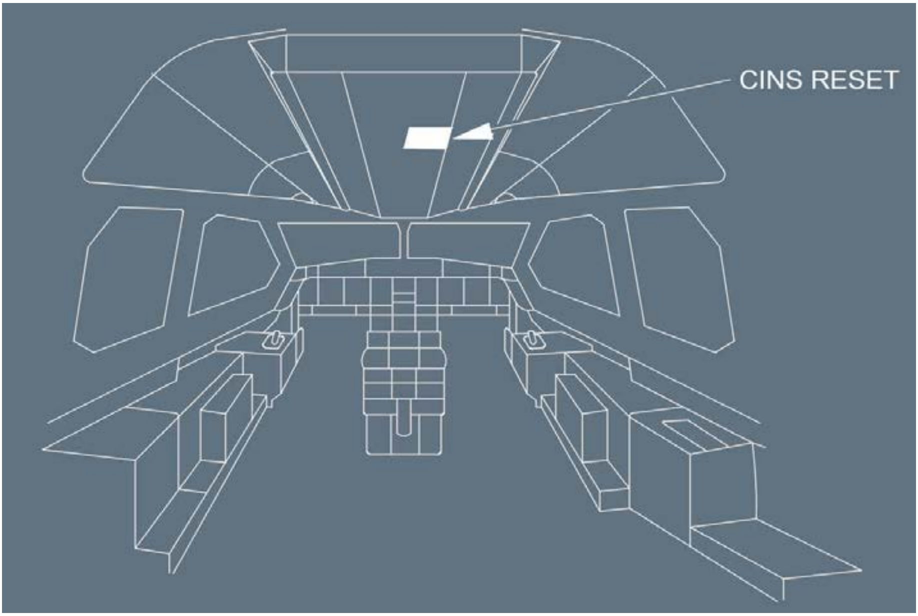


The pushbutton-switch described here below is installed on the 45 VU panel on the overhead panel.

Note: *After the release of Mobile Com pushbutton, the DISC IN PROG light comes in blue and remains on until the total disconnection of the system.*

CINS RESET PB

Ident.: DSC-46-40-30-00017630.0001001 / 10 NOV 15
Applicable to: ALL

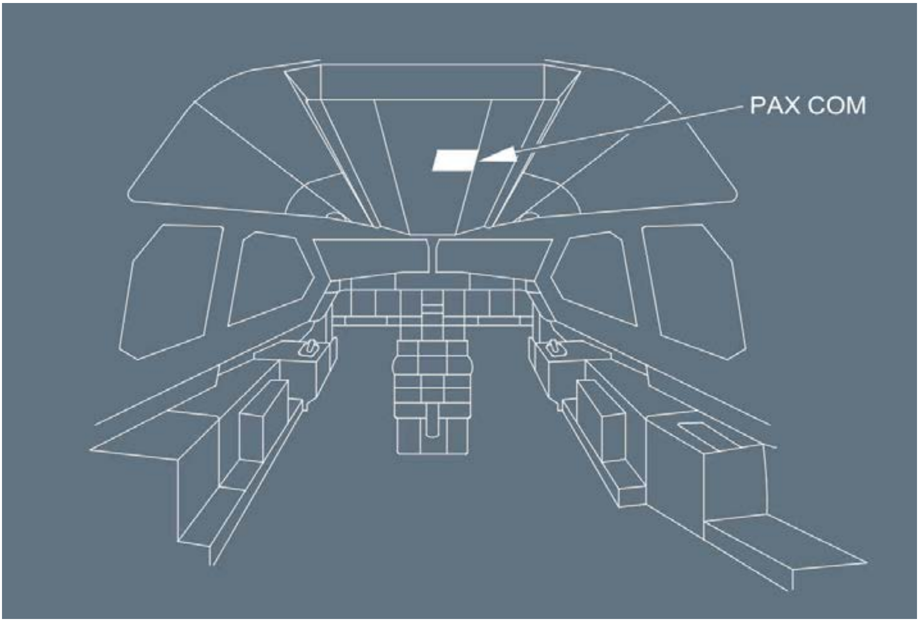


The pushbutton-switch described here below is installed on the 45 VU panel on the overhead panel.

When pressed, it resets all Cabin Connectivity systems.

PAX COM PB-SW

Ident.: DSC-46-40-30-00021654.0001001 / 02 MAY 17
Applicable to: ALL

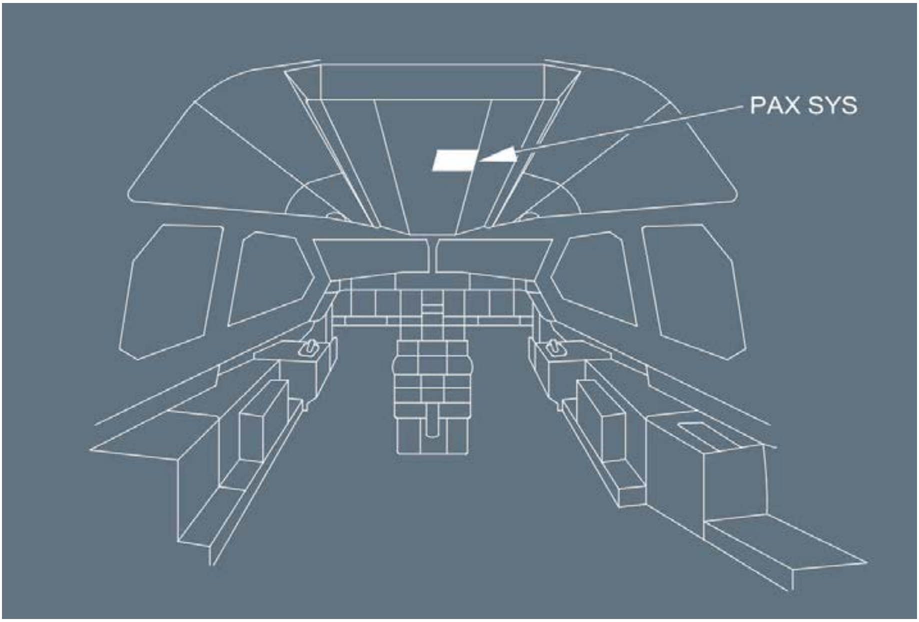


The pushbutton-switch described here below is installed on the 45 VU panel on the overhead panel.

OFF : The Cabin Connectivity system is cut-off. When the pushbutton-switch is released, the OFF light comes on in white.

PAX SYS PB-SW ⧏

Ident.: DSC-46-40-30-00017735.0001001 / 10 NOV 15
Applicable to: ALL

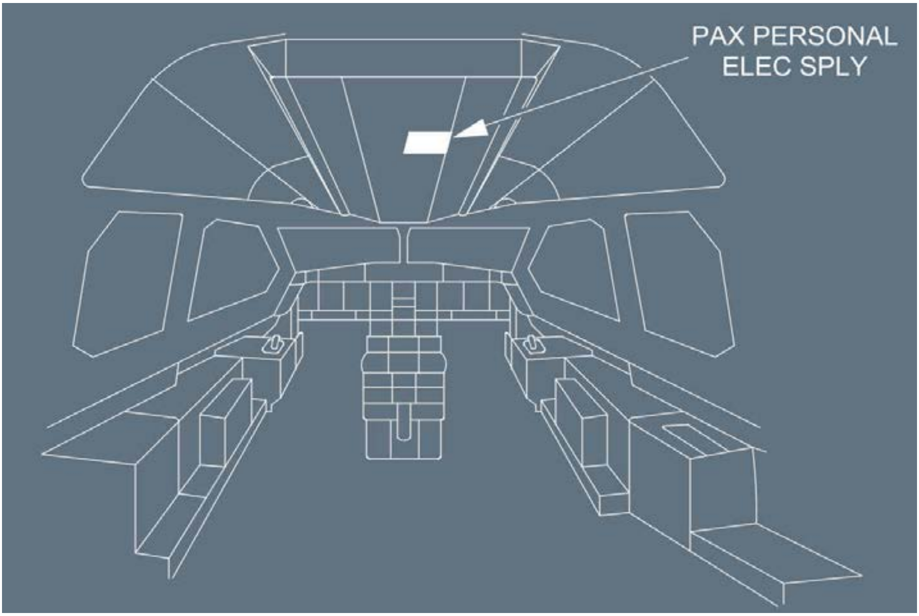


The pushbutton-switch described here below is installed on the 56VU panel on the overhead panel.

AUTO	:	All ISPSUs, In-Flight Entertainment (IFE) and Cabin Connectivity systems are powered.
OFF	:	Simultaneously turns off all ISPSUs, In-Flight Entertainment (IFE) and Cabin Connectivity systems.

PAX PERSONAL ELEC SPLY PB-SW ⧀

Ident.: DSC-46-40-30-00017629.0001001 / 21 MAR 17
Applicable to: ALL



The pushbutton-switch described here below is installed on the 56VU panel on the overhead panel.

AUTO ⧀	:	All ISPSUs, In-Flight Entertainment (IFE) and Cabin Connectivity systems are powered, if the pushbutton-switch located in the forward cabin is also in the on position
OFF	:	Simultaneously turns off all ISPSUs, In-Flight Entertainment (IFE) system and Cabin Connectivity systems.
INOP ⧀	:	This label indicates that the ISPSS has been deactivated and is inoperative.

MEMO DISPLAY

Ident.: DSC-46-40-30-00017628.0001001 / 10 NOV 15
Applicable to: ALL

"GSM DISC < 4 MN"	:	This memo appears in green, if the cockpit switch "Mobile Com" is pushed. It initiates a shutdown of the Cabin Connectivity systems within 4 minutes. The message disappears when the shutdown is completed.

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AIRCRAFT SYSTEMS

APU

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DSC-49-10 Description

DSC-49-10-10 General

DSC-49-10-20 Main Components

DSC-49-20 Controls and Indicators

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GENERAL

Applicable to: ALL

Ident.: DSC-49-10-10-A-00017436.0001001 / 21 MAR 17

The Auxiliary Power Unit (APU) is a self-contained unit that supplies the aircraft with pneumatic and electrical power.

On the ground

- It supplies bleed air for starting the engines and for the air conditioning system
- It supplies electrical power to the electrical system.

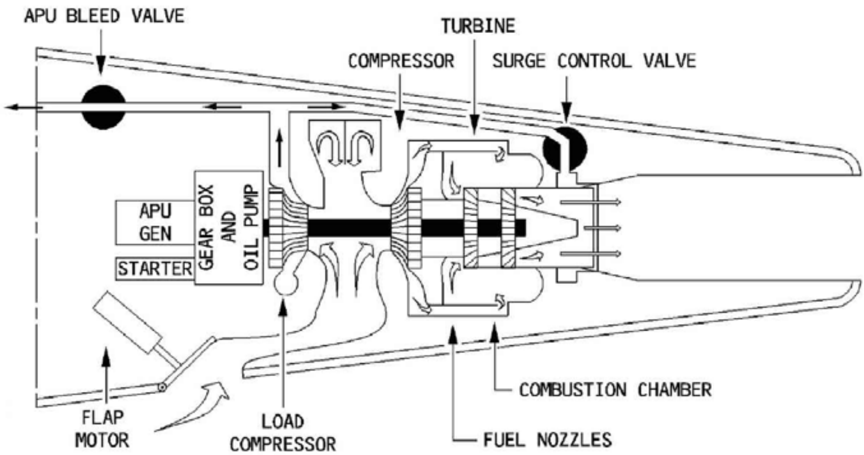
During takeoff

- It supplies bleed air for air conditioning (for example, when optimum aircraft performance is required).

In flight

- It backs up the electrical system
- It backs up the air conditioning
- It can be used to start the engines.

The APU may obtain power for starting from the aircraft's batteries or normal electrical system, or from ground service.
APU starting is permitted throughout the normal flight envelope (*Refer to LIM-APU Operational Envelope*).


APU BLEED VALVE
TURBINE
COMPRESSOR
SURGE CONTROL VALVE
APU GEN
STARTER
GEAR BOX AND OIL PUMP
COMBUSTION CHAMBER
FLAP MOTOR
LOAD COMPRESSOR
FUEL NOZZLES

APU ENGINE

Ident.: DSC-49-10-20-00001528.0001001 / 21 MAR 16
Applicable to: ALL

The basic element of the APU is a single-shaft gas turbine that delivers mechanical shaft power for driving the accessory gearbox (electrical generator, starter, etc.) and produces bleed air (engine starting and pneumatic supply).

ELECTRONIC CONTROL BOX

Ident.: DSC-49-10-20-00001529.0001001 / 21 MAR 16
Applicable to: ALL

The Electronic Control Box (ECB) is a full-authority digital electronic controller that performs the bulk of the APU system logic for all modes of engine operation, such as :
- Sequences the start and monitors it.
- Monitors speed and temperature.
- Monitors bleed air.
- Sequences the shutdown.
- Controls the automatic shutdown.

AIR INTAKE SYSTEM

Ident.: DSC-49-10-20-00001530.0001001 / 21 MAR 16
Applicable to: ALL

The air intake and an electrically operated flap allow external air to reach the compressor inlet.

STARTER

Ident.: DSC-49-10-20-00001531.0001001 / 21 MAR 16
Applicable to: ALL

The ECB controls the electric starter. The starter engages if the air intake is fully open and the MASTER SW and the START pushbutton are ON.

FUEL SYSTEM

Ident.: DSC-49-10-20-00001532.0001001 / 21 MAR 16
Applicable to: ALL

The left fuel feed line supplies the APU.
The required pressure is normally available from tank pumps.
If pressure is not available (batteries only or pumps off) the APU FUEL PUMP starts automatically.
The ECB controls the fuel flow.

OIL SYSTEM

Ident.: DSC-49-10-20-00001533.0001001 / 21 MAR 16
Applicable to: ALL

The APU has an integral independent lubrication system (for lubrication and cooling).

INLET GUIDE VANES (IGV)

Ident.: DSC-49-10-20-00001534.0001001 / 21 MAR 16
Applicable to: ALL

The IGVs control bleed air flow, and a fuel-pressure-powered actuator positions the IGVs.
The ECB controls the actuator in response to aircraft demand.

AIR BLEED SYSTEM

Ident.: DSC-49-10-20-00001535.0003001 / 03 FEB 11
Applicable to: ALL

The air bleed system is fully automatic.
The ECB always sets the APU speed to 100 % except for air conditioning demand, if the ambient temperature is between -18 °C and 35 °C. In this case, the ECB sets the APU speed to 99 %. For all other ambient temperatures (less than -18 °C or more than 35 °C), the ECB sets the APU speed to 100 %.

CONTROLS

Ident.: DSC-49-10-20-00001536.0001001 / 21 MAR 16
Applicable to: ALL

The flight crew uses the controls on the APU panel for routine shutdown. For emergency shutdown :
- the flight crew can push the APU FIRE handle, or
- the ground crew can push the APU SHUT OFF pushbutton on the interphone panel under the nose fuselage.

GROUND OPERATION SAFETY DEVICES

Ident.: DSC-49-10-20-00001537.0001001 / 21 MAR 16
Applicable to: ALL

The APU may run without cockpit crew supervision when the aircraft is on the ground. In case of fire in the APU compartment :
- APU fire warnings operate in the cockpit.
- A horn in the nose gear bay sounds.
- The AVAIL light goes out.
- The FAULT light in the MASTER SW lights up.

- The APU shuts down.
- The APU fire extinguisher discharges.

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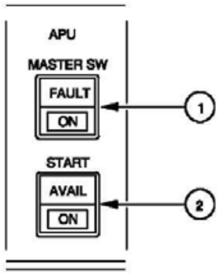
OVERHEAD PANEL

Applicable to: ALL

Ident.: DSC-49-20-A-00017438.0001001 / 21 MAR 16



Ident.: DSC-49-20-A-00017685.0002001 / 21 MAR 16

(1) MASTER SW pb-sw

This switch controls the electric power supply for the operation of the APU and its protective features. It also controls the starting and shutdown sequences.

ON : The blue ON light comes on.
Electric power goes to the APU system; the ECB performs a power-up test.
The APU air intake flap opens.
The APU fuel isolation valve opens.
If no fuel tank pump is running, the APU fuel pump operates.
If the aircraft has ground power or main generator power, the APU page appears on the ECAM display.

OFF : Manual shutdown sequence.

- The ON light on the MASTER SW pb-sw, and the AVAIL light on the START pb go out.
- If the aircraft was using APU bleed air, the APU keeps running for a cooling period of 60 to 120 s.
- At 7 % the air inlet flap closes.

FAULT lt : Depending on version of the ECB , this amber light comes on, and a caution appears on ECAM, when an automatic APU shutdown occurs, which can happen in case of:

Fire (on ground only)
Air inlet flap closed
Overspeed
No acceleration
Slow start
EGT overtemperature
No flame
Reverse flow
Low oil pressure
High oil temperature
DC power lost (BAT OFF when aircraft on batteries only)
Overcurrent
Sensor failure
IGV failure
ECB failure
No speed
Underspeed
Loss of overspeed protection
Oil system shutdown
Inlet overheat
Clogged oil filter
Loss of EGT thermocouples

Ident.: DSC-49-20-A-00017439.0003001 / 21 MAR 16

(2) START pb-sw

ON : Blue ON light comes on.

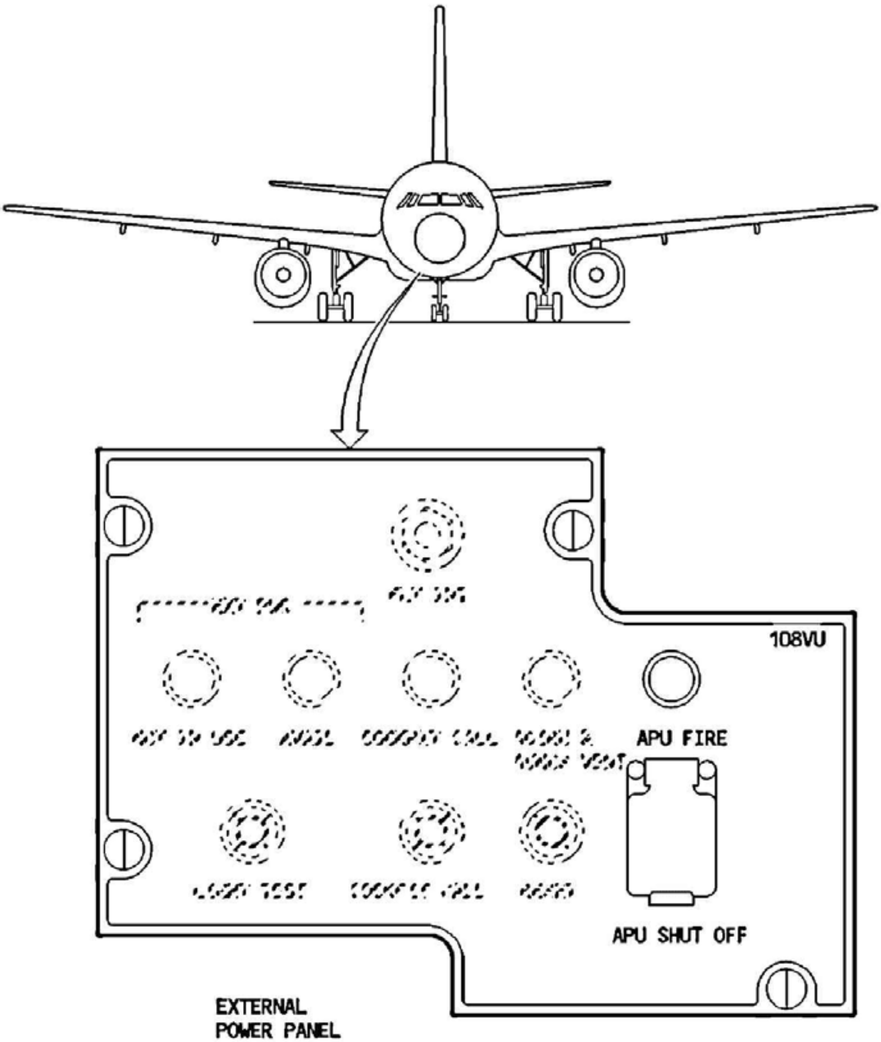
- When the flap is completely open, the starter is energized.
- 1.5 s after the starter is energized, the ignition turns on.
- When N = 60 %. The APU starter is de-energized. The ignition is turned off.
- 2 s after N reached 95 %, or when N is above 99.5 %:
  The ON light on the START pb goes out.
  The APU may now supply bleed air and electrical power to the aircraft systems.
- 10 s later, the APU page disappears from the ECAM display.

AVAIL lt : This green light comes on when N is above 99.5 % or 2 s after N reaches 95 %.

EXTERNAL CONTROLS

Ident.: DSC-49-20-00001539.0001001 / 21 MAR 16

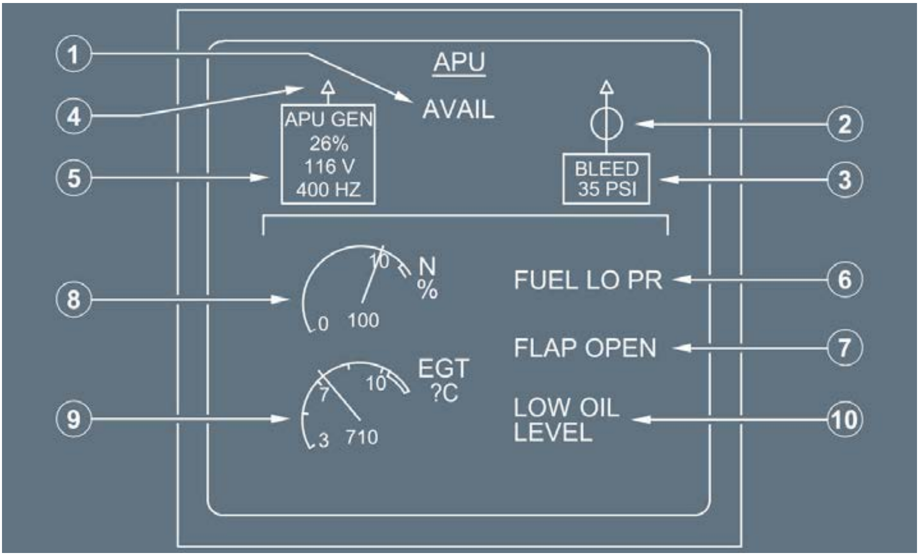
Applicable to: ALL



ECAM APU PAGE

Applicable to: ALL

Ident.: DSC-49-20-B-00017440.0001001 / 21 MAR 16



Ident.: DSC-49-20-B-00017441.0001001 / 21 MAR 16

<u>(1) AVAIL</u>

Displayed in green when APU N is above 95 %.

Ident.: DSC-49-20-B-00017442.0001001 / 21 MAR 16

<u>(2) APU bleed air valve position</u>

Inline-Green	:	The APU bleed air valve is not closed.
Crossline-Green	:	The APU bleed air valve is closed.
Crossline-Amber	:	The APU bleed air valve is closed and the APU bleed is ON.
XX-Amber	:	The APU bleed air valve status information is not available, or the APU BLEED pb status is not available.

Ident.: DSC-49-20-B-00017443.0001001 / 21 MAR 16

<u>(3) APU bleed air pressure</u>

This box displays the relative bleed air pressure in green.

It shows an amber XX when the ADIRS 1 or the ADIRS 2 is not available or selected OFF or the data from the ECB are invalid or not transmitted.

Ident.: DSC-49-20-B-00017444.0001001 / 21 MAR 16

(4) APU GEN line contactor indication

Displayed in green when the APU GEN line contactor is closed.

Ident.: DSC-49-20-B-00017445.0001001 / 21 MAR 16

(5) APU GEN parameters

Identical to the APU GEN parameters on the ELEC page.

Ident.: DSC-49-20-B-00017446.0001001 / 21 MAR 16

(6) FUEL LO PR

Displayed in amber if APU fuel pressure gets low.

Ident.: DSC-49-20-B-00017447.0003001 / 21 MAR 16

(7) FLAP OPEN

- Displayed in green when APU air intake flap is fully open.
- Advisory if the flap is not fully closed 3 min after the MASTER sw has been turned OFF.

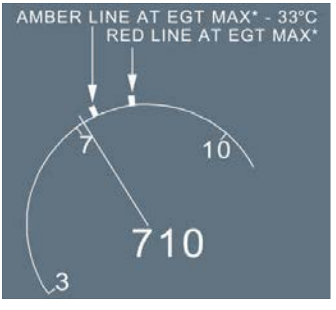
Ident.: DSC-49-20-B-00017448.0001001 / 21 MAR 16

(8) APU N

- Displays APU speed in green.
- Becomes amber when N ≥ 102 %.
- Becomes red when N ≥ 107 %.

Ident.: DSC-49-20-B-00017449.0003001 / 06 SEP 16

(9) APU EGT



- Displays APU EGT in green.
- Becomes amber when EGT ≥ EGT MAX -33 °C.
- Becomes red when EGT ≥ EGT MAX (automatic shutdown begins).

Note: *ECB calculates EGT MAX and transmits it to the ECAM . It is a function of N during start, and a function of ambient temperature when the APU is running.*
Maximum EGT during start: 1 120 °C (above 35 000 ft).
Maximum EGT during start: 1 090 °C (below 35 000 ft).
Maximum EGT with APU running: 675 °C.

Ident.: DSC-49-20-B-00017450.0001001 / 21 MAR 16

(10) LOW OIL LEVEL
Advisory: Displayed if the ECB detects a low APU oil level when the aircraft is on the ground, and the APU is not running.

MEMO DISPLAY

Ident.: DSC-49-20-00016689.0001001 / 21 MAR 16
Applicable to: ALL

APU AVAIL : This memo appears in green, when APU N is above 99.5 % or 2 s after N is above 95 % (depending on the aircraft configuration).

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AIRCRAFT SYSTEMS

DOORS

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Continued on the following page

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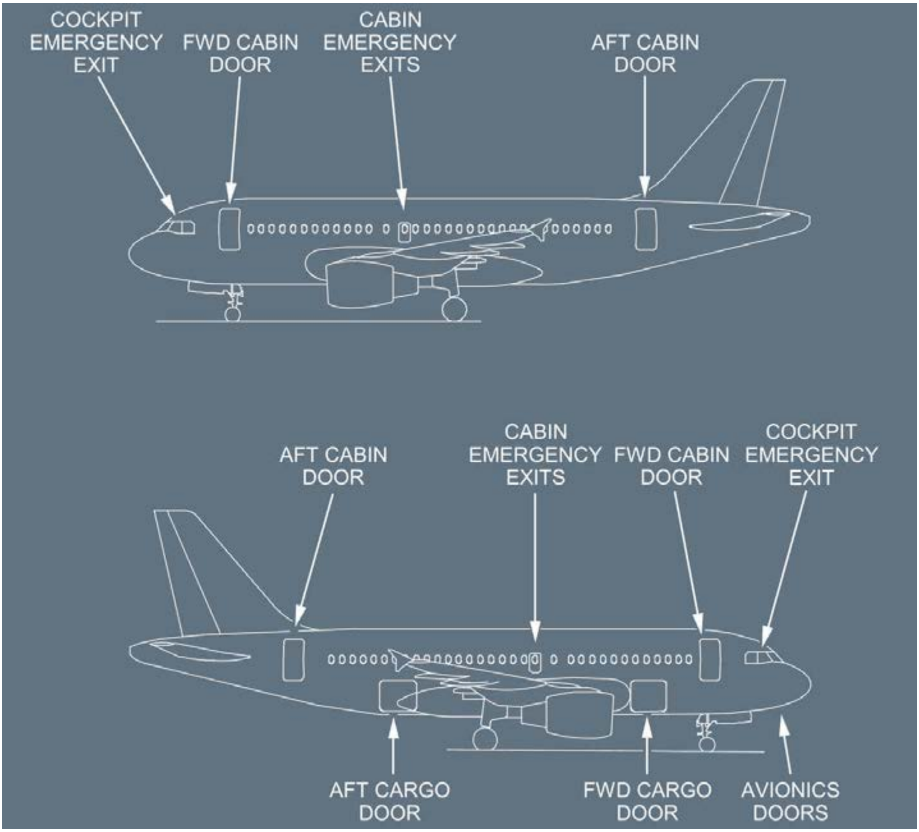
DSC-52-40-30 Cockpit Door Surveillance System (CDSS)

DSC-52-50 How to

DESCRIPTION

Ident.: DSC-52-10-10-00001544.0004001 / 22 MAY 12
Applicable to: ALL

The A319's fuselage has:
- Four passenger doors
- Two emergency exits in the cabin
- Cockpit emergency exits (two sliding windows)
- Two cargo compartment doors
- Four avionic compartment access doors.



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GENERAL

Ident.: DSC-52-10-20-00017564.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft has four plug-type doors that open outward and forward. There are two doors on each side of the fuselage (one door in the FWD section and one door in the AFT section).
The doors are operated from inside or outside of the aircraft. Normal operation is manual, with hydraulic damping.

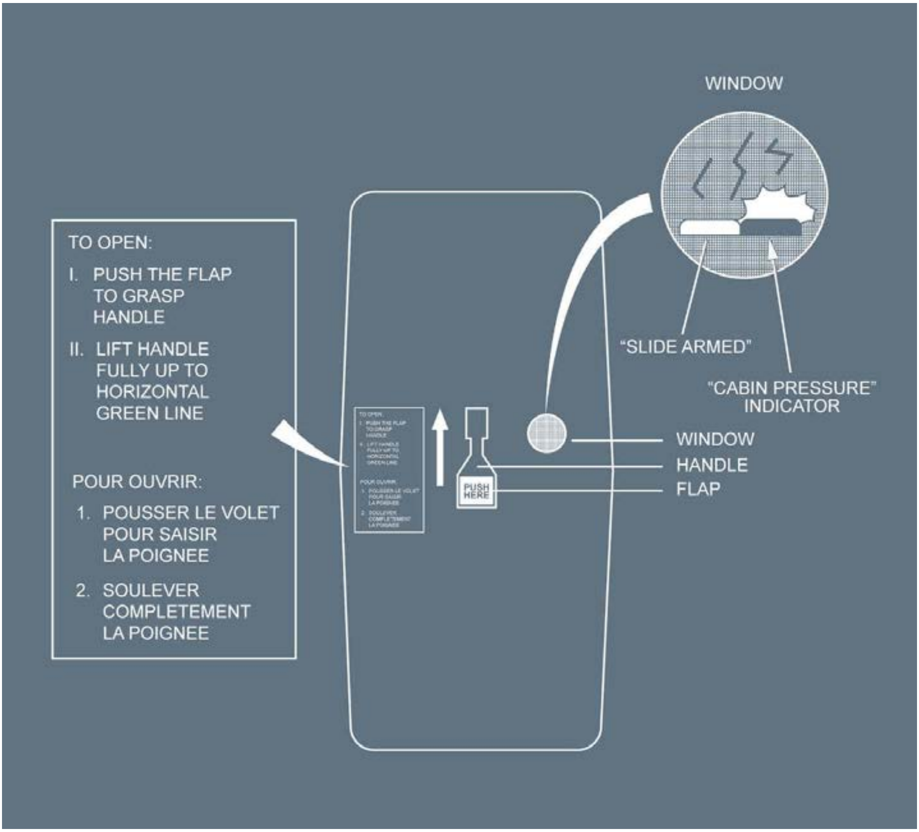
Each door has emergency features:
- An escape slide stowed in a container attached to the inboard lower side of the door
- A damper actuator in normal mode, the damper actuator limits the door travel; in emergency mode, the damper actuator drives the automatic door opening
- A slide arming lever.

When the slide arming lever is in the ARMED position, the slide is connected to the floor brackets on both sides of the door. When the door is open, the slide inflates and deploys automatically. If the inflation bottle fails to discharge automatically, a crew member can open its valve to make it discharge. Opening the door from outside disarms the door and the escape slide.

Each passenger door has :
- A mechanical locking indicator that confirms the locked or unlocked position of the door
- One warning light to show the ARMED or DISARMED indication of the escape slides
- One CABIN PRESSURE warning light that illuminates in the case of a residual pressure in the cabin.

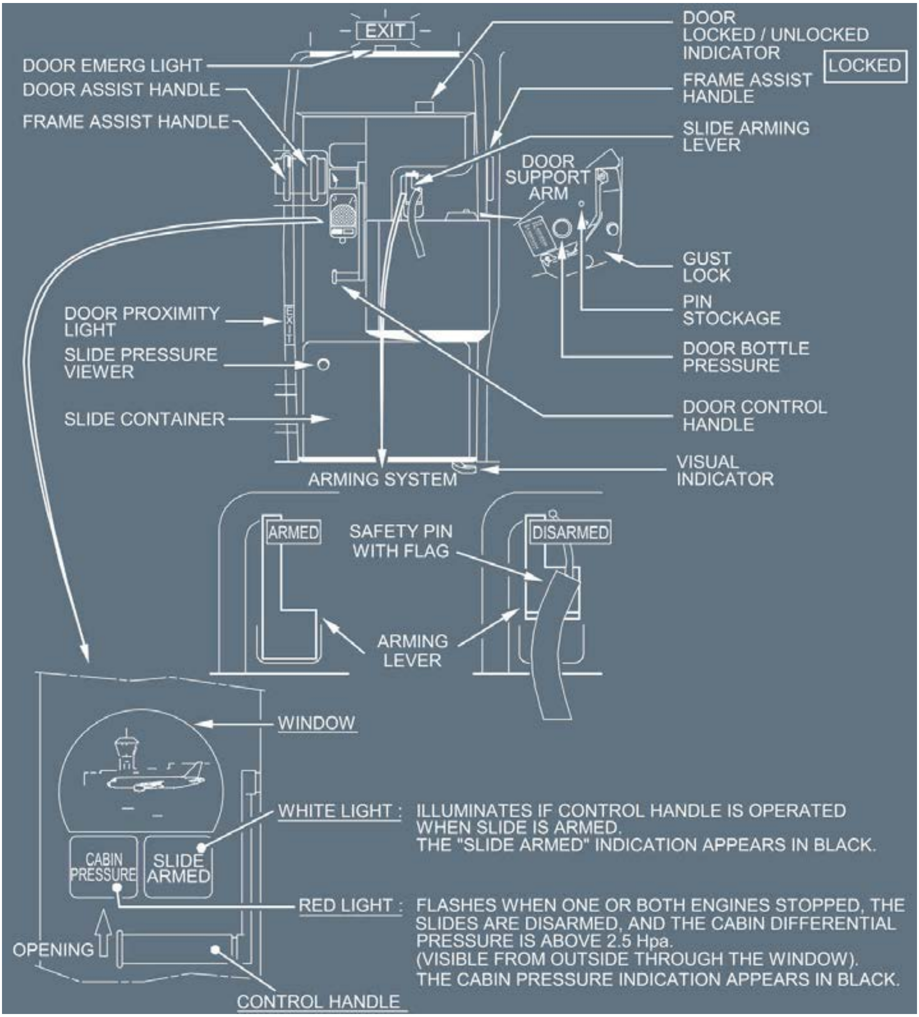
OUTSIDE

Ident.: DSC-52-10-20-00017565.0001001 / 21 MAR 16
Applicable to: ALL



INSIDE

Ident.: DSC-52-10-20-00001547.0002001 / 22 MAY 12
Applicable to: ALL



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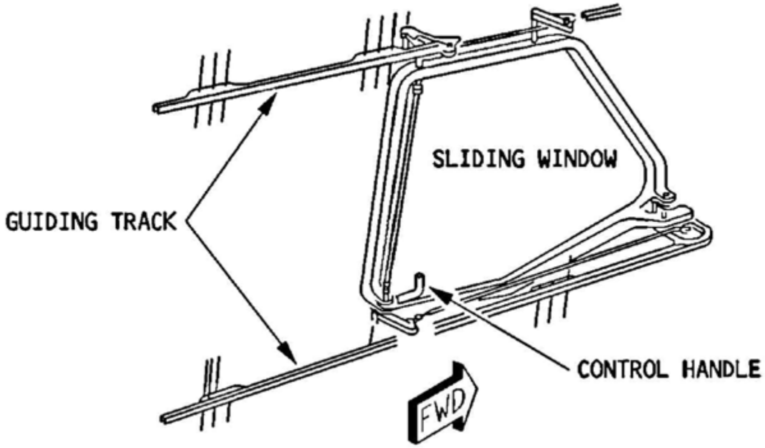
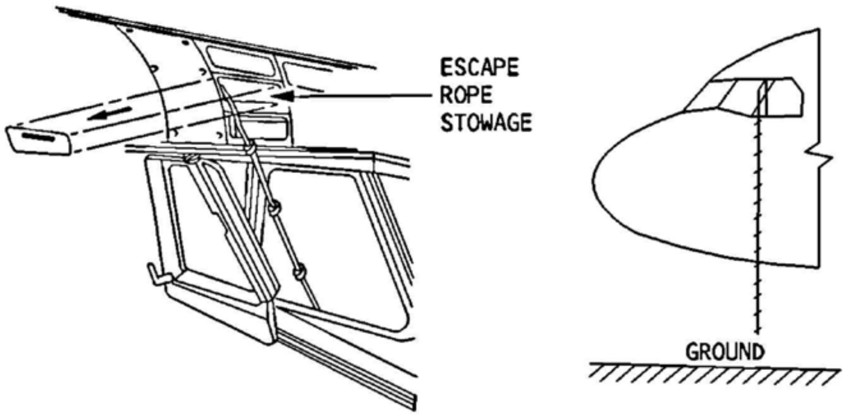
COCKPIT

Ident.: DSC-52-10-30-00017567.0001001 / 21 MAR 16
Applicable to: ALL

The two sliding windows in the cockpit are flight crew emergency exits.
A small compartment, located above each window, contains an escape rope that is long enough to reach the ground when lowered through either sliding window. The cockpit windows can only be opened from inside.



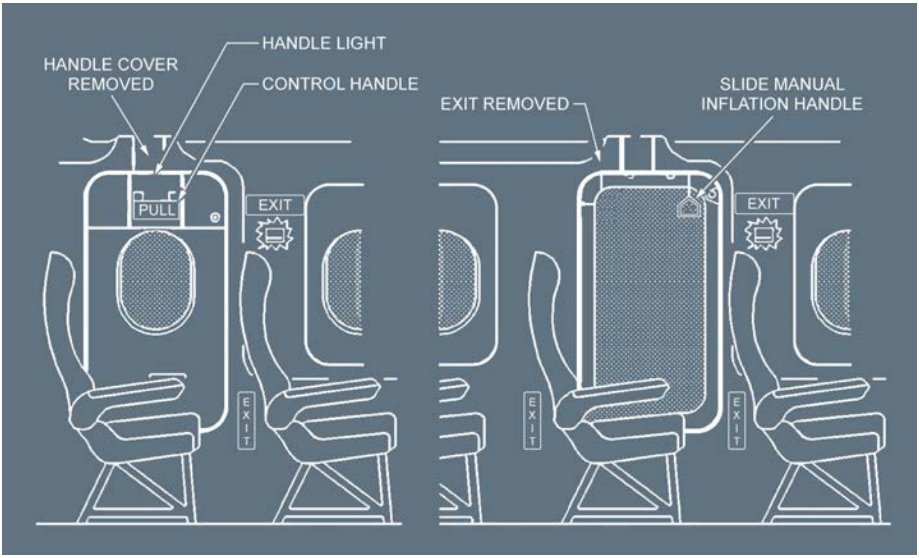


Emergency cockpit evacuation is also possible through the cockpit door escape panel ⩤ . This panel is designed to be pushed open in the direction of the cabin after removal of the quick-release pins.

CABIN

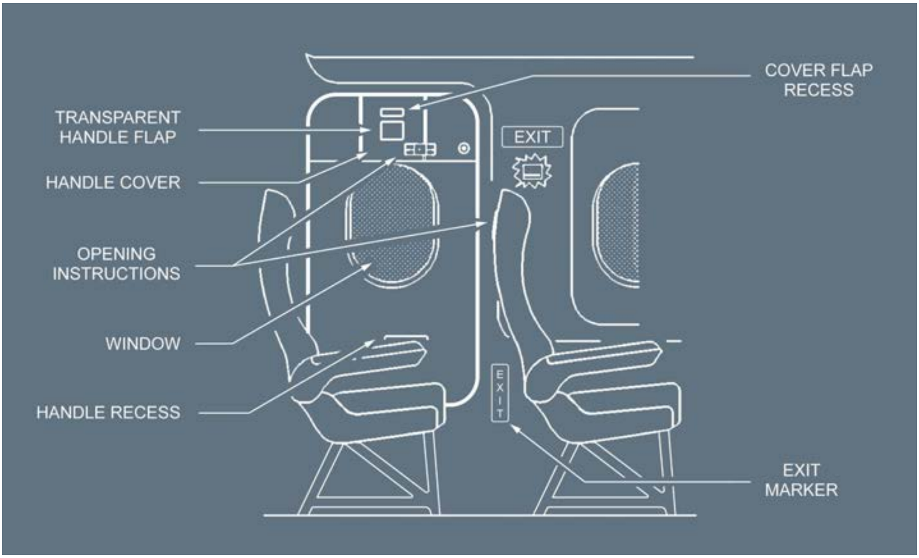
Ident.: DSC-52-10-30-00017568.0002001 / 20 MAR 17
Applicable to: ALL

One emergency exits is located on each side of the cabin, in addition to the passenger doors. The emergency exit is also equipped with an escape slide. In the case of an emergency, the exit opens inwards.



The slide of the overwing emergency exits is always in armed configuration.

To open:
- Remove HANDLE COVER : The HANDLE LIGHT and SLIDE ARMED indicator illuminate
- Pull CONTROL HANDLE : The EXIT moves inwards
- Lift EXIT from frame by holding the HANDLE RECESS
- Throw EXIT out.


COVER FLAP RECESS
TRANSPARENT HANDLE FLAP
HANDLE COVER
OPENING INSTRUCTIONS
WINDOW
HANDLE RECESS
EXIT
EXIT
EXIT MARKER

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GENERAL

Ident.: DSC-52-10-40-00017569.0001001 / 21 MAR 16
Applicable to: ALL

The aircraft has two cargo doors (FWD and AFT cargo doors) on the right side of the fuselage below the cabin floor.

FWD AND AFT CARGO DOORS

Ident.: DSC-52-10-40-00017570.0001001 / 21 MAR 16
Applicable to: ALL

The FWD and AFT cargo doors hydraulically open outward and upward. The doors are hydraulically operated by the yellow hydraulic system. The door locking system (locked open/locked closed) is mechanical.
If the electric pump of the yellow hydraulic system fails, the system can be powered by using a hand pump, located on the hydraulic maintenance panel.
The FWD and AFT cargo doors open only from outside.

Note: *When the electric pump operates the FWD or AFT cargo door, the remaining yellow system devices that operate are the brakes and the engine 2 thrust reverser.*

BULK CARGO DOOR ⋞

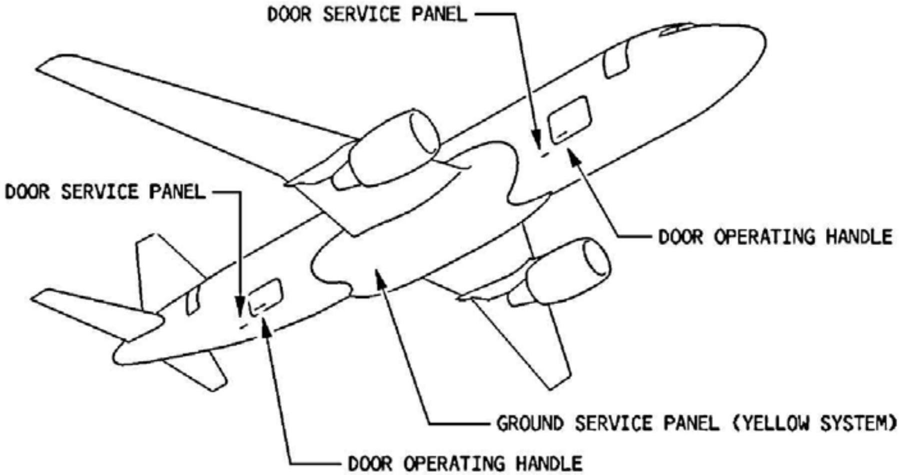
Ident.: DSC-52-10-40-00017571.0001001 / 21 MAR 16
Applicable to: ALL

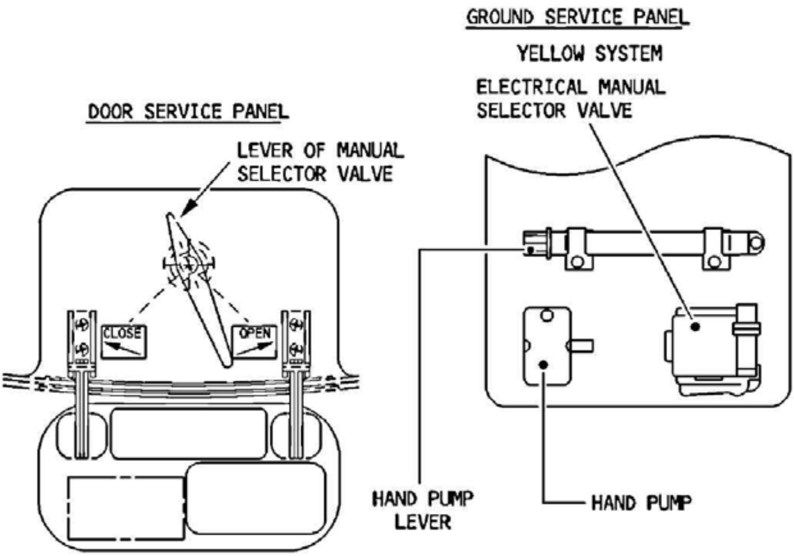
The bulk cargo door opens inward and upward. The bulk cargo door is a plug-type door. The door is mechanically locked and manually operated.
The bulk cargo door opens from the outside or from the inside.

LOCATION OF SERVICE PANELS

Ident.: DSC-52-10-40-00020676.0002001 / 17 MAR 17

Applicable to: ALL





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AVIONICS COMPARTMENT ACCESS DOOR

Ident.: DSC-52-10-50-00017579.0001001 / 21 MAR 16
Applicable to: ALL

Four avionics compartment access doors enable an external access to the avionics compartment.
The doors are manually operated, hinged doors. The doors open inwards.
These doors are in the lower fuselage, around the nose landing gear bay.

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COCKPIT DOOR

Ident.: DSC-52-10-60-00017573.0002001 / 21 MAR 17
Applicable to: ALL

Refer to DSC-52-40-10 Cockpit Door Description for information about the secured cockpit door.

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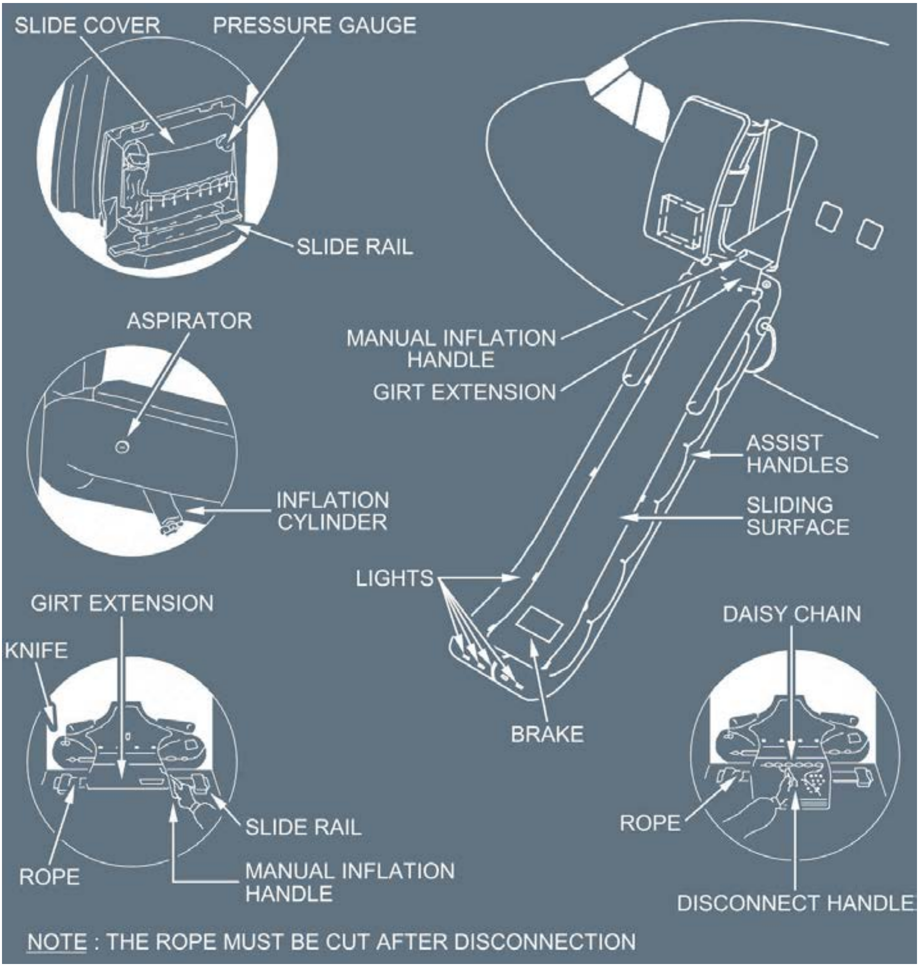
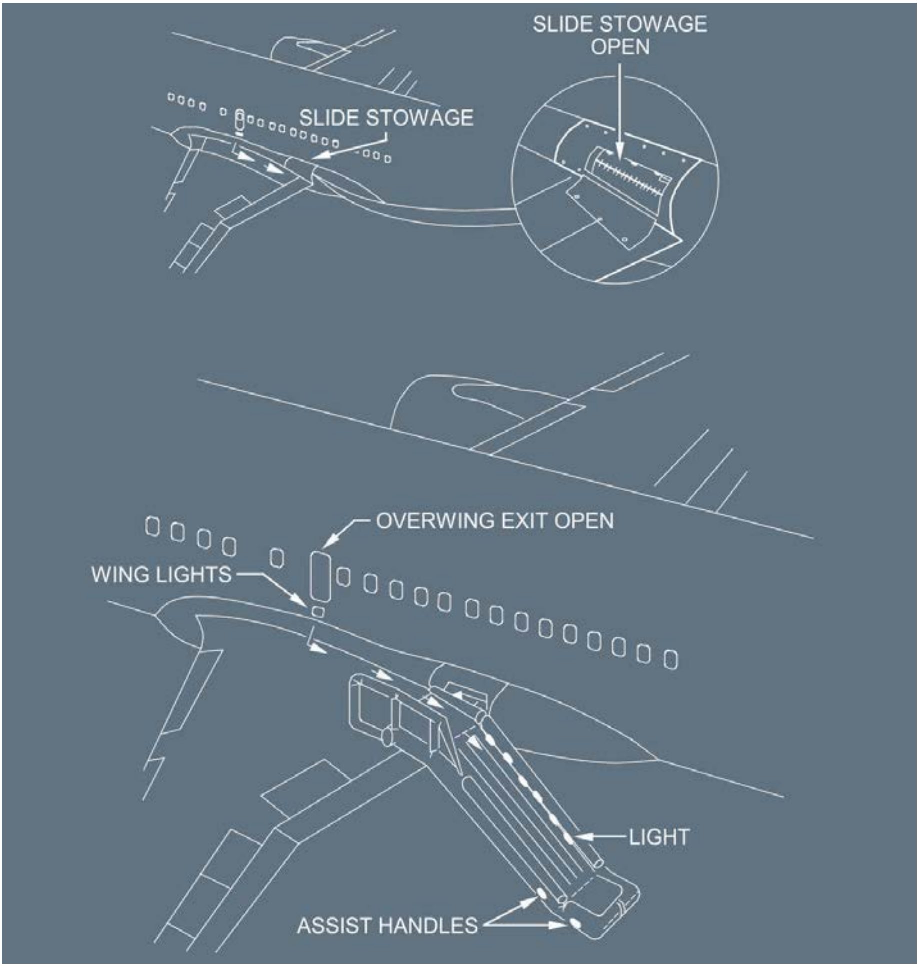
DOOR SLIDES

Ident.: DSC-52-10-80-00001555.0001001 / 09 OCT 12
Applicable to: ALL



WING SLIDES

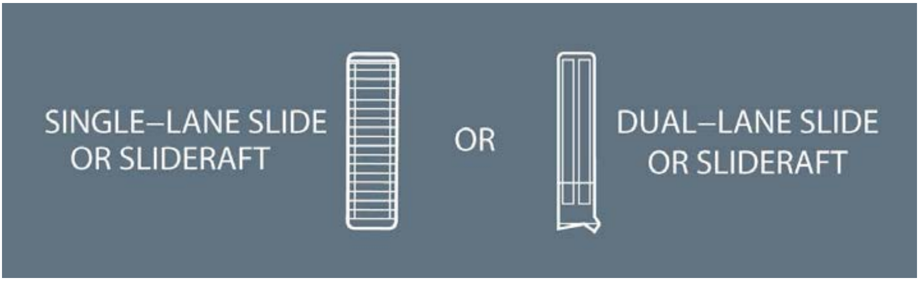
Ident.: DSC-52-10-80-00001556.0002001 / 09 OCT 12
Applicable to: ALL



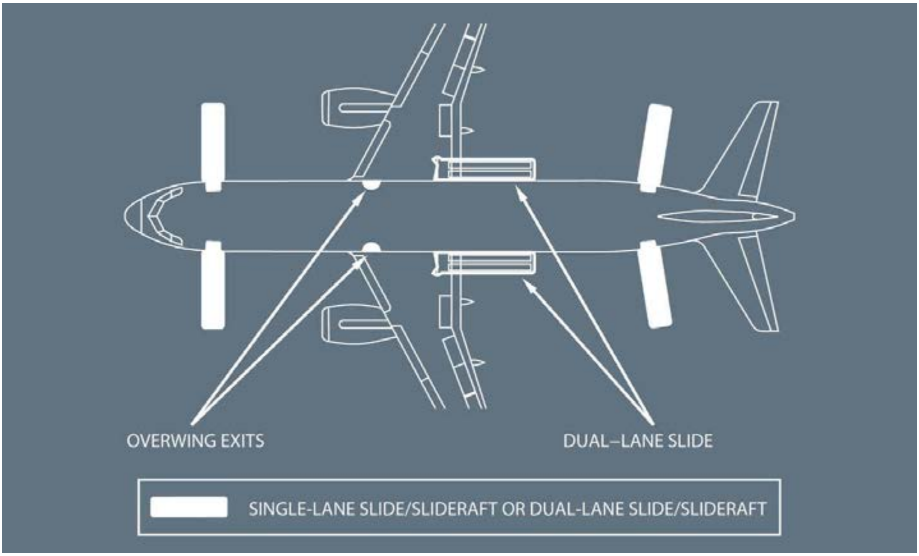
ESCAPE SLIDE ARRANGEMENT

Ident.: DSC-52-10-80-00017577.0003001 / 21 MAR 16
Applicable to: ALL

There are two types of emergency slides: a single-lane escape slide/slideraft or a dual-lane escape slide/slideraft.



Each passenger door either has a single-lane escape slide/slideraft or a dual-lane escape slide/slideraft, and each emergency exit has a dual-lane escape slide.



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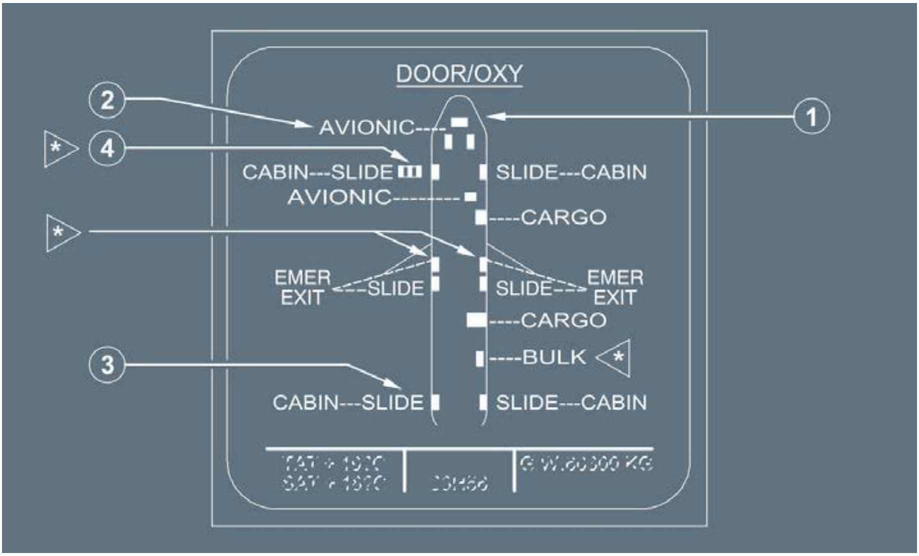
DOOR/OXY SD PAGE

Ident.: DSC-52-20-00017645.0001001 / 21 MAR 16
Applicable to: ALL



(1) Door symbol

Green ☐ : The door is closed and locked.

Amber ■ : The door is not locked.

(2) Door indication
This appears in amber, when the door is not locked.

(3) SLIDE indication
This appears in white, when the slide is armed.

(4) Stair symbol ⊲*
This appears in amber, when the stair door is not closed.

Note: For aircraft without FWD EMER EXIT ⊲ doors, the FWD EMER EXIT door symbols are always displayed in green.*

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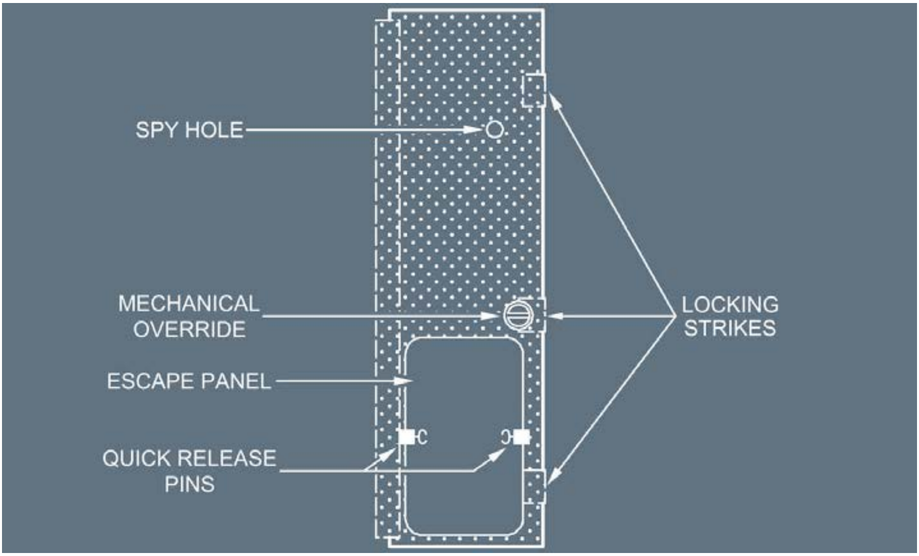
COCKPIT DOOR DESCRIPTION

Ident.: DSC-52-40-10-00017010.0001001 / 17 MAR 17
Applicable to: ALL

A forward-opening hinge door separates the cockpit from the passenger compartment. It has three electric locking strikes, controlled by the flight crew. In normal conditions, when the door is closed, they remain locked. When there is a request to enter the cockpit, the flight crew can authorize entry by unlocking the door, that remains closed until it is pushed open.
When the flight crew does not respond to requests for entry, the door can also be unlocked by the cabin crew, by entering a two to seven-digit code (programmed by the airline) on the keypad, installed on the lateral side of the Forward Attendant Panel (FAP).
The door is bulletproof and fully compliant with rapid decompression requirements.
A mechanical override enables the flight crew to open the door from the cockpit side.
A deadbolt is installed at the level of the center latch area of the cockpit door. This deadbolt bolts the door from the cockpit side, in the event that more than one locking latch strike fails, or in the case of a total CLS failure.



Note: 1. *The escape panel enables the flight crew to evacuate the cockpit, in case of an emergency, when the door is jammed. This panel can only be removed from the cockpit side by pulling the quick release pins towards the center of the flap and kicking the panel open.*
2. *In case of an electrical supply failure, the door is automatically unlocked, but remains closed.*

COCKPIT DOOR LOCKING SYSTEM (CDLS)

Ident.: DSC-52-40-20-00001007.0001001 / 21 MAR 17
Applicable to: ALL

The Cockpit Door Locking System (CDLS) provides a means of electrically locking and unlocking the cockpit door. This system is mainly composed of :
- A keypad, located in the forward cabin, near the cockpit door,
- A toggle switch, located in the center pedestal's Cockpit Door panel,
- A control unit and its CKPT DOOR CONT normal panel, located on the overhead panel,
- A buzzer.

The keypad enables the cabin crew to request access to the cockpit. There are two different access request types : "Routine" and "Emergency" access request.
The toggle switch enables the flight crew to lock or unlock the cockpit door, following an access request, thereby allowing or denying the entry to the cockpit.

The cockpit door control unit is the system controller, in charge of :
- Locking or unlocking the door latches, upon flight crew action.
- Unlocking the door, in case of cockpit decompression (the door then opens towards the cockpit under differential pressure).
- Indicating system failures of electrical latches and pressure sensors.
- Activating the access request buzzer and turning on the keypad LEDs.

The buzzer sounds in the cockpit for 1 to 9 s to indicate that a routine access request has been made, or sounds continuously if an emergency access procedure has been initiated.

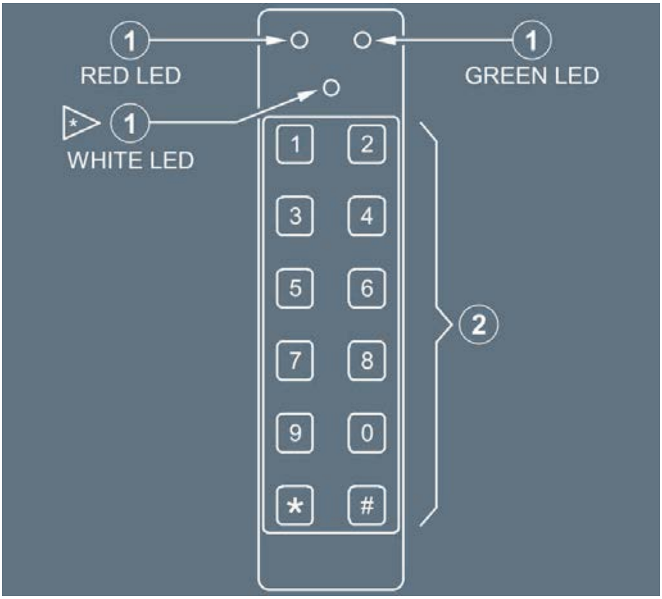
CONTROLS

Applicable to: ALL

Ident.: DSC-52-40-20-A-00001008.0001001 / 21 MAR 17

KEYPAD

The keypad is used by the cabin crew to request pilots to open the door.



(1) Locked/Unlocked Door Indicator

GREEN light ON	:	The door has been unlocked either by a flight crew action, or automatically (during 5 s) when no flight crew action is performed during the delay following an emergency access request. The door can be pushed open.
GREEN light flashes	:	An emergency request to enter the cockpit has been made; the buzzer will sound continuously in the cockpit, but no action has yet been taken by the flight crew.
RED light ON	:	The flight crew has denied access, and the door remains locked.
WHITE light ON	:	The light comes on each time the cabin crew presses a key on the keypad.

(2) Digital Keypad
The keypad is used to sound the buzzer in the cockpit for 1 to 9 s (3 s by default), by entering a zero to seven-digit code, as programmed by the airline, followed by the '#' key.
It is also used to enter the two to seven-digit emergency code, followed by the '#' key, when the flight crew does not respond.

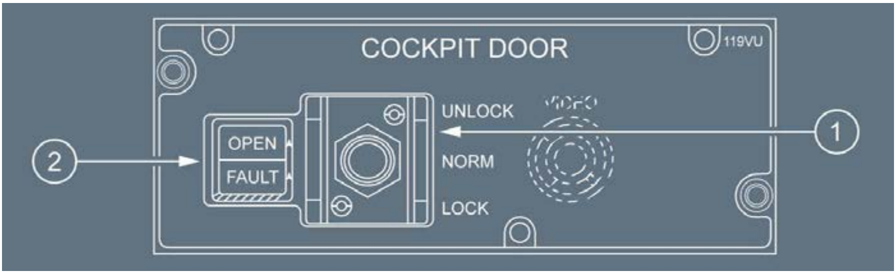
Note: *During the test performed by the cockpit door control unit, the CDLS keypad remains operational, and the CDLS operates as follows:*
The control unit will store access codes that are entered, and the LOCKED/UNLOCKED DOOR INDICATOR (RED/GREEN LEDs) of the keypad will remain on, as long as the test is running.

- *If the correct access code is entered on the keypad, the buzzer will not sound, until the test is completed.*
- *If the emergency access code is entered, the door will unlock. The cockpit buzzer and the LOCKED/UNLOCKED DOOR INDICATOR will be inoperative.*

Ident.: DSC-52-40-20-A-00018437.0001001 / 17 MAR 17

CENTRAL PEDESTAL COCKPIT DOOR PANEL

The secured cockpit door opening is controlled by a toggle switch, located on the central pedestal.



(1) COCKPIT DOOR toggle switch

UNLOCK position : This position is used to enable the cabin crewmember to open the door. The switch must be pulled and maintained in the unlock position until the door is pushed open.

NORM position : All latches are locked, and EMERGENCY access is possible for the cabin crew.

LOCK position : Once the button has been moved to this position, the door is locked ; emergency access, the buzzer, and the keypad are inhibited for a preselected time (5 to 20 min).

Note: *1. If the LOCK position has not been used by the pilot, for at least 5 to 20 min, the cabin crew is able to request emergency access to open the cockpit door.*
2. The UNLOCK position overrides and resets any previous selection.
3. In case of an electrical supply failure, the cockpit door is automatically unlocked, but remains closed.

(2) COCKPIT DOOR Fault Open indicator

OPEN light ON	:	The door is not closed.
OPEN light flashes	:	The cabin crew has started an emergency access procedure. If there is no reaction from the flight crew, the door will unlock at the end of the adjustable time delay (15 to 120 s).
FAULT	:	This light comes on when a system failure has been identified (Example : Latch, pressure sensors, control unit). The inoperative item can be identified by checking the strike and pressure sensor status lights on the CKPT DOOR CONT panel.

Ident.: DSC-52-40-20-A-00001010.0001001 / 09 OCT 12

OVERHEAD CONTROL PANEL

The Cockpit Door Locking System's control panel is located on the overhead panel.

(1) Strikes' status lights

Off : The corresponding (upper, mid, or lower) locking latch is operative.

On : The corresponding (upper, mid, or lower) locking latch is faulty.

(2) Pressure sensor

Two redundant differential pressure sensors enable rapid pressure variation in the cockpit to be detected, in order to command simultaneous opening of all latches when a defined pressure drop is detected.

(3) Pressure sensor status lights

Off : The corresponding (1 or 2) pressure sensor is operative.

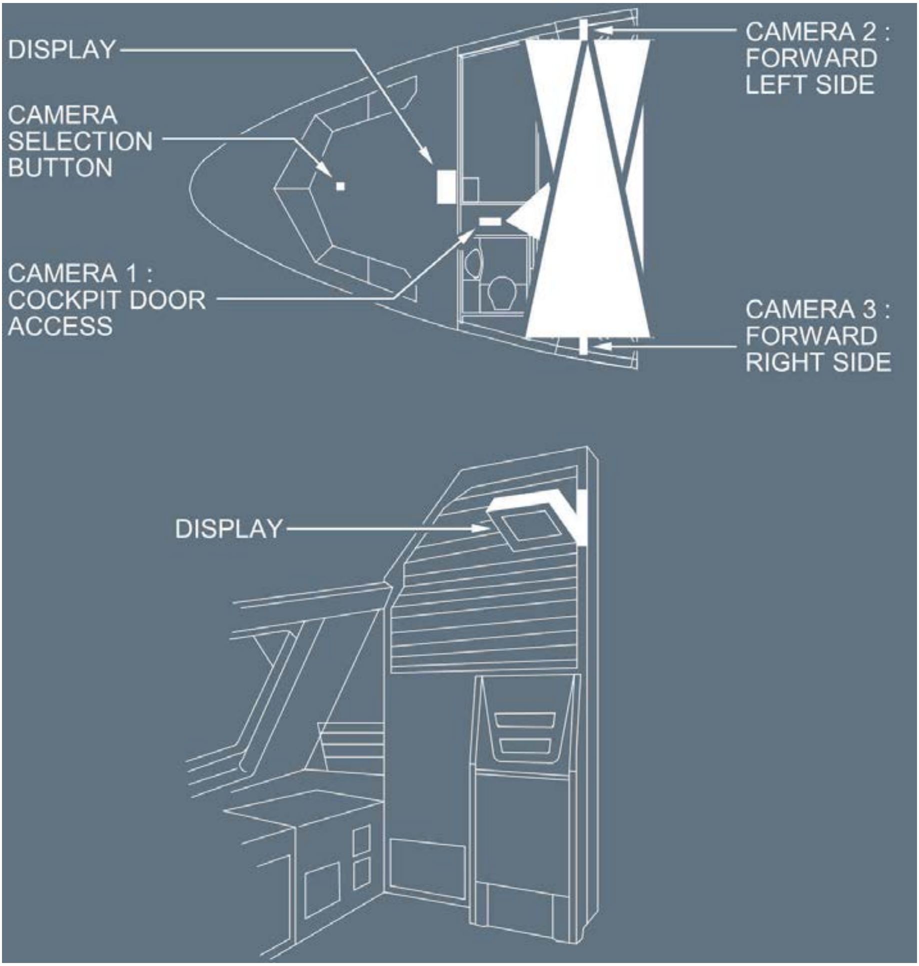
On : The corresponding (1 or 2) pressure sensor is faulty.

Note: These indicators enable the crew to identify the faulty item, when the Central Pedestal Fault indicator light is ON.

GENERAL

Ident.: DSC-52-40-30-00018415.0002001 / 17 MAR 17
Applicable to: ALL

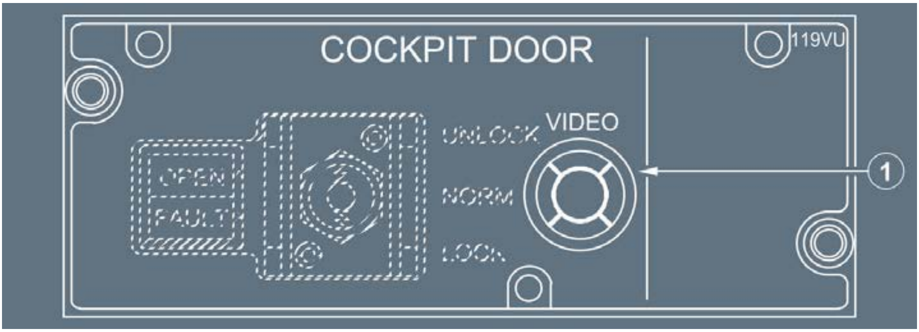
The Cockpit Door Surveillance system consists of three video cameras, which enable the flight crew to identify persons prior to authorizing their entry into the cockpit. An LCD display, located on the rear panel, shows the various camera views. It has automatic brightness adjustment and is activated by the Cockpit Door Video pb.


DISPLAY
CAMERA SELECTION BUTTON
CAMERA 1 : COCKPIT DOOR ACCESS
CAMERA 2 : FORWARD LEFT SIDE
CAMERA 3 : FORWARD RIGHT SIDE
DISPLAY

CONTROLS

Applicable to: ALL

Ident.: DSC-52-40-30-A-00018416.0004001 / 17 MAR 17



(1) Cockpit Door Video pb
Selects the various camera image displays.

Camera 1 image	:	Displayed by pressing the pushbutton when the screen is on standby, or after Camera 2 and 3 images have been displayed. Automatically displayed, after an entry request is performed on the keypad.
Camera 2 and 3 images	:	Displayed on a split screen, when the pushbutton is pressed after Camera 1's image has been displayed.
Standby	:	If the pushbutton is maintained pressed for at least two seconds, or if no action has been taken for 5 min, the screen goes blank and remains on standby.

Note: An entry request, performed on the keypad within 30 s following an earlier entry request, will not lead to the automatic selection of Camera 1, since the flight crew is given authority to select any desired camera image via the cockpit door video pb. After these 30 s, the system reverts to its normal operation.

Ident.: DSC-52-40-30-A-00018417.0001001 / 17 MAR 17

(1) Cockpit Door Video pb

OFF : The Cockpit Door Surveillance System is manually de-energized.

HOW TO OPERATE THE COCKPIT DOOR

Ident.: DSC-52-50-00020495.0001001 / 17 MAR 17
Applicable to: ALL

The secured cockpit door operation is controlled by a toggle sw that is located on the COCKPIT DOOR panel (central pedestal).

DOOR OPENING FROM THE COCKPIT

To enable access to the cockpit, set and maintain the COCKPIT DOOR sw to the UNLOCK position until the door is fully opened. When the door is fully opened, the COCKPIT DOOR sw can be released to the NORM position.

DOOR CLOSING FROM THE COCKPIT

Close the door and check that the OPEN indicator goes off. If the COCKPIT DOOR sw is in the NORM position, the door is locked and emergency access is possible from the cabin. When the door is fully closed, if the cockpit door FAULT light is ON, *Refer to PRO-ABN-DOOR [QRH] COCKPIT DOOR FAULT*.

Note: *If the OPEN indicator is ON when the door is closed, the door may be unlocked. Repeat the above-mentioned opening/closing procedure.*

When the COCKPIT DOOR sw is in the LOCK position the door is locked. In this position, the emergency access, the buzzer, and the keypad are inhibited for a preselected time (5 to 20 min).

ROUTINE ACCESS TO THE COCKPIT FROM THE CABIN (I.E. NORMAL ACCESS)

To request access to the cockpit from the cabin, use the keypad to enter the code and validate with the “#” key.
L2 The Operator defines this code (between 0 and 7 digits).
L1 The buzzer sounds in the cockpit for 1 to 9 s (3 s by default).
After identification of the person (using the Cockpit Door Surveillance System ⊲) that requests access, set the COCKPIT DOOR sw to UNLOCK position to unlock the door. A steady green light on the keypad comes on, that indicates that the door is unlocked.
If the flight crew refuses access to the cockpit by setting the COCKPIT DOOR sw to LOCK position, a steady red light on the keypad comes on, that indicates that the door is locked. The keypad and the buzzer are inhibited for a defined period of time.
If the flight crew does not respond, the door remains locked. If the flight crew does not take any action after a routine cabin request, the cabin crew will be able to open the door with the emergency access procedure.

EMERGENCY ACCESS FROM CABIN TO THE COCKPIT

To request emergency access to the cockpit, use the keypad to enter the emergency code and validate with the “#” key.

L2 The Operator defines this emergency code (between 2 and 7 digits).

L1 The buzzer continuously sounds in the cockpit and the OPEN light flashes on the COCKPIT DOOR panel (central pedestal). In the cabin, the green light on the keypad flashes until the flight crew uses the COCKPIT DOOR sw to either lock or unlock the cockpit door.
After identification of the person (via the Cockpit Door Surveillance system) that requests access, use the COCKPIT DOOR sw to unlock the door.
If the flight crew refuses access by setting the COCKPIT DOOR sw to LOCK position, the keypad and the buzzer are inhibited for a defined period of time.
If the flight crew does not respond, after a preselected time between 15 and 120 s, the door automatically unlocks for 5 s and a steady green light on the keypad comes. The buzzer stops and indicates that the door is unlocked.

EVACUATION THROUGH THE DECOMPRESSION AND EVACUATION PANEL

Pull the quick-release pins of the escape panel towards the center of the flap.
Kick the escape panel toward the cabin and evacuate the cockpit.

HOW TO OPERATE THE FWD AND AFT CARGO DOOR

Ident.: DSC-52-50-00020574.0003001 / 17 MAR 17
Applicable to: ALL

NORMAL OPERATION

OPENING

On the cargo door, push the door handle flap inward to release the door handle from the recess of the door structure. Then, pull the door handle away and upward from the LOCKED to the UNLOCKED position.
Open the access door of the service panel to get access to the selector valve lever. Set the selector valve lever to the OPEN position and maintain the lever in this position until the green indicator light comes on. The green indicator light indicates that the door is fully opened and locked.

Note: *The yellow hydraulic system is pressurized (the YELLOW ELEC PUMP is energized). The operation of the flight controls and PTU is inhibited.*

When the door is fully open, release the selector valve lever. When released, the selector valve lever returns to the neutral position and shuts down the electrical pump.

CLOSING

In order to close the cargo door, set the selector valve lever to the CLOSE position and maintain the lever in this position until the green indicator light goes off. When this light goes off, it means that the door is fully closed and locked.

Note: At first the selector valve lever locks in an intermediate position maintaining a preset pressurization to prevent the door from dropping open.

When the door is fully closed, the selector valve lever returns to the neutral position and shuts down the electrical pump.
On the cargo door, push the door handle flap downwards to the LOCKED position. When the door is locked, the cargo door symbol appears in green on the DOOR/OXY SD page. The CARGO door indication on the ECAM goes off, and the handle flap mechanism locks the operating handle.
Close the access door of the service panel.

HOW TO OPERATE THE FWD AND AFT CARGO DOORS (AUXILIARY OPERATION)

Ident.: DSC-52-50-00020577.0002001 / 17 MAR 17
Applicable to: ALL

AUXILIARY OPERATION

If there is an electrical failure or if the yellow hydraulic electric pump fails, the operator can open or close the cargo door with the use of the hand pump that is accessible via the ground service panel.

Note: Two persons are necessary for this operation.

MANUAL OPENING

To open the cargo door with the use of the hand pump, unlock the cargo door by using the operating handle as for normal operation.
Open the ground service panel of the yellow hydraulic system that is in the belly fairing area.
Open the access door of the door service panel. Set the selector valve lever to the OPEN position and maintain the lever in this position during the operation of the hand pump.
Operate the hand pump until the cargo door is in the fully open position. The green light comes on and indicates that the door is fully opened and locked.
When the cargo door is fully opened, release the selector valve lever of the door service panel.

MANUAL CLOSING

To close the cargo door, set the selector valve lever (on the door service panel) to the CLOSE position and maintain the lever in this position during the operation of the hand pump.
Operate the hand pump until the cargo door is in the fully closed position.
When the cargo door is fully closed, release the selector valve lever of the door service panel.
Lock the cargo door with the use of the operating handle as for normal operation.
Close the access door of the door service panel and of the ground service panel.

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AIRCRAFT SYSTEMS

COCKPIT WINDOWS

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Intentionally left blank

GENERAL

Ident.: DSC-56-10-00000998.0001001 / 17 MAR 17
Applicable to: ALL

The cockpit has fixed and sliding windows.

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FIXED WINDOWS

Ident.: DSC-56-20-00000999.0001001 / 17 MAR 17
Applicable to: ALL

There are four fixed windows :
- two windshields
- two fixed side windows

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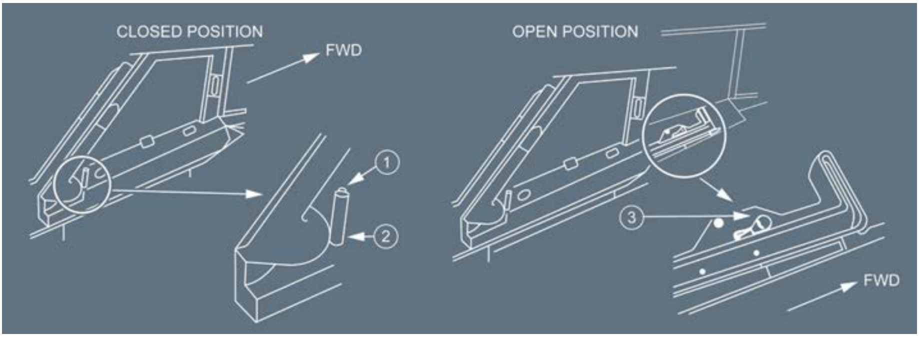
SLIDING WINDOWS

Ident.: DSC-56-30-00018432.0001001 / 17 MAR 17
Applicable to: ALL

The flight crew can use the sliding windows as emergency exits. Therefore they are not permitted to stow any object so that it protrudes into the window area from the side console. Members of the flight crew can use the control handle to slide each of the windows rearward, and can use a locking pin to lock each window open.



(1) Unlocking button
Flight crew presses this button to unlock the control handle.

(2) Control handle

- To open the window, the crew member pulls inward and rearward.
- To close the window, the crew member pushes forward.

(3) Locking pin
This pin locks the window open.
It is near the window's lower guide track and is visible when the window is open.

- Forward
  Between the closed position and the one-third open position, the window is free to move forward and aft.
  When the window is more than one-third open, this pin prevents it from moving forward.
- Aft
  Flight crew must move the locking pin aft in order to close the window. Left sliding window.

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DESCRIPTION

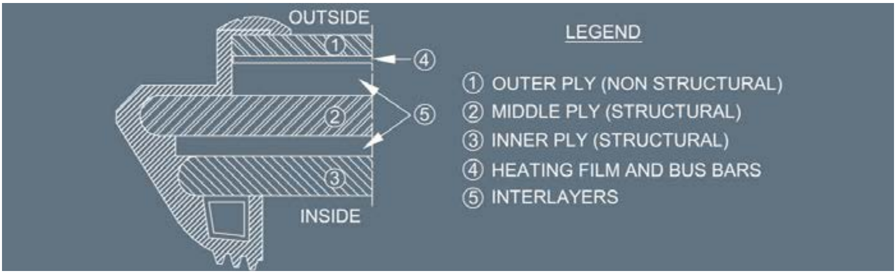
Ident.: DSC-56-40-00013772.0001001 / 17 MAR 17
Applicable to: ALL

COCKPIT WINDSHIELD AND WINDOWS DESCRIPTION

All cockpit windows are fail-safe design.
The windows are made of:

- A non structural ply, the Outer ply (1), which is only a protective layer
- Two structural plies, the Middle ply (2) and the Inner ply (3)
  Each structural ply is able to sustain individually the pressurization loads
- A heating film (4) to defog and/or de-ice the windshield/window
- Two interlayers (5).

Typical Structure Of A Cockpit Window (Cut View)



For information on cockpit window damage procedure, description and evaluation method, *Refer to FCTM/PR-AEP-MISC Cockpit Windshield/Window Cracked*.

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AIRCRAFT SYSTEMS

ENGINES

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DSC-70-05 Overview

DSC-70-10 System Description

DSC-70-20 FADEC

DSC-70-30 Thrust Control System (CFM+PW)

DSC-70-30-10 General

DSC-70-30-20 Thrust Levers

DSC-70-30-30 Thrust Rating Limit

DSC-70-30-40 Thrust Control

DSC-70-40 Fuel System (CFM56)

DSC-70-50 Oil System

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OVERVIEW

Applicable to: ALL

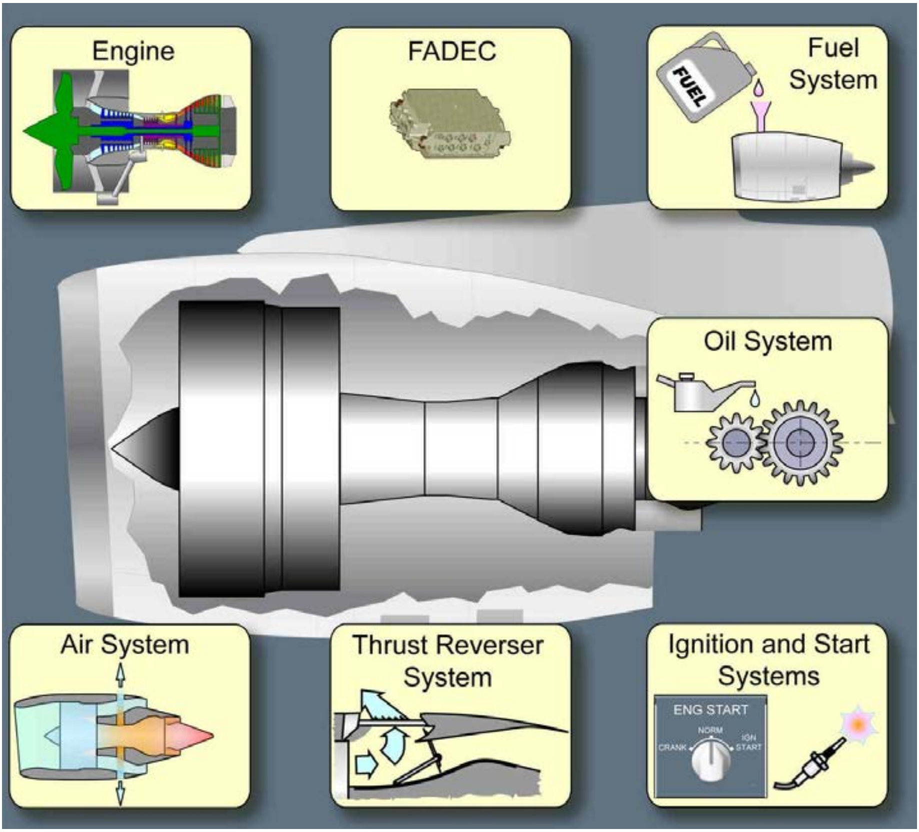
Ident.: DSC-70-05-10-00018242.0002001 / 21 MAR 16

The aircraft has two CFM International CFM56-5B engines that supply power to the aircraft.

Ident.: DSC-70-05-10-00018265.0001001 / 21 MAR 16

The engines are turbofan engines that have:
- A high bypass ratio,
- A Full Authority Digital Engine Control (FADEC),
- A fuel system,
- An oil system,
- An air system,
- A thrust reverser system,
- An ignition system and a start system.

Overview


Engine
FADEC
Fuel System
FUEL
Oil System
Air System
Thrust Reverser System
Ignition and Start Systems
ENG START
NORM
CRANK
IGN START

ENGINE

Ident.: DSC-70-10-00018361.0001001 / 21 MAR 16
Applicable to: ALL

The engine has:
- Two compressor turbine assemblies:
  - The Low Pressure (LP) compressor turbine assembly,
  - The High Pressure (HP) compressor turbine assembly.

L2 Each turbine operates its associated compressor via a shaft.

L1
- One accessory gearbox,
- One combustion chamber.

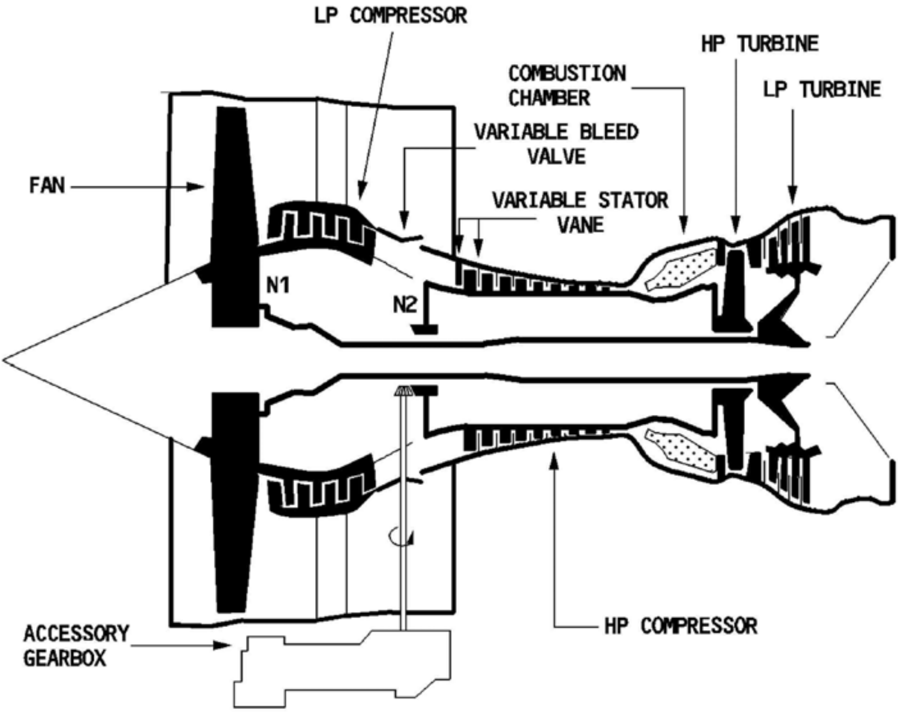
The engine operates as follows:
1. The LP compressor, compresses the air.
2. Then, the air is divided into two flows:
   - Most of the air flows out of the core engine, and provides most of the engine thrust.
   - The remaining air enters the core engine.
3. The HP compressor compresses the air that enters the core engine.
4. The fuel is added to and mixed with the compressed air of the core engine. The mixture is ignited in the combustion chamber.
5. The gas that results from combustion drives the HP and the LP turbines.

The rotation speed of the fan provides the N1 engine parameter.
The rotation speed of the HP rotor provides the N2 engine parameter.
The N1 and N2 engine parameters appear on the Engine/Warning Display (E/WD).
L2 The N1 and N2 engine parameters are current rotation speeds displayed in percentage.

L1 The FADEC uses:
- The N1 engine parameter to compute the applicable engine thrust,
- The N1 and N2 engine parameters for engine control and monitoring.

ENGINE

Ident.: DSC-70-10-00018362.0002001 / 21 MAR 16
Applicable to: ALL



LP COMPRESSOR TURBINE ASSEMBLY

Ident.: DSC-70-10-00018289.0002001 / 21 MAR 16
Applicable to: ALL

LP COMPRESSOR TURBINE ASSEMBLY

The LP compressor turbine assembly has:
- One LP compressor,
- L2 One LP shaft,
- L1 One LP turbine.

L2 The LP shaft connects the LP compressor to the LP turbine.

L3 The LP compressor has a fan and 4 stages, and the LP turbine has 4 stages.

HP COMPRESSOR TURBINE ASSEMBLY

Ident.: DSC-70-10-00018290.0001001 / 21 MAR 16
Applicable to: ALL

HP COMPRESSOR TURBINE ASSEMBLY

The HP compressor turbine assembly has:
- One HP compressor,
- L2 One HP shaft,
- L1 One HP turbine.

L2 The HP shaft connects the HP compressor to the HP turbine.
L3 The HP compressor has 9 stages, and the HP turbine has a single stage.

COMBUSTION CHAMBER

Ident.: DSC-70-10-00018292.0001001 / 21 MAR 16
Applicable to: ALL

COMBUSTION CHAMBER

The combustion chamber burns a mixture of fuel and HP air. The FADEC controls the fuel/air mixture in accordance with the position of the thrust lever and the aircraft operating conditions.
L3 The combustion chamber is an annular assembly with fuel nozzles and two igniters.
The combustion chamber is between the HP compressor and the HP turbine.

ACCESSORY GEARBOX

Ident.: DSC-70-10-00018364.0001001 / 21 MAR 16
Applicable to: ALL

ACCESSORY GEARBOX

The accessory gearbox drives various accessories with mechanical power via the HP shaft for the operation of the engine and the aircraft systems.

L2 The accessory gearbox of each engine operates:
- The oil feed pump that provides the oil system with oil.
- The main engine fuel pump that provides the combustion chamber with fuel.
- The engine-driven hydraulic pumps that pressurize the GREEN and the YELLOW hydraulic systems.
- The engine-driven generators that are the primary source of electrical power.

- The FADEC alternator that provides the FADEC with electrical power.
- The pneumatic starter that enables the engine start.

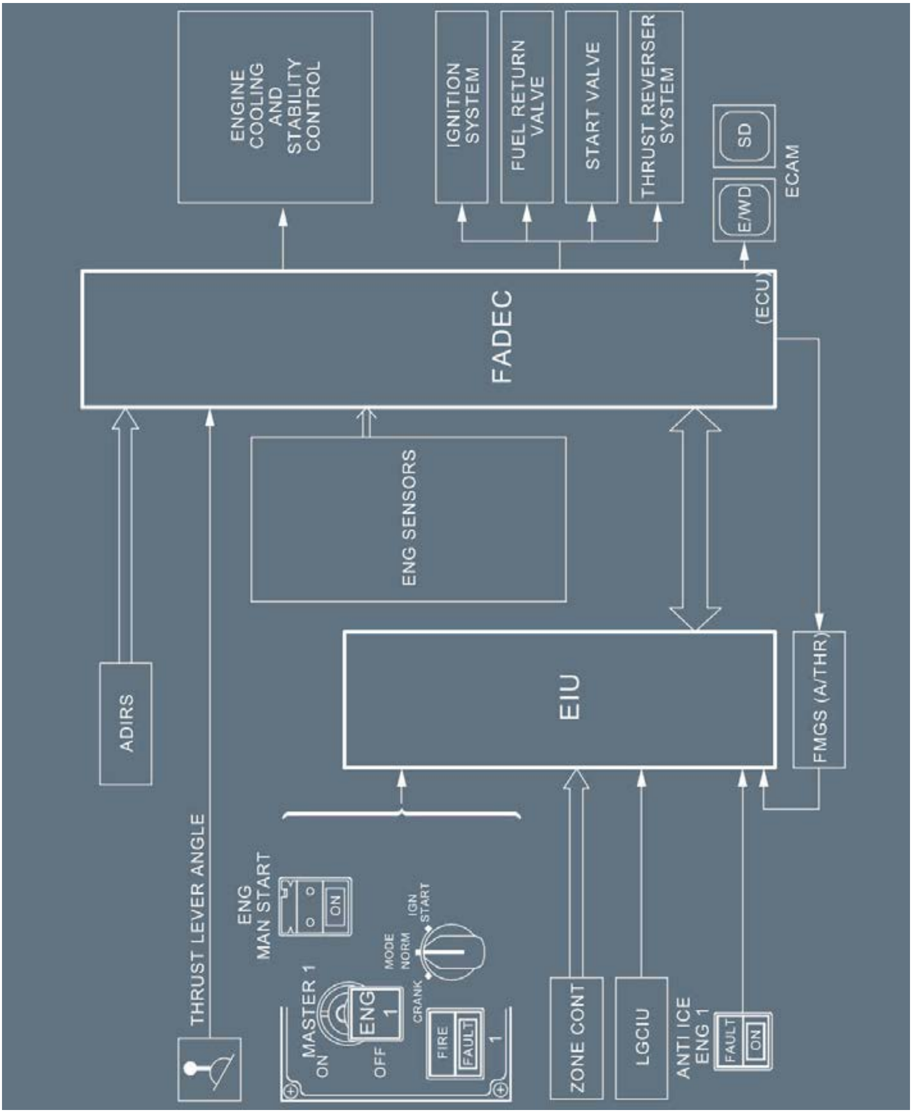
GENERAL

Ident.: DSC-70-20-00020869.0001001 / 17 MAR 17
Applicable to: ALL

Each powerplant has a FADEC (Full Authority Digital Engine Control) system.
FADEC is a digital control system that performs complete engine management.
FADEC has two-channel redundancy, with one channel active and one in standby.
If one channel fails, the other automatically takes control.
The system has a magnetic alternator for an internal power source.
FADEC is mounted on the fan case.
The Engine Interface Unit (EIU) transmits to FADEC the data it uses for engine management.

ARCHITECTURE

Ident.: DSC-70-20-00001566.0004001 / 21 MAR 16


ENGINE COOLING AND STABILITY CONTROL
IGNITION SYSTEM
FUEL RETURN VALVE
START VALVE
THRUST REVERSER SYSTEM
SD
E/WD
ECAM
FADEC
(ECU)
ENG SENSORS
EIU
ADIRS
FMGS (A/THR)
THRUST LEVER ANGLE
ENG MAN START
ON
MASTER 1
ENG 1
ON
OFF
CRANK
MODE
NORM
IGN START
FIRE
FAULT
1
ZONE CONT
LGCIU
ANTI ICE ENG 1
FAULT
ON

FUNCTIONS

Ident.: DSC-70-20-00001567.0001001 / 21 MAR 16
Applicable to: ALL

The FADEC system performs the following functions :

Control of gas generator
- control of fuel flow
- acceleration and deceleration schedules
- variable bleed valve and variable stator vane schedules
- control of turbine clearance
- idle setting

Protection against engine exceeding limits
- protection against N1 and N2 overspeed
- monitoring of EGT during engine start

Power management
- automatic control of engine thrust rating
- computation of thrust parameter limits
- manual management of power as a function of thrust lever position
- automatic management of power (A/THR demand).

Automatic engine starting sequence
- control of :
  - the start valve (ON/OFF)
  - the HP fuel valve
  - the fuel flow
  - the ignition (ON/OFF)
- monitoring of N1, N2, FF and EGT
- initiation of abort and recycle (on the ground only)

Manual engine starting sequence
- passive monitoring of engine
- control of :
  - the start valve
  - the HP fuel valve
  - the ignition

Thrust reverser control
- Actuation of the blocker doors
- Engine setting during reverser operation

Fuel recirculation control
- Recirculation of fuel to the fuel tanks, depending on the engine oil temperature, the fuel system configuration, and the flight phase.

Transmission of engine parameters and engine monitoring information to cockpit indicators

- Primary engine parameters
- Starting system status
- Thrust reverser system status
- FADEC system status

Detection, isolation, and recording of failures

FADEC cooling

IDLE CONTROL

Ident.: DSC-70-20-00015374.0001001 / 17 NOV 14
Applicable to: ALL

The FADEC has the following three idle modes :

Modulated idle

- Is regulated according to :
  - bleed system demand
  - ambient conditions
- Is selected :
  - In flight, when the flaps are retracted (FLAPS lever at zero position)
  - On ground, provided reverse is not selected.

Approach idle

- Is regulated according to aircraft altitude, regardless of bleed system demand.
- Is selected in flight, when the flaps are extended (FLAPS lever not at zero position)
- Allows the engine to accelerate rapidly from idle to go-around thrust.

Reverse idle

- Is selected on ground, when the thrust lever is in REV IDLE position.
- Is slightly higher than forward idle thrust.

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GENERAL

Ident.: DSC-70-30-10-00020872.0002001 / 17 MAR 17
Applicable to: ALL

A FADEC dedicated to each engine controls the thrust.
The pilot uses the thrust levers to set the thrust in manual mode, and the FMGS sets the thrust in automatic mode (A/THR function).
The FADEC prevents the thrust from exceeding the limit for the thrust lever position in both manual and automatic modes.

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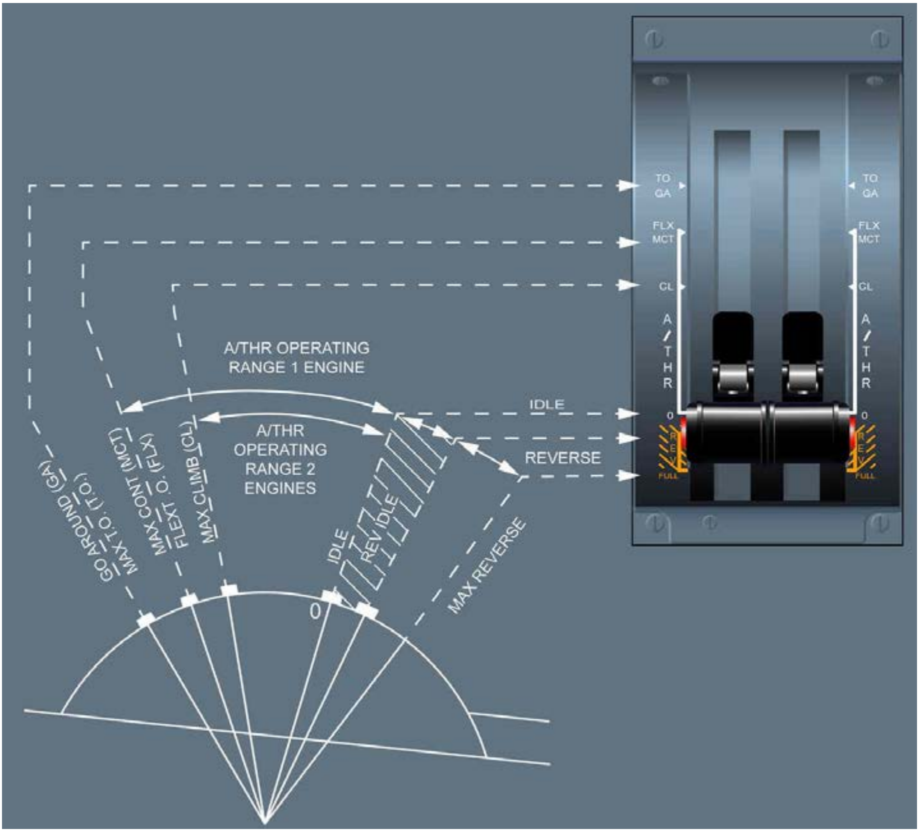
THRUST LEVERS

Ident.: DSC-70-30-20-00020873.0002001 / 17 MAR 17
Applicable to: ALL



The thrust levers can only be moved manually.
They move over a sector that is divided into four operating segments.
The sector has five positions defined by detents or stops.
Thrust lever position is transmitted to the FADEC , which computes and displays the thrust rating limit and the N1 for that Thrust Lever Angle (TLA).

Note: *There is no reverse idle detent. When the pilot moves the lever out of the idle stop by pulling up the reverse lever on the front of the thrust lever, he/she selects reverse idle.*

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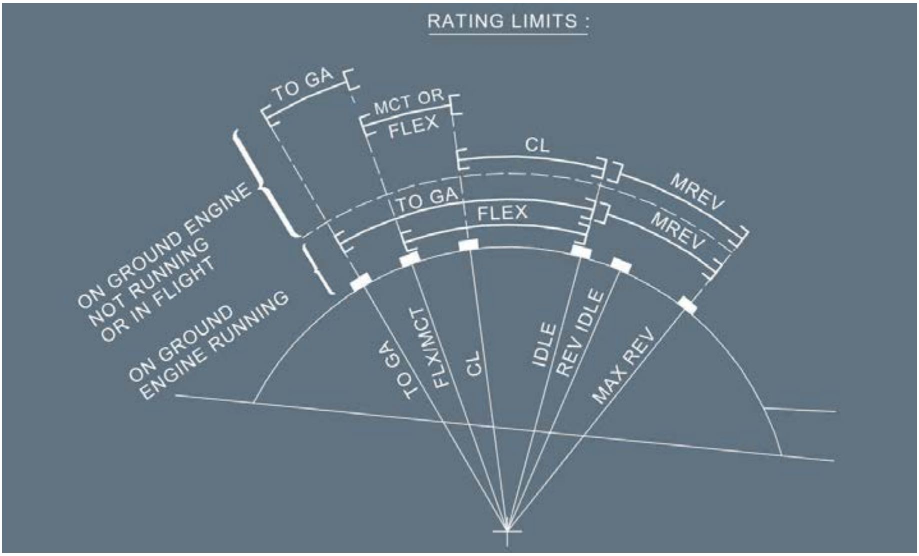
THRUST RATING LIMIT

Ident.: DSC-70-30-30-00001571.0001001 / 21 MAR 16
Applicable to: ALL

The FADEC computes the thrust rating limit for each thrust lever position, as shown below.
If the thrust lever is set in a detent, the FADEC selects the rating limit corresponding to this detent.
If the thrust lever is set between two detents, the FADEC selects the rating limit corresponding to the higher detent.



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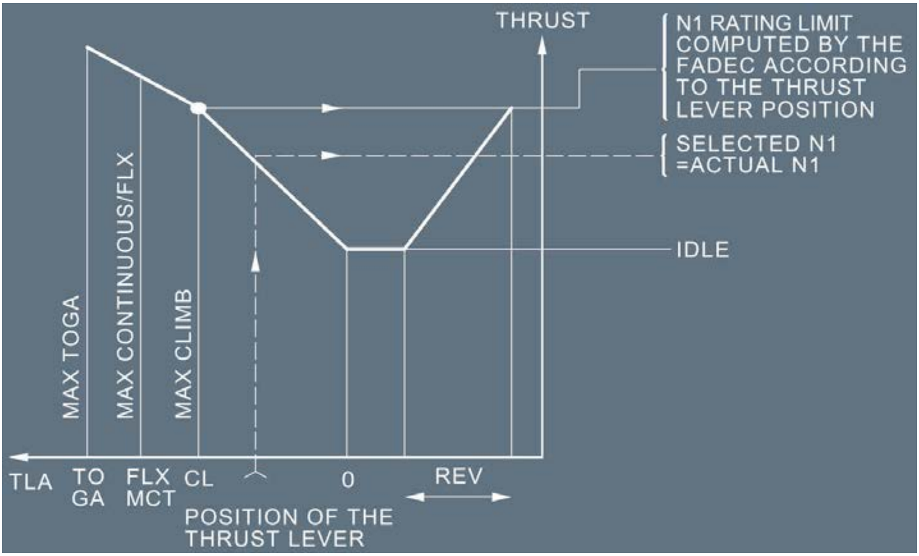
MANUAL MODE

Ident.: DSC-70-30-40-00001572.0001001 / 17 NOV 14
Applicable to: ALL

The engines are in the manual mode provided the A/THR function is:
- not armed or
- armed and not active (thrust lever not in the A/THR operating range and no alpha floor).

In these conditions, each engine is controlled by the position of its thrust lever.
The pilot controls thrust by moving the thrust lever between the IDLE and TOGA positions. Each position of the thrust lever within these limits corresponds to an N1.
When the thrust lever is in a detent, the corresponding N1 is equal to the N1 rating limit computed by the FADEC for that engine.



When the thrust lever is in the FLX/MCT detent:

- **On the ground**
  The engine runs at the flex takeoff thrust rating if the crew has selected a flex takeoff temperature on the MCDU that is higher than the current Total Air Temperature (TAT).
  Otherwise the engine produces Maximum Continuous Thrust (MCT).
- **After takeoff**
  The pilot can change from FLX to MCT by moving the thrust lever to TOGA or CL, then back to MCT. After that, he cannot use the FLX rating.

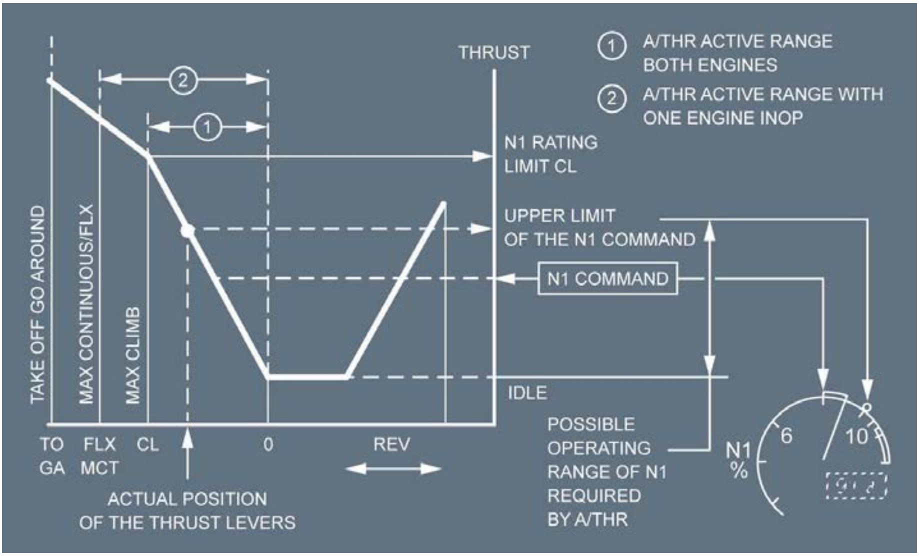
  Note: Setting the thrust lever out of FLX/MCT detent without reaching TOGA or CL detent has no effect.

The pilot can always get MAX TO thrust by setting the thrust levers to TOGA.

AUTOMATIC MODE

Ident.: DSC-70-30-40-00020874.0003001 / 17 MAR 17
Applicable to: ALL

In the autothrust mode (A/THR function active), the FMGC computes the thrust which is limited to the value corresponding to the thrust lever position (unless the alpha-floor mode is activated).



INDICATIONS ON FMA

The FADEC s monitor the positions of the thrust levers, and trigger appropriate indications on the FMA.*Refer to DSC-22_30-100 Autothrust Annunciations (FMA Column 1) - Third Line*.

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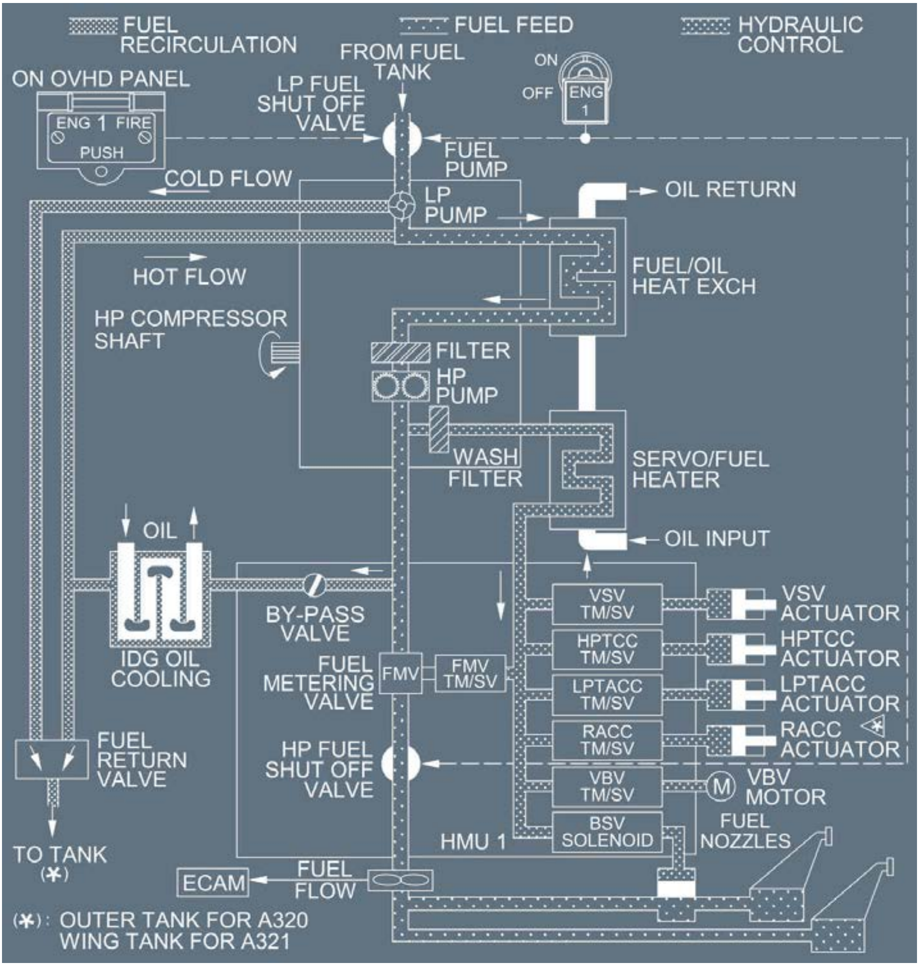
GENERAL

Ident.: DSC-70-40-00020868.0001001 / 17 MAR 17
Applicable to: ALL

The fuel system supplies fuel to the combustion chamber at the required flow rate, pressure, and temperature.
The fuel flows from the tank, via the fuel pump unit and the fuel/oil heat exchanger, to the Hydromechanical Unit (HMU) and to the fuel nozzles.



FUEL PUMP UNIT

Ident.: DSC-70-40-00001586.0001001 / 21 MAR 16
Applicable to: ALL

The HP compressor shaft drives the HP fuel pump assembly. Fuel flows through the LP pump, then through the fuel/oil heat exchanger and the HP pump (gear pump).

The fuel then divides into a filtered flow for the servo fuel heater and the servo valves of the HMU , and an unfiltered flow for the metering valve of the HMU.

SHUT-OFF VALVES

Ident.: DSC-70-40-00001587.0001001 / 12 MAY 16
Applicable to: ALL

Moving the ENG 1 (ENG 2) MASTER switch to OFF directly commands the closing of the LP and HP fuel shut off valves for that engine's fuel system.
It also closes the fuel return valve and opens the bypass valve.

HYDROMECHANICAL UNIT

Applicable to: ALL

Ident.: DSC-70-40-A-00001588.0001001 / 17 MAR 17

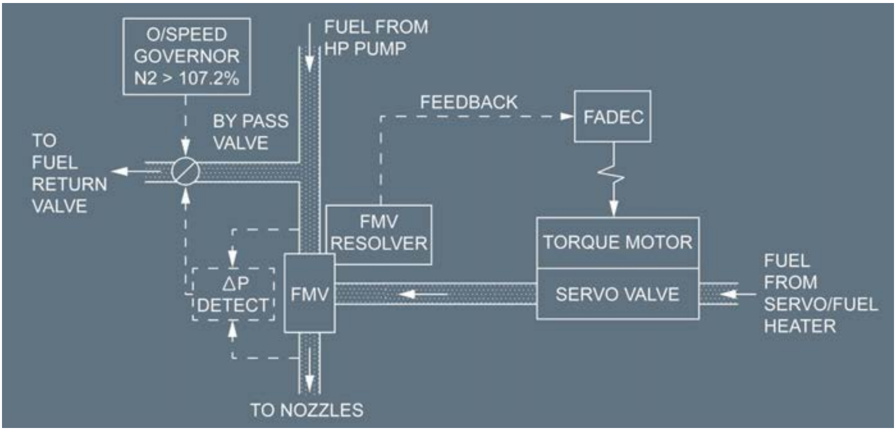
GENERAL

The FADEC controls the HMU, which :
- controls fuel flow to the engine combustion chamber
- controls fuel hydraulic signals to actuators
- protects against overspeeding.

Ident.: DSC-70-40-A-00020880.0001001 / 17 MAR 17

FUEL FLOW

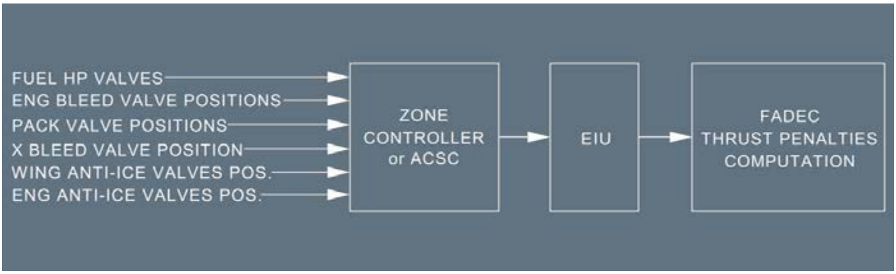
L3 The Fuel Metering Valve (FMV) transforms FADEC orders through a torque motor and servo valve into fuel flow to the engine fuel nozzles.
The FMV resolver generates a feedback signal proportional to the FMV position.
The bypass valve maintains a constant pressure drop across the FMV to ensure that the metered fuel flow is proportional to the FMV position.



L1 The FADEC computes the fuel flow that will maintain the target N1.

As the FADEC maintains this N1, it allows N2 to vary while remaining between N2 minimum and N2 maximum. The FADEC also controls the engine parameters to :
- Limit acceleration and deceleration ;
- Avoid engine stall or flameout ;
- Limit maximum N1 and N2 ;
- Maintain air bleed pressure requirement.

The FADEC computes an N2 correction according to the bleed configuration.



Ident.: DSC-70-40-A-00001590.0001001 / 17 MAR 17

OVERSPEED GOVERNOR SYSTEM

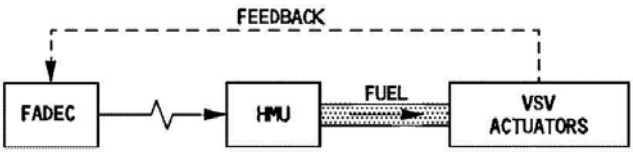
Independent of the FADEC, the overspeed governor limits the N2 by opening the fuel bypass valve, in the event of a malfunction that could lead to an overspeed condition.

Ident.: DSC-70-40-A-00001592.0002001 / 17 MAR 17

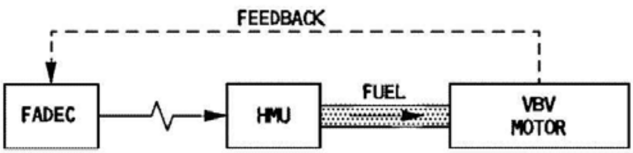
FUEL HYDRAULIC SIGNALS

L3 Fuel hydraulic signals go to :

- Low Pressure Turbine Clearance Control (LPTCC) valves
  (*Refer to DSC-70-60 General*)
- High Pressure Turbine Clearance Control (HPTCC) valves
  (*Refer to DSC-70-60 General*)
- Rotor Active Clearance Control (RACC) system
  (*Refer to DSC-70-60 General*)
- Variable Stator Vanes (VSV)
  The VSV system positions the compressor variable vanes.
  The FADEC maintains optimum compressor efficiency at a steady state and an adequate stall margin for transient engine operation.
  VSVs are fully closed during engine start and are fully open at high thrust.



- Variable Bleed Valves (VBV)
  The FADEC controls the VBV s, upstream of the HP compressor. Their setting depends on compressor inlet temperature and on N2. It varies between full open (start, low thrust, and during fast deceleration) and full closed (high thrust) positions.



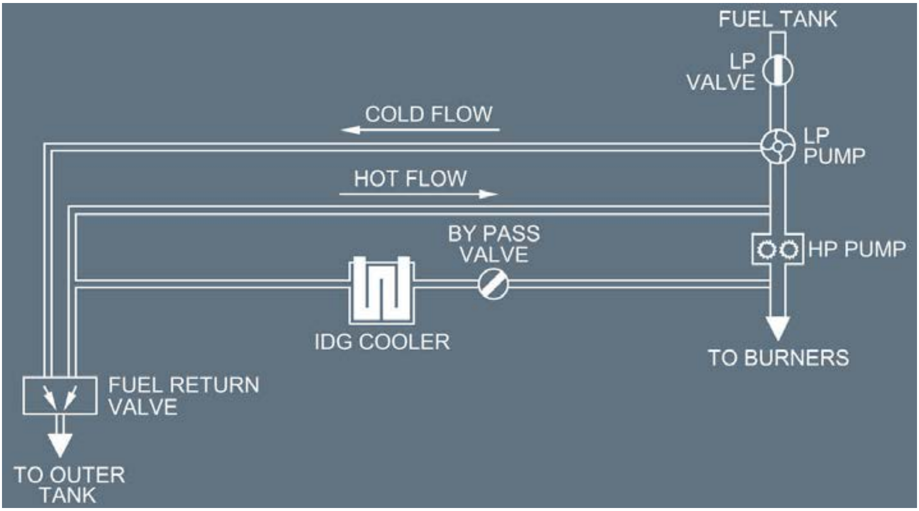
IDG COOLING SYSTEM

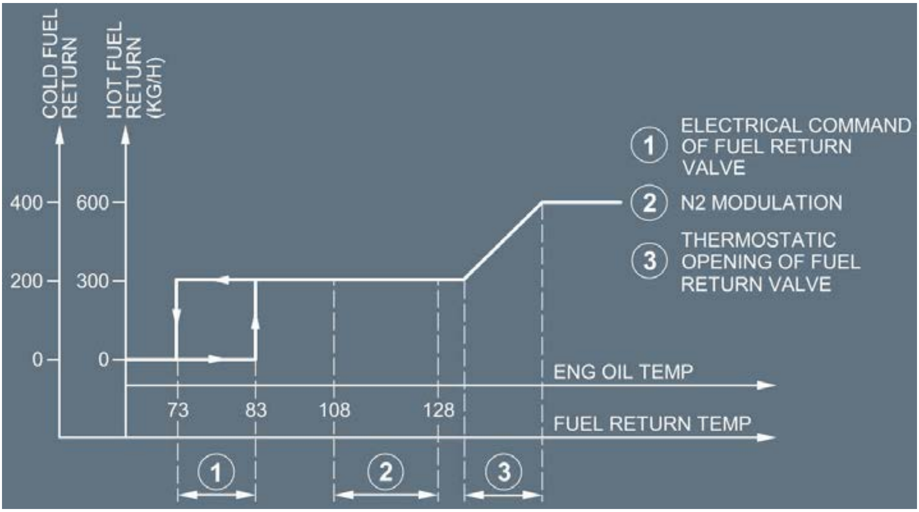
Ident.: DSC-70-40-00001593.0001001 / 26 JUL 12
Applicable to: ALL

Some of the fuel flowing out of the HMU goes to cool the oil systems of the Integrated Drive Generators (IDGs). It then returns to the fuel pump unit or to the tank.
The Fuel Return Valve (FRV), controlled by the FADEC, ensures that this flow is adequate.
L3 At low engine thrust, if the oil going into the IDG is too hot, the cooling fuel is sent back to the tank (300 kg/h).
If oil temperature continues to rise, the ECU increases the minimum N2.
If oil temperature still keeps rising, the FADEC increases the fuel flow to the tank (from 300 to 600 kg/h, depending on fuel return temperature).
The fuel return valve is always mixing hot fuel with cold fuel so that the temperature of fuel returning to the tank stays below 100 °C (from 200 to 400 kg/h, depending on fuel return temperature).

Fuel recirculation to the tank is inhibited (FRV closed) in the following cases :
- at engine shutdown
- during takeoff and climb
- if :
  - wing tank level is below about 300 kg (660 lb).
  - there is fuel overflow in the surge tank
  - fuel feed is by gravity only.
- when fuel temperature in the wing tank in flight is above 52.5 °C

<u>Note:</u> *On the ground, high fuel temperature in the wing tank or fuel overflow in the surge tank does not inhibit the fuel recirculation to the wing tank (FRV remains open).*


FUEL TANK
LP VALVE
COLD FLOW
LP PUMP
HOT FLOW
BY PASS VALVE
HP PUMP
IDG COOLER
TO BURNERS
FUEL RETURN VALVE
TO OUTER TANK


COLD FUEL RETURN
HOT FUEL RETURN (KG/H)
400
200
0
600
300
0
1 ELECTRICAL COMMAND OF FUEL RETURN VALVE
2 N2 MODULATION
3 THERMOSTATIC OPENING OF FUEL RETURN VALVE
ENG OIL TEMP
73
83
108
128
FUEL RETURN TEMP
1
2
3

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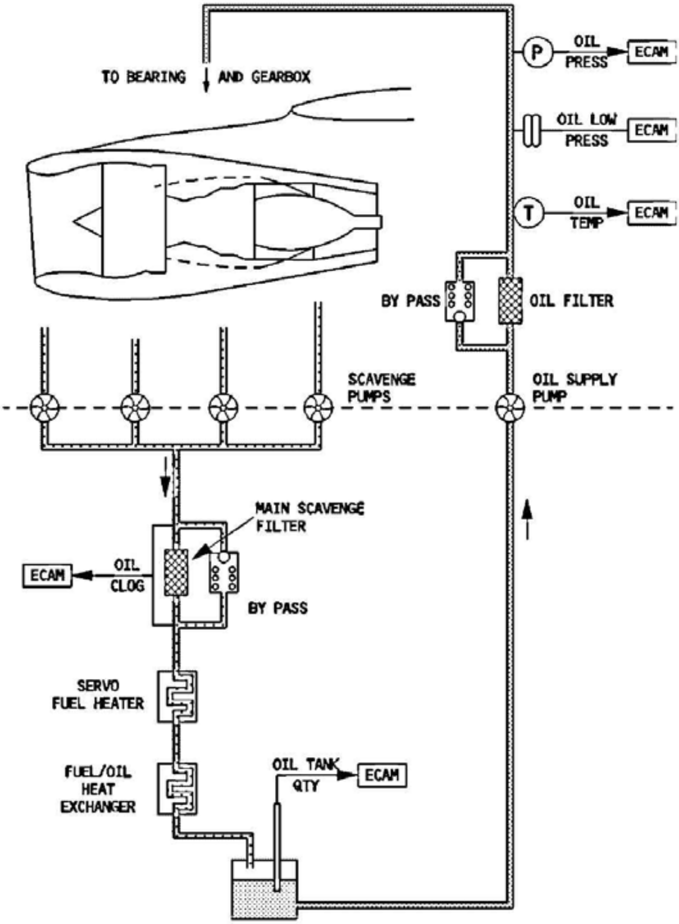
GENERAL

Ident.: DSC-70-50-00001603.0001001 / 21 MAR 16
Applicable to: ALL

The oil system lubricates the engine components.

It contains :
- the oil tank
- the lube and scavenge pump modules
- the fuel/oil heat exchanger
- the filters, chip detectors, pressure relief and bypass valves.

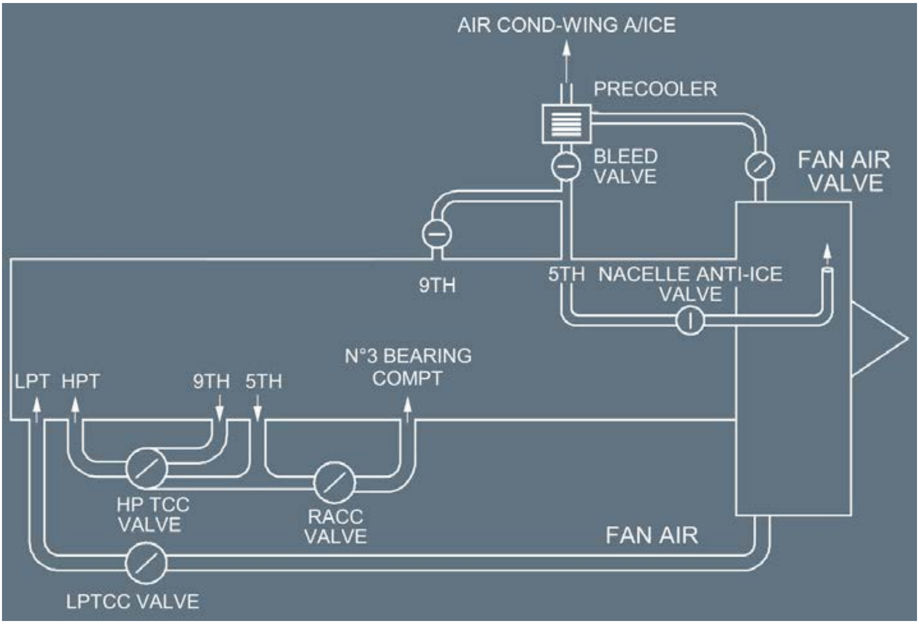

TO BEARING AND GEARBOX
OIL PRESS
ECAM
OIL LOW PRESS
ECAM
OIL TEMP
ECAM
BY PASS
OIL FILTER
SCAVENGE PUMPS
OIL SUPPLY PUMP
MAIN SCAVENGE FILTER
ECAM
OIL CLOG
BY PASS
SERVO FUEL HEATER
FUEL/OIL HEAT EXCHANGER
OIL TANK QTY
ECAM

GENERAL

Ident.: DSC-70-60-00001604.0002001 / 21 MAR 17
Applicable to: ALL

The air bleed system supplies the aircraft with compressed air.

It uses the air for:
- pneumatic system (*Refer to DSC-36-10-10 General*)
- cooling the engine compartment and the turbines.



COOLING

Ident.: DSC-70-60-00001605.0002001 / 21 MAR 16
Applicable to: ALL

ROTOR ACTIVE CLEARANCE CONTROL (RACC) SYSTEM

The FADEC controls the RACC system through the HMU . The RACC system controls the clearance between the rotor blades of the HP compressor and its stator case.
The RACC system uses fifth-stage compressor bleed air that has been modulated according to the N2 and the flight parameters. The bleed air goes to the N°3 bearing compartment, where it is mixed with fan boost discharge.

Clearances are at the maximum when the RACC valve is closed.

HP TURBINE CLEARANCE CONTROL (HPTCC) SYSTEM

The FADEC controls the HPTCC system through the HMU . The HPTCC system controls the HP turbine clearance by modulating the HP compressor bleed air flow for cooling the HP turbine case. It optimizes HP turbine performance and reduces exhaust gas temperature.

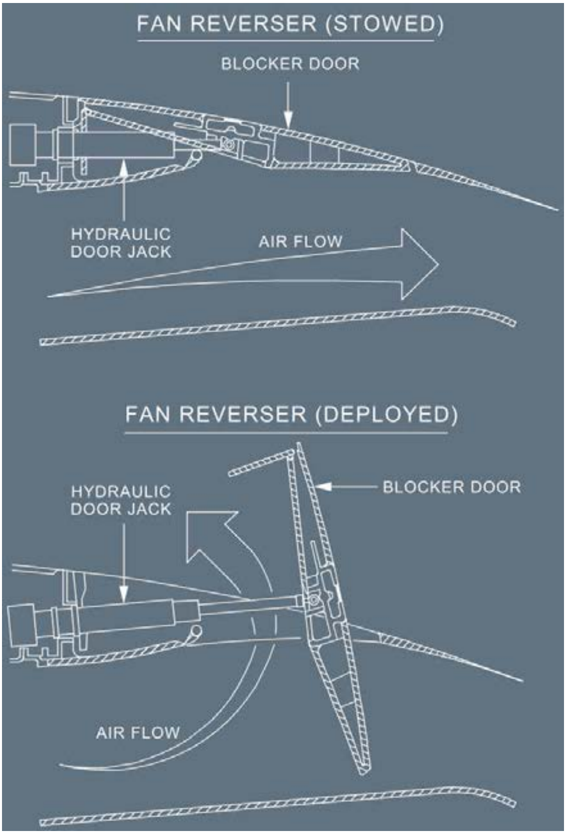
LP TURBINE CLEARANCE CONTROL (LPTCC) SYSTEM

The FADEC controls the LPTCC system through the HMU . The LPTCC system controls LP turbine clearance by modulating the fan bleed air flow for cooling the LP turbine case.

GENERAL

Ident.: DSC-70-70-00020918.0003001 / 17 MAR 17
Applicable to: ALL

The aircraft reverses engine thrust by using four pivoting blocker doors on each engine to deflect the fan airstream.



A hydraulic door jack positions each door.
- The green circuit powers the doors on ENG 1.
- The yellow circuit powers the doors en ENG 2.

The FADEC controls the thrust reverser system. Each FADEC channel performs control and monitoring functions. The systems for the two engines are independent of each other.

The thrust reverser system on each engine has :
- 4 actuators,
- 4 latches,
- Door position switches,
- A Hydraulic Control Unit (HCU) that :
  - Pressurizes the thrust reverser hydraulic system,
  - Regulates the speed of the blocker doors, and
  - Supplies actuators with hydraulic power.
- A hydraulic shutoff valve which allows hydraulic pressure to the HCU.

Each pivoting door moves independently (the doors are not synchronized).
The total actuation time is less than two seconds.

ACTUATION LOGIC

Ident.: DSC-70-70-00020920.0001001 / 17 MAR 17
Applicable to: ALL

Deployment requires :
- One FADEC channel, operating with its associated throttle reverse signal ;
- Right and left main gear compressed signal from the corresponding LGCIUs ;
- A Thrust Lever Angle (TLA) reverse signals from at least one Spoiler Elevator Computer (SEC).

Before deployment is completed, the FADEC sets reverse idle thrust on the engine that is having its thrust reversed.

PROTECTION

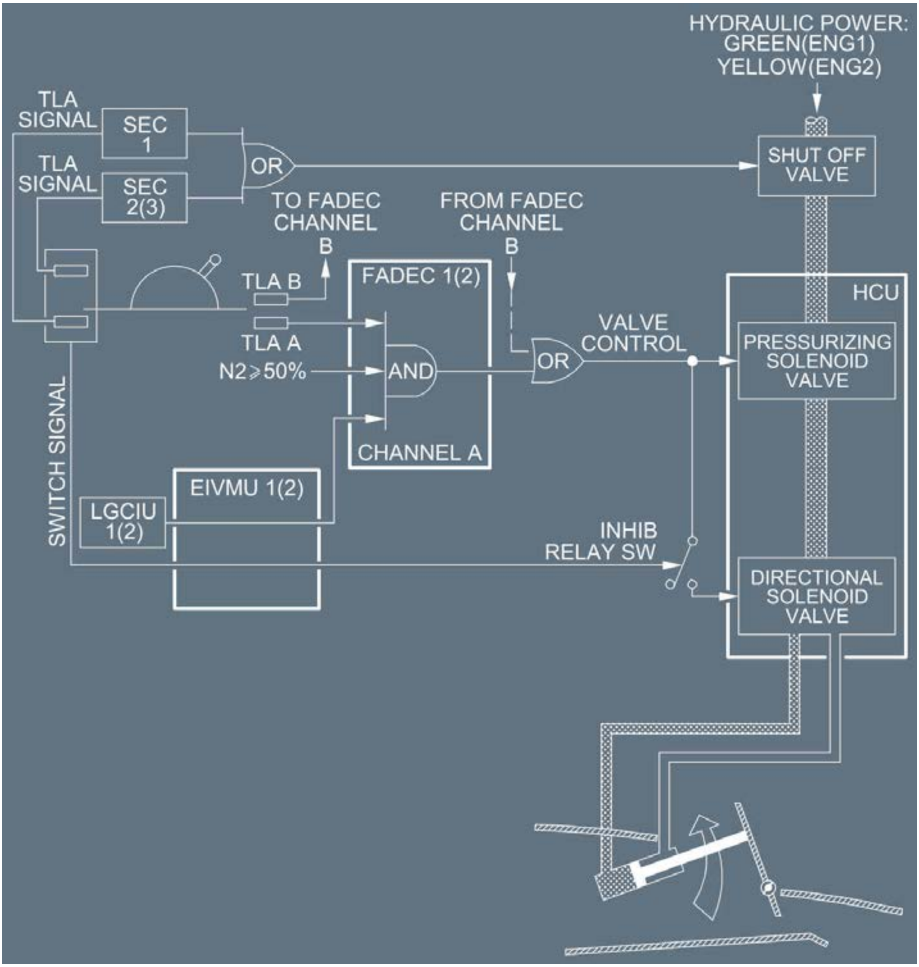
Ident.: DSC-70-70-00020921.0006001 / 17 MAR 17
Applicable to: ALL

- IDLE PROTECTION

The FADEC will automatically select the thrust to idle :
- In case of inadvertent thrust reverser deployment (while thrust reversers are commanded stowed), as soon as the thrust reverser feedback position is above 15 % deployed (thrust decreasing toward idle, when the detected position is between 10 % and 15 %).
- In case of inadvertent thrust reverser stowage (while thrust reversers are commanded deployed), as soon as the thrust reverser feedback position is below 78 % deployed (thrust decreasing toward idle between 90 % and 78 %).

SCHEMATIC

Ident.: DSC-70-70-00020919.0006001 / 17 MAR 17
Applicable to: ALL



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GENERAL

Ident.: DSC-70-80-10-00020922.0001001 / 17 MAR 17
Applicable to: ALL

The FADEC controls and monitors the ignition and starting system according to:
- The position of the ENG MODE selector
- The position of the ENG MASTER sw
- The position of the ENG MAN START pb-sw
- The aircraft status (flight or ground)

The FADEC receives the previous inputs from the EIVMU /EIU.

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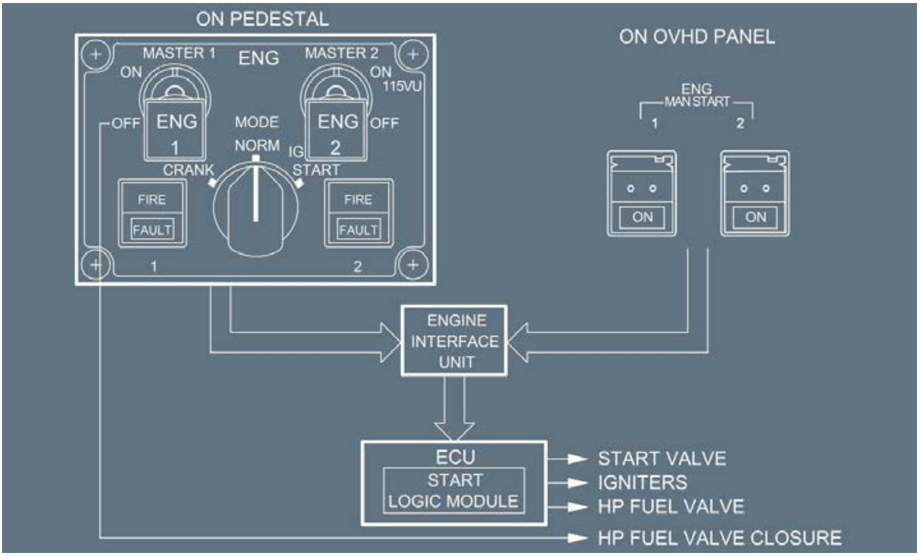
ARCHITECTURE

Ident.: DSC-70-80-20-00001617.0002001 / 21 MAR 16
Applicable to: ALL



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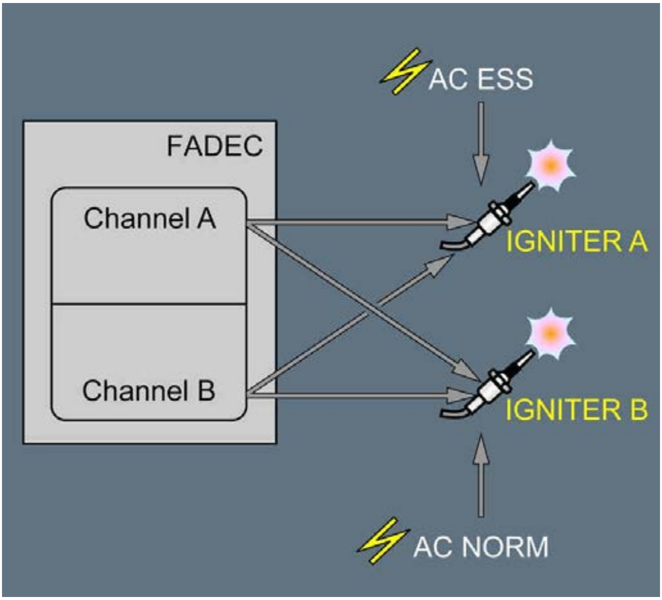
GENERAL

Ident.: DSC-70-80-30-00020923.0001001 / 17 MAR 17
Applicable to: ALL

The ignition system is for engine starting on the ground and restarting in flight. It consists of two identical independent circuits for each engine, normally controlled by the FADEC channel A and channel B. Each FADEC channel can control both igniters.



Note: *Supply for igniter A switches to the STAT INV BUS BAR as soon as the static inverter is operative.*

IGNITION FOR STARTING

Ident.: DSC-70-80-30-00020924.0002001 / 17 MAR 17
Applicable to: ALL

ON THE GROUND

Automatic start:

- During a first automatic start attempt only one igniter is supplied. The FADEC automatically alternates the igniters and/or channels used in successive start sequences.
- The ignition comes on automatically when N2 reaches 16 % and cuts off automatically when N2 reaches 50 %.

- During an automatic start, if the first attempt fails, the FADEC automatically initiates a new start attempt with both igniters energized.
- Manual start:
  - During a manual start both igniters are supplied, when the ENG MASTER sw is ON.
  - Both igniters are cut off when N2 reaches approximately 50 %.

IN FLIGHT

In case of start attempt in flight, when the ENG MASTER sw is ON, both igniters are supplied.

CONTINUOUS IGNITION

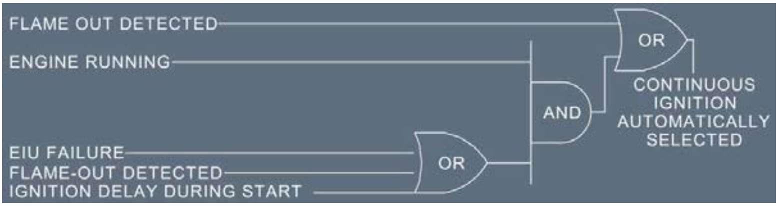
Ident.: DSC-70-80-30-00001620.0004001 / 21 MAR 16
Applicable to: ALL

Continuous ignition may be selected either manually or automatically to maintain engine combustion.

MANUAL SELECTION

In flight, continuous ignition is on when the ENG MODE selector is on IGN/START, if the corresponding engine is running.
Only one igniter is selected. If failed, both igniters are automatically selected.
On the ground after the engine is started, because ignition cuts off automatically, the flight crew must switch the ENG MODE selector to NORM then back to IGN/START to turn on continuous ignition.

AUTOMATIC SELECTION



GENERAL

Ident.: DSC-70-80-40-00001621.0001001 / 21 MAR 16
Applicable to: ALL

The engine starting system consists of an air turbine starter and a start valve.
The start valve admits air supplied by the pneumatic system to operate the starter.
The FADEC controls the start valve electrically and bleed pressure is required for opening the start valve. If electrical control fails when the aircraft is on the ground, a handle allows the start valve to be operated manually.

AUTOMATIC STARTING

Applicable to: ALL

Ident.: DSC-70-80-40-10-00020932.0001001 / 21 MAR 17

GENERAL

This sequence is under the full authority of the FADEC, which controls:
- The start valve
- The igniters
- The fuel HP valves.

Ident.: DSC-70-80-40-10-00020933.0001001 / 21 MAR 17

PROTECTION

The FADEC :
- Detects a hot start, a hung start, a stall, or no light up
- Announces FAULT and identifies the fault in an ECAM message
- Runs an abort sequence if a start aborts on the ground
  - Closes the HP valve
  - Closes the start valve
  - Turns off ignition
  - Cranks the engine crank after the start abort in order to clear out fuel vapors
  - Controls any additional start attempts.

Ident.: DSC-70-80-40-10-00020934.0001001 / 21 MAR 17

DRY CRANKING

Depending on the engine thermal state, the FADEC can initiate a pre-start motoring (dry cranking) up to 60 s. Pre-start motoring is active during all ground starts and ground cranking procedures to limit the engine core speed below the bow rotor critical speed (bow rotor protection). The motoring time will vary depending on the residual thermal condition of the engine and depending on the engine vibration level. During the engine motoring, the FADEC logic limits the maximum N2 around 30 %.

Ident.: DSC-70-80-40-10-00020935.0001001 / 21 MAR 17

WINDMILLING

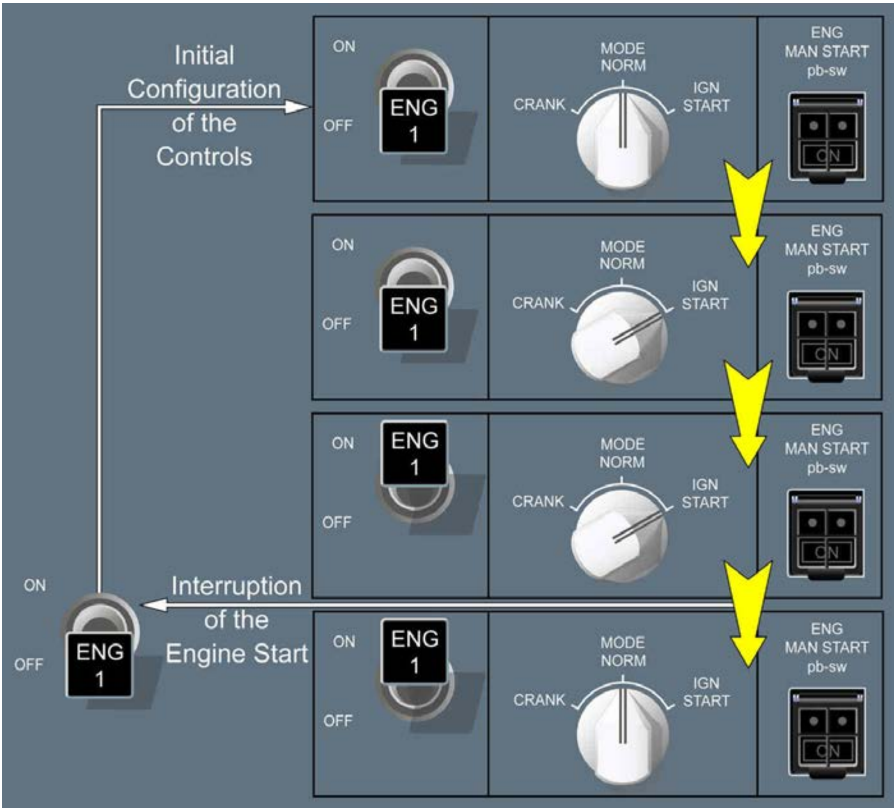
For an in-flight start, the FADEC decides whether the engine is windmilling fast enough or needs assistance from the starter in view of current engine parameters and flight environment parameters.
Flight crew may interrupt this start sequence by moving the ENG MASTER sw to OFF.

AUTOMATIC STARTING SEQUENCE

Applicable to: ALL

Ident.: DSC-70-80-40-20-00020925.0001001 / 21 MAR 17

SEQUENCE OF THE AUTOMATIC START



Ident.: DSC-70-80-40-20-00020926.0001001 / 21 MAR 17

INITIAL CONFIGURATION OF THE CONTROLS

The initial configuration prior an automatic engine start is the following :

- The ENG MASTER sw is set to OFF
- The ENG MODE selector is set to NORM
- The ENG MAN START pb-sw is set to OFF.

Ident.: DSC-70-80-40-20-00020927.0001001 / 21 MAR 17

FIRST STEP

The flight crew must set the ENG MODE selector to IGN/START, leading to the following:
- The ENG SD page appears on the SD
- All engine parameters are available
- Pack valves automatically close.

After 30 s, if the flight crew does not set the ENG MASTER sw to ON (*Refer to DSC-70-80-40 Second Step*), pack valves automatically open again.

Ident.: DSC-70-80-40-20-00020928.0001001 / 21 MAR 17

SECOND STEP

The flight crew must set the ENG MASTER sw to ON, and the following steps occur:
- The LP fuel valve opens
- The engine start valve opens
- The ignition starts:
  - On ground: when N2 > 16 %
  - In flight: Immediately.
- The HP fuel valve opens:
  - On ground: when N2 > 22 %
  - In flight: when N2 > 15 %.
- When N2 > 50 %:
  - The engine start valve closes
  - The ignition stops if on ground
  - The pack valves reopen if another engine is not started within 30 s.

Ident.: DSC-70-80-40-20-00020929.0001001 / 21 MAR 17

THIRD STEP

The automatic engine start is finished.
The flight crew must set the ENG START selector to NORM.

Ident.: DSC-70-80-40-20-00020930.0001001 / 21 MAR 17

INTERRUPTION OF THE AUTOMATIC START

When required by ECAM and after confirmation, the flight crew must set the ENG MASTER lever to OFF.

If the flight crew sets the ENG MASTER sw to OFF, the FADEC automatically :
- Closes the LP and the HP fuel shutoff valves
- Stops to energize the ignitor
- Closes the engine start valve.

MANUAL STARTING

Ident.: DSC-70-80-40-00020937.0001001 / 17 MAR 17
Applicable to: ALL

If an automatic start is not successful, the flight crew can perform a manual start.
In the manual start sequence, the FADEC has limited control. As a result, the flight crew must monitor engine acceleration.

To perform a manual start, the flight crew must :
- Set the ENG MODE selector to IGN/START
- Set the ENG MAN START pb-sw to ON
- Set the ENG MASTER sw to ON.

The FADEC:
- Opens the engine start valve when the flight crew :
  - Sets the ENG MODE selector to IGN/START
  - Sets the ENG MAN START pb-sw to ON
- Opens the HP shutoff valve, and operates both igniters when the flight crew sets the ENG MASTER sw to ON
- Closes the engine start valve, and cuts off the ignition when N2 reaches 50 %.

For more information about the manual start sequence,*Refer to PRO-NOR-SUP-ENG Manual Engine Start - General*.

The FADEC makes a passive survey of the engine during the starting sequence : the flight crew is made aware of an abnormal start by a proper ECAM warning and has to interrupt the start sequence.
The FADEC has not the authority to abort the manual start :
- in flight
- on ground, except if the start EGT limit is exceeded before reaching 50 % N2. In this case only, the FADEC aborts the start.

In flight, the FADEC always commands a starter-assisted air start.

ENGINE VENTILATION (DRY CRANKING)

Ident.: DSC-70-80-40-00020938.0001001 / 21 MAR 17
Applicable to: ALL

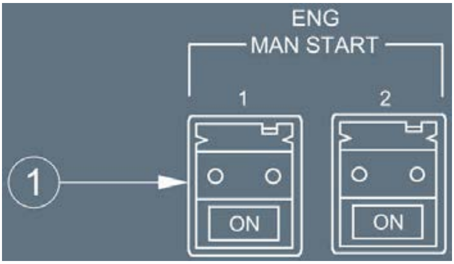
A dry cranking cycle ventilates the engine to remove fuel vapors after an unsuccessful start attempt on the ground.
The flight crew can manually select cranking by setting the ENG MODE selector to CRANK and the ENG MAN START pb-sw to ON (ENG MASTER sw OFF). Flight crew can stop the cranking by setting the ENG MAN START pb-sw to OFF.

ENG MAN START PANEL

Applicable to: ALL

Ident.: DSC-70-90-10-20-00018366.0001001 / 21 MAR 16

ENG MAN START Panel



Ident.: DSC-70-90-10-20-00018370.0001001 / 12 MAY 16

ENG MAN START pb-sw

Off : - Aborts the manual start sequence of the associated engine, when the ENG MODE selector is set to IGN/START and the ENG MASTER lever is set to OFF, or
- Stops the dry crank process of the associated engine, when the ENG MODE selector is set to CRANK and the ENG MASTER lever is set to OFF.

L13

ON (in blue) : - Initiates the manual start sequence of the associated engine, when the ENG MODE selector is set to IGN/START, or
- Initiates the wet crank process of the associated engine, when the ENG MODE selector is set to CRANK and the ENG MASTER lever is set to ON, or
- Initiates the dry crank process of the associated engine, when the ENG MODE selector is set to CRANK and the ENG MASTER lever is set to OFF.

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ENG MODE SELECTOR AND ENG MASTER LEVERS

Applicable to: ALL

Ident.: DSC-70-90-20-30-00018367.0001001 / 12 OCT 16

ENG MODE selector and ENG MASTER Levers

Ident.: DSC-70-90-20-30-00018373.0001001 / 21 MAR 17

ENG MODE START selector

NORM : Normal mode of operation.

IGN/START : Use the IGN/START position to:

- Initiate the automatic or manual start sequences of the associated engine, when the ENG MASTER lever is set to OFF, or
- Initiate the ignitors in flight as required.

L13

CRANK : Use the CRANK position to:

- Initiate the dry crank process of the associated engine, when the ENG MASTER lever is set to OFF and the ENG MAN START pb-sw is set to ON.
- Initiate the wet crank process of the associated engine for maintenance purpose, when the ENG MASTER lever, and the ENG MAN START pb-sw are set to ON.

Ident.: DSC-70-90-20-30-00018371.0001001 / 12 MAY 16

ENG MASTER lever

Also called ENG MASTER sw.

ON : The FADEC:

- Initiates the automatic start sequence of the associated engine, when the ENG MODE selector is set to IGN/START, or
- Initiates the manual start sequence of the associated engine, when the ENG MODE selector is set to IGN/START and the ENG MAN START pb-sw is set to ON.

OFF : The FADEC:

- Shuts down the associated engine, or
- Aborts the start sequence of the associated engine.

Ident.: DSC-70-90-20-30-00018372.0001001 / 21 MAR 17

ENG 1(2) FIRE light

FIRE Light :
A fire is detected in the corresponding engine.
Refer to DSC-26-20-20 ENG 1(2) FIRE Light

ENG 1(2) FAULT light

FAULT light :
This amber light comes on, and a caution appears on ECAM, if there is:

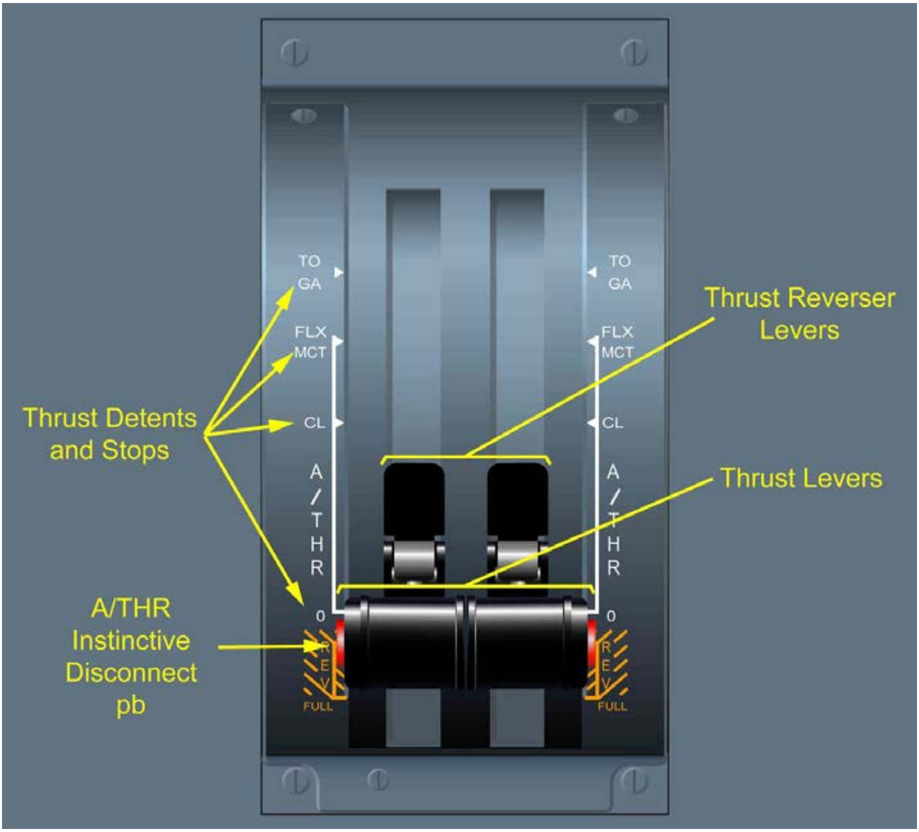
- The position of the HP fuel shutoff valve is abnormal, or
- The automatic start sequence of the associated engine aborts, or
- There is a malfunction of the thrust control.

THRUST LEVERS

Applicable to: ALL

Ident.: DSC-70-90-20-40-00018368.0001001 / 28 JUL 16

Thrust Levers



Ident.: DSC-70-90-20-40-00018376.0001001 / 21 MAR 16

THRUST LEVERS

The flight crew uses the thrust levers in order to:
- Adjust the thrust, or
- Select a thrust stop or detent, or

- Control the deployment and the stowage of the associated reversers, or
- Adjust the associated reverse thrust.

The flight crew can move each thrust lever individually.

L2 The position of the thrust levers appears on the E/WD, via a blue circle on the thrust gauge.

L1 The flight crew can move each thrust lever forward the Idle (0) stop, when the associated thrust reverser lever is set to the locked position.
The flight crew can move each thrust lever backward the Idle (0) stop, when the associated thrust reverser lever is in the unlocked position.

Ident.: DSC-70-90-20-40-00018377.0001001 / 12 OCT 16

THRUST DETENTS AND STOPS

There are two stops and four detents:
- The Idle (0) stop,
- The Climb (CL) detent,
- The Maximum Continuous Thrust (MCT)/Flexible Take Off (FLX) detent,
- The Takeoff (TO)/Go-Around (GA) detent,
- The Rev Idle (R or REV) detent,
- The Rev Max (F or FULL) stop.

Ident.: DSC-70-90-20-40-00018378.0001001 / 21 MAR 16

THRUST REVERSER LEVERS

The flight crew uses the thrust reverser levers in order to unlock the associated thrust lever.
The flight crew can move each thrust reverser lever upward to the unlocked position, when the associated thrust lever is set to the Idle (0) stop.
The thrust reverser levers are automatically reset to the locked position, when the flight crew moves the thrust levers forward the Idle (0) stop.

Ident.: DSC-70-90-20-40-00018379.0001001 / 21 MAR 16

A/THR Instinctive Disconnect pb

Pressing the A/THR instinctive disconnect pb disconnects the A/THR.

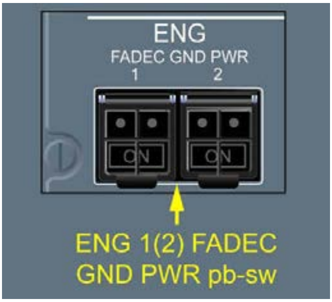
L2 For more information about A/THR instinctive disconnect pb, *Refer to DSC-22_30-90 A/THR Disconnection - General*.

ENG FADEC GND PWR PANEL

Applicable to: ALL

Ident.: DSC-70-90-30-10-00018365.0001001 / 12 OCT 16

ENG FADEC GND PWR Panel



Ident.: DSC-70-90-30-10-00018369.0001001 / 21 MAR 16

ENG FADEC GND PWR PB-SW

Off : The electrical network of the aircraft or the FADEC alternator automatically supplies the FADEC.

ON : On ground, when pressed the electrical network of the aircraft supplies the FADEC when:

- The ENG FIRE pb-sw is not pressed,
- The FADEC alternator does not supply the FADEC.

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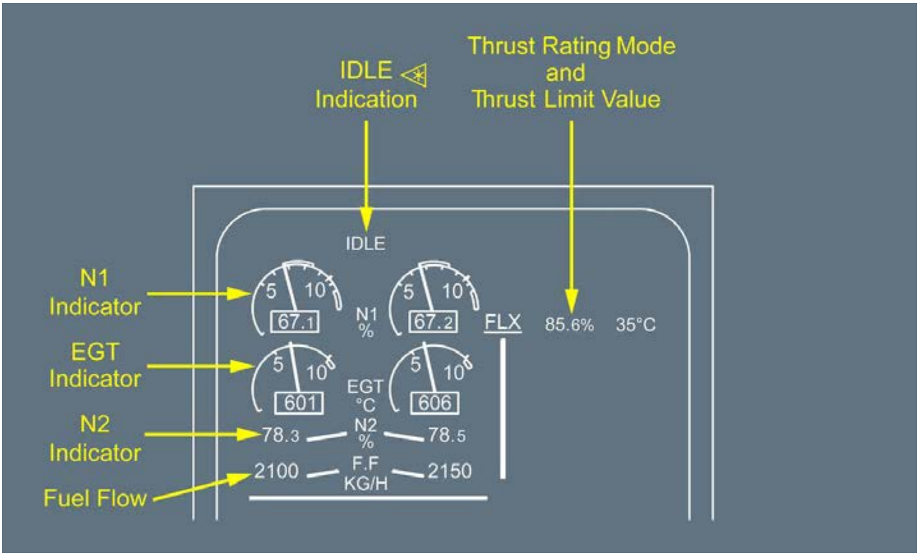
ENGINE/WARNING DISPLAY

Applicable to: ALL

Ident.: DSC-70-90-40-50-00017843.0001001 / 15 NOV 16

Engine/Warning Display



Ident.: DSC-70-90-40-50-00017845.0001001 / 21 MAR 16

A FLOOR INDICATION

The alpha floor protection is active.

L2 For more information, *Refer to DSC-22_30-90 A/THR Modes - ALPHA FLOOR*

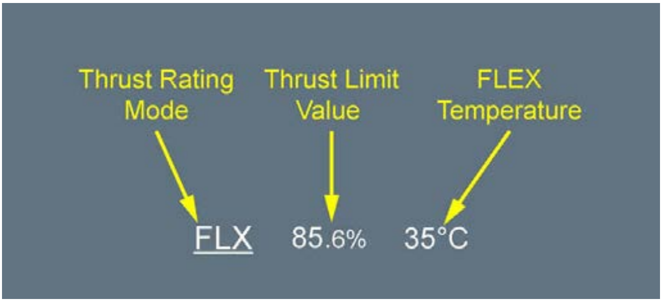
Ident.: DSC-70-90-40-50-00017846.0001001 / 21 MAR 16

THRUST RATING MODE AND THRUST LIMIT VALUE

Indicates the thrust limit value and the associated thrust rating mode based on:

- The position of the thrust levers,
- Aircraft on ground or in flight,
- The engine status, i.e. running or not running,
- The data entered in the T.O and CLB panels of the FMS ACTIVE/PERF page.

Ident.: DSC-70-90-40-50-00017847.0001001 / 21 MAR 16



Ident.: DSC-70-90-40-50-00018201.0001001 / 21 MAR 16

THRUST RATING MODE

The thrust rating modes are:

TOGA	:	Takeoff or go-around (TOGA) thrust rating mode is selected.
MCT	:	Maximum Continuous Thrust (MCT) rating mode is selected.
CLB	:	Climb (CLB) thrust rating mode is selected.
FLX	:	Flexible (FLX) takeoff thrust rating mode is selected.
DCLB	:	Derated Climb ⧼ (DCLB) thrust rating mode is selected.
D04	:	Derated Takeoff ⧼ thrust rating mode is selected. There are several levels of derated takeoff: D04, D08, D12, D16, D20, ...
GA SOFT	:	Go-around Soft ⧼ (GA SOFT) thrust rating mode is selected.
MREV	:	Maximum Reverse (MREV) thrust rating mode is selected.

Ident.: DSC-70-90-40-50-00018203.0001001 / 21 MAR 16

THRUST LIMIT VALUE

N1 value : Indicates the N1 limit value associated with the thrust rating mode.

L2 The thrust limit value disappears when the thrust reversers are selected.

Ident.: DSC-70-90-40-50-00017849.0001001 / 21 MAR 16

FLEX TEMPERATURE

Cyan : Indicates the flexible temperature that the flight crew entered in the T.O panel of the FMS PERF page, when the FLX rating mode is selected

Dashes in cyan	:	Indicates that the Static Air Temperature is above the flexible temperature.

Ident.: DSC-70-90-40-50-00018209.0001001 / 21 MAR 16

IDLE INDICATION

Both engines are at idle speed, and the aircraft is in flight.
L2 Pulses during 10 s, and then remains steady.

Ident.: DSC-70-90-40-50-00018210.0001001 / 21 MAR 16

AVAIL INDICATION

The engine is started, and at or above idle.
L2 On ground, appears steady during 10 s after a successful start. In flight, pulses during 1 min after a successful relight.
The AVAIL Indication disappears when the flight crew moves the thrust lever forward the idle detent.

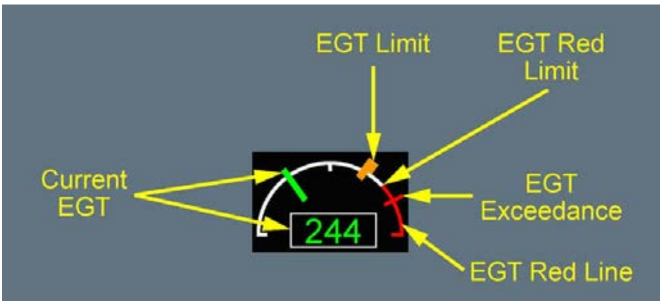
Ident.: DSC-70-90-40-50-00018211.0001001 / 21 MAR 16

REV INDICATION

REV in green	:	On ground, the thrust reverser system is fully deployed.
L12		
REV in amber	:	The thrust reverser system is unlocked. In flight, the REV indication pulses during 9 s and then remains steady.

Ident.: DSC-70-90-40-50-00018213.0001001 / 21 MAR 16

EGT INDICATOR



Ident.: DSC-70-90-40-50-00018216.0002001 / 21 MAR 16

CURRENT EGT

L12

Green	:	The current EGT is in normal range. The scale goes from 0 °C to 1 000 °C.
Amber	:	The current EGT exceeds the EGT amber limit.
Red	:	The current EGT exceeds the EGT red limit.

Ident.: DSC-70-90-40-50-00018218.0003001 / 21 MAR 16

EGT LIMIT

The amber line indicates the maximum EGT (i.e. the EGT limit).
L2 The maximum EGT is:

- 725 °C, during the engine start sequence on ground, or
- 915 °C, in all other cases.

The EGT limit does not appear:

- When a takeoff or a go-around mode is selected, or
- When the thrust reversers are selected, or
- If the alpha floor protection is activated.

Ident.: DSC-70-90-40-50-00018219.0001001 / 21 MAR 16

EGT EXCEEDANCE

The EGT exceedance is the highest value that the EGT reached.
The EGT exceedance appears when:

- The current EGT exceeds the EGT red limit, or
- The EGT exceeded the EGT red limit.

L2 The red mark no longer appears at the next engine start sequence on ground, or after a maintenance action.

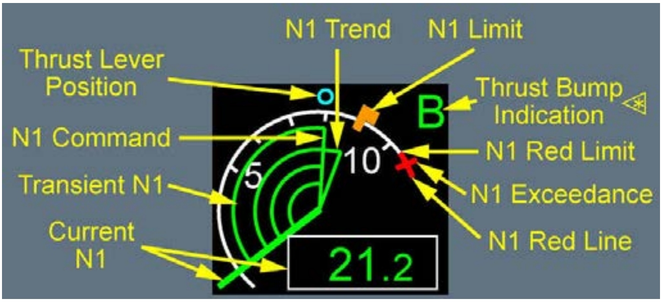
Ident.: DSC-70-90-40-50-00018220.0003001 / 21 MAR 16

EGT RED LINE

The EGT red line appears between the EGT red limit and the end of the scale.
L2 The EGT red limit is 950 °C.

Ident.: DSC-70-90-40-50-00018228.0001001 / 21 MAR 16

N1 INDICATOR



Ident.: DSC-70-90-40-50-00018229.0003001 / 04 JUL 17

CURRENT N1

Green	:	The current N1 is in normal range.
Amber	:	The current N1 exceeds the N1 limit.
Red	:	The current N1 exceeds the N1 red limit. N1 red limit is 104 %.
Dashed	:	The accuracy of the N1 measurement is degraded. Two amber dashes appear over the last digit.

L12 L12

Ident.: DSC-70-90-40-50-00018232.0001001 / 21 MAR 16

N1 COMMAND

Indicates the N1 target, when the A/THR mode is active.

Ident.: DSC-70-90-40-50-00018233.0001001 / 21 MAR 16

TRANSIENT N1

The four green arcs indicate the difference between the N1 command and the current N1 , when the A/THR is active.

Ident.: DSC-70-90-40-50-00018235.0001001 / 21 MAR 16

THRUST LEVER POSITION

The blue circle indicates the position of the thrust lever.

In manual mode, the blue circle corresponds to the N1 value reached after the stabilization of the engine parameters.

Ident.: DSC-70-90-40-50-00018236.0001001 / 21 MAR 16

N1 LIMIT

The amber mark indicates the N1 limit.
L2 This corresponds to the maximum N1 value when the thrust levers are in TO/GA detent.

Ident.: DSC-70-90-40-50-00018237.0001001 / 21 MAR 16

N1 EXCEEDANCE

The N1 exceedance is the highest value that the N1 reached.
The N1 exceedance appears when the current N1 exceeds the N1 red limit.
The N1 exceedance remains even if the N1 value decreases below the N1 red limit.
L2 The red mark no longer appears at the next engine start sequence on ground, or after a maintenance action.

Ident.: DSC-70-90-40-50-00018238.0003001 / 21 MAR 16

N1 RED LINE

The N1 red line appears between the N1 red limit and the end of the scale.
L2 The N1 red limit is 104 %.

Ident.: DSC-70-90-40-50-00018239.0002001 / 21 MAR 16

N2

In a grey box	:	The engine start sequence or the crank process is in progress.
Green:	:	N2 is in normal range.
L12 Red	:	N2 exceeds the N2 red limit. N2 red limit is 105 %. A red cross appears. The red cross no longer appears at the next engine start sequence on ground, or after a maintenance action.
L12 Dashed	:	The accuracy of the N2 measurement is degraded. Two amber dashes appear over the last digit.

Ident.: DSC-70-90-40-50-00018243.0001001 / 21 MAR 16

FUEL FLOW

Green	:	The fuel flow is normal.

Note: *If the system detects a discrepancy between the N1 , N2 , EGT and fuel flow values on the FADEC -DMC bus and the corresponding displayed values, an amber CHECK appears underneath the affected parameter.*

Ident.: DSC-70-90-40-50-00018244.0001001 / 21 MAR 16

THRUST BUMP ⩤ INDICATION

Green : Indicates that the thrust bump is engaged.

Amber : When on the ground, indicates that the thrust bump is selected but not engaged.

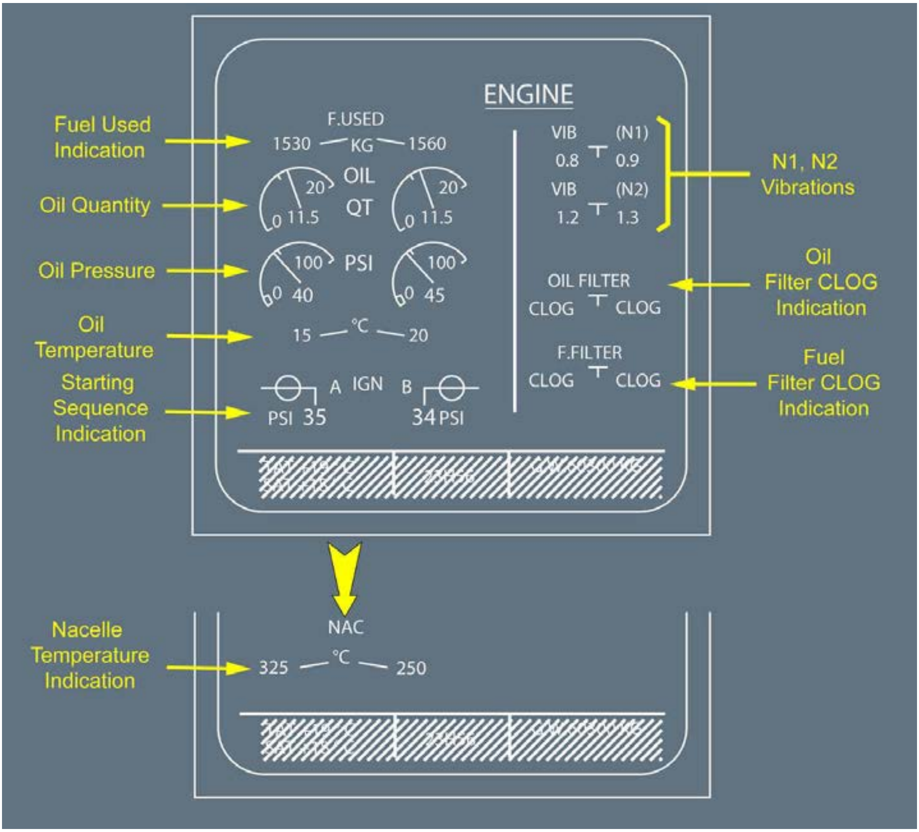
Cyan : When on the ground, Indicates that the thrust bump is selected.

ENG SD PAGE

Applicable to: ALL

Ident.: DSC-70-90-40-60-00018259.0001001 / 21 MAR 16

ENG SD page



Ident.: DSC-70-90-40-60-00018230.0001001 / 21 MAR 16

FUEL USED INDICATION

L12

Green : Indicates the fuel used by each engine.
This value automatically resets on ground, at the next engine start.
Appears in multiples of 10 kg (20 lb).

L12

Dashed	:	The value accuracy is degraded. Two amber dashes appear over all five digits. This occurs when the Fuel Flow is not valid in flight, for more than 1 min.

Ident.: DSC-70-90-40-60-00018260.0001001 / 21 MAR 16

FUEL FILTER CLOG INDICATION

Indicates that the pressure loss across the fuel filter is excessive.

Ident.: DSC-70-90-40-60-00018262.0002001 / 22 MAR 16

OIL QUANTITY

L12

Green	:	The oil quantity is in normal range. The scale goes from 0 to 22 QT.
Pulses green	:	The oil quantity goes below the oil advisory limit (3 QT), that corresponds to the amber mark. The needle and the oil quantity value pulse green. The indication pulses, when oil quantity goes below 3.25 QT , and remains pulsing as long as oil quantity is below 4.75 QT.

Ident.: DSC-70-90-40-60-00018261.0002001 / 21 MAR 16

OIL PRESSURE

L12

Green	:	The oil pressure is in normal range. The scale goes from 0 to 100 PSI.

L12

Pulses green	:	The oil pressure is: - Above the upper advisory limit, or The upper advisory limit is 90 PSI. The oil pressure stops pulsing when oil pressure goes below 85 PSI. - Between the upper red threshold and the lower advisory limit, when N2 is above 75 %. The advisory limit is 16 PSI. The oil pressure stops pulsing, when oil pressure goes below 20 PSI.

L12

Red	:	The oil pressure is in the red range. The red range is between 0 and 13 PSI.

Ident.: DSC-70-90-40-60-00018263.0002001 / 21 MAR 16

OIL TEMPERATURE

Green : The oil temperature is in normal range.

Pulses green : The oil temperature is between 140 °C and 155 °C for less than 15 min.

Amber : The oil temperature is:

- Between 140 °C and 155 °C for more than 15 min, or
- Above 155 °C.

Ident.: DSC-70-90-40-60-00018266.0001001 / 21 MAR 16

OIL FILTER CLOG INDICATION

Indicates that the pressure loss across the oil filter is excessive.

Ident.: DSC-70-90-40-60-00018267.0001001 / 21 MAR 16

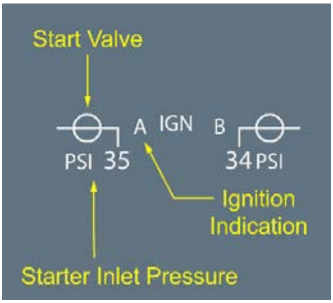
N1 , N2 VIBRATIONS

Green : The vibration of the LP (HP) rotor is in normal range.

Pulses green : The level of LP (HP) rotor vibration is excessive.

Ident.: DSC-70-90-40-60-00018268.0001001 / 21 MAR 16

STARTING SEQUENCE INDICATION



Ident.: DSC-70-90-40-60-00018269.0001001 / 21 MAR 16

IGNITION INDICATION

A : The igniter A (B) is used for the engine start sequence.

A B : Both igniters A and B are used for the engine start sequence or continuous ignition.

Ident.: DSC-70-90-40-60-00018270.0001001 / 21 MAR 16

START VALVE

 : The engine start valve is fully closed.

 : The engine start valve is fully open.

Ident.: DSC-70-90-40-60-00018271.0001001 / 21 MAR 16

STARTER INLET PRESSURE

Green : The starter inlet pressure is normal.

Amber : The starter inlet pressure is either:

- Abnormally high, or
- Abnormally low (below 21 PSI, when N2 is above 10 % and the starter valve is not closed).

Ident.: DSC-70-90-40-60-00018272.0006001 / 21 MAR 16

NACELLE TEMPERATURE INDICATION

The nacelle temperature indication appears when the nacelle temperature of at least one engine goes above the advisory limit if not during the start sequence.

Green : The nacelle temperature is normal.

L12

Pulses green : The nacelle temperature goes above the advisory limit.
The advisory limit is 240 °C.

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MEMO DISPLAY

Applicable to: ALL

Ident.: DSC-70-90-50-A-00018777.0001001 / 13 MAY 16

IGNITION : This memo appears in green when continuous ignition is activated on any engine.

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PROCEDURES

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Intentionally left blank

<table>
<tr><th>M (1)</th><th>Localization</th><th>DU Title</th><th>DU identification</th><th>DU date</th></tr>
<tr><td></td><td>PRO-ABN-ABN-RESET</td><td>System Reset Table</td><td>NG01118</td><td></td></tr>
<tr><td></td><td>PRO-ABN-ABN-RESET</td><td>System Reset Table - WHEEL</td><td>00021059.0001001</td><td>20 MAR 17</td></tr>
<tr><td></td><td colspan="4">Criteria: SA
Applicable to: ALL
Impacted DU: 00021058 System Reset Table - WHEEL</td></tr>
<tr><td></td><td colspan="4"><u>Reason for issue:</u>
The BSCU reset procedure for WHEEL N/W STRG FAULT is amended with a temporary procedure, in order to better address the spurious alerts that are currently encountered in-service.
- Under the very specific conditions defined in the procedure, the flight crews can continue the flight without troubleshooting after a successful BSCU reset.
- For aircraft with BSCU standard 10: The root cause of the spurious alerts that were triggered during taxiing with BSCU standard 10 has been cancelled. Therefore, the associated reset procedure has been removed.</td></tr>
</table>

<table>
<tr><td></td><td>PRO-ABN-ELEC</td><td>ELEC DC ESS BUS FAULT</td><td>NG01103</td><td></td></tr>
<tr><td></td><td>PRO-ABN-ELEC</td><td>ELEC DC ESS BUS FAULT</td><td>00013704.0004001</td><td>23 JUN 15</td></tr>
<tr><td></td><td colspan="4">Criteria: 31-1373, 31-1414, K1806, P6319, SA
Applicable to: ALL
Impacted DU: 00012511 ELEC DC ESS BUS FAULT</td></tr>
<tr><td></td><td colspan="4"><u>Reason for issue:</u>
1. This Temporary Revision is issued to indicate that, in the case of an ELEC DC ESS BUS FAULT, the audio cards of the digital Audio Management Unit (AMU), that are connected to the VHF transceivers, are lost. As a result, communication via VHF 2 and 3 is not available.
2. This Temporary Revision is revised to highlight that, in the case of an ELEC DC ESS BUS FAULT, all audio means of communication (VHF , HF and SATCOM) are lost since all cockpit mikes and headsets are connected to the digital Audio Management Unit (AMU). A corrective modification that provides a backup electrical supply for the AMU audio cards (from DC BUS 1), in the case of an ELEC DC ESS BUS failure, is available through SB 23-1333 / Modification 37782. With this modification audio communications can be recovered, as per ECAM , through VHF 2 or 3.
3. This TDU is reissued to add "L/G ... GRVTY EXTN " procedure in case of loss of "DC ESS BUS" and "DC BUS 2" and also the “AVOID ICING CONDITIONS” line for A/C equipped withfor A/C equipped with FWC H2F6 std.</td></tr>
</table>

(1) Evolution code : N=New, R=Revised, E=Effectivity

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PROCEDURES

ABNORMAL AND EMERGENCY PROCEDURES

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PRO-ABN-ABN-00 INTRODUCTION

PRO-ABN-ABN-ADV [ADV] ECAM ADVISORY

PRO-ABN-ABN-MEM [MEM] MEMORY ITEMS

PRO-ABN-ABN-QRH [QRH] PROCEDURES

PRO-ABN-ABN-RESET [RESET] SYSTEM RESET

PRO-ABN-A-ICE A-ICE

Continued on the following page

Continued from the previous page

PRO-ABN-AIR AIR

PRO-ABN-APU APU

PRO-ABN-APUF APU FIRE

PRO-ABN-AUTO_FLT AUTO FLT

Continued on the following page

Continued from the previous page

Continued on the following page

Continued from the previous page

PRO-ABN-C_B C/B

PRO-ABN-COM COM

PRO-ABN-COND COND

PRO-ABN-CONFIG CONFIG

PRO-ABN-DATALINK DATALINK

Continued on the following page

Continued from the previous page

PRO-ABN-DOOR DOOR

PRO-ABN-EIS EIS

PRO-ABN-ELEC ELEC

Continued on the following page

Continued from the previous page

PRO-ABN-ENG ENG

Continued on the following page

Continued from the previous page

PRO-ABN-F_CTL F/CTL

Continued on the following page

Continued from the previous page

Continued on the following page

Continued from the previous page

PRO-ABN-FUEL FUEL

PRO-ABN-FWS FWS

PRO-ABN-HYD HYD

Continued on the following page

Continued from the previous page

PRO-ABN-LG L/G

PRO-ABN-MISC MISC

Continued on the following page

Continued from the previous page

PRO-ABN-NAV NAV

Continued on the following page

Continued from the previous page

PRO-ABN-OVERSPEED OVERSPEED

PRO-ABN-RECORDER RECORDER

PRO-ABN-SMOKE SMOKE

PRO-ABN-SURV SURV

PRO-ABN-VENT VENT

Continued on the following page

Continued from the previous page

PRO-ABN-WHEEL WHEEL

PRO-ABN-W_A_ICE WING A.ICE

PRO-ABN-90 Detailed Cabin / Cockpit Evacuation Procedure

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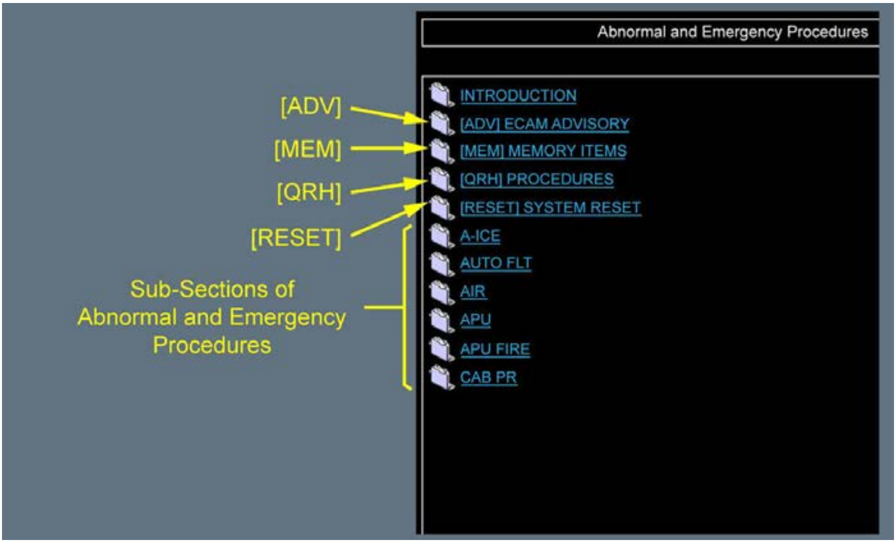
CONTENT

Ident.: PRO-ABN-ABN-00-00020862.0001001 / 20 APR 17
Applicable to: ALL

Abnormal and Emergency procedures involve actions that the flight crew must perform to ensure the overall safety of the flight, and adequate workload.

L2 For more information about the management of abnormal operations, *Refer to FCTM/AOP-30-10 Introduction*.

Abnormal and Emergency Procedure Overview



L1 [ADV] ECAM ADVISORY

The [ADV] ECAM ADVISORY section provides direct access to the list of all advisories that can be displayed on the ECAM SD pages. The [ADV] section is also available in the QRH.

L2 For more information, *Refer to [ADV] ECAM Advisory*.

L1 Advisories are system parameters that start to deviate from their usual operational range. However, an advisory does not require flight crew actions, except monitoring.

L2 For more information about Advisory function, *Refer to DSC-31-20 System Pages*.

L1 [MEM] MEMORY ITEMS

The [MEM] MEMORY ITEMS menu provides direct access to the list of memory items.

L2 For more information, *Refer to [MEM] Memory Items*.

L1 The content of the memory items are described in the applicable sub-sections of the abnormal and emergency procedures.
Memory items are procedures, or critical immediate actions of an ECAM /QRH /OEB procedure, that the flight crew must apply by memory to ensure a safe flight path. In some time-critical situations, the flight crew has no time to refer to the ECAM and/or to the QRH.

L2 For more information, *Refer to FCTM/AOP-10-40 Abnormal and Emergency Procedures*.

L1 [QRH] PROCEDURES

The [QRH] PROCEDURES menu provides direct access to the list of all the FCOM abnormal and emergency procedures that are also in the QRH.

L2 For more information, *Refer to [QRH] Procedures*.

L1 The content of the QRH procedures are described in the applicable sub-sections of the abnormal and emergency procedures.

Note: *Only the FCOM version of a procedure provides layer 2 and 3 information for consultation purpose.*

[RESET] SYSTEM RESET

The [RESET] SYSTEM RESET section provides direct access to the table listing all the system resets that are permitted, and the condition to apply them. The [RESET] section is also available in the QRH.

L2 For direct access to the table, *Refer to [RESET] System Reset*.

L1 SUB-SECTIONS OF ABNORMAL AND EMERGENCY PROCEDURES

This part of the FCOM describes the detailed content of all abnormal and emergency procedures.
All procedures are grouped in sub-sections that can be system related (e.g. AIR, FUEL, etc.) or non-system related (e.g. MISC, T.O, CONFIG, etc.).
The sub-sections are sorted by alphabetic order.
For each sub-section, procedures are listed in the following order:

1. The memory items
   The title of the memory items starts with the [MEM] prefix
2. The abnormal and emergency procedures of the QRH
   The title of these procedures starts with the [QRH] prefix
3. The ECAM procedures.

PROCEDURE LAYOUT

Applicable to: ALL

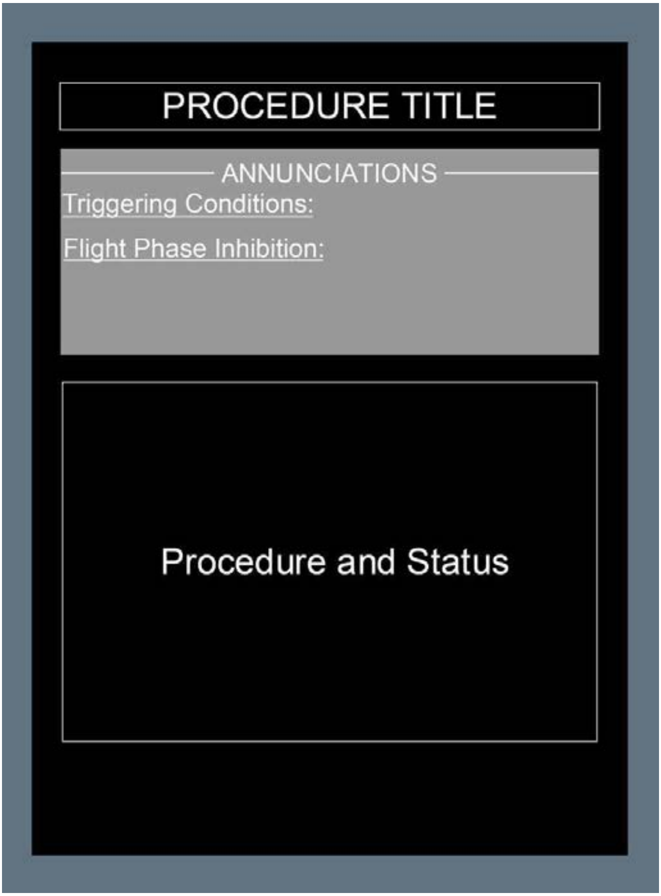
Ident.: PRO-ABN-ABN-00-A-00020863.0001001 / 17 MAR 17

GENERAL

The presentation of procedures is, as far as practicable, identical to the way it is displayed on the ECAM. The abbreviations are identical to those used on the cockpit panels.
All actions and information displayed on ECAM are provided in large letters. Other information, not on ECAM, is provided in small letters.
Expanded information is as far as practicable provided in layer 2. This information:

- Identifies the particular failures
- Explains actions for which the reason is not self-evident
- Provides some background on the reasons and /or the effects of a given action.

FCOM presentation of ABN or EMER procedures



Ident.: PRO-ABN-ABN-00-A-00020864.0001001 / 17 MAR 17

PROCEDURE TITLE

The title of an abnormal or emergency procedure, displayed on the ECAM, appears on white background.
Abnormal procedure displayed on ECAM (amber caution) :

CAB PR SAFETY VALVE OPEN

Emergency procedure displayed on ECAM (red warning) :

CAB PR EXCESS CAB ALT

The title of an abnormal or emergency procedure, that does not appear on the ECAM is on a grey background.
Abnormal procedure not displayed on ECAM :

[QRH] L/G GRAVITY EXTENSION

Emergency procedure not displayed on ECAM :

[QRH] DITCHING

SEVERAL ALERTS UNDER THE SAME TITLE

When applicable, several alerts may be grouped under the same procedure title. However, depending on the failure, the actions that the flight crew should perform may differ.

Note: *Alerts that have the same procedure title may be differentiated by a subtitle (e.g. ENG FIRE (On Ground) versus ENG FIRE (In Flight)).*

Ident.: PRO-ABN-ABN-00-A-00020865.0001001 / 17 MAR 17

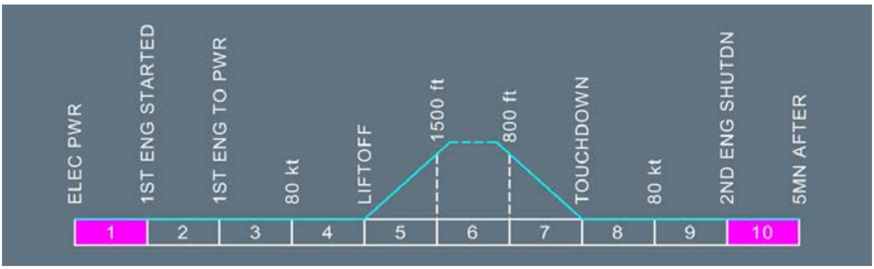
ANNUNCIATIONS

When applicable, the annunciations section provides:

- The triggering conditions, that describe the cause of the alert activation
- The flight phase inhibition.

FLIGHT PHASE INHIBITION

The Flight Phase Inhibition section indicates the flight phases during which the alert is inhibited. In the below example, the alert is inhibited in flight phase 1, and 10.



L2 For more information, *Refer to DSC-31-15 Flight Phases*.

Ident.: PRO-ABN-ABN-00-A-00020866.0001001 / 17 MAR 17

PROCEDURES AND STATUS

The Procedure and Status section provides the procedure and the Status (including approach procedure, limitations, inoperative systems, etc.), with additional information when relevant.

CONDITIONS

BLACK SQUARE

When several procedures appear under the same title, a black square marks the starting point of each procedure.
For example:

Black squares also indicate parts of a procedure among which only one is applicable.
For example:

The ECAM does not display black squares.

BLACK DOT

If an action depends on a precondition, a black dot identifies the precondition. If the precondition appears on ECAM, it appears in LARGE LETTERS. If not, it appears in small letters.
For example:

INDENTATION

Indentation is used in order to identify when an action depends on a precondition/flight phase/procedure.
For example:

- The APPR SPEED is equal to VREF +30 kt only if the flaps are locked, because "APPR SPEED......VREF +30" is indented below "• If flaps locked".
- The MAX SPEED of 250 kt does not depend on the flaps locked condition because it is aligned with "• If Flaps locked". Therefore, MAX SPEED has to be respected whether the flaps are locked or not.

MEMORY ITEMS

Memory items are items that the flight crew must memorize, in order to be able to rapidly apply them, without referring to the ECAM , and/or to the QRH.
Memory items are surrounded by a black box in the FCOM /QRH procedure , in order to enable the flight crew to easily identify them.

Memory items

If no braking:

REV	MAX
BRAKE PEDALS	RELEASE

ABNORMAL AND EMERGENCY CALLOUTS

Applicable to: ALL

Ident.: PRO-ABN-ABN-00-B-00011915.0001001 / 17 MAR 17

ECAM PROCEDURES

1. "ECAM ACTION" is commanded by PF when required.
2. "CLEAR __ (title of the system) ?" is asked by the PM for confirmation by the PF, that all actions have been taken/reviewed on the present WARNING/CAUTION or SYSTEM PAGE. e.g.: CLEAR HYDRAULIC ?
3. "CLEAR __ (title of the system)" is the command by the PF that the action and review is confirmed. For status page; REMOVE STATUS will be used.
4. "ECAM ACTIONS COMPLETE" is the announcement by the PM that all APPLICABLE ACTIONS have been completed.
5. Should the PF require an action from the PM during ECAM procedures, the order "STOP ECAM" will be used. When ready to resume the ECAM the order "CONTINUE ECAM" will be used.

Ident.: PRO-ABN-ABN-00-B-00020059.0001001 / 17 MAR 17

EMERGENCY CALL

Some abnormal/emergency procedures require flight and cabin crews to use specific phraseology when communicating with each other. To ensure effective communication between the flight and cabin crews, the standard phraseology may be recalled at the preflight phase.

FROM	TO	PHRASEOLOGY	REMARKS
cockpit	cabin	Passenger Address (PA) System: "PURSER TO COCKPIT, PLEASE!"	The Purser, or any other cabin crewmember, must go to the cockpit
Cockpit	Cabin	Passenger Address (PA) System: "ATTENTION CREW! AT STATIONS!"	An emergency evacuation may soon be required.
cockpit	cabin	Passenger Address (PA) System: "CABIN CREW and PASSENGERS REMAIN SEATED!"	The captain decides that an evacuation is not required

Continued on the following page

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cockpit	cabin	Passenger Address (PA) System: "PASSENGERS EVACUATE!"	The captain orders an immediate evacuation
cabin	cockpit	Interphone: "PRIO CAPT"	Any crew member can make such a call. The flight crew must reply.

Ident.: PRO-ABN-ABN-00-B-00011916.0001001 / 31 AUG 17

MEMORY ITEMS

The aim of such callouts is to callout the appropriate procedure by calling out, in most cases, the title of the procedure. This will allow the crew to be aware of the situation and be prepared to properly react (crew coordination, task sharing and communication).

GPWS

As soon as avoidance manoeuver is envisaged.
"PULL UP TOGA"

REACTIVE WINDSHEAR

"WINDSHEAR TOGA"

UNRELIABLE SPEED INDICATION

"UNRELIABLE SPEED"

TCAS

- **For aircraft equipped with AP/FD TCAS function :**

  As soon as a Traffic Advisory (TA) is triggered:

  - If the AP/FD TCAS mode is armed : "TCAS blue"
  - If the AP/FD TCAS mode does not arm : "TCAS, I have control"

- **For aircraft not equipped with AP/FD TCAS function :**

  As soon as a Traffic Advisory (TA) is triggered: "TCAS, I have control".

EMERGENCY DESCENT

"EMERGENCY DESCENT"

LOSS OF BRAKING

"LOSS OF BRAKING"

STALL RECOVERY

As soon as any stall indication is recognized.
"STALL, I have control"

STALL WARNING AT LIFT-OFF

"STALL, TOGA 15°"

ECAM ADVISORY CONDITIONS

Applicable to: ALL

SYSTEM	CONDITIONS	RECOMMENDED ACTION

Ident.: PRO-ABN-ABN-ADV-A-00012117.0001001 / 17 MAR 17

APU	FLAP OPEN Flap not fully closed when APU master switch is off.	
	EGT > EGT MAX - 33 °C (inhibited during APU start)	
	OIL QTY (message LOW OIL LEVEL pulsing)	If there is no oil leak, then the remaining oil quantity allows normal APU operation for about 10 h.

Ident.: PRO-ABN-ABN-ADV-A-00012107.0001001 / 31 AUG 17

CAB PR	CAB VERTICAL SPEED V/S > 1 800 ft/min	CPC changeover is recommended: MODE SEL : MAN Wait 10 s then: MODE SEL: AUTO
	CAB ALTITUDE altitude ≥ 8 800 ft	PACK FLOW: HI MODE SEL : MAN Manual pressure control
	ΔP ≥ 1.5 PSI in phase 7	LDG ELEV: ADJUST If unsuccessful: MODE SEL : MAN Manual pressure control

Ident.: PRO-ABN-ABN-ADV-A-00012112.0001001 / 17 MAR 17

ELEC	IDG OIL TEMP ≥ 147 °C	Reduce IDG load if possible (GALLEY or GEN OFF). If required, restore when temperature has dropped. Restrict use of generator to short time, if temperature rises again excessively.

Continued on the following page

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Ident.: PRO-ABN-ABN-ADV-A-00012122.0002001 / 02 MAY 17

SYSTEM	CONDITIONS	RECOMMENDED ACTION
ENG	OIL PRESS P < 16 PSI	- If oil pressure is between 16 and 13 PSI (advisory), continue normal operation. - If oil pressure is below 13 PSI (red indication) without the ENG OIL LO PR ECAM warning, continue normal engine operation (it can be assumed that the oil pressure transducer is faulty). In both cases, monitor other engine parameters especially oil temperature and oil quantity.
	OIL PRESS P > 90 PSI	Monitor other engine parameters closely for symptoms of engine malfunction. If high oil pressure is not accompanied by other abnormal indications operate engine normally for remainder of flight. Record high oil pressure and corresponding N2 readings for maintenance action.
	OIL TEMP T > 140 °C	A rise in oil temperature during normal steady-state operation indicates a system malfunction and should be closely monitored for other symptoms of engine malfunction. Note: *If the OIL TEMP rise follows thrust reduction, increasing thrust may reduce oil temperature.* In addition, a rise in oil temperature could be related to the IDG oil cooling system. To reduce oil temperature rise before limits are reached, the following are recommended: 1. Low Speed - Increase engine speed to increase fuel flow and thereby cool IDG oil. 2. High Speed - Reduce generator load or turn off generator. If oil temperature continues to rise, mechanically disconnect IDG.
	OIL QTY < 3 qt	If oil quantity low at high power setting, expect level increase after power reduction. Monitor affected engine oil parameters and crosscheck with other engine - If pressure and temperature remain normal, continue normal operation.
	NAC TEMP ≥ 240 °C	Monitor engine parameters and crosscheck with other engine
	VIBRATION N1 ≥ 6 units N2 ≥ 4.3 units	*Refer to PRO-ABN-ENG [QRH] HIGH ENGINE VIBRATION*

Continued on the following page

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SYSTEM	CONDITIONS	RECOMMENDED ACTION

Ident.: PRO-ABN-ABN-ADV-A-00012114.0001001 / 21 MAR 17

FUEL	Difference between wing fuel quantities greater than 1 500 kg (3 307 lb)	FUEL MANAGEMENT: CHECK If a fuel leak is suspected, *Refer to PRO-ABN-FUEL [QRH] FUEL LEAK*. For limitations, *Refer to LIM-FUEL Maximum Allowed Fuel Imbalance*
	Fuel temp greater than 45 °C in inner cell, or 55 °C in outer cell	GALLEY: OFF
	Fuel temp lower than -40 °C in inner or outer cell	Consider descending to a lower altitude and/or increasing Mach to increase TAT.

Ident.: PRO-ABN-ABN-ADV-A-00012119.0001001 / 17 MAR 17

OXY	OXY Amber when pressure is < 400 PSI.	If mask is not being used, check if it is correctly stowed, *Refer to DSC-35-20-10 Mask Stowage*.

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[MEM] MEMORY ITEMS

Applicable to: ALL

Ident.: PRO-ABN-ABN-MEM-ABN-MEM-00020871.0001001 / 17 MAR 17

BRAKES

[MEM] LOSS OF BRAKING (*Refer to procedure*)

Ident.: PRO-ABN-ABN-MEM-ABN-MEM-00020948.0001001 / 17 MAR 17

MISC

[MEM] EMER DESCENT (*Refer to procedure*)
[MEM] STALL RECOVERY (*Refer to procedure*)
[MEM] STALL WARNING AT LIFT OFF (*Refer to procedure*)

Ident.: PRO-ABN-ABN-MEM-ABN-MEM-00020949.0001001 / 01 JUN 17

NAV

[MEM] UNRELIABLE SPEED INDICATION (*Refer to procedure*)

Ident.: PRO-ABN-ABN-MEM-ABN-MEM-00020950.0002001 / 17 MAR 17

SURV

[MEM] GPWS/EGPWS CAUTIONS (*Refer to procedure*)
[MEM] GPWS/EGPWS WARNINGS (*Refer to procedure*)
[MEM] TCAS WARNINGS (*Refer to procedure*)
[MEM] WINDSHEAR (*Refer to procedure*)
[MEM] WINDSHEAR AHEAD (*Refer to procedure*)

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[QRH] PROCEDURES

Applicable to: ALL

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021342.0002001 / 17 MAR 17

A-ICE

[QRH] DOUBLE AOA HEAT FAILURE (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021355.0001001 / 17 MAR 17

AIR

[QRH] ENGINE 1+2 BLEED FAULT (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021352.0001001 / 17 MAR 17

BRAKES

[QRH] RESIDUAL BRAKING (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021343.0001001 / 17 MAR 17

CAB PR

[QRH] CABIN OVERPRESSURE (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021346.0001001 / 17 MAR 17

DOOR

[QRH] COCKPIT DOOR FAULT (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021511.0001001 / 17 MAR 17

EIS

[QRH] DISPLAY UNIT FAILURE (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021345.0002001 / 17 MAR 17

ELEC

[QRH] C/B TRIPPED (*Refer to procedure*)
[QRH] ELEC EMER CONFIG SYS REMAINING (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021356.0001001 / 17 MAR 17

ENG

[QRH] ENG DUAL FAILURE - FUEL REMAINING (*Refer to procedure*)
[QRH] ENG DUAL FAILURE - NO FUEL REMAINING (*Refer to procedure*)
[QRH] ENG RELIGHT IN FLIGHT (*Refer to procedure*)

[QRH] ENG STALL (*Refer to procedure*)
[QRH] ENG TAILPIPE FIRE (*Refer to procedure*)
[QRH] HIGH ENGINE VIBRATION (*Refer to procedure*)
[QRH] ON GROUND - NON ENG SHUTDOWN AFTER ENG MASTER OFF (*Refer to procedure*)
[QRH] ONE ENGINE INOPERATIVE - CIRCLING APPROACH (*Refer to procedure*)
[QRH] ONE ENGINE INOPERATIVE - STRAIGHT-IN APPROACH (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021347.0001001 / 17 MAR 17

F/CTL

[QRH] LANDING WITH SLATS OR FLAPS JAMMED (*Refer to procedure*)
[QRH] RUDDER JAM (*Refer to procedure*)
[QRH] STABILIZER JAM (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021348.0001001 / 17 MAR 17

FUEL

[QRH] FUEL IMBALANCE (*Refer to procedure*)
[QRH] FUEL LEAK (*Refer to procedure*)
[QRH] GRAVITY FUEL FEEDING (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021353.0001001 / 17 MAR 17

L/G

[QRH] LANDING WITH ABNORMAL L/G (*Refer to procedure*)
[QRH] L/G GRAVITY EXTENSION (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021358.0001001 / 22 MAR 17

MISC

[QRH] BOMB ON BOARD (*Refer to procedure*)
[QRH] COCKPIT WINDSHIELD / WINDOW ARCING (*Refer to procedure*)
[QRH] COCKPIT WINDSHIELD / WINDOW CRACKED (*Refer to procedure*)
[QRH] DITCHING (*Refer to procedure*)
[QRH] EMER EVAC (*Refer to procedure*)
[QRH] EMER LANDING (*Refer to procedure*)
[QRH] FORCED LANDING (*Refer to procedure*)
[QRH] OVERWEIGHT LANDING (*Refer to procedure*)
[QRH] SEVERE TURBULENCE (*Refer to procedure*)
[QRH] TAILSTRIKE (*Refer to procedure*)
[QRH] VOLCANIC ASH ENCOUNTER (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021354.0001001 / 17 MAR 17

NAV

[QRH] ADR 1+2+3 FAULT (*Refer to procedure*)
[QRH] ADR CHECK PROC (*Refer to procedure*)
[QRH] IR ALIGNMENT IN ATT MODE (*Refer to procedure*)
[QRH] NAV FM / GPS POS DISAGREE (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00020870.0001001 / 17 MAR 17

SMOKE

[QRH] SMOKE / FUMES / AVNCS SMOKE (*Refer to procedure*)
[QRH] REMOVAL OF SMOKE / FUMES (*Refer to procedure*)
[QRH] SMOKE / FIRE FROM LITHIUM BATTERY (*Refer to procedure*)

Ident.: PRO-ABN-ABN-QRH-ABN-QRH-00021512.0001001 / 17 MAR 17

WHEEL

[QRH] WHEEL TIRE DAMAGE SUSPECTED (*Refer to procedure*)

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SYSTEM RESET - GENERAL

Applicable to: ALL

Ident.: PRO-ABN-ABN-RESET-A-00012644.0001001 / 17 MAR 17

Some systems that operate abnormally can be recovered by a reset. The flight crew can perform a system reset with the use of:

- The associated cockpit control, or
- The associated circuit breaker.

WARNING	Only perform one reset at a time, unless indicated differently.

Ident.: PRO-ABN-ABN-RESET-A-00012645.0001001 / 17 MAR 17

Guidelines to reset a system:
- Set the related normal cockpit control to OFF, or pull the corresponding circuit breaker
- Wait 3 s if a normal cockpit control is used, or 5 s if a circuit breaker is used (unless a different time is indicated)
- Set the related normal cockpit control to ON, or push the corresponding circuit breaker
- Wait 3 s for the end of the reset.

Note: The flight crew should report any in-flight reset to the maintenance.

Ident.: PRO-ABN-ABN-RESET-A-00014340.0001001 / 22 MAR 17

■ On ground:

Reset ECU (CFM) or EEC (IAE) or EIU only when engine shut down.

Reset BSCU only when aircraft stopped.

Systems not listed in the System Reset Table can be reset following the guidelines described above.

■ In flight:

WARNING	The flight crew can attempt a system reset only when: - An ECAM /OEB /FCOM /QRH procedure requests to reset the system, or - The System Reset Table permits.

CAUTION	Do not pull the following circuit breakers: - SFCC - ECU or EEC or EIU.

Note: Before taking any action on the cockpit C/B s, both the PF and PM must crosscheck and ensure the C/B label corresponds to the affected system.

Refer to System Reset Table.

SYSTEM RESET TABLE

Applicable to: ALL

ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure
A-ICE	ANTI ICE L(R)/WINDSHIELD (WINDOW) (WHC)	*Refer to PRO-ABN-A-ICE ANTI ICE L(R) WINDSHIELD*, if applicable.

Ident.: PRO-ABN-ABN-RESET-B-00012654.0001001 / 20 MAR 17

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Ident.: PRO-ABN-ABN-RESET-B-00021069.0001001 / 20 MAR 17

ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure
AIR	AIR ENG 1(2) BLEED FAULT or AIR ENG 1(2) BLEED ABNORM PR (Engine Bleed Supply System)	*Note: Do not attempt more than one reset.* **On ground or in flight** • **If the PACK (non-affected side) is operative, and If the Wing Anti-Ice is OFF:** - ENG BLEED (affected side)..............................OFF ■ **If the ENG BLEED (affected side) pb-sw FAULT light is on:** - Delay application of the reset until FAULT light extinguishes. ■ **If the ENG BLEED (affected side) pb-sw FAULT light is off:** - X BLEED...AUTO - PACK (affected side).................................ON - ENG BLEED (affected side)......................ON - Check that the affected Engine Bleed Valve is open on the BLEED SD page. • **If** AIR ENG (AFFECTED) BLEED FAULT **alert or** AIR ENG (AFFECTED) BLEED ABNORM PR **alert reoccurs, or If Engine Bleed Valve (affected side) not open on the** BLEED SD page**:** - ENG BLEED (affected side)...............OFF - X BLEED.......................................OPEN *Note: Record the ENG BLEED reset in the logbook (successful or unsuccessful).*
	AIR ENG 1(2) BLEED NOT CLSD (Engine Bleed Supply System)	*Note: Do not attempt more than one reset.* **On ground only** - ENG BLEED (affected side)..............................OFF ■ **If the ENG BLEED (affected side) pb-sw FAULT light is on:** - Delay application of the reset until FAULT light extinguishes. ■ **If the ENG BLEED (affected side) pb-sw FAULT light is off:** - ENG BLEED (affected side)......................ON - Check that the affected Engine Bleed Valve is closed on the BLEED SD page. *Note: Record the ENG BLEED reset in the logbook (successful or unsuccessful).*

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ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure
		Ident.: PRO-ABN-ABN-RESET-B-00021067.0001001 / 21 MAR 17
AUTO FLT	AUTO FLT FCU 1(2) FAULT (FCU)	**In flight:** - Pull the C/B B05 on 49VU for FCU 1, or M21 on 121VU for FCU 2 - Push it after 5 s - Check the displayed targets and the barometer reference, and correct them if necessary. **On ground:** - Pull the C/B B05 on 49VU for FCU 1, or M21 on 121VU for FCU 2 - Push it after 5 s - If AUTO FLT FCU 1+2 FAULT disappears, check the displayed targets and barometer reference, and correct them if necessary (RESET successful) - If AUTO FLT FCU 1+2 FAULT remains, pull both C/B B05 on 49VU and M21 on 121VU - Push them after 7 min , with a delay of less than 5 s between side 1 and 2 - Wait at least 30 s for FCU 1 and FCU 2 safety tests completion - Check the displayed targets and barometer reference, and correct them if necessary (RESET successful).
	AUTO FLT FCU 1 + 2 FAULT (FCU)	**In flight:** - Pull the C/B B05 on 49VU for FCU 1, and then pull M21 on 121VU for FCU 2 - Push them after 5 s - Check the displayed targets and the barometer reference, and correct them if necessary. **On ground:** - Pull the C/B B05 on 49VU for FCU 1, and then pull M21 on 121VU for FCU 2 - Push the C/Bs after 5 s - If AUTO FLT FCU 1(2) FAULT disappears, check the displayed targets and barometer reference, and correct them if necessary (RESET successful) - If AUTO FLT FCU 1(2) FAULT remains, pull again both C/B B05 on 49VU and M21 on 121VU - Push them after 7 min , with a delay of less than 5 s between side 1 and 2 - Wait at least 30 seconds for FCU 1 and FCU 2 safety tests completion - Check the displayed targets and barometer reference, and correct them if necessary (RESET successful)

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ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure
		FCU targets are synchronized on current aircraft values and displayed as selected targets. - Re–enter the barometer altimeter setting value, if necessary.
	AUTO FLT YAW DAMPER 1(2) FAULT (FAC 1(2))	*Refer to PRO-ABN-AUTO_FLT AUTO FLT YAW DAMPER 1(2)*, if applicable.
	AUTO FLT REAC W/S DET FAULT (FAC 1+2)	For Reactive Windshear Detection Fault. Depending on aircraft configuration, *Refer to PRO-ABN-AUTO_FLT AUTO FLT REAC W/S DET FAULT* or *Refer to PRO-ABN-W_S WINDSHEAR DET FAULT*.
	One MCDU locked or blank (MCDU)	**On ground, or in fligth:** - Pull the C/B for the locked or blanck MCDU and push it back after 10 s. The circuit breakers for the MCDUs are: • AUTO FLT /MCDU 1 B1 ON 49 VU (Overhead Panel) • AUTO FLT /MCDU 2 N20 ON 121 VU (Right Rear Maintenance Panel) • AUTO FLT /MCDU 3 N21 ON 121 VU (Right Rear Maintenance Panel)
	Both MCDU locked or blank or FMGC malfunction (FMGC)	**On ground:** - Apply external power or APU generator power - Wait 2 min before resetting the FMGC circuit breakers - FD 1(or 2) (OFF) - Pull the C/B of the affected FMGC and reset it after 10 s. The circuit breakers for the FMGCs are: • AUTO FLT /FMGC 1 B2 ON 49 VU (Overhead Panel) • AUTO FLT /FMGC 2 M17 ON 121 VU (Right Rear Maintenance Panel) **CAUTION** Always wait 1 min after the "PLEASE WAIT" message disappears from the MCDU , before engaging or reengaging the FD s and the AP of the reset FMGC. *Note: Due to electrical transient, MANUAL FMGS RESET procedure may be unsuccessful. If so, the flight crew may attempt the same procedure with engines not running.* **In flight:** - FD 1(or 2) (OFF) - Pull the C/B of the affected FMGC and reset it after 10 s. The circuit breakers for the FMGCs are: • AUTO FLT /FMGC 1 B2 ON 49 VU (Overhead Panel)

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ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure
		• AUTO FLT /FMGC 2 M17 ON 121 VU (Right Rear Maintenance Panel) **CAUTION** Always wait 1 min after the "PLEASE WAIT" message disappears from the MCDU , before engaging or reengaging the FD s and the AP of the reset FMGC.

Ident.: PRO-ABN-ABN-RESET-B-00021056.0001001 / 20 MAR 17

BRAKES	BRAKES SYS 1(2) FAULT
	or
	BRAKES BSCU CH 1(2) FAULT
	(BSCU)
		On ground:
		- STOP aircraft
		- Set PARK BRK handle to ON
		- Confirm that towing bar is disconnected
		- Set A/SKID & N/W STRG sw to OFF
		- Set A/SKID & N/W STRG sw to ON.
		• IF UNSUCCESSFUL:
		  - Pull C/B s M33 and M34 on 121VU for BSCU channel 1
		  - Pull C/B s M36 and M35 on 121VU for BSCU channel 2
		  - Push C/Bs.
		
		After a successful reset, resume to normal operation.
		Note: *After any BSCU reset:*
		1. Check brake efficiency
		2. Record BSCU reset in the logbook.
		
		In flight:
		When landing gear is up only:
		- Set A/SKID & N/W STRG sw to OFF
		- Set A/SKID & N/W STRG sw to ON
		- If required, rearm the autobrake.
		When landing gear is down: reset not authorized.
		Note: *After any BSCU reset:*
		- Record BSCU reset in the logbook.

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Ident.: PRO-ABN-ABN-RESET-B-00021089.0004001 / 20 MAR 17

ECAM System	**System malfunction or ECAM Alert (Affected System)**	**Reset Procedure**
COM	COM CIDS 1+2 FAULT (CIDS)	**On ground, or in flight:** - Pull the C/Bs in the following order: G01 on 49VU , M05 on 121VU G02 on 49VU , M06 on 121VU - Wait 10 s, then - Push the C/Bs in the following order: M05, M06, G01, G02 - After CIDS reset, wait approximately 4 min, before recovering normal operation.
	Uncommanded EVAC horn activation (CIDS)	**On ground, or in flight:** Press the EVAC HORN SHUT OFF pb. Set the EVAC CAPT & PURS/CAPT sw to the CAPT only position. Wait for 3 s. • IF UNSUCCESSFUL: - Pull the C/B s for DIR 2 in the following order: G02 on 49VU , M06 on 121VU. • IF UNSUCCESSFUL: - Pull the C/B s for DIR 1 in the following order: G01 on 49VU , M05 on 121VU - Wait for 1 min, then - Push the C/B s for DIR 2 in the following order: M06, G02 - After CIDS reset, wait approximately 4 min, before recovering normal operation.
	Frozen RMP (RMP)	**On ground, or in flight:** The flight crew must reset all the RMP s one after the other via the RMP control panel: - Set RMP ON/OFF sw to OFF position - Wait 5 s - Set RMP ON/OFF sw to ON position.
	FAP freezing (FAP or Tape reproducer/PRAM)	**On ground, or in flight:** - Pull C/B M14 (or Q14) of the FAP in the 121VU - Wait 10 s before pushing the C/B. • IF UNSUCCESSFUL: - Pull the tape reproducer/PRAM C/B D01 or E01 or F07 on 2000VU (cabin)

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ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure
		- Wait 10 s before pushing the C/B.
	Failure messages on the CIDS FAP in the cabin (VSC)	**On ground, or in flight:** - Pull C/B A06 or B06 on 2001VU, aft cabin - Wait 30 s , then push the C/B.

Ident.: PRO-ABN-ABN-RESET-B-00012659.0001001 / 03 AUG 17

DATALINK	ATSU Malfunction (ATSU)	The ATSU reset should be attempted, only if: - Key selection has no effect on the DCDU or any of the MCDU ATSU DATALINK submenus - ADS-C or CPDLC are inoperative When the ATSU is reset, the following connections are no longer active: - CPDLC: • The flight crew should send a notification to the ATC center to re-establish the CPDLC connection - ADS-C: • As no ADS-C disconnect message is sent, the ATC center(s) assumes that the ADS-C connection is still alive • The flight crew must check that ADS-C is ARMED or ON. **On ground or in flight:** - Pull the C/B s in the following order: L16, L15 on 121VU - Wait 5 s, then - Push the C/Bs in the following order: L15, L16.

Ident.: PRO-ABN-ABN-RESET-B-00012650.0001001 / 20 MAR 17

ELEC	GPU cannot be connected to the aircraft (GAPCU)	**On ground only:** The GPU cannot be connected to the electrical network of the aircraft (AVAIL light is OFF): • If at least one power source (IDG 1 or 2, APU GEN or batteries) is connected to the electrical network of the aircraft - Reset the EXT PWR pb switch on 35VU (Press and release). • If no power source is connected to the electrical network of the aircraft - Set the BAT 1 pb-sw and BAT 2 pb-sw to AUTO.

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ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure

Ident.: PRO-ABN-ABN-RESET-B-00012660.0001001 / 20 MAR 17

ENG	ENG 1(2) FADEC A(B) FAULT (FADEC)	*Refer to PRO-ABN-ENG ENG 1(2) FADEC A(B) FAULT*, if applicable.

Ident.: PRO-ABN-ABN-RESET-B-00012652.0001001 / 20 MAR 17

F/CTL	F/CTL ELAC 1(2) FAULT F/CTL ALTN LAW F/CTL ELAC 1(2) PITCH FAULT (ELAC)	*Refer to PRO-ABN-F/CTL section for associated procedure*, if applicable.
	ELAC or SEC malfunction (ELAC or SEC)	ELAC or SEC may be reset. **WARNING** Do not reset more than one computer at a time. It is possible to reset flight control computers in flight, event if not requested by the ECAM, provided only one reset is performed at a time. *Note: When an ELAC reset is performed on ground the crew must check the pitch trim position. If a reset is performed on ground, the flight crew must then perform a flight control check, Refer to PRO-NOR-SOP-10-TAXI.*

Ident.: PRO-ABN-ABN-RESET-B-00012653.0018001 / 20 MAR 17

FUEL	Loss of fuel quantity indication or Simultaneous triggering of FUEL L OUTER XFR CLOSED and FUEL R OUTER XFR CLOSED, although FUEL SD indicates no anomaly. (FQIC)	**On ground, or in flight:** - Pull the 3 C/Bs: • Channel 1 (A13 on 49VU) • Channel 2 (M27 on 121VU) • Channel 1 and 2 (L26 on 121VU). - Wait 5 s, before pushing the 3 C/Bs. *Note: The fuel quantity indication will be re-established within 1 min.*

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ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure

Ident.: PRO-ABN-ABN-RESET-B-00012655.0002001 / 20 MAR 17

FWC	FWS FWC 1(2) FAULT (FWC)	**On ground:** Pull, then push, the C/B of the affected FWC: - FWC 1 (F01 on 49VU) - FWC 2 (Q7 on 121VU). Wait 50 s after pushing the C/Bs. **In flight:** Pull, then push, the C/B of the affected FWC: - FWC 1 (F01 on 49VU) - FWC 2 (Q7 on 121VU).

Ident.: PRO-ABN-ABN-RESET-B-00021057.0001001 / 21 MAR 17

L/G	L/G LGCIU 1(2) FAULT
	(LGCIU 1(2))
		On ground only:
		The flight crew must depressurize the green hydraulic system before resetting the LGCIU:
		- ENG 1 PUMP OFF
		- PTU OFF.
		When there is no green hydraulic pressure:
		- To reset LGCIU 1:
		  • Pull C/B Q34 on 121VU , then C09 on 49VU
		  • Wait for 15 s , then push the C/Bs.
		- To reset LGCIU 2:
		  • Pull C/B Q35 on 121VU
		  • Wait for 15 s , then push the C/B.
		After the LGCIU reset, restore green hydraulic pressure (ENG 1 PUMP ON, PTU AUTO).

Ident.: PRO-ABN-ABN-RESET-B-00012657.0001001 / 20 MAR 17

NAV	NAV TCAS FAULT (TCAS)	**On ground only:** - Pull C/B K10 on 121VU. - Wait 5 s, then push the C/B.

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ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure

Ident.: PRO-ABN-ABN-RESET-B-00012651.0011001 / 20 MAR 17

SMOKE	SMOKE DET FAULT (SDCU)	**On ground only:** - Pull C/B C06 on 49VU , and C/B T18 on 122VU - Wait 10 s before pushing the C/Bs.

Ident.: PRO-ABN-ABN-RESET-B-00021071.0001001 / 20 MAR 17

VENT	VENT AVNCS SYS FAULT (AEVC)	**On ground only:** - Pull C/B Y17 on 122VU - Wait 5 s before pushing the C/B.

Ident.: PRO-ABN-ABN-RESET-B-00021068.0001001 / 20 MAR 17

WINDSHEAR	WINDSHEAR DET FAULT or AUTO FLT REAC W/S DET FAULT (FAC 1+2)	For Reactive Windshear Detection Fault. Depending on aircraft configuration, refer to PRO-ABN-22 AUTO FLT REAC W/S DET FAULT or to PRO-ABN-22 WINDSHEAR DET FAULT.

Ident.: PRO-ABN-ABN-RESET-B-00021058.0001001 / 20 MAR 17
Impacted by TDU: 00021059 System Reset Table - WHEEL

WHEEL	WHEEL N.W STEER FAULT or WHEEL N/W STRG FAULT (BSCU)	**On ground only:** - STOP aircraft - Set PARK BRK handle to ON - Confirm that towing bar is disconnected - Set A/SKID & N/W STRG sw to OFF - Set A/SKID & N/W STRG sw to ON. In the case of a WHEEL N/W STRG FAULT, the flight crew may attempt a BSCU reset. However, even if the BSCU reset is successful, the flight crew must return to the gate for troubleshooting. The taxi speed must not exceed 10 kt. *Note: After any BSCU reset:* *1. Check brake efficiency* *2. Record the BSCU reset in the logbook.*

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ECAM System	System malfunction or ECAM Alert (Affected System)	Reset Procedure
Ident.: TDU / PRO-ABN-ABN-RESET-B-00021059.0001001 / 20 MAR 17 Impacted DU: 00021058 System Reset Table - WHEEL		
WHEEL	WHEEL N.W STEER FAULT or WHEEL N/W STRG FAULT (BSCU)	**On ground only:** **Case A** If the three conditions below are fulfilled: - the WHEEL N/W STRG FAULT alert was triggered just after engine start - the N/W STRG DISC memo was displayed before the start of the pushback (before the aircraft starts moving) - the N/W STRG DISC memo remained displayed even after the pushback is finished (nosewheel steering selector bypass pin is in the steering position). Apply the below reset procedure. If the ECAM alert disappears after the reset, the flight crew may continue the flight without troubleshooting. **Case B** In all other cases, including in case of doubt on the above conditions, troubleshooting must be performed before continuing the flight, even if the ECAM alert disappears after the reset. For a return to the gate : - Apply the below reset procedure - The taxi speed must not exceed 10 kt. **Reset Procedure:** - STOP aircraft - Set PARK BRK handle to ON - Confirm that towing bar is disconnected - Set A/SKID & N/W STRG sw to OFF - Set A/SKID & N/W STRG sw to ON. *Note:* *After any BSCU reset:* *1. Check brake efficiency* *2. Check absence of aircraft veering* *3. Record the BSCU reset in the logbook.*

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[QRH] DOUBLE AOA HEAT FAILURE

Ident.: PRO-ABN-A-ICE-00010253.0002001 / 17 MAR 17
Applicable to: ALL

In the case of double failure of alpha probe heaters, the choice made by the computers among the 3 ADR values may be erroneous.

One of affected ADRs....................OFF

Keep preferably ADR 1 available as ADR1 is supplied in EMER ELEC config.

NAV ADR 1(2)(3) FAULT
In the case of disagreement between the two remaining ADR s, the NAV ADR DISAGREE ECAM alert will trigger.

ANTI ICE ALL PITOT

Applicable to: ALL

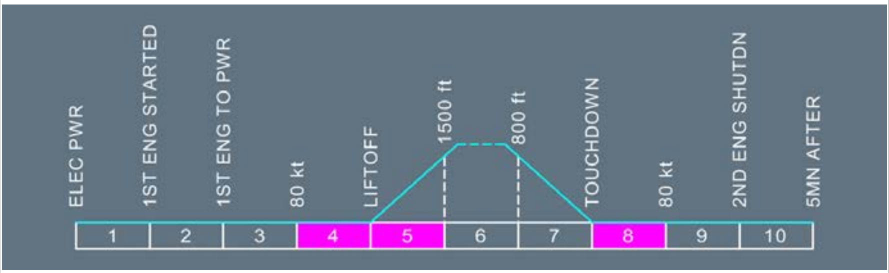
Ident.: PRO-ABN-A-ICE-U-00017184.0003001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating systems of the CAPT , F/O and STBY pitot probes are failed.

Flight Phase Inhibition:



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ANTI ICE ALL PITOT (Cont'd)

Ident.: PRO-ABN-A-ICE-U-00018180.0004001 / 21 MAR 17

L2 In the case of simultaneous pitot icing and in the same amount, ADR 1, ADR 2, and ADR 3 speeds will be in agreement, but incorrect. The following ECAM procedure avoids that the flight controls use erroneous, but coherent, sources.

L1 ADR 1(2)(3) P/B...OFF

L2 *Depending on the status of the static, AOA , and TAT heating, the ECAM requires that either ADR 1, 2 or 3 be switched OFF.*

Note: In the case of subsequent, significant, speed discrepancy between the two remaining ADR s, the "ADR DISAGREE" ECAM caution will trigger.

L1 ● **IF ICING EXPECTED:**

ADR 2(3) P/B...OFF

L2 *Depending on the status of the static, AOA , and TAT heating, the ECAM requires that either ADR 2 or 3 be switched OFF.*

L1 UNREL SPD PROC...APPLY

L2 *Only one ADR is available, and the corresponding pitot probe may be affected by ice accretion. Be prepared to use the UNRELIABLE SPEED INDICATION procedure (Refer to procedure).*

L12

ASSOCIATED PROCEDURES

NAV ADR FAULT

Single ADR FAULT or double ADR FAULT ECAM cautions may trigger, depending on the number of ADRs switched OFF.

L12

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)

Alternate law becomes active, if:
- *One ADR was already switched OFF, and the two remaining ADRs are not in agreement, or*
- *Two ADRs were switched OFF.*

Continued on the following page

ANTI ICE ALL PITOT (Cont'd)

Ident.: PRO-ABN-A-ICE-U-00018298.0002001 / 21 MAR 16

STATUS

- **IF ICING EXPECTED:**
  - ADR 2(3) P/B.. OFF
  - UNREL SPD PROC...APPLY

INOP SYS

CAPT PITOT
F/O PITOT
STBY PITOT
CAPT PROBES [1]
F/O PROBES [2]
STBY PROBES [3]
STEEP APPR (If in ALTN LAW)

[1] *(If all CAPT PROBES heating is lost)*
[2] *(If all F/O PROBES heating is lost)*
[3] *(If all STBY PROBES heating is lost)*

ANTI ICE CAPT(F/O) TAT

Applicable to: ALL

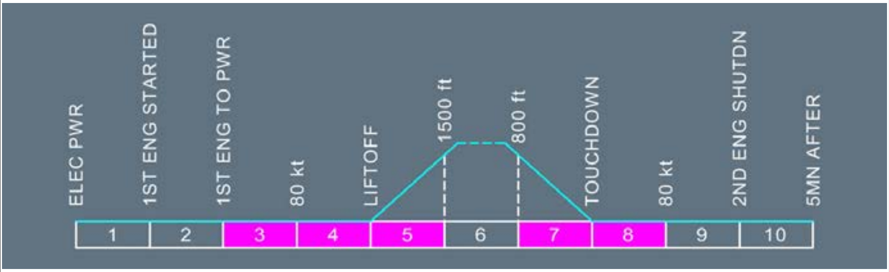
Ident.: PRO-ABN-A-ICE-E-00017171.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating system of the corresponding probe is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-A-ICE-E-00018299.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-A-ICE-E-00018889.0001001 / 21 MAR 16

STATUS

INOP SYS

CAPT(F/O) TAT

ANTI ICE CAPT + F/O PITOT

Applicable to: ALL

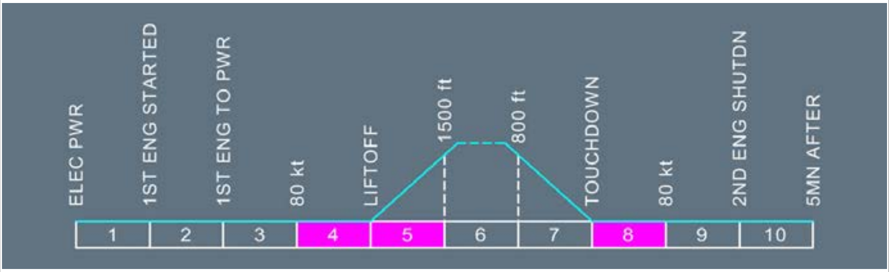
Ident.: PRO-ABN-A-ICE-R-00017177.0003001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating systems of the CAPT and F/O pitot probes are failed.

Flight Phase Inhibition:



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ANTI ICE CAPT + F/O PITOT (Cont'd)

Ident.: PRO-ABN-A-ICE-R-00018300.0002001 / 21 MAR 17

L2 In the case of simultaneous pitot icing and in the same amount, ADR 1 and ADR 2 speeds will be in agreement, but incorrect. Therefore, flight controls will consider the remaining correct source as being faulty, and will reject the only correct source. The following ECAM procedure avoids that the flight controls use two erroneous, but coherent, sources.

L1 ■ **If ADR 3 operative and ON:**

ADR 1(2) P/B...OFF

L2 *Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1 or 2 be switched OFF*

Note: In the case of subsequent, significant, speed discrepancy between the two remaining ADR s, the "ADR DISAGREE" ECAM caution will trigger.

L1 ■ **If ADR 3 failed or OFF:**

L2 No action is required, as long as there are no icing conditions, in order to keep two independent speed sources.

L1 ● **IF ICING EXPECTED:**

ADR 1(2) P/B...OFF

L2 *Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1 or 2 be switched OFF.*

L1 UNREL SPD PROC...APPLY

L2 *Only one ADR is available, and the corresponding pitot probe may be affected by ice accretion. Be prepared to use the UNRELIABLE SPEED INDICATION procedure (Refer to procedure).*

L1

ASSOCIATED PROCEDURES

NAV ADR FAULT

Continued on the following page

ANTI ICE CAPT + F/O PITOT (Cont'd)

Ident.: PRO-ABN-A-ICE-R-00018301.0002001 / 21 MAR 16

STATUS

- **If ADR 3 failed or OFF:**
  - **IF ICING EXPECTED:**
    ADR 1(2) P/B....................OFF
    UNREL SPD PROC....................APPLY

INOP SYS

CAPT PITOT
F/O PITOT
CAPT PROBES (1)
F/O PROBES (2)

(1) *(If all CAPT PROBES heating is lost)*
(2) *(If all F/O PROBES heating is lost)*

ANTI ICE CAPT + STBY PITOT

Applicable to: ALL

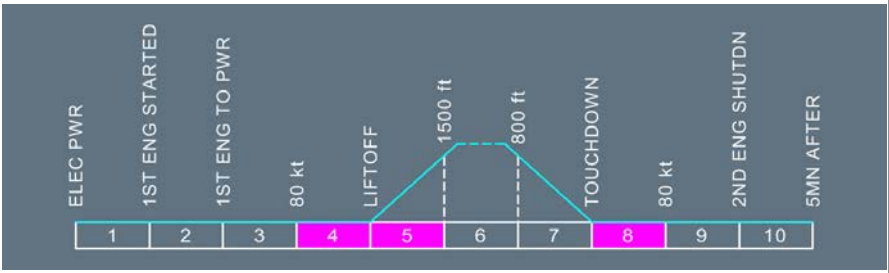
Ident.: PRO-ABN-A-ICE-S-00017178.0003001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating systems of the CAPT and STBY pitot probes are failed.

Flight Phase Inhibition:



Continued on the following page

ANTI ICE CAPT + STBY PITOT (Cont'd)

Ident.: PRO-ABN-A-ICE-S-00018302.0002001 / 21 MAR 17

L2 In the case of simultaneous pitot icing and in the same amount, ADR 1 and ADR 3 speeds will be in agreement, but incorrect. Flight controls will consider the remaining correct source as being faulty, and will reject the only correct source. The following ECAM procedure avoids that the flight controls use two erroneous, but coherent, sources.

L1 ■ **If ADR 2 operative and ON:**

ADR 1(3) P/B....................OFF

L2 *Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1 or 3 be switched OFF*

Note: In the case of subsequent, significant, speed discrepancy between the two remaining ADR s, the “ADR DISAGREE” ECAM caution will trigger.

L1 ■ **If ADR 2 failed or OFF:**

L2 No action is required, as long as there are no icing conditions, in order to keep two independent speed sources.

L1 ● **IF ICING EXPECTED:**

ADR 1(3) P/B....................OFF

L2 *Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1 or 3 be switched OFF.*

L1 UNREL SPD PROC....................APPLY

L2 *Only one ADR is available, and the corresponding pitot probe may be affected by ice accretion. Be prepared to use the UNRELIABLE SPEED INDICATION procedure (Refer to procedure).*

L1

ASSOCIATED PROCEDURES

NAV ADR FAULT

Continued on the following page

ANTI ICE CAPT + STBY PITOT (Cont'd)

Ident.: PRO-ABN-A-ICE-S-00018303.0002001 / 21 MAR 16

STATUS

- **If ADR 2 failed or OFF:**
  - **IF ICING EXPECTED:**
    ADR 1(3) P/B....................OFF
    UNREL SPD PROC....................APPLY

INOP SYS

CAPT PITOT
STBY PITOT
CAPT PROBES [1]
STBY PROBES [2]

(1) *(If all CAPT PROBES heating is lost)*
(2) *(If all STBY PROBES heating is lost)*

ANTI ICE CAPT PITOT OR L(R) STAT OR AOA

Applicable to: ALL

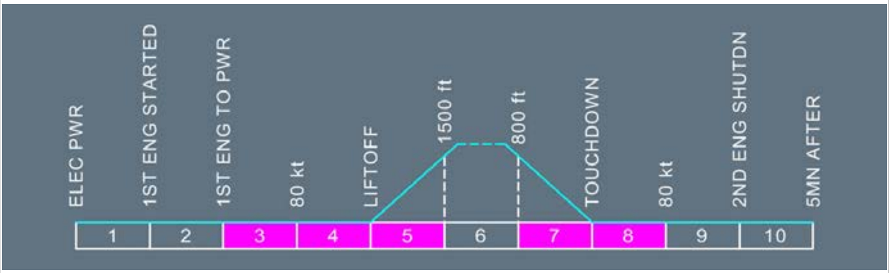
Ident.: PRO-ABN-A-ICE-C-00017169.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating system of the corresponding probe is failed.

Flight Phase Inhibition:



Continued on the following page

ANTI ICE CAPT PITOT OR L(R) STAT OR AOA (Cont'd)

Ident.: PRO-ABN-A-ICE-C-00018310.0002001 / 21 MAR 16

AIR DATA SWTG .... CAPT 3

L2 *ADR 3 supplies data to PFD 1 and ND 1.*

Note: *AIR DATA SWTG should not be selected to CAPT 3 if ADR 3 is not available.*

Ident.: PRO-ABN-A-ICE-C-00018900.0001001 / 21 MAR 16

STATUS

INOP SYS

CAPT PITOT
CAPT L(R) STAT
CAPT AOA

ANTI ICE CAPT PROBES

Applicable to: ALL

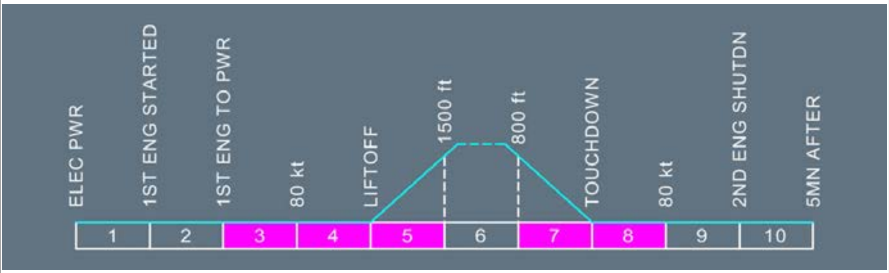
Ident.: PRO-ABN-A-ICE-G-00017173.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the captain probe heat computer is failed.

Flight Phase Inhibition:



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ANTI ICE CAPT PROBES (Cont'd)

Ident.: PRO-ABN-A-ICE-G-00010255.0002001 / 05 AUG 10

AIR DATA SWTG... CAPT 3

L2 *Note: AIR DATA SWTG should not be selected to CAPT 3 if ADR 3 is not available.*

Ident.: PRO-ABN-A-ICE-G-00010256.0001001 / 05 AUG 10

STATUS

INOP SYS

CAPT PROBES

ANTI ICE ENG 1(2) VALVE CLSD

Applicable to: ALL

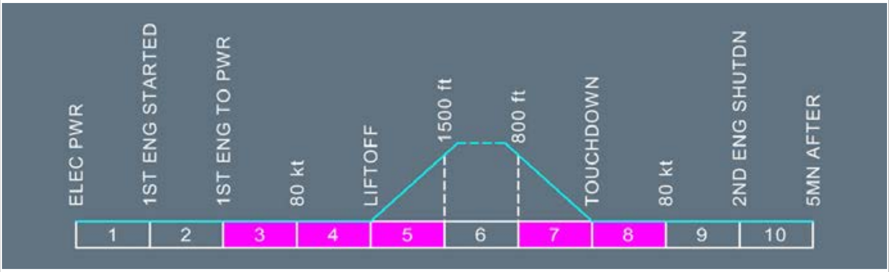
Ident.: PRO-ABN-A-ICE-J-00017163.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the valve is abnormally closed.

Flight Phase Inhibition:



Ident.: PRO-ABN-A-ICE-J-00010269.0001001 / 05 AUG 10

AVOID ICING CONDITIONS

Continued on the following page

ANTI ICE ENG 1(2) VALVE CLSD (Cont'd)

Ident.: PRO-ABN-A-ICE-J-00010270.0001001 / 05 AUG 10

STATUS

AVOID ICING CONDITIONS	**INOP SYS**
	ENG 1 (2) A. ICE

ANTI ICE ENG 1(2) VALVE OPEN

Applicable to: ALL

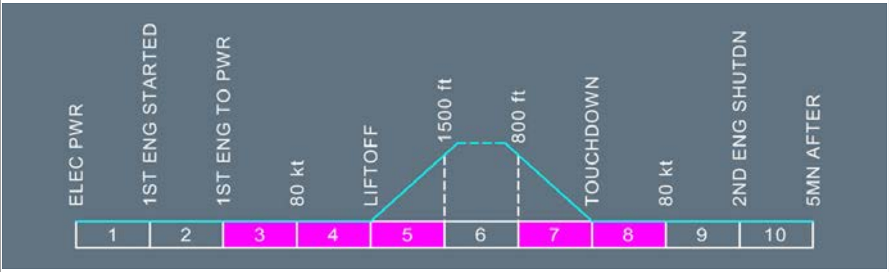
Ident.: PRO-ABN-A-ICE-K-00017162.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the valve is abnormally open.

Flight Phase Inhibition:



Ident.: PRO-ABN-A-ICE-K-00010272.0001001 / 05 AUG 10

THRUST LIM PENALTY

Continued on the following page

ANTI ICE ENG 1(2) VALVE OPEN (Cont'd)

Ident.: PRO-ABN-A-ICE-K-00010273.0001001 / 05 AUG 10

STATUS

THRUST LIM PENALTY

ANTI ICE F/O + STBY PITOT

Applicable to: ALL

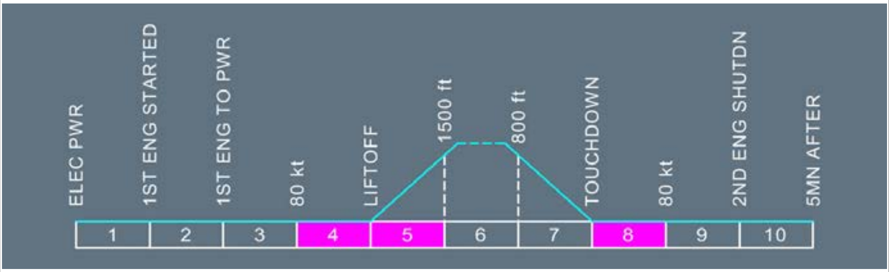
Ident.: PRO-ABN-A-ICE-T-00017179.0003001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating systems of the F/O and STBY pitot probes are failed.

Flight Phase Inhibition:



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ANTI ICE F/O + STBY PITOT (Cont'd)

Ident.: PRO-ABN-A-ICE-T-00018307.0002001 / 21 MAR 17

L2 In the case of simultaneous pitot icing and in the same amount, ADR 2 and ADR 3 speeds will be in agreement, but incorrect. Therefore, flight controls will consider the remaining correct source as being faulty, and will reject the only correct source. The following ECAM procedure avoids that the flight controls use two erroneous, but coherent, sources.

L1 ■ **If ADR 1 operative and ON:**

ADR 2(3) P/B....................OFF

L2 *Depending on the status of the static, AOA , and TAT heating, the ECAM requires that either ADR 2 or 3 be switched OFF.*

Note: In the case of subsequent, significant, speed discrepancy between the two remaining ADR s, the "ADR DISAGREE" ECAM caution will trigger.

L1 ■ **If ADR 1 failed or OFF:**

L2 No action is required, as long as there are no icing conditions, in order to keep two independent speed sources.

L1 ● **IF ICING EXPECTED:**

ADR 2(3) P/B....................OFF

L2 *Depending on the status of the static, AOA , and TAT heating, the ECAM requires that either ADR 2 or 3 be switched OFF.*

L1 UNREL SPD PROC....................APPLY

L2 *Only one ADR is available, and the corresponding pitot probe may be affected by ice accretion. Be prepared to use the UNRELIABLE SPEED INDICATION procedure (Refer to procedure).*

L1

ASSOCIATED PROCEDURES

NAV ADR FAULT

Continued on the following page

ANTI ICE F/O + STBY PITOT (Cont'd)

Ident.: PRO-ABN-A-ICE-T-00018308.0002001 / 21 MAR 16

STATUS

- **If ADR 1 failed or OFF:**
  - **IF ICING EXPECTED:**
    ADR 2(3) P/B....................OFF
    UNREL SPD PROC....................APPLY

INOP SYS

F/O PITOT
STBY PITOT
F/O PROBES [1]
STBY PROBES [2]

(1) *(If all F/O PROBES heating is lost)*
(2) *(If all STBY PROBES heating is lost)*

ANTI ICE F/O PITOT OR L(R) STAT OR AOA

Applicable to: ALL

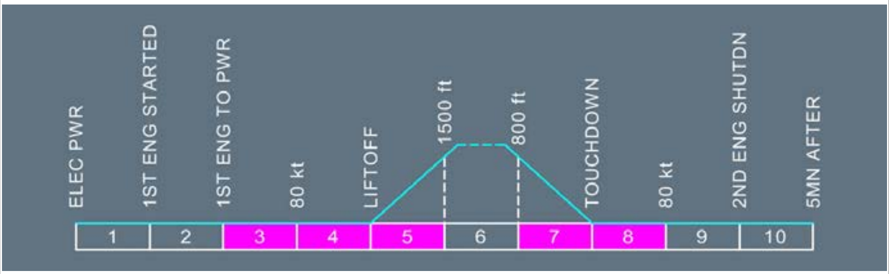
Ident.: PRO-ABN-A-ICE-D-00017170.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating system of the corresponding probe is failed.

Flight Phase Inhibition:



Continued on the following page

ANTI ICE F/O PITOT OR L(R) STAT OR AOA (Cont'd)

Ident.: PRO-ABN-A-ICE-D-00018309.0002001 / 21 MAR 16

AIR DATA SWTG..F/O 3

L2 *ADR 3 supplies data to PFD 2 and ND 2.*

Note: *AIR DATA SWTG should not be selected to F/O 3 if ADR 3 is not available.*

Ident.: PRO-ABN-A-ICE-D-00018901.0001001 / 21 MAR 16

STATUS

INOP SYS

F/O PITOT
F/O L(R) STAT
F/O AOA

ANTI ICE F/O PROBES

Applicable to: ALL

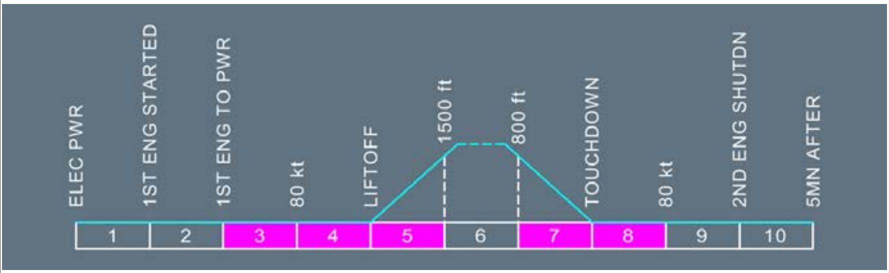
Ident.: PRO-ABN-A-ICE-H-00017174.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the F/O probe heat computer is failed.

Flight Phase Inhibition:



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ANTI ICE F/O PROBES (Cont'd)

Ident.: PRO-ABN-A-ICE-H-00010261.0002001 / 05 AUG 10

AIR DATA SWTG..F/O 3

L2 *Note:* *AIR DATA SWTG should not be selected to F/O 3 if ADR 3 is not available.*

Ident.: PRO-ABN-A-ICE-H-00010263.0001001 / 05 AUG 10

STATUS

INOP SYS

F/O PROBES

ANTI ICE L + R WINDSHIELD

Applicable to: ALL

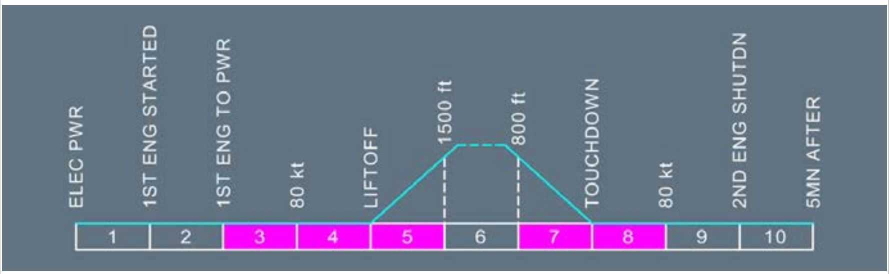
Ident.: PRO-ABN-A-ICE-B-00017167.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating system of both windshields is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-A-ICE-B-00010236.0001001 / 25 FEB 14

Crew awareness.

Continued on the following page

ANTI ICE L + R WINDSHIELD (Cont'd)

Ident.: PRO-ABN-A-ICE-B-00010237.0001001 / 05 AUG 10

STATUS

INOP SYS

WSHLD HEAT

ANTI ICE L(R) WINDOW

Applicable to: ALL

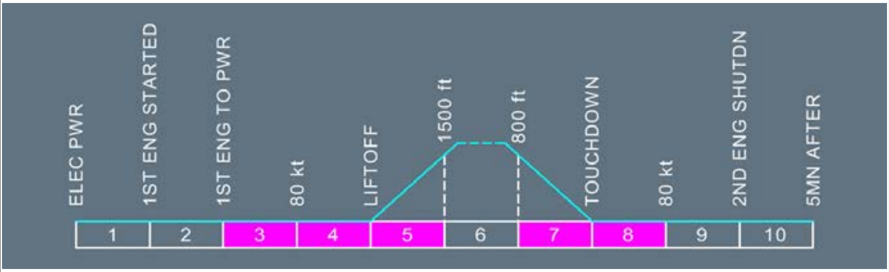
Ident.: PRO-ABN-A-ICE-V-00017168.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating system of the left(right) cockpit window is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-A-ICE-V-00010234.0001001 / 25 FEB 14

Crew awareness.

Continued on the following page

ANTI ICE L(R) WINDOW (Cont'd)

Ident.: PRO-ABN-A-ICE-V-00010235.0001001 / 05 AUG 10

STATUS

INOP SYS

L(R) WNDW HEAT

ANTI ICE L(R) WINDSHIELD

Applicable to: ALL

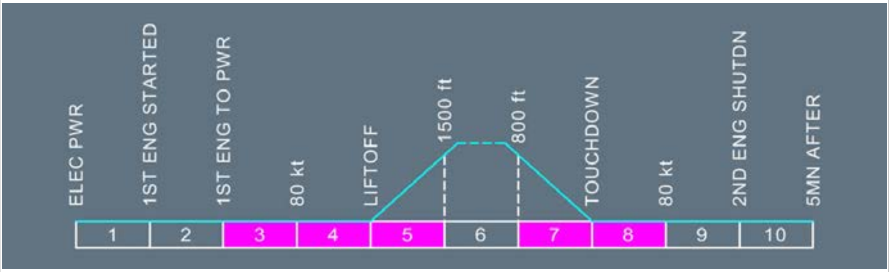
Ident.: PRO-ABN-A-ICE-A-00017166.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating system of the left(right) windshield is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-A-ICE-A-00010232.0001001 / 25 FEB 14

Crew awareness.

Continued on the following page

ANTI ICE L(R) WINDSHIELD (Cont'd)

Ident.: PRO-ABN-A-ICE-A-00010233.0001001 / 05 AUG 10

STATUS

INOP SYS

L(R) WSHLD HEAT

ANTI ICE STBY PITOT OR L(R) STAT OR AOA

Applicable to: ALL

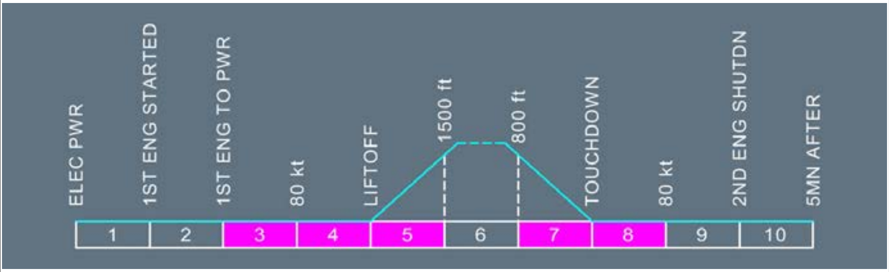
Ident.: PRO-ABN-A-ICE-F-00017172.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the heating system of the corresponding probe is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-A-ICE-F-00010250.0001001 / 25 FEB 14

Crew awareness.

L2 If standby instruments are used, monitor air data information.

Continued on the following page

ANTI ICE STBY PITOT OR L(R) STAT OR AOA (Cont'd)

Ident.: PRO-ABN-A-ICE-F-00010251.0001001 / 05 AUG 10

STATUS

INOP SYS

STBY PITOT
STBY L(R) STAT
STBY AOA

ANTI ICE STBY PROBES

Applicable to: ALL

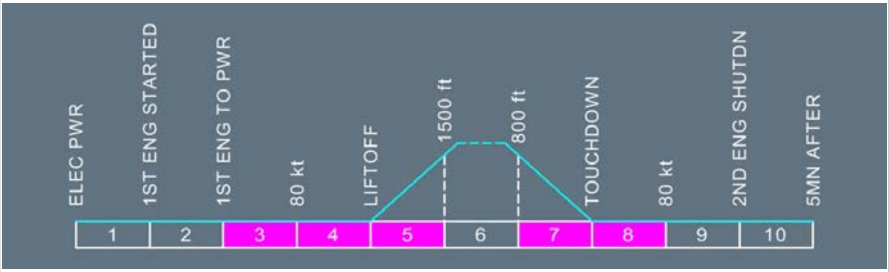
Ident.: PRO-ABN-A-ICE-I-00017176.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the standby probe heat computer is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-A-ICE-I-00010265.0001001 / 25 FEB 14

Crew awareness.

Continued on the following page

ANTI ICE STBY PROBES (Cont'd)

Ident.: PRO-ABN-A-ICE-I-00010266.0001001 / 05 AUG 10

STATUS

INOP SYS

STBY PROBES

[QRH] ENGINE 1+2 BLEED FAULT

Ident.: PRO-ABN-AIR-00017611.0001001 / 21 MAR 17
Applicable to: ALL

Apply this procedure when both engine bleed supply systems are failed.

- **At ANY TIME of the procedure, if** CAB PR EXCESS CAB ALT **alert triggers:** APPLY ECAM PROC

- **If** AIR ENG 1 BLEED FAULT **alert or** AIR ENG 1 BLEED ABNORM PR **alert**
  and
  If AIR ENG 2 BLEED FAULT **alert or** AIR ENG 2 BLEED ABNORM PR **alert:**
  X BLEED .... SHUT
  ENG 1 BLEED .... OFF THEN ON
  ENG 2 BLEED .... OFF THEN ON
  - **If reset unsuccessful (NO engine bleed recovered):**
    DESCENT TO FL 100 / MEA -MORA........ INITIATE
    L2 *Descend rapidly to FL 100 / MEA -MORA, to prevent excessive cabin altitude.*
    L1 ENG 1 BLEED........ OFF
    ENG 2 BLEED........ OFF
    APU BLEED........ OFF
    APU........ START
    WING A.ICE........ OFF
    AVOID ICING CONDITIONS
    - **If APU available:**
      - **When at or below FL 200:**
        KEEP WING A.ICE OFF
        L2 *APU BLEED must not be used for wing anti-ice.*
        L1 APU BLEED........ ON
        L2 *When APU BLEED is ON and pressurization is recovered, reduce rate of descent and consider MAX FL 200.*
        L1
        - **If APU bleed available:**
          MAX FL: 200
          ENG 1 BLEED........ ON
          ENG 2 BLEED........ ON
          APU BLEED........ OFF

Continued on the following page

[QRH] ENGINE 1+2 BLEED FAULT (Cont'd)

- **If no engine bleed recovered:**
  APU BLEED.....ON
  ENG 1 BLEED.....OFF
  ENG 2 BLEED.....OFF

  WING A.ICE NOT AVAILABLE
  - **If PACK 1 inoperative:**
    X BLEED.....OPEN

    L2 *To supply the PACK 2 from the APU bleed.*

L1

- **If APU bleed not available:**
  CONTINUE DESCENT TO FL 100 / MEA-MORA
  APU BLEED.....OFF
  - **When at or below FL 100 / MEA-MORA:**
    ENG 1 BLEED.....ON
    ENG 2 BLEED.....ON
    - **If no engine bleed recovered:**
      ENG 1 BLEED.....OFF
      ENG 2 BLEED.....OFF

      WING A.ICE NOT AVAILABLE
      - **When CAB PR ΔP < 1 psi:**
        RAM AIR.....ON

        MAX FL: 100 / MEA-MORA

- **If APU not available:**
  CONTINUE DESCENT TO FL 100 / MEA-MORA
  APU BLEED.....OFF
  - **When at or below FL 100 / MEA-MORA:**
    ENG 1 BLEED.....ON
    ENG 2 BLEED.....ON
    - **If no engine bleed recovered:**
      ENG 1 BLEED.....OFF
      ENG 2 BLEED.....OFF

      WING A.ICE NOT AVAILABLE

Continued on the following page

[QRH] ENGINE 1+2 BLEED FAULT (Cont'd)

- **When CAB PR ΔP < 1 psi:**
  RAM AIR.......ON
  MAX FL: 100 / MEA-MORA

■ **If at least one engine bleed failed due to bleed leak or engine fire or Start Air Valve failed open:**
DESCENT TO FL 100 / MEA -MORA.......INITIATE
L2 *Descend rapidly to FL 100 / MEA -MORA, to prevent excessive cabin altitude.*
L1 X BLEED.......SHUT
ENG 1 BLEED.......OFF
ENG 2 BLEED.......OFF
APU BLEED.......OFF
APU.......START
WING A.ICE.......OFF
AVOID ICING CONDITIONS

■ **If** AIR ENG 2 BLEED FAULT **alert or** AIR ENG 2 BLEED ABNORM PR **alert:**

- **When at or below FL 100 / MEA-MORA:**
  ENG 2 BLEED.......ON
  - **If engine 2 bleed not recovered:**
    ENG 2 BLEED.......OFF
    WING A.ICE NOT AVAILABLE
    - **When CAB PR ΔP < 1 psi:**
      RAM AIR.......ON
      MAX FL: 100 / MEA-MORA

■ **If** AIR ENG 1 BLEED FAULT **alert or** AIR ENG 1 BLEED ABNORM PR **alert:**

■ **If APU available:**

- **When at or below FL 200:**
  KEEP WING A.ICE OFF
  L2 *APU BLEED must not be used for wing anti-ice.*
  L1 APU BLEED.......ON
  L2 *When APU BLEED is ON and pressurization is recovered, reduce rate of descent and consider MAX FL 200.*

Continued on the following page

[QRH] ENGINE 1+2 BLEED FAULT (Cont'd)

L1

- **If APU bleed available:**

  MAX FL: 200
  ENG 1 BLEED.....ON
  APU BLEED.....OFF

  - **If engine 1 bleed not recovered:**

    APU BLEED.....ON
    ENG 1 BLEED.....OFF

    WING A.ICE NOT AVAILABLE

- **If APU bleed not available:**

  CONTINUE DESCENT TO FL 100 / MEA-MORA
  APU BLEED.....OFF

  - **When at or below FL 100 / MEA-MORA:**

    ENG 1 BLEED.....ON

    - **If engine 1 bleed not recovered:**

      ENG 1 BLEED.....OFF

      WING A.ICE NOT AVAILABLE

      - **When CAB PR ΔP < 1 psi:**

        RAM AIR.....ON

        MAX FL: 100 / MEA-MORA

- **If APU not available:**

  CONTINUE DESCENT TO FL 100 / MEA-MORA
  APU BLEED.....OFF

  - **When at or below FL 100 / MEA-MORA:**

    ENG 1 BLEED.....ON

    - **If engine 1 bleed not recovered:**

      ENG 1 BLEED.....OFF

      WING A.ICE NOT AVAILABLE

      - **When CAB PR ΔP < 1 psi:**

        RAM AIR.....ON

        MAX FL: 100 / MEA-MORA

Continued on the following page

[QRH] ENGINE 1+2 BLEED FAULT (Cont'd)

- **If neither** AIR ENG 1(2) BLEED FAULT **alert nor** AIR ENG 1(2) BLEED ABNORM PR **alert on any side:**

  NO ENGINE BLEED CAN BE RECOVERED

  WING A.ICE NOT AVAILABLE

  - **When at or below FL 100 / MEA-MORA**
    and
    CAB PR ΔP < 1 psi:
    RAM AIR..ON
    MAX FL: 100 / MEA-MORA

AIR APU BLEED FAULT

Applicable to: ALL

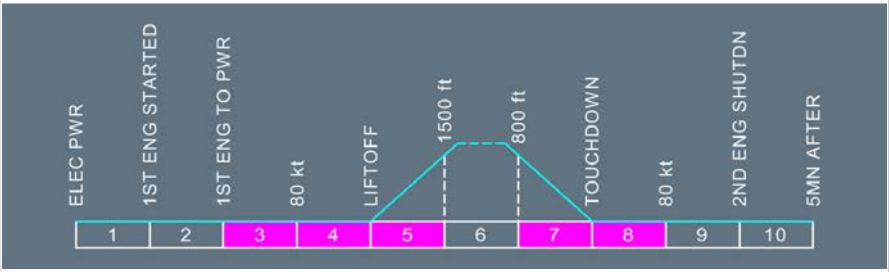
Ident.: PRO-ABN-AIR-G-00017375.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the APU is running and the position of the APU bleed valve disagrees with the selected position of the APU BLEED pb-sw.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-G-00017552.0001001 / 21 MAR 16

Crew awareness.

Continued on the following page

AIR APU BLEED FAULT (Cont'd)

Ident.: PRO-ABN-AIR-G-00011266.0001001 / 05 AUG 10

STATUS

INOP SYS

APU BLEED (If valve closed)

AIR APU BLEED LEAK

Applicable to: ALL

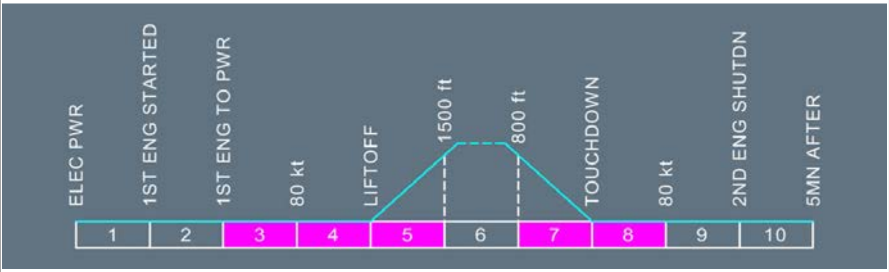
Ident.: PRO-ABN-AIR-F-00017376.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the APU bleed leak detection loop detects a temperature above 124 °C.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-F-00017553.0001001 / 21 MAR 16

APU BLEED (IF NOT CLOSED)...OFF

L2 *When the APU BLEED pb-sw is ON, the FAULT light remains on.*
When the APU BLEED pb-sw is OFF, the FAULT light goes off when the overheat disappears.

Continued on the following page

AIR APU BLEED LEAK (Cont'd)

Ident.: PRO-ABN-AIR-F-00011100.0001001 / 05 AUG 10

STATUS

INOP SYS

APU BLEED

AIR BLEED 1(2) OFF

Applicable to: ALL

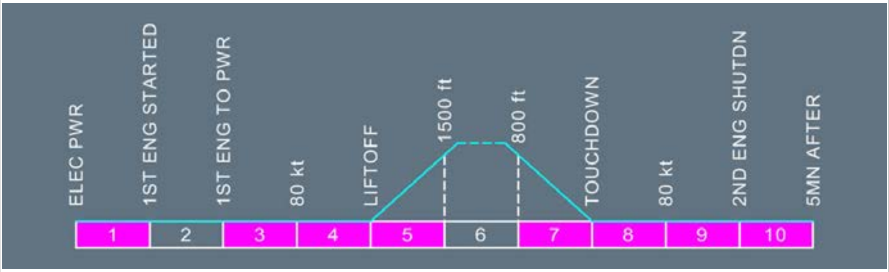
Ident.: PRO-ABN-AIR-AA-00017374.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the ENG 1(2) BLEED pb-sw is abnormally set to OFF.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-AA-00017555.0001001 / 21 MAR 16

Crew awareness.

AIR ENG 1(2) BLEED ABNORM PR

Applicable to: ALL

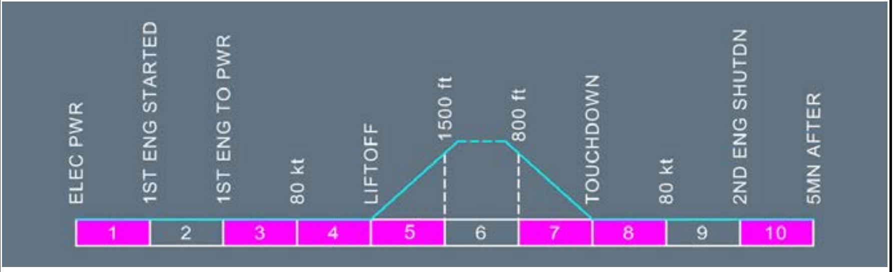
Ident.: PRO-ABN-AIR-B-00017378.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the regulated pressure in the engine bleed duct is abnormal.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-B-00017584.0005001 / 21 MAR 16

- **If wing anti-ice is off, and both packs are on:**
  PACK FLOW .... LO
  L2 *The PACK FLOW selector must be set to LO, due to precooler performance.*
- L1 **If wing anti-ice is on, and both packs are on:**
  PACK (AFFECTED) .... OFF
  L2 *One pack must be closed when the flight crew uses wing anti-ice because of precooler performance.*

L1 X BLEED .... OPEN

Continued on the following page

AIR ENG 1(2) BLEED ABNORM PR (Cont'd)

Ident.: PRO-ABN-AIR-B-00011089.0001001 / 05 AUG 10

STATUS

ONE PACK ONLY IF WAI ON

INOP SYS

ENG 1(2) BLEED
PACK 1(2) (If closed)

AIR ENG 1(2) BLEED FAULT

Applicable to: ALL

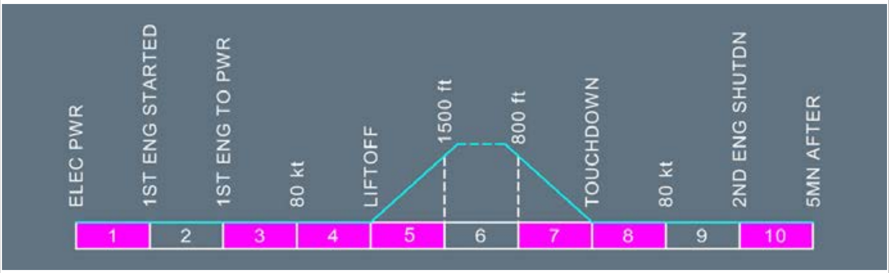
Ident.: PRO-ABN-AIR-C-00017369.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the engine 1(2) is running and:
- The engine bleed air pressure is above 57 PSI (+3/-0), or
- The engine bleed air temperature is above:
  - 257 °C for more than 55 s
  - 270 °C for more than 15 s
  - 290 °C for more than 5 s.

Flight Phase Inhibition:



Continued on the following page

AIR ENG 1(2) BLEED FAULT (Cont'd)

Ident.: PRO-ABN-AIR-C-00017605.0005001 / 21 MAR 16

ENG BLEED (AFFECTED, IF NOT AUTOMATICALLY CLOSED)....OFF

L2 *When the ENG BLEED pb-sw is ON, the FAULT light remains on.*
When the ENG BLEED pb-sw is OFF, the FAULT light goes off when the failure (overheat or overpressure) disappears.

L1
- **If wing anti-ice is off and both packs are on:**
  PACK FLOW....LO
  The PACK FLOW selector must be set to LO, due to precooler performance.
- **If wing anti-ice is on and both packs are on:**
  PACK (AFFECTED)....OFF
  L2 *One pack must be closed when the flight crew uses wing anti-ice because of precooler performance.*

L1 X BLEED....OPEN

Ident.: PRO-ABN-AIR-C-00011092.0001001 / 05 AUG 10

STATUS

	INOP SYS
ONE PACK ONLY IF WAI ON	ENG 1(2) BLEED PACK 1(2) (If closed)

AIR ENG 1(2) BLEED LO TEMP
(OPPOSITE BLEED AVAILABLE)

Applicable to: ALL

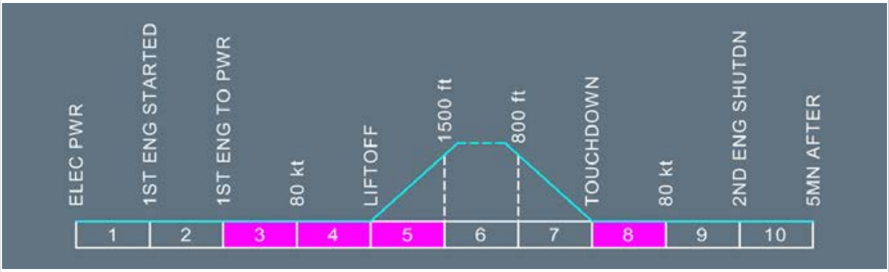
Ident.: PRO-ABN-AIR-M-00017379.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the associated engine bleed supplies bleed air at a temperature below 150 °C in flight and the WING A-ICE pb-sw is set to ON.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-M-00017560.0001001 / 21 MAR 16

A/THR..OFF
THR LEVER (AFFECTED ENGINE)..ADVANCE

L2 *The thrust lever of the affected engine must be advanced, with the autothrust OFF.*
Low bleed temperature may be due to low outside air temperature. Therefore, increasing engine thrust may increase bleed temperature and clear the ECAM caution.

L1 ● **IF UNSUCCESSFUL:**

X BLEED...OPEN
ENG BLEED (AFFECTED)..OFF
ASSOCIATED PACK (IF OPPOSITE PACK ON)...OFF

L2 *One pack must be closed, when the flight crew uses wing anti-ice, due to precooler performance.*

Continued on the following page

AIR ENG 1(2) BLEED LO TEMP (Cont'd)
(OPPOSITE BLEED AVAILABLE)

Ident.: PRO-ABN-AIR-M-00011115.0001001 / 21 AUG 15

STATUS

INOP SYS

ENG 1(2) BLEED
PACK 1(2) (If selected OFF)

AIR ENG 1(2) BLEED LO TEMP
(OPPOSITE BLEED NOT AVAILABLE)

Applicable to: ALL

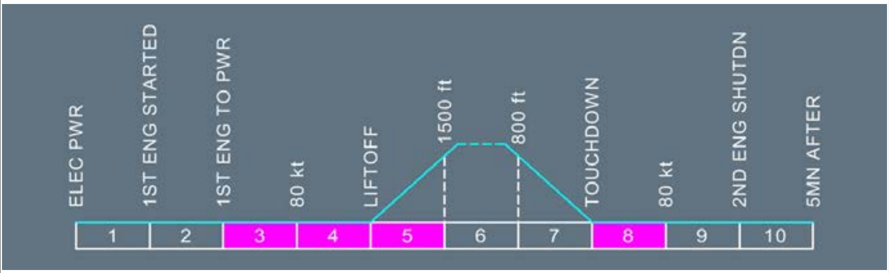
Ident.: PRO-ABN-AIR-N-00018208.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the associated engine bleed supplies bleed air at a temperature below 150 °C in flight and the WING A-ICE pb-sw is set to ON.

Flight Phase Inhibition:



Continued on the following page

AIR ENG 1(2) BLEED LO TEMP (Cont'd)
(OPPOSITE BLEED NOT AVAILABLE)

Ident.: PRO-ABN-AIR-N-00017561.0001001 / 21 MAR 16

A/THR..OFF
THR LEVER (AFFECTED ENGINE)..ADVANCE

L2 *The thrust lever of the affected engine must be advanced, with the autothrust OFF.*
Low bleed temperature may be due to low outside air temperature. Therefore, increasing engine thrust may increase bleed temperature and clear the ECAM caution.

L1 ● **IF UNSUCCESSFUL:**
WING A. ICE..OFF
AVOID ICING CONDITIONS

Ident.: PRO-ABN-AIR-N-00011117.0003001 / 17 MAR 17

STATUS

AVOID ICING CONDITIONS	**INOP SYS**
● **IF SEVERE ICE ACCRETION:**	WING A. ICE
MIN SPD..........VLS +10 / G DOT	
MANEUVER WITH CARE	
LDG DIST PROC..........APPLY	

AIR ENG 1+2 BLEED LO TEMP

Applicable to: ALL

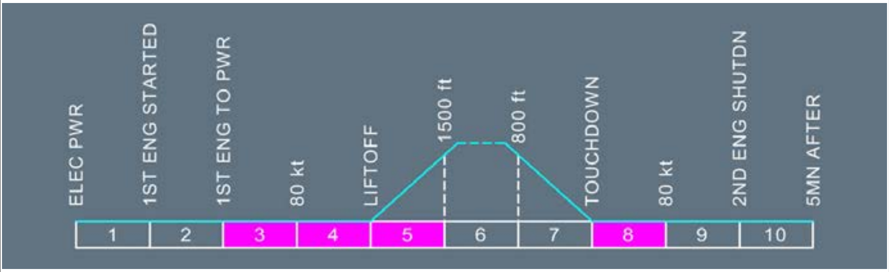
Ident.: PRO-ABN-AIR-O-00017381.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both engine bleeds supply bleed air at a temperature below 150 °C in flight and the WING A-ICE pb-sw is set to ON.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-O-00011118.0001001 / 05 AUG 10

A/THR .... OFF
THR LEVERS .... ADVANCE

L2 *The thrust lever of the affected engine must be advanced, with the autothrust OFF.*
Low bleed temperature may be due to low outside air temperature. Therefore, increasing engine thrust may increase bleed temperature and clear the ECAM caution.

L1 ● **IF UNSUCCESSFUL:**

WING A. ICE .... OFF
AVOID ICING CONDITIONS

Continued on the following page

AIR ENG 1+2 BLEED LO TEMP (Cont'd)

Ident.: PRO-ABN-AIR-O-00011119.0003001 / 17 MAR 17

STATUS

AVOID ICING CONDITIONS

- **IF SEVERE ICE ACCRETION:**
  MIN SPD..VLS +10 / G DOT
  MANEUVER WITH CARE
  LDG DIST PROC..APPLY

INOP SYS

WING A. ICE

AIR ENG 1(2) BLEED HI TEMP

Applicable to: ALL

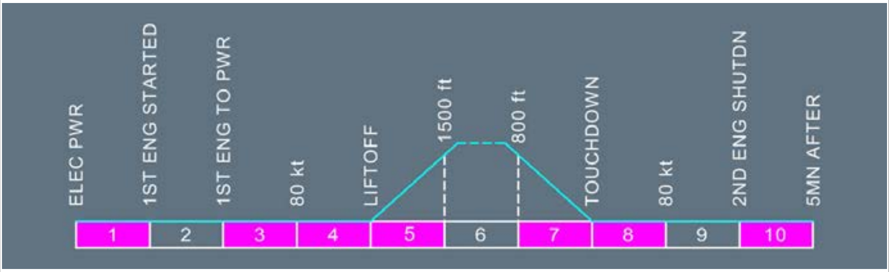
Ident.: PRO-ABN-AIR-P-00017391.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the precooler outlet temperature is above 240 °C.

Flight Phase Inhibition:



Continued on the following page

AIR ENG 1(2) BLEED HI TEMP (Cont'd)

Ident.: PRO-ABN-AIR-P-00014306.0001001 / 21 AUG 15

- **If wing anti-ice off:**
  PACK 2 (1).. OFF
- **If wing anti-ice on and opposite pack off:**

  Note: *If Wing Anti-Ice is required (icing conditions) while operating with one PACK, consider switching OFF the remaining pack, if aircraft's altitude permits.*

  PACK 1 (2) OR WAI..OFF
- **If wing anti-ice on and affected pack off:**
  PACK 2 (1) OR WAI..OFF

Ident.: PRO-ABN-AIR-P-00014307.0005001 / 17 MAR 17

L12

STATUS

AVOID ICING CONDITIONS	**INOP SYS**
● **IF SEVERE ICE ACCRETION:**	WING A. ICE
MIN SPD................ VLS+10/G DOT	
Note: *In the case of severe ice accretion, with wing anti-ice failed, the Angle-of-Attack (AOA) protections remain efficient.*	
MANEUVER WITH CARE	
LDG DIST PROC................APPLY	

AIR ENG 1(2) BLEED NOT CLSD

Applicable to: ALL

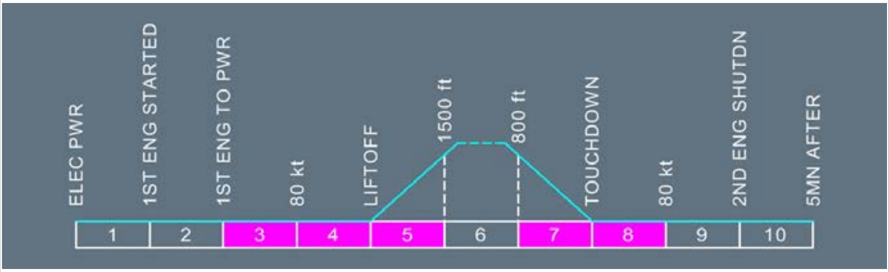
Ident.: PRO-ABN-AIR-A-00017372.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the engine bleed valve fails to close:
- During engine start or when APU BLEED pb-sw is set to ON
- At engine shutdown or when APU BLEED pb-sw is set to OFF with engine not running.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-A-00017562.0001001 / 21 MAR 16

ENG BLEED (AFFECTED).. OFF

L2 Note: *The warning may be triggered due to residual pressure between the HP or IP valves and the engine bleed valve after:*
- *Engine shutdown, or*
- *APU BLEED pb-sw is selected OFF with engine not running.*

Ident.: PRO-ABN-AIR-A-00011087.0001001 / 05 AUG 10

STATUS

	INOP SYS
ONE PACK ONLY IF WAI ON	ENG 1(2) BLEED

AIR ENG 1(2) HP VALVE FAULT

Applicable to: ALL

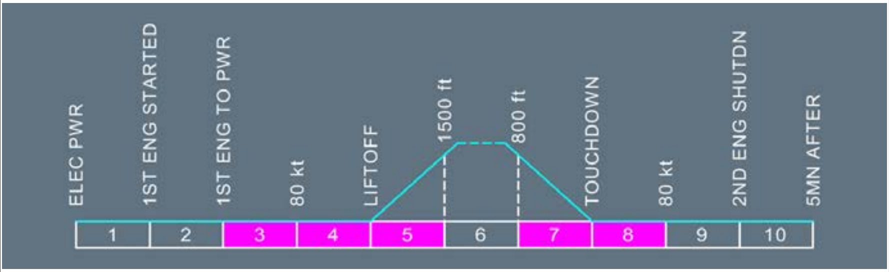
Ident.: PRO-ABN-AIR-H-00017384.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the HP valve is abnormally closed.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-H-00011103.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-AIR-H-00011104.0001001 / 05 AUG 10

STATUS

AIR PRESS LOW AT IDLE

AIR FWD(AFT) CRG VENT FAULT

Applicable to: ALL

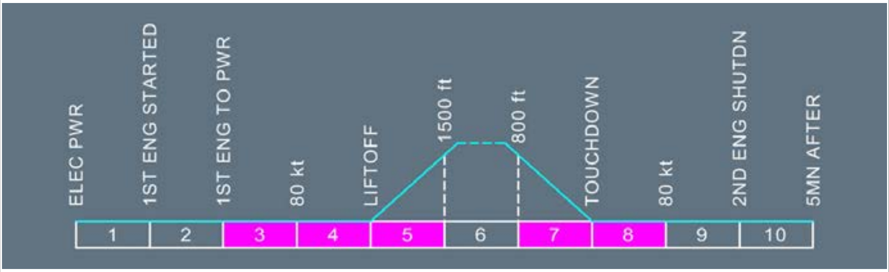
Ident.: PRO-ABN-AIR-AE-00017337.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the forward(aft) cargo ventilation fan is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-AE-00017933.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-AIR-AE-00017934.0001001 / 21 MAR 16

STATUS

INOP SYS

FWD(AFT) CRG HEAT
FWD(AFT) CRG VENT

AIR L(R) WING OR ENG 1(2) BLEED LEAK

Applicable to: ALL

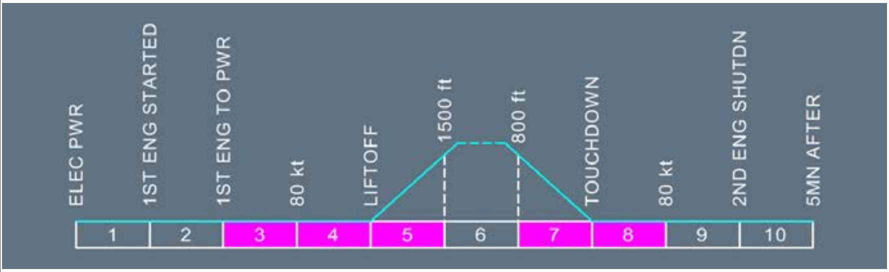
Ident.: PRO-ABN-AIR-D-00017370.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 The AIR L(R) WING LEAK alert triggers when both wing bleed leak detection loops detect a temperature above 124 °C .
The AIR ENG 1(2) BLEED LEAK alert triggers when the pylon bleed leak detection loop detects a temperature above 204 °C and engine 1(2) is running.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-D-00017563.0001001 / 21 MAR 16

ENG BLEED (AFFECTED, IF NOT AUTOMATICALLY CLOSED)....................OFF

L2 *When the ENG BLEED pb-sw is ON, the FAULT light remains on.*
When the ENG BLEED pb-sw is OFF, the FAULT light goes off when the overheat disappears.

L1 ● **If left wing or engine 1 bleed leak:**
APU BLEED (IF NOT CLOSED)....................OFF

X BLEED (IF NOT CLOSED)....................SHUT
WING ANTI-ICE....................OFF
AVOID ICING CONDITIONS

Continued on the following page

AIR L(R) WING OR ENG 1(2) BLEED LEAK (Cont'd)

Ident.: PRO-ABN-AIR-D-00011096.0003001 / 17 MAR 17

STATUS

AVOID ICING CONDITIONS

- **IF SEVERE ICE ACCRETION:**
  MIN SPD..VLS +10 / G DOT
  MANEUVER WITH CARE
  LDG DIST PROC..APPLY

INOP SYS

WING A.ICE
ENG 1(2) BLEED
PACK 1(2)

AIR L(R) WNG LEAK DET FAULT

Applicable to: ALL

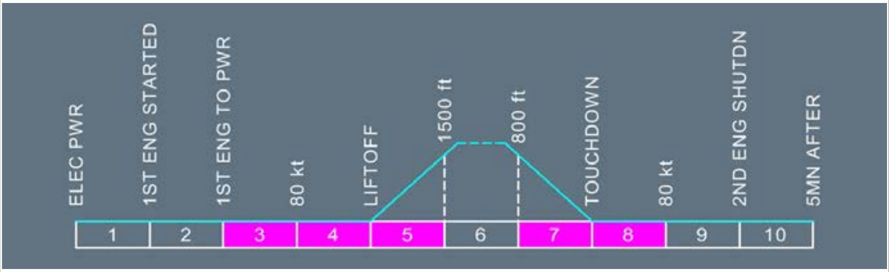
Ident.: PRO-ABN-AIR-J-00017387.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both wing bleed leak detection loops are inoperative in one wing.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-J-00011107.0001001 / 25 FEB 14

Crew awareness.

Continued on the following page

AIR L(R) WNG LEAK DET FAULT (Cont'd)

Ident.: PRO-ABN-AIR-J-00011108.0005001 / 17 MAR 11

STATUS

INOP SYS

L(R) WNG LK DET

AIR PACK 1(2) FAULT

Applicable to: ALL

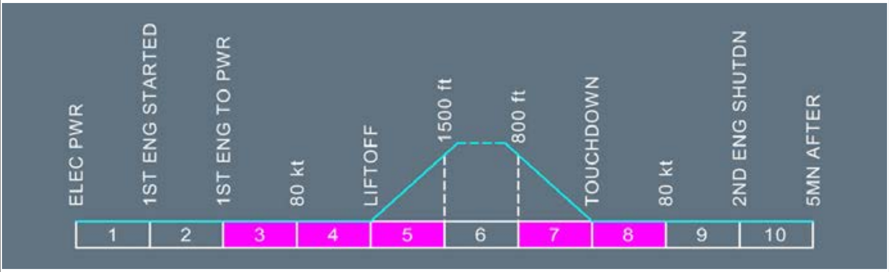
Ident.: PRO-ABN-AIR-AF-00017290.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- The position of the pack flow control valve disagrees with the commanded position, or
- The pack compressor outlet temperature rises above 230 °C four times during the same flight.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-AF-00010712.0001001 / 05 AUG 10

PACK (AFFECTED).. OFF

Continued on the following page

AIR PACK 1(2) FAULT (Cont'd)

Ident.: PRO-ABN-AIR-AF-00010713.0001001 / 05 AUG 10

STATUS

INOP SYS

PACK 1(2)

AIR PACK 1+2 FAULT

Applicable to: ALL

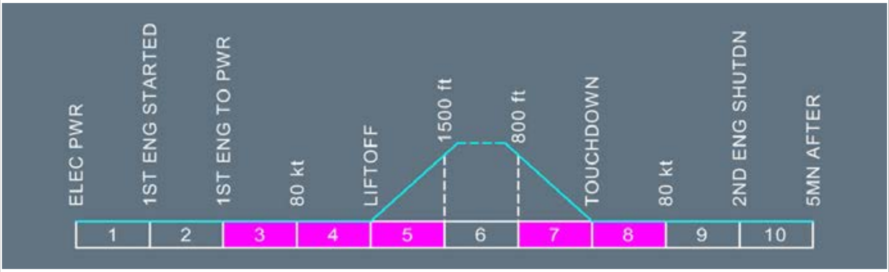
Ident.: PRO-ABN-AIR-AG-00017292.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one pack is off, and the other is failed.

Flight Phase Inhibition:



Continued on the following page

AIR PACK 1+2 FAULT (Cont'd)

Ident.: PRO-ABN-AIR-AG-00017935.0001001 / 21 MAR 16

PACK (AFFECTED).. OFF

L2 *The fault light goes off, when the failure disappears.*

Note: The rate at which the cabin altitude increases may be minimized by closing the FWD CARGO ISOL VALVE , if the cargo freight permits.

L1 DESCENT TO FL 100/MEA.

L2 *Descend to FL 100, or MEA, whichever is higher.*

L1
- **WHEN DIFF PR < 1 PSI AND FL BELOW 100:**
  RAM AIR..ON
  MAX FL.. 100/MEA
- **If FAULT was due to an overheat:**

ASSOCIATED PROCEDURES

AIR PACK 1 (2) OVHT

- **WHEN PACK OVHT OUT:**
  PACK (AFFECTED)..ON

Ident.: PRO-ABN-AIR-AG-00017936.0001001 / 17 MAR 17

STATUS

- **If packs not recovered:**
  MAX FL..100/MEA
  - **If FAULT was due to an overheat:**
    - **WHEN PACK OVHT OUT:**
      PACK (AFFECTED)..ON

INOP SYS

PACK 1 + 2
FWD CRG HEAT

AIR PACK 1(2) OFF

Applicable to: ALL

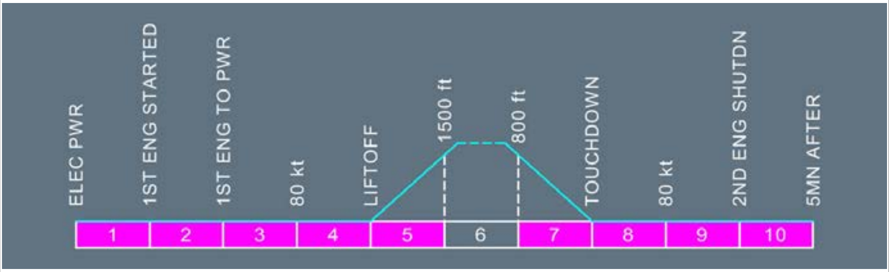
Ident.: PRO-ABN-AIR-AJ-00017294.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the PACK 1(2) pb-sw is set to OFF and no failure is detected.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-AJ-00017941.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-AIR-AJ-00010715.0001001 / 05 AUG 10

STATUS

	INOP SYS
	PACK 1(2)

AIR PACK 1(2) OVHT

Applicable to: ALL

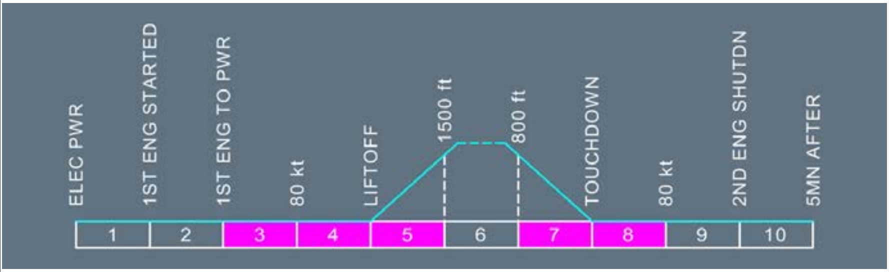
Ident.: PRO-ABN-AIR-AK-00017284.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- The pack compressor outlet temperature rises above 260 °C, or
- The pack compressor outlet temperature rises above 230 °C four times during the same flight, or
- The pack outlet temperature rises above 95 °C.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-AK-00017942.0001001 / 21 MAR 16

PACK (AFFECTED).. OFF

L2 *High flow is automatically selected on the remaining pack.*
Fault light goes off, when the overheat disappears.

L1 ● **WHEN PACK OVHT OUT:**
PACK (AFFECTED)..ON

Continued on the following page

AIR PACK 1(2) OVHT (Cont'd)

Ident.: PRO-ABN-AIR-AK-00010711.0001001 / 10 JAN 11

	STATUS
● **WHEN PACK OVHT OUT:**	**INOP SYS**
PACK (AFFECTED).. ON	PACK 1(2) (1)

(1) *(If pack not recovered)*

AIR PACK 1(2) REGUL FAULT

Applicable to: ALL

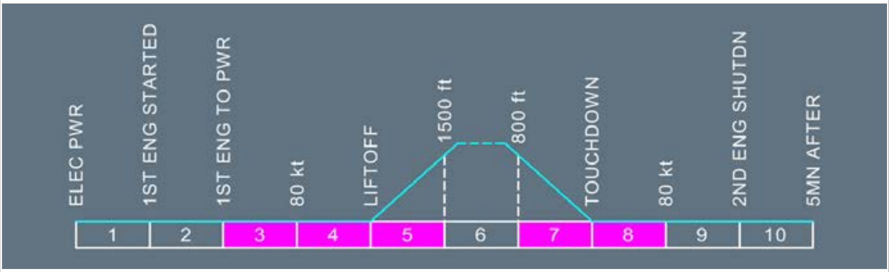
Ident.: PRO-ABN-AIR-AL-00017298.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- The pack main channel is failed, or
- The pack main and secondary channels are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-AL-00018089.0001001 / 21 MAR 16

Crew awareness.

Continued on the following page

AIR PACK 1(2) REGUL FAULT (Cont'd)

Ident.: PRO-ABN-AIR-AL-00010719.0002001 / 10 JAN 11

L12

STATUS

- **If the primary channel fails:**

  The pack air inlet flap fully opens; pack flow is fixed at the previous setting.

- **If the primary and secondary channels fail:**

  PACK 1(2) AT FIXED TEMP

  The pack outlet temperature is controlled by the pack anti-ice valve and is stabilized to a temperature between 5 °C (41 °F) and 30 °C (86 °F) within a maximum of 6 min.

INOP SYS

PACK 1(2) REGUL

AIR X BLEED FAULT

Applicable to: ALL

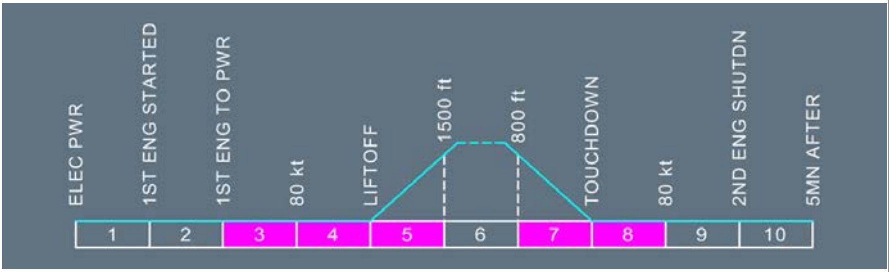
Ident.: PRO-ABN-AIR-E-00017383.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the crossbleed valve position disagrees with the X-BLEED selector position.

Flight Phase Inhibition:



Ident.: PRO-ABN-AIR-E-00011097.0001001 / 05 AUG 10

X BLEED... MAN CTL

L2 *Select OPEN, when the APU BLEED pb-sw is ON, or for engine start, or when WING ANTI-ICE pb-sw is ON and one bleed is inoperative.*
Select SHUT in other cases.

L1 ● **If manual opening inoperative, and only one bleed available:**

WING ANTI ICE...OFF

AVOID ICING CONDITIONS

Continued on the following page

AIR X BLEED FAULT (Cont'd)

Ident.: PRO-ABN-AIR-E-00017612.0002001 / 21 MAR 16

STATUS

- **If manual opening inoperative, and only one bleed available:**

  AVOID ICING CONDITIONS

  - **IF SEVERE ICE ACCRETION:**

    MIN SPD.......................................VLS +10 / G DOT

    MANEUVER WITH CARE

  LDG DIST PROC..APPLY

X BLEED MAN CTL

INOP SYS

WING A.ICE
X BLEED

APU AUTO (EMER) SHUT DOWN

Applicable to: ALL

Ident.: PRO-ABN-APU-A-00016876.0001001 / 21 MAR 16

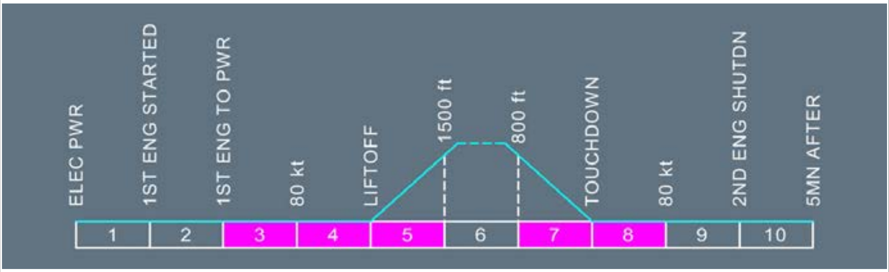
ANNUNCIATIONS

Triggering Conditions:

L2 The APU AUTO SHUT DOWN alert triggers when an automatic shutdown of the APU occurs for a reason other than a fire.
The APU EMER SHUT DOWN triggers when:

- The APU SHUT OFF sw on the External Power Panel is pushed or,
- The APU FIRE pb is pushed or,
- An APU fire on ground is detected.

Flight Phase Inhibition:



Ident.: PRO-ABN-APU-A-00018193.0001001 / 21 MAR 16

MASTER SW...OFF

Ident.: PRO-ABN-APU-A-00010106.0001001 / 05 AUG 10

STATUS

INOP SYS

APU

APU FIRE DET FAULT

Applicable to: ALL

Ident.: PRO-ABN-APU-D-00021359.0001001 / 17 MAR 17

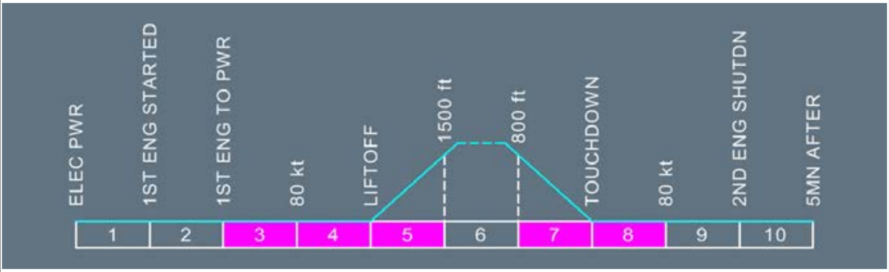
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- Both loops are inoperative, or
- Fire Detector Unit is inoperative.

Flight Phase Inhibition:



Ident.: PRO-ABN-APU-D-00021360.0001001 / 17 MAR 17

Crew awareness.

Ident.: PRO-ABN-APU-D-00021361.0001001 / 17 MAR 17

STATUS

INOP SYS

APU FIRE DET

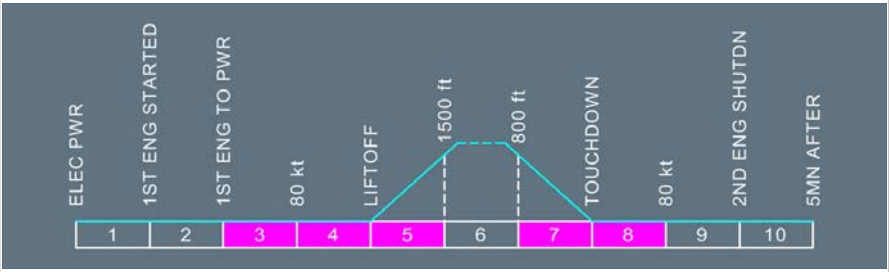
APU FIRE LOOP A(B) FAULT

Applicable to: ALL

Ident.: PRO-ABN-APU-B-00021362.0001001 / 17 MAR 17

ANNUNCIATIONS

Flight Phase Inhibition:



Ident.: PRO-ABN-APU-B-00021363.0001001 / 17 MAR 17

L2 Crew awareness.

Ident.: PRO-ABN-APU-B-00021364.0001001 / 17 MAR 17

STATUS

INOP SYS

APU LOOP A(B)

Intentionally left blank

APU FIRE

Applicable to: ALL

Ident.: PRO-ABN-APUF-C-00017402.0001001 / 21 MAR 16

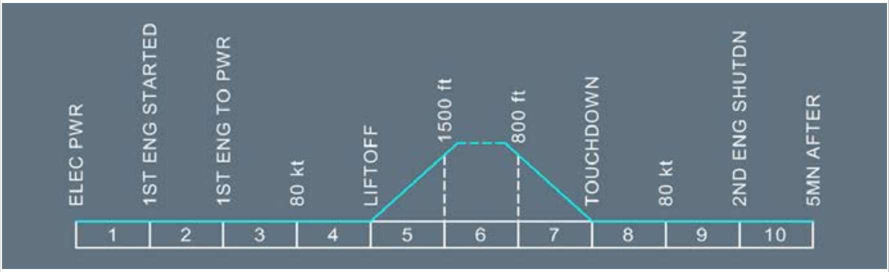
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- Fire is detected by both loops, or
- Fire is detected by one loop when the other loop is faulty, or
- A rupture occurs in both loops within 5 s.

Flight Phase Inhibition:



Ident.: PRO-ABN-APUF-C-00017925.0001001 / 21 MAR 16

LAND ASAP

APU FIRE P/B...PUSH

L2 *APU LP valve closes.*
Aural warning stops.
APU FIRE pb-sw remains on, as long as a fire is detected.

L1 AGENT AFTER 10 S...DISCH

L2 *The 10 s delay allows the airflow to decrease, which increases the effect of the agent.*
Automatic countdown on the ECAM.

L1 MASTER SW...OFF

L2 *Do not attempt to restart the APU.*

Continued on the following page

APU FIRE (Cont'd)

Ident.: PRO-ABN-APUF-C-00012211.0001001 / 16 NOV 11

STATUS

INOP SYS

APU

AUTO FLT A/THR LIMITED

Applicable to: ALL

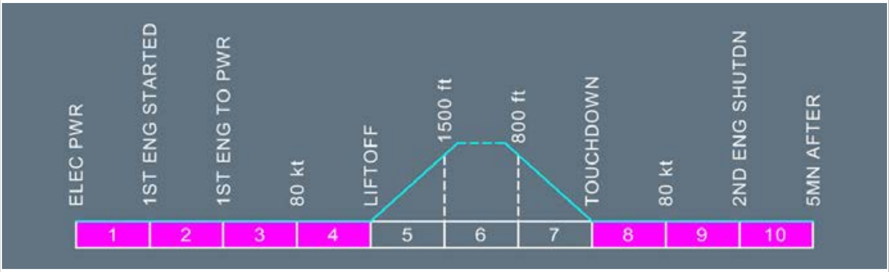
Ident.: PRO-ABN-AUTO_FLT-S-00016943.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when A/THR is active but thrust levers are set below CL detent (2 engines), or MCT detent (1 engine).
This caution is repeated every 5 s as long as the thrust lever are not moved.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-S-00018689.0001001 / 21 MAR 16

THR LEVERS...MOVE

L2 *Thrust lever must be set in the relevant detent.*

AUTO FLT A/THR OFF

Applicable to: ALL

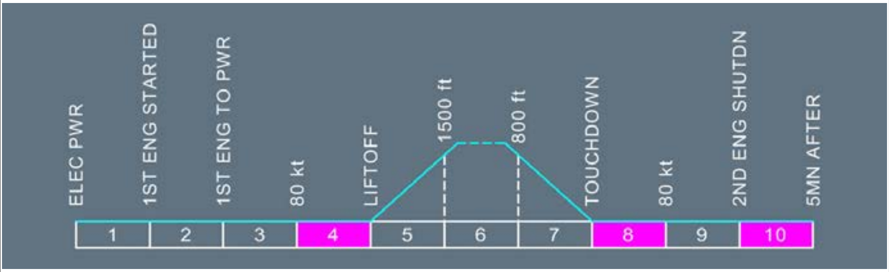
Ident.: PRO-ABN-AUTO_FLT-L-00016941.0002001 / 20 APR 17

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when this warning is displayed only for involuntary disconnection. The amber A/THR OFF and ENG THRUST LOCKED messages are displayed in the left lower part of ECAM upper DU.
For voluntary disconnection, an amber A/THR OFF message is displayed on the right lower part of ECAM upper DU.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-L-00018694.0002001 / 21 MAR 16

L2 If the A/THR is failed, the flight crew may recover it by engaging the other AP , and then trying to re-engage the A/THR.

Note: If the A/THR is recovered with AP 2, A/THR will be lost again at AP 2 disengagement.

L1 THR LEVERS..MOVE

L2 *If the thrust levers are not moved within 5 s, the "ENG THRUST LOCKED" warning is displayed (Refer to PRO-ABN-ENG ENG THRUST LOCKED).*

Continued on the following page

AUTO FLT A/THR OFF (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-L-00010469.0001001 / 05 AUG 10

STATUS

CAT 2 ONLY

INOP SYS

A/THR
CAT 3

AUTO FLT AP OFF

Applicable to: ALL

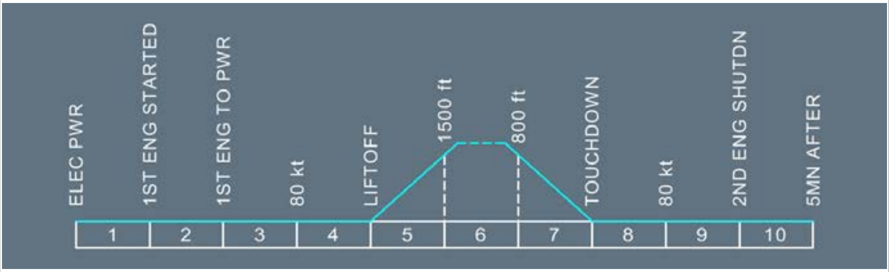
Ident.: PRO-ABN-AUTO_FLT-K-00016947.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when this warning is displayed only for involuntary disconnection.
For voluntary disconnection, a red AP OFF message is displayed in the right lower part of ECAM upper DU.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-K-00018695.0001001 / 21 MAR 16

Crew awareness.

Continued on the following page

AUTO FLT AP OFF (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-K-00017453.0002001 / 21 MAR 16

STATUS

INOP SYS

AP (Affected)
CAT 2 (1)
GLS AUTOLAND (1)

(1) *(If both AP lost)*

AUTO FLT FAC 1(2) FAULT

Applicable to: ALL

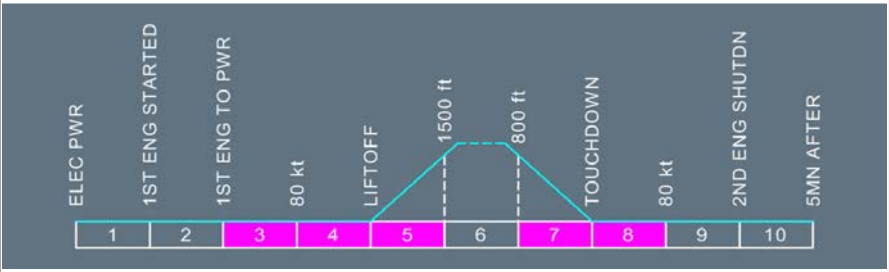
Ident.: PRO-ABN-AUTO_FLT-G-00016911.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one FAC computer is failed.

Flight Phase Inhibition:



Continued on the following page

AUTO FLT FAC 1(2) FAULT (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-G-00010457.0001001 / 05 AUG 10

FAC (AFFECTED)........ OFF THEN ON

- **IF UNSUCCESSFUL:**
  FAC (AFFECTED)........ OFF

L2 *All functions are performed by the remaining FAC.*

Ident.: PRO-ABN-AUTO_FLT-G-00017506.0001001 / 21 MAR 16

L12

STATUS

	INOP SYS
BOTH PFD ON SAME FAC *See* (1) CAT 3 SINGLE ONLY	CAT 3 DUAL FAC 1(2)

(1) *Characteristic speeds, displayed on the two PFD s, are computed by the same FAC.*

AUTO FLT FAC 1 + 2 FAULT

Applicable to: ALL

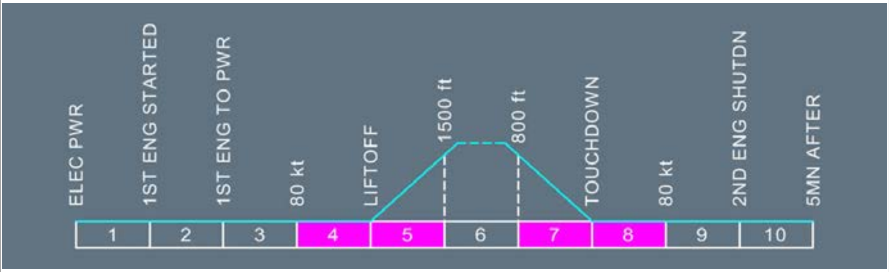
Ident.: PRO-ABN-AUTO_FLT-H-00016926.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the two FAC computers are failed.

Flight Phase Inhibition:



Continued on the following page

AUTO FLT FAC 1 + 2 FAULT (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-H-00017454.0003001 / 22 MAR 17

RUD WITH CARE ABV 140 KT

L2 *Depending on when the failure occurs, the rudder travel limiter system may not be in the correct position for the flight speed. Therefore, to prevent damage to the aircraft structure, use the rudder with care, when the speed is above 140 kt.*
At slats' extension, full rudder travel authority is recovered.

L1 FAC 1 .... OFF THEN ON
FAC 2 .... OFF THEN ON

- **IF UNSUCCESSFUL:**

  FAC 1 + 2 .... OFF

L2 *With FAC 1 + 2 inoperative, the rudder travel limit system, rudder trim control, yaw damper and PFD characteristic speeds are lost.*

L12

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)

F/CTL normal laws are lost. All protections, except maneuver protections, are lost.

L1 MAX SPEED .... 320 KT

L2 *Speed is limited, due to the loss of high-speed protections.*

Continued on the following page

AUTO FLT FAC 1 + 2 FAULT (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-H-00017456.0018001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT
RUD WITH CARE ABV 140 KT

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

GPWS LDG FLAP 3...ON

Displayed, when flaps in CONF 3.

APPR SPD..VREF + 10 KT
LDG DIST PROC.. APPLY

ALTN LAW : PROT LOST
WHEN L/G DN : DIRECT LAW

See (2)

INOP SYS

WNDSHEAR DET (1)
REAC W/S DET (1)
F/CTL PROT
FAC 1 + 2
AP 1 + 2
A/THR
CAT 2
GLS AUTOLAND
STEEP APPR
ROW/ROP

(1) *(The REAC W/S DET inop sys replaces the WNDSHEAR DET inop sys on aircraft equipped with the PWS)*

(2) *At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).*

AUTO FLT FCU 1(2) FAULT

Applicable to: ALL

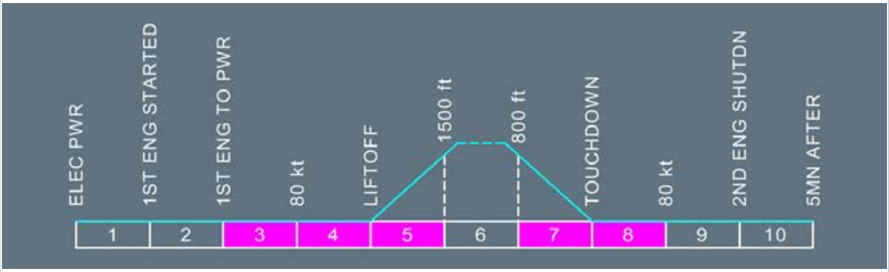
Ident.: PRO-ABN-AUTO_FLT-J-00016923.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when only one FCU channel remain operative.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-J-00010464.0001001 / 05 AUG 10

BARO REF..X CHECK

L2 *One FCU channel is lost:*
Therefore, crosscheck the barometric reference settings on the FCU and PFDs.

Ident.: PRO-ABN-AUTO_FLT-J-00010465.0001001 / 05 AUG 10

STATUS

INOP SYS

FCU 1(2)

AUTO FLT FCU 1 + 2 FAULT

Applicable to: ALL

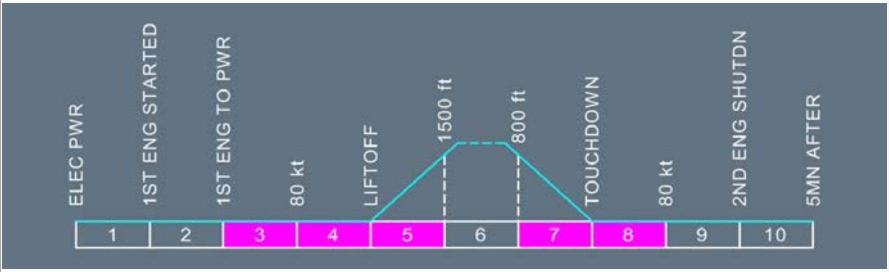
Ident.: PRO-ABN-AUTO_FLT-I-00016946.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the FCU is completely loss.

Flight Phase Inhibition:



Continued on the following page

AUTO FLT FCU 1 + 2 FAULT (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-I-00017463.0001001 / 21 MAR 16

PFD BARO REF: STD ONLY

L2 *With both FCU channels failed, the barometer reference automatically goes to 1 013 hPa.*
Use standby altimeter, and change this to the actual barometer setting.
Do not insert the MDA (MDH) value on the MCDU PERF APPR Page (because the PFD altitude is referenced to STD, and not to the correct barometric value).
The PM must then perform the standard callouts ("HUNDRED ABOVE"and "MINIMUM"), using the STBY altimeter.

In addition:
- *All FCU controls are inoperative.*
- *A/THR , AP 1 + 2, and FD 1 + 2 are not available.*
  (Except in LAND or GO AROUND mode where only A/THR is lost).
- *On PFD:*
  - *Altitude alert is inoperative.*
  - *ILS/GLS /MLS deviation scales are displayed.*
  - *Flight path vector is displayed.*
  - *Mach indication is inoperative.*
  - *FMA is lost except in LAND or GA mode.*
- *On ND:*
  - *ROSE NAV mode with map (80 NM range) is displayed.*
  - *VOR /ADF needles:*
    Needle 1 is related to VOR1 only.
    Needle 2 is related to ADF 2 only (ADF 1 if ADF2 not installed).
    (VOR selection on DDRMI is not affected)
    (ADF selection on DDRMI (if available) is not affected).
  - *The weather radar image may be lost. If the image remains displayed it must be disregarded. In all cases, red "WXR RNG" message is displayed.*

Continued on the following page

AUTO FLT FCU 1 + 2 FAULT (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-I-00017512.0002001 / 21 MAR 16

STATUS

PFD BARO REF : STD ONLY

- **If in LAND or GA:**
  CAT 2 ONLY

INOP SYS

FCU 1 + 2
AP 1 + 2 (1)
A/THR
CAT 3 (2)
CAT 2 (1)
GPWS TERR

(1) *(If not LAND or GA)*
(2) *(If in LAND or GA mode)*

AUTO FLT REAC W/S DET FAULT

Applicable to: ALL

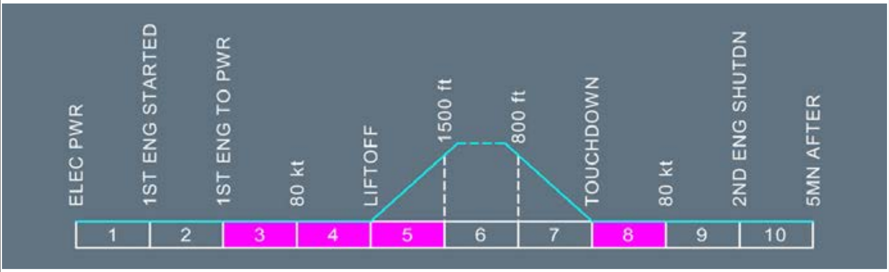
Ident.: PRO-ABN-AUTO_FLT-N-00017473.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the reactive windshear function is lost.

Flight Phase Inhibition:



Continued on the following page

AUTO FLT REAC W/S DET FAULT (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-N-00017479.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-AUTO_FLT-N-00017480.0001001 / 21 MAR 16

L12

STATUS

INOP SYS

REAC W/S DET

Note: *On ground, this warning may appear spuriously. This warning is cancelled by resetting both FACs, one after the other.*
- *FAC 1: Pull then push AUTO FLT/FAC 1/26VAC and 28VDC circuit breakers BO3 and B04 on 49VU.*
- *FAC 2: Pull then push AUTO FLT/FAC 2/26VAC and 28VDC circuit breakers M18 and M19 on 121VU.*

AUTO FLT RUD TRIM 1(2) FAULT

Applicable to: ALL

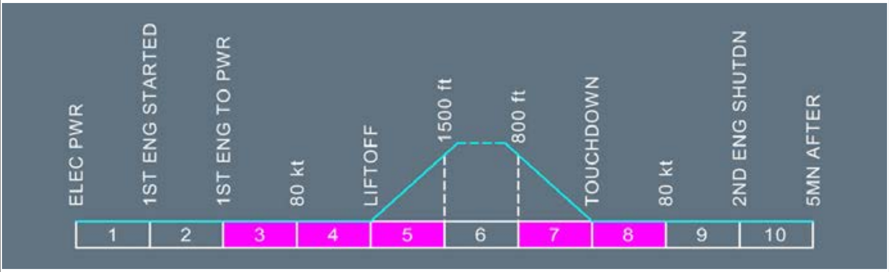
Ident.: PRO-ABN-AUTO_FLT-C-00016921.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one rudder trim actuator is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-C-00010449.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-AUTO_FLT-C-00017513.0001001 / 21 MAR 16

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	CAT 3 DUAL RUD TRIM 1(2)

AUTO FLT RUD TRIM SYS

Applicable to: ALL

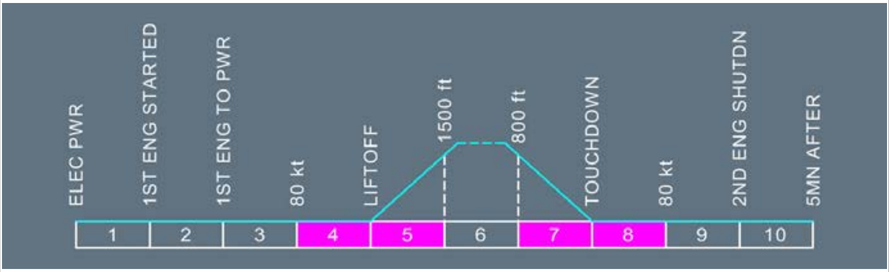
Ident.: PRO-ABN-AUTO_FLT-D-00016928.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the rudder trim system is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-D-00010451.0002001 / 05 AUG 10

FAC 1.. OFF THEN ON
FAC 2.. OFF THEN ON

Ident.: PRO-ABN-AUTO_FLT-D-00017464.0002001 / 21 MAR 16

STATUS

INOP SYS

RUD TRIM
AP 1 + 2
CAT 2
GLS AUTOLAND

AUTO FLT RUD TRV LIM 1(2)

Applicable to: ALL

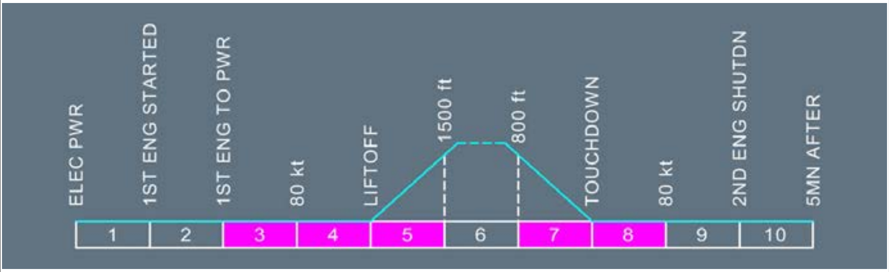
Ident.: PRO-ABN-AUTO_FLT-E-00016922.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one rudder travel limitation actuator is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-E-00010453.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-AUTO_FLT-E-00010454.0001001 / 05 AUG 10

STATUS

INOP SYS

RUD TRV LIM 1(2)

AUTO FLT RUD TRV LIM SYS

Applicable to: ALL

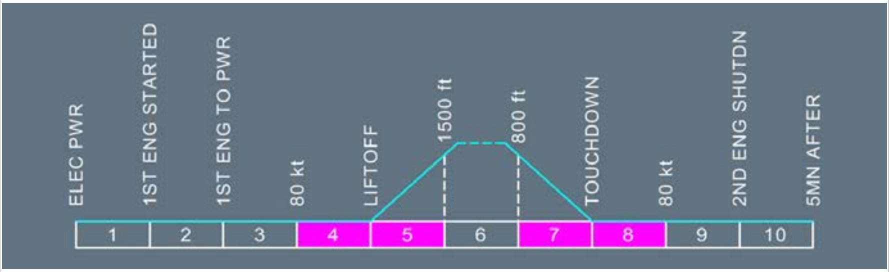
Ident.: PRO-ABN-AUTO_FLT-F-00016929.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the rudder travel limitation system is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-F-00017465.0006001 / 22 MAR 17

RUD WITH CARE ABV 140 KT

L2 *Depending on when the failure occurs, the rudder travel limiter system may not be in the correct position for the flight speed. Therefore, to prevent damage to the aircraft structure, use the rudder with care, when the speed is greater than 140 kt.*
At slats' extension, full rudder travel authority can be recovered.

L1 FAC 1 .... OFF THEN ON
FAC 2 .... OFF THEN ON

- **If TLU (rudder or pedals) remains locked at high speed after slat extension:**

  MAX X WIND FOR LDG 15 KT
  AUTO BRK .... DO NOT USE

L2 *Do not use the autobrake, so as not to delay the application of differential braking at landing roll.*

L1
- **AT LDG ROLL:**

  DIFF BRAKING .... AS RQRD

Continued on the following page

AUTO FLT RUD TRV LIM SYS (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-F-00017467.0006001 / 22 MAR 17

L12

STATUS

RUD WITH CARE ABV 140 KT

- **If TLU (rudder or pedals) remains locked at high speed after slat extension:**

  MAX X WIND FOR LDG 15 KT

  AUTO BRK.. DO NOT USE

  Do not use the autobrake, so as not to delay the application of differential braking at landing roll.

  - **AT LDG ROLL:**

    DIFF BRAKING.. AS RQRD

CAT 3 SINGLE ONLY

INOP SYS

RUD TRV LIM

Note: An autoland must not be performed with a crosswind greater than 12 kt.

AUTO FLT YAW DAMPER 1(2)

Applicable to: ALL

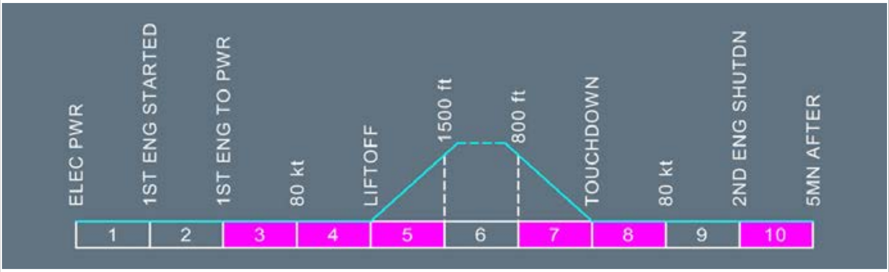
Ident.: PRO-ABN-AUTO_FLT-A-00016912.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one yaw damper actuator is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-A-00010444.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-AUTO_FLT-A-00017515.0001001 / 21 MAR 16

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	CAT 3 DUAL YAW DAMPER 1(2)

AUTO FLT YAW DAMPER SYS

Applicable to: ALL

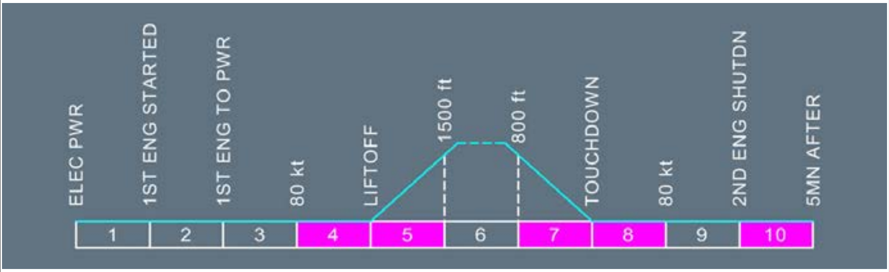
Ident.: PRO-ABN-AUTO_FLT-B-00016927.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the yaw damper system is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-AUTO_FLT-B-00017469.0002001 / 22 MAR 17

L2 Loss of yaw dampers 1 + 2.

L1 FAC 1 .... OFF THEN ON

FAC 2 .... OFF THEN ON

- **If fault remains:**

L12

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)

F/CTL normal laws are lost. All protections, except maneuver protections, are lost.

MAX SPEED .... 320 KT

Continued on the following page

AUTO FLT YAW DAMPER SYS (Cont'd)

Ident.: PRO-ABN-AUTO_FLT-B-00017470.0003001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT

Speed is limited, due to the loss of high-speed protections.

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

GPWS LDG FLAP 3..ON

Will be displayed, when flaps in CONF 3.

APPR SPD.. VREF + 10 KT

LDG DIST PROC.. APPLY

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

See (1)

INOP SYS

F/CTL PROT

YAW DAMPER

AP 1 + 2

CAT 2

STEEP APPR

GLS AUTOLAND

(1) *At landing gear extension, control reverts to direct law in pitch,as well as in roll*
Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW.

Intentionally left blank

AVIONICS SMOKE

Applicable to: ALL

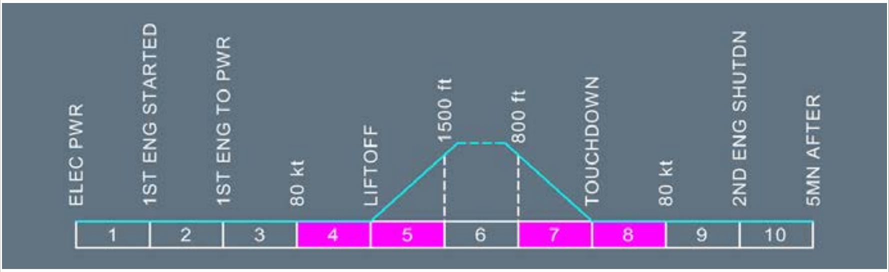
Ident.: PRO-ABN-AVNCS-M-00017405.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when smoke in the ventilation extraction duct is detected.

Flight Phase Inhibition:



Ident.: PRO-ABN-AVNCS-M-00014922.0001001 / 22 MAR 17

L2 The description of this procedure is included in the SMOKE/FUMES/AVNCS SMOKE procedure (*Refer to procedure*)

Intentionally left blank

BLEED MONITORING FAULT

Applicable to: ALL

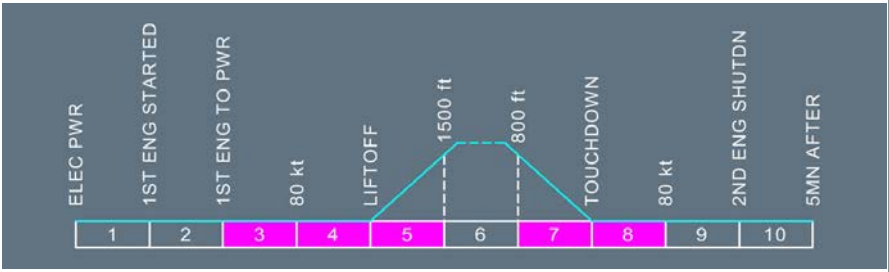
Ident.: PRO-ABN-BLEED-L-00017385.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both BMC are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-BLEED-L-00011111.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-BLEED-L-00011112.0001001 / 05 AUG 10

STATUS

INOP SYS

BMC 1 + 2

Intentionally left blank

[MEM] LOSS OF BRAKING

Ident.: PRO-ABN-BRAKES-00011315.0001001 / 17 MAR 17
Applicable to: ALL

- **IF NO BRAKING AVAILABLE:**

  REV .... MAX

  BRAKE PEDALS .... RELEASE

  Brake pedals should be released when the A/SKID & N/W STRG sw is switched OFF, since the pedal force or displacement produces more braking action in alternate mode than in normal mode.

  A/SKID OFF .... ORDER

  L2 *The PF orders the PM to set the A/SKID & N/W STRG sw to OFF.*

  L1 A/SKID & N/W STRG .... OFF

  Braking system reverts to alternate mode.

  BRAKE PEDALS .... PRESS

  Apply brake with care, since initial pedal force or displacement produces more braking action in alternate mode than in normal mode.

  MAX BRK PR .... 1000 PSI

  Monitor brake pressure or BRAKES PRESS indicator. Limit brake pressure to approximately 1 000 PSI and, at low ground speed, adjust brake pressure as required.

  - **If STILL NO BRAKING:**

    PARKING BRAKE .... SHORT AND SUCCESSIVE APPLICATIONS

    Use short successive parking brake applications to stop the aircraft. Brake onset asymmetry may be felt at each parking brake application. If possible, delay the use of the parking brake until low speed, to reduce the risk of tire burst and lateral control difficulties.

[QRH] RESIDUAL BRAKING

Ident.: PRO-ABN-BRAKES-00011318.0001001 / 17 MAR 17
Applicable to: ALL

- **In flight:**
  BRAKE PEDALS.....PRESS SEVERAL TIMES
  Press the brake pedals several times. This could zero a residual pressure on the alternate system.
  - **If residual pressure remains:**
    A/SKID & N/W STRG sel.....KEEP ON
    - **For landing:**
      AUTO/BRK.....MED
      Using MED mode gives immediate priority to normal braking upon landing gear touchdown, which cancels residual alternate pressure.
      - **If autobrake not available:**
        APPLY BRAKING JUST AFTER TOUCHDOWN

    POSSIBLE BRAKING ASYMMETRY

  Note: *If tire damage is suspected after landing, Refer to LIM-LG Taxi with Deflated or Damaged Tires.*

BRAKES A/SKID N/WS FAULT OR ANTI SKID N/WS OFF

Applicable to: ALL

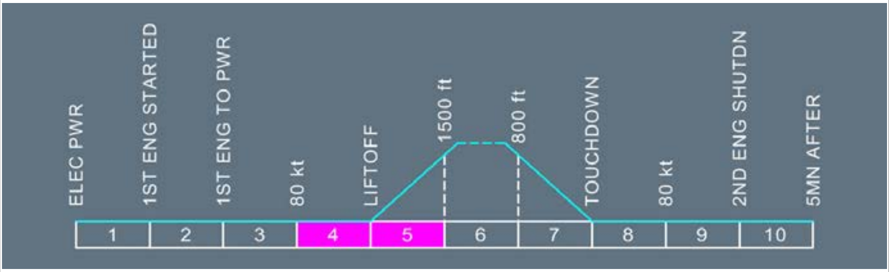
Ident.: PRO-ABN-BRAKES-J-00017807.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- There is a loss of normal brake system associated with Y HYD SYS LO PRESS, or
- Both BSCU channels are failed, or
- The A/SKID & N/W STRG sw is set to OFF.

Flight Phase Inhibition:



Ident.: PRO-ABN-BRAKES-J-00018571.0001001 / 21 MAR 16

MAX BRK PR.. 1000 PSI

L2 *Monitor brake pressure on the BRAKES PRESS indicator. Limit brake pressure to approximately 1 000 PSI and, at low ground speed, adjust brake pressure as required. Avoid landing on an icy runway.*

Continued on the following page

BRAKES A/SKID N/WS FAULT OR ANTI SKID N/WS OFF (Cont'd)

Ident.: PRO-ABN-BRAKES-J-00018670.0003001 / 21 MAR 16

L12

STATUS

MAX BRK PR........1000 PSI LDG DIST PROC........APPLY ● **If Y SYS LO PR:** BRK Y ACCU PR ONLY CAT 3 SINGLE ONLY *See* (1)	**INOP SYS** CAT 3 DUAL ANTI SKID N/W STRG NORM BRK AUTO BRK

(1) *Note:* *Automatic rollout is not permitted as specified in QRH (Refer to QRH/OPS Required Equipment for CAT2 and CAT3).*

BRAKES AUTO BRK FAULT

Applicable to: ALL

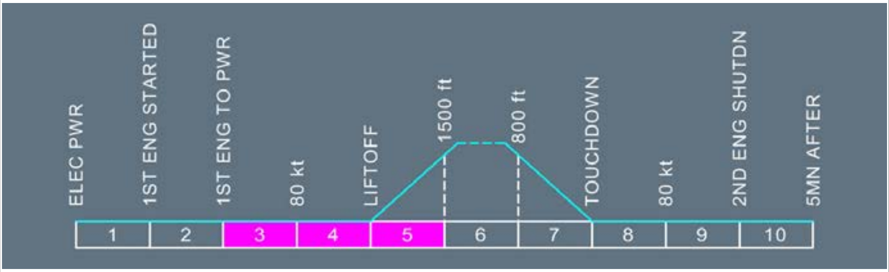
Ident.: PRO-ABN-BRAKES-N-00017806.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the autobrake is failed, after being armed.

Flight Phase Inhibition:



Ident.: PRO-ABN-BRAKES-N-00018672.0001001 / 21 MAR 16

L2 The AUTO BRK FAULT alert may be due to a failure of the autobrake mode itself, or to a brake released condition. The flight crew should, therefore, be prepared to counter a possible slight lateral drift at landing, via the rudder.

L1 BRAKE RELEASED

Continued on the following page

BRAKES AUTO BRK FAULT (Cont'd)

Ident.: PRO-ABN-BRAKES-N-00011314.0001001 / 11 MAY 12

STATUS

LDG DIST PROC.. APPLY

INOP SYS

AUTO BRK
NORM BRK [(1)]

(1) *(NORM BRK is inoperative in case of failure causing the AUTO BRK FAULT caution to trigger with a switch to alternate braking (failures affecting the BSCU, the Normal Selector Valve, the Normal Servo Valve, or brake pedal transmitter unit).)*

BRAKES HOT

Applicable to: ALL

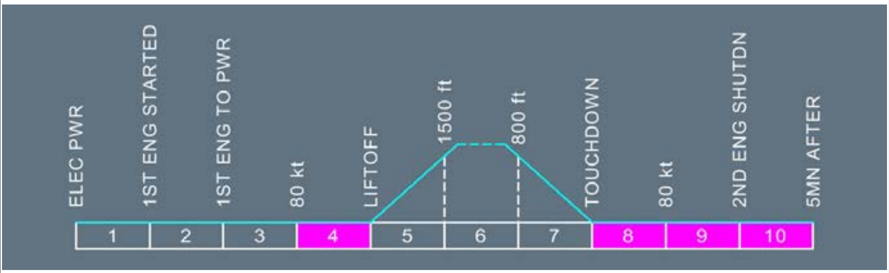
Ident.: PRO-ABN-BRAKES-M-00017786.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one brake temperature is above 300 °C. The alert disappears when the highest brake temperature is below 290 °C.

Flight Phase Inhibition:



Continued on the following page

BRAKES HOT (Cont'd)

Ident.: PRO-ABN-BRAKES-M-00018675.0008001 / 21 MAR 17

■ **On ground:**

PARK BRK: PREFER CHOCKS

L2 *If the BRAKES HOT alert is still on when the aircraft is parked, the flight crew should not set the PARKING BRK ON.*

L1 BRK FAN ....ON

L2 *Note: Before they select the brake fans at the gate, the flight crew should first warn the ground personnel in order to avoid blowing carbon brake dust on them.*

L1 DELAY T.O. FOR COOL

L2
- *Delay takeoff, until the brake temperature is below 300 °C with the brake fans OFF, and 150 °C with the brake fans ON*
- *Refer to PRO-NOR-SOP-21 After Landing - Brake Temperature for brake temperature limitations requiring maintenance actions.*

L1 ■ **In flight:**

● **IF PERF PERMITS:**

MAX SPEED..250/.60

L/G..DN FOR COOL

L2 *If performance permits, the landing gear should be extended or, if already extended, it should remain so, to improve brake cooling.*

L1 ● **FOR L/G RETRACTION:**

MAX SPEED..220/.54

L2 *Reduce speed for landing gear retraction, when the brake temperature is within limits.*

Continued on the following page

BRAKES HOT (Cont'd)

Ident.: PRO-ABN-BRAKES-M-00011312.0001001 / 05 AUG 10

L12

STATUS

MAX SPEED... 280/.67
See (1)

(1) *As long as the landing gear is extended, limit the speed to 280 kt/M 0.67.*
For landing gear retraction when the brake temperature is within limits, reduce the speed to 220 kt.

BRAKES PARK BRK FAULT

Applicable to: ALL

Ident.: PRO-ABN-BRAKES-X-00017823.0001001 / 21 MAR 16

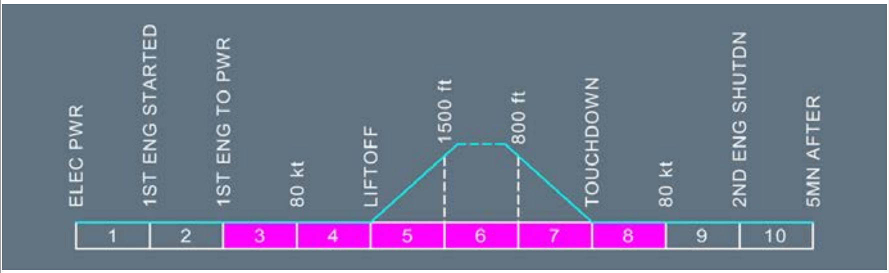
ANNUNCIATIONS

Triggering Conditions:

L2

This alert triggers when a discrepancy between the position of the parking brake handle and the applied parking brake pressure is detected.

Flight Phase Inhibition:



Continued on the following page

BRAKES PARK BRK FAULT (Cont'd)

Ident.: PRO-ABN-BRAKES-X-00018359.0002001 / 20 MAY 16

- **On ground:**
  - **If PARKING BRK handle is OFF and parking brake pressure is still applied:**
    BRK PRESS STILL APPLIED
  - **If PARKING BRK handle is ON and no parking brake pressure is applied:**
    BRK PRESS RELEASED
    PARK BRK.. OFF
    - **BEFORE ENG SHUT DOWN:**
      CHOCKS.. CONSIDER

BRAKES PARK BRK ON

Applicable to: ALL

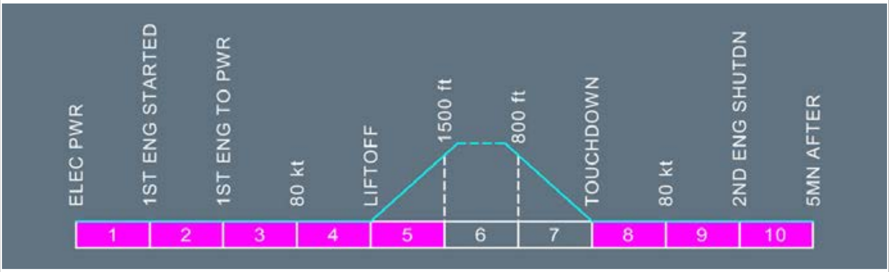
Ident.: PRO-ABN-BRAKES-Y-00017815.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the parking brake is ON in flight.

Flight Phase Inhibition:



Ident.: PRO-ABN-BRAKES-Y-00018360.0001001 / 21 MAR 16

PARK BRK.. OFF

BRAKES SYS 1(2) FAULT

Applicable to: ALL

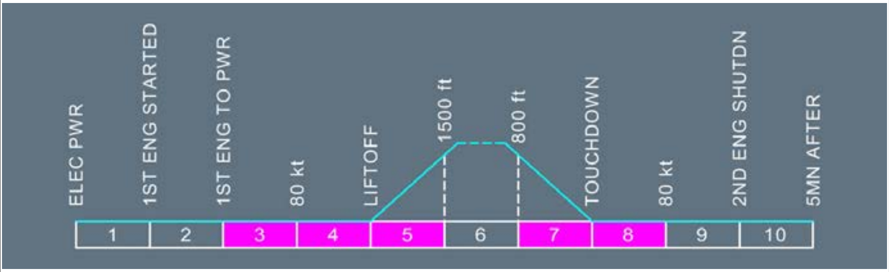
Ident.: PRO-ABN-BRAKES-L-00017812.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one BSCU channel is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-BRAKES-L-00011309.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-BRAKES-L-00011310.0001001 / 05 AUG 10

STATUS

INOP SYS

BRK SYS 1(2)

[QRH] CABIN OVERPRESSURE

Ident.: PRO-ABN-CAB_PR-00010761.0001001 / 17 MAR 17
Applicable to: ALL

Apply the following procedure (not displayed on ECAM) in case of total loss of cabin pressure control leading to overpressure.

PACK 1 OR 2....................OFF
VENTILATION BLOWER....................OVRD
VENTILATION EXTRACT....................OVRD

Cabin air is extracted overboard

ΔP....................FREQUENTLY MONITOR

- **If ΔP > 9 PSI:**
  LAND ASAP

  PACK 1....................OFF
  PACK 2....................OFF

- **10 min before landing:**
  PACK 1....................OFF
  PACK 2....................OFF
  VENTILATION BLOWER....................AUTO
  VENTILATION EXTRACT....................AUTO

- **Before door opening:** CHECK ΔP ZERO

CAB PR EXCESS CAB ALT

Applicable to: ALL

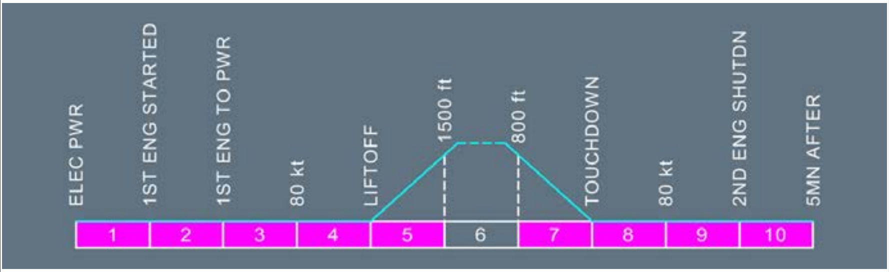
Ident.: PRO-ABN-CAB_PR-T-00017316.0005001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- In climb or descent, the cabin altitude is above the higher of:
  - 9 550 ft, or
  - 1 000 ft above the airfield pressure altitude.
- In cruise, the cabin altitude is above 9 550 ft.

Flight Phase Inhibition:



Continued on the following page

CAB PR EXCESS CAB ALT (Cont'd)

Ident.: PRO-ABN-CAB_PR-T-00018066.0004001 / 20 DEC 16

Rely on the CAB PR EXCESS CAB ALT warning even if not confirmed on the CAB PRESS SD page. The warning can be triggered by a cabin pressure sensor different from the one used to control the pressure and display the cabin altitude on the SD.

- **If above FL 100:**
  CREW OXY MASK....................USE
  - **If below FL 160:**
    DESCENT....................INITIATE
    MAX FL....................100/MEA
  - **If above FL 160:**
    SIGNS....................ON
    EMER DESCENT:
    DESCENT....................INITIATE
    - **If A/THR is not active:**
      THR LEVERS....................IDLE

L2 *If the A/THR is active, check A/THR is at IDLE on the ED.*

L1 SPD BRK....................FULL

L2 *Extension of speedbrakes will significantly increase VLS.*
In order to avoid autopilot disconnection and automatic retraction of speedbrakes due to possible activation of angle of attack protection, allow the speed to increase before starting to use speedbrakes.

L1 SPD....................MAX/APPROPRIATE

L2 *Descend at maximum appropriate speed. However, if structural damage is suspected use the flight controls with care and reduce speed as appropriate. The landing gear may be extended. In this case, speed must be reduced to VLO/VLE.*

L1 ENG MODE SEL....................IGN
ATC....................NOTIFY

L2 *Notify ATC of the nature of the emergency, and state intention. The flight crew can communicate with the ATC using voice, or CPDLC when the voice contact cannot be established or has a poor quality.*
Squawk 7700 unless otherwise specified by ATC.

L12

Note: *To save oxygen, set the oxygen diluter selector to N position.*

Continued on the following page

CAB PR EXCESS CAB ALT (Cont'd)

With the oxygen diluter left to 100 %, oxygen quantity may not be sufficient for the entire descent profile.
Ensure that the flight crew can communicate wearing oxygen masks. Avoid the continuous use of the interphone position to minimize the interference from the noise of the oxygen mask.

L1 MAX FL...100/MEA

- **IF CAB ALT > 14 000 FT:**

PAX OXY MASKS...MAN ON

L2 *This action confirms that the passenger oxygen masks are released.*

Note: When descent is established and if time permits, check that the OUTFLOW VALVE is closed on the CAB PRESS SD page. If it is not closed and ΔP is positive, select the other CPC. If the OUTFLOW VALVE is still not closing set the cabin pressure MODE SEL pb to MAN and the V/S CTL sw to full down.
Notify the cabin crew when the aircraft reaches a safe flight level, and when cabin oxygen is no longer necessary.

Ident.: PRO-ABN-CAB_PR-T-00010755.0001001 / 05 AUG 10

STATUS

MAX FL.. 100/MEA

CAB PR LDG ELEV FAULT

Applicable to: ALL

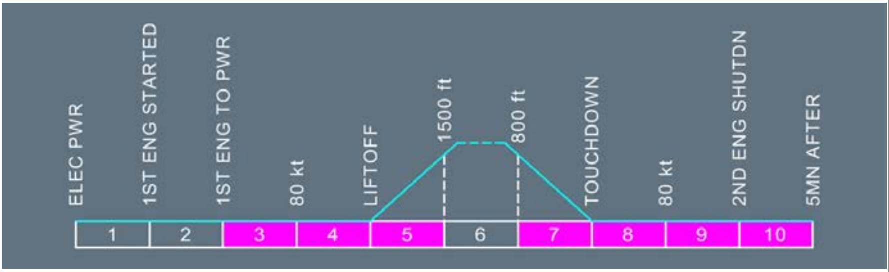
Ident.: PRO-ABN-CAB_PR-AF-00017325.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the LDG ELEV selector is set to AUTO and the landing field elevation of the FMGS is not available.

Flight Phase Inhibition:



Ident.: PRO-ABN-CAB_PR-AF-00018936.0002001 / 21 MAR 16

LDG ELEV .... ADJUST

L2 *The flight crew must select the landing field elevation manually with the LDG ELEV selector. Refer to the LDG ELEV indication on the CRUISE page on the CAB PRESS SD page to adjust the required landing field elevation.*

Note: If the landing is performed on QFE, set 0 ft on LDG ELEV selector.

CAB PR LO DIFF PR

Applicable to: ALL

Ident.: PRO-ABN-CAB_PR-AG-00017320.0001001 / 21 MAR 16

ANNUNCIATIONS

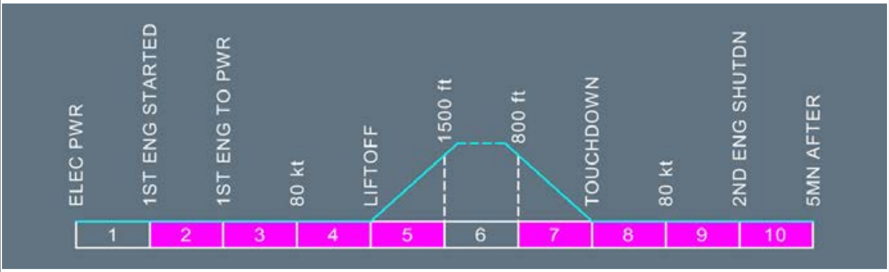
Triggering Conditions:

L2 This alert triggers when:

- The time to reach ΔP = 0 is less than 1.5 min, and
- The time to reach ΔP = 0 is less than the time for CAB ALT to reach landing field elevation +30 s, and
- The aircraft is at least 3 000 ft above the landing field elevation.

Note: The alert remains, when the aircraft descends within 3 000 ft of the landing field elevation.

Flight Phase Inhibition:



Ident.: PRO-ABN-CAB_PR-AG-00010762.0002001 / 05 AUG 10

EXPECT HI CAB RATE
A/C V/S..REDUCE

L2 *This line is not displayed in case of Emergency Descent due to Excessive Cabin Altitude.*

CAB PR OFV NOT OPEN

Applicable to: ALL

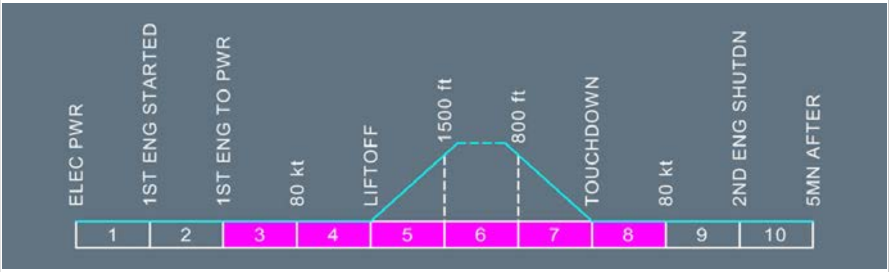
Ident.: PRO-ABN-CAB_PR-AH-00017323.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers, on ground, when the outflow valve is not fully open (time delay 70 s).

Flight Phase Inhibition:



Ident.: PRO-ABN-CAB_PR-AH-00018802.0001001 / 21 MAR 16

MODE SEL..MAN
MAN V/S CTL..FULL UP

L2 *It may take 10 s in manual mode before the crew notices a change of the outflow valve position.*

L1 ● **IF UNSUCCESSFUL :**

PACK 1..OFF
PACK 2..OFF

CAB PR SAFETY VALVE OPEN

Applicable to: ALL

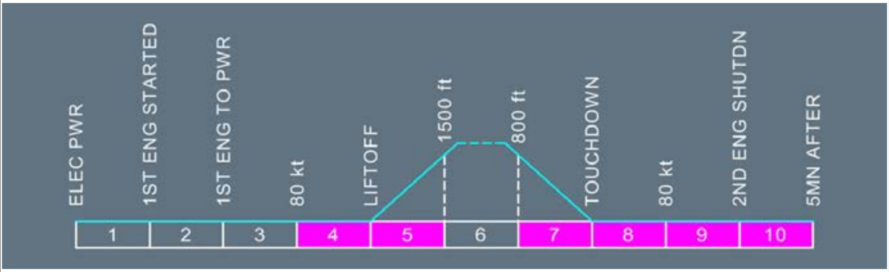
Ident.: PRO-ABN-CAB_PR-W-00017324.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers:
- On ground, if the safety valve is not fully closed, or
- In flight, if the safety valve is not fully closed for more than 1 min.

Flight Phase Inhibition:



Ident.: PRO-ABN-CAB_PR-W-00018092.0002001 / 21 MAR 16

■ **IF DIFF PR ABV 8 PSI:**

MODE SEL...MAN

MAN V/S CTL...AS RQRD

L2 *If overpressure is confirmed, reduce cabin ΔP.*
It may take 10 s in manual mode before the flight crew notices a change of the outflow valve position.

L1 ● **IF UNSUCCESSFUL:**

A/C FL... REDUCE

■ **IF DIFF PR BELOW 0 PSI:**

EXPECT HI CAB RATE

A/C V/S... REDUCE

Continued on the following page

CAB PR SAFETY VALVE OPEN (Cont'd)

Ident.: PRO-ABN-CAB_PR-W-00018093.0003001 / 21 MAR 16

STATUS

MAN CAB PR CTL
TGT V/S: CLIMB 500 FT/MIN
TGT V/S: DESC 300 FT/MIN

A/C FL	CAB ALT TGT
390	8 000
350	7 000
300	5 500
250	3 000
< 200	0

- **DURING FINAL APPR :**
  MAN V/S CTL..FULL UP

CAUTION	Check that ΔP is zero before opening the doors.

CAB PR SYS 1(2) FAULT

Applicable to: ALL

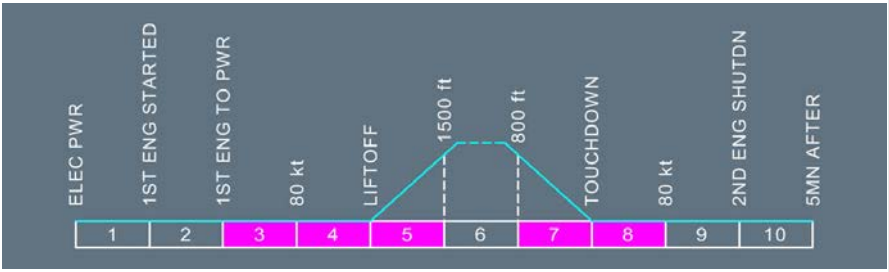
Ident.: PRO-ABN-CAB_PR-U-00017326.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the cabin pressure controller is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-CAB_PR-U-00010756.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-CAB_PR-U-00010758.0001001 / 05 AUG 10

STATUS

INOP SYS

CAB PR 1 (2)

CAB PR SYS 1+2 FAULT

Applicable to: ALL

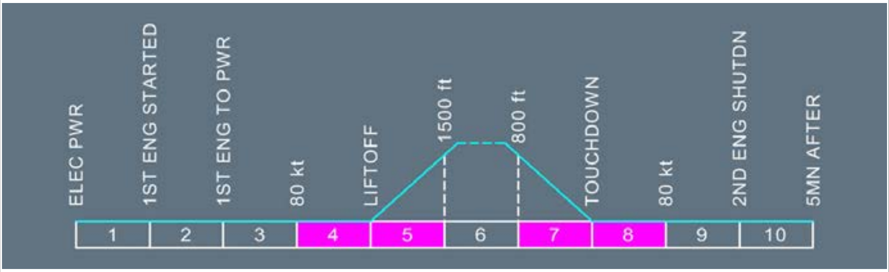
Ident.: PRO-ABN-CAB_PR-V-00017319.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both cabin pressure controllers are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-CAB_PR-V-00010759.0001001 / 05 AUG 10

L2 Due to the slow closure of the outflow valve in manual pressurization mode and depending on the failure, the following procedure may not avoid the depressurization.

L1 MODE SEL... MAN
MAN V/S CTL... AS RQRD

L2
- *It may take 10 s in manual mode before the crew notices a change of the outflow valve position. Use the cabin V/S indication to confirm the outflow valve operation.*
- *Monitor cabin V/S and CAB ALT frequently and adjust as necessary. Maintain aircraft altitude at or above cabin altitude.*
- *The two safety valves limit ΔP to 8.6 PSI.*

Continued on the following page

CAB PR SYS 1+2 FAULT (Cont'd)

Ident.: PRO-ABN-CAB_PR-V-00018107.0003001 / 21 MAR 16

L12

STATUS

MAN CAB PR CTL
TGT V/S : CLIMB 500 FT/MIN
TGT V/S : DESC 300 FT/MIN

A/C FL	CAB ALT TGT
390	8 000
350	7 000
300	5 500
250	3 000
< 200	0

- **DURING FINAL APPR :**
  V/S CTL..FULL UP
  When on intermediate approach (below airfield pressure altitude +2 500 ft), adjust ΔP = 0.

CAUTION	Check that ΔP is zero before opening the doors.

INOP SYS

CAB PR 1+2

CARGO SMOKE FWD(AFT) BTL SQUIB FAULT

Applicable to: ALL

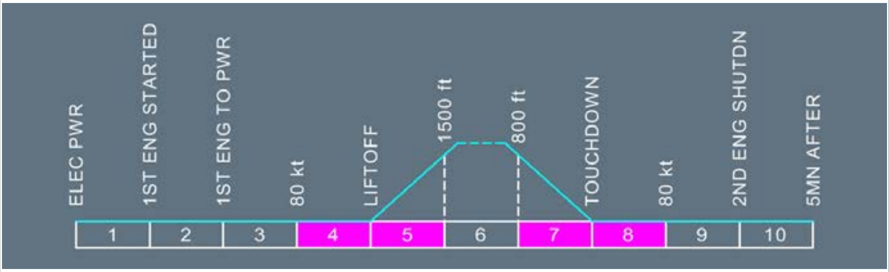
Ident.: PRO-ABN-CRG_SMOKE-I-00017415.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when FWD or AFT bottle squib is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-CRG_SMOKE-I-00018442.0001001 / 21 MAR 16

Crew awareness.

Intentionally left blank

C/B TRIPPED

Applicable to: ALL

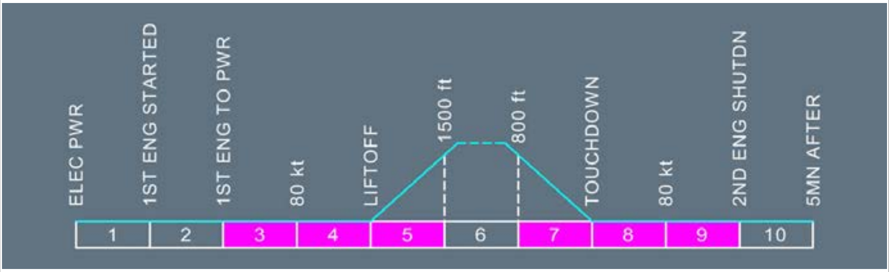
Ident.: PRO-ABN-C_B-Y-00017390.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one C/B is tripped in the designated zone.

Flight Phase Inhibition:



Ident.: PRO-ABN-C_B-Y-00012551.0001001 / 25 FEB 14

Crew awareness.

- **If one green circuit breaker (C/B) is tripped, one of the following messages appears after one minute, depending on the location of the affected C/B:**
  C/B TRIPPED ON OVHD PNL
  C/B TRIPPED ON L(R) ELEC BAY
  C/B TRIPPED REAR PNL J-M OR N-R OR S-V OR W-Z

L2 Note: *In flight, do not reengage a C/B that has tripped by itself, unless the Captain judges it necessary to do so for the safe continuation of the flight. This procedure should be adopted only as a last resort, and only one reengagement should be attempted.*
On ground, do not reengage the C/B of the fuel pump(s) of any tank. For all other C/B s, if the flight crew coordinates the action with maintenance, the flight crew may reengage a tripped C/B , provided that the cause of the tripped C/B is identified.

Intentionally left blank

COM ACARS FAULT

Applicable to: ALL

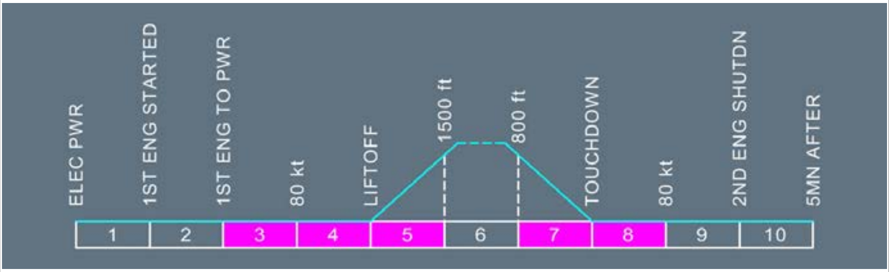
Ident.: PRO-ABN-COM-B-00016895.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a failure of ACARS.

Flight Phase Inhibition:



Ident.: PRO-ABN-COM-B-00017538.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-COM-B-00010037.0001001 / 05 AUG 10

STATUS

INOP SYS

ACARS

COM CIDS 1 + 2 FAULT

Applicable to: ALL

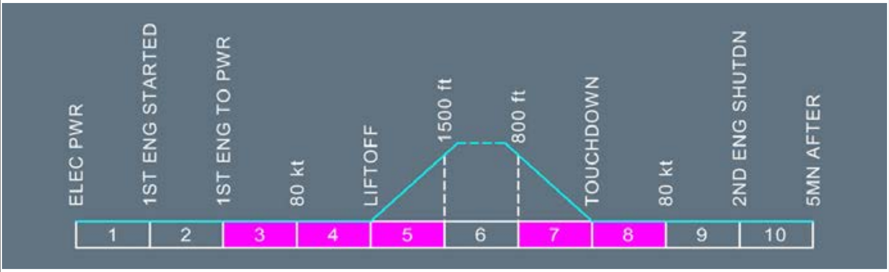
Ident.: PRO-ABN-COM-A-00016887.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a total loss of CIDS.

Flight Phase Inhibition:



Ident.: PRO-ABN-COM-A-00010033.0001001 / 25 FEB 14

L2 Passenger address, cabin and service interphone, and passenger signs are inoperative.

L1 Crew awareness.

Ident.: PRO-ABN-COM-A-00010034.0001001 / 05 AUG 10

STATUS

INOP SYS

CIDS

COM HF 1(2) DATA FAULT

Applicable to: ALL

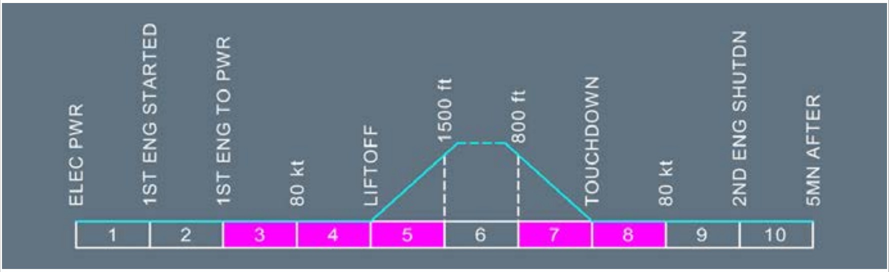
Ident.: PRO-ABN-COM-F-00016896.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when data communications via HF 1(2) are inoperative.

Flight Phase Inhibition:



Ident.: PRO-ABN-COM-F-00017499.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-COM-F-00010045.0001001 / 17 MAR 11

STATUS

INOP SYS

HF 1(2) DATA

COM SATCOM DATA FAULT

Applicable to: ALL

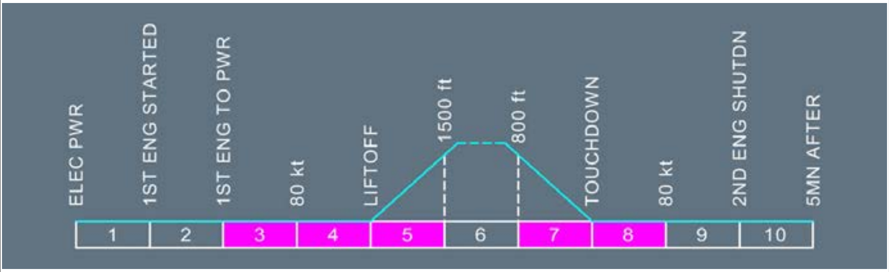
Ident.: PRO-ABN-COM-D-00016899.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the ACARS transmissions via SATCOM are lost.

Flight Phase Inhibition:



Ident.: PRO-ABN-COM-D-00017548.0001001 / 21 MAR 16

L2 Telephone transmissions are still available. ACARS communications are inoperative.

L1 Crew awareness.

Ident.: PRO-ABN-COM-D-00010041.0001001 / 21 MAR 16

STATUS

INOP SYS

SATCOM DATA

COM SATCOM FAULT

Applicable to: ALL

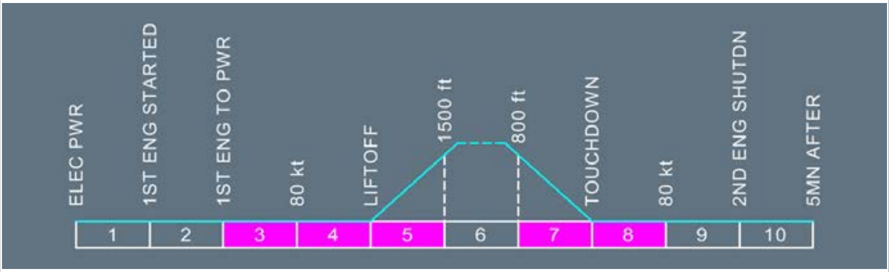
Ident.: PRO-ABN-COM-C-00016894.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the telephone and the ACARS transmission are lost.

Flight Phase Inhibition:



Ident.: PRO-ABN-COM-C-00017500.0001001 / 21 MAR 16

L2 ACARS and telephone communications are inoperative.

L1 Crew awareness.

Ident.: PRO-ABN-COM-C-00017502.0001001 / 21 MAR 16

STATUS

INOP SYS

SATCOM

COM SINGLE PTT STUCK

Applicable to: ALL

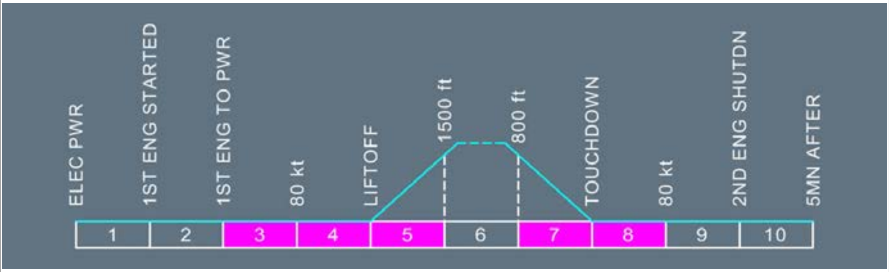
Ident.: PRO-ABN-COM-G-00016902.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when any PTT transmission selector is jammed in the transmit position for more than 40 s (VHF) or for more than 180 s (HF).

Flight Phase Inhibition:



Continued on the following page

COM SINGLE PTT STUCK (Cont'd)

Ident.: PRO-ABN-COM-G-00017503.0001001 / 21 MAR 16

ACP1 VHF 1(2)(3) TX.................................... DESELECT
ACP1 HF 1(2) TX.................................... DESELECT

- **IF UNSUCCESSFUL:**

  ACP2 VHF 1(2)(3) TX.................................... DESELECT
  ACP2 HF 1(2) TX.................................... DESELECT

- **IF UNSUCCESSFUL:**

  ACP3 VHF 1(2)(3) TX.................................... DESELECT
  ACP3 HF 1(2) TX.................................... DESELECT

When the ACP linked to the faulty PTT is detected, the previous ECAM actions are replaced by the following ones:

AUDIO SWTG.................................... DO NOT USE

- **ON AFFECTED ACP:**

  ALL TX KEYS.................................... DO NOT USE

- **ON ALL OTHER ACP:**

  VHF 1(2)(3) TX.................................... RESELECT
  HF 1(2) TX.................................... RESELECT

Ident.: PRO-ABN-COM-G-00014765.0001001 / 26 NOV 12

STATUS

	INOP SYS
AUDIO SWTG.................................... DO NOT USE	SINGLE PTT

COM VHF 1(2)(3) /HF 1(2) EMITTING

Applicable to: ALL

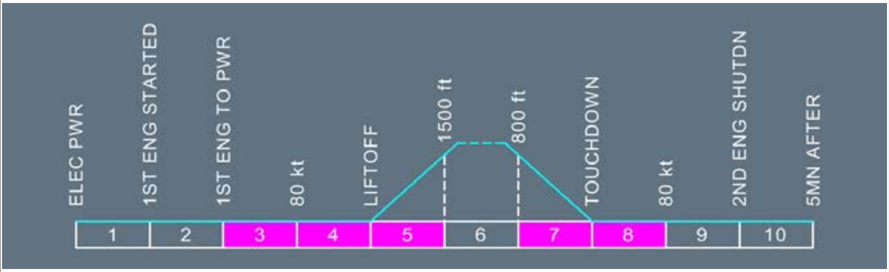
Ident.: PRO-ABN-COM-I-00016892.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 For VHF 1(2)(3) EMITTING, the alert triggers when the transmitter emits more than 30 s or 60 s depending on aircraft configuration.
For HF 1(2) EMITTING, the alert triggers when the transmitter emits more than 60 s.

Flight Phase Inhibition:



Ident.: PRO-ABN-COM-I-00017549.0001001 / 21 MAR 16

L2 1. If any Push To Talk (PTT) transmission selector (sidestick PTT , hand mike PTT , or ACP PTT switch) is jammed in the transmit position, try to release it in order to remove the caution.
2. If unsuccessful, deselect the identified failed VHF /HF transmission keys on the associated Audio Control Panel (ACP) to remove the caution. This ACP should only be used in reception mode. The associated PTT transmission selectors must not be used.

   Note: *In this case, the ACP of the unaffected side may be used to recover the deselected VHF /HF channel.*

3. If no transmission key on the ACP is found in the “transmit” position, pull the affected VHF /HF C/B associated to the ECAM message : COM\HF1 C/B HA 14 on 49 VU , COM NAV\HF2 C/B L13 on 121 VU , COM\VHF\1 C/B G09 on 49 VU , COM NAV\VHF\2 C/B L04 on 121 VU , COM \VHF\3 C/B L05 on 121 VU.

COM VHF 3 DATA FAULT

Applicable to: ALL

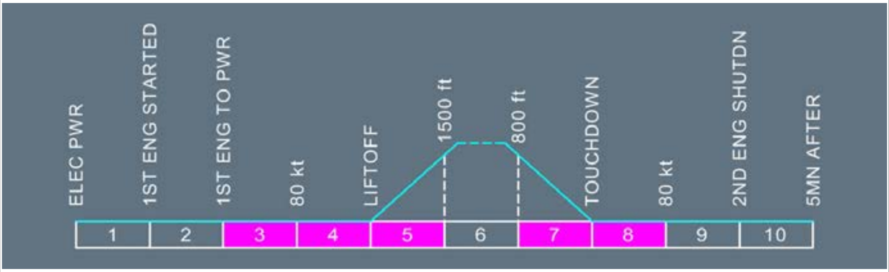
Ident.: PRO-ABN-COM-E-00016897.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when data communication via VHF 3 are inoperative.

Flight Phase Inhibition:



Ident.: PRO-ABN-COM-E-00017550.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-COM-E-00010043.0001001 / 17 MAR 11

STATUS

	INOP SYS
	VHF 3 DATA

Intentionally left blank

COND FWD CAB/AFT CAB/CKPT DUCT OVHT

Applicable to: ALL

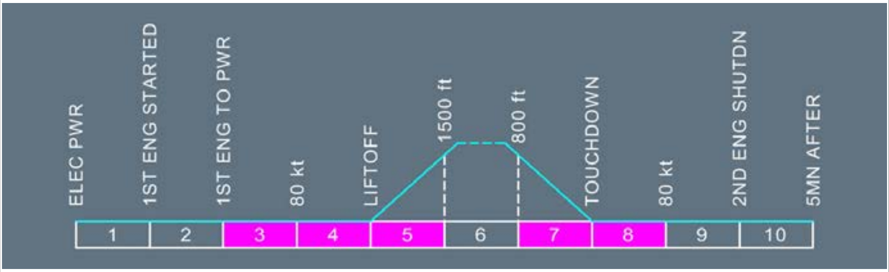
Ident.: PRO-ABN-COND-F-00017295.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the duct temperature rises above 88 °C.

Flight Phase Inhibition:



Ident.: PRO-ABN-COND-F-00010720.0001001 / 05 AUG 10

- **WHEN DUCT TEMP < 70 DEG C:**

  HOT AIR....................OFF THEN ON

  L2 *Hot air pressure regulating valve reopens.*

Ident.: PRO-ABN-COND-F-00018037.0001001 / 21 MAR 16

L12

STATUS

- **If system not recovered:**

  CAB TEMP BY PACK ONLY

  Basic temperature regulation is by packs only (remains automatic).

INOP SYS

HOT AIR
FWD CRG HEAT

COND FWD(AFT) CARGO DUCT OVHT

Applicable to: ALL

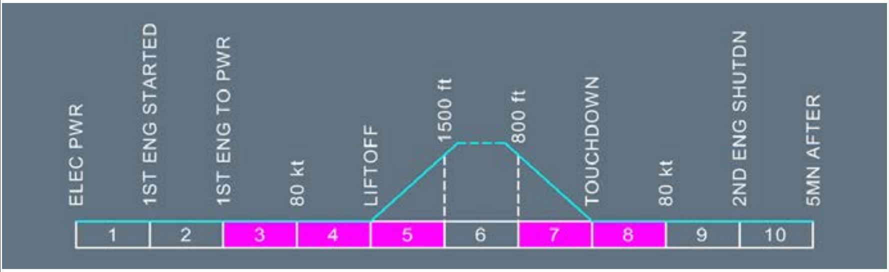
Ident.: PRO-ABN-COND-G-00017339.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the duct temperature in the forward(aft) cargo compartment rises above 88 °C.

Flight Phase Inhibition:



Ident.: PRO-ABN-COND-G-00018038.0001001 / 21 MAR 16

- **WHEN DUCT TEMP < 70 DEG C:**

  HOT AIR..OFF THEN ON

L2 *Hot air pressure regulating valve reopens.*

Ident.: PRO-ABN-COND-G-00018039.0001001 / 21 MAR 16

L12

STATUS

- **If system not recovered:**

  CAB TEMP BY PACK ONLY

  Basic temperature regulation is by packs only (remains automatic).

INOP SYS

FWD(AFT) CRG HEAT

COND FWD(AFT) CRG HEAT FAULT

Applicable to: ALL

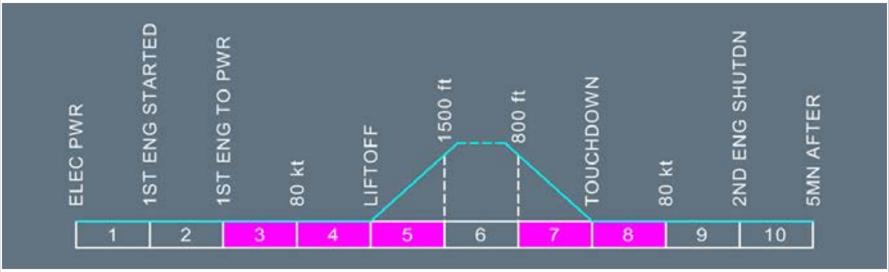
Ident.: PRO-ABN-COND-N-00017341.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers if the heating controller of the forward(aft) cargo compartment is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-COND-N-00018040.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-COND-N-00018041.0001001 / 21 MAR 16

STATUS

INOP SYS

FWD(AFT) CRG HEAT

COND FWD(AFT) CRG ISOL VALVE

Applicable to: ALL

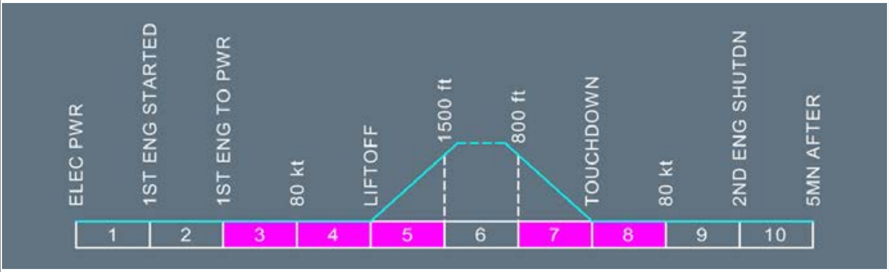
Ident.: PRO-ABN-COND-M-00017335.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers if the forward(aft) cargo isolation valve disagrees with the selected position.

Flight Phase Inhibition:



Ident.: PRO-ABN-COND-M-00018042.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-COND-M-00018043.0001001 / 21 MAR 16

STATUS

INOP SYS

FWD(AFT) CRG HEAT
FWD(AFT) CRG VENT

COND HOT AIR FAULT

Applicable to: ALL

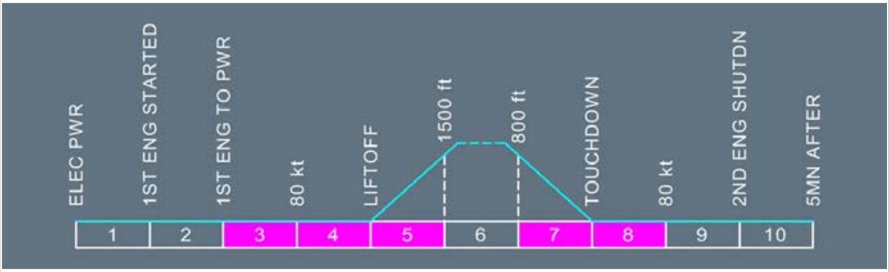
Ident.: PRO-ABN-COND-I-00017296.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the position of the hot air pressure regulating valve disagrees with the commanded position.

Flight Phase Inhibition:



Ident.: PRO-ABN-COND-I-00018940.0001001 / 21 MAR 16

HOT AIR (IF NOT CLOSED)..OFF

- **IF HOT AIR STILL OPEN and DUCT OVHT persists:**
  PACK 1..OFF
  PACK 2..OFF
  DESCENT TO FL 100/MEA

L2 *Descend to FL 100, or MEA, whichever is higher.*

L1 ● **WHEN DIFF PR < 1 PSI AND FL BELOW 100:**
  RAM AIR..ON
  MAX FL..100/MEA

Continued on the following page

COND HOT AIR FAULT (Cont'd)

Ident.: PRO-ABN-COND-I-00018044.0001001 / 21 MAR 16

L12

STATUS

- **If HOT AIR closed only:**
  CAB TEMP BY PACK ONLY
  Basic temperature regulation by packs only (remains automatic).

INOP SYS

PACK 1+2 (If PACKS OFF)
HOT AIR
FWD CRG HEAT

COND L+R CAB FAN FAULT

Applicable to: ALL

Ident.: PRO-ABN-COND-R-00017297.0001001 / 21 MAR 16

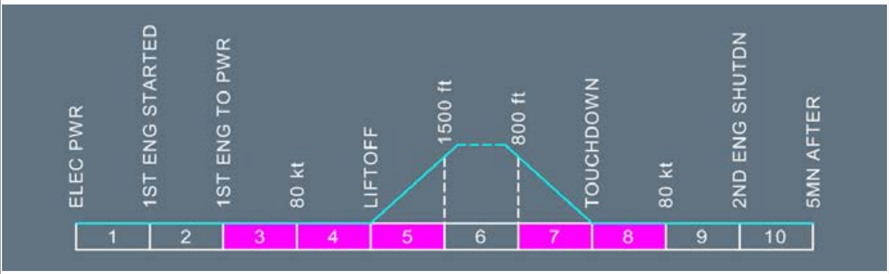
ANNUNCIATIONS

Triggering Conditions:

L2

This alert triggers if both recirculation fans are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-COND-R-00018045.0001001 / 22 MAR 17

PACK FLOW..HI

Continued on the following page

COND L+R CAB FAN FAULT (Cont'd)

Ident.: PRO-ABN-COND-R-00018046.0001001 / 21 MAR 16

STATUS

INOP SYS

L+R CAB FAN

COND LAV + GALLEY FAN FAULT

Applicable to: ALL

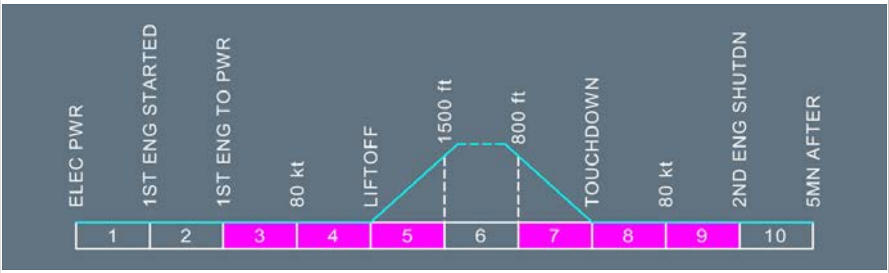
Ident.: PRO-ABN-COND-S-00017300.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers if the extraction fan of the lavatory and galley is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-COND-S-00010751.0002001 / 25 FEB 14

L2 Cabin zone temperature sensors are normally ventilated by the air extracted by the fan. Therefore, cabin zone temperature regulation is lost.

L1 Crew awareness.

Continued on the following page

COND LAV + GALLEY FAN FAULT (Cont'd)

Ident.: PRO-ABN-COND-S-00010752.0002001 / 05 AUG 10

L12

STATUS

CAB ZONE AT FIXED TEMP
See (1)

INOP SYS

GALLEY FAN

(1)
- *Cabin zone inlet duct temperature is constant (15 °C or 59 °F).*
- *Cockpit temperature regulation is normal.*

COND TRIM AIR SYS FAULT

Applicable to: ALL

Ident.: PRO-ABN-COND-AI-00017305.0001001 / 21 MAR 16

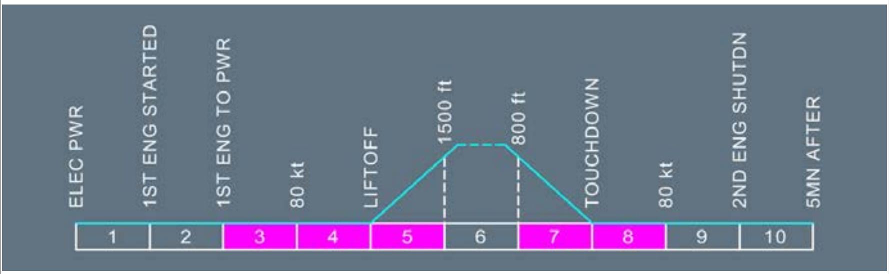
ANNUNCIATIONS

Triggering Conditions:

L2

This alert triggers when:
- One trim air valve is failed, or
- There is an overpressure downstream of the hot air valve.

Flight Phase Inhibition:



Continued on the following page

COND TRIM AIR SYS FAULT (Cont'd)

Ident.: PRO-ABN-COND-AI-00010730.0001001 / 05 AUG 10

- **One trim valve failed:**

  A message corresponding to the affected valve is displayed:
  AFT CAB TRIM VALVE
  FWD CAB TRIM VALVE
  CKPT TRIM VALVE

- **High pressure detected downstream of the hot air pressure regulating valve:**
  TRIM AIR HI PR

L2 *Note:* *If the warning and the TRIM AIR HI PR message are triggered when all trim air valves are closed (during the first 30 s after the packs are selected on, or in flight, if all zone heating demands are fulfilled), disregard them.*

COND ZONE REGUL FAULT
(PRIMARY CHANNEL FAILED)

Applicable to: ALL

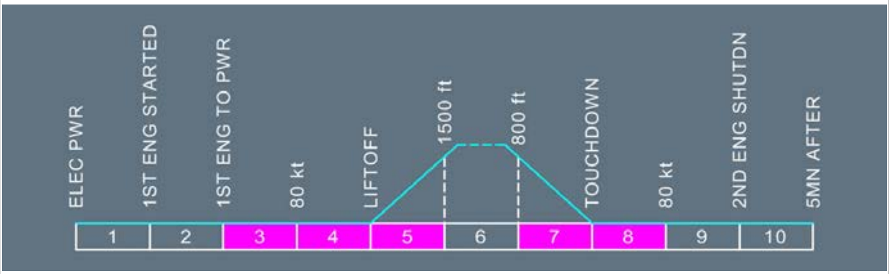
Ident.: PRO-ABN-COND-P-00017309.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the primary channel of the zone controller is failed.

Flight Phase Inhibition:



Continued on the following page

COND ZONE REGUL FAULT (Cont'd)
(PRIMARY CHANNEL FAILED)

Ident.: PRO-ABN-COND-P-00010744.0001001 / 25 FEB 14

L2 The hot air pressure regulating valve and trim air valves close.

L1 Crew awareness.

Ident.: PRO-ABN-COND-P-00018078.0001001 / 21 MAR 16

L12

STATUS

CAB ZONE AT FIXED TEMP

See (1)

INOP SYS

FWD CRG HEAT

(1) *The packs control zones to 24 °C (75 °F) via the zone controller secondary channel:*
- *Pack 1 controls the cockpit*
- *Pack 2 controls the cabin.*

COND ZONE REGUL FAULT
(PRIMARY AND SECONDARY CHANNELS FAILED)

Applicable to: ALL

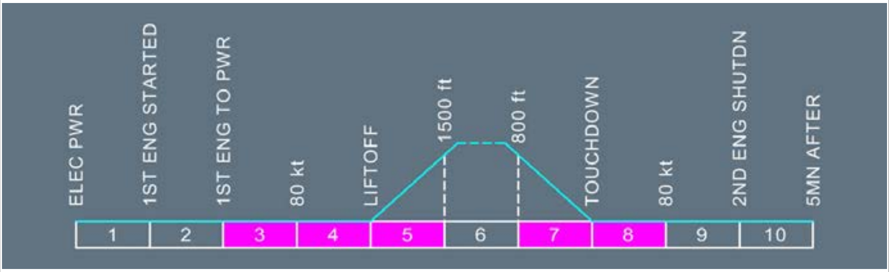
Ident.: PRO-ABN-COND-Q-00018304.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the primary and secondary channels of the zone controller are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-COND-Q-00010746.0001001 / 25 FEB 14

L2 The hot air pressure regulating valve and trim air valves close.

L1 Crew awareness.

Continued on the following page

COND ZONE REGUL FAULT (Cont'd)
(PRIMARY AND SECONDARY CHANNELS FAILED)

Ident.: PRO-ABN-COND-Q-00018081.0001001 / 21 MAR 16

L12

STATUS

ENG 1 APPR IDLE ONLY
ENG 2 APPR IDLE ONLY
See (1)
PACKS AT FIXED TEMP
See (2)

INOP SYS

ZONE REGUL
FWD CRG HEAT

(1) *As the FADEC no longer receives a bleed demand correction, only approach idle can be selected.*
(2) *The packs are controlled to deliver a fixed temperature of 20 °C (68 °F) for pack 1, and 10 °C (50 °F) for pack 2.*

CONFIG L(R) SIDESTICK FAULT
(BY TAKE OVER)

Applicable to: ALL

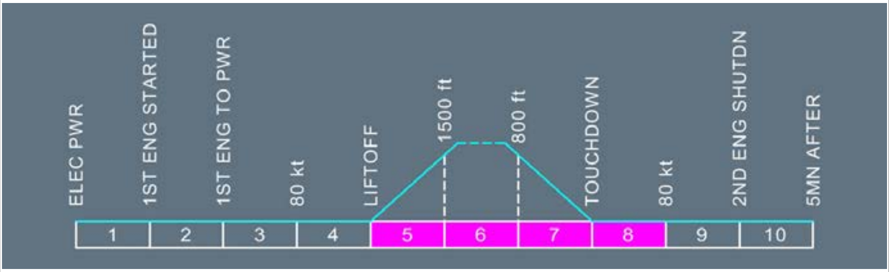
Ident.: PRO-ABN-CONFIG-AA-00018894.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the L or R sidestick is inoperative (takeover pb pressed more than 30 s) and when thrust levers are set at TO , or Flex TO, or when pressing T.O CONFIG pb.

Flight Phase Inhibition:



Ident.: PRO-ABN-CONFIG-AA-00018411.0001001 / 21 MAR 16

L(R) TAKEOVER ....DEPRESS

L2 *The affected stick becomes operative.*

CONFIG PARK BRK ON

Applicable to: ALL

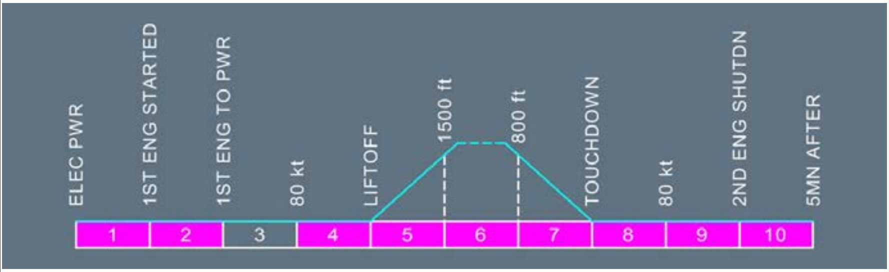
Ident.: PRO-ABN-CONFIG-Z-00017858.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the parking brake is on and thrust levers are set at TO or FLXTO power position.

Flight Phase Inhibition:



Ident.: PRO-ABN-CONFIG-Z-00011302.0001001 / 05 AUG 10

L2 Check that the parking brake handle is in the OFF position. If warning stays on, check that the brake pressure is at zero on the BRAKES PRESSURE indicator.

CONFIG PITCH TRIM NOT IN T.O RANGE

Applicable to: ALL

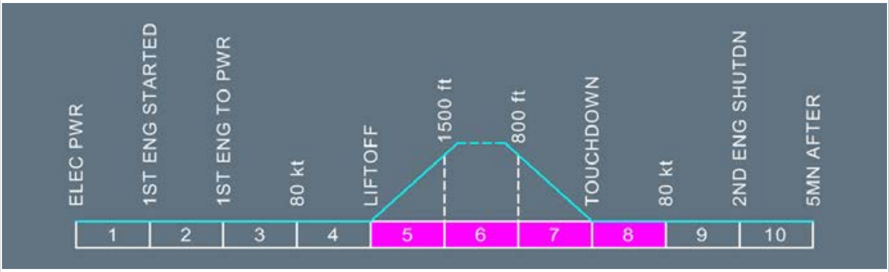
Ident.: PRO-ABN-CONFIG-AB-00018895.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 If the PITCH TRIM is not in TO configuration, this alert triggers:
- when thrust levers are set at TO , or Flex TO, or
- when pressing T.O CONFIG pb.

Flight Phase Inhibition:



Ident.: PRO-ABN-CONFIG-AB-00011773.0001001 / 25 FEB 14

Crew awareness.

CONFIG RUD TRIM NOT IN T.O RANGE

Applicable to: ALL

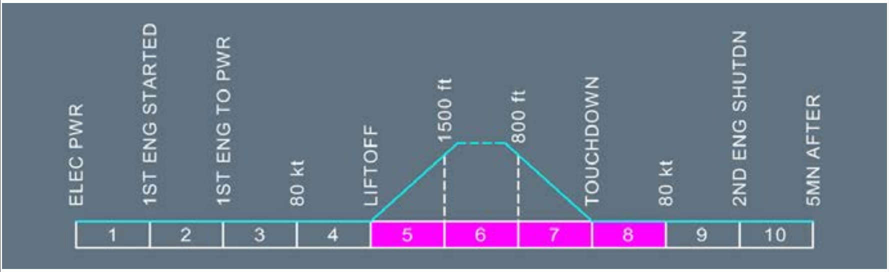
Ident.: PRO-ABN-CONFIG-AC-00018896.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 If the RUD TRIM is not in TO configuration, this alert triggers:
- when thrust levers are set at TO , or Flex TO, or
- when pressing T.O CONFIG pb.

Flight Phase Inhibition:



Ident.: PRO-ABN-CONFIG-AC-00011776.0001001 / 25 FEB 14

Crew awareness.

CONFIG SLATS (FLAPS) NOT IN T.O CONFIG

Applicable to: ALL

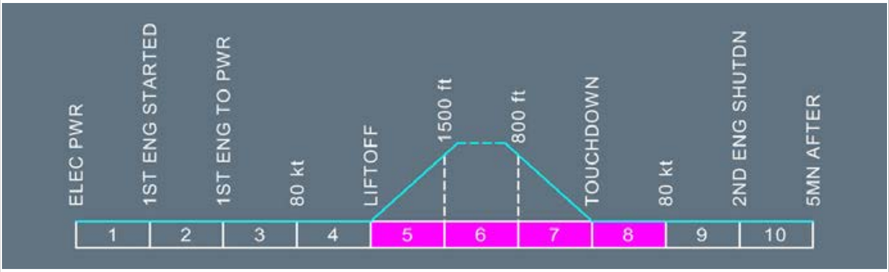
Ident.: PRO-ABN-CONFIG-AD-00018897.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 If the slats or flaps are not in TO configuration, this alert triggers:
- when thrust levers are set at TO , or Flex TO, or
- when pressing T.O CONFIG pb.

Flight Phase Inhibition:



Ident.: PRO-ABN-CONFIG-AD-00011758.0001001 / 25 FEB 14

Crew awareness.

CONFIG SPD BRK NOT RETRACTED

Applicable to: ALL

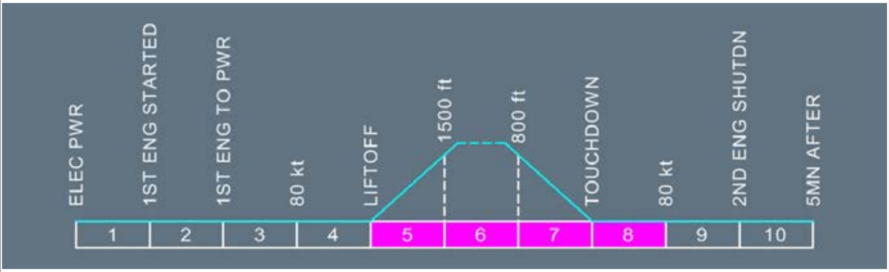
Ident.: PRO-ABN-CONFIG-AE-00018898.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 If the speed brakes are not retracted, this alert triggers:
- when thrust levers are set at TO , or Flex TO, or
- when pressing T.O CONFIG pb.

Flight Phase Inhibition:



Ident.: PRO-ABN-CONFIG-AE-00011766.0001001 / 09 FEB 16

Crew awareness.

DATALINK ATSU FAULT

Applicable to: ALL

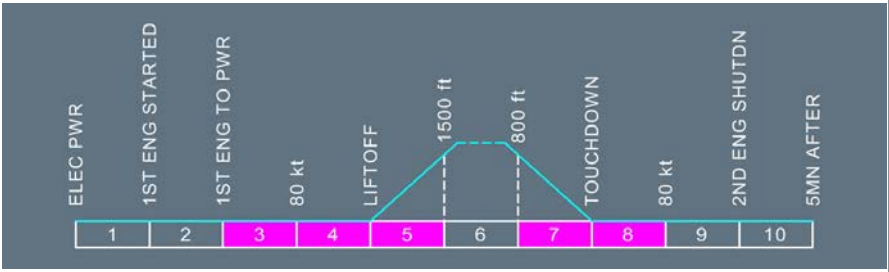
Ident.: PRO-ABN-DATALINK-A-00017150.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a failure in ATSU initialization associated with ATSU INIT FAULT ECAM message.

Flight Phase Inhibition:



Ident.: PRO-ABN-DATALINK-A-00018462.0001001 / 21 MAR 17

Crew awareness.

ATSU INIT FAULT

L2 *Displayed, in case of failure upon ATSU initialization.* *Refer to DSC-46-10-50 How to Initialize.*

Ident.: PRO-ABN-DATALINK-A-00018463.0001001 / 21 MAR 16

STATUS

INOP SYS

ATSU
DATA COMPANY

DATALINK COMPANY FAULT

Applicable to: ALL

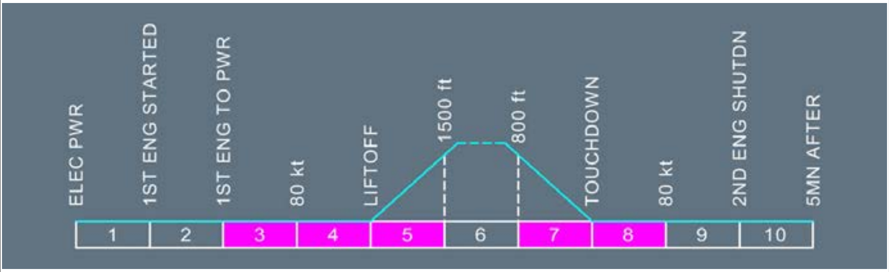
Ident.: PRO-ABN-DATALINK-C-00017151.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a failure in the AOC datalink communications.

Flight Phase Inhibition:



Ident.: PRO-ABN-DATALINK-C-00018458.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-DATALINK-C-00018459.0001001 / 21 MAR 16

STATUS

INOP SYS

DATA COMPANY

[QRH] COCKPIT DOOR FAULT

Ident.: PRO-ABN-DOOR-00009968.0003001 / 17 MAR 17
Applicable to: ALL

CKPT DOOR CONT [OVHD PANEL] .... CHECK

- **If one or more STRIKE status light on:**
  COCKPIT DOOR.......... OPEN
  COCKPIT DOOR sw .... UNLOCK 10 s THEN NORM
  - **If two or more STRIKE status lights on:**

    COCKPIT DOOR NOT INTRUSION PROOF.
- **If two CHAN status lights on:**

  Automatic latch release is not available, in case of cockpit decompression.
- **If no status light on:**

  TO UNLOCK THE DOOR: COCKPIT DOOR HANDLE AVAIL

DOOR L(R)(FWD)(AFT) AVIONICS
(IN FLIGHT)

Applicable to: ALL

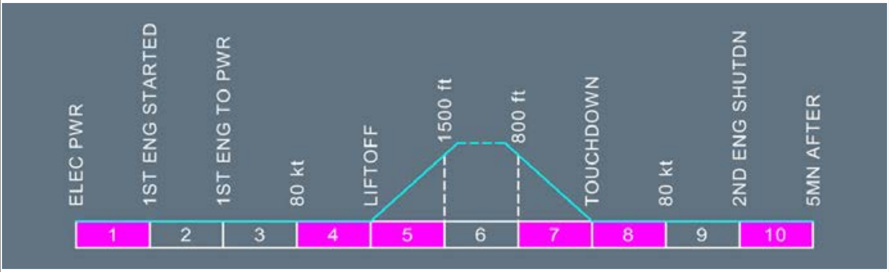
Ident.: PRO-ABN-DOOR-A-00016888.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the L(R)(FWD)(AFT) avionics door is not detected closed by the proximity sensors.

Flight Phase Inhibition:



Ident.: PRO-ABN-DOOR-A-00018945.0001001 / 21 MAR 16

L2 No crew action required as long as cabin pressure is normal.

L1 ● **IF ABN CAB V/S:**

MAX FL.. 100/MEA

L2 *Limit maximum flight level to FL 100, or MEA, or minimum obstacle clearance altitude. Avionics doors are of plug type. Therefore full depressurization is not recommended.*

Ident.: PRO-ABN-DOOR-A-00018944.0002001 / 21 MAR 16

STATUS

● **IF ABN CAB V/S:**

MAX FL.. 100/MEA

DOOR L(R)(FWD)(AFT) AVIONICS
(ON GROUND)

Applicable to: ALL

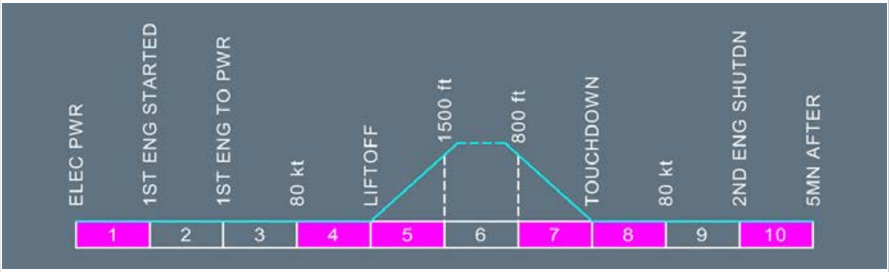
Ident.: PRO-ABN-DOOR-C-00019100.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the L(R)(FWD)(AFT) avionics door is not detected closed by the proximity sensors.

Flight Phase Inhibition:



Ident.: PRO-ABN-DOOR-C-00019096.0001001 / 21 MAR 16

Crew awareness.

DOOR L(R) FWD(AFT) CABIN
(IN FLIGHT)

Applicable to: ALL

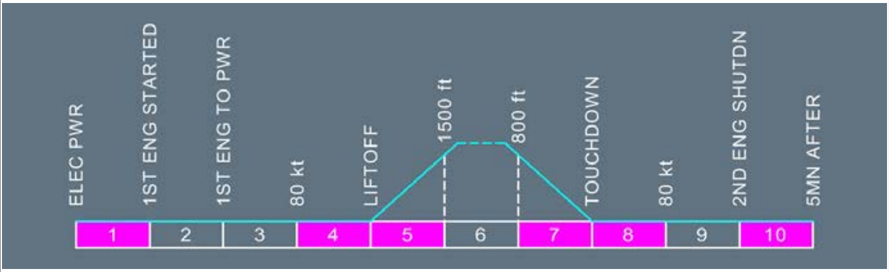
Ident.: PRO-ABN-DOOR-D-00019103.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the L(R) FWD(AFT) cabin door is not detected closed by the proximity sensors.

Flight Phase Inhibition:



Ident.: PRO-ABN-DOOR-D-00019101.0001001 / 21 MAR 16

No crew action required as long as cabin pressure is normal.

- **IF ABN CAB V/S:**

  MAX FL.. 100/MEA

L2 *Limit maximum flight level to FL 100, or MEA, or minimum obstacle clearance altitude.*
If door warning is accompanied by abnormal increase of cabin altitude, flight crew must reduce cabin ΔP and altitude by descending.

Ident.: PRO-ABN-DOOR-D-00019104.0002001 / 21 MAR 16

STATUS

- **IF ABN CAB V/S:**

  MAX FL.. 100/MEA

DOOR L(R) FWD(AFT) CABIN
(ON GROUND)

Applicable to: ALL

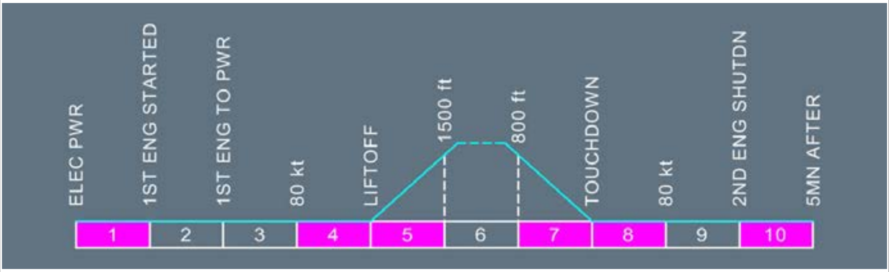
Ident.: PRO-ABN-DOOR-E-00019106.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the L(R) FWD(AFT) cabin door is not detected closed by the proximity sensors.

Flight Phase Inhibition:



Ident.: PRO-ABN-DOOR-E-00019102.0001001 / 21 MAR 16

L2 The crew may confirm a cabin door warning by checking the visual indicator on the door.

L1 Crew awareness.

DOOR L(R) EMER EXIT
(IN FLIGHT)

Applicable to: ALL

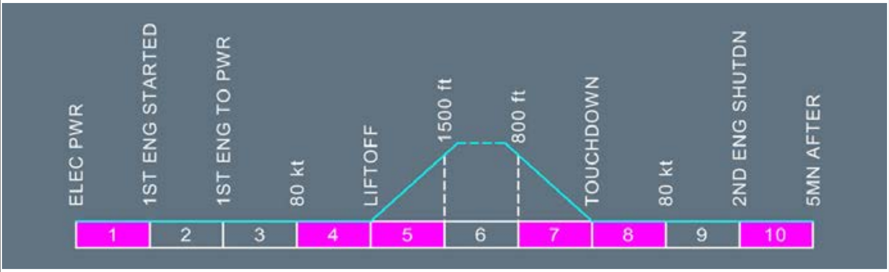
Ident.: PRO-ABN-DOOR-F-00019113.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the L(R) emergency exit door is not detected closed by the proximity sensors.

Flight Phase Inhibition:



Ident.: PRO-ABN-DOOR-F-00019112.0002001 / 21 MAR 16

No crew action required as long as cabin pressure is normal.

- **IF ABN CAB V/S:**

  MAX FL.. 100/MEA

L2 *Limit maximum flight level to FL 100, or MEA, or minimum obstacle clearance altitude.*
If door warning is accompanied by abnormal increase of cabin altitude, flight crew must reduce cabin ΔP and altitude by descending.

Ident.: PRO-ABN-DOOR-F-00019114.0005001 / 21 MAR 16

STATUS

- **IF ABN CAB V/S:**

  MAX FL.. 100/MEA

DOOR L(R) EMER EXIT
(ON GROUND)

Applicable to: ALL

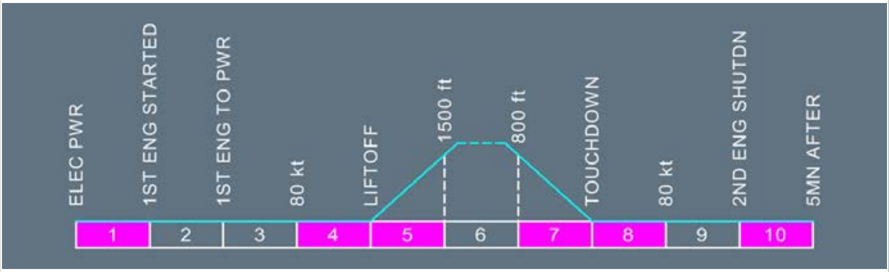
Ident.: PRO-ABN-DOOR-G-00019117.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the L(R) emergency exit door is not detected closed by the proximity sensors.

Flight Phase Inhibition:



Ident.: PRO-ABN-DOOR-G-00019116.0002001 / 21 MAR 16

L2 The crew may confirm an emergency exit door warning by checking the visual indicator on the door.

L1 Crew awareness.

DOOR FWD(AFT)(BULK) CARGO
(IN FLIGHT)

Applicable to: ALL

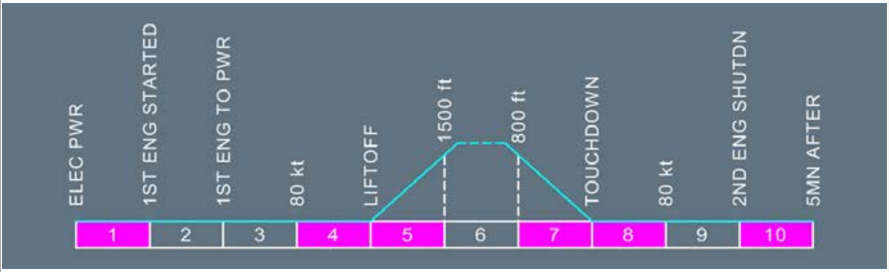
Ident.: PRO-ABN-DOOR-B-00016890.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the FWD(AFT)(BULK) cargo door is not detected closed by the proximity sensors.

Flight Phase Inhibition:



Ident.: PRO-ABN-DOOR-B-00019126.0001001 / 21 MAR 16

No crew action required as long as cabin pressure is normal.

- **IF ABN CAB V/S:**

  MAX FL.. 100/MEA

L2 *Limit maximum flight level to FL 100, or MEA, or minimum obstacle clearance altitude.*
If door warning is accompanied by abnormal increase of cabin altitude, flight crew must reduce cabin ΔP and altitude by descending.

Ident.: PRO-ABN-DOOR-B-00018946.0002001 / 21 MAR 16

STATUS

- **IF ABN CAB V/S:**

  MAX FL.. 100/MEA

DOOR FWD(AFT)(BULK) CARGO
(ON GROUND)

Applicable to: ALL

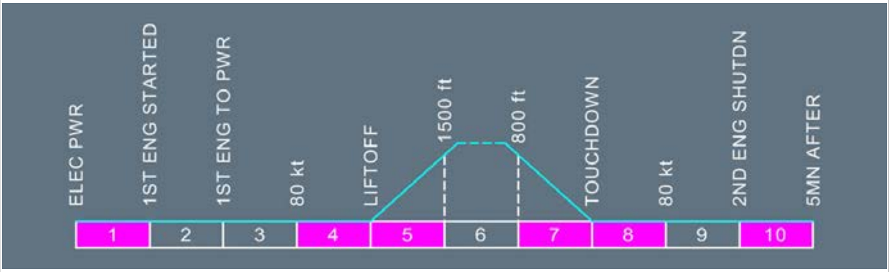
Ident.: PRO-ABN-DOOR-H-00019129.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the FWD(AFT)(BULK) cargo door is not detected closed by the proximity sensors.

Flight Phase Inhibition:



Ident.: PRO-ABN-DOOR-H-00018947.0002001 / 21 MAR 16

L2 The crew may confirm a cargo door warning by checking the indication on the cargo door.
L1 Crew awareness.

Intentionally left blank

[QRH] DISPLAY UNIT FAILURE

Ident.: PRO-ABN-EIS-00021170.0001001 / 17 MAR 17
Applicable to: ALL

■ **If DU flashes:**

This phenomenon may be due to Intermittent Electrical Power Supply Interruptions. It is evidenced by one, or a combination, of the following :
- Flashing of PFD , ND , ECAM DUs (blank screen or diagonal line),
- Flashing of MCDU,
- Intermittent flight control law reversion.

■ **If captain PFD, ND, Upper ECAM or MCDU 1 affected:**

GEN 1 .... OFF

■ **If DUs flash continues :**

GEN 1 .... ON

■ **If DUs flash stops :**

KEEP GEN 1 OFF

Keep the generator OFF for the rest of the flight.

RUD TRIM .... CHECK/RESET

Use the slide slip indication to reset the rudder trim if necessary. Intermittent Electrical Power Supply Interruptions may cause offset in the rudder trim.

APU START .... CONSIDER

■ **If first officer PFD, ND, lower ECAM or MCDU 2 affected:**

GEN 2 .... OFF

■ **If DUs flash continues :**

GEN 2 .... ON

■ **If DUs flash stops :**

KEEP GEN 2 OFF

Keep the generator OFF for the rest of the flight.

RUD TRIM .... CHECK/RESET

Use the slide slip indication to reset the rudder trim if necessary. Intermittent Electrical Power Supply Interruptions may cause offset in the rudder trim.

APU START .... CONSIDER

■ **If DU blank or distorted:**

DU brightness knob (affected DU) .... AS RQRD

Continued on the following page

[QRH] DISPLAY UNIT FAILURE (Cont'd)

The DU can be switched off.

CONSIDER ECAM/ND XFR

CONSIDER PFD/ND XFR

- **If diagonal line on affected DU:**

  This failure may be caused by a DMC FAULT, or a communication interruption between the DMC and DU.

  CONSIDER EIS DMC SWITCHING

  - **If unsuccessful:**

    DU brightness knob (affected DU).. OFF THEN ON

    Note: The ND display may disappear if too many waypoints and associated information are displayed. Reduce ND range, or deselect WPT or CSTR , and the ND display may automatically recover, after about 30 s.

- **If inversion of E/WD and SD:**

  ECAM UPPER DISPLAY brightness knob..OFF THEN ON

  The same action on the EIS DMC SWITCHING selector produces the same effect.

EIS DMC 1(2)(3) FAULT

Applicable to: ALL

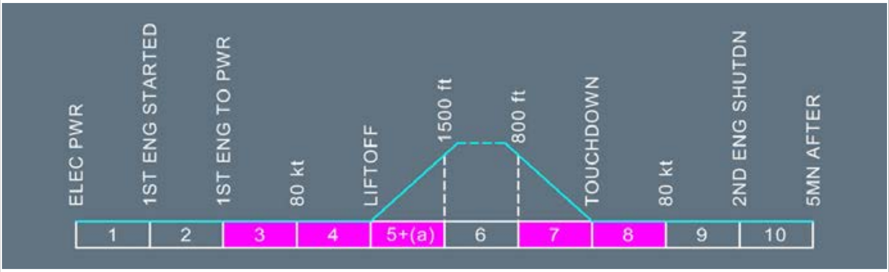
Ident.: PRO-ABN-EIS-F-00017307.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when DMC 1, or DMC 2, or DMC 3 is failed.

Flight Phase Inhibition:



L1 *Note:* *(a) Inhibited only during first 15 s of Flight Phase 5.*

Ident.: PRO-ABN-EIS-F-00010057.0002001 / 10 AUG 10

■ **DMC 1**

EIS DMC SWITCH .... CAPT 3

L2 *DMC 3 replaces DMC 1.*

L1 ■ **DMC 2**

EIS DMC SWITCH .... F/O 3

L2 *DMC 3 replaces DMC 2.*

L1 ■ **DMC 3**

Crew awareness.

Continued on the following page

EIS DMC 1(2)(3) FAULT (Cont'd)

Ident.: PRO-ABN-EIS-F-00010058.0001001 / 10 AUG 10

STATUS

INOP SYS

DMC 1(2)(3)

EIS DMC/FWC COM FAULT

Applicable to: ALL

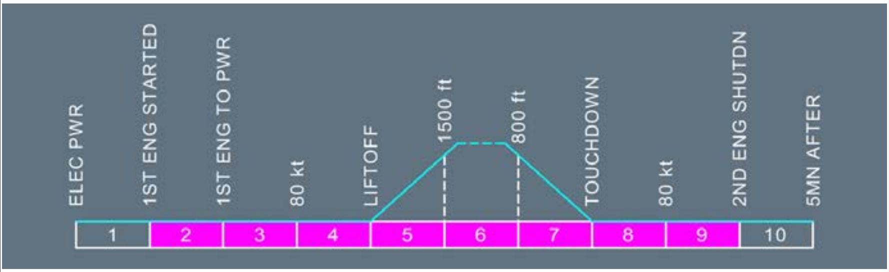
Ident.: PRO-ABN-EIS-I-00017317.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when at least one of the FWC detects the loss of both DMC 1/3 and DMC2/3 busses.

Flight Phase Inhibition:



Ident.: PRO-ABN-EIS-I-00014308.0001001 / 25 FEB 14

Crew awareness.

[QRH] C/B TRIPPED

Ident.: PRO-ABN-ELEC-00012643.0001001 / 17 MAR 17
Applicable to: ALL

- **On ground:**
  Do not reengage the circuit breaker (C/B) of the fuel pump(s) of any tank. For all other C/B , if the flight crew coordinates the action with maintenance, the flight crew may reengage a tripped C/B, provided that the cause is identified.
- **In flight:**
  Do not reengage a circuit breaker (C/B), unless the captain judges it necessary to do so for the safe continuation of the flight. Only one reengagement should be attempted.

[QRH] ELEC EMER CONFIG SYS REMAINING

Applicable to: ALL

ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING	BAT ONLY IN FLIGHT	BAT ONLY ON THE GROUND
Ident.: PRO-ABN-ELEC-S-00018562.0003001 / 17 MAR 17				
AIR COND PRESS	PRESS AUTO SYS 1	NORM	NORM	NORM
	MAN PRESS CTL	INOP	INOP	INOP[(a)]
	RAM AIR	NORM	NORM	NORM
	PACK VALVE 1	NORM	Closure Inop	Closure Inop
	PACK VALVE 2	Closure Inop	Closure Inop	Closure Inop [(a)]
	AVIONIC VENT	NORM	NORM	Partial
	AFT CRG ISOL VALVES	NORM	INOP	INOP
Ident.: PRO-ABN-ELEC-S-00012522.0001001 / 17 MAR 17				
FMGS	FMGC (NAV FUNCTION)	N°1 only	Inop	Inop
	MCDU	N°1 only	Inop	Inop
	FAC	N°1 only	Inop	Inop
	FCU	ch 1 only	ch 1 only	ch 1 only
Ident.: PRO-ABN-ELEC-S-00018533.0002001 / 17 MAR 17				
COM	VHF 1	NORM	NORM	NORM
	HF 1	NORM	INOP	INOP
	RMP 1	NORM	NORM	NORM
	ACP (CAPT , F/O)	NORM	NORM	NORM
	CIDS	NORM	NORM	NORM
	INTERPHONE	NORM	NORM	NORM
	CVR	NORM	INOP	INOP
	LOUDSPEAKER 1	NORM	NORM	NORM
Ident.: PRO-ABN-ELEC-S-00012524.0001001 / 17 MAR 17				
EMER EQPT	CREW OXY	NORM	NORM [(b)]	NORM [(b)]
	PAX OXY mask release (auto + man)	NORM	INOP	INOP
	SLIDES ARM/WARN	NORM	NORM	NORM

Continued on the following page

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ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING	BAT ONLY	
			IN FLIGHT	ON THE GROUND

Ident.: PRO-ABN-ELEC-S-00012525.0002001 / 17 MAR 17

FIRE	ENG 1 LOOP	A only	A only	A only
	ENG 2 LOOP	B only	B only	B only
	APU LOOP	INOP	INOP	INOP[(a)]
	CARGO SMOKE DET	ch 1 only	INOP	INOP
	ENG FIRE EXT.	Bottle 1 only	Bottle 1 only	Bottle 1 only
	APU FIRE EXT.	Squib A only	Squib A only	Squib A only
	CARGO FIRE EXT.	INOP	INOP	INOP[(a)]
	APU AUTO EXT.	INOP	INOP	INOP[(a)]

Ident.: PRO-ABN-ELEC-S-00018017.0001001 / 17 MAR 17

FLT CTL	ELAC	N°1 only	N°1 + N°2	N°1 + N°2 [(d)]
	SEC	N°1 only	N°1 only	N°1 only
	FCDC	N°1 only	INOP	INOP
	SFCC	N°1 only	N°1 only	N°1 only
	Flaps pos ind	NORM	NORM	NORM [(c)]

Ident.: PRO-ABN-ELEC-S-00018018.0001001 / 17 MAR 17

FUEL	LP VALVE	NORM	NORM	NORM
	FQI channel 1	NORM	INOP	INOP
	X FEED VALVE	NORM	INOP	INOP
	INTERTANK TRANSFER VALVE	NORM	INOP	INOP

Ident.: PRO-ABN-ELEC-S-00012528.0001001 / 17 MAR 17

HYD	FIRE VALVES	NORM	NORM	NORM

Ident.: PRO-ABN-ELEC-S-00018539.0002001 / 17 MAR 17

ICE-RAIN	WING A.ICE	NORM	INOP	INOP
	ENG A.ICE VALVE	OPEN	OPEN	OPEN
	CAPT PITOT	NORM	NORM	NORM[(c)]
	CAPT AOA	NORM	INOP	INOP
	RAIN REPELLENT (CAPT)	NORM	NORM	NORM

Continued on the following page

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ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING	BAT ONLY	
			IN FLIGHT	ON THE GROUND

Ident.: PRO-ABN-ELEC-S-00018538.0002001 / 17 MAR 17

EIS	PFD 1	NORM	NORM	NORM [c]
	ND 1	NORM	INOP	INOP
	ECAM upper disp.	NORM	NORM	NORM [c]
	DMC 1 or 3	NORM	NORM	NORM [c]
	SDAC 1, FWC 1	NORM	NORM	NORM [c]
	ECAM CONT. panel	NORM	NORM	NORM
FLT INS	CLOCKS	NORM	NORM	NORM

Ident.: PRO-ABN-ELEC-S-00018537.0001001 / 17 MAR 17

L/G	LGCIU SYS 1	NORM	NORM	NORM
	BRK PRESS IND	NORM	NORM	NORM
	PARK BRK	NORM	NORM	NORM

Ident.: PRO-ABN-ELEC-S-00012532.0001001 / 17 MAR 17

LIGHTS	EMER CKPT	NORM	NORM	NORM
	EMER CAB	NORM	NORM	NORM

Ident.: PRO-ABN-ELEC-S-00018550.0002001 / 17 MAR 17

NAV	IR	N°1 only [e]	N°1 only [e]	N°1 only [e]
	ADR	N°1 only	N°1 only	N°1 only
	VOR	N°1 only	N°1 only	N°1 only [c]
	MMR	N°1 only	N°1 only	N°1 only [c]
	DME	N°1 only	INOP	INOP
	DDRMI	NORM	NORM	NORM [c]
	ATC	N°1 only	INOP	INOP
	STBY HORIZON	NORM	NORM	NORM
	STBY COMP (LT)	NORM	NORM	NORM
	STBY ALTI (VIB)	NORM	INOP	INOP

Ident.: PRO-ABN-ELEC-S-00018541.0002001 / 17 MAR 17

PNEU	ENG 1 BLEED	NORM	BMC 1 INOP	BMC 1 INOP
	ENG 2 BLEED	BMC 2 INOP	BMC 2 INOP	BMC 2 INOP
	APU BLEED	INOP	INOP	INOP [a]
	X BLEED (MAN CTL)	NORM	INOP	INOP

Continued on the following page

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ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING	BAT ONLY	
			IN FLIGHT	ON THE GROUND

Ident.: PRO-ABN-ELEC-S-00018019.0002001 / 17 MAR 17

APU	ECB-STARTER	NORM[f]	NORM[g]	INOP[a]
	FUEL LP VALVE	NORM	NORM	NORM
	FUEL PUMP	NORM	NORM	NORM

Ident.: PRO-ABN-ELEC-S-00018540.0002001 / 17 MAR 17

PWR PLT	FADEC	A+B [h]	A+B [h]	A+B [h]
	IGNITION	A only	A only	A only
	HP FUEL VALVE closure	NORM	NORM	NORM

Ident.: PRO-ABN-ELEC-S-00012537.0001001 / 17 MAR 17

MISC	MECH HORN	NORM	NORM	NORM

(a) *Restored, when speed is below 100 kt.*

(b) *Crew supply solenoid valve inoperative.*

(c) *Lost, when the speed is below 50 kt.*

(d) *Lost, 30 s after the last engine shutdown.*

(e) *IR 2 and IR 3 are lost 5 min after failure of main generators but if IR 3 replaces IR 1 (ATT -HDG selector at CAPT 3), IR 3 remains supplied.*

(f) *For APU start only.*

(g) *Not available for 45 s, after the loss of both engine generators.*

(h) *Channels A and B are self powered above 10 % N2 for IAE or PW engines, 12 % N2 for CFM56 engines, or 8 % N2 for CFM LEAP-1A engines. If N2 is below these values, only Channel A is powered.*

ELEC AC BUS 1 FAULT

Applicable to: ALL

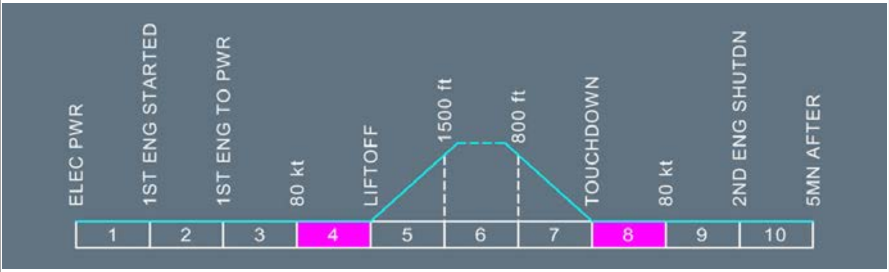
Ident.: PRO-ABN-ELEC-I-00017346.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the AC 1 busbar is not supplied.

Flight Phase Inhibition:



Continued on the following page

ELEC AC BUS 1 FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-I-00017853.0003001 / 21 MAR 16

L2 AC BUS 1 normally supplies the AC ESS BUS and, through TR1, the DC ESS BUS. In the case of an AC BUS 1 FAULT, both the AC and DC ESS BUS will be lost and therefore the AC ESS BUS FAULT and the DC ESS BUS FAULT will be displayed on the ECAM.
However, for aircraft equipped with AC ESS FEED Auto Switching , the AC ESS BUS and the DC ESS BUS will automatically recover, due to the fact that the AC BUS 2 will automatically supply the AC ESS BUS.
The flight crew can manually recover the AC ESS BUS and the DC ESS BUS by setting the AC ESS FEED pb-sw to ALTN , as requested by the AC ESS BUS FAULT ECAM procedure

L1 BLOWER.. OVRD

L2 *The avionics ventilation system is in the closed circuit configuration.*
Air conditioning is added to the ventilation air.

L1 FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

ASSOCIATED PROCEDURES

WHEEL N.W. STEER FAULT

L12

ASSOCIATED PROCEDURES

ENG 1 EPR MODE FAULT

This associated procedure is only applicable to aircraft equipped with IAE engines.
Refer to PRO-ABN-ENG ENG 1(2) EPR MODE FAULT (First Threshold).

SECONDARY FAILURES

* AVNCS VENT
* HYD
* FUEL
* F/CTL

Continued on the following page

ELEC AC BUS 1 FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-I-00017867.0021001 / 22 MAR 17

L12

STATUS

LDG DIST PROC.. APPLY

FUEL CONSUMPT INCRSD

See [1]

FMS PRED UNRELIABLE

See [2]

CAB ZONE AT FIXED TEMP

See [3]

SLATS SLOW

CAT 2 ONLY

INOP SYS

See below

INOP SYS

BLUE HYD	SPLR 3	ADR 3
RA 1	CAPT TAT	L WSHLD HEAT
L WNDW HEAT	CAT 3	L+R TK PUMP 1
CTR TK PUMP 1	VENT BLOWER	GALLEY FAN
CRG HEAT (if both FWD and aft crg heat installed)	CRG vent (if both FWD and aft crg heat installed)	AFT CRG HEAT
FWD CRG HEAT	AFT CRG VENT	FWD CRG VENT
GND COOL	N/W STRG	MAIN GALLEY
B ELEC PUMP	BRK SYS 1/BSCU CH 1	DMC 3
GPWS	LAV DET	PACK 1 REGUL
REVERSER 1	GPWS TERR	STEEP APPR

Other INOP SYS

Left cabin fan	Radar 1	Stby Pitot/AOA
ADF 1	ACARS /ATSU	Brake fans 5, 6, 7 and 8
HUD	MCDU 3	Engine 1 ignition B
EVMU eng 1 and eng 2	Printer	Zone controller prim channel

Continued on the following page

ELEC AC BUS 1 FAULT (Cont'd)

Hydraulic quantity indication TCAS	Partial galley	PVI

Note: The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*
(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*
(3) *Due to the loss of the galley fan, the Pack 1 controller, and the primary zone controller channel. (See associated procedures).*

ELEC AC BUS 2 FAULT

Applicable to: ALL

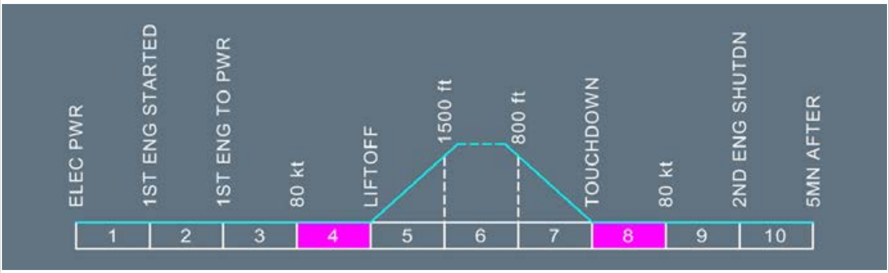
Ident.: PRO-ABN-ELEC-J-00017348.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the AC 2 busbar is not supplied.

Flight Phase Inhibition:



Continued on the following page

ELEC AC BUS 2 FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-J-00017877.0002001 / 21 MAR 16

EXTRACT .... OVRD

L2 *The avionics ventilation system is in the closed circuit configuration.*
Air conditioning is added to the ventilation air.

L1 ATC/XPDR .... SYS 1

ASSOCIATED PROCEDURES

L/G LGCIU 2 FAULT

L12

ASSOCIATED PROCEDURES

ENG 2 EPR MODE FAULT

This associated procedure is only applicable to aircraft equipped with IAE engines.
Refer to PRO-ABN-ENG ENG 1(2) EPR MODE FAULT (First Threshold).

SECONDARY FAILURES

* AVNCS VENT
* FUEL

Continued on the following page

ELEC AC BUS 2 FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-J-00017878.0004001 / 22 MAR 17

L12

STATUS

ENG 2 APPR IDLE ONLY
PACK 2 AT FIXED TEMP
See (1)
FLS : F-APP+RAW ONLY

INOP SYS

See below

INOP SYS

ADR 2	Y ELEC PUMP	SDAC 2
FWC 2	DMC 2	RECORDER SYS (OR FDIU)
R WSHLD HEAT	LGCIU 2	RA 2
F/O PITOT	F/O AOA	F/O TAT
R WNDW HEAT	L+R TK PUMP 2	RUD TRV LIM 2
REVERSER 2	VENT EXTRACT	GND COOL
PACK 2 REGUL	MAIN GALLEY	YAW DAMPER 2
RUD TRIM 2	FAC 2	CAT 2
CTR TK PUMP 2	ACT PUMP	BRK SYS 2 /BSCU CH 2
ILS 2 (OR LS 2 for aircraft equipped with MLS /GLS /FLS)	GPS 2	ATC 2 or ATC/XPDR 2
GLS AUTOLAND	ROW/ROP	

Other INOP SYS

Right cabin fan	Brake fans 1, 2, 3 and 4	ADF 2
DME 2	RADAR 2	WXR 2
MCDU 2	ENG 2 ignition B	VOR 2
F/O PFD and ND	QAR	ECAM lower DU
HF 2		

Note: *The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.*

Continued on the following page

ELEC AC BUS 2 FAULT (Cont'd)

(1) *Due to the loss of Pack 2 controller, the pack outlet temperature is controlled by the pack anti-ice valve and is stabilized to a temperature between 5 °C (41 °F) and 30 °C (86 °F) within a maximum of 6 min.*

ELEC AC ESS BUS ALTN

Applicable to: ALL

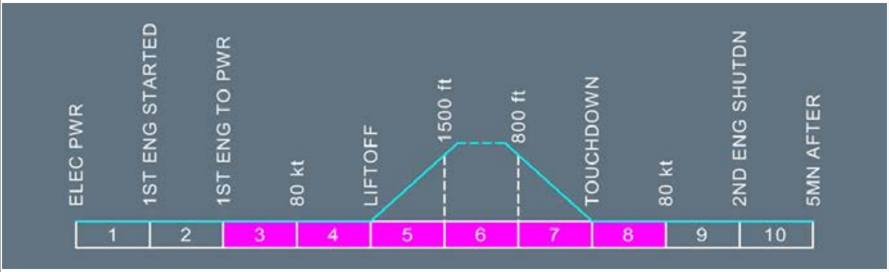
Ident.: PRO-ABN-ELEC-Z-00017356.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the AC ESS busbar is supplied from the AC 2 busbar although the AC ESS FEED pb-sw is set to normal.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-Z-00017893.0001001 / 21 MAR 16

Crew awareness.

ELEC AC ESS BUS FAULT

Applicable to: ALL

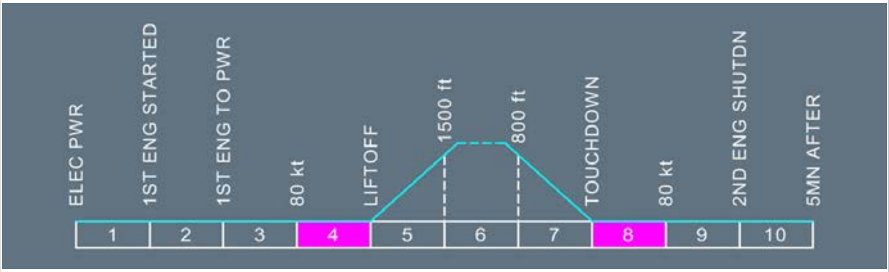
Ident.: PRO-ABN-ELEC-K-00017357.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the AC ESS busbar is not supplied.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-K-00012502.0002001 / 24 MAR 11

AC ESS FEED.. ALTN

L2 *AC BUS 2 supplies AC ESS BUS.*

L1 ATC/XPDR.. SYS 2

Continued on the following page

ELEC AC ESS BUS FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-K-00018552.0014001 / 01 JUN 16

L12

STATUS

	INOP SYS
	See below

INOP SYS

ADR 1	LS 1	GPS 1
CAPT PITOT	CAPT AOA	CAT 2
SDAC 1	FWC 1	DMC 1
GPWS	GPWS terr	YAW DAMPER 1
RUD TRIM 1	RUD TRV LIM 1	GLS AUTOLAND
ATC 1 or ATC/XPDR 1	ROW/ROP	

Other INOP SYS

RMP's lighting (RMP's still operative)	VOR 1	MCDU 1
CVR	ECAM upper display	CAPT ND
CAPT PFD	DME 1	APU fuel pump
DDRMI	HF 1	Passenger oxygen masks (auto + manual)

Note: *The warning may be caused by a sub BUS failure. As a result, only a part of the above-listed systems may be lost.*

ELEC AC ESS BUS SHED

Applicable to: ALL

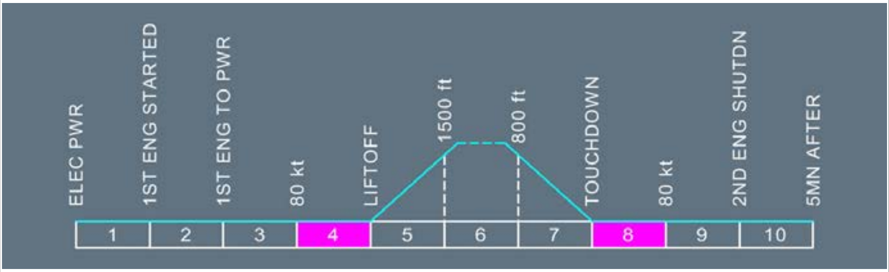
Ident.: PRO-ABN-ELEC-L-00017349.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the AC SHED ESS busbar is not supplied.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-L-00012504.0002001 / 03 DEC 13

ATC/XPDR.. SYS 2

Continued on the following page

ELEC AC ESS BUS SHED (Cont'd)

Ident.: PRO-ABN-ELEC-L-00018554.0004001 / 21 MAR 16

L12

STATUS

INOP SYS

CAPT AOA
ATC 1 or ATC/XPDR 1
See below

Other INOP SYS

MCDU 1
CVR
Passenger oxygen masks (auto + manual)
DME 1
CAPT AOA heat
APU fuel pump
CAPT ND
HF 1

Note: *The warning may be caused by a failure in a sub BUS. Consequently only a part of the systems listed above may be lost.*

ELEC APU GEN FAULT

Applicable to: ALL

Ident.: PRO-ABN-ELEC-E-00017362.0001001 / 21 MAR 16

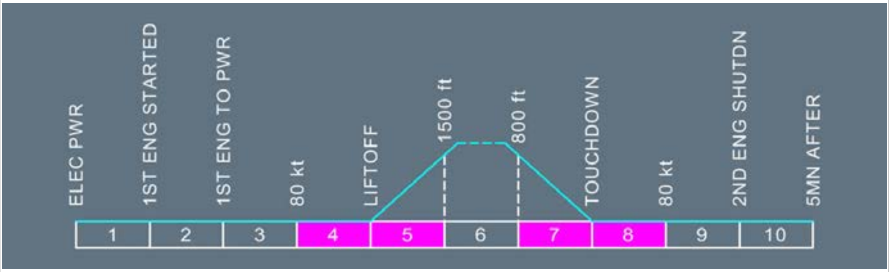
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- The protection trip is initiated by the associated GCU, or
- The line contactor is open with APU GEN pb-sw set to ON.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-E-00012490.0002001 / 18 MAR 11

APU GEN.. OFF THEN ON

- **IF UNSUCCESSFUL:**

  APU GEN..OFF

Continued on the following page

ELEC APU GEN FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-E-00012491.0001001 / 18 MAR 11

STATUS

INOP SYS

MAIN GALLEY (1)
APU GEN

(1) *(When only one GEN operating)*

ELEC BAT 1(2) FAULT

Applicable to: ALL

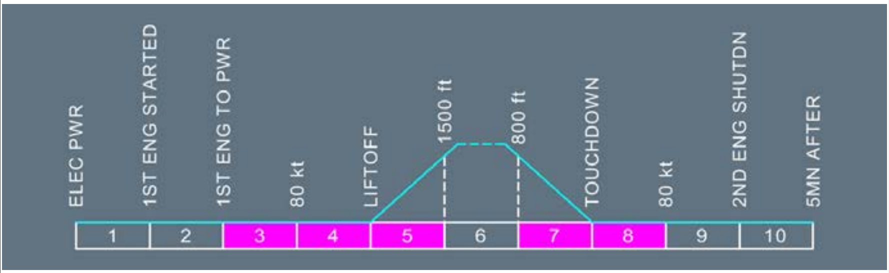
Ident.: PRO-ABN-ELEC-F-00017367.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the charging current increases at an abnormal rate.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-F-00017894.0001001 / 21 MAR 16

L2 Battery contactor is opened automatically by the battery charge limiter.

L1 Crew awareness.

Continued on the following page

ELEC BAT 1(2) FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-F-00017895.0001001 / 21 MAR 16

	STATUS
	INOP SYS
APU BAT START NOT AVAIL	BAT 1(2)

ELEC BAT 1(2) OFF

Applicable to: ALL

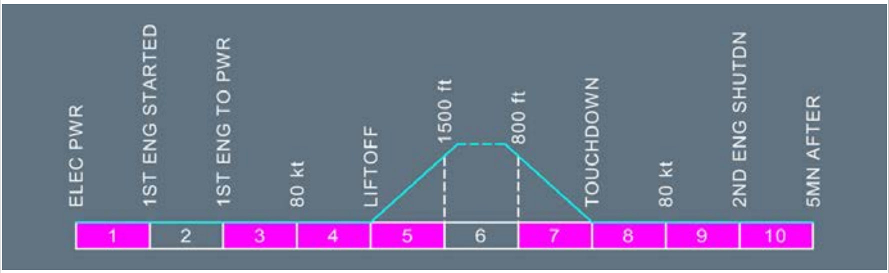
Ident.: PRO-ABN-ELEC-G-00017371.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the BAT 1(2) pb-sw is set to OFF and no failure is detected.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-G-00018943.0001001 / 21 MAR 16

Crew awareness.

Continued on the following page

ELEC BAT 1(2) OFF (Cont'd)

Ident.: PRO-ABN-ELEC-G-00012495.0001001 / 19 AUG 10

STATUS

APU BAT START NOT AVAIL

ELEC BCL 1(2) FAULT

Applicable to: ALL

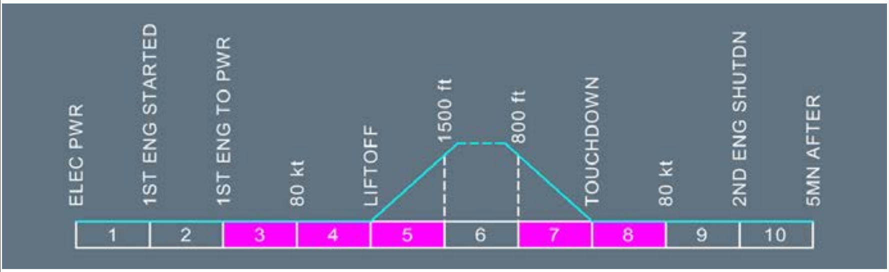
Ident.: PRO-ABN-ELEC-H-00017377.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the battery charge limiter 1(2) is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-H-00012496.0001001 / 25 FEB 14

Crew awareness.

Continued on the following page

ELEC BCL 1(2) FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-H-00012497.0001001 / 19 AUG 10

STATUS

APU BAT START NOT AVAIL

INOP SYS

BCL 1(2)

ELEC DC BAT BUS FAULT

Applicable to: ALL

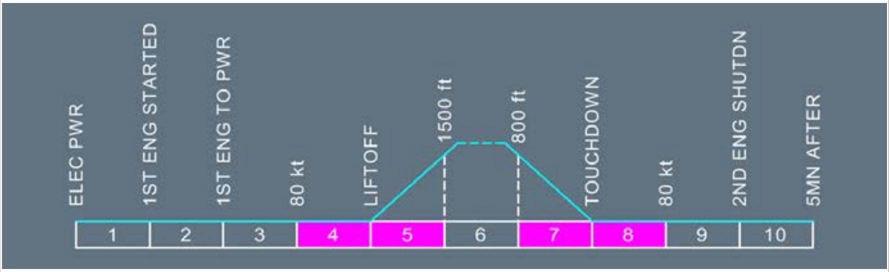
Ident.: PRO-ABN-ELEC-W-00017358.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the DC BAT busbar is not supplied.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-W-00012545.0001001 / 22 MAR 16

Crew awareness.

Continued on the following page

ELEC DC BAT BUS FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-W-00012546.0006001 / 21 MAR 16

L12

STATUS

APU BAT START NOT AVAIL

ECB is no longer supplied

INOP SYS

APU FIRE DET

Other INOP SYS

APU ECB
Stick and rudder pedals lock *(by AP)*
Forward (aft) cargo fire extinguishing
Forward (aft) cargo heat controller
Fwd cargo isol valves
APU fuel LP valve
Manual pressure control

Note: *The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.*

ELEC DC BUS 1 FAULT

Applicable to: ALL

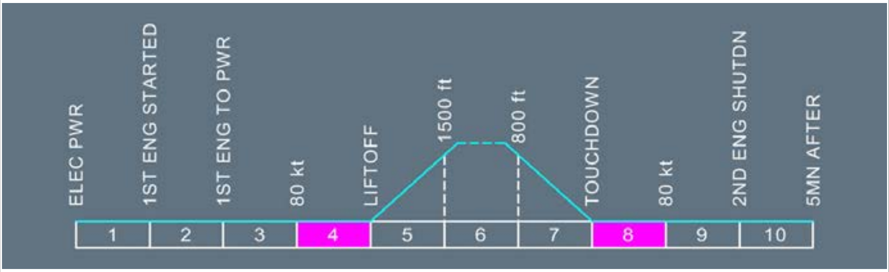
Ident.: PRO-ABN-ELEC-M-00017350.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the DC 1 busbar is not supplied.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-M-00012507.0001001 / 15 DEC 15

BLOWER.. OVRD
EXTRACT.. OVRD

L2 *The Air conditioning system provides ventilation to the avionics. This ventilation air is exhausted overboard.*

L1

SECONDARY FAILURES

*AVNCS VENT

Continued on the following page

ELEC DC BUS 1 FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-M-00018555.0011001 / 22 MAR 17

L12

STATUS

CAB ZONE AT FIXED TEMP
See (1)
CAT 3 SINGLE ONLY

INOP SYS

See below

INOP SYS

ACP 3	CAPT STAT heat	STBY STAT heat
L. WSHLD HEAT	L. WNDW HEAT	CTR TK PUMP 1
AVNCS VENT	GALLEY FAN	GND COOL
REVERSER 1	BRAKES SYS 1	LAV DET
PACK 1 REGUL	CAT 3 DUAL	

Other INOP SYS

Left cab fan	Zone controller primary channel	Sel cal
CFDIU	VHF 3	RMP 3
L CTR TK XFR valve	Hot air	Capt wiper
Eng 1 oil press and qty ind.	TPIS	Brake temps ind.

Note: *The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.*

(1) *Due to the loss of the galley fan, the Pack 1 controller, and the primary zone controller channel. (See associated procedures).*

ELEC DC BUS 2 FAULT

Applicable to: ALL

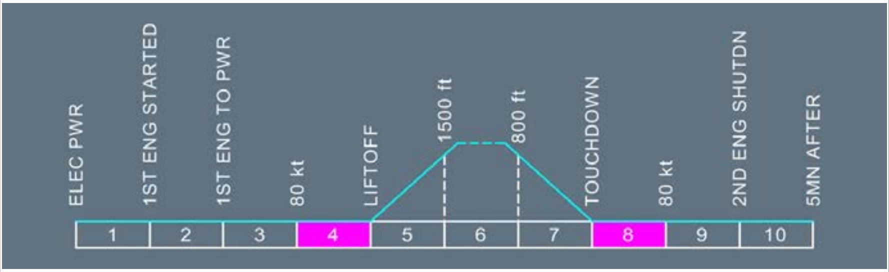
Ident.: PRO-ABN-ELEC-N-00017352.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the DC 2 busbar is not supplied.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-N-00017898.0004001 / 21 MAR 16

AIR DATA SWTG...F/O3
BARO REF...CHECK

L2 *Since one FCU channel is lost, crosscheck the barometer reference settings on the FCU and PFD.*

L1 ● **If DC ESS BUS is failed:**

L/G...GRVTY EXTN

L2 *Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION.*

L1 FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

* CAB PRESS
* FUEL
* WHEEL
* F/CTL

Continued on the following page

ELEC DC BUS 2 FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-N-00017899.0012001 / 22 MAR 17

L12

STATUS

- **IF ABN CAB V/S:**
  MAX FL.. 100/MEA
- **If DC ESS BUS is failed:**
  L/G..GRVTY EXTN

LDG DIST PROC.. APPLY

FUEL CONSUMPT INCRSD

See (3)

FMS PRED UNRELIABLE

See (4)

ENG 2 APPR IDLE ONLY

BOTH PFD ON SAME FAC

PACK 2 AT FIXED TEMP

- **If DC ESS BUS is failed:**
  L/G CONTROL NOT AVAIL

SLATS/FLAPS SLOW

CAT 3 SINGLE ONLY

INOP SYS

See below

INOP SYS

SPLR 1+2+5	ELAC 2 (1)	SEC 2+3
VHF 2	F/O STAT	R WSLHD HEAT
R WNDW HEAT	AP 2	FCU 2
CAT 3 DUAL	FAC 2	L TK PUMP 2
R TK PUMP 2	CTR TK PUMP 2	LGCIU 2
REVERSER 2	CAB PR 2	MAIN GALLEY
Y ELEC PUMP (if selected ON)	BRK SYS 2	ENG 1 LOOP B
ENG 2 LOOP A	PACK 2 REGUL	FCDC 2
LGCIU 1 (2)	ROW/ROP	

Other INOP SYS

Continued on the following page

ELEC DC BUS 2 FAULT (Cont'd)

SFCC 2	R cabin fan	F/O wiper
F/O rain rplnt	Eng 1 and 2 fire ext btl 2	Autobrake (due to loss of 2 SECs)
BMC 2	Bleed X feed auto control	RMP 2
FQI channel 2	zone controller sec channel	CTR TK XFR valve R
SDCU 2 or CIDS 2 SMOKE DETECT	Brake fan	Eng 2 oil low press and qty ind
R loudspeaker	rudder trim ind	FMGC 2
CDLS		

Note:
- *The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.*
- *The flight crew must monitor the CAB V/S, because the proximity sensor of the bulk cargo door is no longer electrically supplied.*

(1) *Lost after 30 s, but recovered at landing gear extension.*
(2) *(If DC ESS BUS is failed)*
(3) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*
(4) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

ELEC DC BUS 1+2 FAULT

Applicable to: ALL

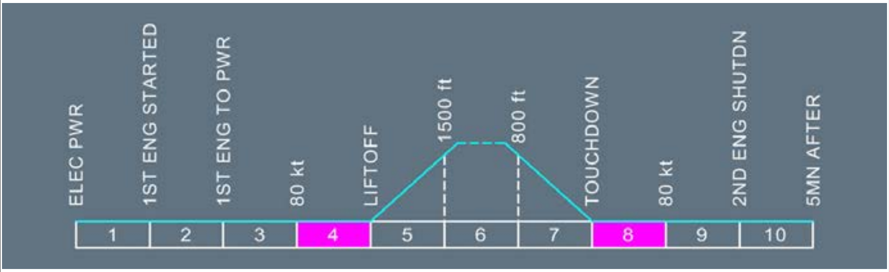
Ident.: PRO-ABN-ELEC-Q-00017353.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the DC 1 and DC 2 busbars are not supplied.

Flight Phase Inhibition:



Continued on the following page

ELEC DC BUS 1+2 FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-Q-00018565.0004001 / 21 MAR 16

BLOWER..OVRD
EXTRACT..OVRD
BARO REF...CHECK

L2 *Crosscheck the barometer reference settings on the FCU and PFDs.*

L1 FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE
MAX BRK PR..1 000 PSI

L2 *Brake pressure must be limited to approximately 1 000 PSI, since antiskid is lost.*

L1

ASSOCIATED PROCEDURES

ELEC DC BAT BUS FAULT

SECONDARY FAILURES

* CAB PRESS
* FUEL
* AIR COND
* BRAKES
* F/CTL

Continued on the following page

ELEC DC BUS 1+2 FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-Q-00018566.0017001 / 22 MAR 17

L12

STATUS

MAX BRK PR....................1000 PSI

LDG DIST PROC.................... APPLY

FUEL CONSUMPT INCRSD

See (2)

FMS PRED UNRELIABLE

See (3)

ENG 1 APPR IDLE ONLY

ENG 2 APPR IDLE ONLY

BOTH PFD ON SAME FAC

CTR TK FUEL UNUSABLE

APU BAT START NOT AVAIL

CAB ZONE AT FIXED TEMP

PACKS AT FIXED TEMP

SLATS/FLAPS SLOW

CAT 3 SINGLE ONLY

FLS ◁ LIMITED TO F-APP+RAW

INOP SYS

See below

INOP SYS

SPLR 1+2+5	ELAC 2 (1)	SEC 2+3
VHF 2	ACP 3	CAPT STAT heat
F/O STAT heat	STBY STAT heat	WSHLD HEAT
WNDW HEAT	AP 2	FCU 2
CAT 3 DUAL	FAC 2	SDCU
ANTI SKID	N/W STRG	LGCIU 2
REVERSER 1+2	CAB PRESS 2	AVNCS VENT
L+R CAB FAN	GALLEY FAN	CRG HEAT ◁
GND COOL ◁	MAIN GALLEY	Y ELEC PUMP
Brk sys 1+2	APU FIRE DET	LAV DET
ENG 1 LOOP B	ENG 2 LOOP A	PACK 1 REGUL
PACK 2 REGUL	FCDC 2	CTR TK PUMPS

Continued on the following page

ELEC DC BUS 1+2 FAULT (Cont'd)

L TK PUMP 2	R TK PUMP 2	

Other INOP SYS

Selcal	Brake temp indication	Brake fans
TPIS	Capt and F/O wipers	Eng 1 and 2 oil pressure and quantity indication
AUTO BRK	Forward (aft) cargo isolation valves	Manual pressure control
VHF 3	RMP 2	RMP 3
CFDIU	Right loudspeakers	SFCC 2
APU ECB	Forward (aft) cargo heat controller	CDLS
FMGC 2	Rudder trim indication	BMC 2
FQI channel 2	Eng 1 and 2 fire ext btl 2	X Bleed auto and manual control
Stick and rudder pedals lock (by AP)	Forward (aft) cargo fire extinguishing	SDCU 2 or CIDS 2 SMOKE DETECT

<u>Note:</u> *The warning may be caused by a failure in a sub BUS. Consequently, only a part of the above-listed systems may be lost.*

(1) *Lost after 30 s, but is recovered at landing gear extension.*
(2) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*
(3) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

ELEC DC EMER CONFIG

Applicable to: ALL

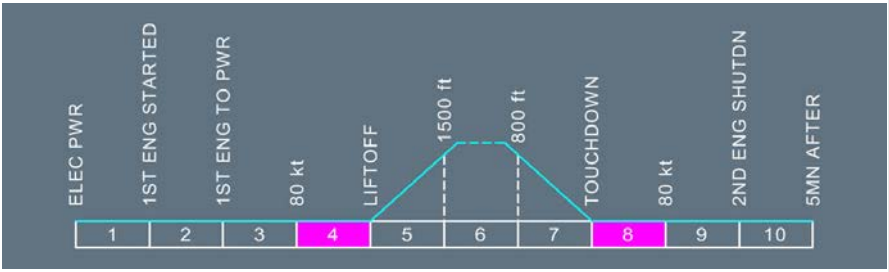
Ident.: PRO-ABN-ELEC-X-00017359.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the DC 1, DC 2 and DC ESS busbars are not supplied.

Flight Phase Inhibition:



Continued on the following page

ELEC DC EMER CONFIG (Cont'd)

Ident.: PRO-ABN-ELEC-X-00018557.0006001 / 21 MAR 16

LAND ASAP

EMER ELEC PWR....................MAN ON

L2 *The emergency generator supplies DC ESS BUS.*
But, DC BUS 1, DC BUS 2, and DC BAT BUS are still not supplied.

L1 FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

ASSOCIATED PROCEDURES

ELEC DC BUS 1 + 2 FAULT

BLOWER....................OVRD
EXTRACT....................OVRD
BARO REF....................CHECK

L2 *Crosscheck the barometer reference settings on the FCU and PFDs.*

L1 MAX BRK PR....................1 000 PSI

L2 *Brake pressure must be limited to approximately 1 000 PSI, since antiskid is lost.*

L1 FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

ASSOCIATED PROCEDURES

ELEC DC BAT BUS FAULT

SECONDARY FAILURES

* CAB PRESS
* HYD
* FUEL
* AIR COND
* BRAKES
* WHEEL
* F/CTL

Continued on the following page

ELEC DC EMER CONFIG (Cont'd)

Ident.: PRO-ABN-ELEC-X-00018558.0003001 / 21 MAR 16

L12

STATUS

MIN RAT SPEED.. 140 KT
PROC: GRVTY FUEL FEEDING
MAX BRK PR.. 1 000 PSI
FUEL GRVTY FEED

LDG DIST PROC.. APPLY

Refer to the list of STATUS INFO of the ELEC DC BUS 1+2 BUS FAULT ECAM alert

See (1)

INOP SYS

Refer to the list of INOP SYS ON ECAM of the ELEC DC BUS 1+2 FAULT ECAM alert

Note: *To verify the other INOP SYS not displayed on the ECAM, Refer to PRO-ABN-ELEC ELEC DC BUS 1+2 FAULT - FWSPAGE and Refer to PRO-ABN-ELEC ELEC DC BAT BUS FAULT - FWSPAGE.*

(1) *Note:* *DC ESS BUS is lost at landing gear extension.*
Consequently, all means of communications are lost since all ACPs are lost.
To verify the list of STATUS INFO, Refer to PRO-ABN-ELEC ELEC DC BUS 1+2 FAULT - FWSPAGE

ELEC DC ESS BUS FAULT

Applicable to: ALL

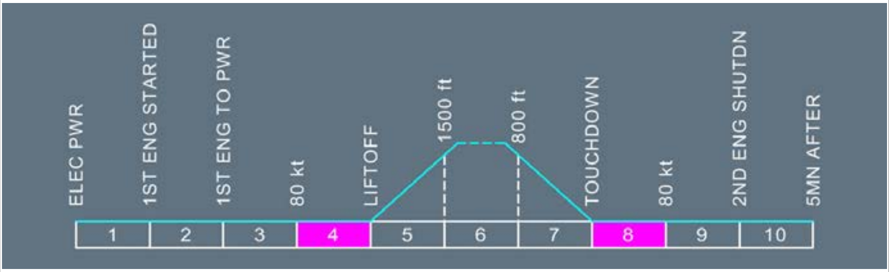
Ident.: PRO-ABN-ELEC-O-00017354.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the DC ESS busbar is not supplied.

Flight Phase Inhibition:



Continued on the following page

ELEC DC ESS BUS FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-O-00012511.0005001 / 05 MAR 13
Impacted by TDU: 00013704 ELEC DC ESS BUS FAULT

VHF 2 OR 3 .... USE
AUDIO SWTG .... SELECT

L2 *ACP 1 and 2 are lost. Therefore, set the AUDIO SWTG rotary selector to CAPT 3 or F/O 3 to recover communications.*

L1 BARO REF .... CHECK

L2 *Crosscheck the barometer reference settings on the FCU and the PFD.*

L1 GPWS SYS .... OFF

- **If DC BUS 2 is failed:**

  L/G .... GRVTY EXTN

L2 *Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION.*

L1 FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE
AVOID ICING CONDITIONS

ASSOCIATED PROCEDURES

NAV GPWS FAULT
GPWS .... OFF

L2 *Note: To shut down the engines on ground, use the ENG FIRE pb-sw.*

L1

SECONDARY FAILURES

* CAB PRESS
* HYD
* F/CTL

Continued on the following page

ELEC DC ESS BUS FAULT (Cont'd)

Ident.: TDU / PRO-ABN-ELEC-O-00013704.0004001 / 23 JUN 15
Impacted DU: 00012511 ELEC DC ESS BUS FAULT

VHF 2 OR 3 .... USE

L2 *In the case of an ELEC DC ESS BUS FAULT, the audio cards of the AMU are lost. Since all cockpit mikes and headsets are connected to the AMU, all audio means of communication (VHF , HF and SATCOM)are lost.*
The use of VHF 2 or 3 do not allow to recover communications.

L1 AUDIO SWTG .... SELECT
BARO REF .... CHECK

L2 *Crosscheck the barometer reference settings on the FCU and the PFD.*

L1 GPWS .... OFF

- **If DC BUS 2 is failed:**
  L/G .... GRVTY EXTN

L2 *Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION.*

L1 AVOID ICING CONDITIONS

ASSOCIATED PROCEDURES

NAV GPWS FAULT
GPWS .... OFF

ASSOCIATED PROCEDURES

FUEL L TANK PUMP 1 LO PR

FUEL R TANK PUMP 1 LO PR

L2 *Note: To shut down the engines on ground, use the ENG FIRE pb-sw.*

L1

SECONDARY FAILURES

* CAB PRESS
* HYD
* F/CTL

Continued on the following page

ELEC DC ESS BUS FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-O-00018671.0010001 / 25 JUL 17

L12

STATUS

- **If DC BUS 2 is failed:**
  L/G..GRVTY EXTN

LDG DIST PROC... APPLY

FUEL CONSUMPT INCRSD
See (3)
FMS PRED UNRELIABLE
See (4)
ENG 1 APPR IDLE ONLY
ENG 2 APPR IDLE ONLY
BOTH PFD ON SAME FAC

- **If DC BUS 2 is failed:**
  L/G CONTROL NOT AVAIL

SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

INOP SYS

See below

INOP SYS

B HYD	SPLR 3	VHF 1
ACP 1+2	WING A. ICE	AP 1
A/THR	FCU 1	FAC 1
L TK PUMP 1	R TK PUMP 1	REV 2
ENG 2 START	CAB PR 1	STEEP APPR
VENT EXTRACT	B ELEC PUMP	GPWS
ENG 1 LOOP A	ENG 2 LOOP B	FCDC 1
LGCIU 1	LGCIU 2 (1)	ROW/ROP

Other INOP SYS

BRK PRESS indicator	Flight interphone	EIU 2 (2)
Capt rain repellent	Avionics air cond valve	Standby compass light

Continued on the following page

ELEC DC ESS BUS FAULT (Cont'd)

HP fuel shutoff valves	SFCC 1	RMP 1
Hyd fire valves Eng 1 and 2	Ram air inlet	ECAM Control Panel
Left loudspeaker	DC SHED ESS BUS	

Note: *1. The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.*

(1) *(If DC BUS 2 is failed)*
(2) *Autothrust, eng start and reverser inop.*
(3) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*
(4) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

ELEC DC ESS BUS SHED

Applicable to: ALL

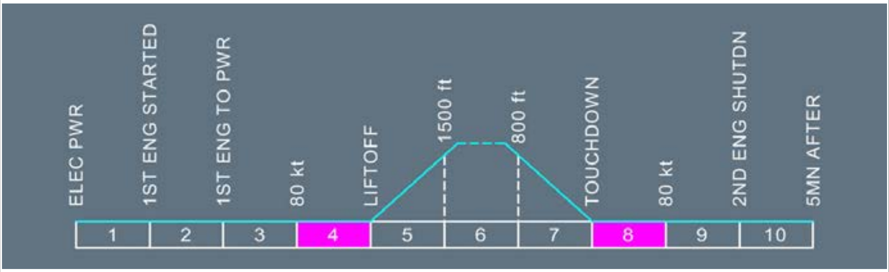
Ident.: PRO-ABN-ELEC-P-00017355.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the DC SHED ESS busbar is not supplied.

Flight Phase Inhibition:



Continued on the following page

ELEC DC ESS BUS SHED (Cont'd)

Ident.: PRO-ABN-ELEC-P-00012513.0001001 / 30 MAR 12

EXTRACT .... OVRD

L2 *Cooling air is supplied by the air conditioning system, without overboard extraction.*

L1 AVOID ICING CONDITIONS

SECONDARY FAILURES

*AVNCS VENT

Continued on the following page

ELEC DC ESS BUS SHED (Cont'd)

Ident.: PRO-ABN-ELEC-P-00018561.0005001 / 17 MAR 17

L12

STATUS

AVOID ICING CONDITIONS

- **IF SEVERE ICE ACCRETION**
  MIN SPD...VLS + 10/G DOT
  MANEUVER WITH CARE
  LDG DIST PROC...APPLY

BOTH PFD ON SAME FAC
CAT 3 SINGLE ONLY

INOP SYS

WING A. ICE
AP 1
CAT 3 DUAL
FAC 1
VENT EXTRACT
AFT CRG HEAT
FWD CRG HEAT
AFT CRG VENT
FWD CRG VENT
FCDC 1
ROW/ROP

See below

Other INOP SYS

Passenger oxygen mask (auto drop out)
X BLEED valve man ctl
FMGC 1
STBY ALTI vib
FQ1 channel 1
BMC 1
SDCU 1 or CIDS 1 SMOKE DETECT

Note: *The warning may be caused by a failure in a sub BUS. Consequently only a part of the systems listed above may be lost.*

Continued on the following page

ELEC DC ESS BUS SHED (Cont'd)

ELEC EMER CONFIG

Applicable to: ALL

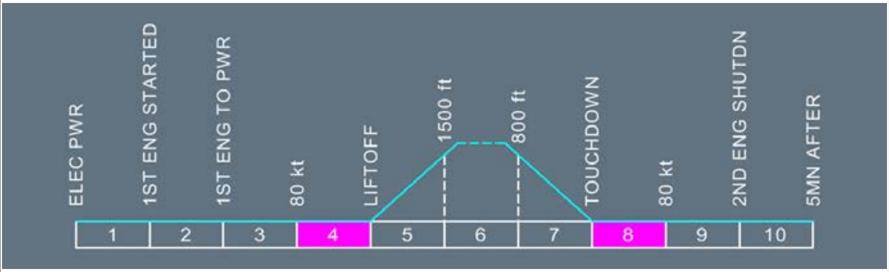
Ident.: PRO-ABN-ELEC-R-00018283.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the AC 1 and AC 2 busbars are not supplied.

Flight Phase Inhibition:



Continued on the following page

ELEC EMER CONFIG (Cont'd)

Ident.: PRO-ABN-ELEC-R-00018642.0006001 / 22 MAR 17

LAND ASAP

MIN RAT SPEED....................................140 KT

CAUTION	*The RAT is capable of supplying the EMER GEN down to 125 kt, except during flare.*

GEN 1 + 2....................................OFF THEN ON

- **IF UNSUCCESSFUL:**

  BUS TIE....................................OFF

  L2 *Setting BUS TIE pb-sw to OFF segregates both generator channels.*

  L1 GEN 1 + 2....................................OFF THEN ON

  L2 *Note: If any generator reset is successful, reset both FAC's.*

  L1 EMER ELEC PWR (IF EMER GEN NOT IN LINE)....................................MAN ON

  ENG MODE SEL....................................IGN

  L2 *Engines are fed by gravity only.*

L1 VHF1/HF1 /ATC1....................................USE

L2 *Only VHF 1, HF 1 and ATC 1 are supplied in the electrical emergency configuration.*

Note: FMGC 1, which is lost temporarily, can be regained by flight crew passing through the MCDU MENU page.

L1 FUEL GRVTY FEED

L2 *Engines are fed by gravity only. Avoid negative Gs.*

L1 PROC: GRVTY FUEL FEEDING

L2 *Apply GRVTY FUEL FEEDING procedure (Refer to PRO-ABN-FUEL [QRH] GRAVITY FUEL FEEDING).*

L1 FAC 1....................................OFF THEN ON

L2 *The rudder trim is recovered, although no indication is available.*

L1 BUS TIE....................................AUTO

L2 *Setting BUS TIE pb-sw to AUTO enables the APU to take an available electrical channel.*

L1 APU (IF AVAIL)....................................START

L2 *APU start is not available for 45 s after the loss of both engine generators. This 45 s delay prevents any interference with emergency generator coupling.*

Continued on the following page

ELEC EMER CONFIG (Cont'd)

If the APU is available, the APU may be started when below FL 250.

L1 BLOWER + EXTRACT....................OVRD

L2 *Cooling air is supplied by the air conditioning system and exhausted overboard through the extract valve.*

L1 FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

L2 *Note:* *On IAE powered aircraft, the warning "EPR MODE FAULT N1 DEGRADED MODE" is displayed.*

L1

ASSOCIATED PROCEDURES

FLT CTL ALTN LAW
(PROT LOST)
MAX SPEED....................320 KT

L2 *Speed limited due to loss of flight control normal laws.*

Continued on the following page

ELEC EMER CONFIG (Cont'd)

Ident.: PRO-ABN-ELEC-R-00018643.0023001 / 22 MAR 17

L12

STATUS

MIN RAT SPEED.. 140 KT
MAX SPEED... 320 KT
MAX BRK PR... 1 000 PSI
FUEL GRVTY FEED
AVOID NEGATIVE G FACTOR

Note: *If there are discrepancies between airspeed indications on the Captain's PFD and on the STBY indicator, disregard the STBY indication (probe not deiced).*

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

APPR SPD... VREF +10/140 KT

The approach speed must be at least minimum RAT speed (140 kt).

LDG DIST PROC.. APPLY

FUEL CONSUMPT INCRSD

See (2)

FMS PRED UNRELIABLE

See (3)

ALTN LAW: PROT LOST
WHEN L/G DN: DIRECT LAW
SLATS/FLAPS SLOW
FLS LIMITED TO F-APP + RAW

See (4)

INOP SYS

F/CTL PROT
REVERSER 1+2
ADR 2+3
IR 2
RA 1+2
SPLR 1+2+5
ELAC 2
SEC 2+3
A/CALL OUT
AP 1+2
A/THR
FUEL PUMPS
ANTI SKID
N/W STRG
CAT 2
STEEP APPR

See (1)

(1) *For other systems' status: Refer to the "ELEC EMER CONFIG SYS REMAINING" table.*

Continued on the following page

ELEC EMER CONFIG (Cont'd)

(2) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(3) *Disregard FMS fuel predictions and refer to QRH/PER-B Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

(4) *Note: In ELEC EMER configuration, the center tank fuel is unusable.*

ELEC EMER GEN 1 LINE OFF

Applicable to: ALL

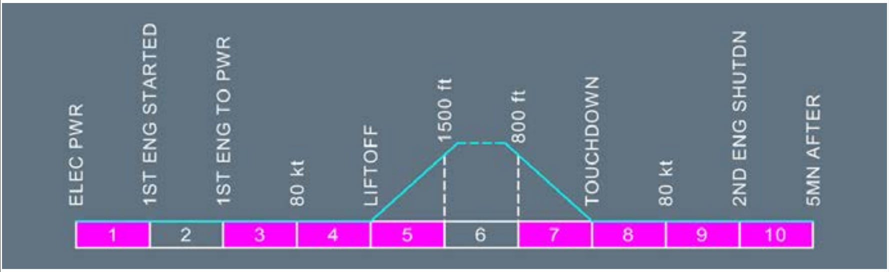
Ident.: PRO-ABN-ELEC-AB-00017382.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the GEN 1 LINE pb-sw is abnormally set to OFF position.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-AB-00012550.0001001 / 25 FEB 14

L2 With the GEN 1 LINE pb-sw (on the EMER ELEC PWR panel) in the OFF position, the GEN 1 line contactor is open and GEN 2 supplies the AC BUS 1 channel.

L1 Crew awareness.

L2 Set the GEN 1 LINE pb-sw to ON.

ELEC ESS BUSES ON BAT

Applicable to: ALL

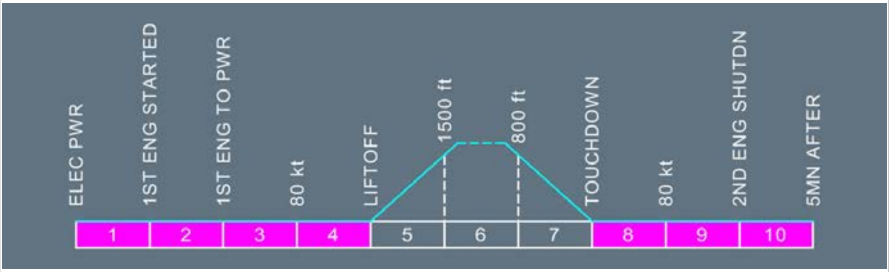
Ident.: PRO-ABN-ELEC-AA-00018284.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the DC ESS and AC ESS busbars are supplied by the batteries.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-AA-00018021.0002001 / 21 MAR 16

L2 AC ESS BUS is supplied via the static inverter.

L1 **LAND ASAP**

MIN RAT SPEED..140 KT

L2 *Displayed, if the RAT is extended.*

L1 EMER ELEC PWR..MAN ON

L2 *ESS BUSES are supplied by the emergency generator*

ELEC GEN 1(2) OR APU GEN OVERLOAD

Applicable to: ALL

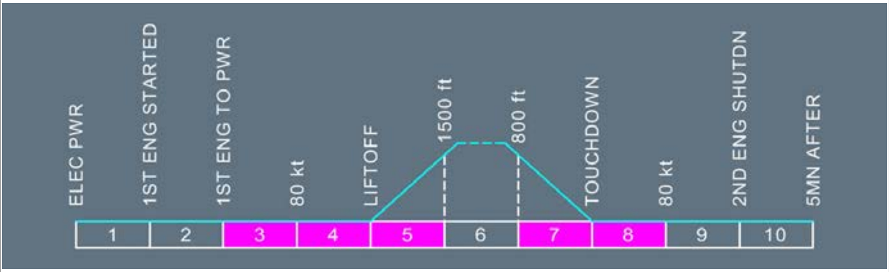
Ident.: PRO-ABN-ELEC-T-00017363.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the load of one generator is above 100% of rated output.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-T-00018023.0002001 / 21 MAR 16

GALY/CAB...OFF

Ident.: PRO-ABN-ELEC-T-00018024.0002001 / 21 MAR 16

STATUS

INOP SYS

GALY/CAB

ELEC GEN 1(2) FAULT

Applicable to: ALL

Ident.: PRO-ABN-ELEC-B-00017360.0001001 / 21 MAR 16

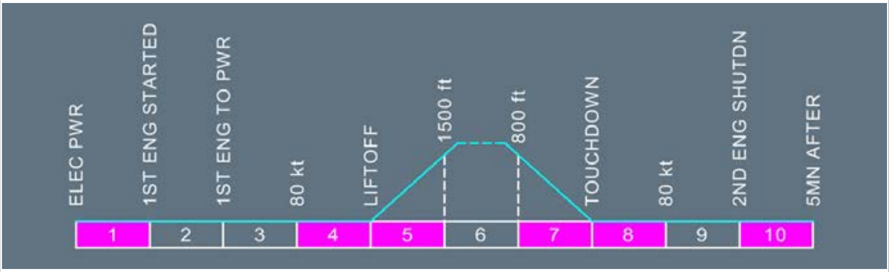
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:.

- The protection trip is initiated by the associated GCU, or
- The line contactor is open with the associated GEN pb-sw set to ON.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-B-00018025.0001001 / 21 MAR 16

GEN (AFFECTED)..OFF THEN ON

- **IF UNSUCCESSFUL:**
  GEN (AFFECTED)..OFF

Continued on the following page

ELEC GEN 1(2) FAULT (Cont'd)

Ident.: PRO-ABN-ELEC-B-00018026.0001001 / 21 MAR 16

L12

STATUS

Note: *If available, the APU may be started, and the APU GEN used.*

CAT 3 SINGLE ONLY

INOP SYS

MAIN GALLEY (1)
GEN 1(2)
CAT 3 DUAL

(1) *(only if APU GEN is not online)*

ELEC GEN 1(2) OFF

Applicable to: ALL

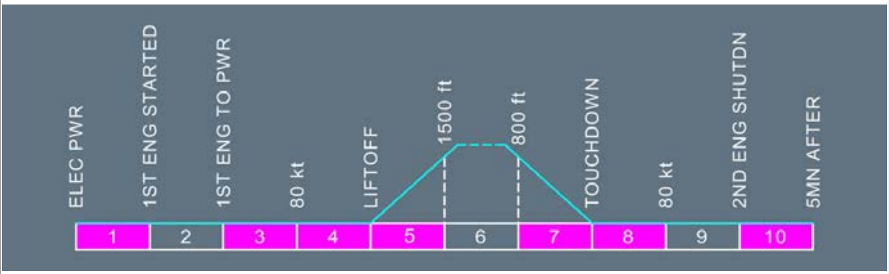
Ident.: PRO-ABN-ELEC-C-00017361.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the GEN 1(2) pb-sw is set to OFF and no failure is detected.

Flight Phase Inhibition:



Continued on the following page

ELEC GEN 1(2) OFF (Cont'd)

Ident.: PRO-ABN-ELEC-C-00018027.0001001 / 21 MAR 16

L2 Turn the affected GEN ON.

L1 Crew awareness.

Ident.: PRO-ABN-ELEC-C-00018028.0001001 / 21 MAR 16

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	MAIN GALLEY (1) GEN 1(2) CAT 3 DUAL

(1) *(only if APU GEN is not online)*

ELEC IDG 1(2) DISCONNECTED

Applicable to: ALL

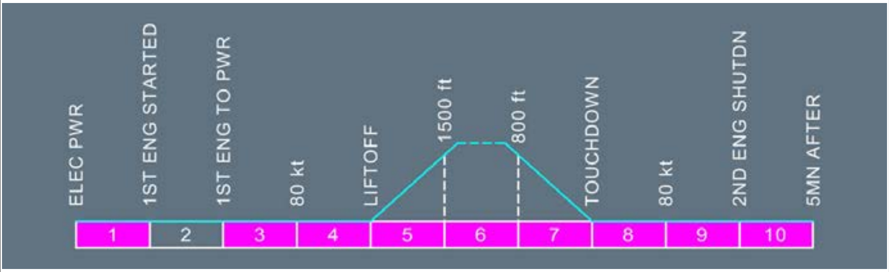
Ident.: PRO-ABN-ELEC-D-00017366.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the IDG 1(2) is disconnected.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-D-00018029.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-ELEC-D-00018030.0001001 / 21 MAR 16

L12

STATUS

Note: If available, the APU may be started, and the APU GEN used.

CAT 3 SINGLE ONLY

INOP SYS

MAIN GALLEY [1]
GEN 1(2)
CAT 3 DUAL

[1] *(only if APU GEN is not online)*

ELEC IDG 1(2) OIL LO PR/OVHT

Applicable to: ALL

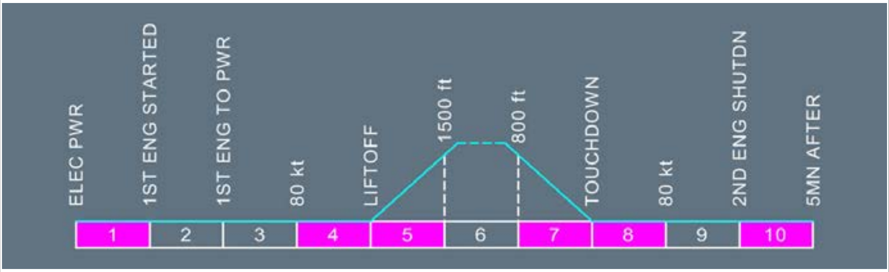
Ident.: PRO-ABN-ELEC-A-00018285.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 The alert ELEC IDG 1(2) OIL LO PR triggers when the IDG 1(2) oil pressure is low.
The alert ELEC IDG 1(2) OIL OVHT triggers when the IDG 1(2) outlet oil temperature rises above 185 °C.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-A-00018031.0001001 / 21 MAR 16

IDG (AFFECTED)..OFF

L2 *If the associated engine is running, the IDG (integrated drive generator) must be disconnected from the engine at, or above, idle to prevent damage to the disconnect mechanism.*
Press the IDG pb-sw until the GEN FAULT light comes on. However, do not press for more than 3 s, to avoid damage to the disengage solenoid
The IDG FAULT light goes off, when the IDG is disconnected.

Continued on the following page

ELEC IDG 1(2) OIL LO PR/OVHT (Cont'd)

Ident.: PRO-ABN-ELEC-A-00018032.0001001 / 21 MAR 16

L12

STATUS

Note: If available, the APU may be started and the APU GEN used.

CAT 3 SINGLE ONLY

INOP SYS

MAIN GALLEY [1]
GEN 1(2)
CAT 3 DUAL

[1] *(only if APU GEN is not online)*

ELEC STATIC INV FAULT

Applicable to: ALL

Ident.: PRO-ABN-ELEC-AC-00017380.0001001 / 21 MAR 16

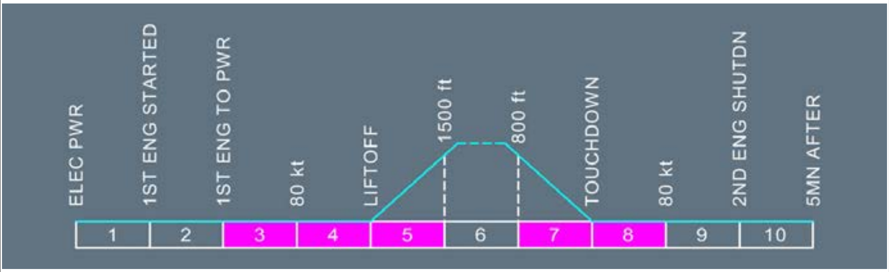
ANNUNCIATIONS

Triggering Conditions:

L2

The alert triggers when the static inverter is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-AC-00012549.0001001 / 25 FEB 14

Crew awareness.

ELEC TR 1(2) FAULT

Applicable to: ALL

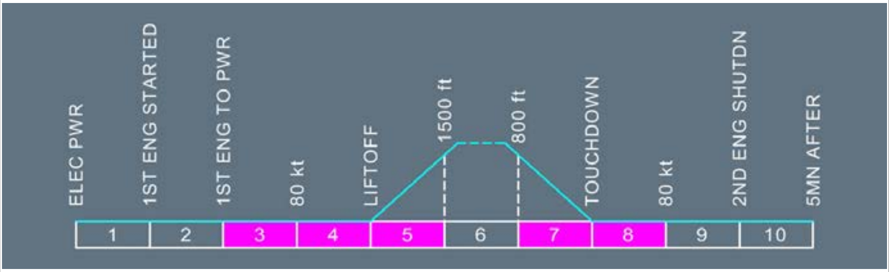
Ident.: PRO-ABN-ELEC-U-00017373.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the TR 1(2) is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ELEC-U-00012541.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-ELEC-U-00018531.0001001 / 21 MAR 16

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	TR 1(2) CAT 3 DUAL

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[QRH] ENG DUAL FAILURE - FUEL REMAINING

Applicable to: ALL

Ident.: PRO-ABN-ENG-X-00012309.0061001 / 17 MAR 17

As long as none of the engines recover, the flight crew must apply this paper procedure when required by the ECAM ENG DUAL FAILURE procedure. If time permits, clear ECAM alerts, and check the ECAM STATUS page.

LAND ASAP

OPTIMUM RELIGHT SPD.. 300 kt

PITCH TARGET In case of speed indication failure:	
Gross Weight	***Pitch (°)***
At or below 50 000 kg/110 000 lb	*-4.5*
60 000 kg/132 000 lb	*-3.5*
70 000 kg/154 000 lb	*-2.5*

AVERAGE GLIDING DISTANCE : 2 NM / 1000 FT (300kt NO WIND)

DETERMINE LANDING STRATEGY

VHF1/HF1 /ATC1..USE

ATC..NOTIFY

TRANSPONDER..SELECT A7700

Notify air traffic control of the nature of the emergency, and state intentions. If there is no contact with air traffic control Switch to code A7700, or transmit a distress message on one of the following frequencies: VHF frequency 121.5 MHz, HF 2 182 kHz or 8 364 kHz.

- **If no relight after 30 s:**

  ENG MASTERS..OFF 30 S / ON

  Unassisted start attempts can be repeated until successful, or until APU bleed is available.

- **If unsuccessful:**

  CREW OXY MASKS (above FL 100)..ON

  Cabin altitude will increase, due to the lack of engine bleed: The EXCESS CAB ALT warning could be triggered. Depending on the situation, to gain gliding distance, the flight crew may disregard the ECAM emergency descent requirement, because passengers will be provided with oxygen for a sufficient period of time.

  APU (IF AVAIL)..START

  If the APU is available, it may be started when below FL 250 and the APU BLEED may be used for engine start below FL 200.

  WING ANTI ICE..OFF

Continued on the following page

[QRH] ENG DUAL FAILURE - FUEL REMAINING (Cont'd)

APU BLEED..ON

- **In sequence:**

  ENG MASTERS (all non running engines)..OFF

  After 30 s

  ENG MASTERS (one at a time)..ON

  Between each attempt to relight the same engine, wait at least 30 s with the associated ENG MASTER lever set to OFF.

Continued on the following page

[QRH] ENG DUAL FAILURE - FUEL REMAINING (Cont'd)

Ident.: PRO-ABN-ENG-X-00012310.0041001 / 17 MAR 17

- **When APU bleed is available or if engine restart is definitively considered impossible:**

OPTIMUM SPEED WITH ALL ENGINES INOPERATIVE (KNOTS)			
Gross Weight (1 000 kg)	**At or below FL 200**	**FL 300**	**FL 400**
78	241	251	261
76	237	247	257
72	229	239	249
68	221	231	241
64	213	223	233
60	205	215	225
56	197	207	217
52	189	199	209
48	181	191	201
44	173	183	193
40	165	175	185

AVERAGE GLIDING DISTANCE: 2.5 NM / 1000 FT (NO WIND)

AVERAGE RATE OF DESCENT: 1 600 FT/MIN

PREPARE CABIN AND COCKPIT

- *Loose equipment secured.*
- *Survival equipments prepared.*
- *Belts and shoulder harnesses locked.*

SIGNS...ON
COMMERCIAL...OFF

USE RUDDER WITH CARE

As hydraulic power is only available from the RAT, avoid large and rapid rudder deflection.

- **When below FL 150:**

RAM AIR...ON

Ident.: PRO-ABN-ENG-X-00012311.0001001 / 17 MAR 17

BARO REF...SET
CREW MASKS/OXY SUPPLY (below FL 100)...OFF
ELT (when conditions permit)...ON

Continued on the following page

[QRH] ENG DUAL FAILURE - FUEL REMAINING (Cont'd)

Ident.: PRO-ABN-ENG-X-00012312.0093001 / 09 MAY 17

- **If forced landing anticipated:**

  AVERAGE GLIDING DISTANCE 1.2NM / 1000FT (CONF3, L/G DOWN, NO WIND)

  - **For approach:**

    FOR LANDING : USE FLAP 3

    SLATS AVAIL ONLY

    MIN APPR SPEED : 150 kt

    VAPP.. DETERMINE

Gross Weight (1 000 kg)	*40*	*44*	*48*	*52*	*56*	*60*	*64*	*68*	*72*	*76*
VAPP	*150*	*150*	*150*	*150*	*150*	*151*	*155*	*159*	*163*	*167*

  - **At a suitable altitude (not below 3 000 ft AGL):**
    - **When in CONF 3 and VAPP:**

      GRAVITY GEAR EXTN handcrank.................... PULL AND TURN

      FLT CTL DIRECT LAW

      MAN PITCH TRIM NOT AVAILABLE

    - **When L/G downlocked:**

      L/G lever..DOWN

      APPROACH SPEED.................................. ADJUST

      MAX SPEED : 200 kt

      ADJUST SPEED TO REACH LANDING FIELD

      SPLRs..ARM

      MAX BRK PR : 1 000 PSI

  - **At 2 000 ft AGL:**

    CABIN CREW.................................. NOTIFY FOR LANDING

  - **At 500 ft AGL:**

    BRACE FOR IMPACT..................................ORDER

  - **At touchdown:**

    ENG MASTERS.. OFF

    APU MASTER SW..OFF

    BRAKES ON ACCU ONLY

Continued on the following page

[QRH] ENG DUAL FAILURE - FUEL REMAINING (Cont'd)

- **When aircraft stopped:**

  PARKING BRK...ON
  ATC...NOTIFY
  FIRE pb (ENGs & APU)...PUSH
  AGENT (ENGs & APU)...DISCH

  - **If evacuation required:**

    EVACUATION... INITIATE

    Make a short and precise announcement to order the emergency evacuation.
    Press the EVAC COMMAND pb.

    ELT .... CHECK EMITTING

    If not, switch on the transmitter.

  - **If evacuation not required:**

    CABIN CREW and PASSENGERS (PA)...NOTIFY

Continued on the following page

[QRH] ENG DUAL FAILURE - FUEL REMAINING (Cont'd)

Ident.: PRO-ABN-ENG-X-00012313.0034001 / 17 MAR 17

- **If ditching anticipated:**
  - **For approach:**

    FOR LANDING : USE FLAP 3

    SLATS AVAIL ONLY

    MIN APPR SPEED : 150 kt

    VAPP.. DETERMINE

Gross Weight (1 000 kg)	*40*	*44*	*48*	*52*	*56*	*60*	*64*	*68*	*72*	*76*
VAPP	*150*	*150*	*150*	*150*	*150*	*151*	*155*	*159*	*163*	*167*

- **At a suitable altitude (not below 3 000 ft AGL):**

  KEEP LANDING GEAR UP

  FOR FLARE: TARGET PITCH 11 ° & MIN V/S

  Note: *Prefer ditching parallel to the swell. If that causes a strong crosswind, ditch into the wind.*

- **At 2 000 ft AGL:**

  CABIN CREW.................................... NOTIFY FOR DITCHING
  DITCHING pb.................................... ON

- **At 500 ft AGL:**

  BRACE FOR IMPACT.................................... ORDER

- **At touchdown:**

  ENG MASTERS.................................... OFF
  APU MASTER SW.................................... OFF

- **After ditching:**

  ATC (VHF 1).................................... NOTIFY
  FIRE pb (ENGs & APU).................................... PUSH
  AGENTs (ENGs & APU).................................... DISCH
  EVACUATION.................................... INITIATE
  ELT .... CHECK EMITTING

  If not, switch on the transmitter.

[QRH] ENG DUAL FAILURE - NO FUEL REMAINING

Applicable to: ALL

Ident.: PRO-ABN-ENG-Y-00012602.0084001 / 17 MAR 17

The flight crew must apply this paper procedure when required by the ENG DUAL FAILURE procedure. If time permits, clear ECAM alerts, and check the ECAM STATUS page.

THRUST LEVERS...IDLE
FAC 1...OFF THEN ON

Resetting FAC 1 pb also enables rudder trim recovery, even if no indication is available. Once the hydraulic power is lost, the right aileron is lost, and is in the upfloat position. Rudder trim may be used to compensate for this upfloating aileron.

OPTIMUM SPEED..215 kt / GREEN DOT

Initially, fly 215 kt, because the PFD may not display the correct green dot speed. Then fly the green dot speed according to the following table:

GREEN DOT SPEED WITH ALL ENGINES INOPERATIVE (KNOTS)			
Gross Weight (1000 kg)	***At or below FL 200***	***FL 300***	***FL 400***
68	*221*	*231*	*241*
64	*213*	*223*	*233*
60	*205*	*215*	*225*
56	*197*	*207*	*217*
52	*189*	*199*	*209*
48	*181*	*191*	*201*
44	*173*	*183*	*193*
40	*165*	*175*	*185*

AVERAGE GLIDING DISTANCE: 2.5 NM / 1000 FT (GREEN DOT NO WIND)
AVERAGE RATE OF DESCENT: 1600 FT/MIN

DETERMINE LANDING STRATEGY
EMER ELEC PWR MAN ON pb...PRESS
VHF1/HF1 /ATC1...USE
ATC...NOTIFY
TRANSPONDER...SELECT A7700

Notify air traffic control of the nature of the emergency, and state intentions. Switch to code A7700, or transmit a distress message on one of the following frequencies: VHF frequency 121.5 MHz, HF 2 182 kHz or 8 364 kHz.

CREW OXY MASKS (above FL 100)...ON

Continued on the following page

[QRH] ENG DUAL FAILURE - NO FUEL REMAINING (Cont'd)

Cabin altitude will increase due to the lack of engine bleed: The EXCESS CAB ALT warning could be triggered. Depending on the situation, to gain gliding distance, the flight crew may disregard the ECAM emergency descent requirement, because passengers will be provided with oxygen for a sufficient period of time.

PREPARE CABIN AND COCKPIT

- *Loose equipment secured.*
- *Survival equipments prepared.*
- *Belts and shoulder harnesses locked.*

SIGNS....................ON
COMMERCIAL....................OFF
USE RUDDER WITH CARE

As hydraulic power is only available from the RAT, avoid large and rapid rudder deflection.

● **When below FL 150:**

RAM AIR....................ON

Switch ON the RAM AIR to ensure complete depressurization.

Ident.: PRO-ABN-ENG-Y-00012317.0001001 / 17 MAR 17

BARO REF....................SET
CREW MASKS/OXY SUPPLY (below FL 100)....................OFF
ELT ⧏ (when conditions permit)....................ON

Continued on the following page

[QRH] ENG DUAL FAILURE - NO FUEL REMAINING (Cont'd)

Ident.: PRO-ABN-ENG-Y-00012318.0034001 / 09 MAY 17

- **If forced landing anticipated:**

  AVERAGE GLIDING DISTANCE 1.2NM / 1000FT (CONF3, L/G DOWN, NO WIND)

  - **For approach:**

    FOR LANDING : USE FLAP 3

    SLATS AVAIL ONLY

    MIN APPR SPEED : 150 kt
    VAPP.. DETERMINE

Gross Weight (1000 kg)	*40*	*44*	*48*	*52*	*56*	*60*	*64*	*68*	*72*	*76*
VAPP	*150*	*150*	*150*	*150*	*150*	*151*	*155*	*159*	*163*	*167*

    - **At a suitable altitude (not below 3 000 ft AGL):**
      - **When in CONF 3 and VAPP :**

        GRAVITY GEAR EXTN handcrank.. PULL AND TURN

        FLT CTL DIRECT LAW

        MAN PITCH TRIM NOT AVAILABLE

      - **When L/G downlocked :**

        L/G lever...DOWN
        APPROACH SPEED... ADJUST

        ADJUST SPEED TO REACH LANDING FIELD

        MAX SPEED : 200 kt
        SPLRs...ARM

        MAX BRK PR : 1 000 PSI

  - **At 2 000 ft AGL:**

    CABIN CREW.. NOTIFY FOR LANDING

  - **At 500 ft AGL:**

    BRACE FOR IMPACT..ORDER

  - **At touchdown:**

    ENG MASTERS.. OFF
    BRAKES ON ACCU ONLY

  - **When aircraft stopped:**

    PARKING BRK...ON

Continued on the following page

[QRH] ENG DUAL FAILURE - NO FUEL REMAINING (Cont'd)

ATC..NOTIFY

- **If evacuation required:**

  EVACUATION..INITIATE

  Make a short and precise announcement to order the emergency evacuation.
  Press the EVAC COMMAND pb .

  ELT ....CHECK EMITTING

  If not, switch on the transmitter

- **If evacuation not required:**

  CABIN CREW and PASSENGERS (PA)..NOTIFY

Continued on the following page

[QRH] ENG DUAL FAILURE - NO FUEL REMAINING (Cont'd)

Ident.: PRO-ABN-ENG-Y-00012319.0034001 / 17 MAR 17

- **If ditching anticipated:**
  - **For approach:**

    FOR LANDING : USE FLAP 3

    SLATS AVAIL ONLY

    MIN APPR SPEED : 150 kt

    VAPP.. DETERMINE

Gross Weight (1 000 kg)	*40*	*44*	*48*	*52*	*56*	*60*	*64*	*68*	*72*	*76*
VAPP	*150*	*150*	*150*	*150*	*150*	*151*	*155*	*159*	*163*	*167*

    - **At a suitable altitude (not below 3 000 ft AGL):**

      KEEP LANDING GEAR UP

      FOR FLARE: TARGET PITCH 11 ° & MIN V/S

      Note: *Prefer ditching parallel to the swell. If that causes a strong crosswind, ditch into the wind.*

  - **At 2 000 ft AGL:**

    CABIN CREW.. NOTIFY FOR DITCHING

    DITCHING pb.. ON
  - **At 500 ft AGL:**

    BRACE FOR IMPACT.. ORDER
  - **At touchdown:**

    ENG MASTERS.. OFF
  - **After ditching:**

    ATC (VHF 1).. NOTIFY

    EVACUATION.. INITIATE

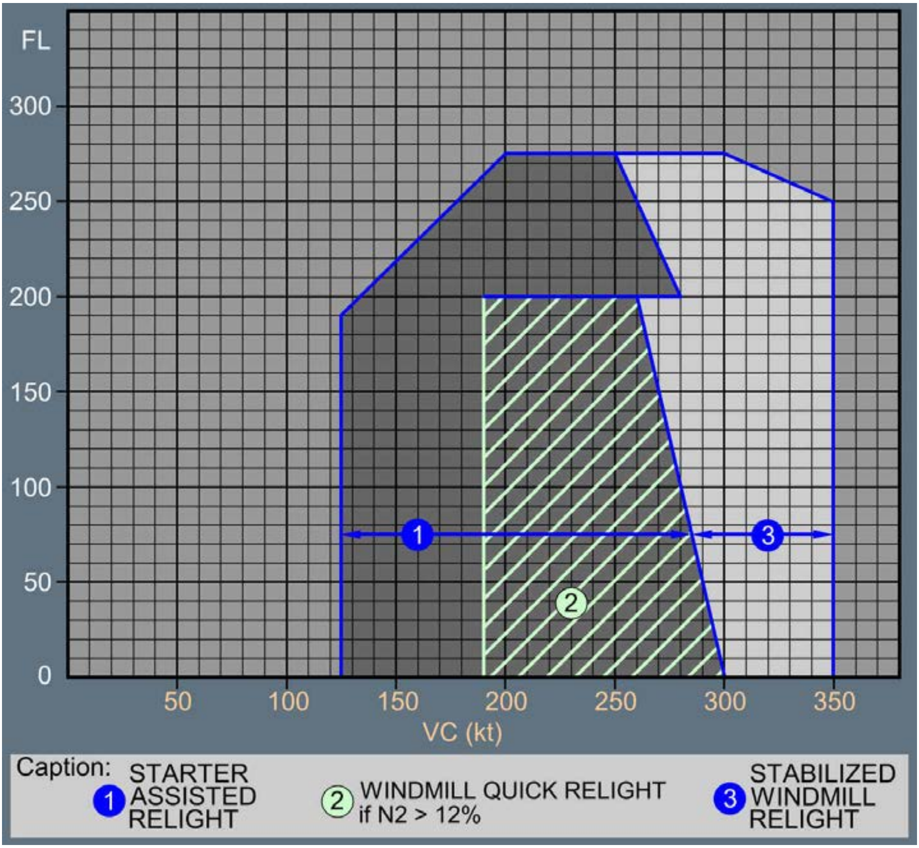
    ELT .... CHECK EMITTING

    If not, switch on the transmitter.

[QRH] ENG RELIGHT
IN FLIGHT

Ident.: PRO-ABN-ENG-00012594.0001001 / 17 MAR 17
Applicable to: ALL

Engine Relight Envelope



ENG MASTER (affected engine)..OFF
THR LEVER (affected engine)..Check IDLE
ENG MODE sel..IGN
X BLEED..OPEN

Continued on the following page

[QRH] ENG RELIGHT (Cont'd)
IN FLIGHT

If outside the windmilling start envelope, the FADEC will open the starter valve.

WING ANTI ICE (for starter assist)....OFF
ENG MASTER (affected engine)....ON
ENG PARAMETERS (N2, EGT)....MONITOR

Engine light up should be achieved within 30 s after fuel flow increases.

AUTOMATIC START ABORT NOT AVAIL

Be aware that, unlike the procedure for auto start on ground, the crew must take appropriate action in case of an abnormal start.
Monitor N2. If uncertain about successful relight, move the thrust lever forward and check engine response.

- **If ENG 1(2) START FAULT - ENG STALL triggers, and ENG parameters normal:**
  DISREGARD ECAM ALERT

- **When idle reached:**
  ENG MODE sel....NORM
  TCAS MODE sel ....TA/RA
  Check that the selector is at TA /RA since, if the ENG SHUT DOWN procedure (Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN) has been applied, the TCAS mode selector may have been set to the TA position.
  X BLEED....AUTO
  Affected SYS....RESTORE

- **If no relight:**
  ENG MASTER (affected engine)....OFF
  Wait 30 s before attempting a new start (to drain the engine).

[QRH] ENGINE TAILPIPE FIRE

Ident.: PRO-ABN-ENG-00017781.0001001 / 17 MAR 17
Applicable to: ALL

Internal engine fire may be encountered during engine start or engine shutdown.
Internal engine fire may be seen by the ground crew, or the EGT may fail to decrease after the ENG MASTER lever is set to OFF.

CAUTION	External fire agents can cause severe corrosive damage. Consider the use of external fire agents only if the following procedure does not stop engine tailpipe fire.

ENG MASTER (affected engine) .... OFF

Note: Do not press the engine fire pushbutton, since this would cut off the FADEC power supply, which would prevent motoring sequence.

ENG MAN START pb (affected engine).................................... OFF
ESTABLISH AIR BLEED PRESS

Select the APU, or opposite BLEED, to motor the engine.
If APU BLEED is not available, and the opposite engine is shut down, connect external pneumatic power (if readily available).

BEACON .... ON
ENG MODE sel.................................... CRANK
ENG MAN START pb (affected engine).................................... ON

For aircraft equipped with IAE or PW6000 engines, the start valve automatically reopens, when N2 is below 10 %.
For aircraft equipped with CFM 56-5A/5B engines, the start valve automatically reopens, when N2 is below 20 %
For aircraft equipped with CFM LEAP-1A engines, the start valve automatically reopens, when N2 is below approximately 60 %

- **When fire stopped:**
  ENG MAN START pb (affected engine).................................... OFF
  ENG MODE sel.................................... NORM

  Maintenance action is due.

[QRH] HIGH ENGINE VIBRATION

Ident.: PRO-ABN-ENG-00012294.0006001 / 17 MAR 17
Applicable to: ALL

The VIB advisory on ECAM (N1 ≥ 6 units, N2 ≥ 4.3 units) is mainly a guideline for the flight crew to monitor engine parameters more closely.
The ECAM vibration advisory alone does not require engine shut down.

Note: *1. High engine vibration may be accompanied by cockpit and cabin smoke and/or the smell of burning. This may be due only to compressor blade tip contact with associated abradable seals.*
2. High N1 vibration are generally accompanied by perceivable airframe vibrations. High N2 vibration can occur without perceivable airframe vibrations.

ENG PARAMETERS .... CHECK

Check engine parameters and especially EGT; crosscheck with other engine. Report in maintenance log.

■ **If icing suspected:**

An increase of engine vibration in icing conditions with or without engine anti-ice may be due to fan blades and/or spinner icing. Icing may be suspected if N1 vibration occurs without other engine parameters variation.

A/THR .... OFF
THRUST (one engine at a time).......... IDLE THEN INCREASE N1 > 80 %

Reduce thrust to idle if flight conditions permit.
If ENG ANTI ICE is off, switch it ON ***at idle fan speed,*** *one engine after the other with approximately 30 s interval.*
To shed ice, it may be necessary to perform several thrust variations between idle and a thrust compatible with the flight phase. For efficient ice shedding, thrust should be increased to at least 80% N1 if flight conditions permit.
After each thrust variation, vibrations should decrease, indicating the progress of the ice shedding.
When the ice is shed, vibrations should return to normal and the flight crew can resume normal engine operation.

■ **If icing not suspected:**

● **If above vibration advisory and flight conditions permit:**
THRUST (affected engine).......... REDUCE BELOW ADVISORY THRESHOLD

● **After landing:** SHUT DOWN ENGINE WHEN POSSIBLE

[QRH] ON GROUND - NON ENG SHUTDOWN AFTER ENG MASTER OFF

Ident.: PRO-ABN-ENG-00020795.0001001 / 17 MAR 17
Applicable to: ALL

The normal procedure to shut down an engine is to set the ENG MASTER lever to OFF. In the case where the engine does not shut down as expected, use the following procedure:

ECAM FUEL PAGE...SELECT
LP FUEL VALVE POSITION (affected engine)..........................CHECK

- **If LP fuel valve closed (cross line amber):**

  NO CREW ACTION

- **If LP fuel valve open:**

  ENG FIRE pb-sw (affected engine).....................................PRESS

  Using the ENG FIRE pb-sw will force the LP fuel valve to close. The engine will shut down after a time delay.

GROUND STAFF...NOTIFY

IN BOTH CASES, ENGINE WILL SHUT DOWN AFTER A TIME DELAY UP TO 2 MIN 30 S
The engine shuts down when the remaining fuel between the LP fuel valve and the nozzles is burned. The time delay for engine shutdown depends on airport altitude and fuel recirculation system operation.

[QRH] ONE ENGINE INOPERATIVE - CIRCLING APPROACH

Ident.: PRO-ABN-ENG-00010682.0005001 / 17 MAR 17
Applicable to: ALL

MAXIMUM WEIGHT FOR CIRCLING IN CONF 3 WITH GEAR DOWN (1000 KG)								
OAT (°C)	AIRPORT ELEVATION (feet)							
	0	2 000	4 000	6 000	8 000	10 000	12 000	14 000
0	74	72	69	67	64	62	59	55
5	74	72	69	67	64	62	58	53
10	74	72	69	67	64	59	55	50
15	74	72	69	66	61	57	52	48
20	74	72	68	63	59	54	50	46
25	74	70	66	61	56	52	48	43
30	72	68	63	58	54	49	45	
35	71	66	61	56	52	48		
40	68	63	59	54				
45	66	61	56					
50	63	58						
55	61							

- **If aircraft weight above maximum weight for circling in CONF 3 with gear down:**

  DELAY GEAR EXTENSION TO MAINTAIN LEVEL FLIGHT

  The aircraft cannot maintain level flight, in CONF 3 and with the landing gear down.

  FOR LANDING: USE FLAP 3

  CONF 3 is preferred, to minimize a configuration change in short final.

  GPWS LDG FLAP 3...ON

  Note: - *If circling below 750 ft RA, "L/G GEAR NOT DOWN" alert will trigger. The pilot can cancel the aural warning by pressing the EMER CANC pb.*
  - *If the landing gear is not downlocked at 500 ft RA , GPWS "TOO LOW GEAR" aural alert will trigger.*

[QRH] ONE ENGINE INOPERATIVE - STRAIGHT-IN APPROACH

Ident.: PRO-ABN-ENG-00010681.0001001 / 17 MAR 17
Applicable to: ALL

- **If NO level off expected during final approach:**
  DELAY CONF FULL UNTILL ESTABLISHED ON FINAL DESCENT
- **If level off expected during final approach:**
  FOR LANDING: USE CONF 3

ENG 1(2) BLEED STATUS FAULT
(IN FLIGHT)

Applicable to: ALL

Ident.: PRO-ABN-ENG-W-00017963.0001001 / 21 MAR 16

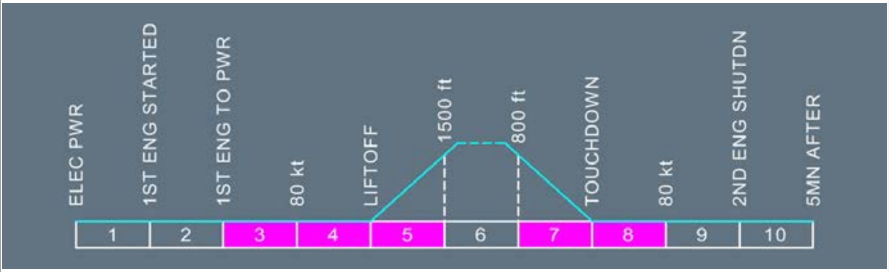
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the status of one of the following valves is not received by the FADEC active channel:

- Bleed valves, or
- Pack valves, or
- Wing and engine anti ice valves, or
- Cross-bleed valve.

Flight Phase Inhibition:



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ENG 1(2) BLEED STATUS FAULT (Cont'd)
(IN FLIGHT)

Ident.: PRO-ABN-ENG-W-00018707.0001001 / 21 MAR 16

- **If ENG ANTI ICE on:**

  ENG MODE SEL..IGN

Ident.: PRO-ABN-ENG-W-00012303.0001001 / 17 AUG 10

STATUS

ENG 1(2) HI GND IDLE

ENG 1(2) BLEED STATUS FAULT
(ON GROUND)

Applicable to: ALL

Ident.: PRO-ABN-ENG-V-00017965.0001001 / 21 MAR 16

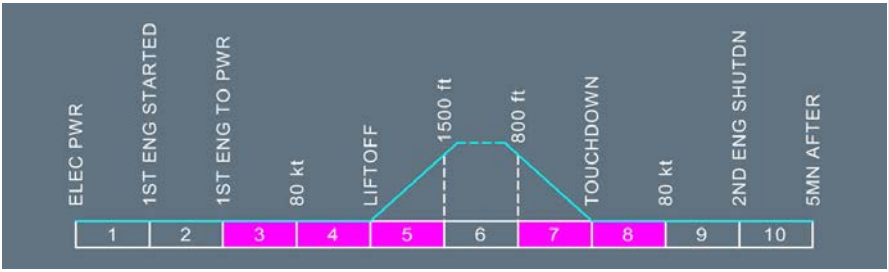
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the status of one of the following valves is not received by the FADEC active channel:

- Bleed valves, or
- Pack valves, or
- Wing and engine anti ice valves, or
- Cross-bleed valve.

Flight Phase Inhibition:



Continued on the following page

ENG 1(2) BLEED STATUS FAULT (Cont'd)
(ON GROUND)

Ident.: PRO-ABN-ENG-V-00018708.0001001 / 21 MAR 16

L2 HI GND IDLE

FADEC increases minimum idle as if valves were opened.

L1
- **If ENG ANTI ICE on:**

  ENG MODE SEL...IGN

L2 *When ENG anti ice is on, there is no automatic selection of continuous relight since FADEC does not know position of engine anti ice valves position.*

L1
- **BEFORE T.O.:**

  PACK (ASSOCIATED SIDE)...OFF

L2 *Associated pack must be closed to reduce risk of excessive EGT.*

Ident.: PRO-ABN-ENG-V-00012301.0001001 / 17 AUG 10

STATUS

ENG 1(2) HI GND IDLE

ENG COMPRESSOR VANE

Applicable to: ALL

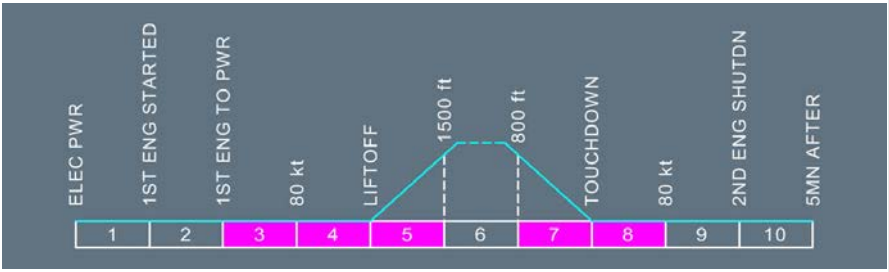
Ident.: PRO-ABN-ENG-CY-00017907.0001001 / 31 AUG 17

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a loss of the redundancy (i.e. one channel is detected faulty) of the compressor vane (i.e. VBV, VSV) control system on both engines. The control of the compressor vane is still fully operative on both engines.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CY-00017757.0001001 / 21 MAR 16

Crew awareness.

ENG 1(2) COMPRESSOR VANE

Applicable to: ALL

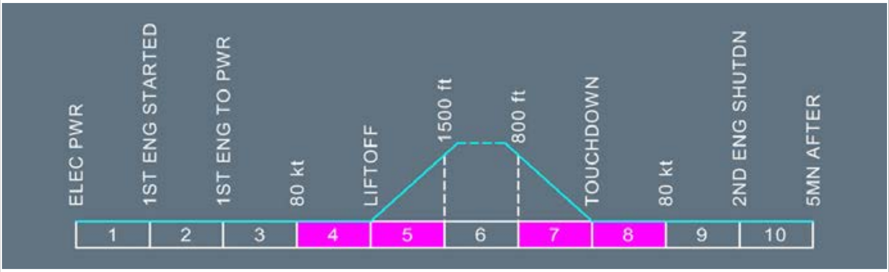
Ident.: PRO-ABN-ENG-N-00017966.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when either Variable Bleed Valve (VBV) or Variable Stator Vane (VSV) is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-N-00017655.0003001 / 21 MAR 17

- **On ground:**
  THR LEVERS (AFFECTED)....................IDLE
  ENG MASTER (AFFECTED)....................OFF

Depending on the type of failure, one of the following two messages is displayed:

AVOID RAPID THR CHANGES or

If the A/THR is engaged, adjust the thrust levers to align the thrust lever commands with actual N1 and disconnect A/THR.

ENG (AFFECTED) SLOW RESPONSE

Continued on the following page

ENG 1(2) COMPRESSOR VANE (Cont'd)

Ident.: PRO-ABN-ENG-N-00012155.0001001 / 17 AUG 10

STATUS

AVOID RAPID THR CHANGES

ENG (affected) SLOW RESPONSE

ENG 1(2) CTL VALVE FAULT

Applicable to: ALL

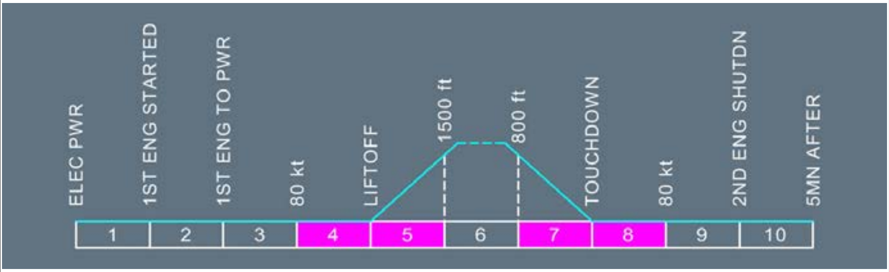
Ident.: PRO-ABN-ENG-Q-00017967.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- The Burner Staging Valve (BSV) is failed, or
- The HP Turbine Clearance (HPTC) system is failed, or
- The Rotor Active Clearance Control (RACC) system is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-Q-00018709.0001001 / 21 MAR 16

MAX N2..96 %

L2 *Retard associated thrust lever to limit N2 to 96 %.*

Continued on the following page

ENG 1(2) CTL VALVE FAULT (Cont'd)

Ident.: PRO-ABN-ENG-Q-00012233.0001001 / 17 AUG 10

STATUS

MAX ENG (AFFECTED) N2..96 %

ENG DUAL FAILURE

Applicable to: ALL

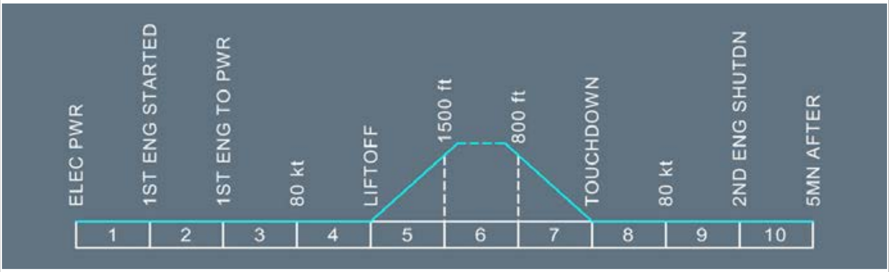
Ident.: PRO-ABN-ENG-S-00017909.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the two engines are failed.

Flight Phase Inhibition:



Continued on the following page

ENG DUAL FAILURE (Cont'd)

Ident.: PRO-ABN-ENG-S-00012282.0115001 / 21 MAR 17

L2 This warning inhibits the ELEC EMER CONFIG warning, and provides the flight crew with the immediate reference to the main actions to take in the case of a dual engine failure. This procedure then directs the flight crew to apply the applicable QRH procedure, depending on if there is fuel or not.

When applying the ENG DUAL FAILURE QRH procedure:
- If one or more engines are recovered, apply the corresponding ECAM procedure instead
- If no engines are recovered, continue to apply the ENG DUAL FAILURE QRH procedure. If time permits, clear ECAM alerts, and check the ECAM STATUS page.

L1 **LAND ASAP**

EMER ELEC PWR (IF EMER GEN NOT IN LINE).......MAN ON

L2 *Pressing EMER ELEC PWR MAN ON pb allows extension of RAT and emergency generator coupling.*

L1 THR LEVERS.......IDLE
FAC 1.......OFF THEN ON

L2 *Resetting FAC 1 enables the recovery of characteristics speed displayed on the PFD.*
Resetting FAC 1 also enables rudder trim recovery, even if no indication is available.
When the hydraulic power is lost, the right aileron is lost, and is in the upfloat position.
Rudder trim may be used to compensate for this upfloating aileron.

L1 ● **IF NO FUEL:**
OPT SPD.......215 KT/GREEN DOT

L2 *If there is no fuel remaining, the optimum speed is the green dot speed.*
Initially fly 215 kt then refer to the QRH procedure to get the accurate green dot speed.

L1 ENG/NO FUEL PROC.......APPLY

L2 *Refer to procedure.*

L1 ● **IF FUEL REMAINS:**
ENG MODE SEL.......IGN
OPT RELIGHT SPD.......300 KT

L2 *If there is fuel remaining, the optimum speed is the optimum relight speed.*
The ECAM provides reference to an envelope speed. In case of speed indication failure (volcanic ash), pitch attitude for optimum relight is provided in the QRH procedure.

L1 ENG/FUEL PROC.......APPLY

Continued on the following page

ENG DUAL FAILURE (Cont'd)

L2 *Refer to procedure.*

Continued on the following page

ENG DUAL FAILURE (Cont'd)

Ident.: PRO-ABN-ENG-S-00012283.0044001 / 21 MAR 16

L12

STATUS

MIN RAT SPEED.......... 140 KT
MAX SPEED 320/0.77
MAX BRK PR.......... 1000 PSI
MANEUVER WITH CARE
FUEL GRVTY FEED
AVOID NEGATIVE G FACTOR

APPR PROC

- **IF HYD NOT RECOVERED:**
  FOR LDG.......... USE FLAP 3
- **WHEN CONF 3 AND VAPP:**
  L/G .... GRVTY EXTN
  (Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION). Being stabilized at VAPP before selecting the gear down enables the aircraft to be trimmed for approach.
  APPR SPD.......... VREF +25 KT
  Approach speed must be increased, due to the loss of flaps.

LDG DIST PROC.......... APPLY

ALTN LAW: PROT LOST
WHEN L/G DN: DIRECT LAW
See (1)
BRK Y ACCU PR ONLY
See (2)
SLATS SLOW

INOP SYS

See below

INOP SYS

G+Y HYD	F/CTL PROT	STABILIZER

Continued on the following page

ENG DUAL FAILURE (Cont'd)

R AIL	REVERSER 1+2	ADR 2+3
IR 2+3	RA 1+2	SPLR 1+2+4+5
ELAC 2	SEC 2+3	FLAPS
YAW DAMPER	A/CALL OUT	AP 1+2
A/THR	FUEL PUMPS	ANTI SKID
N/W. STEER	AUTO BRK	CAT 2
L/G RETRACT	CAB PR 1+2	PACK 1+2

(1) *At landing gear extension, control reverts to direct law in pitch as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).*

(2) *7 full brake applications are available.*

ENG 1(2) EIU FAULT

Applicable to: ALL

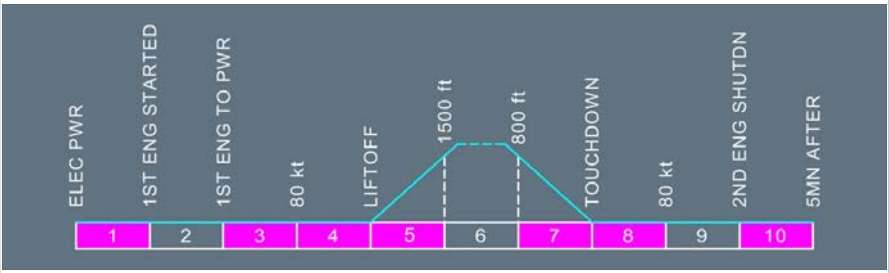
Ident.: PRO-ABN-ENG-B-00017970.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the data bus between the EIU and ECU is failed.

Flight Phase Inhibition:



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ENG 1(2) EIU FAULT (Cont'd)

Ident.: PRO-ABN-ENG-B-00017658.0002001 / 21 MAR 17

Crew awareness.

L2 The following consequences affect the aircraft when this alert is triggered:
- Affected engine start is lost
- Autothrust control is lost
- Thrust reverser on the affected engine is lost
- When idle is selected, only approach idle is available
- Bleed corrections on N1 limit are lost (*Refer to PRO-ABN-ENG ENG 1(2) BLEED STATUS FAULT (In Flight)*).

Ident.: PRO-ABN-ENG-B-00017659.0001001 / 21 MAR 16

L12

STATUS

	INOP SYS
ENG 1(2) APPR IDLE ONLY *Minimum idle is lost.*	A/THR REVERSER 1(2) ENG 1(2) START

ENG 1(2) FADEC A(B) FAULT

Applicable to: ALL

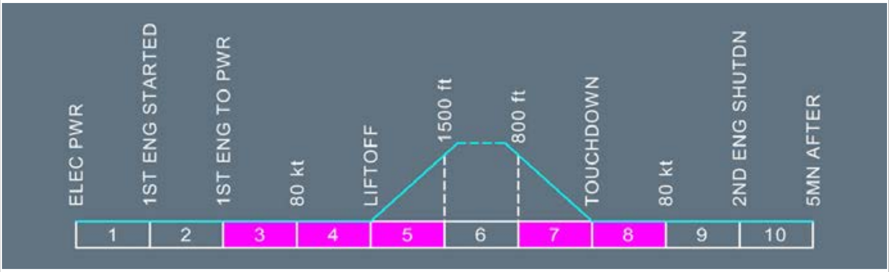
Ident.: PRO-ABN-ENG-AZ-00017972.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the associated FADEC channel is lost.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-AZ-00017661.0001001 / 31 AUG 17

Crew awareness.

- **For aircraft equipped with CFM engines:**

L2 *Note:* *Some cases of spurious FADEC fault have been experienced at engine start on ground.*

The caution can be considered as spurious, if it disappears after application of the following procedure:

- *Set the master sw to OFF, and wait until N2 speed goes below 5 % (If N2 indication is not available, wait 2 minutes before going to next step).*
- *Pull and reset the C/B 's of the affected ECU electrical supply (A04 or A05 on 49 VU or R41 or Q40 on 121 VU).*
- *Wait 10 s for the ECU power-up sequence, and restart the engine.*

ENG 1(2) FADEC ALTERNATOR

Applicable to: ALL

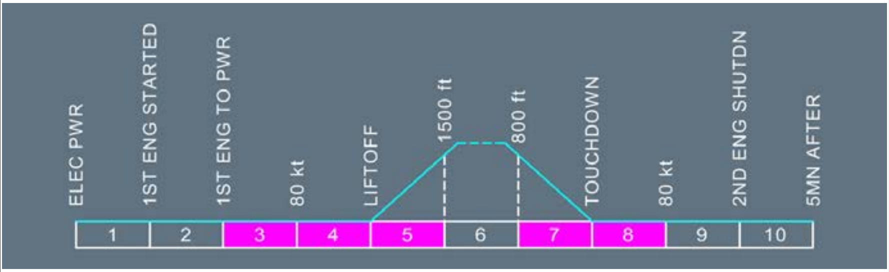
Ident.: PRO-ABN-ENG-BA-00017974.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the electrical auto supply for the FADEC system is lost.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-BA-00017662.0001001 / 21 MAR 16

Crew awareness.

ENG 1(2) FADEC FAULT

Applicable to: ALL

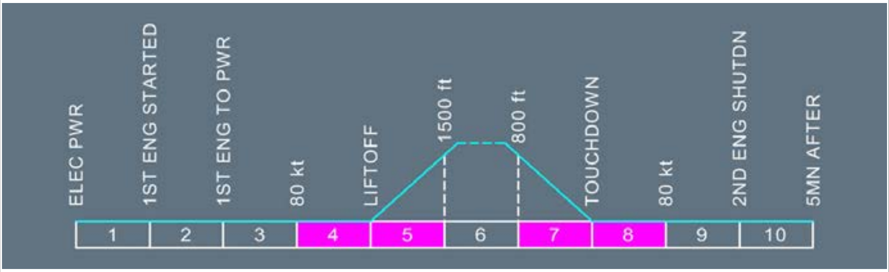
Ident.: PRO-ABN-ENG-BC-00017975.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both FADEC channels are lost.

Flight Phase Inhibition:



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ENG 1(2) FADEC FAULT (Cont'd)

Ident.: PRO-ABN-ENG-BC-00017663.0005001 / 21 MAR 17

- **On ground:**

  THR LVR (AFFECTED) NOT ABOVE IDLE
  ENG (AFFECTED) PARAMETERS....................CHECK

L2 *Due to the fact that engine indications are lost, other system pages such as HYD SD page, ELEC SD page or BLEED SD page must be used to check engine status.*

L1
  - **IF ABN ENG OPERATION:**

    ENG MASTER (AFFECTED)....................OFF

- **In flight:**

  THR LEVER (AFFECTED).................... IDLE
  ENG (AFFECTED) PARAMETERS....................CHECK

L2 *Due to the fact that engine indications are lost, other system pages such as HYD SD page, ELEC SD page or BLEED SD page must be used to check engine status.*

L1
  - **IF ABN ENG OPERATION:**

    ENG MASTER (AFFECTED)....................OFF

L12

ASSOCIATED PROCEDURES

ENG 1(2) SHUT DOWN

(Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN).

Ident.: PRO-ABN-ENG-BC-00019553.0001001 / 13 MAY 16

STATUS

- **On ground:**

  THR LVR 1(2) NOT ABOVE IDLE

ENG 1(2) FADEC HI TEMP

Applicable to: ALL

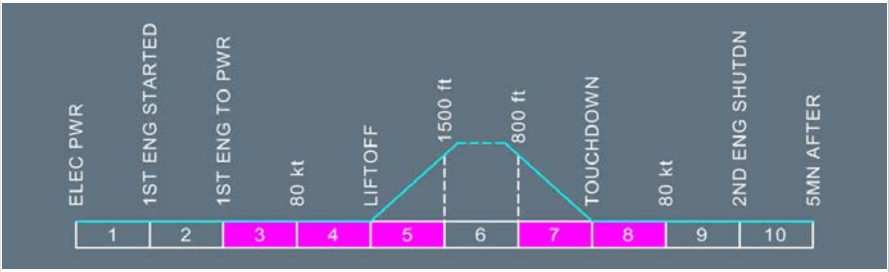
Ident.: PRO-ABN-ENG-BD-00017976.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when high temperature is detected by one or both channels.

Flight Phase Inhibition:



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ENG 1(2) FADEC HI TEMP (Cont'd)

Ident.: PRO-ABN-ENG-BD-00017664.0004001 / 21 MAR 17

- **If the ECU TEMP is above 105 °C:**

  FADEC OVHT

L2 *Reducing engine power should decrease temperature in the ECU area.*
If overheating is severe enough, ECU failure could result in a significant loss of engine functions.

L1 ■ **On the ground:**

THR LEVER (AFFECTED).......... IDLE
ENG MASTER (ASSOCIATED ENGINE).......... OFF
ENG MODE SEL.......... NORM
FADEC GND PWR.......... CHECK OFF

■ **In flight:**

ENG (AFFECTED) PARAMETERS.......... CHECK

- **IF ABN ENG OPERATION:**

  THR LEVER (AFFECTED).......... IDLE
  ENG MASTER (ASSOCIATED ENGINE).......... OFF

L12

ASSOCIATED PROCEDURES

ENG 1(2) SHUT DOWN

(Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN).

ENG 1(2) FAIL

Applicable to: ALL

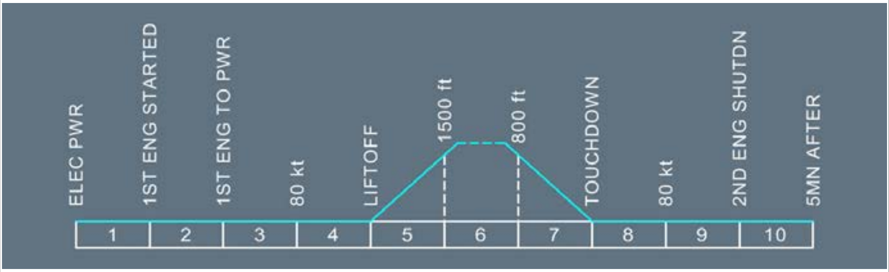
Ident.: PRO-ABN-ENG-BJ-00017982.0002001 / 06 JUN 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the engine core speed is below idle, with the ENG MASTER lever set to ON, and ENG FIRE pb not pushed.

Flight Phase Inhibition:



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ENG 1(2) FAIL (Cont'd)

Ident.: PRO-ABN-ENG-BJ-00017667.0003001 / 21 MAR 17

L2 An engine flame-out may be recognized by a rapid decrease in EGT , N2 , FF , followed by decrease in N1 for CFM engines, or EPR for IAE engines.

Engine damage may be accompanied by:
- Loud noise,
- Significant increase in aircraft vibrations and/or buffeting,
- Repeated or uncontrollable engine stalls,
- Associated abnormal indications such as hydraulic fluid loss, or no N2 indication.

L1 **LAND ASAP**

- **Before takeoff or after landing:**

  THR LEVER (AFFECTED ENGINE).. IDLE
  ENG MASTER (AFFECTED ENGINE)..OFF

  - **IF DAMAGE:**

    ENG FIRE P/B (AFFECTED ENGINE).. PUSH
    AGENT 1.. DISCH

  - **IF NO DAMAGE:**

L2 For CFM engines, if conditions permit, do not restart the engine. A new engine start would erase FADEC troubleshooting data.

L1 ENG (AFFECTED) RELIGHT..CONSIDER

L2 *If no damage, a new start sequence may be initiated.*

L12

ASSOCIATED PROCEDURES

ENG 1(2) SHUT DOWN

Apply the ENG SHUT DOWN procedure (Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN), if damage or if engine relight is unsuccessful.

L1 - **In flight:**

  ENG MODE SEL.. IGN

L2 *Selection of continuous ignition confirms the immediate relight attempt made by the FADEC.*

L1 THR LEVER (AFFECTED ENGINE).. IDLE

Continued on the following page

ENG 1(2) FAIL (Cont'd)

L2 Note: *In case of GPWS (EGPWS) alerts, reduce speed with care below VLS with flaps extended (at light weights VMCA may be reached before αMax) when applying the GPWS (EGPWS) procedure.*

L1 ● **IF NO ENG RELIGHT AFTER 30 S:**

L2 The 30 s countdown starts as soon as the ENG 1(2) FAIL alert is triggered.

L1 ENG MASTER (AFFECTED ENGINE)...OFF

■ **IF DAMAGE:**

ENG FIRE P/B (AFFECTED ENGINE)..PUSH
AGENT 1 (AFTER 10 SECONDS IN FLIGHT)... DISCH

L12

ASSOCIATED PROCEDURES

ENG 1(2) SHUT DOWN

L2 *Apply the ENG SHUT DOWN procedure (Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN), if damage or if engine relight is unsuccessful.*
If high vibration occurs and continues after engine shutdown, reduce airspeed and descent to a safe altitude.
Attempt to determine and use a practical airspeed and altitude for minimum vibrations.

L1 ■ **IF NO DAMAGE:**

ENG (AFFECTED) RELIGHT... CONSIDER

L2 *Apply ENG RELIGHT (in flight) procedure (Refer to PRO-ABN-ENG [QRH] ENG RELIGHT IN FLIGHT).*

ENG 1(2) FIRE
(IN FLIGHT)

Applicable to: ALL

Ident.: PRO-ABN-ENG-DQ-00017401.0001001 / 21 MAR 16

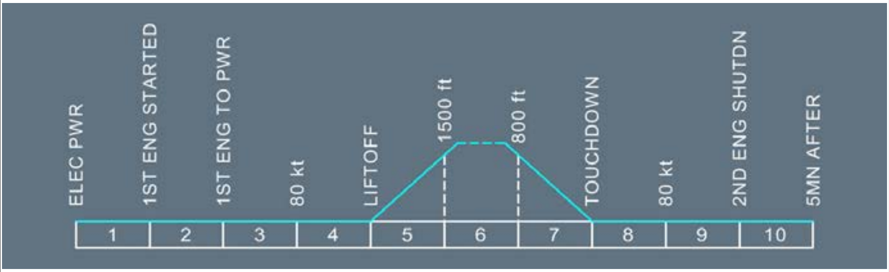
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- Fire is detected by both loops, or
- Fire is detected by one loop when the other loop is faulty, or
- A rupture occurs in both loops within 5 s.

Flight Phase Inhibition:



Continued on the following page

ENG 1(2) FIRE (Cont'd)
(IN FLIGHT)

Ident.: PRO-ABN-ENG-DQ-00018190.0002001 / 21 MAR 17

LAND ASAP

THR LEVER (AFFECTED)........ IDLE
ENG MASTER (AFFECTED)........ OFF

L2 *LP and HP valves close.*

L1 ENG FIRE P/B (AFFECTED)........ PUSH

L2 *When pushed:*
- *Aural warning stops*
- *The light remains on, until the fire is extinguished, regardless of the position of the ENG FIRE pb-sw*
- *FADEC is no longer supplied.*

L1 AGENT 1 AFTER 10 S........ DISCH

L2 *The 10 s delay allows N1 to decrease, reducing nacelle ventilation, and thereby increasing the effect of the agent.*
Automatic countdown on the ECAM.

L1 ATC........ NOTIFY

L2 *Notify ATC of the nature of the emergency, and state intentions*

L1 ● **IF FIRE AFTER 30 S:**

AGENT 2........ DISCH

L2 *Discharge the second agent, if the fire warning remains 30 s after the discharge of the first agent.*

L12

ASSOCIATED PROCEDURES

ENG 1(2) SHUTDOWN

Do not attempt to restart the engine.
*For the ENG SHUTDOWN procedure, see the ENG section (**Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN**).*

ENG 1(2) FIRE
(ON GROUND)

Applicable to: ALL

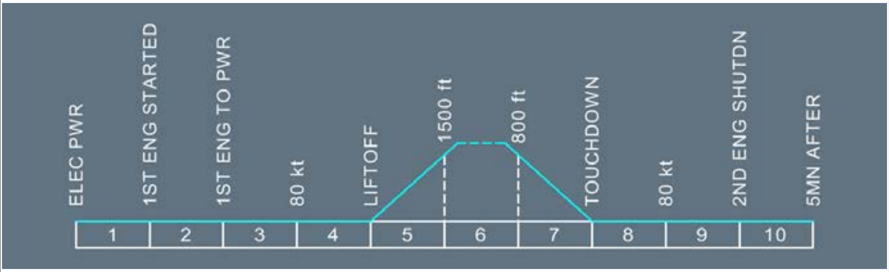
Ident.: PRO-ABN-ENG-DR-00018553.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- Fire is detected by both loops, or
- Fire is detected by one loop when the other loop is faulty, or
- A rupture occurs in both loops within 5 s.

Flight Phase Inhibition:



Continued on the following page

ENG 1(2) FIRE (Cont'd)
(ON GROUND)

Ident.: PRO-ABN-ENG-DR-00018192.0004001 / 14 FEB 17

THR LEVERS...IDLE

L2 *Full reverse may be used to stop the aircraft.*

L1 ● **WHEN A/C IS STOPPED:**

PARKING BRK...ON
ATC (VHF 1)...NOTIFY

L2 *Notify ATC of the nature of the emergency, and state intensions.*
Only VHF 1 is available on batteries.

L1 CABIN CREW (PA)...ALERT
ENG MASTER (AFFECTED)...OFF

L2 *Associated LP and HP valves close.*

L1 ENG FIRE P/B (AFFECTED)...PUSH

L2 *When pushed:*
- *Aural warning stops*
- *The light remains on, until the fire is extinguished, regardless of the position of the ENG FIRE pb-sw*
- *FADEC is no longer supplied.*

L1 AGENT 1+2...DISCH
EMER EVAC PROC...APPLY

L2 *Refer to PRO-ABN-MISC [QRH] EMER EVAC or Refer to QRH/ABN-25 EMER EVAC*

ENG 1(2) FIRE DET FAULT

Applicable to: ALL

Ident.: PRO-ABN-ENG-DO-00020838.0001001 / 17 MAR 17

ANNUNCIATIONS

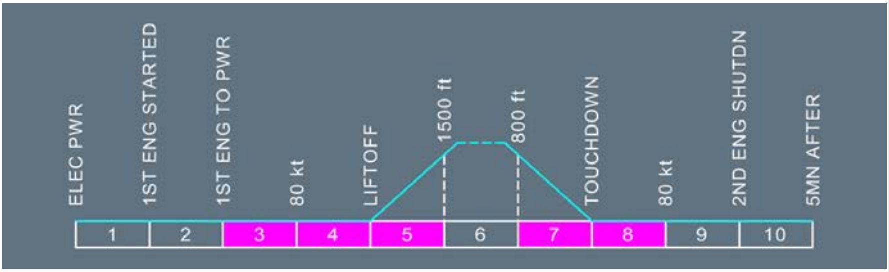
Triggering Conditions:

L2

This alert triggers when:

- Both loops are inoperative, or
- Fire Detector Unit is inoperative.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-DO-00020837.0001001 / 17 MAR 17

Crew awareness.

Ident.: PRO-ABN-ENG-DO-00020839.0001001 / 17 MAR 17

STATUS

INOP SYS

FIRE DET 1(2)

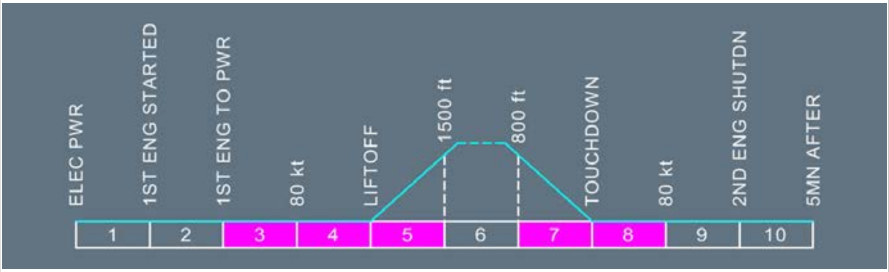
ENG 1(2) FIRE LOOP A(B) FAULT

Applicable to: ALL

Ident.: PRO-ABN-ENG-DP-00020841.0001001 / 17 MAR 17

ANNUNCIATIONS

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-DP-00020840.0001001 / 17 MAR 17

L2 Crew awareness.

Ident.: PRO-ABN-ENG-DP-00020842.0001001 / 17 MAR 17

STATUS

INOP SYS

ENG 1(2) LOOP A(B)

ENG 1(2) FUEL CTL FAULT

Applicable to: ALL

Ident.: PRO-ABN-ENG-O-00017983.0001001 / 21 MAR 16

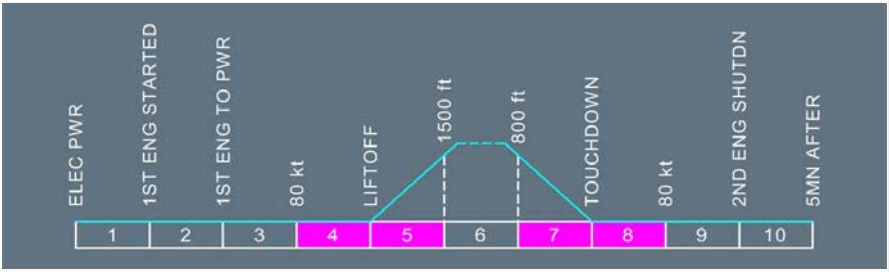
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- The Fuel Metering Valve (FMV) position is failed, or
- The FMV command is failed, or
- The FMV position feedback is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-O-00017679.0003001 / 21 MAR 16

- **On ground:**
  THR LEVER (AFFECTED).. IDLE
  ENG MASTER (AFFECTED)..OFF

AVOID RAPID THR CHANGES, or
ENG (AFFECTED) SLOW RESPONSE

L2 Depending on the type of failure, one of the above two messages is displayed.

Continued on the following page

ENG 1(2) FUEL CTL FAULT (Cont'd)

Ident.: PRO-ABN-ENG-O-00017681.0001001 / 21 MAR 16

STATUS

AVOID RAPID THR CHANGES or

ENG (affected) SLOW RESPONSE

ENG 1(2) FUEL FILTER CLOG

Applicable to: ALL

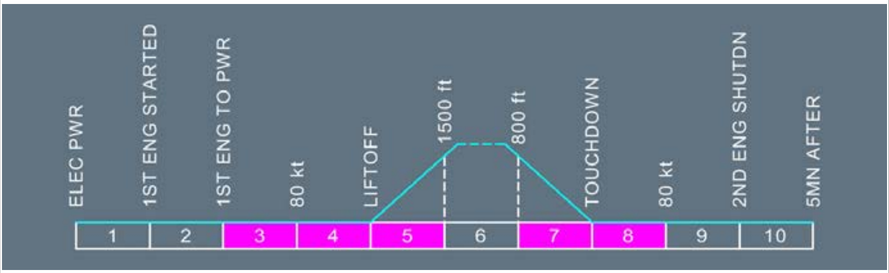
Ident.: PRO-ABN-ENG-BK-00017984.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the fuel filter is clogged.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-BK-00012068.0001001 / 18 AUG 14

Crew awareness.

L2 Maintenance action is due.

ENG 1(2) FUEL RETURN VALVE

Applicable to: ALL

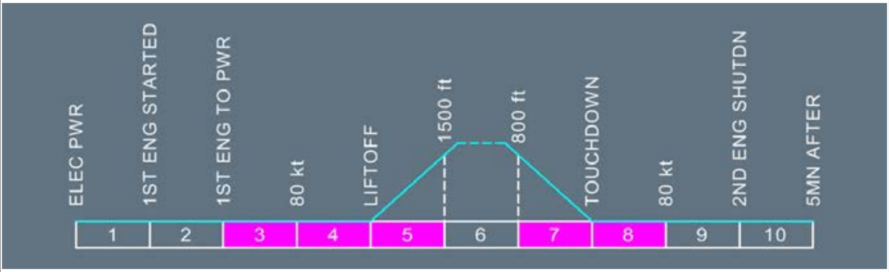
Ident.: PRO-ABN-ENG-BP-00017986.0001001 / 13 MAY 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the fuel return valve is failed in closed, or in open position.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-BP-00012277.0001001 / 25 FEB 14

- **VALVE NOT OPEN**

L2 The valve is failed closed.

L1 Crew awareness.

- **VALVE NOT CLOSED**

L2 The valve is failed open.

L1 Crew awareness.

ENG 1(2) HP FUEL VALVE

Applicable to: ALL

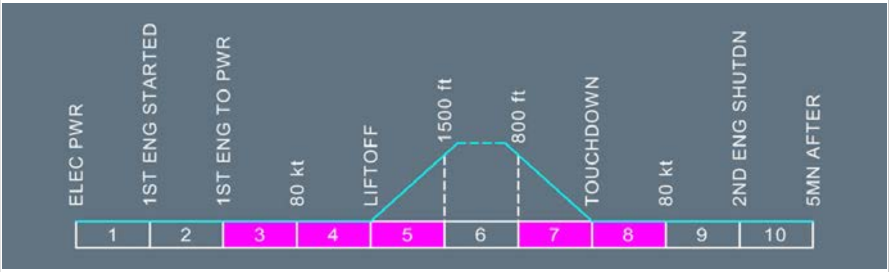
Ident.: PRO-ABN-ENG-BY-00017955.0001001 / 13 MAY 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when HP fuel valve is failed in closed or open position.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-BY-00012096.0001001 / 13 MAY 16

- **HP fuel valve failed closed, and associated engine below idle:**
  HP FUEL VALVE NOT OPEN
  - **On the ground:**
    MAN START (IF MAN START PERFORMED)..........OFF
    ENG MASTER (AFFECTED)..........OFF
- **HP fuel valve failed open, and associated engine below idle**
  or
  HP fuel valve failed closed, and associated engine at or above idle:
  HP FUEL POS SWT FAULT

ENG 1(2) IGN FAULT (IGN A OR B FAULT)

Applicable to: ALL

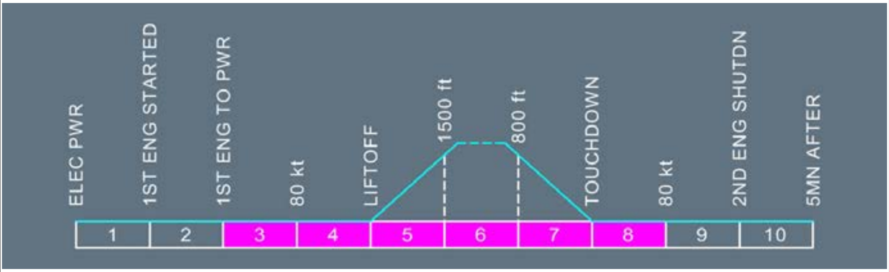
Ident.: PRO-ABN-ENG-J-00017956.0002001 / 20 APR 17

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when ignition circuit A or B is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-J-00012134.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-ENG-J-00012136.0001001 / 17 AUG 10

STATUS

INOP SYS

ENG 1(2) IGN A (B)

ENG 1(2) IGN FAULT (IGN A+B FAULT)

Applicable to: ALL

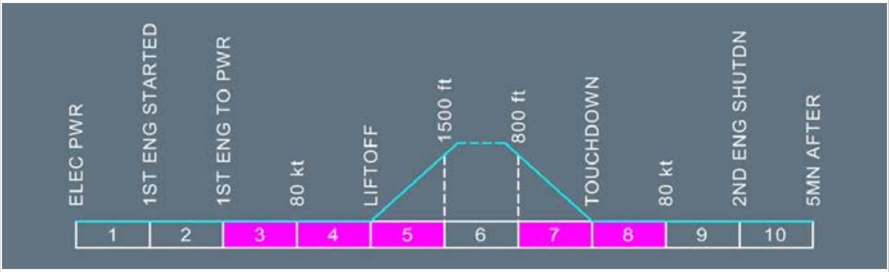
Ident.: PRO-ABN-ENG-K-00017957.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both ignition circuits are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-K-00012139.0001001 / 12 JAN 11

AVOID ADVERSE CONDITIONS

Ident.: PRO-ABN-ENG-K-00012141.0001001 / 12 JAN 11

STATUS

INOP SYS

ENG 1(2) IGN

ENG 1(2) LOW N1 (ON GROUND)

Applicable to: ALL

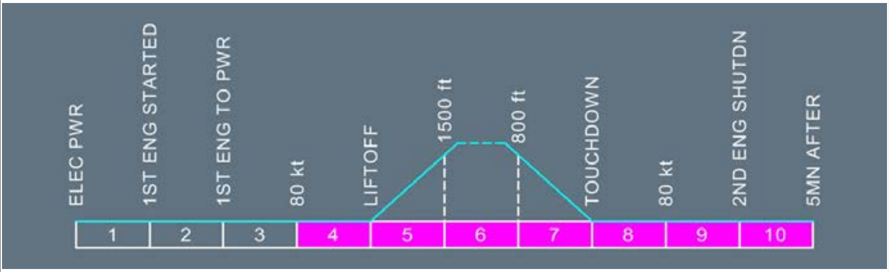
Ident.: PRO-ABN-ENG-CA-00017958.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when N1 rotation is failed during start.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CA-00012101.0004001 / 16 NOV 11

L2 No N1 rotation during start.

L1 ● **IF CONFIRMED:**

THR LEVER (AFFECTED).. IDLE

ENG MASTER (AFFECTED).. OFF

ENG 1(2) N1 OR N2 OR EGT OR FF DISCREPANCY

Applicable to: ALL

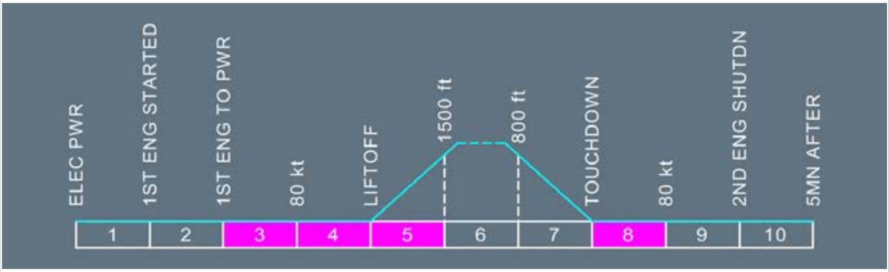
Ident.: PRO-ABN-ENG-CC-00017959.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when a discrepancy between real and displayed values is detected.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CC-00017696.0001001 / 21 MAR 16

L2 The upper ECAM upper displays a CHECK (or CHK) message below the affected indication.
Normal indication may be recovered by switching from DMC 1 to DMC 3.
If unsuccessful, and if both thrust levers are at the same position, crosscheck with the opposite parameter.

L1 Crew awareness.

ENG 1(2) N1/N2/EGT OVER LIMIT

Applicable to: ALL

Ident.: PRO-ABN-ENG-CD-00018006.0002001 / 21 MAR 16

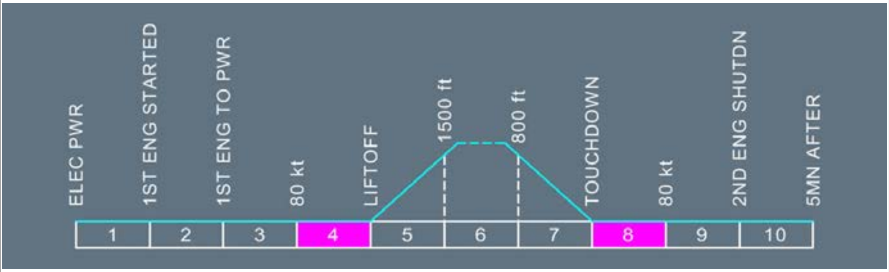
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- N1 is above 104 %, or
- N2 is above 105 %, or
- EGT is above 725 °C during start, or above 950 °C when the thrust levers are at TOGA or FLX/MCT position, or 915 °C in the other cases.

Flight Phase Inhibition:



Continued on the following page

ENG 1(2) N1/N2/EGT OVER LIMIT (Cont'd)

Ident.: PRO-ABN-ENG-CD-00012079.0013001 / 21 MAR 17

■ **Max pointer indication:**

L2 EGT between 915 °C and 950 °C (except during takeoff, alpha floor activation, or reverse selected), or EGT between 950 °C and 970 °C, or

N1 between 104.0 % and 105.8 % or

N2 between 105.0 % and 105.8 %

L1 THR LEVER (OF AFFECTED ENGINE)..BELOW LIMIT

L2 *Normal operation may be resumed and maintained until next landing. Report in maintenance log.*

L1 ■ **Max pointer indication:**

L2 EGT above 970 °C or

N1 above 105.8 % or

N2 above 105.8 %

L1 THR LEVER (OF AFFECTED ENGINE)..IDLE

ENG MASTER (OF AFFECTED ENGINE)..OFF

L2 *If conditions do not permit engine shutdown land ASAP using the minimum thrust required to sustain safe flight.*

L12

ASSOCIATED PROCEDURES

ENG 1(2) SHUT DOWN

Apply the ENG SHUT DOWN procedure (Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN).

ENG 1(2) OIL FILTER CLOG

Applicable to: ALL

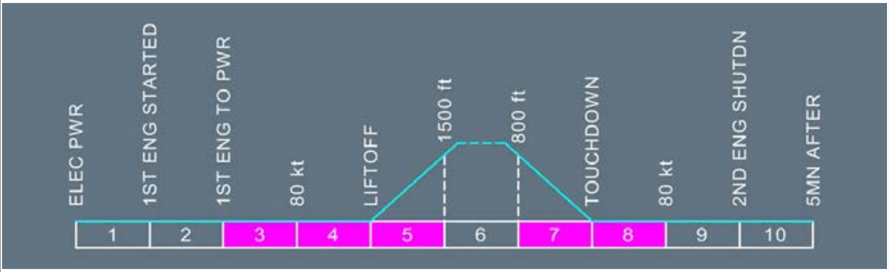
Ident.: PRO-ABN-ENG-CF-00017964.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the oil filter is clogged.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CF-00012078.0003001 / 18 AUG 14

Crew awareness.

L2 Maintenance action is due, except if the caution is temporarily displayed during cold engine start with engine oil temperature lower than 40 °C.

ENG 1(2) OIL HI TEMP

Applicable to: ALL

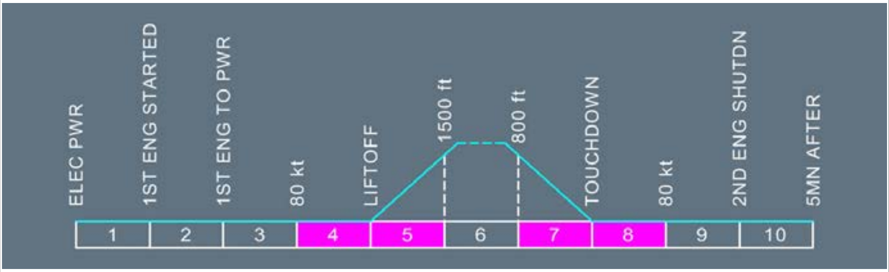
Ident.: PRO-ABN-ENG-CH-00017969.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the oil temperature is:
- Between 140 °C and 155 °C for more than 15 min, or
- Above 155 °C.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CH-00017822.0002001 / 21 MAR 17

THR LEVER (AFFECTED ENGINE)....................IDLE
ENG MASTER (AFFECTED ENGINE)....................OFF

L2 *For aircraft equipped with IAE or PW6000 engines, operation above the maximum temperature require engine shutdown.*

L12

ASSOCIATED PROCEDURES

ENG 1 (2) SHUT DOWN

Apply the ENG SHUT DOWN procedure (Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN).

ENG 1(2) OIL LO PR

Applicable to: ALL

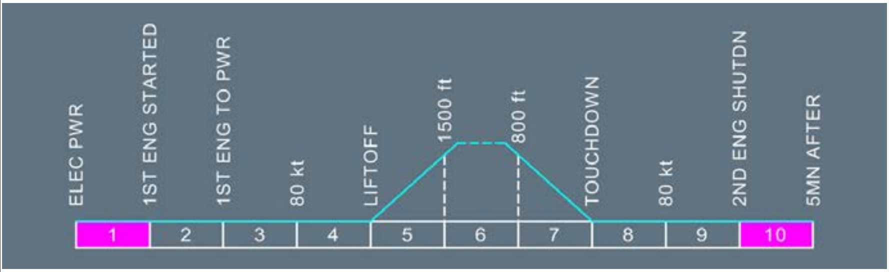
Ident.: PRO-ABN-ENG-CI-00018002.0006001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when oil pressure is below 13 PSI.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CI-00018796.0001001 / 21 MAR 17

L2 Check oil pressure indication on ENG SD page.

L1 THR LEVER (OF AFFECTED ENGINE)..IDLE

ENG MASTER (OF AFFECTED ENGINE)..OFF

L12

ASSOCIATED PROCEDURES

ENG 1(2) SHUT DOWN

Carry out ENG SHUT DOWN procedure (Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN).

Note: If oil pressure is low (< 13 PSI) is indicated only on ENG SD page (red indication) without the ENG OIL LO PR warning, it can be assumed, that the oil pressure transducer is faulty. Flight crew may continue engine operation while monitoring other engine parameters.

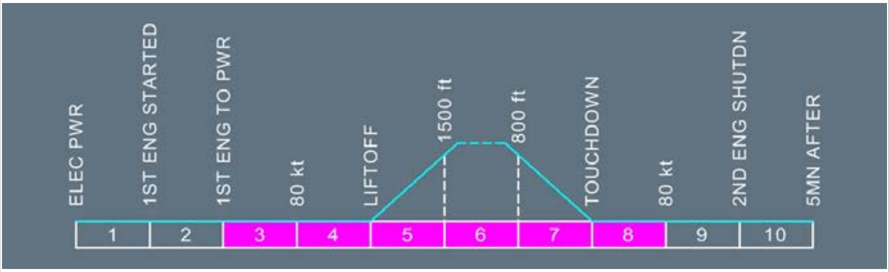
ENG 1(2) ONE TLA FAULT

Applicable to: ALL

Ident.: PRO-ABN-ENG-CM-00017977.0001001 / 21 MAR 16

ANNUNCIATIONS

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CM-00012144.0001001 / 25 FEB 14

Crew awareness.

ENG 1(2) OVSPD PROT FAULT

Applicable to: ALL

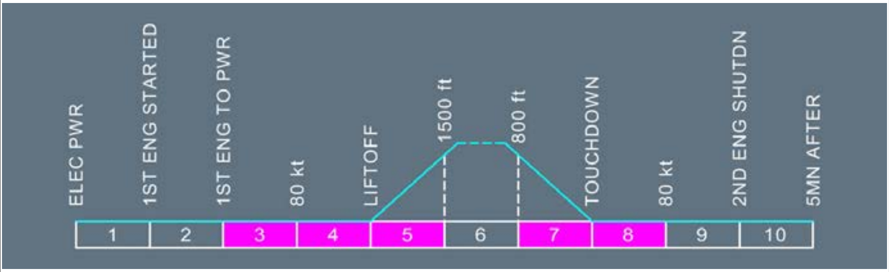
Ident.: PRO-ABN-ENG-CN-00017980.0003001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the overspeed protection is lost.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CN-00012166.0001001 / 25 FEB 14

Crew awareness.

L12

Note: *If the warning appears during engine start, shut down the engine. Restart the engine. If the warning still appears, maintenance action is due.*

ENG 1(2) PROBES FAULT

Applicable to: ALL

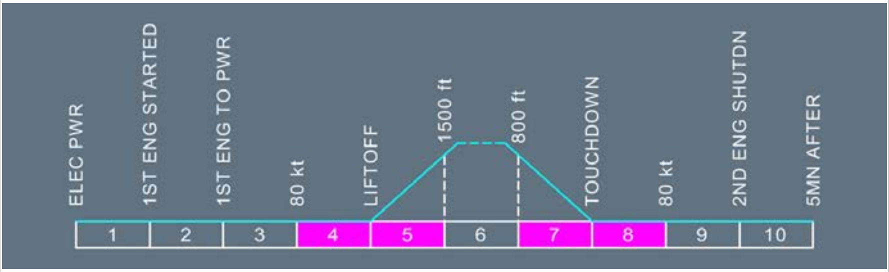
Ident.: PRO-ABN-ENG-CO-00017981.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when T12, PO or PT2 data are unavailable on both channels.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CO-00018734.0001001 / 21 MAR 16

Crew awareness.

ENG 1(2) REV ISOL FAULT

Applicable to: ALL

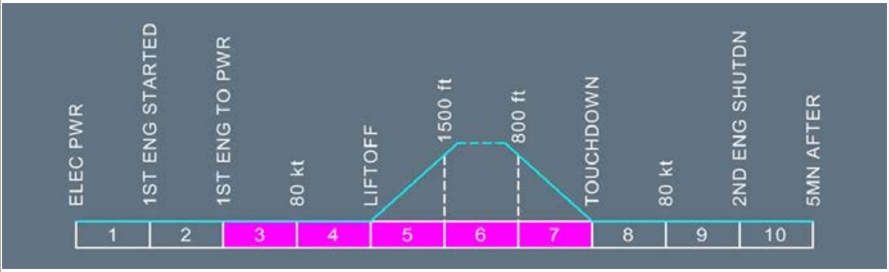
Ident.: PRO-ABN-ENG-CP-00017989.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the thrust reverser shut off valve is failed in open position.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CP-00018735.0001001 / 21 MAR 16

Crew awareness.

ENG 1(2) REV PRESSURIZED

Applicable to: ALL

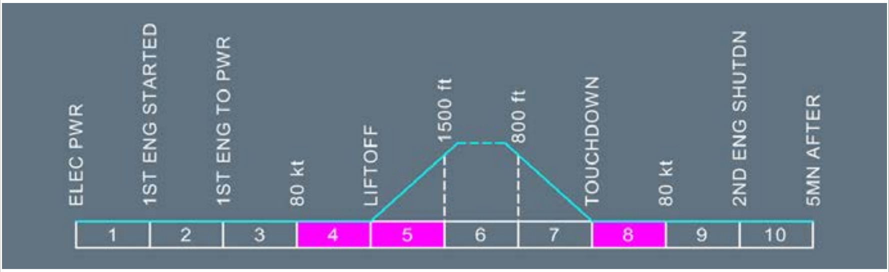
Ident.: PRO-ABN-ENG-CR-00017992.0001001 / 13 MAY 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when thrust reverser system is pressurized while:
- For CFM engines: The reverser doors are stowed and locked, or
- For IAE and PW engines: There is no reverse deployment order.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CR-00017702.0002001 / 21 MAR 16

- **In flight:**

  THR LEVER 1(2).. IDLE

  L2 *If flight conditions permit, reduce the thrust of the affected engine to IDLE as a precautionary measure.*

- L1 **On ground:**

  THR LVR 1(2) NOT ABOVE IDLE

ENG REV SET

Applicable to: ALL

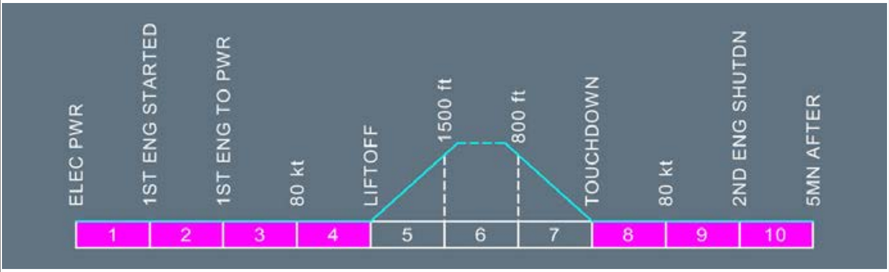
Ident.: PRO-ABN-ENG-DA-00017905.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the reverse thrust is selected in flight.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-DA-00017776.0001001 / 21 MAR 16

THR LEVER (AFFECTED ENGINE).. FWD THR

ENG 1(2) REV SWITCH FAULT

Applicable to: ALL

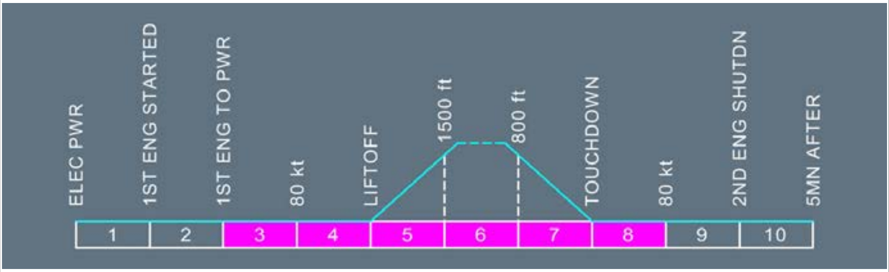
Ident.: PRO-ABN-ENG-CS-00017870.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the reverser permission switch is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CS-00012098.0001001 / 25 FEB 14

Crew awareness.

ENG 1(2) REVERSE UNLOCKED

Applicable to: ALL

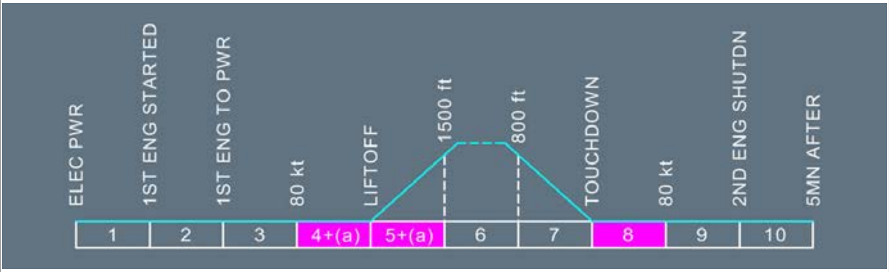
Ident.: PRO-ABN-ENG-CT-00017871.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one or more reverser doors are not locked in stowed position in flight, or on ground with no deploy order.

Flight Phase Inhibition:



Note: *(a) Alert not inhibited in the flight phases 4 and 5, if the engine thrust is automatically set to idle.*

Continued on the following page

ENG 1(2) REVERSE UNLOCKED (Cont'd)

Ident.: PRO-ABN-ENG-CT-00012084.0007001 / 21 MAR 17

L2 One or more reverser doors are not stowed.
If N1 is above 70 %, the auto-restow function is inhibited in flight and on ground.

L1 ■ **On ground:**

ENG 1(2) AT IDLE

L2 *Only displayed, if the FADEC automatically sets the engine at idle (i.e. when 4 reverser doors are not stowed, or 1, 2, or 3 reverser doors are not stowed with the reverser pressurized).*

L1 THR LEVER (AFFECTED ENGINE).. IDLE
ENG MASTER (AFFECTED ENGINE)..OFF

■ **In flight:**

LAND ASAP

ENG 1(2) AT IDLE

L2 *Only displayed, if the engine is automatically set at idle.*

L1 THR LEVER (AFFECTED ENGINE).. IDLE
MAX SPEED.. 300/.78

● **IF BUFFET:**

L2 The warning alone, without buffet or vibration, may be a false warning.

L1 MAX SPEED .... 240 KT
ENG MASTER (AFFECTED ENGINE)..OFF

● **If reverser is actually deployed:**

RUD TRIM ....FULL R (L)
CONTROL HDG WITH ROLL

L12

ASSOCIATED PROCEDURES

ENG 1(2) SHUT DOWN

Apply the ENG SHUT DOWN procedure (Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN).

ENG 1(2) REVERSER FAULT

Applicable to: ALL

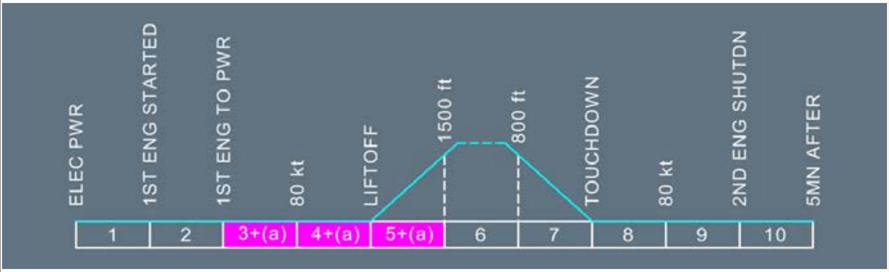
Ident.: PRO-ABN-ENG-A-00017872.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the thrust reverser on one engine is failed (due to system components or inputs).

Flight Phase Inhibition:



Note: (a) Alert not inhibited in the flight phases 3, 4, 5, if engine thrust is automatically set to idle.

Ident.: PRO-ABN-ENG-A-00017703.0003001 / 21 MAR 16

- **If reverser position fault with reverser pressurized:**

LAND ASAP

ENG 1(2) AT IDLE

L2 *Thrust of the affected engine is locked at idle.*

L1 THR LEVER 1(2).. IDLE

L2 *Set thrust lever of affected engine at idle.*

Continued on the following page

ENG 1(2) REVERSER FAULT (Cont'd)

Ident.: PRO-ABN-ENG-A-00012070.0001001 / 17 AUG 10

STATUS

INOP SYS

REVERSER 1(2)

ENG 1(2) SENSOR FAULT

Applicable to: ALL

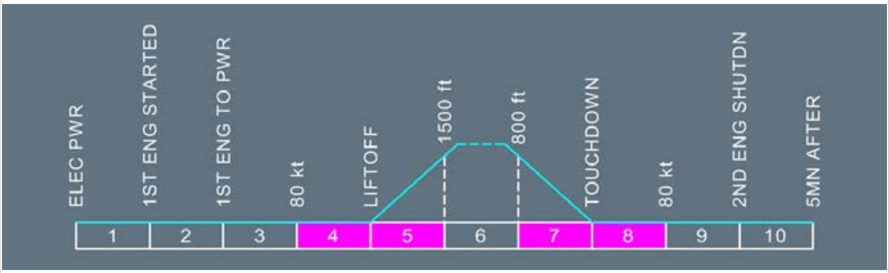
Ident.: PRO-ABN-ENG-R-00017873.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when PS3 or T25 or T3 or N1 or N2 data is unavailable on both channels.

Flight Phase Inhibition:



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ENG 1(2) SENSOR FAULT (Cont'd)

Ident.: PRO-ABN-ENG-R-00012235.0003001 / 16 NOV 11

L2 PS3, T25, T3, N1 , N2 data not available on both ECU channels.

L1
- **On ground:**
  THR LEVER (AFFECTED)........................ IDLE
  ENG MASTER (AFFECTED)........................OFF
- **In flight:**
  AVOID RAPID THR CHANGES.

Ident.: PRO-ABN-ENG-R-00017707.0001001 / 21 MAR 16

STATUS

AVOID RAPID THR CHANGES.

ENG 1(2) SHUT DOWN

Applicable to: ALL

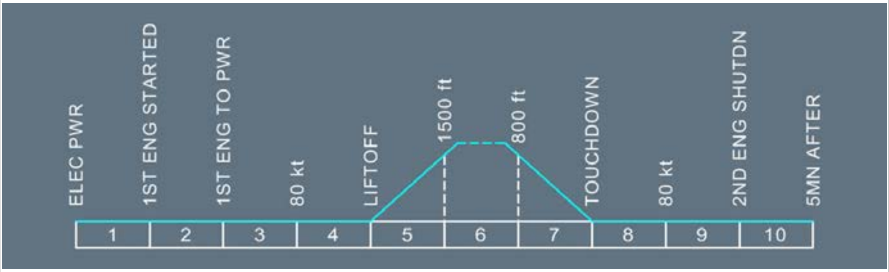
Ident.: PRO-ABN-ENG-I-00017874.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when ENG master is at off in phases 3 to 8, or ENG FIRE pb is pushed in phases 1, 2, 9 and 10.

Flight Phase Inhibition:



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ENG 1(2) SHUT DOWN (Cont'd)

Ident.: PRO-ABN-ENG-I-00017837.0006001 / 20 MAR 17

LAND ASAP

- **If wing anti-ice ON:**
  - **If Elec Emer Config:**
    PACK 1 .... OFF
    L2 *In Elec Emer config, only Pack 1 pb-sw can be set to off.*
  - L1 **If not Elec Emer Config:**
    PACK (AFFECTED SIDE) .... OFF
    L2 *One pack must be closed when wing anti-ice is in use due to precooler performance.*
  - L1 **If ENG FIRE pb not pushed:**
    X BLEED (IF ENG FIRE PB NOT PUSHED) .... OPEN
    L2 *X BLEED selector must be opened to have symmetrical wing anti-icing.*

L1 ENG MODE SEL .... IGN

L2 *Continuous ignition is selected, in order to protect the remaining engine.*

- L1 **IF NO FUEL LEAK:**
  IMBALANCE .... MONITOR

TCAS MODE SEL .... TA

- **If REV unlocked:**
  - **IF BUFFET:**
    MAX SPEED .... 240 KT
- **If ENG FIRE pb-sw pushed:**
  X BLEED .... SHUT
  WING ANTI ICE .... OFF

AVOID ICING CONDITIONS

SECONDARY FAILURES

* HYD
* ELEC
* AIR BLEED

Continued on the following page

ENG 1(2) SHUT DOWN (Cont'd)

L2

Note: *In some conditions, with full asymmetric power, the aircraft may be control-limited before reaching the protection system limit. Therefore, in extreme conditions, where low speed may be advantageous (GPWS , WINDSHEAR, etc.), reduce speed with care below VLS and respect the minimum control speed.*

Continued on the following page

ENG 1(2) SHUT DOWN (Cont'd)

Ident.: PRO-ABN-ENG-I-00017852.0005001 / 22 MAR 17

L12

STATUS

- **If ENG 1(2) FIRE pb-sw pushed:**
  AVOID ICING CONDITIONS
  - **IF SEVERE ICE ACCRETION:**
    MIN SPD.. VLS + 10/G DOT
    MANEUVER WITH CARE
    LDG DIST PROC.. APPLY
- **If REV unlocked:**
  MAX SPEED..300/0.78

APPR PROC

- **If REV unlocked:**
  - **4 doors not stowed (CFM) or reverser deployed (IAE/PW):**
    - **IF BUFFET:**
      FOR LDG..USE FLAP 1
      This line is replaced by "FOR LDG : USE FLAP 1" when CONF 1 is selected, as a reminder.
      APPR SPD..VREF + 55 KT
      RUD TRIM..5 DEG R(L)
      When committed to land, set 5 ° rudder trim towards live engine.
      A/THR..OFF
      GPWS FLAP MODE.. OFF
    - **WHEN LDG ASSURED:**
      L/G..DOWN
    - **AT 800 FT AGL:**
      TARGET SPD..VREF + 40 KT
      LDG DIST PROC..APPLY

INOP SYS

CAT 3 DUAL
ENG 1(2) BLEED
PACK 1(2)
MAIN GALLEY
GEN 1(2)
G ENG 1 PUMP or
Y ENG 2 PUMP
WING A. ICE (1)
AFT CRG HEAT
STEEP APPR

Continued on the following page

ENG 1(2) SHUT DOWN (Cont'd)

- **1, 2, or 3 doors not stowed (CFM), or reverse detected unlocked (IAE/PW):**
  - **IF BUFFET:**
    FOR LDG..USE FLAP 3
    This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.
    GPWS LDG FLAP 3.. ON
    APPR SPD....................................VREF + 10 KT
    LDG DIST PROC......................................APPLY
- **If WING A/ICE off and ENG 1(2) FIRE pb-sw not pressed:**
  - **IF PERF PERMITS:**
    X BLEED..OPEN
    If no obstacle constraint exists, open the XBLEED. To determine the single engine gross ceiling, decrease by1 200 ft the result provided by the QRH table (Refer to QRH/PER-L Ceilings (Paper Only)) or by the performance application of FlySmart with Airbus.
  - **For A321 aircraft:**
    ECON FLOW.. ON
    AFT CRG HOT AIR ✱ .... OFF
    The ECON FLOW must be selected ON, and the aft cargo heat ✱ must be selected OFF, due to precooler performance.
- **IF NO ENG 1(2) DAMAGE:**
  CONSIDER ENG 1(2) RELIGHT

CAT 3 SINGLE ONLY
ONE PACK ONLY IF WAI ON
See (2)

(1) *(if affected ENG FIRE pb-sw pushed)*

(2) *Note:* - *If available, the APU may be started and the APU GEN used*
- *If the ENG 1 FIRE pb-sw is pushed, APU bleed must not be used.*

Continued on the following page

ENG 1(2) SHUT DOWN (Cont'd)

If ENG 2 FIRE pb-sw is pushed, APU bleed may be used, provided the X BLEED rotary selector is set at SHUT.

- *After landing, the Fuel Used value of the engine, shutdown in flight, becomes incorrect.*

ENG 1(2) STALL

Applicable to: ALL

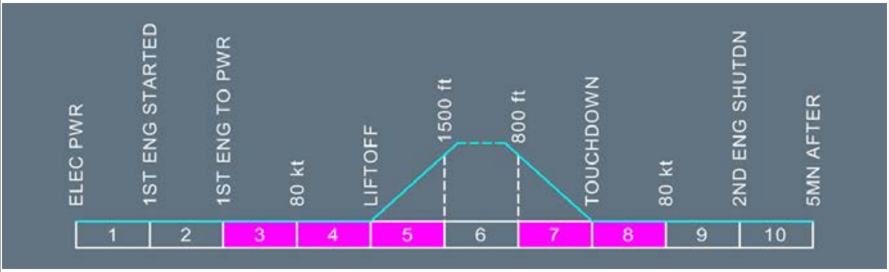
Ident.: PRO-ABN-ENG-Z-00017876.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when an engine stall is detected.

Flight Phase Inhibition:



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ENG 1(2) STALL (Cont'd)

Ident.: PRO-ABN-ENG-Z-00017749.0003001 / 17 MAR 17

L2 A stall may be indicated by varying degrees of abnormal engine noises, accompanied by flame from the engine exhaust (and possibly from the engine inlet in severe case), fluctuating performance parameters, sluggish or no thrust lever response, high EGT and/or a rapid EGT rise when thrust lever is advanced. Engine stalls must be reported for maintenance action.

L1 THR LEVER (AFFECTED ENGINE)....................IDLE
ENG MASTER (AFFECTED ENGINE)....................OFF

ASSOCIATED PROCEDURES

ENG 1(2) SHUT DOWN

- **If N2 is above IDLE:**

L2 This caution is not displayed on the ECAM.
Consequently, if the crew detects a stall, it must apply the following procedure:

L1
- **On ground:**
  THR LEVER (AFFECTED ENGINE)....................IDLE
  ENG MASTER (AFFECTED ENGINE)....................OFF
- **In flight:**
  THR LEVER (AFFECTED ENGINE)....................IDLE
  ENG PARAMETERS (AFFECTED ENGINE)....................CHECK
  - **If abnormal ENG parameters:**
    ENG MASTER (AFFECTED ENGINE)....................OFF

L12

ASSOCIATED PROCEDURES

ENG 1(2) SHUT DOWN

Apply the ENG SHUT DOWN procedure (Refer to PRO-ABN-ENG ENG 1(2) SHUT DOWN).

  - **If normal ENG parameters:**
    ENG ANTI ICE (AFFECTED ENGINE)....................ON
    WING ANTI ICE....................ON

L2 *Operation of ENG and WING ANTI ICE will increase the stall margin but EGT increases accordingly.*

L1 THR LEVER (AFFECTED ENGINE).................... SLOWLY MOVE FORWARD

Continued on the following page

ENG 1(2) STALL (Cont'd)

- **If stall recurs:**

  THR LEVER (AFFECTED ENGINE)..MOVE BACKWARD

  L2 *Reduce thrust and operate below the stall threshold where stall recurs.*

L1
- **If stall does not recur:**

  L2 CONTINUE NORMAL ENGINE OPERATION

Ident.: PRO-ABN-ENG-Z-00017748.0001001 / 21 MAR 16

STATUS

CONSIDER ENG 1(2) RELIGHT

ENG 1(2) START FAULT

Applicable to: ALL

Ident.: PRO-ABN-ENG-AD-00017995.0001001 / 13 MAY 16

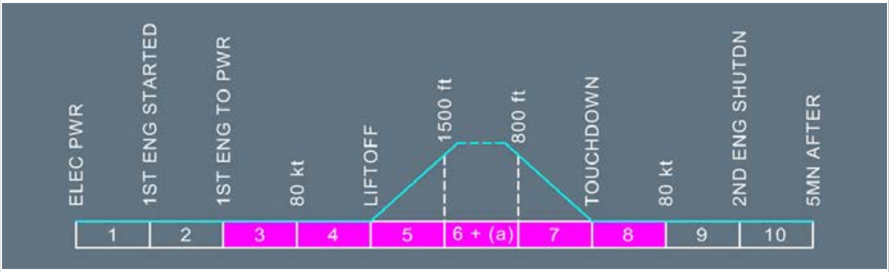
ANNUNCIATIONS

Triggering Conditions:

L2

This alert triggers when start fault due to:
- No light up, or
- Engine stall, or
- Engine overtemperature (above 725 °C), or
- Starter time exceeded, or
- Low start air pressure, or
- Thrust lever not at idle.

Flight Phase Inhibition:



Note: *Alert inhibited in the flight phase 6, only if it is due to thrust lever not at idle.*

Continued on the following page

ENG 1(2) START FAULT (Cont'd)

Ident.: PRO-ABN-ENG-AD-00012100.0005001 / 13 MAY 16

ENG 1(2) IGNITION FAULT:

L2 The engine does not start within the 18 s that follow the ignition start.

L1
- **In flight:**
  ENG MASTER (AFFECTED)....................OFF

  L2 *Wait 30 s before attempting a new start (to drain the engine).*

L1
- **On the ground (auto start) :**

  L2 If the engine does not start, the FADEC can attempt an additional engine restart. After any start attempt that is not successful, a dry crank phase automatically occurs. The ECAM displays the following messages:

  L1 AUTO CRANK IN PROGRESS
  NEW START IN PROGRESS
  - **When the final dry cranking process is finished:**
    ENG MASTER (AFFECTED)....................OFF

    L2 *Following starter cooldown, the pilot must decide whether to attempt auto or manual start, or to report the no start condition for appropriate maintenance action.*

L1
- **On the ground (manual start):**
  ENG MASTER (AFFECTED)....................OFF
  MAN START (AFFECTED)....................OFF
  MODE SEL....................CRANK
  MAN START (AFFECTED)....................ON

  L2 *<u>Note:</u> ECAM does not display the last two lines of the above procedure.*
  Dry crank the engine for 30 s. The start valve automatically reopens when N2 is below 20 %.
  After the starter cools, and for any subsequent attempt to start the engine, the flight crew must perform a manual start, or must report the "no start condition" to maintenance for appropriate action.

L1
ENG 1(2) STALL, ENG 1(2) EGT OVERLIMIT:

- **In flight:**
  ENG MASTER (AFFECTED)....................OFF

  L2 *Wait 30 s before attempting a new start (to drain the engine).*

Continued on the following page

ENG 1(2) START FAULT (Cont'd)

L1 ● **On ground (auto start):**

L2 If the FADEC detects a stall or a potential EGT overheat, the FADEC will reduce the fuel schedule in stages, if necessary, to achieve a normal condition. The following message will be displayed on the ECAM:

L1 NEW START IN PROGRESS

● **If restart not possible:**

L2 If normal conditions cannot be achieved, the FADEC shuts off fuel and turn off ignition. Then a dry crank phase automatically occurs. The ECAM displays the following message:

L1 AUTO CRANK IN PROGRESS
ENG MASTER (AFFECTED)....................OFF

L2
- *The fuel metering valve and starter air valve are automatically closed. Both igniters are turned off*
- *Setting ENG MASTER to OFF confirms automatic start abort*
- *In case of ENG STALL, consider making a XBLEED start, if pressure is low.*

L1 ● **On ground (manual start):**
ENG MASTER (AFFECTED)....................OFF
MAN START (AFFECTED)....................OFF
MODE SEL....................CRANK
MAN START (AFFECTED)....................ON

L2 Note: *ECAM does not display the last two lines of the above procedure.*
Dry crank the engine for 30 s. The start valve automatically reopens when N2 is below 20 %.
After the starter cools, and for any subsequent attempt to start the engine, the flight crew must perform a manual start, or must report the "no start condition" to maintenance for appropriate action.

L1 ■ **STARTER TIME EXCEEDED:**
MAN START (IF MANUAL START IS PERFORMED)....................OFF
ENG MASTER (AFFECTED)....................OFF

■ **LO START AIR PRESS:**
BLEED AIR SUPPLY.................... CHECK

Continued on the following page

ENG 1(2) START FAULT (Cont'd)

■ **THR LEVER NOT AT IDLE:**

THR LEVER...IDLE

ENG 1(2) START VALVE FAULT

Applicable to: ALL

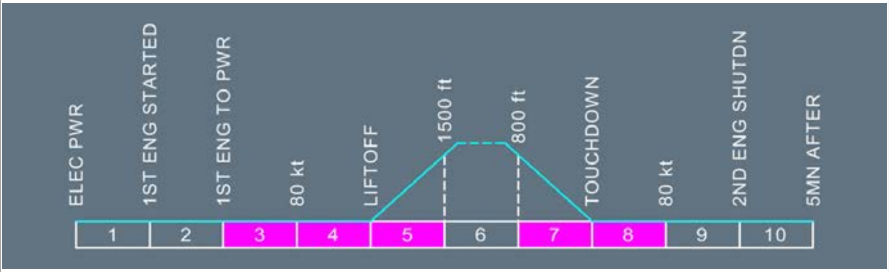
Ident.: PRO-ABN-ENG-D-00017932.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the start valve is stuck in closed or open position.

Flight Phase Inhibition:



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ENG 1(2) START VALVE FAULT (Cont'd)

Ident.: PRO-ABN-ENG-D-00018010.0002001 / 21 MAR 17

■ START VALVE NOT CLOSED

L2 Remove all bleed sources supplying the faulty start valve.

L1 APU BLEED (IF ENG 1 AFFECTED).. OFF
X BLEED.. SHUT

- **In flight:**
  ENG BLEED (AFFECTED SIDE).. OFF
- **On the ground:**
  MAN START (IF MAN START PERFORMED).. OFF
  ENG MASTER (AFFECTED SIDE).. OFF

L2 *On the ground, consider application of "START VALVE MANUAL OPERATION" procedure.*

L1

■ START VALVE NOT OPEN

- **If opposite engine running:**
  X BLEED.. OPEN
- **If APU AVAIL below FL 200:**
  APU BLEED.. ON
- **If UNSUCCESSFUL:**
  MAN START (IF MAN START PERFORMED).. OFF
  ENG MASTER (AFFECTED) (IF AUTO START PERFORMED).. OFF

L2 *MAN START procedure is useless since in both cases, the start valve is controlled by FADEC.*
On the ground, consider application of "START VALVE MANUAL OPERATION" procedure.

L1

- **EEC control of start valve failed (for IAE or PW 6000 engines):**
  - **On the ground:**
    START VALVE MAN ONLY

L2 *Start valve must be manually opened (Refer to PRO-NOR-SUP-ENG Engine Start Valve Manual Operation).*

L1

  - **In flight:**
    WINDMILL START ONLY.

L2 *Windmilling start only is available since EEC cannot control the start valve.*

ENG 1(2) THR LEVER ABV IDLE

Applicable to: ALL

Ident.: PRO-ABN-ENG-CW-00017922.0002001 / 21 MAR 16

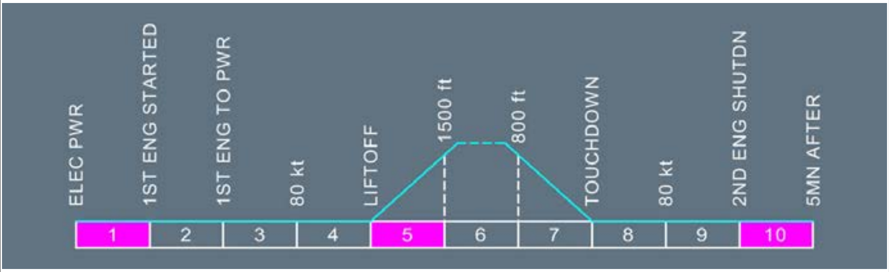
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- One thrust lever is above idle while the other thrust lever is in the reverse detent at landing.
- One thrust lever is above idle while the other thrust lever is at idle, at reverser deselection during landing roll.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-CW-00018748.0002001 / 21 MAR 16

L2 The repetitive "RETARD-RETARD" synthetic voice is triggered at landing.

L1 THR LEVER (AFFECTED ENGINE)..IDLE

ENG 1(2) THR LEVER DISAGREE

Applicable to: ALL

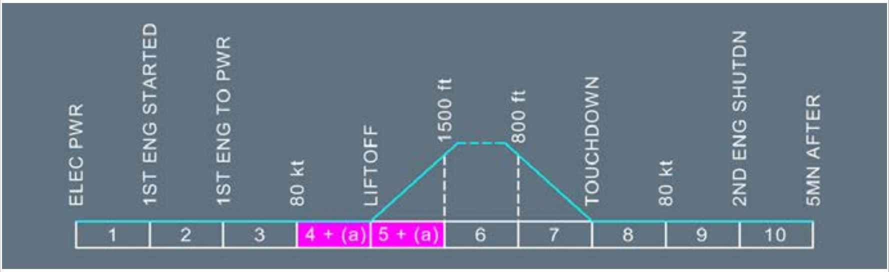
Ident.: PRO-ABN-ENG-L-00017999.0004001 / 06 SEP 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when a discrepancy between both resolvers of a thrust lever is detected.

Flight Phase Inhibition:



Note: *(a) Alert not inhibited in the flight phases 4 and 5, if the FADEC automatically selects IDLE thrust.*

Continued on the following page

ENG 1(2) THR LEVER DISAGREE (Cont'd)

Ident.: PRO-ABN-ENG-L-00012146.0017001 / 02 MAY 17

L2 Both Thrust Lever Angle (TLA) sensors not in agreement on one engine.

L1 LAND ASAP

- **On ground (if both TLA not at TOGA or FLX/MCT or if only one TLA is at TOGA or FLX/MCT and the other is below IDLE):**

  ENG (AFFECTED) IDLE POWER ONLY.

L2 *In that situation, the FADEC automatically selects IDLE.*

L1 THR LEVER (AFFECTED).. IDLE

- **During take-off (if both TLA are above IDLE):**

  ENG (AFFECTED) TO, FLX, OR DRT TO

L2 *If both TLA are above IDLE, the FADEC automatically selects TO , FLX TO, or DRT TO thrust until thrust reduction, after which the maximum available thrust is CLB.*

L1
- **In cruise (with slats retracted):**

  AVAIL MAX POWER : CLB

L2 *In flight, if the failure occurs while the thrust lever is between idle and MCT , and if the slats are not extended, (or when MN > 0.55, if the onside EIU is failed) the FADEC selects the larger TLA power limited to CLB.*

L1 A/THR (IF ENGAGED) ....KEEP ON

A/THR (IF NOT ENGAGED AND IF SLATS ARE NOT EXTENDED) .... ON

L2 *With A/THR engaged, thrust is automatically managed between IDLE and higher TLA position.*

L1
- **In approach (with slats extended):**

  ENG (AFFECTED) AT IDLE (WHEN SLATS ARE EXTENDED FOR APPROACH)..

L2 *If TLA at, or below, MCT and if the slats are extended for approach, (or when MN < 0.47, if the onside EIU is failed).*

L1 THR LEVER (AFFECTED).. IDLE

Continued on the following page

ENG 1(2) THR LEVER DISAGREE (Cont'd)

Ident.: PRO-ABN-ENG-L-00018067.0013001 / 21 MAR 16

L12

STATUS

- **If TLA at, or below, MCT**
  - **WHEN SLATS OUT:**

    (Displayed, if slats not extended), or
  - **WHEN MN < 0.47:**

    (Displayed, if the onside EIU is failed)

    ENG (AFFECTED) AT IDLE

    For any case of thrust lever disagree (TO, FLEX, or between Idle and MCT), the FADEC will command idle thrust for the approach when slats are extended (or when the Mach number is less than 0.47, if associated EIU is failed). It is independent of the autothrust condition. The affected engine's thrust remains definitively at idle, even for go-around.

ENG (affected) AVAIL MAX PWR: CLB
ON GND ENG (affected) MAX PWR: IDLE.

INOP SYS

ENG 1(2) THR

ENG 1(2) THR LEVER FAULT

Applicable to: ALL

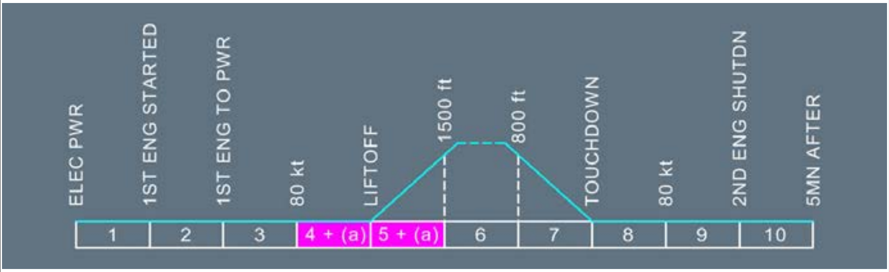
Ident.: PRO-ABN-ENG-M-00018000.0003001 / 01 JUN 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both resolvers on one thrust lever are failed.

Flight Phase Inhibition:



Note: (a) Alert not inhibited in flight phases 4 and 5 if the FADEC automatically selects IDLE thrust.

Continued on the following page

ENG 1(2) THR LEVER FAULT (Cont'd)

Ident.: PRO-ABN-ENG-M-00018069.0009001 / 21 MAR 16

LAND ASAP

- **On the ground:**

  ENG (AFFECTED) IDLE POWER ONLY.

  L2 *Idle power is automatically selected by FADEC.*
  If associated thrust reverser is already deployed, FADEC commands restow.

  L1 THR LEVER (AFFECTED).. IDLE

- **In flight:**

  L2 If the selected thrust lever position at the time of fault detection is:
  TO or FLEX: FADEC freezes TO or FLEX TO thrust until slat retraction. At slat retraction it selects CLB thrust.
  Between IDLE and MCT: in manual thrust setting mode, engine rating freezes at CLB , or IDLE with slats extended (or MN < 0.47 if the FADEC no longer receives the slats position due to EIU failure). It is possible to activate autothrust. If selected, autothrust mode manages thrust between idle and CLB.

  L1 ENG (AFFECTED) AT IDLE

  L2 *For any case of thrust lever fault (TO, FLEX or between IDLE and MCT) the FADEC will command idle thrust for the approach when slats are extended (or when MN < 0.47 if associated EIU is failed). It is independant of the autothrust condition. Thrust of affected engine remains definitively at idle even for go around.*

  L1 THR LEVER (AFFECTED) .... IDLE

  L2 *When slats are extended or MN < 0.47, if on side EIU is failed.*

  L1
  - **A/THR engaged:**

    A/THR.. KEEP ON

  - **A/THR not engaged:**

    ENG (AFFECTED) HI PWR IN MAN THR.

    L2 *Inhibited when the FADEC commands the affected engine at IDLE.*

    L1
    - **BEFORE SLATS IN:**

      A/THR .... ON

      HI PWR ONLY

      L2 *If thrust lever angle failed in TO or flex position.*

Continued on the following page

ENG 1(2) THR LEVER FAULT (Cont'd)

Ident.: PRO-ABN-ENG-M-00012152.0002001 / 14 NOV 11

L12

STATUS

- **WHEN SLATS OUT:**

  (Displayed if slats not extended) or,

- **WHEN MN < 0.47:**

  (Displayed if the onside EIU is failed).

ENG 1(2) AT IDLE

INOP SYS

REVERSER 1(2)
ENG 1(2) THR

ENG THR LEVERS NOT SET

Applicable to: ALL

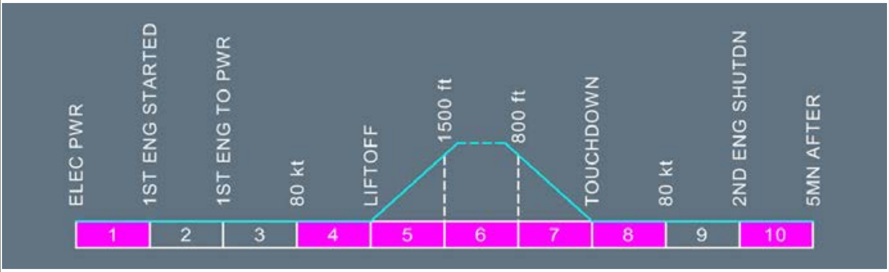
Ident.: PRO-ABN-ENG-DD-00017892.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the levers position does not correspond to TO power mode.

Flight Phase Inhibition:



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ENG THR LEVERS NOT SET (Cont'd)

Ident.: PRO-ABN-ENG-DD-00017863.0003001 / 21 MAR 16

L2 At least one FADEC engaged a takeoff thrust mode that is not in accordance with the position of the thrust levers.

Note: 1. *The takeoff thrust mode is engaged when the flight crew sets the thrust levers above the CL position.*
2. *The flex takeoff thrust mode is armed only if the flight crew entered a FLEX TO TEMP on the MCDU that is above the OAT.*

L1
- **If the flex mode is not armed, and the flight crew sets the thrust levers below or at the MCT/FLX position:**
  THR LEVERS.. TO/GA
- **If the flex mode is armed, and the flight crew sets the thrust levers below the MCT/FLX position:**
  THR LEVERS .... MCT/FLX

ENG THRUST LOCKED

Applicable to: ALL

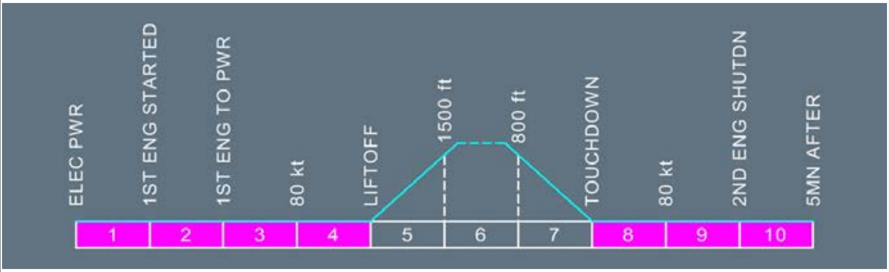
Ident.: PRO-ABN-ENG-DE-00017888.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when thrust levers are not moved within 5 s, following an unvoluntary disconnection of the A/THR (or disconnection through the FCU pb).

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-DE-00017865.0002001 / 21 MAR 16

THR LEVERS..MOVE

ENG TYPE DISAGREE

Applicable to: ALL

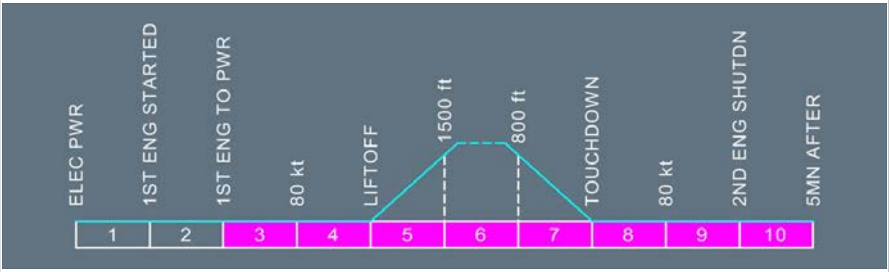
Ident.: PRO-ABN-ENG-DF-00017881.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when a rating discrepancy between two engines is detected.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-DF-00017868.0001001 / 21 MAR 16

Crew awareness.

ENG VIB SYS FAULT

Applicable to: ALL

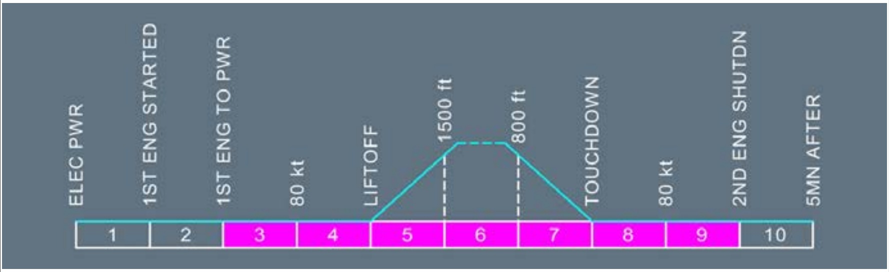
Ident.: PRO-ABN-ENG-DG-00017879.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the vibration detection system is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-ENG-DG-00012074.0001001 / 25 FEB 14

Crew awareness.

[QRH] LANDING WITH SLATS OR FLAPS JAMMED

Ident.: PRO-ABN-F_CTL-00010683.0001001 / 17 MAR 17
Applicable to: ALL

LDG DIST PROC...APPLY

Determine flap lever position for landing

- **Repeat the following until landing configuration is reached:**

  SPD SEL...VFE NEXT - 5 kt

  AT VFE NEXT: SELECT FLAPS LEVER ONE STEP DOWN

  <u>Note:</u>
  - *OVERSPEED alert, and VLS displayed on the PFD, are computed according to the actual flaps/slats position*
  - *VFE and VFE NEXT are displayed on the PFD according to the FLAPS lever position. If not displayed, use the placard speeds*
  - *If VLS is greater than VFE NEXT (overweight landing case), the FLAPS lever can be set in the required next position, while the speed is reduced to follow VLS reduction as surfaces extend. The VFE warning threshold should not be triggered. In this case, disconnect the A/THR . A/THR can be re-engaged when the landing configuration is established.*

- **When in landing CONF and in final approach:**

  DECELERATE TO CALCULATED VAPP

  AP BELOW 500 ft AGL : DO NOT USE

- **For Go-around:**

<table>
<tr><th colspan="6">MAX SPEED</th></tr>
<tr><th>Flaps
Slats</th><th>F = 0</th><th>0 < F ≤ 1</th><th>1 < F ≤ 2</th><th>2 < F ≤ 3</th><th>F > 3</th></tr>
<tr><td>S = 0</td><td>NO LIMITATION</td><td rowspan="3">215 kt</td><td rowspan="3">200 kt</td><td rowspan="3">185 kt</td><td rowspan="2">177 kt
(Not allowed)</td></tr>
<tr><td>0 < S < 1</td><td rowspan="2">230 kt</td></tr>
<tr><td>S = 1</td><td rowspan="2">177 kt</td></tr>
<tr><td>1 < S ≤ 3</td><td colspan="2">200 kt</td><td>200 kt</td><td>185 kt</td></tr>
<tr><td>S > 3</td><td colspan="2">177 kt</td><td>177 kt</td><td>177 kt</td><td>177 kt</td></tr>
</table>

- **If SLATS FAULT:**
  - **For circuit:**

    MAINTAIN SLATS/FLAPS CONFIGURATION

    Recommended speed: MAX SPEED - 10 kt

Continued on the following page

[QRH] LANDING WITH SLATS OR FLAPS JAMMED (Cont'd)

- **For diversion:**

  SELECT CLEAN CONFIGURATION

  Recommended speed for flaps retraction: between MAX SPEED - 10 kt and MAX SPEED.

  Recommended diversion speed: MAX SPEED - 10 kt.

  INCREASED FUEL CONSUMPTION

■ **If FLAPS FAULT:**

- **For circuit:**

  MAINTAIN SLATS/FLAPS CONFIGURATION

  Recommended speed: MAX SPEED - 10 kt

- **For diversion:**

  ■ **If FLAPS jammed at 0:**

  SELECT CLEAN CONFIGURATION

  Recommended speed for slats retraction: between MAX SPEED - 10 kt and MAX SPEED

  USE NORMAL OPERATING SPEEDS

  ■ **If FLAPS jammed > 0:**

  MAINTAIN SLAT/FLAP CONFIGURATION

  Recommended speed for diversion: MAX SPEED - 10 kt

  Note: *In case of a go-around with CONF FULL selected, the L/G NOT DOWN warning is triggered at landing gear retraction.*

  INCREASED FUEL CONSUMPTION

CAUTION	For flight with SLATS or FLAPS extended, fuel consumption is increased. Refer to the fuel flow indication. As a guideline, determine the fuel consumption in clean configuration at the same altitude without airspeed limitation (e.g. From ALTERNATE FLIGHT PLANNING tables) and multiply this result by the applicable Fuel Penalty Factor provided in the QRH, to obtain the fuel penalty required to reach the destination in the current configuration. *Refer to QRH/OPS Fuel Penalty Factors/ECAM Alert Table*.

[QRH] RUDDER JAM

Ident.: PRO-ABN-F_CTL-00011807.0001001 / 17 MAR 17
Applicable to: ALL

L2 Rudder jamming may be detected by undue (and adverse) pedal movement during rolling maneuvers.
This is because the yaw damper orders can no longer be sent to the rudder, but are fed back to the pedals.
Use F/CTL SD page for a visual check of the rudder position.

L1
- **For approach:**

  AVOID LANDING WITH CROSSWIND FROM THE SIDE WHERE THE RUDDER IS DEFLECTED

  MAX CROSSWIND FOR LDG: 15 kt
  AUTO BRK....................DO NOT USE

  L2 *Do not use the autobrake, so as not to delay the application of differential braking at landing roll.*

  L1 FOR LANDING....................USE NORMAL CONF
  SPEED AND TRAJECTORY....................STABILIZE ASAP
  LDG DIST PROC....................APPLY

- **For landing:**

  DIFFERENTIAL BRAKING....................USE ASAP

  REVERSER: SYMMETRIC USE ONLY

  L2 *Use nosewheel steering handle below 70 kt.*

[QRH] STABILIZER JAM

Ident.: PRO-ABN-F_CTL-00011806.0001001 / 17 MAR 17
Applicable to: ALL

L2 The ELACs may not detect a stabilizer jam when the pitch trim wheel is jammed.
The flight control normal law remains active in this case and there is no ECAM warning.
Apply the following procedure.

L1 AP.. OFF
MAN PITCH TRIM.. CHECK

L2 *The pitch trim wheel may not be fully jammed, the force needed may be higher than pre-takeoff manual setting.*

L1 ● **If MAN PITCH TRIM available:**

TRIM FOR NEUTRAL ELEV

L2 *If manual pitch trim is available, trim to maintain the elevator at the zero position (indications on F/CTL SD page).*

L1 ● **If MAN PITCH TRIM not available:**

FOR LANDING: USE FLAP 3

L2 *Do not select configuration full so as not to degrade the handling qualities.*

L1 GPWS LDG FLAP 3..ON

CAT 1 ONLY

ACTIVE CONTROL LAW

Ident.: PRO-ABN-F_CTL-00018549.0001001 / 21 MAR 16
Applicable to: ALL

ACTIVE LAW ▸	PITCH		ROLL	YAW
SYS FAILED▾	**LAW**	**PROTEC**		
ELAC 1 or 2 or SEC 1 or 2	NORM	NORM	NORM	NORM
ELAC 1 and 2 or both ailerons	ALTN	REDUCED	DIRECT	ALTN
2 SEC	NORM	NORM	NORM	NORM
3 SEC	ALTN	REDUCED	DIRECT	ALTN
2 FAC	ALTN	REDUCED	DIRECT	MECH
Yaw damper	ALTN	REDUCED	DIRECT	MECH
2 SFCC (slat channel)	ALTN	NO	DIRECT	ALTN
2 ADR or 2 IR (2nd self detected)	ALTN	REDUCED	DIRECT	ALTN
2 ADR (2nd not self detec.)	ALTN	NO ----- REDUCED (1)	DIRECT	ALTN
2 IR (2nd not self detec.)	DIRECT ----- ALTN (2)	NO ----- REDUCED (2)	DIRECT	MECH ----- ALTN (2)
3 ADR	ALTN	NO	DIRECT	MECH
3 IR	DIRECT	NO	DIRECT	MECH
2 RADIO ALT	NORM ----- DIRECT (4)	NORM ----- NO (4)	NORM ----- DIRECT (4)	NORM ----- MECH (4)
SPOILER 4 or 5 or (4 and 5)	NORM	NORM	NORM	NORM
All SPOILERS	ALTN	REDUCED	DIRECT	ALTN
1 AIL SERVO or 1 AILERON	NORM	NORM	NORM	NORM
1 ELEV SERVO	NORM	NORM	NORM	NORM
1 ELEVATOR	ALTN	REDUCED	DIRECT	ALTN
THS (jammed) (5)	NORM	NORM	NORM	NORM
	ALTN	REDUCED	DIRECT	ALTN
HYD G or Y or B	NORM	NORM	NORM	NORM
HYD G + Y	ALTN	REDUCED	DIRECT	MECH
HYD G + B	ALTN	NO	DIRECT	ALTN
HYD Y + B	NORM	NORM	NORM	NORM
on BATTERIES	ALTN	REDUCED	DIRECT	MECH
on EMER GEN	ALTN	REDUCED	DIRECT	MECH

Continued on the following page

ACTIVE CONTROL LAW (Cont'd)

ACTIVE LAW ▸	PITCH		ROLL	YAW
SYS FAILED▾	LAW	PROTEC		
				– – – – – ALTN (3)

(1) *In case of AOA disagree*

(2) *After the faulty IR is selected OFF*

(3) *After FAC 1 is reset*

(4) *When landing gear down (or CONF 2, if both LGCIUs faulty)*

(5) *Depending where the failure is, control law may revert to alternate law*

ELEVATORS AND STABILIZER CONTROL AFTER FAILURE

Ident.: PRO-ABN-F_CTL-00018591.0001001 / 09 FEB 16
Applicable to: ALL

	LEFT ELEVATOR		THS	RIGHT ELEVATOR	
	BLUE	GREEN	GREEN AND YELLOW	YELLOW	BLUE
NORM OPERATION		ELAC 2	ELAC 2	ELAC 2	
SINGLE FAILURE					
ELAC 2	ELAC 1		ELAC 1		ELAC 1
ELAC 1		ELAC 2	ELAC 2	ELAC 2	
SEC 2		ELAC 2	ELAC 2	ELAC 2	
SEC 1		ELAC 2	ELAC 2	ELAC 2	
G	ELAC 1		ELAC 1		ELAC 1
Y	ELAC 1		ELAC 1		ELAC 1
B		ELAC 2	ELAC 2	ELAC 2	
DOUBLE FAILURE					
ELAC 2 + ELAC 1		SEC 2	SEC 2	SEC 2	
+ SEC 2	ELAC 1		ELAC 1		ELAC 1
+ SEC 1	ELAC 1		ELAC 1		ELAC 1
+ G	ELAC 1		ELAC 1		ELAC 1
+ Y	ELAC 1		ELAC 1		ELAC 1
+ B		SEC 2	SEC 2	SEC 2	
ELAC 1 + SEC 2		ELAC 2	ELAC 2	ELAC 2	
+ SEC 1		ELAC 2	ELAC 2	ELAC 2	
+ G	SEC 1		SEC 2	SEC 2	
+ Y		SEC 2	SEC 2		SEC 1
+ B		ELAC 2	ELAC 2	ELAC 2	
SEC 2 + SEC 1		ELAC 2	ELAC 2	ELAC 2	
+ G	ELAC 1		ELAC 1		ELAC 1
+ Y	ELAC 1		ELAC 1		ELAC 1
+ B		ELAC 2	ELAC 2	ELAC 2	
SEC 1 + G	ELAC 1		ELAC 1		ELAC 1
+ Y	ELAC 1		ELAC 1		ELAC 1
+ B		ELAC 2	ELAC 2	ELAC 2	
G + Y	ELAC 1		INOP		ELAC 1
B + G	Damped		ELAC 2	ELAC 2	
B + Y		ELAC 2	ELAC 2	Damped	
TRIPLE FAILURE					
ELAC 2					
ELAC 1 + SEC 2	SEC 1		SEC 1		SEC 1
+ SEC 1		SEC 2	SEC 2	SEC 2	
+ G	SEC 1		SEC 2	SEC 2	

Continued on the following page

ELEVATORS AND STABILIZER CONTROL AFTER FAILURE (Cont'd)

+ Y		SEC 2	SEC 2		SEC 1
+ B		SEC 2	SEC 2	SEC 2	
SEC 2 + SEC 1	ELAC 1		ELAC 1		ELAC 1
+ G	ELAC 1		ELAC 1		ELAC 1
+ Y	ELAC 1		ELAC 1		ELAC 1
+ B	Centered		Mechanical	Centered	
SEC 1 + G	ELAC 1		ELAC 1		ELAC 1
+ Y	ELAC 1		ELAC 1		ELAC 1
+ B		SEC 2	SEC 2	SEC 2	
G + Y	ELAC 1		INOP		ELAC 1
B + G	Damped		SEC 2	SEC 2	
B + Y		SEC 2	SEC 2	Damped	
ELAC 1					
SEC 2 + SEC 1		ELAC 2	ELAC 2	ELAC 2	
+ G	SEC 1		SEC 1		SEC 1
+ Y	SEC 1		SEC 1		SEC 1
+ B		ELAC 2	ELAC 2	ELAC 2	
SEC 1 + G	Damped		SEC 2	SEC 2	
+ Y		SEC 2	SEC 2	Damped	
+ B		ELAC 2	ELAC 2	ELAC 2	
G + Y	SEC 1		INOP		SEC 1
B + G	Damped		ELAC 2	ELAC 2	
B + Y		ELAC 2	ELAC 2	Damped	
SEC 2					
SEC 1 + G	ELAC 1		ELAC 1		ELAC 1
+ Y	ELAC 1		ELAC 1		ELAC 1
+ B		ELAC 2	ELAC 2	ELAC 2	
G + Y	ELAC 1		INOP		ELAC 1
B + G	Damped		ELAC 2	ELAC 2	
B + Y		ELAC 2	ELAC 2	Damped	
SEC 1					
G + Y	ELAC 1		INOP		ELAC 1
B + G	Damped		ELAC 2	ELAC 2	
B + Y		ELAC 2	ELAC 2	Damped	

F/CTL AIL SERVO FAULT

Applicable to: ALL

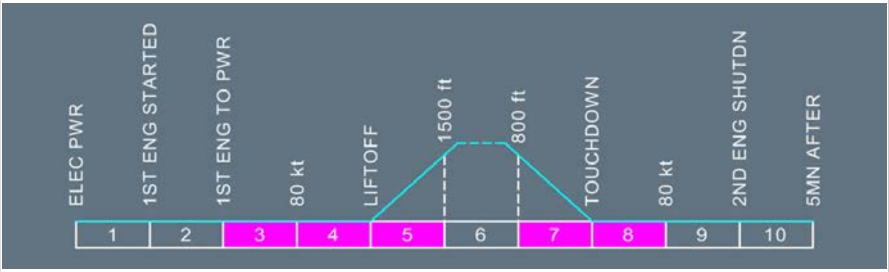
Ident.: PRO-ABN-F_CTL-AF-00016986.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a loss of one servojack on one aileron, or loss of one or both ELAC 1 rudder pedal transducers.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-AF-00018412.0001001 / 21 MAR 16

Crew awareness.

F/CTL ALTN LAW

Applicable to: ALL

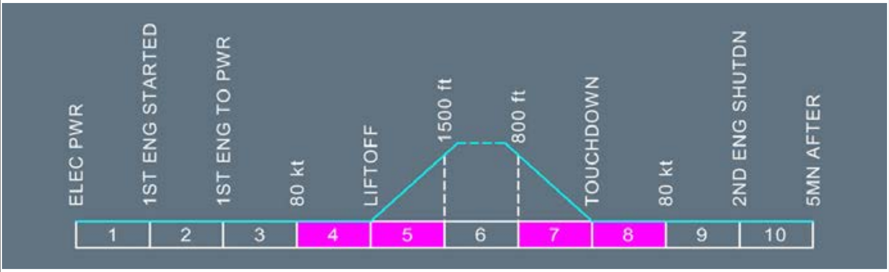
Ident.: PRO-ABN-F_CTL-K-00016965.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when alternate laws are active.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-K-00018413.0001001 / 22 MAR 17

L2 *Refer to DSC-27-20-20 General* for flight characteristics.
With autopilot engaged the FMGC (AP mode) controls the aircraft.

L1 (PROT LOST)

L2 *All protections, except maneuver protections, are lost. Depending on the failure, static stability may be introduced.*

L1 Note: *In case of GPWS (EGPWS) alerts, since protections are lost, respect stall warnings when applying the GPWS (EGPWS) procedure.*

MAX SPEED...320 KT

L2 *(320/.77 if dual hydraulic system low pressure). Speed is limited to 320 /.82 or 320/.77 for dual hydraulic failure, due to the loss of high-speed protection.*

L1 SPD BRK (IF L OR R ELEVATOR FAULT) ....DO NOT USE

Continued on the following page

F/CTL ALTN LAW (Cont'd)

Ident.: PRO-ABN-F_CTL-K-00018414.0003001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT

(320/.77, if dual hydraulic system low pressure).

SPD BRK (IF L OR R ELEVATOR FAULT)....... DO NOT USE

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

GPWS LDG FLAP 3 ....ON

APPR SPD .... VREF+10

LDG DIST PROC .... APPLY

- **If no AP engaged:**

  WHEN L/G DN: DIRECT LAW

  At landing gear extension, control reverts to direct law in pitch, as well as in roll. Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW.

- **If AP engaged:**

  WHEN L/G DN AND AP OFF: DIRECT LAW

If the autopilot is disengaged:
- *Before landing gear extension, flight control alternate law is active.*
- *After landing gear extension, flight control direct law is active. Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW.*

ALTN LAW: PROT LOST

INOP SYS

F/CTL PROT

STEEP APPR

F/CTL DIRECT LAW

Applicable to: ALL

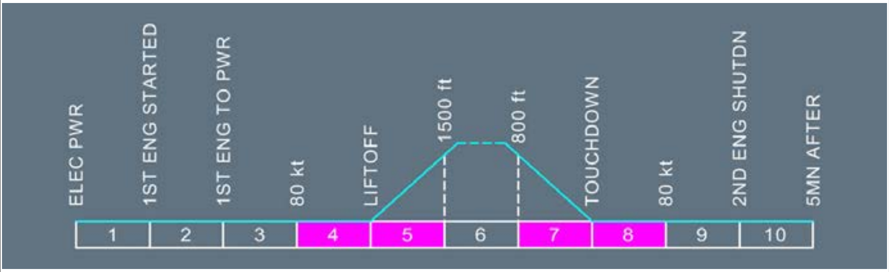
Ident.: PRO-ABN-F_CTL-J-00016964.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when direct law is active.

Flight Phase Inhibition:



Continued on the following page

F/CTL DIRECT LAW (Cont'd)

Ident.: PRO-ABN-F_CTL-J-00018420.0001001 / 22 MAR 17

L2 PFD displays « USE MAN PITCH TRIM » in amber. *Refer to DSC-27-20-10-70 Aircraft Trimming*

L1 (PROT LOST)

L2 Note: *In case of GPWS (EGPWS) alerts, since protections are lost, respect stall warning when applying the GPWS (EGPWS) procedure.*

L1 MAX SPEED....................320/.77

L2 *Speed is limited, due to the loss of high-speed protection. Do not exceed M 0.77, so as not to degrade handling qualities.*

L1 MAN PITCH TRIM (EXCEPT IF HYD Y + G SYS LO PR)....................USE

L2 *Automatic trim is inoperative in direct law.*

L1 MANEUVER WITH CARE

L2 *Use small control inputs at high speed, since in direct law the controls are powerful. Use of manual thrust is recommended. Avoid large thrust changes.*

L1 USE SPD BRK WITH CARE

L2 *At high Mach numbers, use speed brakes with care to avoid too strong nose up changes.*

Continued on the following page

F/CTL DIRECT LAW (Cont'd)

Ident.: PRO-ABN-F_CTL-J-00018422.0003001 / 22 MAR 17

L12

STATUS

MAX SPEED... 320/.77
MANEUVER WITH CARE
USE SPD BRK WITH CARE

APPR PROC

FOR LDG..USE FLAPS 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

GPWS LDG FLAP 3...ON
MAN PITCH TRIM...USE
APPR SPD.. VREF+10
LDG DIST PROC.. APPLY

DIRECT LAW

INOP SYS

F/CTL PROT
STEEP APPR

F/CTL ELAC 1(2) FAULT
(ONE COMPUTER FAILED)

Applicable to: ALL

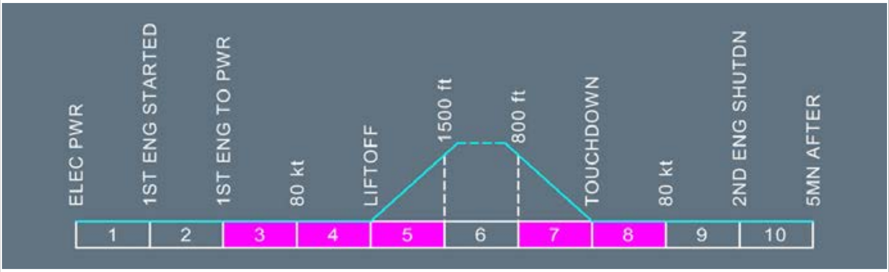
Ident.: PRO-ABN-F_CTL-F-00016960.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a failure of ELAC (FAULT lt on ELAC pb), or when one sidestick transducer is faulty.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-F-00018425.0006001 / 21 MAR 16

ELAC (AFFECTED)....................OFF THEN ON

L2 *Note:* 1. *In some sidestick transducer failure cases, ELAC 1(2) FAULT is triggered without the procedure, and FAULT lt on associated pb does not come on.*
2. *If the ELAC 1 computer is reset on ground the pitch trim returns to the ground setting position (0 °).*

L1 ● **IF UNSUCCESSFUL:**
ELAC (AFFECTED)....................OFF

L2 *Functions are performed by other ELAC.*

L1 FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

Continued on the following page

F/CTL ELAC 1(2) FAULT (Cont'd)
(ONE COMPUTER FAILED)

Ident.: PRO-ABN-F_CTL-F-00018426.0003001 / 21 MAR 17

L12

STATUS

CAT 3 SINGLE ONLY
FUEL CONSUMPT INCRSD
See [(1)]
FMS PRED UNRELIABLE
See [(2)]

INOP SYS

ELAC 1(2)
CAT 3 DUAL

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS chapter in order to find the applicable Fuel Penalty Factor.*

F/CTL ELAC 1(2) FAULT
(BOTH COMPUTERS FAILED)

Applicable to: ALL

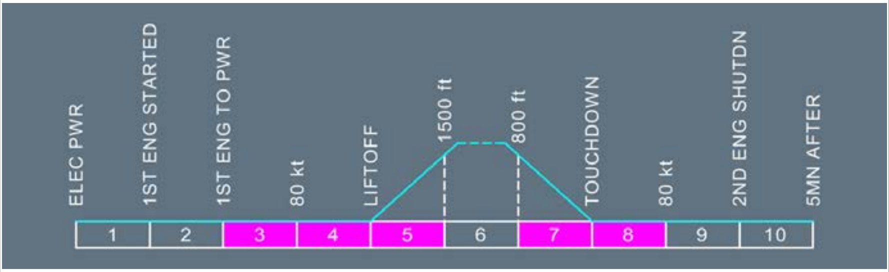
Ident.: PRO-ABN-F_CTL-G-00018899.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a failure of ELAC (FAULT lt on ELAC pb), or when one sidestick transducer is faulty.

Flight Phase Inhibition:



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F/CTL ELAC 1(2) FAULT (Cont'd)
(BOTH COMPUTERS FAILED)

Ident.: PRO-ABN-F_CTL-G-00018433.0003001 / 22 MAR 17

ELAC 1 .... OFF THEN ON

L2 *Note:* *If the ELAC 1 computer is reset on ground, the pitch trim returns to the ground setting position (0 °).*

L1 ELAC 2 .... OFF THEN ON

- **If both ELAC FAULT remain:**
  ELAC 1 .... OFF
  ELAC 2 .... OFF

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)

L2 Pitch and roll normal laws are lost: *Refer to PRO-ABN-F_CTL F/CTL ALTN LAW*. THS motor 1 and both ailerons are lost.

L1 MAX SPEED .... 320 KT

FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

Continued on the following page

F/CTL ELAC 1(2) FAULT (Cont'd)
(BOTH COMPUTERS FAILED)

Ident.: PRO-ABN-F_CTL-G-00018434.0004001 / 22 MAR 17

L12

STATUS

MAX SPEED... 320 KT

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

GPWS LDG FLAP 3..ON

Will be displayed when flaps in CONF 3

APPR SPD...VREF+10 KT
LDG DIST PROC.. APPLY

ALTN LAW: PROT LOST
WHEN L/G DOWN: DIRECT LAW

See (1)

FUEL CONSUMPT INCRSD

See (2)

FMS PRED UNRELIABLE

See (3)

INOP SYS

F/CTL PROT
L+R AIL
ELAC 1+2
AP 1+2
CAT 2
STEEP APPR

(1) *At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).*

(2) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(3) *Disregard FMS fuel predictions and refer to QRH/OPS chapter in order to find the applicable Fuel Penalty Factor.*

F/CTL ELAC 1(2) PITCH FAULT

Applicable to: ALL

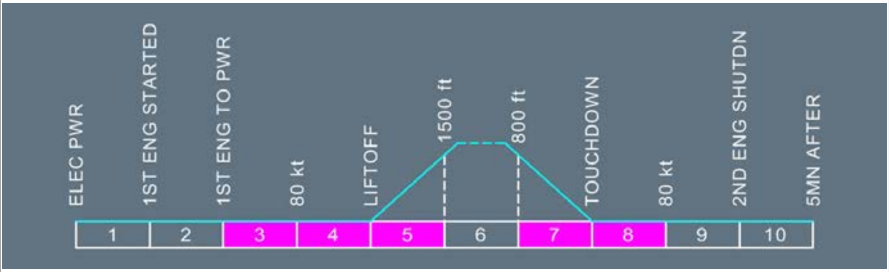
Ident.: PRO-ABN-F_CTL-H-00016977.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a failure of pitch channel in ELAC 1(2).

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-H-00018447.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-F_CTL-H-00018448.0001001 / 21 MAR 16

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	ELAC PITCH (1) CAT 3 DUAL

(1) *(If ELAC 1 and 2 PITCH FAULT)*

F/CTL ELEV SERVO FAULT

Applicable to: ALL

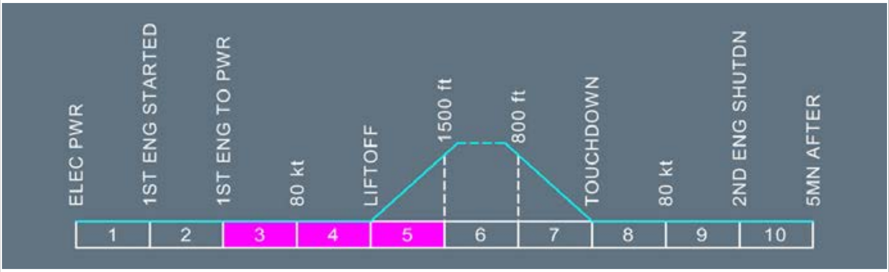
Ident.: PRO-ABN-F_CTL-P-00016979.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a loss of one servojack on one elevator.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-P-00018449.0001001 / 21 MAR 16

Crew awareness.

CAUTION	Do not use speedbrakes above 350 kt/M 0.82 (VMO /MMO).

Ident.: PRO-ABN-F_CTL-P-00018450.0001001 / 21 MAR 16

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	CAT 3 DUAL

F/CTL FCDC 1(2) FAULT

Applicable to: ALL

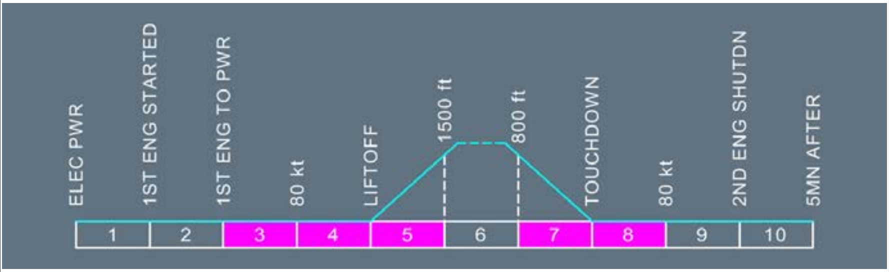
Ident.: PRO-ABN-F_CTL-L-00016981.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a failure of one FCDC.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-L-00011777.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-F_CTL-L-00011778.0001001 / 18 AUG 10

STATUS

INOP SYS

FCDC 1(2)

F/CTL FCDC 1+2 FAULT

Applicable to: ALL

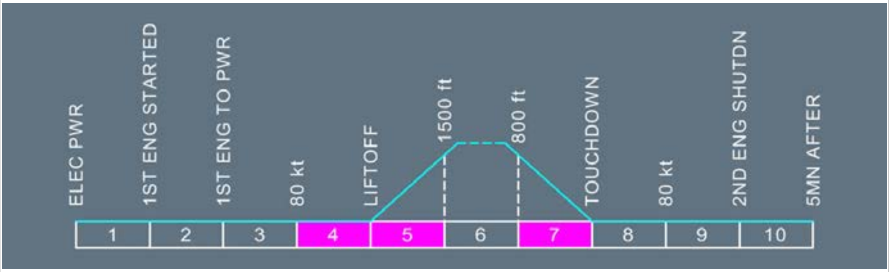
Ident.: PRO-ABN-F_CTL-M-00016963.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a failure of both FCDCs.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-M-00011779.0001001 / 18 AUG 10

MONITOR F/CTL OVHD PNL

L2 *F/CTL data on ECAM is lost.*
Control laws remains normal.

Note: *When both FCDCs fails:*
- *F/CTL warning are not available on the ECAM.*
- *Stall warning may be triggered as in alternate or direct law (it may occur at speeds greater than Vα max).*
- *Bank and pitch limits are no longer displayed on the PFD.*
- *Vα prot, Vα max are lost on the PFD.*
- *Vsw, displayed on the PFD, corresponds to the stall warning of the alternate or direct law.*

Continued on the following page

F/CTL FCDC 1+2 FAULT (Cont'd)

Ident.: PRO-ABN-F_CTL-M-00018451.0001001 / 21 MAR 16

STATUS

	INOP SYS
F/CTL INDICATIONS LOST	FCDC 1 + 2 STEEP APPR

F/CTL FLAP ATTACH SENSOR

Applicable to: ALL

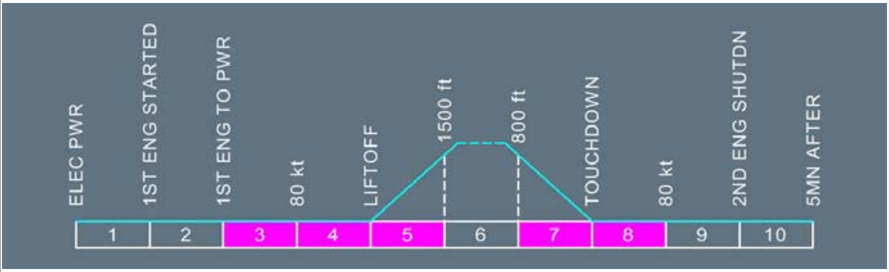
Ident.: PRO-ABN-F_CTL-AH-00016989.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is failure of flap attachment's failure detection sensor.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-AH-00018453.0001001 / 21 MAR 16

Crew awareness.

F/CTL FLAPS FAULT/LOCKED

Applicable to: ALL

Ident.: PRO-ABN-F_CTL-A-00011744.0002001 / 21 MAR 16

- **If flaps locked:**
  WING TIP BRK ON OR ALIGNMENT FAULT

MAX SPEED........................ *REFER TO PRO-ABN-F_CTL F/CTL FLAPS/SLATS FAULT/LOCKED*

L2 *Limit speed to the VFE corresponding to the next flap position*

L1
- **If flaps not locked:**
  FLAPS LEVER..RECYCLE

L2 *Return to the previous selection, then back to the desired position.*

L1
- **If flaps extended:**
  FUEL CONSUMPT INCRSD
  FMS PRED UNRELIABLE

L2
- **If unsuccessful:**

  Refer to PRO-ABN-F_CTL [QRH] Landing with Slats or Flaps Jammed .

  The autopilot may be used down to 500 ft AGL. As it is not tuned for abnormal configurations, its behavior can be less than optimum and must be monitored.

Continued on the following page

F/CTL FLAPS FAULT/LOCKED (Cont'd)

Ident.: PRO-ABN-F_CTL-A-00018456.0004001 / 21 MAR 17

L12

STATUS

APPR PROC

FOR LDG (IF FLAPS ≤ 3)................................USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder

FLAPS (IF FLAPS>3)...............................KEEP CONF FULL
GPWS FLAP MODE (IF FLAPS < 3)...............................OFF
GPWS LDG FLAP 3 (IF FLAPS ≥ 3)...............................ON
APPR SPD.. *REFER TO PRO-ABN-F_CTL F/CTL FLAPS/SLATS FAULT/LOCKED*
LDG DIST PROC.. APPLY

ENG 1 APPR IDLE ONLY (Only in case of FLAPS FAULT)
ENG 2 APPR IDLE ONLY (Only in case of FLAPS FAULT)
FUEL CONSUMPT INCRSD
See (2)
FMS PRED UNRELIABLE
See (3)

INOP SYS

FLAPS
AP 1+2 (1)
A/THR (1)
Moreover, both FDs are lost (1)
CAT 2 (1)
GLS AUTOLAND
STEEP APPR

(1) *(If both flap channels fault.)*
(2) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*
(3) *Disregard FMS fuel predictions and refer to QRH/OPS chapter in order to find the applicable Fuel Penalty Factor.*

F/CTL FLAP LVR NOT ZERO

Applicable to: ALL

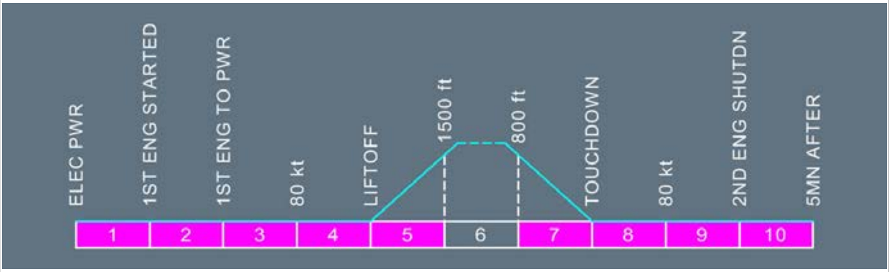
Ident.: PRO-ABN-F_CTL-AI-00018902.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the FLAP lever is not in the zero position, and the aircraft is above 22 000 ft.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-AI-00018454.0001001 / 21 MAR 16

Crew awareness.

F/CTL FLAP SYS 1(2) FAULT

Applicable to: ALL

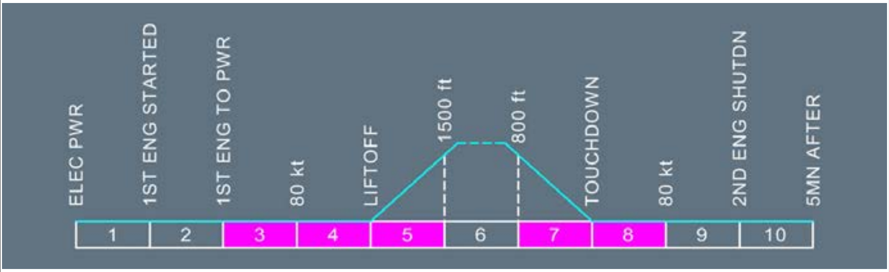
Ident.: PRO-ABN-F_CTL-E-00016990.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is failure of flap channel in one SFCC.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-E-00011753.0002001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-F_CTL-E-00011754.0002001 / 30 MAR 12

L12

STATUS

APPR PROC

- **In case of FLAP SYS 1 FAULT:**
  GPWS FLAP MODE...OFF
  Flap position signal to GPWS is lost.

ENG 1(2) APPR IDLE ONLY
FLAPS SLOW

F/CTL FLAPS/SLATS FAULT/LOCKED

Ident.: PRO-ABN-F_CTL-00018457.0001001 / 17 MAR 17
Applicable to: ALL

<table>
<tr><th colspan="6">MAX SPEED</th></tr>
<tr><th>Flaps(1)
Slats(1)</th><th>F = 0</th><th>0 < F ≤ 1</th><th>1 < F ≤ 2</th><th>2 < F ≤ 3</th><th>F > 3</th></tr>
<tr><td>S = 0</td><td>NO LIMITATION</td><td rowspan="3">215 kt</td><td rowspan="4">200 kt</td><td rowspan="4">185 kt</td><td rowspan="2">Not allowed
(177 kt)</td></tr>
<tr><td>0 < S <1</td><td rowspan="2">230 kt</td></tr>
<tr><td>S = 1</td><td rowspan="2"></td></tr>
<tr><td>1 < S ≤ 3</td><td colspan="2">200 kt</td></tr>
<tr><td>S > 3</td><td colspan="5">177 kt</td></tr>
</table>

(1) *Slats/Flaps position displayed on the upper ECAM display.*

<table>
<tr><th colspan="6">APPR SPD</th></tr>
<tr><th>Flaps(1)
Slats(1)</th><th>F = 0</th><th>0 < F < 1</th><th>1 ≤ F < 2</th><th>2 ≤ F < 3</th><th>F ≥ 3</th></tr>
<tr><td>S = 0</td><td>VREF +60 (Appr)
VREF +50 (Touch Down)</td><td rowspan="2">VREF +45</td><td rowspan="2">VREF +30</td><td rowspan="2">VREF +25</td><td rowspan="2">(FLAPS > 3
not allowed)
VREF +25</td></tr>
<tr><td>0 < S < 1</td><td></td></tr>
<tr><td>1 ≤ S ≤ 3</td><td colspan="2" rowspan="2">VREF +25</td><td rowspan="2">VREF +15</td><td rowspan="2">VREF +10</td><td>VREF +10</td></tr>
<tr><td>S > 3</td><td>VREF +5</td></tr>
</table>

(1) *Slats/Flaps position displayed on the upper ECAM display.*

CAUTION	For flight with SLATS or FLAPS extended, fuel consumption is increased. Refer to the fuel flow indication. As a guideline, determine the fuel consumption in clean configuration, at the same altitude without airspeed limitation (e.g. from ALTERNATE FLIGHT PLANNING tables, *Refer to PER-FPL-FLP-ALN-20 ALTERNATE PLANNING ISA*), and multiply this result by the applicable Fuel Penalty Factor provided in the QRH (*Refer to QRH/OPS Fuel Penalty Factors/ECAM Alert Table*) to obtain the fuel penalty required to reach the destination in the current configuration.

F/CTL GND SPLR 5 FAULT

Applicable to: ALL

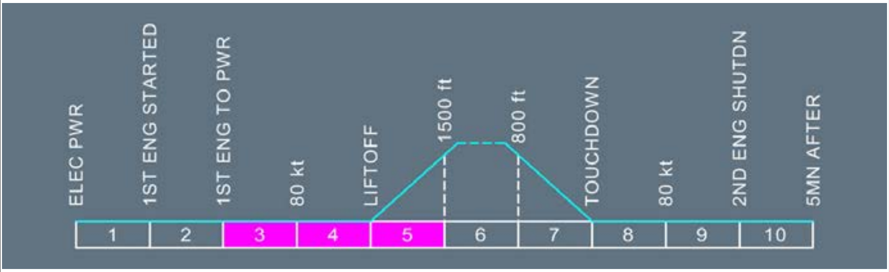
Ident.: PRO-ABN-F_CTL-Z-00016967.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a loss of ground spoiler function in SEC 2.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-Z-00018903.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-F_CTL-Z-00014253.0001001 / 23 MAY 12

L12

STATUS

LDG DIST PROC.. APPLY
.

INOP SYS

GND SPLR 5

F/CTL GND SPLR / 1+2 / 3+4 / FAULT

Applicable to: ALL

Ident.: PRO-ABN-F_CTL-S-00016968.0001001 / 21 MAR 16

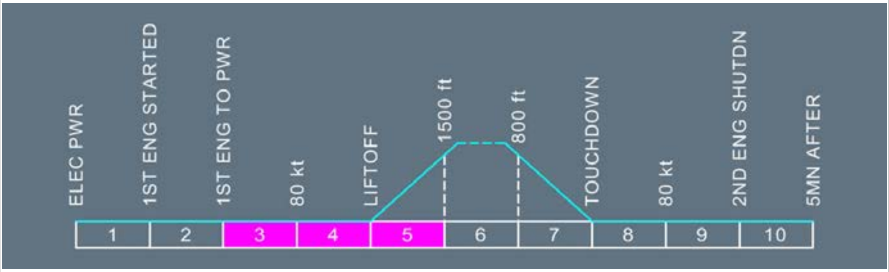
ANNUNCIATIONS

Triggering Conditions:

L2

- GND SPLR FAULT :
  Loss of ground spoiler function in SEC 1+3, or 1+2, or 2+3, or 1+2+3.
  If ground spoiler function is lost in SEC (1+2) or (1+3), one reverser is inoperative.
  If ground spoiler function is lost in SEC (1+2+3), both reversers are inoperative.
  In any case, the autobrake function is lost.
- GND SPLR 1+2(3+4) FAULT:
  Loss of ground spoiler function in SEC 3 (or 1).

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-S-00018466.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-F_CTL-S-00011793.0001001 / 11 MAY 12

STATUS

LDG DIST PROC.. APPLY

INOP SYS

GND SPLR (affected)

F/CTL GND SPLR NOT ARMED

Applicable to: ALL

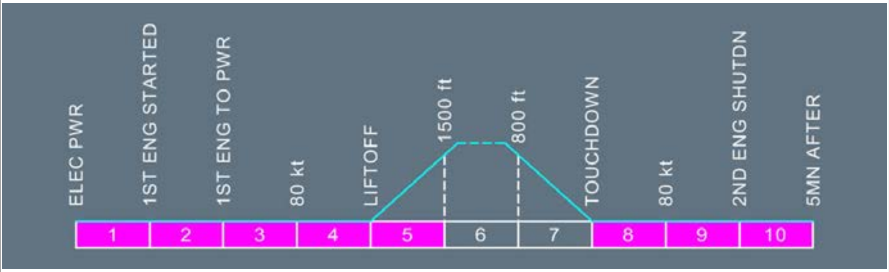
Ident.: PRO-ABN-F_CTL-AJ-00016966.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when ground spoilers are not armed before landing.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-AJ-00018905.0001001 / 21 MAR 16

Crew awareness.

F/CTL L(R) AIL FAULT

Applicable to: ALL

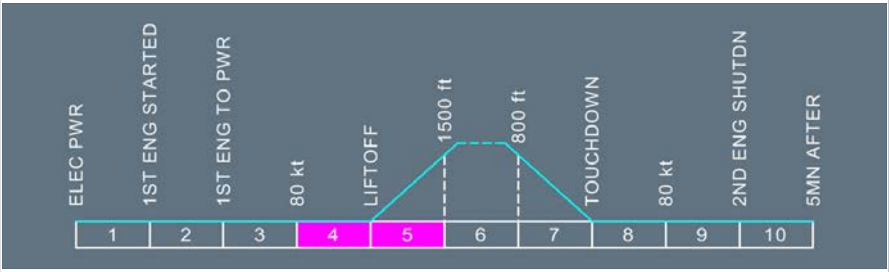
Ident.: PRO-ABN-F_CTL-N-00016975.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a loss of both servojacks on one aileron.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-N-00018474.0002001 / 21 MAR 16

Crew awareness.

FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

Continued on the following page

F/CTL L(R) AIL FAULT (Cont'd)

Ident.: PRO-ABN-F_CTL-N-00011783.0003001 / 21 MAR 17

L12

STATUS

	INOP SYS
FUEL CONSUMPT INCRSD	L (R) AIL
See (1)	
FMS PRED UNRELIABLE	
See (2)	

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS chapter in order to find the applicable Fuel Penalty Factor.*

F/CTL L(R) ELEV FAULT

Applicable to: ALL

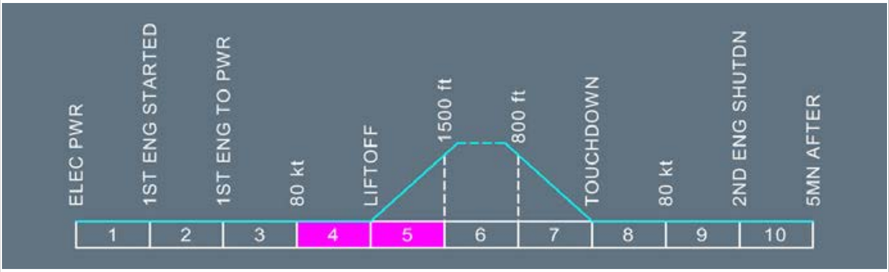
Ident.: PRO-ABN-F_CTL-Q-00016974.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a loss of both servojacks on one elevator, or activation of elevator flutter protection in ELAC.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-Q-00018484.0001001 / 22 MAR 17

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)

L2 *Note:* *If the L(R) elevator fails, the ELAC s loose pitch control through the elevator. Therefore, the SEC s control pitch in alternate law. This is not the case, if the right elevator is lost, due to the failure of B+Y hydraulic circuits. Pitch normal law remains active in ELAC.*

L1 MAX SPEED..320 KT

L2 *Speed is limited, due to the loss of high-speed protection.*

L1 SPD BRK..DO NOT USE

Continued on the following page

F/CTL L(R) ELEV FAULT (Cont'd)

Ident.: PRO-ABN-F_CTL-Q-00018490.0010001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT
SPD BRK..DO NOT USE

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

GPWS LDG FLAP 3..ON

Will be displayed, when flaps in CONF 3.

APPR SPD..VREF+15 KT
LDG DIST PROC.. APPLY

ALTN LAW: PROT LOST
WHEN L/G DN: DIRECT LAW

See (1)

INOP SYS

F/CTL PROT
L (R) ELEV
ELAC PITCH
AP 1+2
CAT 2
GLS AUTOLAND
STEEP APPR

(1) *At landing gear extension, control reverts to direct law in pitch, as well as in roll.Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW.*

F/CTL L+R ELEV FAULT

Applicable to: ALL

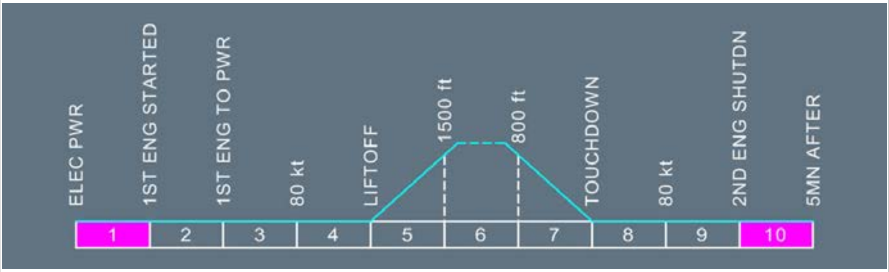
Ident.: PRO-ABN-F_CTL-O-00016958.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both elevators are lost.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-O-00018491.0001001 / 22 MAR 17

MAX SPEED....................320/.77

L2 *Due to loss of high speed protections.*

L1 MAN PITCH TRIM....................USE

L2 *Only manual trim is available for pitch control.*

L1 SPD BRK....................DO NOT USE

L2 *Do not use speed brakes, because it is difficult to control the induced pitch moment with manual pitch trim only.*

Continued on the following page

F/CTL L+R ELEV FAULT (Cont'd)

Ident.: PRO-ABN-F_CTL-O-00018492.0006001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320/.77
SPD BRK...DO NOT USE

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder

GPWS LDG FLAP 3...ON

Will be displayed when flaps in CONF 3.

MAN PITCH TRIM...USE
APPR SPD...VREF+10
LDG DIST PROC... APPLY

PITCH MECH BACK UP
ROLL DIRECT LAW

INOP SYS

L+R ELEV
ELAC PITCH
AP 1+2
CAT 2
GLS AUTOLAND
STEEP APPR

F/CTL L(R) SIDESTICK FAULT

Applicable to: ALL

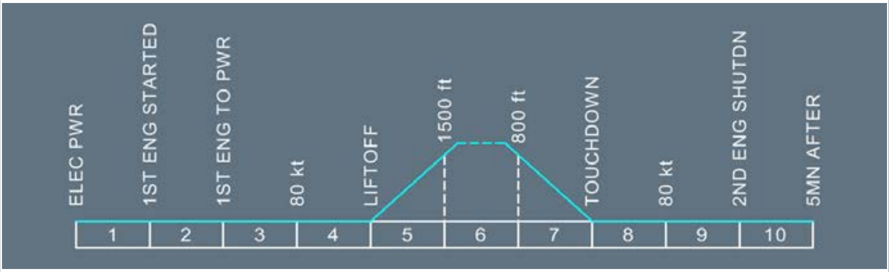
Ident.: PRO-ABN-F_CTL-Y-00016959.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when transducers, on pitch or roll axis, are failed on one sidestick.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-Y-00011756.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-F_CTL-Y-00014250.0001001 / 30 MAR 12

STATUS

INOP SYS

L(R) SIDESTICK

F/CTL PITCH TRIM/MCDU/CG DISAGREE

Applicable to: ALL

Ident.: PRO-ABN-F_CTL-AL-00016956.0003001 / 21 MAR 16

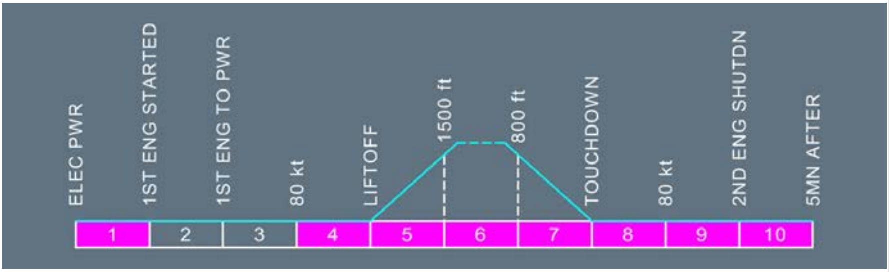
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the system detects that any of the following disagree:

- The real pitch trim value,
- The pitch trim value calculated by the FAC , based on the CG,
- The pitch trim value entered in the MCDU.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-AL-00018906.0025001 / 21 MAR 16

Crew awareness.

F/CTL SEC 1(2)(3) FAULT

Applicable to: ALL

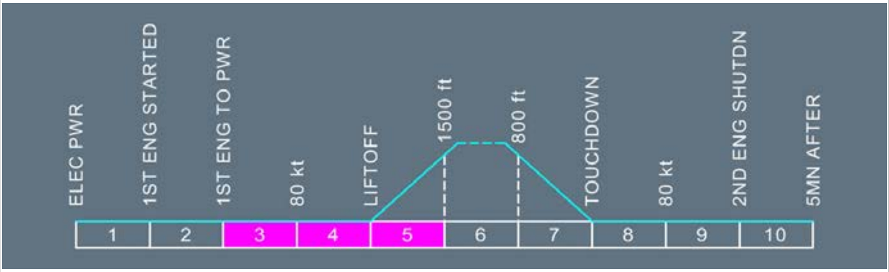
Ident.: PRO-ABN-F_CTL-I-00016961.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a failure of one SEC.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-I-00018502.0001001 / 21 MAR 16

SEC (AFFECTED).......................................OFF THEN ON

- **IF UNSUCCESSFUL:**

  SEC (AFFECTED).......................................OFF

L2 *Associated spoilers are lost. If SEC 1 or 2 fails, LAF is degraded (A320 with LAF only). If all spoilers are inoperative (3 SECs failed), roll direct law and pitch alternate law become active.*

L1 SPD BRK (IF SEC 1 AFFECTED).......................................DO NOT USE

L2 *VLS would not be corrected, if speed brakes 2 extend (no speed brake position sent to FACs).*

L1
- **If SEC 1 + 2 + 3 fail.**

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)

Continued on the following page

F/CTL SEC 1(2)(3) FAULT (Cont'd)

Ident.: PRO-ABN-F_CTL-I-00018504.0004001 / 01 JUN 16

L12

STATUS

SPD BRK....................DO NOT USE
(If SEC 1 is affected.)

- **If SEC 1 + 2 + 3 fail:**
  FOR LDG....................USE FLAP 3
  APPR SPD....................VREF + 10KT

LDG DIST PROC.................... APPLY

- **(If SEC 1 + 2 + 3 fail).**
  ALTN LAW: PROT LOST
- If no AP engaged
  and
  SEC 1 + 2 + 3 fail.
  WHEN L/G DN: DIRECT LAW
  If SEC 1 + 2 + 3 fail. In such a case, the LGCIU information can no longer be sent to the ELAC . For the activation of DIRECT law, the ELAC uses the condition “slats and flaps in CONF 2”, instead of “landing gear down”.
- If AP engaged
  and
  SEC 1 + 2 + 3 fail.
  WHEN L/G DN AND AP OFF: DIRECT LAW
  If SEC 1 + 2 + 3 fail. In such a case, the LGCIU information can no longer be sent to the ELAC . For the activation of DIRECT law, the ELAC uses the condition “slats and flaps in CONF 2”, instead of “landing gear down”.

INOP SYS

F/CTL PROT (1)
SPLR (associated)
SEC (affected)
REVERSER 1(2) (2)
AUTO BRK (3)
STEEP APPR (4)
ROW/ROP

(1) *(If SEC 1 + 2 + 3 fail)*
(2) *(If SEC 1 + 2 fail, reverser 1 is not available for landing. If SEC 1 + 3 fail, reverser 2 is not available for landing)*
(3) *(If at least 2 SECs fail)*

Continued on the following page

F/CTL SEC 1(2)(3) FAULT (Cont'd)

(4) *(If at least SEC 1 fails.)*

F/CTL SIDESTICK PRIORITY

Applicable to: ALL

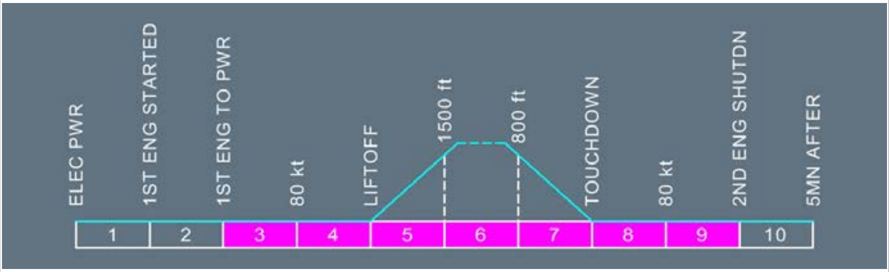
Ident.: PRO-ABN-F_CTL-AM-00016983.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is failure in a sidestick priority logic circuit.

Flight Phase Inhibition:



Continued on the following page

F/CTL SIDESTICK PRIORITY (Cont'd)

Ident.: PRO-ABN-F_CTL-AM-00018509.0001001 / 21 MAR 16

CHECK PRIORITY LOGIC

L2 Check the integrity of flight control priority, as follows (not displayed on ECAM) :

L1 ELAC 1 .... OFF THEN ON

L2 Note: *When the ELAC 1 computer is reset on ground, the pitch trim returns to the ground setting position (0 °).*

L1 ELAC 2 .... OFF THEN ON

L2 ■ **If the warning disappears:**

CAPT TAKE OVER pb .... PRESS (at least 3 seconds)

Check that the :

- *Aural "priority left" message is activated.*
- *F/O red arrow light is on.*

CAPT TAKE OVER pb .... RELEASE
F/O TAKE OVER pb .... PRESS (at least 3 seconds)

Check that the:

- *Aural "priority right" message is activated*
- *CAPT red arrow light is on.*

F/O TAKE OVER pb .... RELEASE

Check that the warning does not reappear.

Note: *There is no need to move the sidestick for the check.*

■ **If the warning does not disappear, or if the warning reappears after the above check:**

Maintenance action is due.

F/CTL SLAT(FLAP) TIP BRK FAULT

Applicable to: ALL

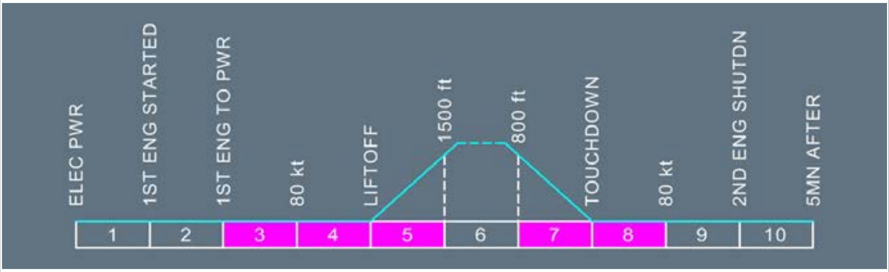
Ident.: PRO-ABN-F_CTL-AN-00016996.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is failure of one wing tip brake on slats or flaps, or failure of one wing tip brake solenoid on slats, or flaps.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-AN-00018510.0001001 / 21 MAR 16

Crew awareness.

F/CTL SLATS AND FLAPS FAULT IN CONF 0

Applicable to: ALL

Ident.: PRO-ABN-F_CTL-C-00018511.0001001 / 22 MAR 17

FLAPS LEVER.....RECYCLE

- **If both slat channels fail:**

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)
MAX SPEED..... 320 KT

Continued on the following page

F/CTL SLATS AND FLAPS FAULT IN CONF 0 (Cont'd)

Ident.: PRO-ABN-F_CTL-C-00018512.0002001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT

ALTN LAW: PROT LOST

APPR PROC

FOR LDG.. USE FLAP 1

With FLAPS lever set at 1, AP /FD GO AROUND mode is available.

CTR TK PUMPS..OFF

GPWS FLAP MODE...OFF

APPR SPD.. VREF +60 KT

Approach with A/THR in selected mode is recommended.

- **If both slat channels fail:**
  WHEN L/G DN: DIRECT LAW
- **AT 300 FT AGL:**
  TARGET SPD.................................... VREF +50 KT
  Reduce speed between 500 ft and 300 ft to reach VREF +50 kt at runway threshold, and disconnect A/THR , as the target speed may be below VLS.
  LDG DIST PROC..APPLY
- **Only in case of FLAPS FAULT:**
  ENG 1 APPR IDLE ONLY
  ENG 2 APPR IDLE ONLY

INOP SYS

F/CTL PROT (1)
SLATS
FLAPS
AP 1+2 (2)
A/THR (2)
Moreover, both FDs are lost (2)
CAT 2 (2)
STEEP APPR

(1) *(If both slat channels fail.)*
(2) *(If both slat or flap channels fail.)*

F/CTL SLATS FAULT/LOCKED

Applicable to: ALL

Ident.: PRO-ABN-F_CTL-B-00018517.0002001 / 22 MAR 17

- **If slats locked:**
  WING TIP BRK ON

MAX SPEED........................ REFER TO PRO-ABN-F_CTL F/CTL FLAPS/SLATS FAULT/LOCKED

L2 *Speed is limited to the VFE corresponding to the next slat position.*

L1
- **If slats not locked:**
  FLAPS LEVER..RECYCLE

L2 *Return to the previous selection, then back to the desired position.*

L1
- **If slats extended:**
  FUEL CONSUMPT INCRSD
  FMS PRED UNRELIABLE
- **If unsuccessful:**

L2 *Refer to PRO-ABN-F_CTL [QRH] Landing with Slats or Flaps Jammed.*

The autopilot may be used down to 500 ft AGL. As it is not tuned for the abnormal configurations, its behavior could be less than optimum and must be monitored.

L1
L12

Note: 1. *If there is a SLATS FAULT after both slat channels fail, alternate law becomes active (Refer to PRO-ABN-F_CTL F/CTL ALTN LAW).*
2. *If the slats are locked in clean configuration (<18 °), alternate law without protection is selected once the flaps are at or above CONF 2.*

- **If slats not at zero:**
  FUEL MODE SEL...MAN

L2 *To allow CTR TK feeding.*

L1 CTR TK PUMPS..AS RQRD

L2 *Set CTR TK PUMPS pb to OFF when CTR TK is empty or during approach.*

Continued on the following page

F/CTL SLATS FAULT/LOCKED (Cont'd)

Ident.: PRO-ABN-F_CTL-B-00018518.0004001 / 22 MAR 17

L12

STATUS

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

CTR TK PUMPS.. OFF

GPWS LDG FLAP 3.. ON

APPR SPD... *REFER TO PRO-ABN-F_CTL F/CTL FLAPS/SLATS FAULT/LOCKED*

LDG DIST PROC.. APPLY

CTR TK FEED: MAN ONLY

- **If both slat channels fail, or slats are locked in clean configuration and flaps are at, or above, CONF 2:**
  ALTN LAW: PROT LOST
  WHEN L/G DN: DIRECT LAW

FUEL CONSUMPT INCRSD

See (2)

FMS PRED UNRELIABLE

See (3)

INOP SYS

F/CTL PROT (1)
SLATS
AP 1+2 (1)
A/THR (1)
Moreover, both FDs are lost (1)
CAT 2 (1)
STEEP APPR (1)
GLS AUTOLAND

(1) *(If both slat channels fail.)*

(2) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(3) *Disregard FMS fuel predictions and refer to QRH/OPS chapter in order to find the applicable Fuel Penalty Factor.*

F/CTL SLAT SYS 1(2) FAULT

Applicable to: ALL

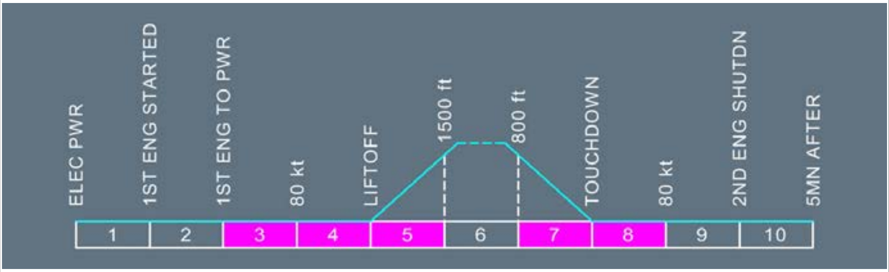
Ident.: PRO-ABN-F_CTL-D-00016995.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is failure of slat channel in one SFCC.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-D-00011751.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-F_CTL-D-00011752.0001001 / 18 AUG 10

	STATUS
SLATS SLOW	

F/CTL SPD BRK 2 (3+4) FAULT

Applicable to: ALL

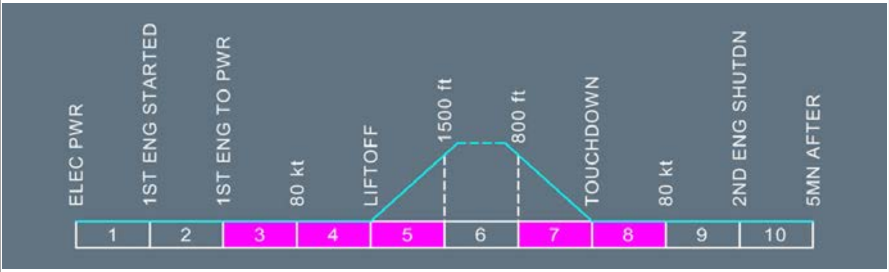
Ident.: PRO-ABN-F_CTL-W-00016980.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when speedbrake lever transducers to SEC 3 (1) failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-W-00018519.0001001 / 21 MAR 16

- **If SPD BRK 3+4 affected:**
  SPD BRK.. DO NOT USE

L2 *Do not use speedbrakes since it is not efficient to use only surfaces n° 2, and would active the SPD BRK DISAGREE caution.*

Ident.: PRO-ABN-F_CTL-W-00018520.0001001 / 21 MAR 16

STATUS

- **If SPD BRK 3+4 affected:**
  SPD BRK.. DO NOT USE

LDG DIST PROC.. APPLY

INOP SYS

SPD BRK (affected)
STEEP APPR (1)

(1) *(if SPD BRK 3 and 4 are affected)*

F/CTL SPD BRK DISAGREE
(SURFACES 3+4 AFFECTED)

Applicable to: ALL

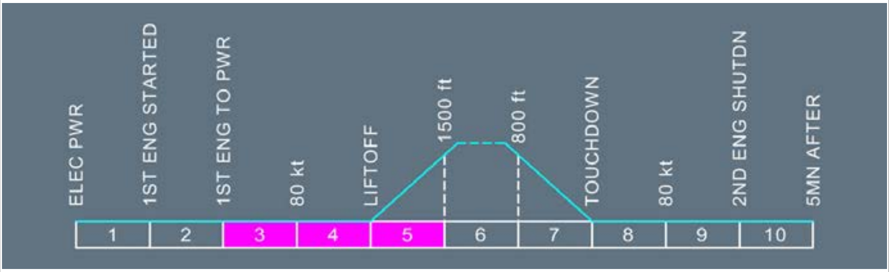
Ident.: PRO-ABN-F_CTL-T-00016970.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a position disagree between surfaces and lever position.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-T-00018521.0001001 / 21 MAR 16

SPD BRK LEVER....................RETRACT
SPD BRK....................DO NOT USE

Ident.: PRO-ABN-F_CTL-T-00018522.0001001 / 21 MAR 16

STATUS

SPD BRK....................DO NOT USE

INOP SYS

SPD BRK 3+4
STEEP APPR

F/CTL SPD BRK DISAGREE
(SURFACES 2+3+4 AFFECTED)

Applicable to: ALL

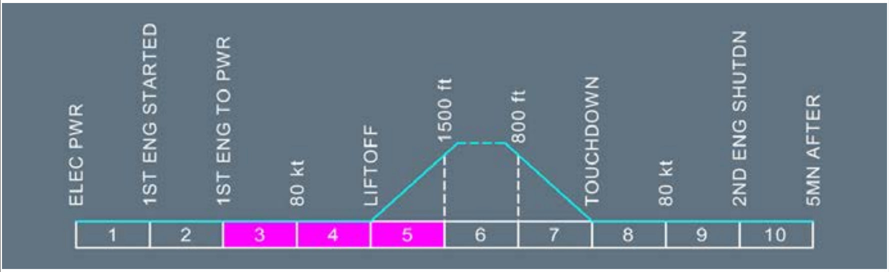
Ident.: PRO-ABN-F_CTL-U-00018907.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a position disagree between surfaces and lever position.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-U-00018523.0001001 / 21 MAR 16

SPD BRK LEVER..RETRACT

F/CTL SPD BRK FAULT

Applicable to: ALL

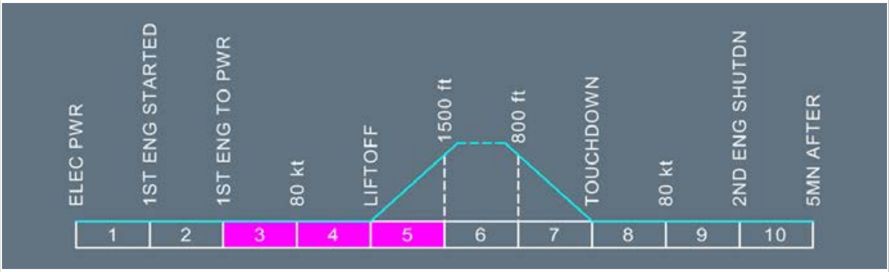
Ident.: PRO-ABN-F_CTL-V-00016971.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when speedbrake lever transducers to SEC 1 and 3 failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-V-00018534.0001001 / 21 MAR 16

L2 In addition, associated ground spoilers are available only through reverse selection.
L1 Crew awareness.

Ident.: PRO-ABN-F_CTL-V-00018535.0001001 / 22 MAR 17

STATUS

LDG DIST PROC.. APPLY

INOP SYS

SPD BRK
STEEP APPR (1)

(1) *(if SPD BRK 3 or 4 are affected)*

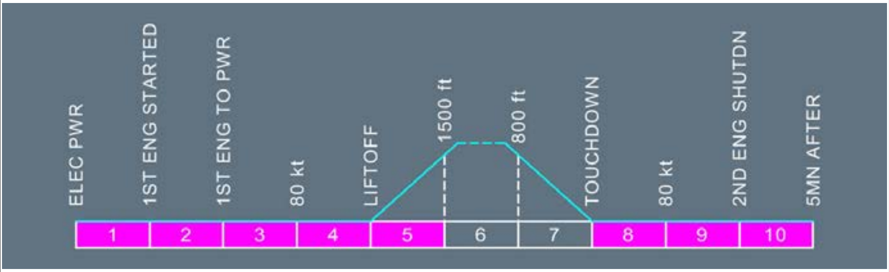
F/CTL SPD BRK STILL OUT

Applicable to: ALL

Ident.: PRO-ABN-F_CTL-AO-00016972.0002001 / 21 MAR 16

ANNUNCIATIONS

Flight Phase Inhibition:



Ident.: PRO-ABN-F_CTL-AO-00011810.0014001 / 25 FEB 14

Crew awareness.

F/CTL SPLR FAULT

Applicable to: ALL

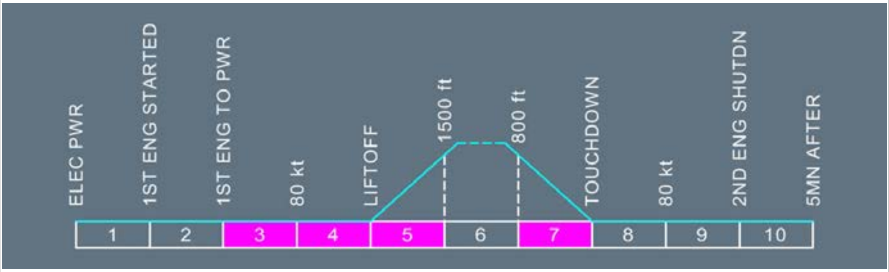
Ident.: PRO-ABN-F_CTL-R-00016976.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a loss of one or more spoilers.

Flight Phase Inhibition:



Continued on the following page

F/CTL SPLR FAULT (Cont'd)

Ident.: PRO-ABN-F_CTL-R-00018536.0003001 / 22 MAR 17

L2 *Note: If heavy vibrations are felt, CONF 3 may be used for landing in order to reduce the buffeting.*

L1 ● **If one or more spoilers are fully extended:**

Current Flight Level (FL) may not be maintained due to increased drag. Maintain a cruise FL as high as possible.

OPT SPD...G DOT+10KT

L2 *Whenever possible, target green dot speed +10 kt to minimize fuel consumption. However, if buffet is encountered at GDOT speed +10 kt, increase speed to fly out of buffet condition.*

L1 AP...DO NOT USE

L2 *Depending on the failed spoiler position, the AP may not have enough authority to counteract the roll induced by spoiler runaway.*

L1 SPD BRK (IF SPOILERS 3+4 AFFECTED)...DO NOT USE

L2 *Do not use speedbrakes, since using only surfaces N° 2 is not efficient and would activate the SPD BRK DISAGREE caution.*

L1 ● **If one or more spoilers are extended:**

FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

Continued on the following page

F/CTL SPLR FAULT (Cont'd)

Ident.: PRO-ABN-F_CTL-R-00018544.0004001 / 21 MAR 17

L12

STATUS

- **If one or more spoilers are fully extended:**
  AP....................DO NOT USE
- **If spoilers 3+4 affected:**
  SPD BRK....................DO NOT USE

APPR PROC

- **If one or more spoilers are fully extended:**

  In clean configuration, if VLS is above VFE_{NEXT}, the flight crew should deselect A/THR, decelerate to VFE_{NEXT}, and select CONF 1 when below VFE_{NEXT}. When established at CONF 1, the flight crew can reengage the A/THR and use managed speed again.

  FOR LDG....................USE FLAP 3

  This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

  GPWS LDG FLAP 3 ....ON
  APPR SPD : VREF + 10 KT

LDG DIST PROC....................APPLY

FUEL CONSUMPT INCRSD
See (3)
FMS PRED UNRELIABLE
See (4)

INOP SYS

SPLR (affected)
SPD BRK (1)
STEEP APPR (2)

(1) *(If spoilers 2+3+4 affected)*
(2) *(if spoilers 3 and/or 4 affected)*
(3) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*
(4) *Disregard FMS fuel predictions and refer to QRH/OPS chapter in order to find the applicable Fuel Penalty Factor.*

F/CTL STABILIZER JAM

Applicable to: ALL

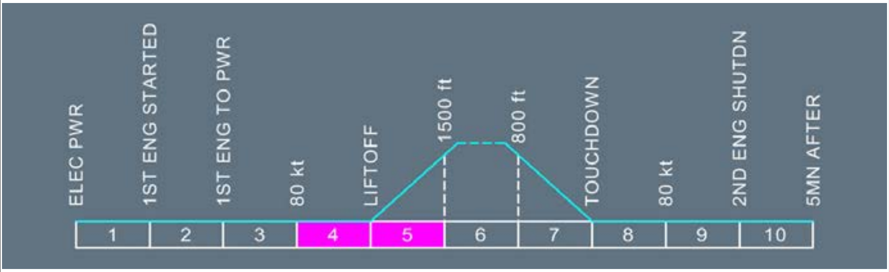
Ident.: PRO-ABN-F_CTL-X-00016973.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is a loss of the electrical control of the stabilizer (with or without jamming of the stabilizer).

Flight Phase Inhibition:



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F/CTL STABILIZER JAM (Cont'd)

Ident.: PRO-ABN-F_CTL-X-00018545.0001001 / 22 MAR 17

L2 When the Flight Control Computers detect a loss of electrical control of the stabilizer, pitch control law reverts to alternate law. Depending on the type of failure, the MAN PITCH TRIM may still be available.

L1 MAN PITCH TRIM.. CHECK

L2 *The force needed on the PITCH TRIM wheel may be higher than during pre-takeoff manual setting.*

L1
- **IF MAN TRIM AVAIL:**

  TRIM FOR NEUTRAL ELEV

L2 *If manual pitch trim is available, trim to maintain the elevator at the zero position (indications on F/CTL SD page).*

L1

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)
MAX SPEED..320 KT

Continued on the following page

F/CTL STABILIZER JAM (Cont'd)

Ident.: PRO-ABN-F_CTL-X-00018546.0003001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT

APPR PROC:

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

GPWS LDG FLAP 3.. ON

Will be displayed when flaps in CONF 3

- **IF MAN TRIM NOT AVAIL:**
  - **WHEN CONF 3 AND VAPP:**

    L/G.. DN

    Landing gear extension is delayed, in order to delay the switching to direct law.

APPR SPD:.. VREF + 10 KT
LDG DIST PROC.. APPLY
ALTN LAW: PROT LOST
WHEN L/G DN: DIRECT LAW

At landing gear extension, control reverts to direct law in pitch, as well as in roll. Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW.

INOP SYS

F/CTL PROT
STABILIZER
ELAC PITCH
AP 1 + 2
CAT 2
GLS AUTOLAND
STEEP APPR

[QRH] FUEL IMBALANCE

Ident.: PRO-ABN-FUEL-00011257.0002001 / 17 MAR 17
Applicable to: ALL

FOB.. CHECK

Compare the FOB + FU , with the FOB at departure.
If the difference is significant, or if the FOB + FU decreases, suspect a fuel leak.

CAUTION	A fuel imbalance may indicate a fuel leak. Do not apply this procedure, if a fuel leak is suspected. *Refer to PRO-ABN-FUEL [QRH] FUEL LEAK*.

FUEL X FEED..ON

- **On lighter side and in center tank:**
  FUEL PUMPS..OFF
- **When fuel balanced:**
  FUEL PUMPS..ON
  FUEL X FEED..OFF

<u>Note:</u> *There is no requirement to correct an imbalance, until the ECAM fuel advisory is displayed.*

[QRH] FUEL LEAK

Ident.: PRO-ABN-FUEL-00018665.0003001 / 17 MAR 17
Applicable to: ALL

A fuel leak may be detected, if:
- The sum of FOB and FU significantly less than FOB at engine start or is decreasing, or
- A passenger observes fuel spray from engine/pylon or wingtip/sharklet, or
- The total fuel quantity is decreasing at an abnormal rate, or
- A fuel imbalance is developing, or
- Fuel quantity in a tank is decreasing too fast (leak from engine/pylon, or hole in a tank), or
- The Fuel flow is excessive (leak from engine), or
- Fuel is smelt in the cabin.
- The destination EFOB turns to amber on the F-PLN (or on the FUEL PRED) page, or
- "DEST EFOB BELOW MIN" appears on the MCDU scratchpad.

If visibility permits, leak source may be identified by a visual check from the cabin.

WHEN A LEAK IS CONFIRMED

LAND ASAP

■ **Leak from engine/pylon confirmed by excessive fuel flow or visual check:**

THR LEVER (affected engine)....................IDLE
ENG MASTER (affected engine)....................OFF
FUEL X FEED....................AS RQRD

If the leak stops, the crossfeed valve can now be opened to re-balance fuel quantity, or to enable use of fuel from both wings.

DO NOT RESTART AFFECTED ENGINE

■ **Leak from engine/pylon not confirmed or leak not located:**

Stop any fuel transfer, and then monitor the depletion rate of each inner tank, to determine if the leak is from an engine or a wing, or from the Center tank, or the APU feeding line.

FUEL X FEED....................MAINTAIN CLOSED

The crossfeed valve must remain closed to prevent the leak from affecting both sides.

CTR TK PUMP 1....................OFF
CTR TK PUMP 2....................OFF

Each engine is fed via its associated inner tank only.

INNER TANK FUEL QUANTITIES....................MONITOR

Monitor the depletion rate of each inner tank.

Continued on the following page

[QRH] FUEL LEAK (Cont'd)

- **If one inner tank depletes faster than other by at least 300 kg (660 lb) in less than 30 min:**

  An engine leak may still be suspected. Therefore:

  THR LEVER (engine on leaking side)........ IDLE
  ENG MASTER (engine on leaking side)........ OFF
  CTR TK PUMP 1........ ON
  CTR TK PUMP 2........ ON
  FUEL LEAK........ MONITOR

  - **If leak stops:**

    ENGINE LEAK CONFIRMED

    FUEL X FEED........ AS RQRD

    DO NOT RESTART AFFECTED ENGINE

  - **If leak continues (after engine shutdown):**

    WING LEAK SUSPECTED

    ENGINE RESTART........ CONSIDER

CAUTION	Do not apply the FUEL IMBALANCE procedure. Approach and landing can be done, even with one full wing/one empty wing.

- **If both inner tanks deplete at a similar rate:**

  LEAK FROM CENTER TANK OR APU FEEDING LINE SUSPECTED

  - **If fuel smell in cabin:**
    APU........ OFF

    This prevents additional fuel loss through the APU feeding line.

  - **When fuel quantity in one inner tank less than 3 000 kg (6 600 lb):**
    CTR TK PUMP 1........ ON
    CTR TK PUMP 2........ ON

- **For landing:** DO NOT USE REVERSERS

[QRH] GRAVITY FUEL FEEDING

Ident.: PRO-ABN-FUEL-00011261.0001001 / 17 MAR 17
Applicable to: ALL

ENG MODE SEL....................IGN
AVOID NEGATIVE G FACTOR
MAX FL: GRAVITY FEED CEILING

- *Current FL if flight time above FL 300 > 30 min.*
- *FL 300 if flight time above FL 300 < 30 min.*
- *Highest of FL 150 or 7 000 ft above takeoff airport if FL 300 never exceeded.*
- *FL 100 for JET B.*

● **When reaching gravity feed ceiling:**
FUEL X FEED....................OFF

● **If no fuel leak and with one engine running (fed by gravity):**
FUEL X FEED....................ON
BANK ANGLE....................1° WING DOWN ON LIVE ENG SIDE
The fuel from the wing tank on the engine running side is used.
RUDDER TRIM....................USE
Use rudder trim to maintain constant course and neutral stick.

● **When fuel imbalance reaches 1 000 kg (2 200 lb):**
BANK ANGLE....................2° or 3° WING DOWN ON LIVE ENG SIDE
Use fuel from the opposite wing tank, until fuel imbalance is reduced to 0.

FUEL ACT XFR FAULT

Applicable to: ALL

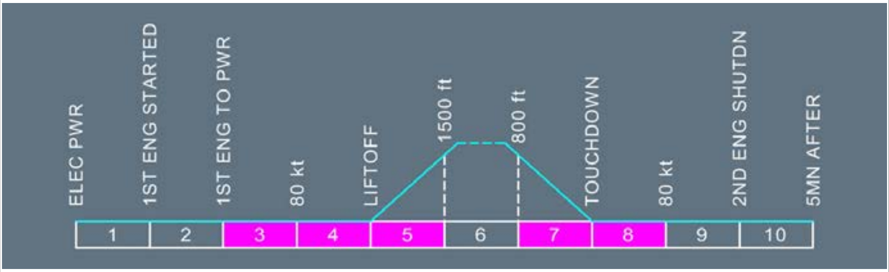
Ident.: PRO-ABN-FUEL-R-00016820.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- The ACT quantity > 250 kg (550 lb) and
- The CTR TK quantity < 3 000 kg (6 600 lb).

Flight Phase Inhibition:



Continued on the following page

FUEL ACT XFR FAULT ⩤ (Cont'd)

Ident.: PRO-ABN-FUEL-R-00017614.0001001 / 21 MAR 16

ACT...FWD

- **IF NECESSARY:**

  DESCEND TO FL270

L2 *Note:* - *ACT transfer rate depends on altitude and on remaining ACT fuel quantity.*
- *If ACT transfer is uncertain, set the ACT pb to AUTO to avoid pump dry running.*
- *ACT pb can be set back to FWD at lower Flight Level to recover remaining ACT fuel.*

L1
- **WHEN ACT EMPTY:**

  ACT...AUTO

  - **For A321 aircraft equipped with 1 ACT ⩤ :**

    ACT UNUSABLE (IF AUTOMATIC AND MANUAL MODES ARE FAILED)

- **For aircraft equipped with 2 ACTs ⩤ :**
  - **IF NO XFR:**

    ACT UNUSABLE
    PROC...APPLY

FUEL ACT PUMP LO PR

Applicable to: ALL

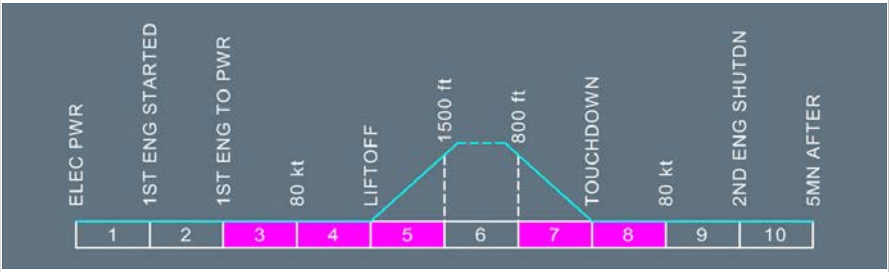
Ident.: PRO-ABN-FUEL-BB-00016811.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the ACT pump is in low pressure.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-BB-00018877.0001001 / 21 MAR 16

ACT LO LVL

L2 *Note: Displayed if ACT is empty.*

L1 ACT..OFF

FUEL APU LP VALVE FAULT

Applicable to: ALL

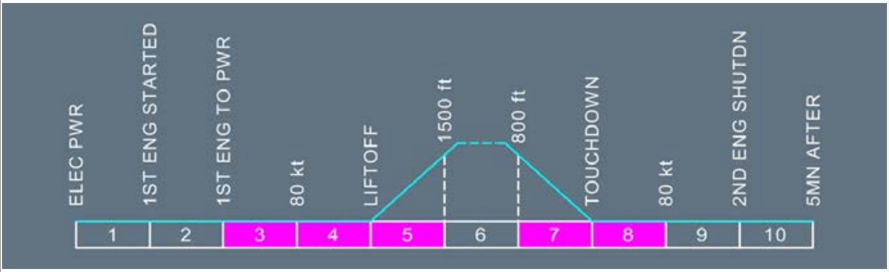
Ident.: PRO-ABN-FUEL-BC-00016826.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the valve position disagrees with the selected position.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-BC-00017633.0002001 / 21 MAR 16

Crew awareness.

FUEL AUTO FEED FAULT

Applicable to: ALL

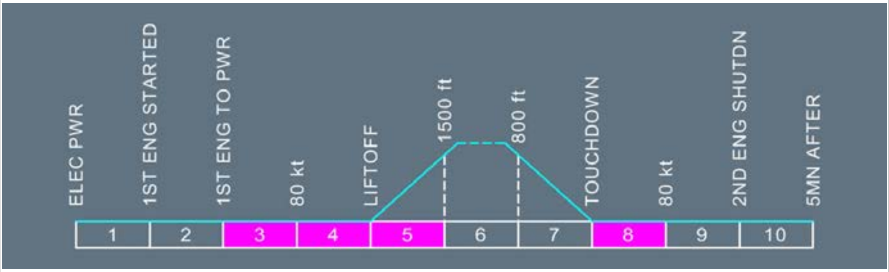
Ident.: PRO-ABN-FUEL-Q-00016698.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- CTR TK quantity > 250 kg (550 lb) and left or right wing tanks quantity < 5 000 kg (11 000 lb), or
- CTR TK pumps do not stop after slat extension or CTR TK level is low.

Flight Phase Inhibition:



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FUEL AUTO FEED FAULT (Cont'd)

Ident.: PRO-ABN-FUEL-Q-00017666.0001001 / 21 MAR 16

FUEL MODE SEL..MAN

L2 *The center tank pumps will run and feed the engines.*

L1 ■ **Fuel in one wing tank < 5 000 kg (11 000 lb) and in center tank > 250 kg (550 lb):**

CTR TK PUMP 1..ON
CTR TK PUMP 2..ON

L2 *When the center tank is empty, CTR TK PUMP LO PR alert will come on.*
For aircraft equipped with CFM engines only : If the center tank is not empty at slat extension, CTR TK PUMPs should be switched OFF. This action will prevent a possible wing tank overflow on ground, due to IDG fuel recirculation.

L1 ■ **CTR TK PUMPS running after slat extension, or LO LVL in center tank:**

CTR TK PUMP 1..OFF
CTR TK PUMP 2..OFF

Ident.: PRO-ABN-FUEL-Q-00018882.0001001 / 21 MAR 16

STATUS

CTR TK FEED : MAN ONLY

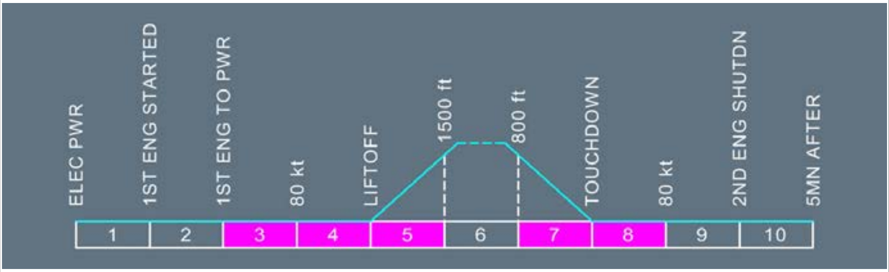
FUEL CTR TK PUMP 1(2) LO PR

Applicable to: ALL

Ident.: PRO-ABN-FUEL-M-00016843.0001001 / 21 MAR 16

ANNUNCIATIONS

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-M-00018914.0003001 / 21 MAR 16

- **IF NO FUEL LEAK:**
  FUEL X FEED..ON

CTR TK PUMP (AFFECTED)..OFF

L2 *A fuel imbalance may occur, if the performance of the pumps of one wing is different from that of the other wing, and the CTR TK PUMP that is not affected stops automatically because:*
- *The L(R) INR TK is full, or*
- *The CTR TK is empty.*

In this case, apply the FUEL IMBALANCE procedure, as required.

L1
- **WHEN CTR TK EMPTY:**
  FUEL X FEED..OFF

L2 *When the CTR TK is empty, the X FEED pb-sw must be turned off, to avoid a possible fuel imbalance.*

Continued on the following page

FUEL CTR TK PUMP 1(2) LO PR (Cont'd)

Ident.: PRO-ABN-FUEL-M-00018918.0002001 / 21 MAR 16

STATUS

- **WHEN CTR TK EMPTY:**
  FUEL X FEED..OFF

INOP SYS

CTR TK PUMP 1(2)

FUEL CTR TK PUMPS LO PR

Applicable to: ALL

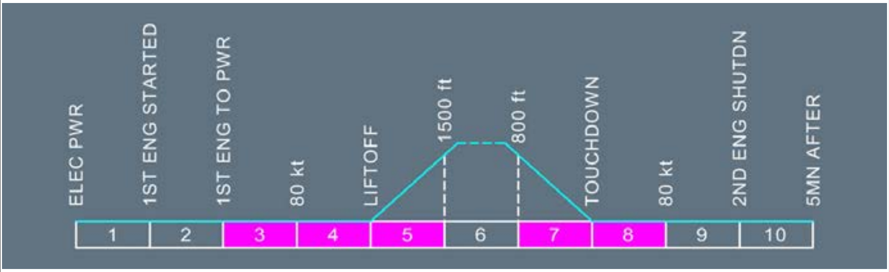
Ident.: PRO-ABN-FUEL-N-00016845.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the pressure of the CTR TK pumps is low.

Flight Phase Inhibition:



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FUEL CTR TK PUMPS LO PR (Cont'd)

Ident.: PRO-ABN-FUEL-N-00011221.0003001 / 30 MAR 12

L2 Set FUEL MODE SEL pb-sw to MAN, to avoid the possible triggering of the FUEL CTR TK PUMPS OFF ECAM caution.

L1 CTR TK PUMP 1 .... OFF
CTR TK PUMP 2 .... OFF
FUEL X FEED .... OFF
CTR TK UNUSABLE

L2 *Gravity feeding from the center tank is not possible (no by-pass valve fitted on the center tank pumps).*

Ident.: PRO-ABN-FUEL-N-00011222.0001001 / 13 AUG 10

STATUS

	INOP SYS
CTR TK FUEL UNUSABLE	CTR TK PUMPS

FUEL CTR TK PUMPS OFF

Applicable to: ALL

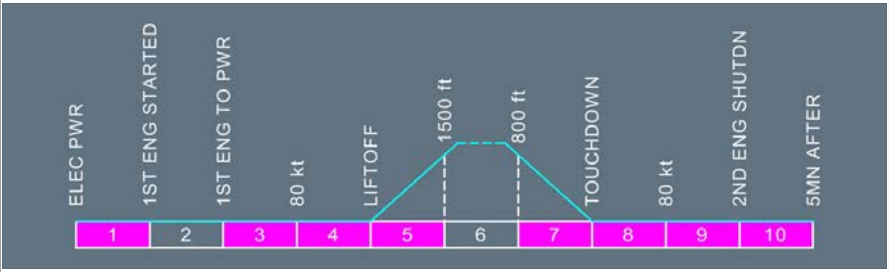
Ident.: PRO-ABN-FUEL-BE-00016846.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both CTR TK PUMP 1 pb-sw and CTR TK PUMP 2 pb-sw are at OFF with no failure.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-BE-00011260.0002001 / 10 JAN 11

L2 The center tank pumps pushbuttons are OFF, with slats retracted.

L1 CTR TK PUMP 1 .... ON
CTR TK PUMP 2 .... ON

FUEL ENG 1(2) LP VALVE OPEN

Applicable to: ALL

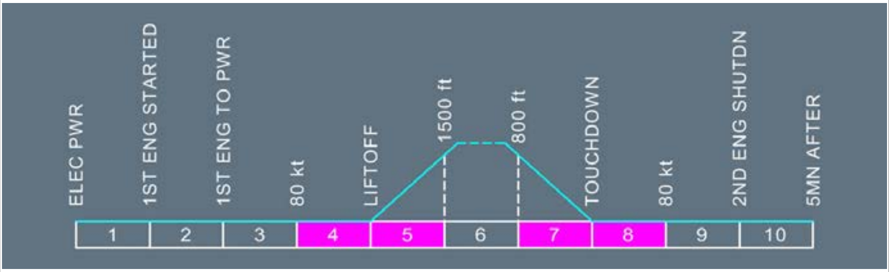
Ident.: PRO-ABN-FUEL-BG-00016814.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the valve remains in the open position.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-BG-00011217.0001001 / 25 FEB 14

Crew awareness.

FUEL FQI CH 1(2) FAULT

Applicable to: ALL

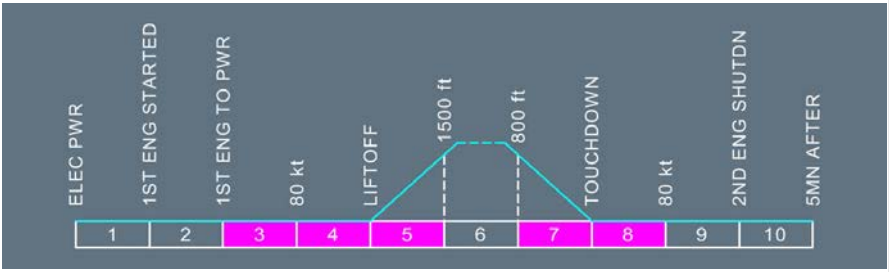
Ident.: PRO-ABN-FUEL-BI-00016817.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when a FQI channel is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-BI-00011216.0001001 / 25 FEB 14

Crew awareness.

FUEL L (R) OUTER (INNER) TK HI TEMP

Applicable to: ALL

Ident.: PRO-ABN-FUEL-BL-00016825.0001001 / 21 MAR 16

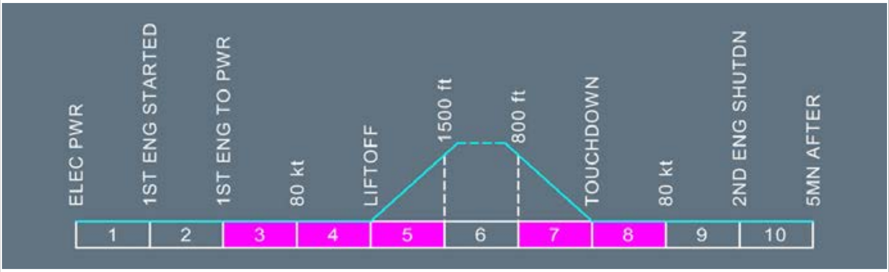
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the fuel temperature:

- In outer cell, is above 55 °C on ground
- In outer cell, is above 60 °C in flight
- In inner cell, is above 45 °C on ground
- In inner cell, is above 54 °C in flight.

Flight Phase Inhibition:



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FUEL L (R) OUTER (INNER) TK HI TEMP (Cont'd)

Ident.: PRO-ABN-FUEL-BL-00011214.0001001 / 13 AUG 10

L2 This caution may spuriously trigger due to interference from communication equipment. Therefore, the flight crew should wait 2 min while the fuel temperature measurement is updated. After 2 min, if the ECAM caution has not disappeared, the flight crew must apply the following procedure:

L1 GALLEY...OFF

L2 *Reducing electrical loads reduce heat emitted by IDG.*

L1 ■ **On the ground:**

LIMITED TAXI TIME

- **If temp reaches 60° C in outer cell or 54° C in inner cell:**

  DELAY T.O.

  ENG MASTER (AFFECTED SIDE)..OFF

■ **In flight:**

ENG F. FLOW (AFFECTED SIDE)..INCREASE

L2 *Disconnect autothrust. Adjust the thrust lever to increase fuel flow through the IDG oil heat exchanger and decrease the temperature of the fuel returning to the outer cell.*

L1
- **IF TEMP ABV 65 DEG C in outer cell or 57 DEG C in inner cell:**

  APU...AS RQRD

L2 *APU if available may be started and APU GEN used to allow IDG disconnection.*

L1
  - **If opposite GEN avail:**

    IDG (AFFECTED SIDE)..OFF

FUEL L (R) OUTER (INNER) TK LO TEMP

Applicable to: ALL

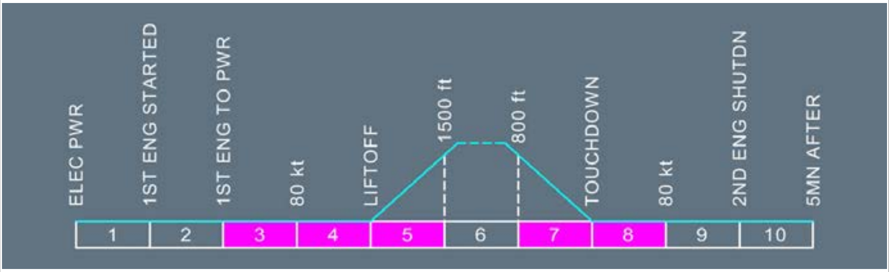
Ident.: PRO-ABN-FUEL-BM-00016827.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the fuel temperature is approximately below -43 °C.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-BM-00011208.0001001 / 25 FEB 14

- **On the ground before takeoff:**

  DELAY T.O

  L2 *Do not takeoff until temperatures are within limits.*

L1
- **In flight:**

  Crew awareness.

  L2 Consider descending to a lower altitude and/or increasing Mach to increase TAT.

FUEL L (R) OUTER XFR CLOSED

Applicable to: ALL

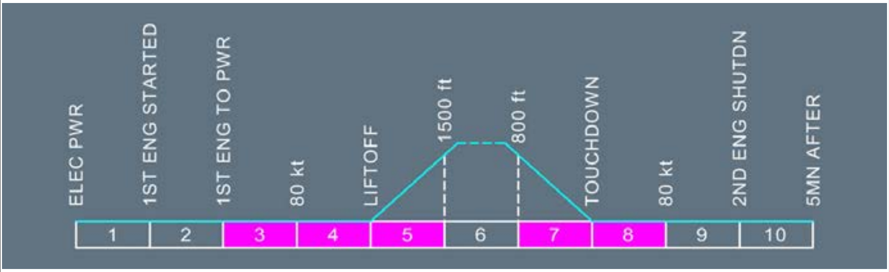
Ident.: PRO-ABN-FUEL-V-00016829.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both transfer valves remain closed after inner tank reaches the low level.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-V-00014879.0006001 / 07 MAR 13

Note: When fuel quantity in affected wing reaches low level, corresponding FUEL WING TK LO LVL warning is triggered.

L (R) OUTER TK UNUSABLE

Ident.: PRO-ABN-FUEL-V-00014881.0006001 / 07 MAR 13

STATUS

L (R) OUTER TK UNUSABLE

FUEL L (R) OUTER XFR OPEN

Applicable to: ALL

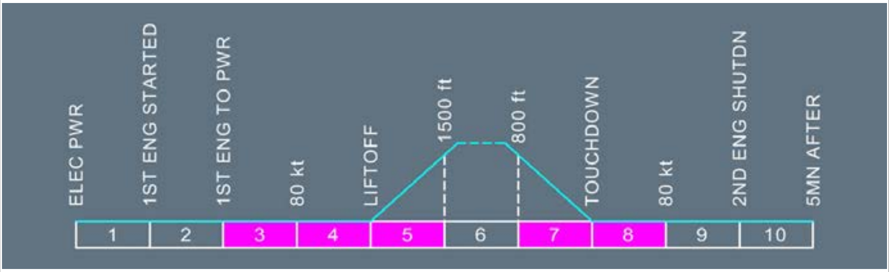
Ident.: PRO-ABN-FUEL-W-00016831.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when either transfer valve opens before inner tank reaches low level.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-W-00014882.0006001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-FUEL-W-00014883.0006001 / 07 MAR 13

STATUS

INOP SYS

L (R) CELL VALVE

FUEL L (R) TK PUMP 1(2) LO PR

Applicable to: ALL

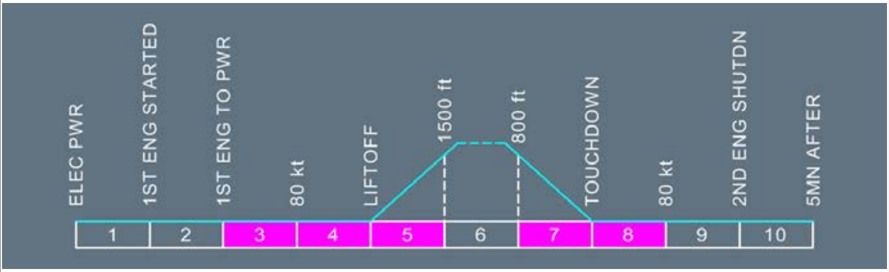
Ident.: PRO-ABN-FUEL-D-00016832.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the pressure of one tank pump is low.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-D-00011177.0002001 / 13 AUG 10

TK PUMP (AFFECTED)..OFF

L2 *Note:* *Aircraft altitude must be limited to 35 000 ft if a single fuel pump feeds both engines with hot JET B (JP4) fuel (fuel temperature above 30 °C).*

Ident.: PRO-ABN-FUEL-D-00011178.0001001 / 13 AUG 10

STATUS

	INOP SYS
	TK PUMP (affected)

FUEL L (R) TK PUMP 1 + 2 LO PR
(CENTER TANK EMPTY)

Applicable to: ALL

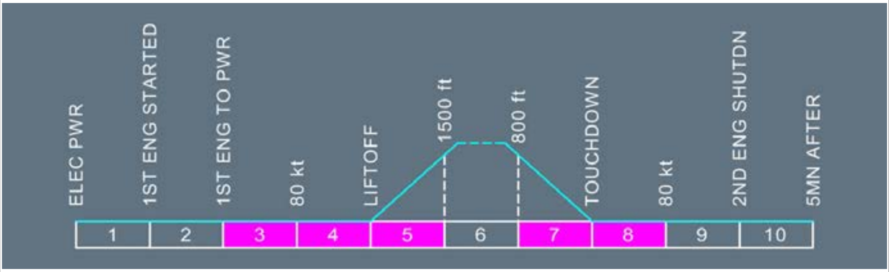
Ident.: PRO-ABN-FUEL-C-00018184.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the pressure of the tank pumps is low.

Flight Phase Inhibition:



Continued on the following page

FUEL L (R) TK PUMP 1 + 2 LO PR (Cont'd)
(CENTER TANK EMPTY)

Ident.: PRO-ABN-FUEL-C-00017648.0004001 / 21 MAR 16

- **IF NO FUEL LEAK:**
  FUEL X FEED (IF ABOVE FL150)..ON

ENG MODE SEL..IGN

L2 *The selection of continuous relight protects against flame-out, caused by possible fuel supply surging.*

L1 TK PUMP 1 (AFFECTED)..OFF
TK PUMP 2 (AFFECTED)..OFF

- **WHEN TK (affected) FUEL RQRD:**
  TK (AFFECTED) FEED..GRVTY ONLY

L2 *Apply GRVTY FUEL FEED procedure, (Refer to PRO-ABN-FUEL [QRH] GRAVITY FUEL FEEDING).*
Fuel from the affected tank may be used immediately if there is no ceiling limitation for gravity fuel feeding.

L1 FUEL X FEED (IF BELOW FL150)..OFF

- **If FUEL X FEED off:**

L2 As long as fuel X feed is closed, associated engine is fed by gravity only.

L1 PROC: GRVTY FUEL FEEDING

L2 *Apply GRVTY FUEL FEED procedure, (Refer to PRO-ABN-FUEL [QRH] GRAVITY FUEL FEEDING).*

L1 AVOID NEGATIVE G FACTOR

L2 *Avoiding negative g will prevent fuel surging and therefore reduce the risk of engine malfunction.*

Ident.: PRO-ABN-FUEL-C-00011175.0001001 / 13 AUG 10

STATUS

- **If FUEL X FEED off:**
  PROC:GRVTY FUEL FEEDING
  AVOID NEGATIVE G FACTOR

TK (AFFECTED) GRVTY FEED ONLY

INOP SYS

TK PUMPS (affected)

FUEL L (R) TK PUMP 1 + 2 LO PR
(CENTER TANK NOT EMPTY)

Applicable to: ALL

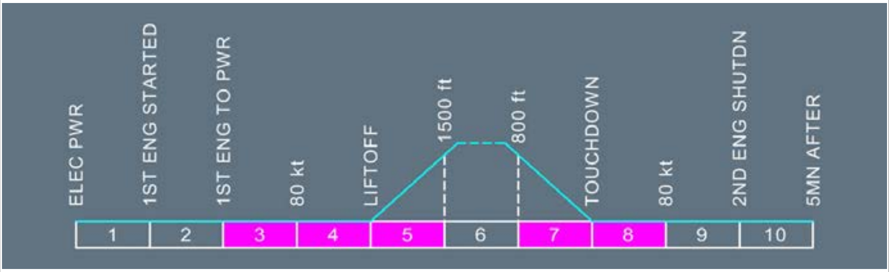
Ident.: PRO-ABN-FUEL-B-00018196.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the pressure of the tank pumps is low.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-B-00011170.0003001 / 26 JUL 12

FUEL MODE SEL (IF CTR TK NOT FEEDING)....................MAN

L2 *Setting FUEL MODE SEL pb-sw to MAN will allow center tank pumps to run.*
If the center tank is not empty at slat extension, CTR TK PUMPs should be switched OFF. This action will prevent a possible wing tank overflow on ground, due to IDG fuel recirculation.

L1 TK PUMP 1 (AFFECTED)....................OFF
TK PUMP 2 (AFFECTED)....................OFF

- **WHEN TK (affected) FUEL RQRD:**

L2 Apply the GRVTY FUEL FEEDING procedure, (*Refer to PRO-ABN-FUEL [QRH] GRAVITY FUEL FEEDING*).

L1 TK (AFFECTED) FEED....................GRVTY ONLY
PROC: GRVTY FUEL FEEDING

Continued on the following page

FUEL L (R) TK PUMP 1 + 2 LO PR (Cont'd)
(CENTER TANK NOT EMPTY)

Ident.: PRO-ABN-FUEL-B-00011171.0001001 / 13 AUG 10

STATUS

	INOP SYS
PROC:GRVTY FUEL FEEDING	TK PUMPS (affected)
TK (AFFECTED) GRVTY FEED ONLY	
CTR TK FEED: MAN ONLY	

FUEL L (R) WING TK LO LVL

Applicable to: ALL

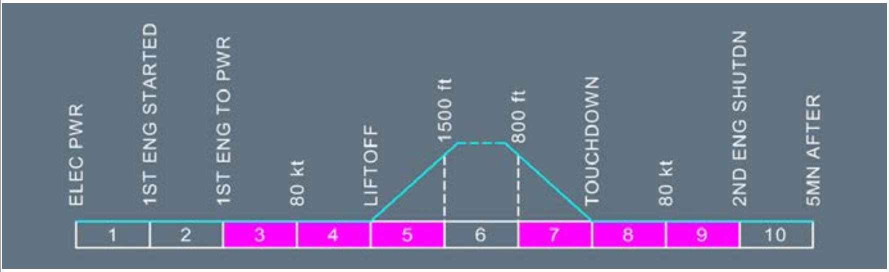
Ident.: PRO-ABN-FUEL-E-00016837.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when left or right wing tanks quantity is below 750 kg (1 650 lb). This alert is triggered by sensors getting dry and is independent from the fuel quantity indications.

Flight Phase Inhibition:



Continued on the following page

FUEL L (R) WING TK LO LVL (Cont'd)

Ident.: PRO-ABN-FUEL-E-00018927.0002001 / 21 MAR 16

- **If center tank not empty:**
  FUEL MODE SEL.. MAN
- **IF NO FUEL LEAK AND FUEL IMBALANCE:**
  FUEL X FEED.. ON
  TK PUMP 1 (ON SIDE WITH LO LVL).................................... OFF
  TK PUMP 2 (ON SIDE WITH LO LVL).................................... OFF

L2 *Note:* *TK PUMP 1+2 (on side with LO LVL) LO PR warning will be triggered.*

Ident.: PRO-ABN-FUEL-E-00018928.0001001 / 21 MAR 16

STATUS

	INOP SYS
If center tank not empty: CTR TK FEED: MAN ONLY	TK PUMPS

FUEL L + R WING TK LO LVL

Applicable to: ALL

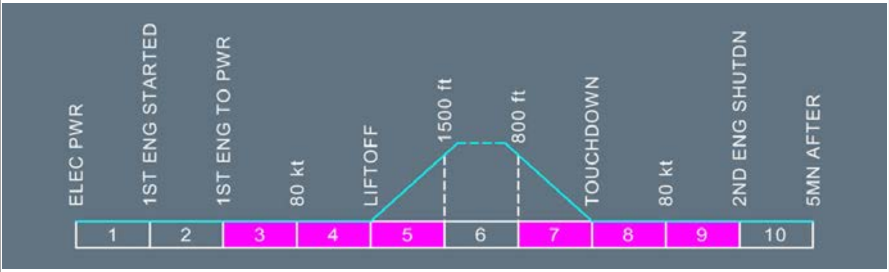
Ident.: PRO-ABN-FUEL-BO-00016810.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the low level is detected in both wing inner tanks. The alert is triggered by sensors getting dry and is independent from the fuel quantity indications.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-BO-00018673.0003001 / 21 MAR 16

LAND ASAP

FUEL MODE SEL (IF CENTER TANK NOT EMPTY)....................MAN
ALL TK PUMPS....................ON

L2 *All pumps in center tank and in wing tanks will run.*

L1 ■ **IF NO FUEL LEAK:**
FUEL X FEED....................ON

■ **IF GRVTY FEED:**
FUEL X FEED....................OFF

FUEL X FEED VALVE FAULT

Applicable to: ALL

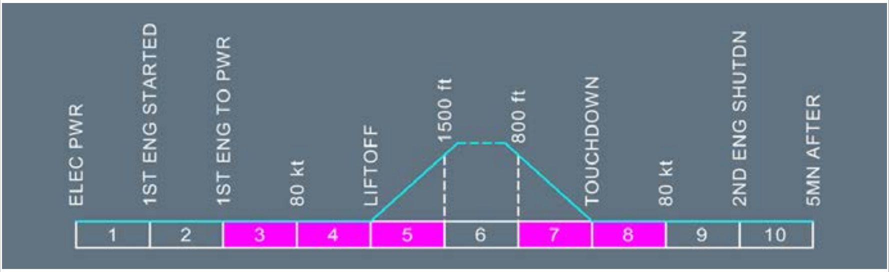
Ident.: PRO-ABN-FUEL-J-00016842.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the valve position disagrees with the selected position.

Flight Phase Inhibition:



Ident.: PRO-ABN-FUEL-J-00011206.0001001 / 25 FEB 14

L2 If valve failed open, maintain fuel balance with selective use of pumps.
If valve failed closed and if unable to maintain an acceptable balance, land as soon as possible.

L1 Crew awareness.

Ident.: PRO-ABN-FUEL-J-00011207.0001001 / 13 AUG 10

STATUS

INOP SYS

FUEL X FEED

Intentionally left blank

FWS FWC 1 + 2 FAULT

Applicable to: ALL

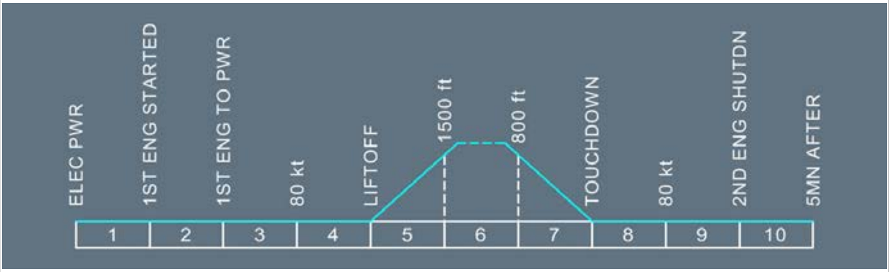
Ident.: PRO-ABN-FWS-H-00017311.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both FWC 1 and FWC 2 are failed, or when the communication between the FWC and the EIS is lost.

Flight Phase Inhibition:



Ident.: PRO-ABN-FWS-H-00010055.0001001 / 14 FEB 13

MONITOR SYS
MONITOR OVERHEAD PANEL

NOT AVAIL

ECAM WARN
ALTI ALERT
STATUS
A/CALL OUT
MEMO

Continued on the following page

FWS FWC 1 + 2 FAULT (Cont'd)

Ident.: PRO-ABN-FWS-H-00010056.0001001 / 14 FEB 13

L2

Other INOP SYS

CAT2

ECAM Cautions and Warnings, aural warnings, master caution and warning lights are lost.
ECAM system pages are still available. therefore check regularly (more often than usual) cockpit panels for local warnings and ECAM system pages for system checks.
Check the general status of the systems for the DES /APPR preparation.

FWS FWC 1(2) FAULT

Applicable to: ALL

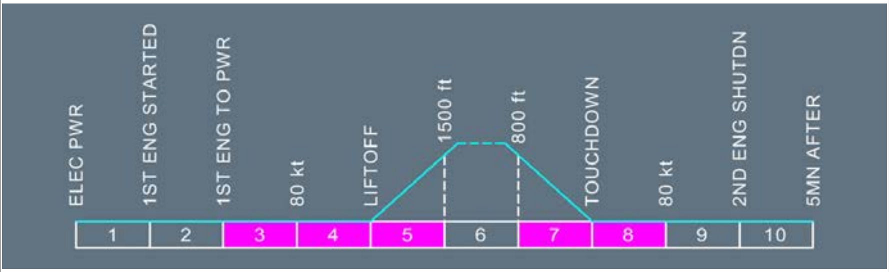
Ident.: PRO-ABN-FWS-G-00017310.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when either FWC 1 or, FWC 2 is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-FWS-G-00010059.0001001 / 10 AUG 10

Crew awareness.

Continued on the following page

FWS FWC 1(2) FAULT (Cont'd)

Ident.: PRO-ABN-FWS-G-00010060.0001001 / 10 AUG 10

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	CAT 3 DUAL FWC 1(2)

FWS OEB/FWC DISCREPANCY

Applicable to: ALL

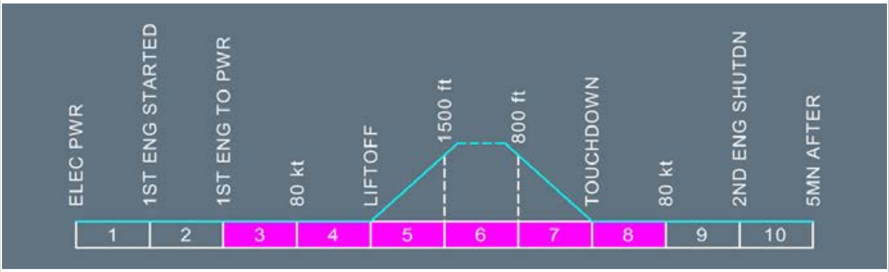
Ident.: PRO-ABN-FWS-J-00017314.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when FWC 1 and FWC 2 do not have the same OEB s listed in their OEB reminder database.

Flight Phase Inhibition:



Ident.: PRO-ABN-FWS-J-00010050.0001001 / 10 AUG 10

OEB DATABASE..XCHECK

L2 *This action is normally performed by maintenance.*

FWS SDAC 1 + 2 FAULT

Applicable to: ALL

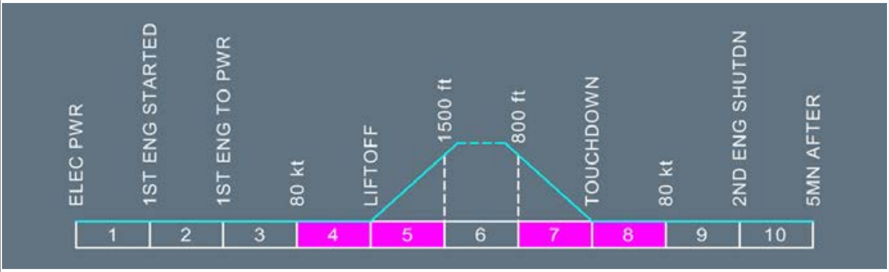
Ident.: PRO-ABN-FWS-E-00017306.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both SDAC 1 and SDAC 2 are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-FWS-E-00010053.0001001 / 10 AUG 10

MONITOR OVERHEAD PANEL

L2 *Amber cautions are lost. Aircraft status on the ECAM STATUS page is lost.*
Only red warnings, engine and fuel parameters, and slat/flap positions are available on the upper ECAM DU.

L1 ECAM ENG FUEL F/CTL WHEEL (L/G POS IND) SYS PAGES AVAIL.

Ident.: PRO-ABN-FWS-E-00010054.0002001 / 10 AUG 10

STATUS

INOP SYS

SDAC 1 + 2

FWS SDAC 1(2) FAULT

Applicable to: ALL

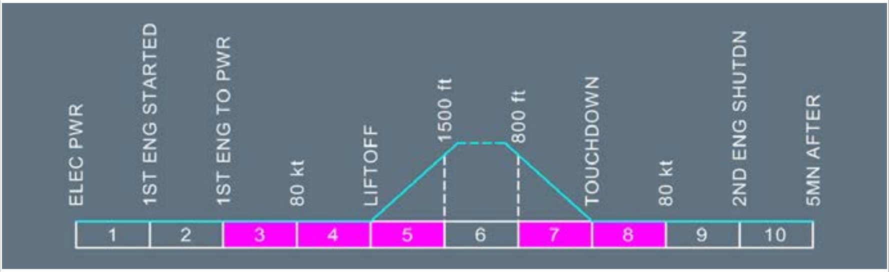
Ident.: PRO-ABN-FWS-D-00017308.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alerts triggers when either SDAC 1 or, SDAC 2 is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-FWS-D-00010051.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-FWS-D-00010052.0001001 / 10 AUG 10

L12

STATUS

INOP SYS

SDAC 1(2)

Note: *Although the ECAM may display some symbols and/or parameters in amber, this does not always signify that additional systems are failed.*

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HYD B ELEC PUMP LO PR OR OVHT

Applicable to: ALL

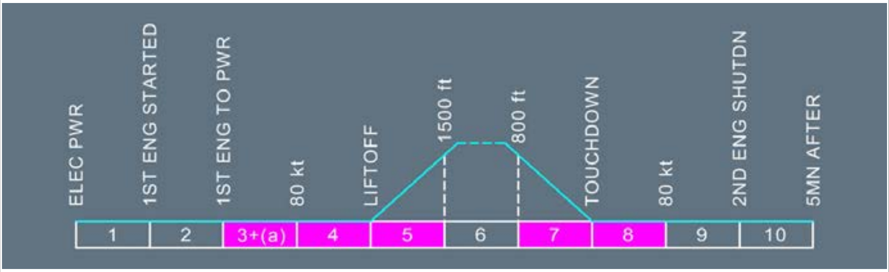
Ident.: PRO-ABN-HYD-T-00017137.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 LO PR: This alert triggers when the pump outlet pressure ≤1 450 PSI (the alert resets if pressure ≥1 750 PSI).
OVHT: This alert triggers when the blue electric pump overheats.

Flight Phase Inhibition:



Note: (a) The Flight Phase Inhibition 3 is only available for HYD B ELEC PUMP OVHT.

Ident.: PRO-ABN-HYD-T-00011661.0002001 / 27 NOV 12

BLUE ELEC PUMP...OFF
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

ASSOCIATED PROCEDURES

B SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD B ELEC PUMP LO PR OR OVHT (Cont'd)

Ident.: PRO-ABN-HYD-T-00018313.0003001 / 21 MAR 17

L12

STATUS

APPR PROC

HYD LO PR

- **IF BLUE OVHT OUT:**
  BLUE ELEC PUMP.. AUTO

LDG DIST PROC.. APPLY

FUEL CONSUMPT INCRSD
See [(1)]
FMS PRED UNRELIABLE
See [(2)]
SLATS SLOW
CAT 3 SINGLE ONLY

INOP SYS

BLUE HYD
SPLR 3
CAT 3 DUAL
B ELEC PUMP
STEEP APPR

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*
(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD B RSVR LO AIR PR

Applicable to: ALL

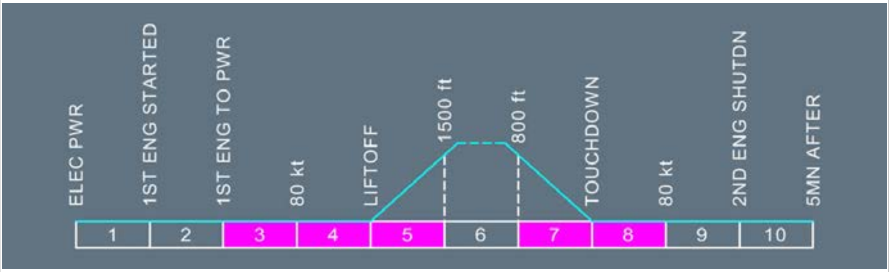
Ident.: PRO-ABN-HYD-A-00017106.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the reservoir air pressure ≤ 22 PSI (the alert resets if pressure ≥ 25 PSI).
This alert triggers when the reservoir air pressure ≤ 30 PSI (detected in flight but only displayed on ground after landing).

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-A-00011602.0002001 / 05 MAR 13

- **IF PRESS FLUCTUATES:**
  BLUE ELEC PUMP....................OFF

ASSOCIATED PROCEDURES

B SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD B RSVR LO AIR PR (Cont'd)

Ident.: PRO-ABN-HYD-A-00018312.0003001 / 21 MAR 17

L12

STATUS

APPR PROC

The probability of cavitation increases with altitude. Therefore, it may be possible to restore the system after descending to a lower altitude.

HYD LO PR

BLUE ELEC PUMP...AUTO

- **If sys not recovered:**

  LDG DIST PROC...APPLY

FUEL CONSUMPT INCRSD

See (1)

FMS PRED UNRELIABLE

See (2)

SLATS SLOW

CAT 3 SINGLE ONLY

INOP SYS

BLUE HYD
SPLR 3
CAT 3 DUAL
B ELEC PUMP
STEEP APPR

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD B RSVR LO LVL

Applicable to: ALL

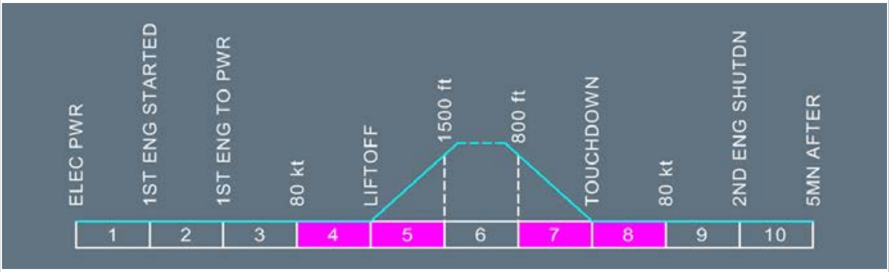
Ident.: PRO-ABN-HYD-C-00017144.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 The alert triggers when the fluid quantity < 2.4 l (0.63 US Gal).

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-C-00011606.0002001 / 05 MAR 13

BLUE ELEC PUMP .... OFF

ASSOCIATED PROCEDURES

B SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD B RSVR LO LVL (Cont'd)

Ident.: PRO-ABN-HYD-C-00018314.0003001 / 21 MAR 17

L12

STATUS

LDG DIST PROC.. APPLY

FUEL CONSUMPT INCRSD

See [(1)]

FMS PRED UNRELIABLE

See [(2)]

SLATS SLOW

CAT 3 SINGLE ONLY

INOP SYS

BLUE HYD
SPLR 3
CAT 3 DUAL
EMER GEN
B ELEC PUMP
STEEP APPR

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD B RSVR OVHT

Applicable to: ALL

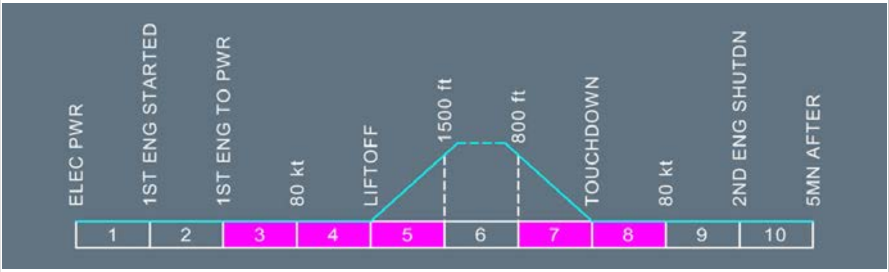
Ident.: PRO-ABN-HYD-B-00017108.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the fluid temperature ≥93 °C (the alert resets if temperature ≤88 °C).

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-B-00011604.0002001 / 05 MAR 13

BLUE ELEC PUMP .... OFF

ASSOCIATED PROCEDURES

B SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD B RSVR OVHT (Cont'd)

Ident.: PRO-ABN-HYD-B-00018315.0003001 / 21 MAR 17

L12

STATUS

APPR PROC

HYD LO PR

- **IF BLUE OVHT OUT:**
  BLUE ELEC PUMP.. AUTO
- **If sys not recovered:**
  LDG DIST PROC..APPLY

FUEL CONSUMPT INCRSD

See (1)

FMS PRED UNRELIABLE

See (2)

SLATS SLOW

CAT 3 SINGLE ONLY

INOP SYS

BLUE HYD
SPLR 3
CAT 3 DUAL
B ELEC PUMP
STEEP APPR

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD G ENG 1 PUMP LO PR
(PTU OPERATIVE)

Applicable to: ALL

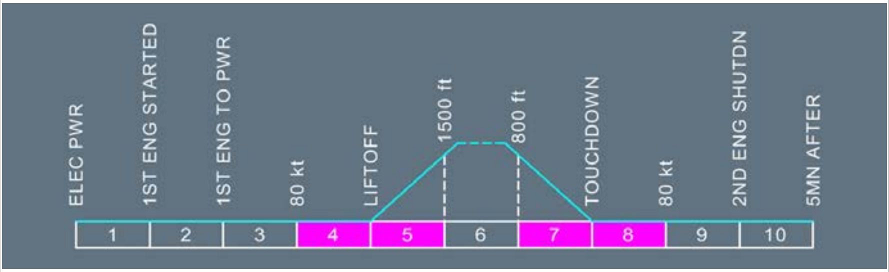
Ident.: PRO-ABN-HYD-N-00017136.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the pump outlet pressure ≤1 750 PSI (the alert resets if pressure ≥2 200 PSI).

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-N-00011648.0001001 / 18 AUG 10

GREEN ENG 1 PUMP..OFF

Ident.: PRO-ABN-HYD-N-00011649.0001001 / 17 MAR 11

STATUS

INOP SYS

G ENG 1 PUMP

HYD G ENG 1 PUMP LO PR
(PTU INOPERATIVE)

Applicable to: ALL

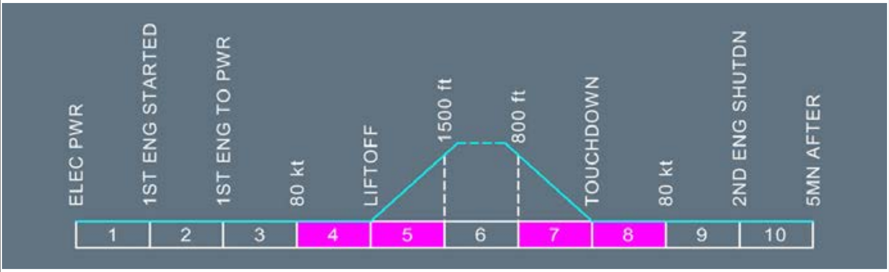
Ident.: PRO-ABN-HYD-P-00018805.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the pump outlet pressure ≤1 750 PSI (the alert resets if pressure ≥2 200 PSI).

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-P-00011652.0001001 / 18 AUG 10

GREEN ENG 1 PUMP..OFF

ASSOCIATED PROCEDURES

G SYS LO PR

SECONDARY FAILURES

*WHEEL
*F/CTL

Continued on the following page

HYD G ENG 1 PUMP LO PR (Cont'd)
(PTU INOPERATIVE)

Ident.: PRO-ABN-HYD-P-00018316.0001001 / 21 MAR 16

STATUS

L/G .... GRVTY EXTN LDG DIST PROC .... APPLY SLATS/FLAPS SLOW CAT 3 SINGLE	**INOP SYS** GREEN HYD SPLR 1+5 CAT 3 DUAL N.W. STEER AUTO BRK NORM BRK L/G RETRACT REVERSER 1 PTU G ENG 1 PUMP YAW DAMPER 1

HYD G RSVR LO AIR PR

Applicable to: ALL

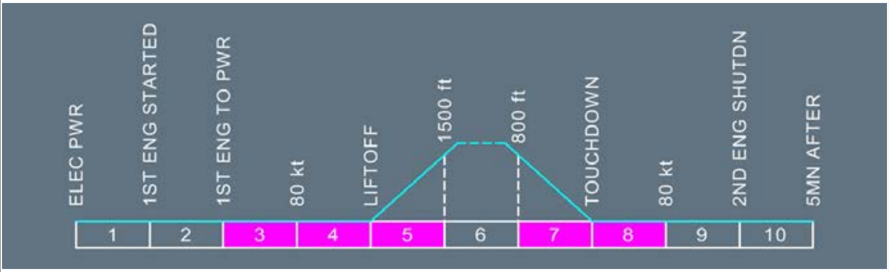
Ident.: PRO-ABN-HYD-D-00017104.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the reservoir air pressure ≤22 PSI (the alert resets if air pressure ≥25 PSI).

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-D-00011609.0002001 / 05 MAR 13

- **IF PRESS FLUCTUATES:**
  - PTU...OFF
  - GREEN ENG 1 PUMP...OFF

G ENG 1 PUMP LO PR

ASSOCIATED PROCEDURES

G SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*WHEEL
*F/CTL

Continued on the following page

HYD G RSVR LO AIR PR (Cont'd)

Ident.: PRO-ABN-HYD-D-00018317.0006001 / 21 MAR 17

L12

STATUS

APPR PROC

HYD LO PR

The probability of cavitation increases with altitude. Therefore, it may be possible to restore the system after descending to a lower altitude.

GREEN ENG 1 PUMP.. ON

- **IF HYD NOT RECOVERED:**

  L/G...GRVTY EXTN

  Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION

  LDG DIST PROC..APPLY

FUEL CONSUMPT INCRSD

See (1)

FMS PRED UNRELIABLE

See (2)

ALTN Y BRK WITH A/SKID

SLATS/FLAPS SLOW

CAT 3 SINGLE ONLY

INOP SYS

GREEN HYD
SPLR 1 + 5
CAT 3 DUAL
N/W STRG
AUTO BRK
NORM BRK
L/G RETRACT
REVERSER 1
YAW DAMPER 1

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD G RSVR LO LVL

Applicable to: ALL

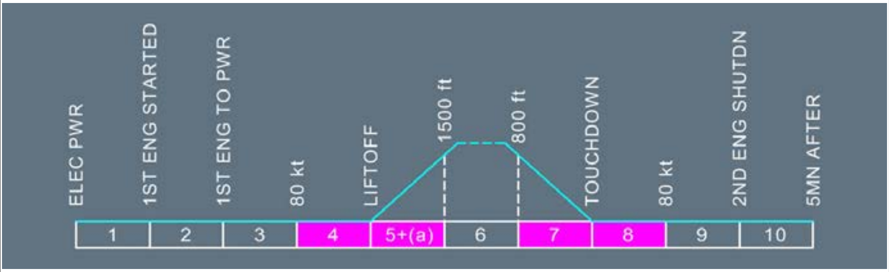
Ident.: PRO-ABN-HYD-F-00017142.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the fluid quantity < 3.5 l (0.92 US Gal).

Flight Phase Inhibition:



L1 *Note: The HYD G RSVR LO LVL alert is inhibited for the first 15 s of flight phase 5.*

Ident.: PRO-ABN-HYD-F-00011614.0002001 / 05 MAR 13

PTU...OFF
GREEN ENG 1 PUMP..OFF
G ENG 1 PUMP LO PR

ASSOCIATED PROCEDURES

G SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*WHEEL
*F/CTL

Continued on the following page

HYD G RSVR LO LVL (Cont'd)

Ident.: PRO-ABN-HYD-F-00018320.0006001 / 21 MAR 17

L12

STATUS

L/G.. GRVTY EXTN

Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION

LDG DIST PROC.. APPLY

FUEL CONSUMPT INCRSD

See [(1)]

FMS PRED UNRELIABLE

See [(2)]

ALTN Y BRK WITH A/SKID

SLATS/FLAPS SLOW

CAT 3 SINGLE ONLY

INOP SYS

GREEN HYD
SPLR 1 + 5
CAT 3 DUAL
N/W STRG
AUTO BRK
NORM BRK
L/G RETRACT
REVERSER 1
YAW DAMPER 1

[(1)] *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

[(2)] *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD G RSVR OVHT

Applicable to: ALL

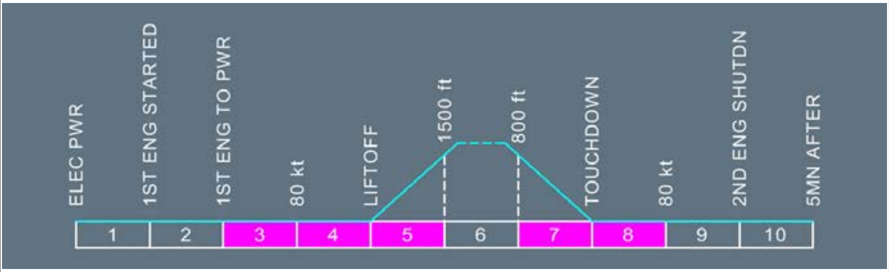
Ident.: PRO-ABN-HYD-E-00017107.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the fluid temperature ≥93 °C (the alert resets if temperature ≤88 °C).

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-E-00011612.0002001 / 05 MAR 13

PTU..OFF
GREEN ENG 1 PUMP..OFF
G ENG 1 PUMP LO PR

ASSOCIATED PROCEDURES

G SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*WHEEL
*F/CTL

Continued on the following page

HYD G RSVR OVHT (Cont'd)

Ident.: PRO-ABN-HYD-E-00018321.0006001 / 02 MAY 17

L12

STATUS

APPR PROC	INOP SYS
HYD LO PR	GREEN HYD
● **IF GREEN OVHT OUT:**	SPLR 1 + 5
GREEN ENG 1 PUMP....................ON	CAT 3 DUAL
● **IF HYD NOT RECOVERED:**	N/W STRG
L/G....................GRVTY EXTN	AUTO BRK
Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION	NORM BRK
LDG DIST PROC....................APPLY	L/G RETRACT
FUEL CONSUMPT INCRSD	REVERSER 1
See (1)	YAW DAMPER 1
FMS PRED UNRELIABLE	
See (2)	
SLATS/FLAPS SLOW	
CAT 3 SINGLE ONLY	

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD Y ELEC PUMP LO PR OR OVHT

Applicable to: ALL

Ident.: PRO-ABN-HYD-M-00017133.0001001 / 21 MAR 16

ANNUNCIATIONS

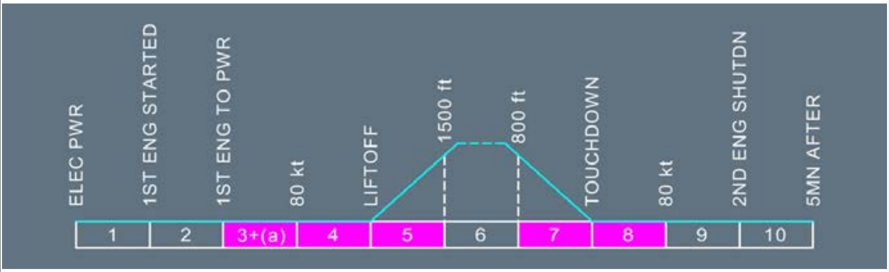
Triggering Conditions:

L2 LO PR: This alert triggers when the yellow system pressure ≤1 450 PSI (the alert resets if pressure ≥1 750 PSI) with:

- Y ELEC PUMP pb at ON
- Y ENG PUMP and PTU not available.

OVHT: This alert triggers when the yellow electric pump overheats.

Flight Phase Inhibition:



Note: *(a) The Flight Phase Inhibition 3 is only available for HYD Y ELEC PUMP OVHT.*

Continued on the following page

HYD Y ELEC PUMP LO PR OR OVHT (Cont'd)

Ident.: PRO-ABN-HYD-M-00019032.0003001 / 21 MAR 16

YELLOW ELEC PUMP.. OFF

ASSOCIATED PROCEDURES

Y SYS LO PR

BRK Y ACCU PR MONITOR

L2 *This check is recommended to cover the case of a pipe rupture, which could lead to the simultaneous loss of the hydraulic system and the accumulator fluid. If this occurs, the loss of the accumulator should be observed on the indicator within 10 min. In that case: The only remaining braking means is the normal braking using green pressure, the parking brake should not be used since it is not available and the chocks should be in place before engine 1 shutdown.*

L1 FUEL CONSUMPT INCRSD

FMS PRED UNRELIABLE

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD Y ELEC PUMP LO PR OR OVHT (Cont'd)

Ident.: PRO-ABN-HYD-M-00018322.0003001 / 21 MAR 17

L12

STATUS

APPR PROC

HYD LO PR

- **IF YELLOW OVHT OUT:**
  YELLOW ENG 2 PUMP..ON
  PTU...AUTO
  The above two lines are only displayed, in case of an electrical pump overheat.

LDG DIST PROC.. APPLY

FUEL CONSUMPT INCRSD

See [(1)]

FMS PRED UNRELIABLE

See [(2)]

FLAPS SLOW

CAT 3 SINGLE ONLY

INOP SYS

YELLOW HYD
SPLR 2+4
CAT 3 DUAL
REVERSER 2
Y ELEC PUMP
YAW DAMPER 2

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD Y ENG 2 PUMP LO PR
(PTU OPERATIVE)

Applicable to: ALL

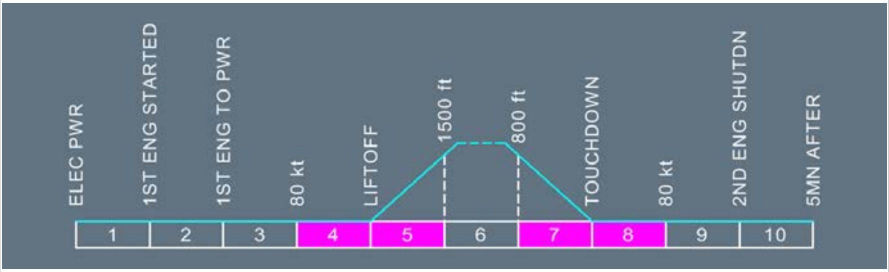
Ident.: PRO-ABN-HYD-O-00017135.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the pump outlet pressure ≤1 750 PSI (the alert resets if pressure ≥2 200 PSI).

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-O-00011650.0001001 / 18 AUG 10

YELLOW ENG 2 PUMP..OFF

Ident.: PRO-ABN-HYD-O-00011651.0001001 / 18 AUG 10

STATUS
INOP SYS
Y ENG 2 PUMP

HYD Y ENG 2 PUMP LO PR
(PTU INOPERATIVE)

Applicable to: ALL

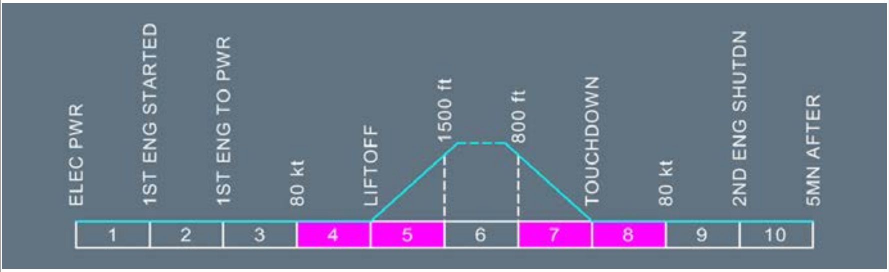
Ident.: PRO-ABN-HYD-Q-00018806.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the pump outlet pressure ≤1 750 PSI (the alert resets if pressure ≥2 200 PSI).

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-Q-00011654.0001001 / 18 AUG 10

YELLOW ENG 2 PUMP..OFF

ASSOCIATED PROCEDURES

Y SYS LO PR

L2 *Note: If yellow system is affected, the yellow electrical pump may be used.*

L1

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD Y ENG 2 PUMP LO PR (Cont'd)
(PTU INOPERATIVE)

Ident.: PRO-ABN-HYD-Q-00018323.0001001 / 21 MAR 16

L12

STATUS

LDG DIST PROC.. APPLY

FLAPS SLOW
CAT 3 SINGLE
See (1)

INOP SYS

YELLOW HYD
SPLR 2+4
CAT 3 DUAL
REVERSER 2
PTU
Y ENG 2 PUMP
YAW DAMPER 2

(1) *Note:* *Following a yellow hydraulic system failure, the parking brake may be inoperative due to a yellow accumulator low pressure.*

HYD Y RSVR LO AIR PR

Applicable to: ALL

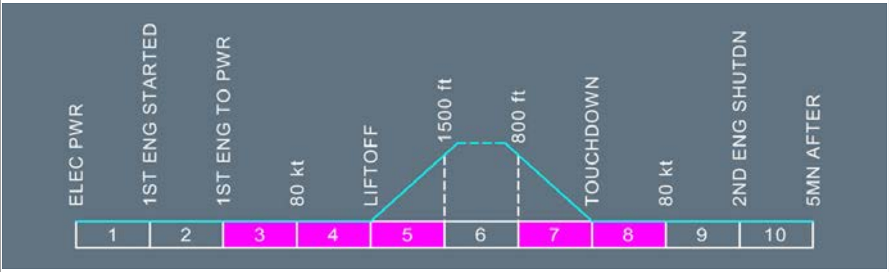
Ident.: PRO-ABN-HYD-G-00017105.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the reservoir air pressure ≤ 22 PSI (the alert resets if pressure ≥ 25 PSI).

Flight Phase Inhibition:



Continued on the following page

HYD Y RSVR LO AIR PR (Cont'd)

Ident.: PRO-ABN-HYD-G-00011626.0003001 / 27 NOV 12

- **IF PRESS FLUCTUATES:**
  PTU....................OFF
  YELLOW ENG 2 PUMP....................OFF
  YELLOW ELEC PUMP....................OFF

BRK Y ACCU PR MONITOR

L2 *This check is recommended to cover the case of a pipe rupture, which could lead to the simultaneous loss of the hydraulic system and the accumulator fluid. If this occurs, the loss of the accumulator should be observed on the indicator within 10 min. In that case : The only remaining braking means is normal braking, using green pressure. The parking brake should not be used since, it is not available. And, the chocks should be in place before Engine 1 shutdown.*

L1 Y ENG 2 PUMP LO PR

ASSOCIATED PROCEDURES

Y SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD Y RSVR LO AIR PR (Cont'd)

Ident.: PRO-ABN-HYD-G-00018324.0006001 / 21 MAR 17

L2 The probability of cavitation increases with altitude.
Therefore, it may be possible to restore the system after descending to a lower altitude.

L12

STATUS

APPR PROC

HYD LO PR
YELLOW ENG 2 PUMP.. ON

- **If sys not recovered:**
  LDG DIST PROC..APPLY

FUEL CONSUMPT INCRSD
See (1)
FMS PRED UNRELIABLE
See (2)
FLAPS SLOW
CAT 3 SINGLE

INOP SYS

YELLOW HYD
SPLR 2 + 4
CAT 3 DUAL
REVERSER 2
YAW DAMPER 2

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*
(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD Y RSVR LO LVL

Applicable to: ALL

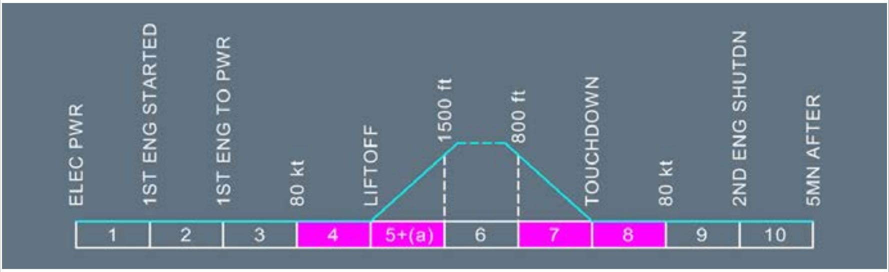
Ident.: PRO-ABN-HYD-I-00017143.0002001 / 06 SEP 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the fluid quantity < 3.5 l (0.92 US Gal).

Flight Phase Inhibition:



L1 *Note:* *(a) The HYD Y RSVR LO LVL alert is inhibited for the first 15 s of flight phase 5.*

Continued on the following page

HYD Y RSVR LO LVL (Cont'd)

Ident.: PRO-ABN-HYD-I-00011631.0003001 / 05 MAR 13

PTU....................OFF
YELLOW ENG 2 PUMP....................OFF
YELLOW ELEC PUMP....................OFF
BRK Y ACCU PR MONITOR

L2 *This check is recommended to cover the case of a pipe rupture, which could lead to the simultaneous loss of the hydraulic system and the accumulator fluid. If this occurs, the loss of the accumulator should be observed on the indicator within 10 min. In that case: The only remaining braking means is normal braking, using green pressure. The parking brake should not be used since, it is not available. And, the chocks should be in place before Engine 1 shutdown.*

L1 Y ENG 2 PUMP LO PR

ASSOCIATED PROCEDURES

Y SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD Y RSVR LO LVL (Cont'd)

Ident.: PRO-ABN-HYD-I-00018326.0005001 / 21 MAR 17

L12

STATUS

LDG DIST PROC.. APPLY

FUEL CONSUMPT INCRSD
See (1)
FMS PRED UNRELIABLE
See (2)
FLAPS SLOW
CAT 3 SINGLE
See (3)

INOP SYS

YELLOW HYD
SPLR 2 + 4
CAT 3 DUAL
REVERSER 2
CARGO DOOR
YAW DAMPER 2

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

(3) *Note: Following a yellow hydraulic system failure, the parking brake may be inoperative due to a yellow accumulator low pressure.*

HYD Y RSVR OVHT

Applicable to: ALL

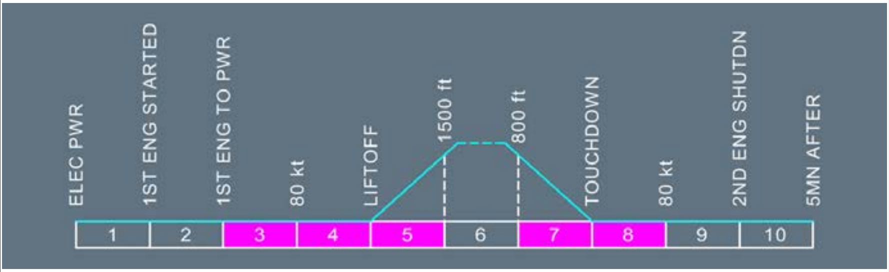
Ident.: PRO-ABN-HYD-H-00017109.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the fluid temperature ≥93 °C (the alert resets if temperature ≤88 °C).

Flight Phase Inhibition:



Continued on the following page

HYD Y RSVR OVHT (Cont'd)

Ident.: PRO-ABN-HYD-H-00011629.0003001 / 05 MAR 13

PTU....................OFF
YELLOW ENG 2 PUMP....................OFF
YELLOW ELEC PUMP....................OFF
BRK Y ACCU PR MONITOR

L2 *This check is recommended to cover the case of a pipe rupture, which could lead to the simultaneous loss of the hydraulic system and the accumulator fluid. If this occurs, the loss of the accumulator should be observed on the indicator within 10 min. In that case: The only remaining braking means is normal braking, using green pressure. The parking brake should not be used since, it is not available. And, the chocks should be in place before Engine 1 shutdown.*

L1 Y ENG 2 PUMP LO PR

ASSOCIATED PROCEDURES

Y SYS LO PR
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD Y RSVR OVHT (Cont'd)

Ident.: PRO-ABN-HYD-H-00018327.0006001 / 21 MAR 17

L12

STATUS

APPR PROC

HYD LO PR

- **IF YELLOW OVHT OUT:**
  YELLOW ENG 2 PUMP..ON
- **If not recovered:**
  LDG DIST PROC...APPLY

FUEL CONSUMPT INCRSD

See (1)

FMS PRED UNRELIABLE

See (2)

FLAPS SLOW

CAT 3 SINGLE

INOP SYS

YELLOW HYD
SPLR 2 + 4
CAT 3 DUAL
REVERSER 2
YAW DAMPER 2

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD B+Y SYS LO PR

Applicable to: ALL

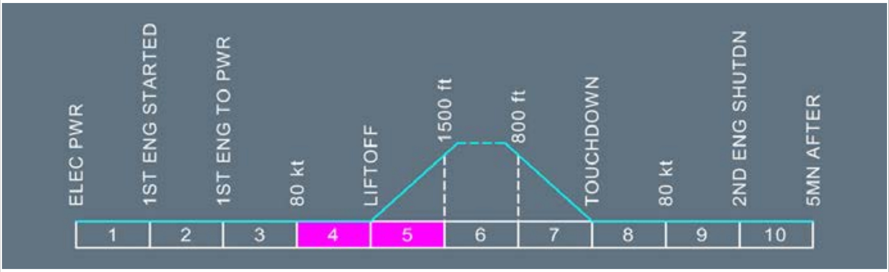
Ident.: PRO-ABN-HYD-L-00018917.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the blue and yellow systems pressure ≤1 450 PSI (the alert resets if pressure ≥1 750 PSI).

Flight Phase Inhibition:



Continued on the following page

HYD B+Y SYS LO PR (Cont'd)

Ident.: PRO-ABN-HYD-L-00018727.0002001 / 21 MAR 16

L2 *Note:* *If the yellow hydraulic system is lost due to low level, the "HYD PTU FAULT" ECAM message may appear, and requests that the flight crew switches the PTU off.*

L1 **LAND ASAP**

- **If yellow sys lost by ENG 2 PUMP LO PR:**
  YELLOW ELEC PUMP.....ON
- **If blue sys lost by ELEC PUMP LO PR:**
  RAT.....MAN ON
  L2 *To extend the RAT, the flight crew must press the RAT MAN ON pb located on the Hydraulic overhead panel.*
  L1 MIN RAT SPD.....140 KT

AFFECTED PUMPS.....OFF
MAX SPEED.....320/0.77

L2 *Note:* *Flight controls remain in normal law.*

L1 MANEUVER WITH CARE
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

L2
- **If blue or yellow sys recovered:**
  See procedure for single failure.

L1
- **If neither system recovered:**

SECONDARY FAILURES

*F/CTL

Continued on the following page

HYD B+Y SYS LO PR (Cont'd)

Ident.: PRO-ABN-HYD-L-00018342.0008001 / 21 MAR 17

L12

STATUS

MIN RAT SPD..140 KT
(If B PUMP LO PR)
MAX SPEED..320/0.77
MANEUVER WITH CARE

APPR PROC

DUAL HYD LO PR
(Line not displayed for dual LO LVL)

- **If sys lost by RSVR LO AIR PR:**

  In approach, system lost by RSVR LO AIR PR may be recovered at low altitude.

  RELATED PUMP..ON

- **If sys lost by RSVR OVHT:**

  In approach, system lost by RSVR OVHT may be recovered if OVHT indication disappears.

  - **IF BLUE OVHT OUT:**
    BLUE ELEC PUMP...AUTO
  - **IF YELLOW OVHT OUT:**
    YELLOW ENG 2 PUMP......................................ON

- **IF HYD NOT RECOVERED (line not displayed for dual LO LVL):**
  - **For A321 aircraft:**
    FOR LDG..USE FLAP 3
    This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.
    GPWS LDG FLAP 3..ON

  L/G...GRVTY EXTN

INOP SYS

B+Y HYD
R ELEV
SPLR 2+3+4
SPD BRK
AP 1+2
CARGO DOOR (If Y RSVR LO LVL)
REVERSER 2
B ELEC PUMP
EMER GEN (If B RSVR LO LVL)
YAW DAMPER 2
CAT 2
GLS AUTOLAND
STEEP APPR

Continued on the following page

HYD B+Y SYS LO PR (Cont'd)

Landing gear is extended by gravity to preserve green system integrity Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION.

- **For A321 aircraft:**
  APPR SPD..VREF +10 KT

LDG DIST PROC.. APPLY

SLATS/FLAPS SLOW

See [1]

FUEL CONSUMPT INCRSD

See [2]

FMS PRED UNRELIABLE

See [3]

(1) *Note: Following a yellow hydraulic system failure, the parking brake may be inoperative due to yellow accumulator low pressure.*

(2) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(3) *Disregard FMS fuel predictions and refer to QRH/OPS - Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD G+B SYS LO PR

Applicable to: ALL

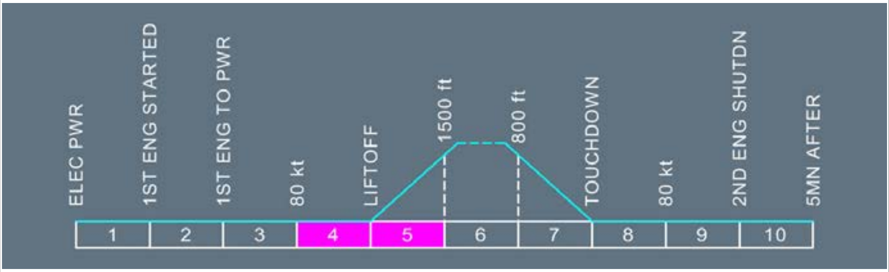
Ident.: PRO-ABN-HYD-J-00018920.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the green and blue systems pressure ≤1 450 PSI (the alert resets if pressure ≥1 750 PSI).

Flight Phase Inhibition:



Continued on the following page

HYD G+B SYS LO PR (Cont'd)

Ident.: PRO-ABN-HYD-J-00018349.0002001 / 22 MAR 17

L2 *Note: If the green hydraulic system is lost due to low level, the "HYD PTU FAULT" ECAM message may appear, and requests the flight crew to switch the PTU off.*

L1 **LAND ASAP**

- **If blue sys lost by ELEC PUMP LO PR:**
  - RAT....................MAN ON
  - MIN RAT SPD....................140 KT

AFFECTED PUMPS....................OFF
MANEUVER WITH CARE
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)

L2 The flight control normal laws and associated protections are lost. Only load factor limitation is furnished (alternate law without protection).

L1 MAX SPEED....................320/0.77

L2 *Speed is limited due to loss of high speed protection.*

L1 SPD BRK....................DO NOT USE

- **If blue sys recovered:**

  See procedure for single failure.

- **If blue sys not recovered:**

  Refer to PRO-ABN-F_CTL [QRH] Landing with Slats or Flaps Jammed.

SECONDARY FAILURES

*WHEEL
*F/CTL

Continued on the following page

HYD G+B SYS LO PR (Cont'd)

Ident.: PRO-ABN-HYD-J-00018350.0011001 / 22 MAR 17

L12

STATUS

MIN RAT SPD (IF RAT OUT).. 140 KT

(If B PUMP LO PR)

MAX SPEED... 320/0.77

MANEUVER WITH CARE

SPD BRK...DO NOT USE

APPR PROC

DUAL HYD LO PR

(Line not displayed for a double LO LVL):

- **If sys lost by RSVR LO AIR PR:**
  RELATED PUMPS.. ON
- **If sys lost by RSVR OVHT:**
  - **IF BLUE OVHT OUT:**
    BLUE ELEC PUMP...AUTO
  - **IF GREEN OVHT OUT:**
    GREEN ENG 1 PUMP... ON
- **IF HYD NOT RECOVERED (line not displayed for a double LO LVL):**
  A/THR.. OFF
  Select the target speed on the FCU . Due to the loss of slats and some flight control surfaces, the A/THR may not satisfactorily maintain speed.
  FOR LDG...USE FLAP 3
  This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.
  GPWS LDG FLAP 3... ON
  - **WHEN SPD 200 KT (displayed when slats are retracted):**
    L/G.. GRVTY EXTN

INOP SYS

G+B HYD
F/CTL PROT
L ELEV
L+R AIL
SPLR 1+3+5
SLATS
AP 1+2
N/W STRG
AUTO BRK
NORM BRK
L/G RETRACT
REVERSER 1
EMER GEN (If B RSVR LO LVL)
B ELEC PUMP
YAW DAMPER 1
CAT 2
GLS AUTOLAND
STEEP APPR

Continued on the following page

HYD G+B SYS LO PR (Cont'd)

Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION

Extend the landing gear at 200 kt to revert sooner in direct law. This provides, below 200 kt , a better pitch control than in alternate law with one elevator lost and all slats lost.

APPR SPD... VREF +25 KT

Approach speed must be increased, due to the loss of ailerons and slats.

LDG DIST PROC.. APPLY

ALTN LAW: PROT LOST
WHEN L/G DN: DIRECT LAW

See (1)

FUEL CONSUMPT INCRSD

See (2)

FMS PRED UNRELIABLE

See (3)

FLAPS SLOW

(1) *At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).*

(2) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(3) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

HYD G+Y SYS LO PR

Applicable to: ALL

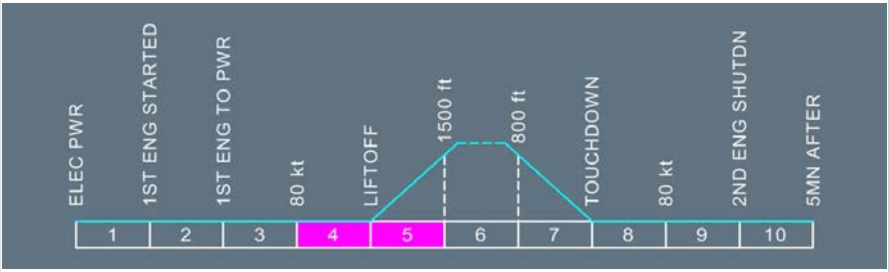
Ident.: PRO-ABN-HYD-K-00018921.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the green and yellow systems pressure ≤1 450 PSI (the alert resets if pressure ≥1 750 PSI).

Flight Phase Inhibition:



Continued on the following page

HYD G+Y SYS LO PR (Cont'd)

Ident.: PRO-ABN-HYD-K-00018352.0003001 / 22 MAR 17

LAND ASAP

PTU..OFF
AFFECTED PUMPS..OFF

- **If yellow sys lost by ENG 2 PUMP LO PR:**
  YELLOW ELEC PUMP..ON

MANEUVER WITH CARE
FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)

L2 Flight control normal laws and associated protections are lost. Only load factor limitation, high and low speed stability are provided (alternate law with reduced protection).

L1 MAX SPEED..320/0.77

L2 *Speed is limited due to loss of high speed protection.*

L1 ■ **If yellow sys recovered:**

See procedure for single failure.

■ **If yellow sys not recovered:**

Refer to PRO-ABN-F_CTL [QRH] Landing with Slats or Flaps Jammed.

SECONDARY FAILURES

*F/CTL
*WHEEL

Continued on the following page

HYD G+Y SYS LO PR (Cont'd)

Ident.: PRO-ABN-HYD-K-00018353.0014001 / 22 MAR 17

L12

STATUS

MAX SPEED....................320/0.77
MAX BRK PR....................1 000 PSI
MANEUVER WITH CARE

APPR PROC

DUAL HYD LO PR

(Line not displayed for a double LO LVL)

- **If sys lost by RSVR LO AIR PR:**
  RELATED PUMP....................ON
- **If sys lost by RSVR OVHT:**
  - **IF GREEN OVHT OUT:**
    GREEN ENG 1 PUMP....................ON
  - **IF YELLOW OVHT OUT:**
    YELLOW ENG 2 PUMP....................ON
- **IF HYD NOT RECOVERED (line not displayed for a double LO LVL):**
  FOR LDG....................USE FLAP 3
  This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.
  GPWS FLAP MODE....................OFF
  - **WHEN CONF 3 AND VAPP:**
    L/G....................GRVTY EXTN
    Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION. Being stabilized at VAPP, before selecting the gear down, enables the aircraft to be trimmed for approach.

APPR SPD....................VREF +25 KT

Approach speed must be increased, due to the loss of flaps.

LDG DIST PROC....................APPLY

INOP SYS

G+Y HYD
F/CTL PROT
STABILIZER
REVERSER 1+2
SPLR 1+2+ 4+5
FLAPS
LAF
YAW DAMPER
AP 1+2
ANTI SKID
N/W STRG
NORM BRK
AUTO BRK
L/G RETRACT
CARGO DOOR (If Y RSVR LO LVL)
CAT 2
GLS AUTOLAND
STEEP APPR

Continued on the following page

HYD G+Y SYS LO PR (Cont'd)

ALTN LAW: PROT LOST
WHEN L/G DN: DIRECT LAW
See (1)
BRK Y ACCU PR ONLY
See (2)
FUEL CONSUMPT INCRSD
See (3)
FMS PRED UNRELIABLE
See (4)
SLATS SLOW
See (5)

(1) *At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).*

(2) *7 full brake applications are available.*

(3) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(4) *Disregard FMS fuel predictions and refer to QRH/OPS Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.*

(5)

Note: *Following a yellow hydraulic system failure, the parking brake may be inoperative due to yellow accumulator low pressure.*

HYD PTU FAULT

Applicable to: ALL

Ident.: PRO-ABN-HYD-R-00017140.0001001 / 21 MAR 16

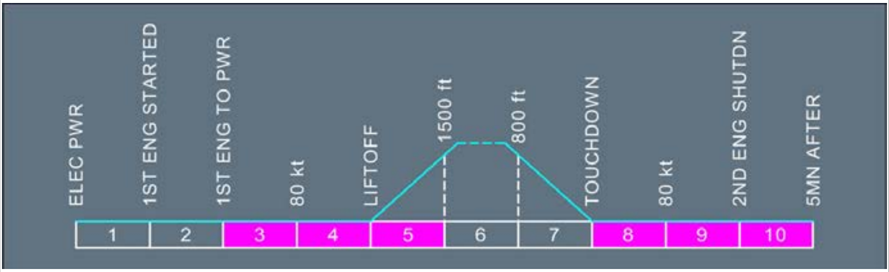
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- On ground, PTU does not run if the differential pressure is higher than 650 PSI between G and Y system, or
- In flight, PTU at AUTO position does not run when G or Y reservoir level is low, and G or Y system pressure is low.

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-R-00011657.0001001 / 31 AUG 17

L2 Note: *This warning is triggered, if the last engine is started within 40 s following the end of the cargo doors operation. In this case, reset the warning by switching the yellow ELEC pump ON, then OFF.*

L1 ● **If green or yellow reservoir low level and system low press:**

PTU...OFF

Continued on the following page

HYD PTU FAULT (Cont'd)

Ident.: PRO-ABN-HYD-R-00011658.0001001 / 18 AUG 10

STATUS

INOP SYS

PTU

HYD RAT FAULT

Applicable to: ALL

Ident.: PRO-ABN-HYD-S-00017141.0001001 / 21 MAR 16

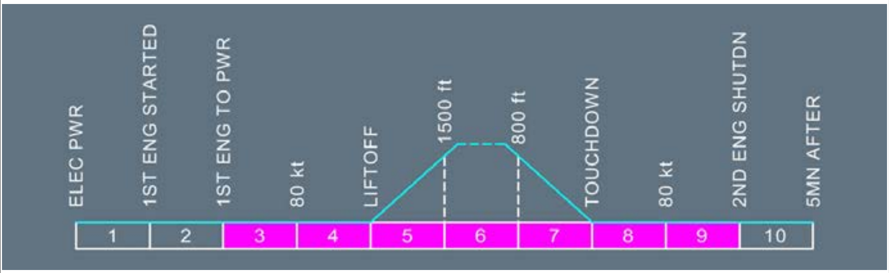
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- The RAT is not fully stowed, or
- Pressure is present in the RAT stowing actuator, or
- The RAT pump is not available.

Flight Phase Inhibition:



Ident.: PRO-ABN-HYD-S-00011659.0001001 / 16 NOV 11

Crew awareness.

Continued on the following page

HYD RAT FAULT (Cont'd)

Ident.: PRO-ABN-HYD-S-00011660.0001001 / 18 AUG 10

STATUS

INOP SYS

RAT

Intentionally left blank

[QRH] LANDING WITH ABNORMAL L/G

Applicable to: ALL

Ident.: PRO-ABN-LG-AD-00018650.0002001 / 17 MAR 17

The procedure is intended for use when the nose or main landing gear fail to extend and/or lock down following the application of the L/G GRVTY EXTN procedure.
It is preferable to use any available landing gear, rather than carry out a belly landing.
Under these circumstances, a hard surface runway landing is recommended.
Full advantage should be taken of any foam, spread on the runway.

CAUTION	Do not apply this procedure if at least one green triangle is displayed on each landing gear on the WHEEL SD page. This is sufficient to confirm that the landing gear is downlocked. Disregard any possible GPWS "TOO LOW GEAR" aural alert.

Ident.: PRO-ABN-LG-AD-00018651.0002001 / 17 MAR 17

CABIN CREW....................NOTIFY
Notify the cabin crew of the nature of the emergency encountered and state intentions. Specify the amount of available preparation time.
ATC....................NOTIFY
Notify ATC of the nature of the emergency and state intentions.
GALY & CAB....................OFF

CONSIDER FUEL REDUCTION. This reduces VREF and, consequently, the load factor at impact and the energy to be dissipated.

- **If NOSE L/G abnormal:**

  SHIFT CG AFT IF POSSIBLE

  - *10 pax from front to rear moves the CG roughly 4 % aft*
  - *10 pax from mid to rear moves the CG roughly 2.5 aft.*

- **If one MAIN L/G abnormal:**

  FUEL DISTRIBUTION....................CONSIDER
  Open the fuel X-FEED valve and switch off the pumps on the side with landing gear normally extended.

OXYGEN CREW SUPPLY....................OFF
SIGNS....................ON
CABIN and COCKPIT (LOOSE EQPT)....................SECURE

Continued on the following page

[QRH] LANDING WITH ABNORMAL L/G (Cont'd)

Ident.: PRO-ABN-LG-AD-00018652.0001001 / 17 MAR 17

- **For approach:**
  GPWS SYS....OFF
  L/G lever....CHECK DOWN
  GRVTY GEAR EXTN handcrank....TURN BACK TO NORMAL
  Rotating three turns back to normal may, in certain cases, pressurize the landing gear down actuators, thereby reducing the probability of gear collapse after touchdown.
  DO NOT ARM AUTOBRAKE
  Manual braking will enable better pitch and roll control. Moreover, with at least one main landing gear in the abnormal position the autobrake cannot be activated (ground spoilers not armed).
  EMER EXIT LT....ON
  CABIN REPORT....OBTAIN
  A/SKID & N/W STRG....OFF
  With one main landing gear not extended, the reference speed used by the anti-skid to detect a wheel blockage is not correctly initialized. As a result, the anti-skid must be switched off to prevent permanent brake release.
  MAX BRAKE PR : 1 000 PSI
  Modulate the brake pressure to 1 000 PSI because the anti-skid is off.
  - **If one or both MAIN L/G abnormal:** DO NOT ARM GROUND SPOILERS
    To keep as much roll authority as possible for maintaining the wings level.
    Ground spoiler extension would prevent spoilers from acting as roll surfaces.

  RAM AIR....ON
  To ensure full depressurization of the aircraft before impact.
  DOME LT....DIM
  Set the dome light to DIM to ensure that there is a light source after both engines are shut down after landing, in order to see and read the BRAKE PRESS indicator.
- **At 500 ft AGL:**
  BRACE FOR IMPACT....ORDER

Continued on the following page

[QRH] LANDING WITH ABNORMAL L/G (Cont'd)

Ident.: PRO-ABN-LG-AD-00018654.0001001 / 17 MAR 17

- **At flare, touchdown and rollout:**

  Engines should be shut down sufficiently early to ensure fuel is shut off before the nacelles impact, but sufficiently late to ensure adequate hydraulic supplies for the flight controls.

  Engine pumps continue to supply adequate hydraulic pressure for 30 s after engine shutdown.

  DO NOT USE REVERSE

  - **If NOSE L/G abnormal:**

    KEEP NOSE UP

    After touchdown, keep the nose off the runway by the use of the elevator. Then, lower the nose on to the runway before elevator control is lost.

    BRAKES.. SMOOTHLY APPLY

    Adapt braking to the efficiency of the elevator.

    BEFORE NOSE IMPACT : ALL ENG MASTERS OFF

  - **If one MAIN L/G abnormal:**

    AT TOUCHDOWN : ALL ENG MASTERS OFF

    KEEP AFFECTED SIDE WING UP

    Use roll control, as necessary, to maintain the unsupported wing up as long as possible.

  - **If both MAIN L/G abnormal:**

    DURING FLARE : ALL ENG MASTERS OFF

    MIN PITCH ATT : 6 °

Continued on the following page

[QRH] LANDING WITH ABNORMAL L/G (Cont'd)

Ident.: PRO-ABN-LG-AD-00018655.0001001 / 09 MAY 17

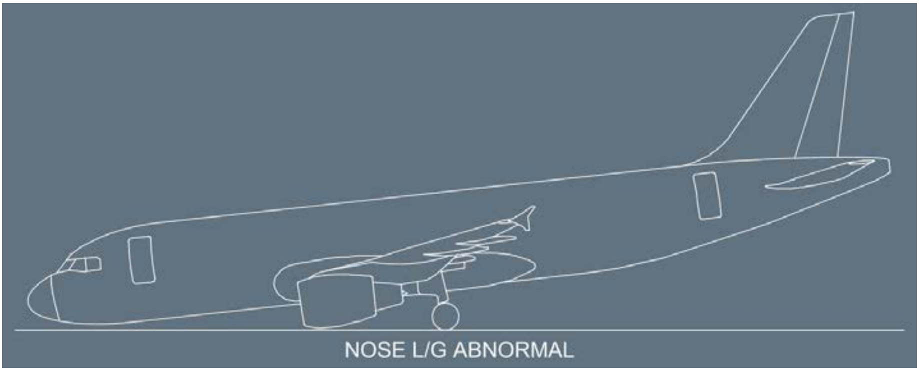
- **When aircraft stopped:**
  PARK BRK...ON
  ALL FIRE pb (ENG s & APU)..................................... PUSH
  ALL AGENT (ENG s & APU)....................................... DISCH
  - **If evacuation required:**
    EVACUATION...INITIATE
    Make a short and precise announcement to order the emergency evacuation.
    Press the EVAC COMMAND pb .
  - **If evacuation not required:**
    CABIN CREW and PASSENGERS (PA)...............................NOTIFY
    Ensure that all the landing gears are secured before initiating the disembarkation (before switching OFF the seat belts signs).

Continued on the following page

[QRH] LANDING WITH ABNORMAL L/G (Cont'd)

Ident.: PRO-ABN-LG-AD-00018711.0001001 / 17 MAR 17

REFERENCE AIRCRAFT ATTITUDE AFTER IMPACT



[QRH] L/G GRAVITY EXTENSION

Ident.: PRO-ABN-LG-00011286.0010001 / 17 MAR 17
Applicable to: ALL

CAUTION	Do not apply this procedure if at least one green triangle is displayed on each landing gear on the WHEEL SD page. This is sufficient to confirm that the landing gear is downlocked. Disregard any possible GPWS "TOO LOW GEAR" aural alert.

GRAVITY GEAR EXTN handcrank....................PULL AND TURN

Rotate the handle clockwise 3 turns until reaching the mechanical stop, even if resistance is felt.

L/G lever ....DOWN

The landing gear lever should be confirmed in the DOWN position for the following reasons:

- *To extinguish the UNLK lights on the landing gear indication panel.*
- *To prevent the L/G CTL message from appearing on the WHEEL SD page.*
- *To minimize the risk of landing gear retraction on the ground, due to an unknown system fault, when the free-fall system is reset.*

GEAR DOWN indications (if available)....................CHECK

The L/G LGCIU 2 FAULT or BRAKES SYS 1(2) FAULT alert may be spuriously triggered after a gravity extension.

Note:
1. *Depending on aircraft speed, the display may show the landing gear doors in the amber transit position.*
2. *In the event of gravity extension, caused by the failure of both LGCIU s, landing gear position indication on ECAM are lost. LDG GEAR lights on LDG GEAR control panel remain available, if LGCIU 1 is electrically supplied.*
3. *If the three green downlock arrows are not on, it is possible that the handcrank is not at the mechanical stop. Check that the handcrank is firmly against the mechanical stop.*

N/W STEERING NOT AVAILABLE

■ **If successful:**

DO NOT RESET LDG GEAR GRVTY EXTN

Do not reset the free-fall system. This will avoid such undesirable effects as further loss of fluid, in the event of a leak, or possible landing gear unlocking, in the event of a gear selector valve jamming in the UP position.

Note: *The free-fall system may be reset in flights used for training. If the green hydraulic system is available, resetting the free-fall system allows the landing gear doors to be closed and the nosewheel steering to operate.*

Continued on the following page

[QRH] L/G GRAVITY EXTENSION (Cont'd)

The flight crew should not reset the free-fall system on the ground after flight.

- **If unsuccessful:**

  LDG WITH ABNORMAL L/G PROC...APPLY

  Refer to PRO-ABN-LG [QRH] Landing with Abnormal L/G.

L/G DOORS NOT CLOSED

Applicable to: ALL

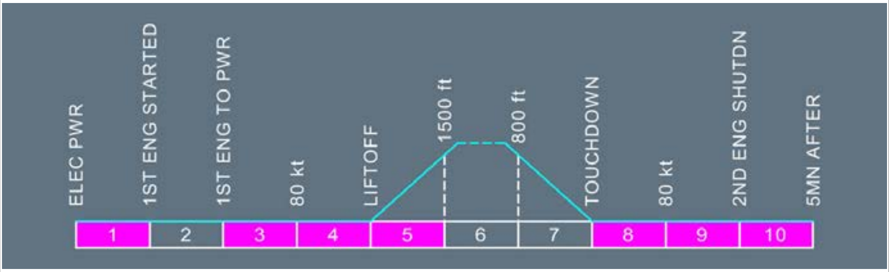
Ident.: PRO-ABN-LG-D-00017734.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one gear door is not uplocked.

Flight Phase Inhibition:



Continued on the following page

L/G DOORS NOT CLOSED (Cont'd)

Ident.: PRO-ABN-LG-D-00011287.0003001 / 01 DEC 14

- **If the L/G lever is UP:**
  - **WHEN SPD < 220/0.54:**

    L/G LEVER.. RECYCLE

L2 *Note:* *To recycle the landing gear, the flight crew must perform the following actions:*
- *Move the landing gear lever down*
- *Wait for the landing gear to downlock and for the landing gear doors to close. Simultaneously monitor the WHEEL page on the System Display (SD)*
- *Move the landing gear lever up.*

The active LGCIU changes when the landing gear is recycled.

L1
- **IF UNSUCCESSFUL:**

  MAX SPEED.. 250/0.60

FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

Ident.: PRO-ABN-LG-D-00011288.0002001 / 17 MAR 17

L12

STATUS

MAX SPEED.............................. 250/.60	**INOP SYS**
FUEL CONSUMPT INCRSD	L/G DOOR
See (1)	
FMS PRED UNRELIABLE	
See (2)	

(1) *This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *Disregard FMS fuel predictions and Refer to QRH/OPS Fuel Penalty Factors/ECAM Alert Table in order to find the applicable Fuel Penalty Factor.*

L/G GEAR NOT DOWN

Applicable to: ALL

Ident.: PRO-ABN-LG-AA-00017859.0001001 / 21 MAR 16

ANNUNCIATIONS

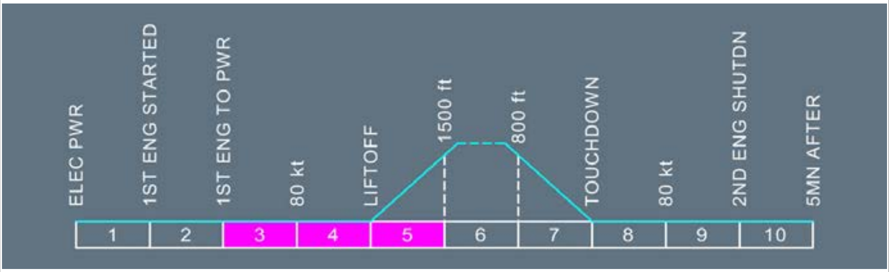
Triggering Conditions:

L2 This alert triggers when:

1. L/G is not downlocked and radio height is lower than 750 ft and both engines N1 lower than 75% (or if engine shutdown N1 of remaining engine lower than 97%) or
2. L/G is not downlocked and radio height is lower than 750 ft and both engines are not at T.O power and flaps at 1, 2, 3 or FULL or
3. L/G is not downlocked and flaps at 3 or FULL and both radio altimeters are failed.

Note: *In the cases 2 and 3 above, the aural warning can only be cancelled by the emergency cancel pushbutton.*

Flight Phase Inhibition:



Ident.: PRO-ABN-LG-AA-00018573.0002001 / 21 MAR 16

L2 When this warning appears, the red arrow on the instrument panel comes on.

L1 Crew awareness.

L/G GEAR NOT DOWNLOCKED

Applicable to: ALL

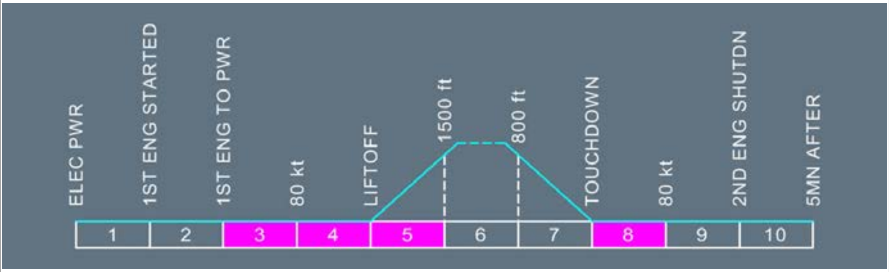
Ident.: PRO-ABN-LG-C-00017860.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one gear is not downlocked and L/G is selected down.

Flight Phase Inhibition:



Ident.: PRO-ABN-LG-C-00011284.0002001 / 01 DEC 14

L2 This warning appears, if the landing gear sequence is not completed after 30 s.

L1 L/G LEVER.. RECYCLE

L2 *Note:* *To recycle the landing gear, the flight crew must perform the following actions:*
- *Move the landing gear lever up*
- *Wait for the landing gear to uplock and for the landing gear doors to close. Simultaneously monitor the WHEEL page on the System Display (SD)*
- *Move the landing gear lever down.*

The active LGCIU changes when the landing gear is recycled.

L1 ● **IF UNSUCCESSFUL AFTER 120 s:**

L/G.. GRVTY EXTN

L2 *Rotate the handle clockwise about 3 turns until reaching the mechanical stop. Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION.*

Continued on the following page

L/G GEAR NOT DOWNLOCKED (Cont'd)

Ident.: PRO-ABN-LG-C-00011285.0001001 / 21 MAR 16

L12

STATUS

L/G.. GRVTY EXTN

CAT 3 SINGLE ONLY

See (2)

INOP SYS

CAT 3 DUAL
N.W. STEER

See (1)

(1) *As nose gear doors remain open, hydraulic power for nosewheel steering is lost.*

(2) *If gravity extension is unsuccessful, Refer to PRO-ABN-LG [QRH] Landing with Abnormal L/G.*

L/G GEAR NOT UPLOCKED

Applicable to: ALL

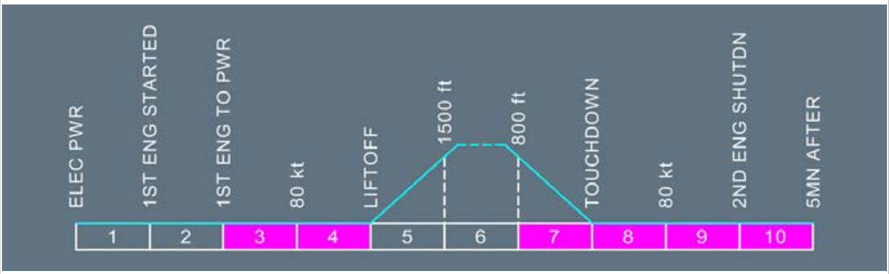
Ident.: PRO-ABN-LG-B-00017736.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one gear is not uplocked and L/G is not selected down.

Flight Phase Inhibition:



Continued on the following page

L/G GEAR NOT UPLOCKED (Cont'd)

Ident.: PRO-ABN-LG-B-00011061.0003001 / 01 DEC 14

L2 This warning appears if the landing gear sequence is not completed after 30 s.

L1 ■ **L/G doors closed:**

AVOID EXCESS G FACTOR

L2 *Because the gear rests on the doors, avoid excessive load factors in order not to damage door structure.*

L1 ■ **L/G doors not closed and shock absorber fault:**

MAX SPEED.......... 220/0.54
L/G.......... DOWN
MAX SPEED.......... 280/0.67

■ **L/G doors not closed and no shock absorber fault:**

MAX SPEED.......... 220/0.54
L/G LEVER.......... RECYCLE

L2 *Note:* *To recycle the landing gear, the flight crew must perform the following actions:*
- *Move the landing gear lever down*
- *Wait for the landing gear to downlock and for the landing gear doors to close. Simultaneously monitor the WHEEL page on the System Display (SD)*
- *Move the landing gear lever up.*

The active LGCIU changes when the landing gear is recycled.

L1 ● **IF UNSUCCESSFUL:**

L/G.......... DOWN
MAX SPEED.......... 280/0.67

FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE

Continued on the following page

L/G GEAR NOT UPLOCKED (Cont'd)

Ident.: PRO-ABN-LG-B-00018687.0002001 / 25 JUL 17

L12

STATUS

MAX SPEED.. 280/.67

FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE
See (1)

INOP SYS

L/G RETRACT

(1)
If the flight is continued (to destination or to alternate) with landing gear extended:
- *Disregard FMS fuel predictions. Refer to QRH/OPS Fuel Penalty Factors/ECAM Alert Table in order to find the applicable Fuel Penalty Factor*
- *Disregard FMS altitude and speed predictions. Time predictions are only valid in cruise*
- *Do not use the managed speed mode (except in approach)*
- *Do not use the CLB and the DES autopilot modes.*
  Also Refer to PRO-NOR-SUP-L/G- Flight with Gear Down.

L/G GEAR UPLOCK FAULT

Applicable to: ALL

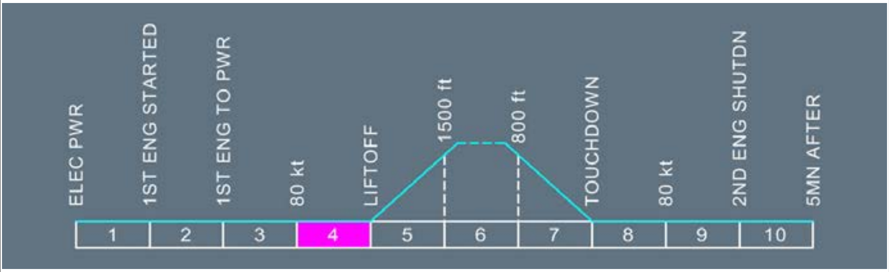
Ident.: PRO-ABN-LG-E-00017737.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one gear uplock is engaged with corresponding gear downlocked.

Flight Phase Inhibition:



Ident.: PRO-ABN-LG-E-00011289.0002001 / 27 NOV 12

L/G....................KEEP DOWN

L2 *The landing gear must be left down to avoid structural damage, because the uplock device will stay in the locked position.*

L1 MAX SPEED....................280/.67

FUEL CONSUMPT INCRSD

FMS PRED UNRELIABLE

Continued on the following page

L/G GEAR UPLOCK FAULT (Cont'd)

Ident.: PRO-ABN-LG-E-00018719.0002001 / 25 JUL 17

L12

STATUS

MAX SPEED........ 280/.67	**INOP SYS**
L/G........ KEEP DOWN	L/G RETRACT
FUEL CONSUMPT INCRSD	
See (1)	
FMS PRED UNRELIABLE	
See (2)	

(1) *This message triggers when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.*

(2) *If the flight is continued (to destination or to alternate) with landing gear extended:*

- *Disregard FMS fuel predictions. Refer to QRH/OPS Fuel Penalty Factors/ECAM Alert Table in order to find the applicable Fuel Penalty Factor*
- *Disregard FMS altitude and speed predictions. Time predictions are only valid in cruise*
- *Do not use the managed speed mode (except in approach)*
- *Do not use the CLB and the DES autopilot modes.*
  Also Refer to PRO-NOR-SUP-L/G- Flight with Gear Down.

L/G LGCIU 1(2) FAULT

Applicable to: ALL

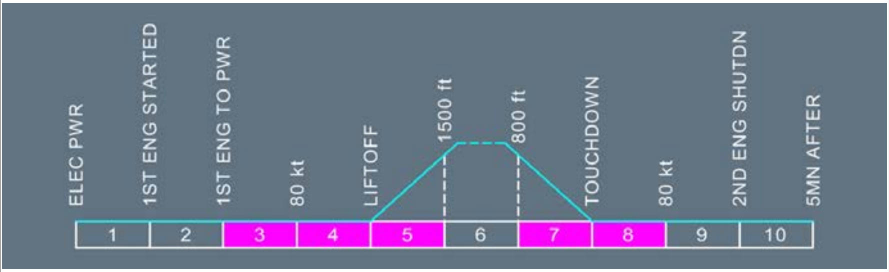
Ident.: PRO-ABN-LG-G-00018059.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when LGCIU 1(2) is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-LG-G-00018681.0002001 / 21 MAR 16

- **If LGCIU 1 is failed:**

  GPWS SYS..OFF

  L2 *GPWS receives "L/G in up position" information even if the landing gear is down. Set the GPWS SYS pb-sw to OFF in order to prevent untimely warnings during the approach.*

Continued on the following page

L/G LGCIU 1(2) FAULT (Cont'd)

Ident.: PRO-ABN-LG-G-00018682.0001001 / 21 MAR 16

L12

STATUS

	INOP SYS
ENG 1(2) APPR IDLE ONLY *See* (2)	LGCIU 1(2) REVERSER 1(2) GPWS (1)

Note: 1. *The partial spoiler extension at landing when only one main landing gear is compressed is not available. The spoilers extend normally on ground when wheel speed greater than 72 kt.*
2. *Depending on the LGCIU failure, only a part of the above systems may be lost.*

(1) *(If LGCIU 1 is failed)*
(2) *When idle is selected on ground with slats extended, only approach idle is available.*

L/G LGCIU 1+2 FAULT

Applicable to: ALL

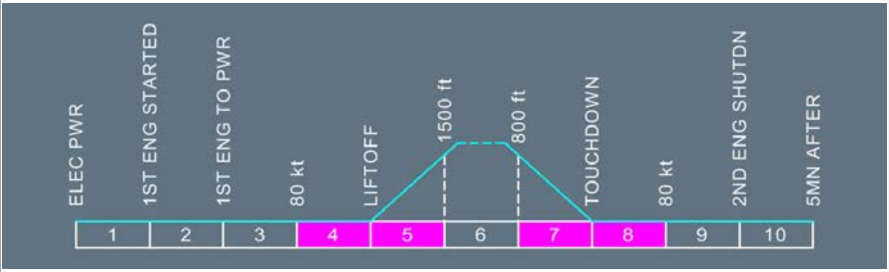
Ident.: PRO-ABN-LG-V-00017739.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both LGCIUs are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-LG-V-00018683.0002001 / 21 MAR 16

L2 Normal landing gear control and position indications are lost. LDG GEAR lights on LDG GEAR control panel remain available if LGCIU 1 is electrically supplied.

L1 L/G .... GRVTY EXTN

L2 *Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION.*

L1 GPWS SYS .... OFF

L2 *As LGCIU 1 is lost, GPWS receives “L/G in up position” information even if the landing gear is down.*
Set the GPWS SYS pb-sw to OFF in order to prevent untimely warnings during approach.

Continued on the following page

L/G LGCIU 1+2 FAULT (Cont'd)

Ident.: PRO-ABN-LG-V-00018684.0008001 / 05 OCT 16

L12

STATUS

- **If the selected configuration is not FLAP 3:**
  FOR LDG..USE FLAP 3
- **If the selected configuration is FLAP 3:**
  FOR LDG: USE FLAP 3

L/G.. GRVTY EXTN

L/G CONTROL NOT AVAIL
ENG 1 APPR IDLE ONLY
ENG 2 APPR IDLE ONLY

INOP SYS

REVERSER 1+2
AP 1+2 (1)
CAT 2 (1)
A/THR
N/W STRG
GLS AUTOLAND
LGCIU 1
LGCIU 2
GPWS
ROW/ROP

Note: 1. *The partial spoiler extension at landing when only one main landing gear is compressed is not available. The spoilers extend normally on ground when wheel speed greater than 72 kt.*
2. *In flight with both LGCIU s "faulty", whatever the landing gear configuration, when the flight crew switches ON Wing Anti-Ice pb, the Wing Anti-Ice pb will illuminate "on" and there will be only 30 s of heating. This loss of Wing Anti-ice will not have an ECAM/Aural warning, although BLEED SD page shows a "no-Anti-ice" legend.*

(1) *(Except in LAND mode)*

L/G SHOCK ABSORBER FAULT
(SHOCK ABSORBER EXTENDED ON GROUND)

Applicable to: ALL

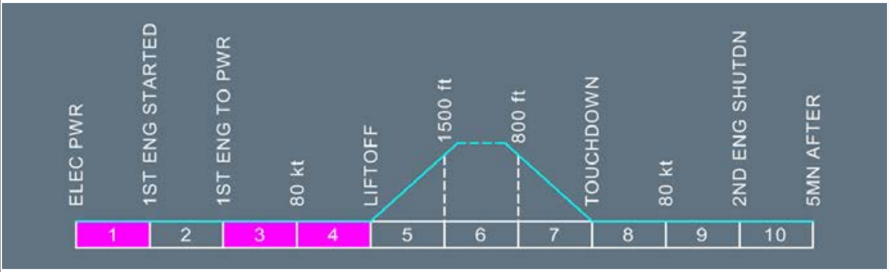
Ident.: PRO-ABN-LG-AB-00017733.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one shock absorber is not compressed after landing.

Flight Phase Inhibition:



Ident.: PRO-ABN-LG-AB-00011056.0001001 / 25 FEB 14

Crew awareness.

L/G SHOCK ABSORBER FAULT
(SHOCK ABSORBER NOT EXTENDED AFTER LIFTOFF)

Applicable to: ALL

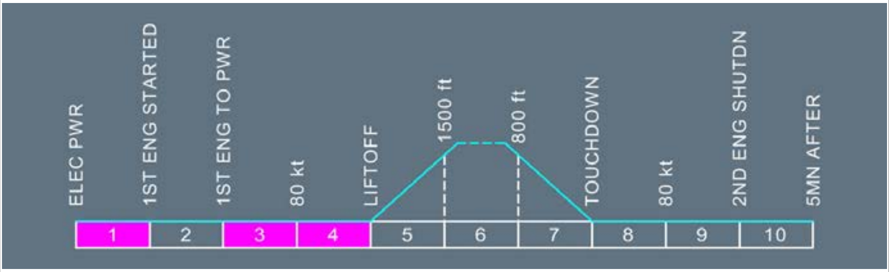
Ident.: PRO-ABN-LG-A-00018062.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one shock absorber is not extended when airborne.

Flight Phase Inhibition:



Ident.: PRO-ABN-LG-A-00011058.0003001 / 25 FEB 14

- **Shock absorber not extended after liftoff and L/G uplocked :**

  Crew awareness.

- **Shock absorber not extended after liftoff and L/G not uplocked :**

  MAX SPEED..280/.67

  - **If L/G lever still down :**

    L/G..KEEP DOWN

  - **If L/G lever selected up :**

    L/G..DOWN

  FUEL CONSUMPT INCRSD
  FMS PRED UNRELIABLE

Continued on the following page

L/G SHOCK ABSORBER FAULT (Cont'd)
(SHOCK ABSORBER NOT EXTENDED AFTER LIFTOFF)

Ident.: PRO-ABN-LG-A-00011059.0003001 / 25 JUL 17

L12

STATUS

- **If L/G not uplocked:**
  MAX SPEED..280/.67
  L/G..KEEP DOWN

FUEL CONSUMPT INCRSD
FMS PRED UNRELIABLE
See (1)

INOP SYS

L/G RETRACT

(1)
If the flight is continued (to destination or to alternate) with landing gear extended:
- *Disregard FMS fuel predictions. Refer to QRH/OPS Fuel Penalty Factors/ECAM Alert Table in order to find the applicable Fuel Penalty Factor*
- *Disregard FMS altitude and speed predictions. Time predictions are only valid in cruise*
- *Do not use the managed speed mode (except in approach)*
- *Do not use the CLB and the DES autopilot modes.*
  Also Refer to PRO-NOR-SUP-L/G- Flight with Gear Down.

Note: *In few cases, autothrust and autopilot may also be lost.*
If WHEEL N.W. STEER FAULT is also displayed, then the nose wheels may be at maximum deflection. (Turned 90 ° from center.) During landing, delay nose wheel touchdown for as long as possible.

L/G SYS DISAGREE

Applicable to: ALL

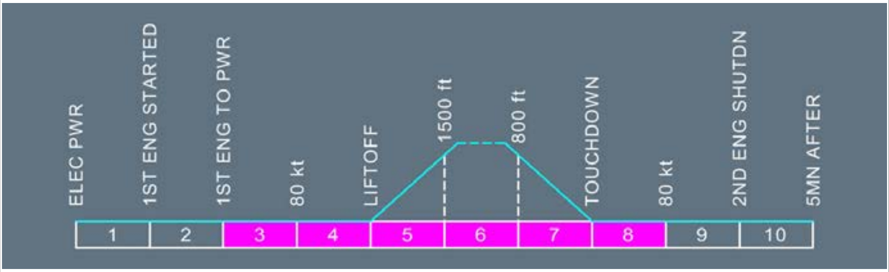
Ident.: PRO-ABN-LG-AC-00017861.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when LGCIU 1 and LGCIU 2 detect a discrepancy between the landing gear positions.

Flight Phase Inhibition:



Ident.: PRO-ABN-LG-AC-00018664.0002001 / 21 MAR 16

Crew awareness.

Intentionally left blank

[MEM] EMER DESCENT

Ident.: PRO-ABN-MISC-00012092.0001001 / 17 MAR 17
Applicable to: ALL

CREW OXY MASKS....................USE
SIGNS....................ON
EMER DESCENT....................INITIATE

- **If A/THR not active:**

  THR LEVERS....................IDLE

SPD BRK....................FULL

- **When descent established:**

  SPEED....................MAX/APPROPRIATE

  - **If structural damage suspected:** MANEUVER WITH CARE

  CONSIDER L/G EXTENSION
  ENG MODE SEL....................IGN
  ATC....................NOTIFY

  Notify ATC of the nature of the emergency, and state intention. The flight crew can communicate with the ATC using voice, or CPDLC when the voice contact cannot be established or has poor quality.

  EMER DESCENT (PA)....................ANNOUNCE

  The flight crew must inform the cabin of emergency descent on the PA system.

  ATC XPDR 7700....................CONSIDER

  Squawk 7700 unless otherwise specified by ATC.

  CREW OXY MASKS DILUTION....................NORM

  - *To save oxygen, set the oxygen diluter selector to the N position*
  - *If the oxygen diluter selector remains set to 100 %, oxygen quantity may be insufficient to cover the entire emergency descent profile*
  - *Ensure that crew communication is established with oxygen masks. Avoid the continuous use of the interphone to minimize interference with the breathing noise in the oxygen mask.*

  MAX FL: 100/MEA-MORA

  - **If CAB ALT above 14 000 ft:**

    OXYGEN PAX MASK MAN ON....................PRESS

    This action confirms that the passenger oxygen masks are released.

Continued on the following page

[MEM] EMER DESCENT (Cont'd)

Note: *Notify the cabin crew, when the aircraft reaches a safe flight level, and when cabin oxygen is no more necessary.*

[MEM] STALL RECOVERY

Ident.: PRO-ABN-MISC-00013768.0001001 / 17 MAR 17
Applicable to: ALL

As soon as any stall indication (could be aural warning, buffet...) is recognized, apply the immediate actions:

NOSE DOWN PITCH CONTROL....................APPLY

This will reduce angle of attack

Note: *In case of lack of pitch down authority, reducing thrust may be necessary.*

BANK....................WINGS LEVEL

- **When out of stall (no longer stall indications) :**

  THRUST....................INCREASE SMOOTHLY AS NEEDED

  Note: *In case of one engine inoperative, progressively compensate the thrust asymmetry with rudder.*

  SPEEDBRAKES....................CHECK RETRACTED
  FLIGHT PATH....................RECOVER SMOOTHLY

  - **If in clean configuration and below 20 000 ft :**

    FLAP1....................SELECT

    Note: *If a risk of ground contact exists, once clearly out of stall (no longer stall indications), establish smoothly a positive climb gradient.*

[MEM] STALL WARNING AT LIFT-OFF

Ident.: PRO-ABN-MISC-00013769.0001001 / 17 MAR 17
Applicable to: ALL

Spurious stall warning may sound in NORMAL law, if an angle of attack probe is damaged. In this case, apply immediately the following actions:

THRUST.. TOGA

At the same time:

PITCH ATTITUDE..15 °
BANK..WINGS LEVEL

Note: *When a safe flight path and speed are achieved and maintained, if stall warning continues, consider it as spurious.*

[QRH] BOMB ON BOARD

Ident.: PRO-ABN-MISC-00012095.0002001 / 17 MAR 17
Applicable to: ALL

COCKPIT PROCEDURES

BACKGROUND

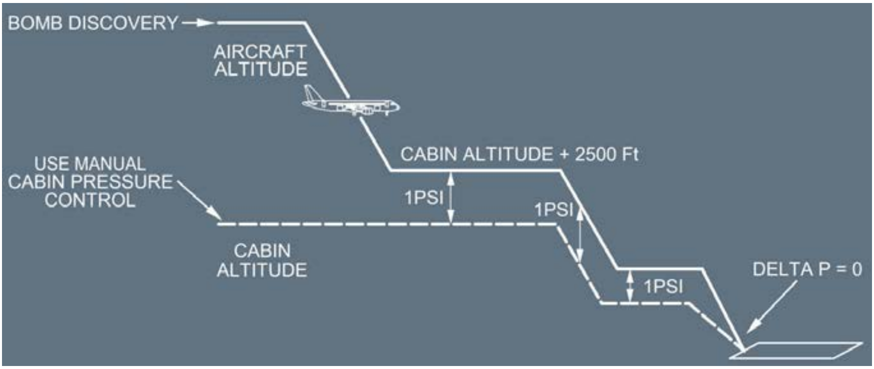
To avoid the activation of an altitude-sensitive bomb, the cabin altitude should not exceed the value at which the bomb has been discovered.
To reduce the effects of the explosion, the aircraft should fly as long as possible with approximately 1 PSI differential pressure, to help the blast go outwards. 1 PSI differential pressure corresponds to a 2 500 ft difference between the aircraft and the cabin altitude.
These conditions are achieved by using the manual pressure control.

PROCEDURE

The following procedure assumes that it is initiated during climb or cruise:

First, maintain the cabin altitude using manual pressure mode.
While maintaining the cabin altitude, descend the aircraft to the cabin altitude + 2 500 ft and maintain delta P at 1 PSI.
During further steps of descent, maintain delta P at 1 PSI using the cabin V/S target selector.
During the approach, use automatic pressure mode in order to reduce the differential pressure to zero at touchdown.

If flight conditions are different, the crew should adapt the procedure, bearing in mind the above-mentioned principles (background paragraph).



CKPT / CAB COM.. ESTABLISH

Continued on the following page

[QRH] BOMB ON BOARD (Cont'd)

■ **If landing and evacuation possible within 30 min:**

ATC / COMPANY...NOTIFY
EVAC...PREPARE

■ **If landing and evacuation NOT possible within 30 min:**

AIRCRAFT (IF CLIMBING)...LEVEL OFF
CABIN PRESS MODE SEL...MAN

The purpose is to immediately prevent the cabin altitude from increasing, in order to avoid the activation of an altitude-sensitive bomb.

MAINTAIN CAB ALT

Use MAN V/S CTL selector to maintain the cabin altitude at the value it had when the bomb was discovered.

ATC / COMPANY...NOTIFY

To obtain expert advice from explosive specialists.

TRGT SPEED: PREFER LO IAS

Low speed could reduce the consequences of possible structural damage, if the bomb explodes.

DESCENT TO CAB ALT + 2 500 ft or MEA - MORA..INITIATE

Descending to 2 500 ft above the cabin altitude gives a cabin differential pressure of approximately 1 PSI, which helps to ensure that the blast goes outwards, if the bomb explodes.

AVOID SHARP MANEUVERS

Which might result in the bomb moving.

MAINTAIN CAB ALT

Use MAN V/S CTL selector to maintain the cabin altitude. Initially brief UP input should be required; but, be careful not to increase the cabin altitude.

● **When at CAB ALT + 2 500 ft:**

MAINTAIN 1 PSI ΔP

Use MAN V/S CTL selector to adjust delta P to 1 PSI. Brief DN input should be initially required to set 0 ft/min cabin vertical speed.

GALLEY...OFF
FUEL RESERVES...DETERMINE

When flying at cabin altitude + 2 500 ft, fuel consumption in CONF 1, with landing gear down, will be about 2.1 times that consumed in clean configuration.

Continued on the following page

[QRH] BOMB ON BOARD (Cont'd)

- **When bomb secured at the LRBL or cannot be moved:**

  Least Risk Bomb Location (LRBL) is the center of the RH aft cabin door

  EMER EXIT LT...ON

  To recover minimum cabin lighting when the COMMERCIAL pb-sw will be switched OFF

  COMMERCIAL...OFF

- **If fuel permits:**

  FLAPS...AT LEAST CONF 1
  L/G lever (except for flight over water)...DOWN

  The detonation could damage the landing systems. Therefore, if fuel permits, configure the aircraft for landing as soon as possible. Reducing the speed will minimize stress on the aircraft structure.

  USE NORMAL CONF FOR LANDING

DURING FURTHER DESCENT: MAINTAIN MAX 1 PSI ΔP

Use MAN V/S CTL selector to DN to adjust delta P to 1 PSI.

- **During approach:**

  CABIN PRESS MODE SEL...AUTO

  This allows CPC to automatically control the cabin altitude to 0 during final approach.

- **When aircraft on ground and stopped in a remote area (if possible):**

  Refer to PRO-ABN-MISC [QRH] EMER EVAC

CABIN PROCEDURES

If a suspect device is found in the cabin:

WARNING	Do not cut or disconnect any wires and do not open or attempt to gain entry to internal components of a closed or concealed suspect device. Any attempt may result in an explosion. Booby-trapped closed devices have been used on aircraft in the past.

WARNING	Alternate locations must not be used without consulting with an aviation explosives security specialist. Never take a suspect device to the flight deck.

CAUTION	The least risk bomb location for the aircraft structure and systems is center of the RH aft cabin door.

EOD PERSONNEL ON BOARD...CHECK

Continued on the following page

[QRH] BOMB ON BOARD (Cont'd)

Announce “Is there any EOD personnel on board ?”. By using the initials, only persons familiar with EOD (Explosive Ordnance Disposal) will be made aware of the problem.

DO NOT OPEN THE BOMB
DO NOT CUT BOMB’S WIRES
SECURE BOMB AGAINST SLIPPING
PROTECT BOMB AGAINST SHOCKS

Secure in the attitude found and do not lift before having checked for an anti-lift ignition device.

PASSENGERS.. LEAD AWAY FROM BOMB

Move passengers at least 4 seat rows away from the bomb location. On full flights, it may be necessary to double up passengers to achieve standoff from the suspect device.
Passengers near the bomb should protect their heads with pillows, blankets.
All passengers must remain seated with seatbelts on and, if possible, head below the top of the head rest. Seat backs and tray tables should be in their full upright position.
Service items may need to be collected in order to secure tray tables.

PORTABLE ELECTRONIC DEVICES...SWITCH OFF

The cabin crews must command passengers to switch off all portable electronic devices.

BOMB..CHECK NO ANTI-LIFT DEVICE

To check for an anti-lift switch or lever, slide a string or stiff card, (such as the emergency information card) under the bomb, without disturbing the bomb.
If the string or card cannot be slipped under the bomb, it may indicate that an anti-lift switch or lever is present and that the bomb cannot be moved.
If a card is used and can be slid under the bomb, leave it under the bomb and move together with the bomb.
If it is not possible to move the bomb, then it should be surrounded with a single thin sheet of plastic (e. g. trash bag), then with wetted materials, and other blast attenuation materials such as seat cushions and soft carry-on baggage. Move personnel as far away from the bomb location as possible.

EMERGENCY EQUIPMENT..REMOVE AND STOW

Emergency equipment (PBE, fire extinguisher, ...) located close to the LRBL must be removed and stowed in alternate location.

GALLEY/IFE POWER...OFF

All galley and IFE equipment located close to the LRBL must be switched off.

- **If the bomb can be moved:**
  RH AFT CABIN DOOR SLIDE.. DISARM
  LEAST RISK BOMB LOCATION (LRBL).. PREPARE

Continued on the following page

[QRH] BOMB ON BOARD (Cont'd)

Build up a platform of solid baggage against the door up to about 25 cm (10 in) below the middle of the door.
On top of this, build up at least 25 cm (10 in) of wetted material such as blankets and pillows.
Place a single thin sheet of plastic (e. g. trash bag) on top of the wetted materials. This prevents any possible short circuit.

CAUTION	*DO NOT OMIT THE PLASTIC SHEETS, AS THE SUSPECT DEVICE COULD GET WET AND POSSIBLY SHORT CIRCUIT ELECTRONIC COMPONENTS CAUSING INADVERTENT DEVICE ACTIVATION.*

BOMB INDICATION LINE...POSITION

<u>Note:</u> *A bomb location indicator line is a 6 to 8 ft (1.8 to 2.4 m) (e.g. neckties, headset cord, or belts connected together) preferably of constrating color, that helps the responding bomb squad find the precise location of the suspect device within the LRBL stack once constructed.*

Position the bomb indication line from the location on the platform where you will place the suspect device, EXTENDING outward into the aisle.

BOMB...MOVE TO LRBL

Carefully carry in the attitude found and place on top of the wetted materials in the same attitude and as close to the door structure as possible.

CAUTION	*Ensure that the suspect device, when placed on the stack against the door, is above the slide pack but not against the door handle, and if possible, avoid placement in the view port.*

LEAST RISK BOMB LOCATION (LRBL)..COMPLETE

Place an additional single thin sheet of plastic over the bomb.

CAUTION	*DO NOT OMIT THE PLASTIC SHEETS, AS THE SUSPECT DEVICE COULD GET WET AND POSSIBLY SHORT CIRCUIT ELECTRONIC COMPONENTS CAUSING INADVERTENT DEVICE ACTIVATION.*

Build up at 25 cm (10 in) of wetted material around the sides and on top of the bomb.

DO NOT PLACE ANYTHING BETWEEN THE BOMB AND THE DOOR, AND MINIMIZE AIRSPACE AROUND THE BOMB.

The idea is to build up a protective surrounding of the bomb so that the explosive force is directed in the only unprotected area into the door structure.
Fill the area around the bomb with seat cushions and other soft materials such as hand luggage (saturated with water or any other nonflammable liquid) up to the cabin ceiling,

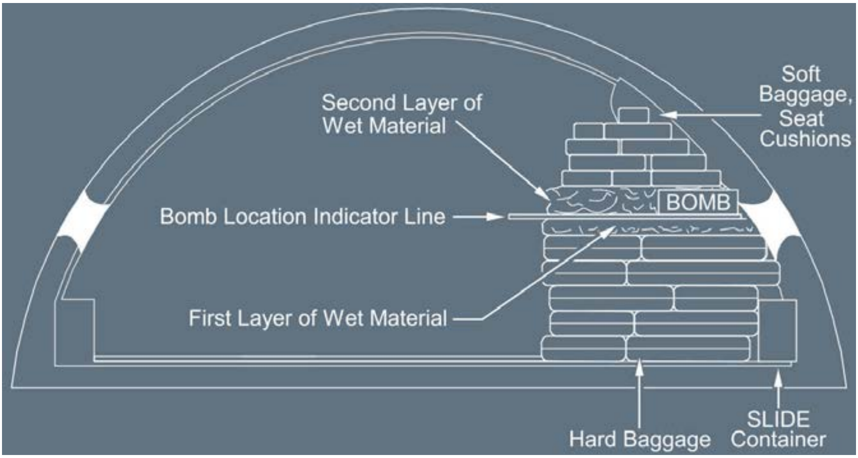
Continued on the following page

[QRH] BOMB ON BOARD (Cont'd)

compressing as much as possible. Secure the LRBL stack in place using belt, ties or other appropriate materials. The more material stacked around the bomb, the less the damage will be.

USE ONLY SOFT MATERIAL. AVOID USING MATERIALS CONTAINING ANY INFLAMMABLE LIQUID AND ANY METAL OBJECTS WHICH COULD BECOME DANGEROUS PROJECTILES.

LRBL STACK



PASSENGERS.. MOVE/ADVISE

Move passengers at least 4 seat rows away from the least risk bomb location (RH aft cabin door). On full flights, it may be necessary to double up passengers to achieve standoff from the suspect device.
Passengers near the bomb should protect their heads with pillows, blankets. All passengers must remain seated with seatbelts on and, if possible, head below the top of the head rest. Seat backs and tray tables must be in their full upright position.

CABIN CREW.. NOTIFY COCKPIT CREW

Cabin crew notify the flight crew that the bomb is secured at the LRBL.

EVACUATION/DISEMBARKATION...EXECUTE

Evacuate through normal and emergency exits on the opposite side of the “bomb” location. Do not use the door just opposite the “bomb”.

Continued on the following page

[QRH] BOMB ON BOARD (Cont'd)

Use all available airport facilities to disembark without delay.

[QRH] COCKPIT WINDSHIELD / WINDOW ARCING

Ident.: PRO-ABN-MISC-00012099.0001001 / 17 MAR 17
Applicable to: ALL

Affected WINDOW / WINDSHIELD ANTI-ICE C/B...PULL

Pull the circuit breaker of the affected window/windshield heating system, in case of:
- *Electrical arcing of the cockpit windshield/window, or*
- *Burning smell or smoke identified as coming from the bottom right corner of CAPT windshield or bottom left corner of the F/O windshield.*

On the rear C/B panel:
- *ANTI-ICE L WSHLD AF10 C/B [123VU],*
- *ANTI-ICE R WSHLD AF03 C/B [123VU],*
- *ANTI-ICE/WINDOWS L X14 C/B [122VU],*
- *ANTI-ICE/WINDOWS R W14 C/B [122VU].*

[QRH] COCKPIT WINDSHIELD / WINDOW CRACKED

Ident.: PRO-ABN-MISC-00012097.0001001 / 17 MAR 17
Applicable to: ALL

TOUCH THE CRACK WITH A PEN (OR CAREFULLY WITH FINGERNAIL)

- **If no crack on cockpit side:**
  NO LIMITATION
  The inner ply is not affected. Therefore, the window/windshield is still able to sustain the differential pressure up to the maximum flight level.

- **If cracks on cockpit side:**
  MAX FL: 230 / MEA-MORA
  The inner ply is affected. The flight crew is not able to easily determine if other plies are affected. Descend to FL 230/MEA and reduce differential pressure to 5 PSI .

  Note: The maximum flight level is restricted to FL 230/MEA to obtain ΔP 5 PSI , without resulting in an excessive cabin altitude and an EXCESS CAB ALT warning.

  The following procedure enables maintaining ΔP 5 PSI in manual cabin pressure mode.
  CAB PRESS MODE SEL...MAN
  DISREGARD THE CAB ALT TARGET TABLE DISPLAYED ON THE ECAM
  MAN V/S CTL...AS RQRD
  SET THE CABIN ALTITUDE ACCORDING TO THE TABLE BELOW TO MAINTAIN ΔP 5 PSI

FL	*100*	*150*	*200*	*230*
CABIN ALTITUDE	*0*	*3 000*	*6 000*	*8 000*

  - **When starting the descent for approach:**
    CAB PRESS MODE SEL...AUTO

Note: Due to the increased noise level, pay particular attention to visual warnings.

- **If visibility not sufficient for approach due to damage:**
  CONSIDER AUTOLAND
  - **For approach, if AUTOLAND not available:**
    CAB PRESS MODE SEL...MAN
    MAN V/S CTL...FULL UP
    MAX SPEED: 200 kt
    PF SLIDING WINDOW...OPEN

[QRH] DITCHING

Ident.: PRO-ABN-MISC-00012087.0037001 / 17 MAR 17
Applicable to: ALL

This procedure applies when engines are running. If engines are not running, *Refer to QRH/ABN-19 ENG DUAL FAILURE - FUEL REMAINING - DITCHING* or *Refer to QRH/ABN-19 ENG DUAL FAILURE - NO FUEL REMAINING - DITCHING*

ATC....................NOTIFY
ATC XPDR 7700....................CONSIDER
PREPARE CABIN AND COCKPIT

Notify the cabin crew of the nature of the emergency and state intentions.

Specify the available time:
- *Loose equipment secured*
- *Survival equipment prepared*
- *Belts and shoulder harnesses locked*

GPWS SYS....................OFF
GPWS TERR....................OFF

Pressing OFF the SYS pb and TERR pb avoids nuisance warnings.

SIGNS....................ON
EMER EXIT LT....................ON
COMMERCIAL....................OFF
LDG ELEV....................SELECT 00
BARO....................SET
DISREGARD NORM C/Ls
ELT (when conditions permit)....................ON

- **For approach and ditching:**

  KEEP LANDING GEAR UP
  SLATS / FLAPS....................MAX AVAIL
  FOR FLARE: TARGET PITCH 11 ° & MIN V/S

  Note: *Prefer ditching parallel to the swell. If that causes a strong crosswind, ditch into the wind.*

- **At 2 000 ft AGL:**

  CAB PRESS MODE SEL....................AUTO
  The outflow valve would remain open, if the MODE SEL pb were not at AUTO.
  ALL BLEEDS (ENGs & APU)....................OFF

Continued on the following page

[QRH] DITCHING (Cont'd)

CABIN CREW....................NOTIFY FOR DITCHING
DITCHING pb....................ON

The outflow valve, emergency ram air inlet, avionics ventilation inlet and extract valves, and pack flow control valves, and the forward cargo outlet isolation valve, close.

- **At 500 ft AGL:**

BRACE FOR IMPACT....................ORDER

- **At touchdown:**

ALL ENG MASTERS....................OFF
APU MASTER SW....................OFF

- **After ditching:**

ATC (VHF 1)....................NOTIFY

With engine and APU shut down, only VHF 1 is supplied.

ALL FIRE pb (ENGs & APU)....................PUSH
ALL AGENTS (ENGs and APU)....................DISCH
EVACUATION....................INITIATE
ELT....................CHECK EMITTING

If not, switch on the transmitter.
After impact the lowest point of the passenger exits (aft door) remains above the waterline for more than 7 min.

[QRH] EMER EVAC

Ident.: PRO-ABN-MISC-00012083.0001001 / 09 MAY 17
Applicable to: ALL

Apply this procedure when considering an emergency evacuation, or when required by the ECAM. Carefully analyze the situation before deciding to evacuate passengers. However do not waste valuable time.

AIRCRAFT / PARKING BRK...STOP / ON
ATC (VHF1)...NOTIFY

Notify ATC of the nature of the emergency, and state intentions.
Only VHF 1 is available on batteries.

CABIN CREW (PA)...ALERT

Make a short and precise announcement to warn that an emergency evacuation may be required.

ΔP (only if MAN CAB PR has been used)...CHECK ZERO

If ΔP is not at zero, MODE selector on MAN and V/S CTL FULL UP, to fully open the outflow valve.

- **If ΔP not at zero:**
  CAB PR MODE SEL...MAN
  V/S CTL...FULL UP

ALL ENG MASTER...OFF

Associated LP and HP valves close.

ALL FIRE pb (ENGs & APU)...PUSH
ALL AGENTS (ENGs & APU)...AS RQRD

Engine Agent 2 is not available.
The use of agents is required if the ENG FIRE or APU FIRE is displayed.

- **If evacuation required:**
  EVACUATION...INITIATE
  Make a short and precise announcement to order the emergency evacuation.
  Press the EVAC COMMAND pb.

- **If evacuation not required:**
  CABIN CREW AND PASSENGERS (PA)...NOTIFY

[QRH] EMER LANDING
ALL ENG FAILURE

Ident.: PRO-ABN-MISC-00015075.0009001 / 17 MAR 17
Applicable to: ALL

Apply the following if not able to maintain altitude after the loss of thrust near the ground.

■ **If ditching anticipated:**

APU....................................START
L/G LEVER....................................CHECK UP
FOR LANDING....................................USE FLAP 2

L2 *Only slats extend, and slowly.*

L1 VAPP....................................DETERMINE

Weight	40 t / 90 klb	50 t / 110 klb	60 t / 130 klb	70 t / 155 klb	80 t / 175 klb	90 t / 200 klb	95 t / 210 klb
VAPP	150 kt	150 kt	163 kt	173 kt	183 kt	193 kt	198 kt

DITCHING pb ....ON

L2 *Ditch the aircraft parallel to the swell. If that causes a strong crosswind, ditch the aircraft into the wind.*

L1 ● **At 500 ft AGL or below:**

BRACE FOR IMPACT....................................ORDER

● **For flare:**

TOUCH DOWN AT MIN V/S

TARGET PITCH ATT 11 °

● **At touchdown:**

ALL ENG MASTERS....................................OFF
APU MASTER SW....................................OFF
EMER EVAC PROC....................................APPLY

L2 *Refer to PRO-ABN-MISC [QRH] EMER EVAC*

L1 ■ **If forced landing anticipated:**

APU....................................START
FOR LANDING....................................USE FLAP 2

L2 *Only slats extend, and slowly.*

L1 VAPP....................................DETERMINE

Weight	40 t	50 t	60 t	70 t	80 t	90 t	95 t

Continued on the following page

[QRH] EMER LANDING (Cont'd)
ALL ENG FAILURE

	/ 90 klb	/ 110 klb	/ 130 klb	/ 155 klb	/ 175 klb	/ 200 klb	/ 210 klb
VAPP	150 kt	150 kt	163 kt	173 kt	183 kt	193 kt	198 kt

GND SPLRs..ARM

- **At 1 000 ft AGL at the latest:**

  GRAVITY GEAR EXTN handcrank..PULL AND TURN

  L2 *Flight controls revert to direct law at landing gear extension. To ensure correct aircraft trimming for approach, extend the landing gear only when the aircraft is in CONF 2 and at VAPP . Disregard the ″USE MAN PITCH TRIM″ message on the PFD, because the stabilizer is jammed, due to not sufficient hydraulic power.*

  L1
  - **When L/G downlocked:**

    L/G LEVER..DOWN

- **At 500 ft AGL or below:**

  BRACE FOR IMPACT..ORDER

- **For flare:**

  TOUCH DOWN AT MIN V/S

- **At touchdown:**

  ALL ENG MASTERS..OFF

  APU MASTER SW..OFF

  EMER EVAC PROC..APPLY

  L2 *Refer to PRO-ABN-MISC [QRH] EMER EVAC*

[QRH] FORCED LANDING

Ident.: PRO-ABN-MISC-00012090.0032001 / 09 MAY 17
Applicable to: ALL

If engines are not running, *Refer to QRH/ABN-19 ENG DUAL FAILURE - FUEL REMAINING - FORCED LANDING* or *Refer to QRH/ABN-19 ENG DUAL FAILURE - NO FUEL REMAINING - FORCED LANDING*

ATC....................NOTIFY
ATC XPDR 7700....................CONSIDER
PREPARE CABIN AND COCKPIT

Notify the cabin crew of the nature of the emergency and state intentions.

Specify the available time:
- *Loose equipment secured.*
- *Survival equipment prepared.*
- *Belts and shoulder harnesses locked.*

GPWS SYS....................OFF
GPWS TERR....................OFF

Switching the SYS pb and TERR pb OFF avoids nuisance warnings.

SIGNS....................ON
EMER EXIT LT....................ON
COMMERCIAL....................OFF
LDG ELEV....................SET

If not known, select an approximate value.

BARO....................SET
DISREGARD NORM C/Ls
ELT (when conditions permit)....................ON

- **For approach and landing:**

  RAM AIR....................ON

  Switch ON the RAM AIR to ensure complete cabin depressurization on ground.

  L/G lever ....DOWN
  SLATS / FLAPS....................MAX AVAIL
  GND SPLR....................ARM

  MAX BRK PR: 1000 PSI

- **At 2 000 ft AGL:**

  CABIN CREW....................NOTIFY FOR LANDING

Continued on the following page

[QRH] FORCED LANDING (Cont'd)

- **At 500 ft AGL:**
  BRACE FOR IMPACT .... ORDER
- **At touchdown:**
  ALL ENG MASTERS .... OFF
  APU MASTER SW .... OFF

  BRACES ON ACCU ONLY
- **When aircraft stopped:**
  PARKING BRK .... ON
  ATC (VHF 1) .... USE

  With both engines and APU shut down, only VHF 1 is supplied.

  ALL FIRE pb (ENGs & APU) .... PUSH
  ALL AGENTS (ENGs & APU) .... DISCH
  - **If evacuation required:**
    EVACUATION .... INITIATE

    Make a short and precise announcement to order the emergency evacuation.
    Press the EVAC COMMAND pb .

    ELT .... CHECK EMITTING

    If not, switch on the transmitter.
  - **If evacuation not required:**
    CABIN CREW AND PASSENGERS (PA) .... NOTIFY

[QRH] OVERWEIGHT LANDING

Ident.: PRO-ABN-MISC-00012093.0059001 / 17 MAR 17
Applicable to: ALL

USE CONF FULL FOR LANDING UNLESS SPECIFIED BY ABN PROC OR LIMITED BY LANDING PERF

MAX WEIGHT (1 000 kg) FOR LANDING IN CONF FULL (GO AROUND IN CONF 3 CLIMB GRADIENT 2.1 %)								
OAT (°C)	AIRPORT ELEVATION (feet)							
	0	2 000	4 000	6 000	8 000	10 000	12 000	14 000
<10	74	72	70	68	65	62	59	56
15	74	72	70	68	65	62	59	56
20	74	71	70	67	65	62	59	55
25	73	71	69	67	65	62	57	52
30	73	71	69	67	64	58	54	
35	73	71	69	65	60			
40	73	71	67	62				
45	72	68	64					
50	69	65						
55								

- **If aircraft weight above maximum weight for landing in conf FULL:** USE FLAP 3 FOR LANDING

LDG DIST......CHECK

- **For approach:**
  PACK 1......OFF OR SUPPLIED BY APU
  PACK 2......OFF OR SUPPLIED BY APU
  Selecting packs OFF (or supplied from APU) will increase the maximum thrust available from the engines, in the event of a go-around.
- **If landing CONF other than full:** USE CONF 1+F FOR GO AROUND

SPEED AT RUNWAY THRESHOLD: VLS

Reduce the selected speed on the FCU to reach VLS at runway threshold.

MINIMIZE V/S AT TOUCHDOWN

- **At main landing gear touchdown:** USE MAX REVERSER
- **After nosewheel touchdown:** APPLY BRAKES AS NECESSARY

Continued on the following page

[QRH] OVERWEIGHT LANDING (Cont'd)

Maximum braking may be used after nosewheel touchdown. But, if landing distance permits, delay or reduce braking to take full benefit of the available runway length.

- **When landing completed:**

BRAKE FANS .... ON

Be prepared for tire deflation, if temperatures exceed 800 °C.

[QRH] SEVERE TURBULENCE

Applicable to: ALL

Ident.: PRO-ABN-MISC-10-00002202.0001001 / 17 MAR 17

Whenever possible, avoid areas with known or forecasted severe turbulence. If turbulence is unavoidable, aim to keep the speed in the region of the target speed given in this section, so as to provide the best protection against the effect of gust on the structural limits, whilst maintaining an adequate margin above VLS.
Sufficient buffet margin exists at optimum altitude. In order to further increase the margin to buffet onset, consider descending to a lower altitude.
Severe turbulence is defined as turbulence that causes large, abrupt changes in altitude and/or attitude. It usually causes large variations in airspeed. Occupants are forced violently against their seat belts and loose objects will move around the aircraft.
If severe turbulence occurs during a flight, the flight crew must make a logbook entry in order to initiate maintenance action.

Note: Recommendations for severe turbulence are also applicable to extreme turbulence.

Ident.: PRO-ABN-MISC-10-00002203.0001001 / 22 FEB 17

Before the aircraft enters an area where turbulence is expected:

- All loose equipment must be secured in the cockpit and in the cabin
- The flight crew must set the SEAT BELTS sw to ON.

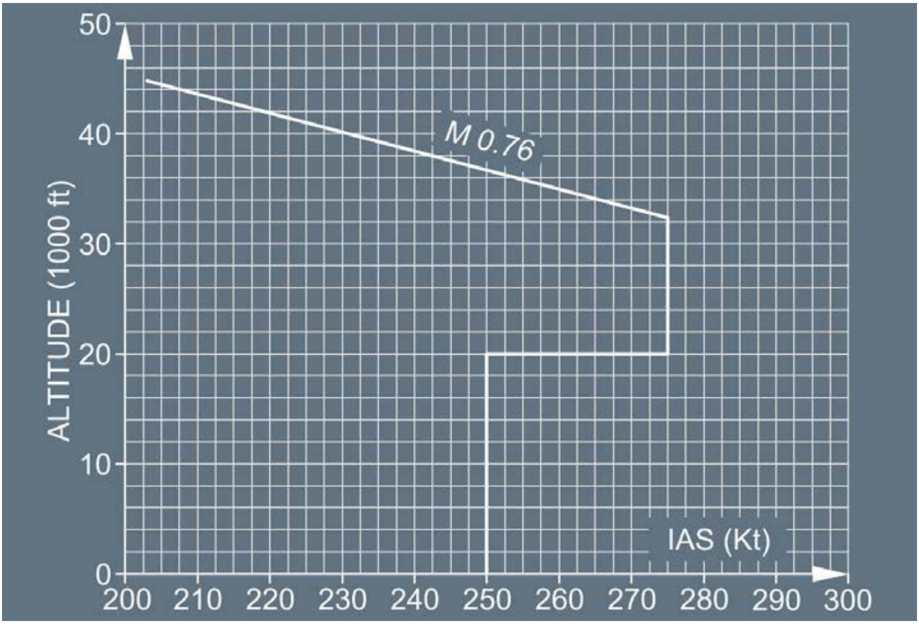
Ident.: PRO-ABN-MISC-10-00002301.0001001 / 09 DEC 09

Keep the autopilot ON.
When thrust changes become excessive : Disconnect Autothrust.
For approach : Use A/THR for managed speed.

Ident.: PRO-ABN-MISC-10-00002208.0004001 / 22 MAY 12

Set the thrust to give the recommended speed (*Refer to PRO-ABN-MISC [QRH] Thrust Setting (N1) for Recommended Speed*). This thrust setting attempts to obtain, in stabilized conditions, the speed for turbulence penetration given in the graph below.

Only change thrust in case of an extreme variation in airspeed, and do not chase your Mach or airspeed.
A transient increase is preferable to a loss of speed, that decreases buffet margins and is difficult to recover.



Ident.: PRO-ABN-MISC-10-00007380.0030001 / 17 MAR 11

SEVERE TURBULENCE											
SPEED AND THRUST SETTING FOR RECOMMENDED TURBULENCE SPEED											
FL	SPD or Mach	GROSS WEIGHT (1000 kg)									
		40	44	48	52	56	60	64	68	72	76
		N1 %									
390	0.76	78.9	79.7	80.6	81.7	82.8	–	–	–	–	–
370	0.76	78.2	78.8	79.5	80.3	81.3	82.3	83.4	–	–	–
350	0.76	77.8	78.4	79.0	79.6	80.3	81.2	82.1	83.1	84.1	–
330	0.76	77.8	78.3	78.9	79.5	80.0	80.7	81.4	82.2	83.1	84.0
310	275	77.1	77.6	78.1	78.7	79.3	80.0	80.6	81.2	81.9	82.8
290	275	75.6	76.1	76.6	77.1	77.7	78.4	79.2	80.0	80.6	81.4
270	275	74.1	74.5	75.1	75.7	76.2	76.9	77.6	78.3	79.2	80.1
250	275	72.6	73.0	73.5	74.1	74.7	75.3	76.1	76.8	77.6	78.4
200	275	69.2	69.5	69.9	70.3	70.8	71.4	72.0	72.7	73.4	74.1
150	250	61.4	61.9	62.5	63.2	64.0	64.8	65.7	66.8	67.9	68.8
100	250	58.0	58.5	59.1	59.7	60.3	61.0	61.7	62.6	63.5	64.5
50	250	54.1	54.5	55.1	55.7	56.4	57.2	58.0	58.9	59.9	60.8

Ident.: PRO-ABN-MISC-10-00007386.0001001 / 09 JUN 15

If the flight crew flies the aircraft manually:
- The flight crew may expect large variations in altitude, but should not chase altitude.
- The flight crew should consider descending to or below OPT FL, in order to increase the margin to buffet.

Ident.: PRO-ABN-MISC-10-00007388.0002001 / 29 SEP 15

Configuration FULL, or 3, can be used.
CONF FULL provides better handling capability in turbulent conditions, however, CONF 3 provides more energy and less drag.

[QRH] TAILSTRIKE

Ident.: PRO-ABN-MISC-00012273.0001001 / 17 MAR 17
Applicable to: ALL

LAND ASAP

MAX FL: 100 / MEA-MORA

500 ft/min should be targeted for the climb, to minimize pressure changes, and for passenger and crew comfort. Similarly, the rate of descent must be limited to about 1 000 ft/min, except for the final approach that must be performed normally.
Notify the ATC of the aircraft's rate of climb.

RAM AIR...ON
PACK 1...OFF
PACK 2...OFF

[QRH] VOLCANIC ASH ENCOUNTER

Ident.: PRO-ABN-MISC-00012176.0001001 / 17 MAR 17
Applicable to: ALL

180° TURN....................INITIATE

The performance of a 180 ° turn will usually enable the aircraft to exit the volcanic ash clouds as quickly as possible, because volcanic ash clouds can extend for hundreds of nautical miles.

ATC....................NOTIFY

Note: Electrostatic conditions may cause communication problems.

A/THR....................OFF

This prevents the autothrust from generating thrust variations.

THRUST (IF CONDS PERMIT)....................REDUCE

Reduced thrust minimizes ash ingestion.
If altitude permits, reduce thrust to idle. This maximizes engine surge margin and lowers engine turbine temperature.

CREW OXY MASKS....................USE / 100 % / EMER
CABIN CREW....................NOTIFY
OXYGEN PASSENGER MASK MAN ON....................AS RQRD

Depending on contamination.

ENG ANTI ICE....................ON
WING ANTI ICE....................ON
PACK FLOW....................HI

Maximum air bleed gives the engines additional stall margin.

CARGO ISOL VALVES ....OFF

Note: To prevent a cargo smoke warning being triggered

ENGINE PARAMETERS....................MONITOR

Monitor particularly EGT . If EGT exceeds limits, it may become necessary to consider a precautionary engine shutdown and engine restart in flight.

Note: In the case of precautionary shutdown:
- *restart when clear of the volcanic ash cloud*
- *Upon restart, the engine may accelerate very slowly. Do not misinterpret this as a failure to start*
- *Consider that the compressor and turbine blades have been eroded and avoid sudden changes in thrust. Fuel flow and EGT may increase.*

Continued on the following page

[QRH] VOLCANIC ASH ENCOUNTER (Cont'd)

AIRSPEED INDICATIONS...MONITOR

If airspeed is unreliable or lost, Refer to PRO-ABN-NAV UNRELIABLE SPEED INDICATION - Memory Items.

Note: *If both engines flame out and speed indications are lost,Refer to DUAL ENGINE FAILURE procedure to get the required pitch attitude for the optimum relight speed. In case of engine failure, switch off the wing anti ice before engine restart.*

- **If visibility not sufficient for approach due to windshield damage:**

  CONSIDER AUTOLAND

  - **For approach, if AUTOLAND is not available:**

    CAB PRESS MODE SEL...MAN
    MAN V/S CTL...FULL UP

    Due to the increased noise level, pay particular attention to visual warnings.

    MAX SPEED: 200 kt
    PF SLIDING WINDOW...OPEN

Intentionally left blank

[MEM] UNRELIABLE SPEED INDICATION

Applicable to: ALL

Ident.: PRO-ABN-NAV-AM-00017720.0002001 / 17 MAR 17

- **If the safe conduct of the flight is impacted:**

  AP.......... OFF
  A/THR.......... OFF
  FD.......... OFF

  PITCH/THRUST:
  Below THRUST RED ALT.......... 15° / TOGA
  Above THRUST RED ALT and Below FL 100.......... 10° / CLB
  Above THRUST RED ALT and Above FL 100.......... 5° / CLB
  FLAPS (if CONF 0(1)(2)(3)).......... MAINTAIN CURRENT CONF
  FLAPS (if CONF FULL).......... SELECT CONF 3 AND MAINTAIN
  SPEEDBRAKES.......... CHECK RETRACTED
  L/G.......... UP

  When at, or above MSA or Circuit Altitude: Level off for troubleshooting.

Continued on the following page

[MEM] UNRELIABLE SPEED INDICATION (Cont'd)

Ident.: PRO-ABN-NAV-AM-00017722.0006001 / 17 MAR 17

- **To level off:**

AP....................OFF
A/THR....................OFF
FD....................OFF
SPEEDBRAKES....................CHECK RETRACTED
PITCH/THRUST TABLE....................APPLY

PITCH / THRUST FOR LEVEL OFF				
		70 t **155 000 lb**	**60 t** **130 000 lb**	**50 t** **110 000 lb**
SLATS / FLAPS EXTENDED				
CONF	**PITCH**	**THRUST % N1** (Resultant speed)		
3	**7.5°**	**62%** (145 kt)	**58%** (135 kt)	**54%** (125 kt)
2	**5.5°**	**62%** (170 kt)	**58%** (160 kt)	**52%** (145 kt)
1+F	**5°**	**62%** (190 kt)	**58%** (175 kt)	**52%** (160 kt)
1	**6.5°**	**60%** (205 kt)	**56%** (190 kt)	**52%** (175 kt)
CLEAN				
PITCH	**FL**	**THRUST % N1** (Resultant speed)		
4° **at or below FL250**	**100**	**62%** (240 kt)	**60%** (220 kt)	**54%** (200 kt)
	200	**70%** (240 kt)	**66%** (220 kt)	**62%** (200 kt)
3° **above** **FL250**	**300**	**78%** (260 kt)	**76%** (240 kt)	**70%** (220 kt)
	350	**84%** (255 kt)	**80%** (240 kt)	**74%** (220 kt)
	400	/	**86%** (230 kt)	**80%** (215 kt)

FLYING TECHNIQUE TO STABILIZE SPEED

Stabilize the altitude. When altitude is stabilized:
- If the pitch is above the target pitch, increase the thrust and maintain the altitude.
- If the pitch is below the target pitch, decrease the thrust and maintain the altitude.

When the pitch reaches the target pitch, adjust the thrust to keep this target pitch.

Continued on the following page

[MEM] UNRELIABLE SPEED INDICATION (Cont'd)

Ident.: PRO-ABN-NAV-AM-00017724.0002001 / 17 MAR 17

- **When flight path is stabilized:**
  AP....................OFF
  A/THR....................OFF
  FD....................OFF
  SPEEDBRAKES....................CHECK RETRACTED
  FLIGHT PATH....................KEEP STABILIZED

RESPECT STALL WARNING

Ident.: PRO-ABN-NAV-AM-00017725.0001001 / 17 MAR 17

AFFECTED ADR IDENTIFICATION

PROBE/WINDOW HEAT....................ON
ALL SPEED INDICATIONS....................CROSSCHECK
ADR 3 and STBY speeds use the data of the same probe.

- **If at least one ADR confirmed reliable:**
  RELIABLE AIR DATA....................USE
  UNRELIABLE ADR pb(s)....................OFF

- **If affected ADR(s) cannot be identified, or all ADRs affected:**
  KEEP ONE ADR ON
  TWO ADR pbs....................OFF
  This prevents the flight control laws from using two coherent but unreliable ADR data.
  FOR LANDING: USE FLAP 3
  APP SPD ....VLS +10 kt
  LDG DIST PROC....................APPLY
  - **For flight continuation:** USE PITCH/THRUST TABLES

Continued on the following page

[MEM] UNRELIABLE SPEED INDICATION (Cont'd)

Ident.: PRO-ABN-NAV-AM-00017726.0006001 / 17 MAR 17

CLIMB

CLIMB IN CLEAN CONFIGURATION				
		70 t 155 000 lb	60 t 130 000 lb	50 t 110 000 lb
THRUST	FL	PITCH (Resultant speed)		
CLB	50	**11°** (230 kt)	**13°** (210 kt)	**16°** (190 kt)
	100	**10°** (230 kt)	**12°** (210 kt)	**14°** (190 kt)
	200	**7°** (235 kt)	**8°** (215 kt)	**10°** (195 kt)
	300	**6°** (230 kt)	**6°** (215 kt)	**7°** (195 kt)
	400	/	**4°** (210 kt)	**5°** (195 kt)

CRUISE

FLYING TECHNIQUE TO STABILIZE SPEED

Stabilize the altitude. When altitude is stabilized:
- If the pitch is above the target pitch, increase the thrust and maintain the altitude.
- If the pitch is below the target pitch, decrease the thrust and maintain the altitude.

When the pitch reaches the target pitch, adjust the thrust to keep this target pitch.

LEVEL FLIGHT IN CLEAN CONFIGURATION				
		70 t 155 000 lb	60 t 130 000 lb	50 t 110 000 lb
PITCH	FL	THRUST % N1 (Resultant speed)		
4° at or below FL250	100	**62%** (240 kt)	**60%** (220 kt)	**54%** (200 kt)
	200	**70%** (240 kt)	**66%** (220 kt)	**62%** (200 kt)
3° above FL250	300	**78%** (260 kt)	**76%** (240 kt)	**70%** (220 kt)
	350	**84%** (255 kt)	**80%** (240 kt)	**74%** (220 kt)
	400	/	**86%** (230 kt)	**80%** (215 kt)

Note: *If the failure is due to radome destruction, the drag will increase and therefore N1 must be increased by 5 %. Fuel flow will increase by about 27 %.*

DESCENT

DESCENT IN CLEAN CONFIGURATION				
		70 t 155 000 lb	60 t 130 000 lb	50 t 110 000 lb
THRUST	PITCH	Resultant speed		
IDLE	1°	245 kt	225 kt	205 kt

Continued on the following page

[MEM] UNRELIABLE SPEED INDICATION (Cont'd)

INITIAL / INTERMEDIATE APPROACH

APPLY FLYING TECHNIQUE TO STABILIZE SPEED

LEVEL FLIGHT				
		70 t **155 000 lb**	**60 t** **130 000 lb**	**50 t** **110 000 lb**
WITH LANDING GEAR UP				
CONF	**PITCH**	**THRUST % N1** (Resultant speed)		
0	**5°**	**58%** (225 kt)	**54%** (205 kt)	**48%** (185 kt)
1	**6.5°**	**60%** (205 kt)	**56%** (190 kt)	**52%** (175 kt)
1+F	**5°**	**62%** (190 kt)	**58%** (175 kt)	**52%** (160 kt)
2	**5.5°**	**62%** (170 kt)	**58%** (160 kt)	**52%** (145 kt)
WITH LANDING GEAR DOWN				
3	**7.5°**	**68%** (150 kt)	**62%** (135 kt)	**58%** (125 kt)

FINAL APPROACH AT -3° DESCENT FLIGHT PATH

APPROACH IN CONF 3 AND L/G EXTENDED				
		70 t **155 000 lb**	**60 t** **130 000 lb**	**50 t** **110 000 lb**
CONF	**PITCH**	**THRUST (% N1)**		
3	**4°**	**52%**	**48%**	**44%**

[QRH] ADR 1+2+3 FAULT

Applicable to: ALL

Ident.: PRO-ABN-NAV-C-00017828.0001001 / 17 MAR 17

In case of a triple ADR failure, ECAM only displays dual ADR alerts.
All dual ADR alerts trigger: NAV ADR 1+2 FAULT, and NAV ADR 1+3 FAULT, and NAV ADR 2+3 FAULT.

L2 *Note: In case of a simultaneous ADR and IR (same ADIRU) failure, apply the ADR FAULT procedure prior to the IR FAULT procedure.*

L1 ALL ADR pbs...OFF
STBY INST...USE
DISREGARD ECAM ACTIONS FOR AIR DATA SWTG AND ATC
Air data switching and ATC have no effect.

TCAS & ATC ALT RPTG INOP

Ident.: PRO-ABN-NAV-C-00017830.0001001 / 21 MAR 16

Note: The STALL WARNING is lost.

MAX SPEED...320/0.82
See the following table for the IAS/M relationship for 0.82

FL	*390*	*370*	*350*	*330*	*310*	*290*	*280 and below*
MAX SPD	*252*	*265*	*278*	*290*	*305*	*315*	*320*

WHEN L/G DN: DIRECT LAW
At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).

Note: Use manual control of cabin pressurization:
MODE SEL...MAN
MAN V/S CTL...AS RQRD
These lines are not displayed on the ECAM. (For details, Refer to PRO-ABN-CAB_PR CAB PR SYS 1+2 FAULT - FWSPAGE).

Continued on the following page

[QRH] ADR 1+2+3 FAULT (Cont'd)

Ident.: PRO-ABN-NAV-C-00021399.0005001 / 17 MAR 17

STALL WARNING LOST
EXPECT ALTN LAW

FL	*390*	*370*	*350*	*330*	*310*	*290*	*280 and below*
MAX SPEED (kt)	*252*	*265*	*278*	*290*	*305*	*315*	*320*

This table provides IAS/MACH 0.82 relationship at or above FL 280.

USE RUDDER WITH CARE

At slats extension, full rudder travel authority is recovered.

WHEN L/G DOWN: DIRECT LAW

At landing gear extension, flight controls revert to direct law in pitch and in roll.

CABIN PRESS MODE SEL.. MAN
MAN V/S CTL.. AS RQRD

Target CAB PRESS V/S:

- *Climb: 500 ft/min*
- *Descent: 300 ft/min*

AIRCRAFTCRZ FL	***CAB ALT TARGET (ft)***
410	*8000*
350	*7000*
300	*5500*
250	*3000*
<200	*0*

Continued on the following page

[QRH] ADR 1+2+3 FAULT (Cont'd)

Ident.: PRO-ABN-NAV-C-00021262.0001001 / 17 MAR 17

- **For approach:**

  CAT 1 ONLY

  FOR LANDING: USE FLAP 3
  GPWS LDG FLAP 3....................ON
  LDG DIST PROC....................APPLY

  - **For L/G GRVTY EXTN:**
    LDG GEAR GRVTY EXTN handcrank....................PULL AND TURN
  - **When L/G downlocked:**
    L/G lever....................DOWN
    GEAR DOWN indications....................CHECK

    L/G DOORS REMAIN OPEN
  - **During final approach:**
    MAN V/S CTL....................FULL UP
- **Before door opening:** CHECK ∆P ZERO

Continued on the following page

[QRH] ADR 1+2+3 FAULT (Cont'd)

Ident.: PRO-ABN-NAV-C-00016863.0006001 / 22 MAR 17

STATUS

MAX SPEED.. 320/0.82
MANEUVER WITH CARE
RUD WITH CARE ABV 140 KT
See (1)

APPR PROC

FOR LDG.. USE FLAP 3
Do not select CONF FULL, so as not to degrade handling qualities.
GPWS LDG FLAP 3..ON
Displayed, when CONF 3 is selected.
APPR SPD.. VREF +10 KT
LDG DIST PROC.. APPLY

Note: *As the landing gear safety valve is closed, landing gear extension must be performed by gravity (Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION).*

WHEN L/G DN : DIRECT LAW
At landing gear extension, control reverts to direct law in pitch, as well as in roll.

- **DURING FINAL APPR**
  MAN V/S CTL..FULL UP

  Note: *In case of a go-around, respect the maximum speed of 215 kt in CONF 1+F, due to loss of flap auto retraction to CONF 1.*

CAUTION	*Check that the outflow valve is fully open and that cabin altitude is at airfield elevation before opening the doors.*

INOP SYS

F/CTL PROT
WINDSHEAR DET
GPWS
ADR 1+2+3
AP 1+2
A/THR
RUD TRV LIM 1+2
CAB PR 1+2
YAW DAMPER
ATC/XPDR 1
ATC/XPDR 2
STEEP APPR
ROW/ROP

Other INOP SYS

ATC ALTI MODE
TCAS
L/G RETRACT
RAT AUTOMATIC EXTENSION
CAT 2

Continued on the following page

[QRH] ADR 1+2+3 FAULT (Cont'd)

(1) The rudder travel limit value is frozen at the moment when the failure occurs. Therefore, to prevent damage to the aircraft structure, use the rudder with care, when the speed is above 140 kt. At slats' extension, full rudder travel authority is recovered.

[QRH] ADR CHECK PROC

Ident.: PRO-ABN-NAV-00015311.0001001 / 17 MAR 17
Applicable to: ALL

For the ADR CHECK procedure, apply the UNRELIABLE SPEED INDICATION procedure. *Refer to PRO-ABN-NAV UNRELIABLE SPEED INDICATION - Memory Items*.

[QRH] IR ALIGNMENT IN ATT MODE

Ident.: PRO-ABN-NAV-00012425.0002001 / 17 MAR 17
Applicable to: ALL

If IR alignment is lost, the navigation mode is inoperative (red ATT flag on PFD and red HDG flag on ND).
Aircraft attitude and heading may be recovered by applying the following procedure:

IR MODE sel (affected IR).. ATT

ALIGN light on during 30 s.
ATT MODE displayed on CDU.

KEEP SPEED, HEADING, AND FL CONSTANT FOR 30 s

- **For alignment through MCDU:**

  FMS DATA page..SELECT

  The DATA INDEX page is displayed

  IRS MONITOR key.. PRESS
  [SET HDG key] A/C HDG..ENTER

- **For alignment through ADIRS panel:**

  DISPLAY SYS sel.. SELECT AFFECTED SYS
  DISPLAY DATA sel..HDG

  - **If “H” written on the “5” key of ADIRS panel:**

    H Key..PRESS

    Degree marker, zero decimal point, ENT and CLR lights come on.

    A/C HEADING.. ENTER

  A/C HEADING..INSERT
  ENT key.. PRESS

  Example : to enter heading 320 °, dial 3, 2, 0, 0 then press ENT.
  Heading will be displayed on the associated ND.
  “HDG –ATT MODE” will be displayed on CDU.

CROSSCHECK HEADING REGULARLY WITH STBY COMPASS AND UPDATE AS REQUIRED

NAV ADR 1(2)(3) FAULT

Applicable to: ALL

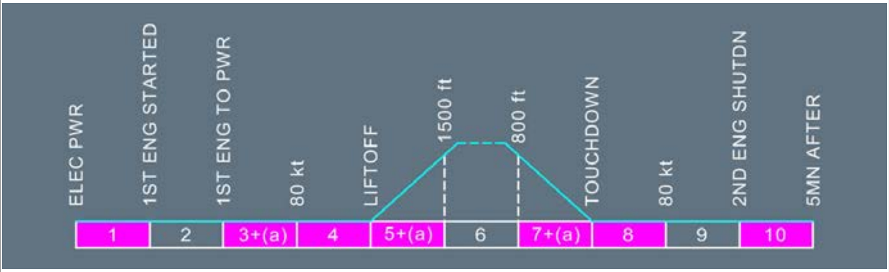
Ident.: PRO-ABN-NAV-A-00018111.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the ADR 1(2)(3) is failed.

Flight Phase Inhibition:



Note: *(a) Not inhibited in flight phase 3 in the case of NAV ADR 3 FAULT while the ADR 3 is in use.*
Not inhibited in flight phases 3, 5, and 7 in the case of NAV ADR 1(2) FAULT.

Continued on the following page

NAV ADR 1(2)(3) FAULT (Cont'd)

Ident.: PRO-ABN-NAV-A-00017302.0003001 / 21 MAR 16

L2 Note: *In case of simultaneous failure of ADR and IR (same ADIRU), apply ADR FAULT procedure before IR FAULT procedure.*

L1 ■ **ADR 1 FAULT:**

AIR DATA SWTG....................CAPT 3

L2 *Select ADR 3 to captain side.*
For aircraft equipped with EGPWS, T2CAS or T3CAS, the GPWS TERR FAULT light comes on, because the predictive functions of the GPWS are inhibited. As such, the GPWS TERR pb-sw should be switched OFF.

L1 ADR 1 P/B....................OFF

■ **ADR 2 FAULT:**

AIR DATA SWTG....................F/O 3

L2 *Select ADR 3 to first officer side.*

L1 ADR 2 P/B....................OFF
BARO REF....................CHECK

L2 *If ADR 2 fails, both baro reference channels are driven by the same FCU channel. Consequently the baro reference displays must be checked.*

L1 ■ **ADR 3 FAULT:**

ADR 3 P/B....................OFF
AIR DATA SWTG (IF ADR 3 IN USE)....................NORM

Ident.: PRO-ABN-NAV-A-00017505.0001001 / 21 MAR 16

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	ADR 1(2)(3) CAT 3 DUAL GPWS (1)

(1) *(in case of ADR 1 FAULT only)*

NAV ADR 1+2(1+3)(2+3) FAULT

Applicable to: ALL

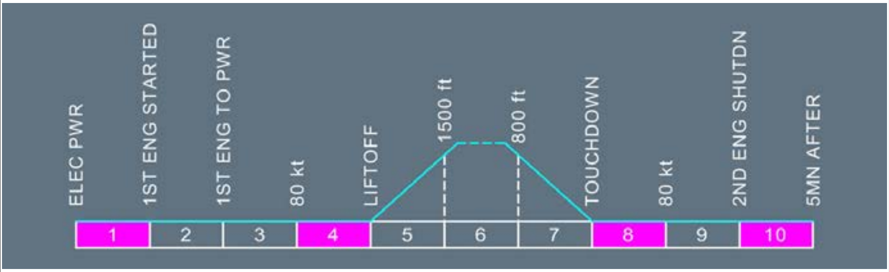
Ident.: PRO-ABN-NAV-B-00018113.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when two ADRs are failed.

Flight Phase Inhibition:



Continued on the following page

NAV ADR 1+2(1+3)(2+3) FAULT (Cont'd)

Ident.: PRO-ABN-NAV-B-00017147.0003001 / 22 MAR 17

L2 Flight control normal laws are lost. Pitch alternate law preserves the neutral static stability. All protections, except maneuver protections are lost.

Note: *In case of a simultaneous ADR and IR (same ADIRU) failure, apply the ADR FAULT procedure prior to the IR FAULT procedure.*

L1 ● **ADR 1+2 FAULT:**

AIR DATA SWTG..CAPT 3

L2 *Set ADR 3 pb-sw (if available) to the captain's side.*

L1 ADR (AFFECTED) P/B..OFF

L2 *As the enhanced functions of the EGPWS or the predictive functions of the GPWS (for aircraft equipped with T2CAS or T3CAS) are inhibited, the GPWS TERR FAULT light comes on. As such, the GPWS TERR pb-sw should be switched OFF.*

L1

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)
MAX SPEED..320 KT

L2 *Speed is limited, due to the loss of high-speed protections.*

L1 ● **ADR 1+3 (or 2+3) FAULT:**

L2 Air data information is lost on one PFD.

Note: *In case of an ADR 1+3 FAULT, the landing gear safety valve is controlled closed:*
- *Landing gear retraction is inoperative*
- *Landing gear extension must be performed by gravity.*

L1 AIR DATA SWTG..NORM
ATC/XPDR (IF ADR 1 FAILED)..SYS 2
ATC/XPDR (IF ADR 2 FAILED)..SYS 1
ADR (AFFECTED) P/B..OFF

L2 *As the enhanced functions of the EGPWS or the predictive functions of the GPWS (for aircraft equipped with T2CAS or T3CAS) are inhibited, the GPWS TERR FAULT light comes on in case of an ADR 1+3 FAULT. As such, the GPWS TERR pb-sw should be switched OFF.*

Continued on the following page

NAV ADR 1+2(1+3)(2+3) FAULT (Cont'd)

L1

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)
MAX SPEED.. 320 KT

L2 *Speed is limited, due to the loss of high-speed protections.*

Continued on the following page

NAV ADR 1+2(1+3)(2+3) FAULT (Cont'd)

Ident.: PRO-ABN-NAV-B-00017397.0007001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF3 is selected, as a reminder.

GPWS LDG FLAP 3..ON

Appears when CONF 3 is selected.

- **If ADR 1+3 FAULT:**

  L/G..GRVTY EXTN

  Refer to PRO-ABN-LG [QRH] L/G GRAVITY EXTENSION

APPR SPD..VREF + 10 KT

LDG DIST PROC.. APPLY

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

At L/G extension, control reverts to direct law in pitch and roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).

FLS LIMITED TO F–APP + RAW

- **If ADR 1 + 3 (or 2 + 3) FAULT:**

  BOTH PFD ON THE SAME FAC

  As the enhanced functions of the EGPWS or the predictive functions of the GPWS (for aircraft equipped with T2CAS or T3CAS) are inhibited, the GPWS TERR FAULT light comes on in case of an ADR 1+3 FAULT. As such, the GPWS TERR pb-sw should be switched OFF.

INOP SYS

F/CTL PROT
ADR 1 + 2 or (2 + 3) or (1 + 3)
AP 1 + 2
A/THR
ATC/XPDR 1 (1)
ATC/XPDR 2 (2)
RUD TRV LIM 1(2) (3)
GPWS (if ADR 1 fault)
N.W. STEER (4)
CAT 2
GLS AUTOLAND
STEEP APPR
ROW/ROP

(1) *(ATC/XPDR 1 in the case of ADR 1 failure)*

(2) *(ATC/XPDR 2 in the case of ADR 2 failure)*

Continued on the following page

NAV ADR 1+2(1+3)(2+3) FAULT (Cont'd)

(3) (in the case of an ADR 1 + 3 FAULT or in the case of an ADR 2 + 3 FAULT)
(4) (if ADR 1 + 3 fault)

NAV ADR DISAGREE

Applicable to: ALL

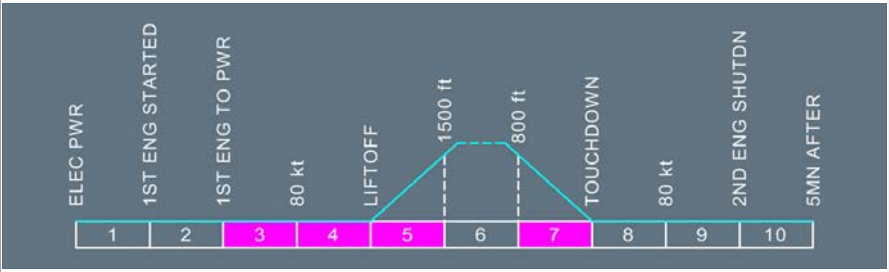
Ident.: PRO-ABN-NAV-U-00018110.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the following conditions occur:
- The ELAC rejected an ADR , or an ADR is faulty
- The speed or the Angle Of Attack (AOA) from the two remaining ADRs are different.

Flight Phase Inhibition:



Continued on the following page

NAV ADR DISAGREE (Cont'd)

Ident.: PRO-ABN-NAV-U-00017130.0002001 / 22 MAR 17

L2 The alternate law activates, and protections are lost.

L1 AIR SPD..X CHECK

- **IF SPD DISAGREE:**

  ADR CHECK PROC..APPLY

L2 To determine the faulty ADR, *Refer to PRO-ABN-NAV UNRELIABLE SPEED INDICATION - Memory Items*.

L1
- **IF NO SPD DISAGREE:**

  AOA DISCREPANCY

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)
MAX SPEED..320 KT

Continued on the following page

NAV ADR DISAGREE (Cont'd)

Ident.: PRO-ABN-NAV-U-00017131.0001001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT

APPR PROC

FOR LDG.. USE FLAP 3

Do not select CONF FULL, so as not to degrade handling qualities.

GPWS LDG FLAP 3...ON

Displayed, when CONF 3 is selected.

APPR SPD.. VREF +10

LDG DIST PROC.. APPLY

- **IF NO SPD DISAGREE:**
  RISK OF UNDUE STALL WARN

ALTN LAW: PROT LOST
WHEN L/G DN: DIRECT LAW
See (1)

INOP SYS

F/CTL PROT
STEEP APPR

(1) *At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).*

NAV ALTI DISCREPANCY

Applicable to: ALL

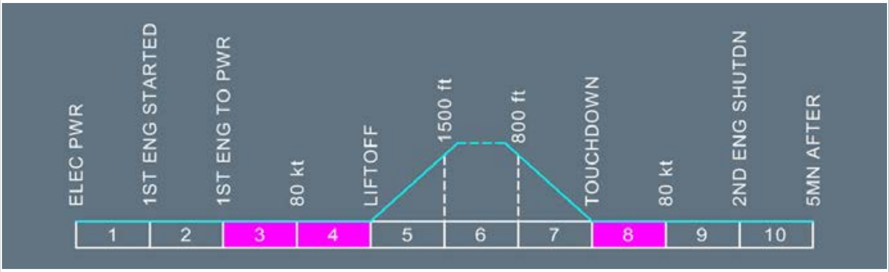
Ident.: PRO-ABN-NAV-AO-00018116.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the difference between the altitude displayed on the CAPT and F/O PFDs is greater than:
- 500 ft, if STD BARO reference is selected
- 250 ft, if QNH or QFE BARO reference is selected.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-AO-00012411.0002001 / 09 APR 14

ALT..X CHECK

L2 *Crosscheck with the standby altimeter.*

L1 AIR DATA SWTG..AS RQRD

L2 *Select ADR 3 to the faulty side.*

NAV CAPT(F/O)(STBY) AOA FAULT

Applicable to: ALL

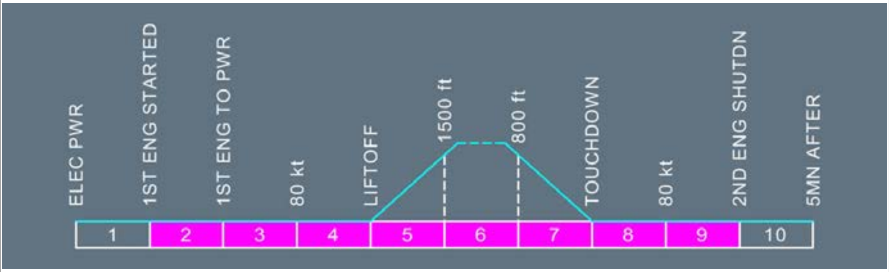
Ident.: PRO-ABN-NAV-V-00018124.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the CAPT (F/O)(STBY) Angle Of Attack (AOA) sensor is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-V-00012458.0003001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-NAV-V-00012459.0003001 / 19 JUN 12

STATUS

INOP SYS

CAPT (F/O) (STBY)
AOA

NAV ATT DISCREPANCY

Applicable to: ALL

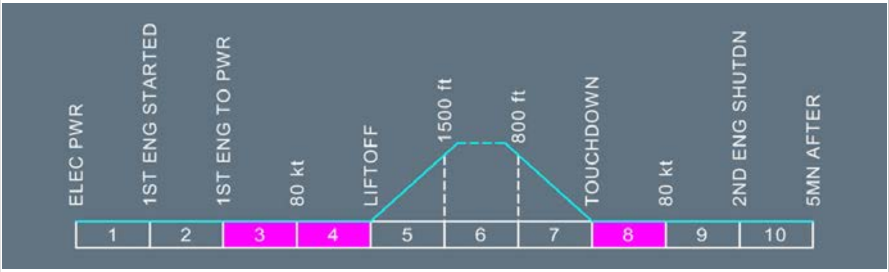
Ident.: PRO-ABN-NAV-AQ-00018122.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the difference between the roll or pitch angle displayed on the CAPT and F/O PFDs is greater than 5 °.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-AQ-00012410.0001001 / 19 AUG 10

ATT .... X CHECK

L2 *Crosscheck with standby horizon.*

L1 ATT HDG SWTG .... AS RQRD

L2 *Select IR 3 (if available) to faulty side.*

NAV BARO REF DISCREPANCY

Applicable to: ALL

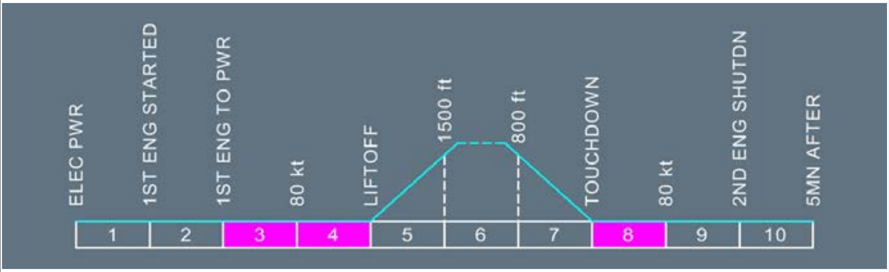
Ident.: PRO-ABN-NAV-AR-00018123.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the BARO reference is not the same on CAPT and F/O sides.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-AR-00012413.0001001 / 16 NOV 11

BARO REF...X CHECK

L2 *Crosscheck the barometric reference selection, captain side versus first officer side.*

NAV FM/GPS POS DISAGREE

Applicable to: ALL

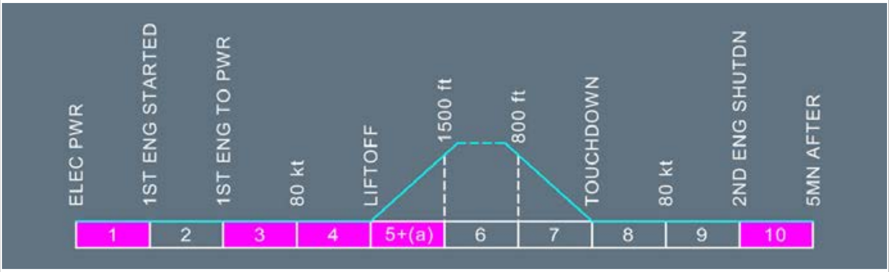
Ident.: PRO-ABN-NAV-AG-00017090.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the FM and GPS positions disagree.

Flight Phase Inhibition:



Note: *(a) Alert inhibited only for the first 15 s in flight phase 5.*

Continued on the following page

NAV FM/GPS POS DISAGREE ⩤ (Cont'd)

Ident.: PRO-ABN-NAV-AG-00017148.0002001 / 21 MAR 17

A/C POS..CHECK

The following procedure is not displayed on the ECAM:

- **During climb, cruise, or descent:**

  Check accuracy on the MCDU PROG page:

  - **If ESTIMATED ACCUR below REQUIRED ACCUR:**

    CONSIDER NAV MODE AND ND ARC/ROSE NAV

  - **If ESTIMATED ACCUR above REQUIRED ACCUR:**

    HDG/TRK MODE..SELECT

    USE RAW DATA

    - **For aircraft equipped with EGPWS ⩤ or T2CAS ⩤ :**

      CONSIDER SWITCHING OFF GPWS TERRAIN FUNCTIONS

  When possible, compare the positions of both FMs with the GPIRS position, on the MCDU POSITION MONITOR page:

  - **If one FM position agrees with onside GPIRS position:**

    USE ASSOCIATED AP/FD

  - **If both FM positions DO NOT agree with onside GPIRS position:**

    GPS.. DESELECT

    USE RAW DATA

- **During ILS/MLS ⩤ /LOC approach:**

  NAV MODE: DO NOT USE

  CONTINUE APPROACH

- **During LOC only approach with FLS ⩤ :**

  NAV MODE: DO NOT USE

  DISREGARD F-G/S DEVIATION

  REVERT TO VERTICAL SELECTED MODE

- **During RNAV GNSS, RNAV RNP, or GLS approach:**

  - **If visual references not sufficient:** GO AROUND

Continued on the following page

NAV FM/GPS POS DISAGREE (Cont'd)

■ **During VOR, VOR-DME, NDB, or NDB-DME approach:**

HDG/TRK MODE.. SELECT

USE RAW DATA

● **If FLS used:**

LS pb.. PRESS

FLS deviations are removed from PFD.

NAV GPS 1(2) FAULT

Applicable to: ALL

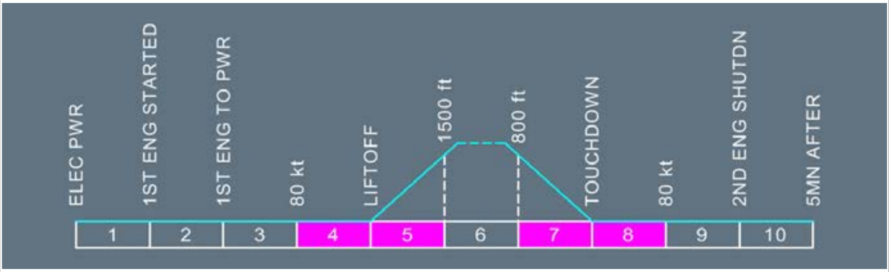
Ident.: PRO-ABN-NAV-L-00018144.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the GPS 1(2) is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-L-00017127.0001001 / 21 MAR 16

Crew awareness.

Continued on the following page

NAV GPS 1(2) FAULT (Cont'd)

Ident.: PRO-ABN-NAV-L-00017128.0001001 / 21 MAR 16

STATUS

- **If both GPS FAULT**
  FLS LIMITED TO F-APP + RAW

INOP SYS

GPS 1(2)

NAV GPWS FAULT

Applicable to: ALL

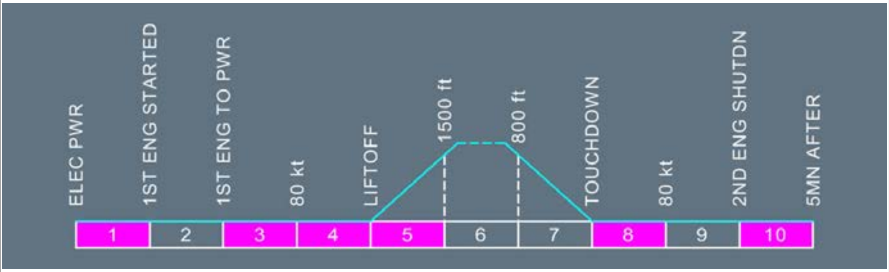
Ident.: PRO-ABN-NAV-N-00018129.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alerts triggers when the GPWS fails.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-N-00012443.0001001 / 16 NOV 11

GPWS......OFF

L2 *This line remains displayed, even after the GPWS pb-sw has been switched OFF.*

Continued on the following page

NAV GPWS FAULT (Cont'd)

Ident.: PRO-ABN-NAV-N-00012444.0001001 / 19 AUG 10

STATUS

INOP SYS

GPWS

NAV GPWS TERR DET FAULT

Applicable to: ALL

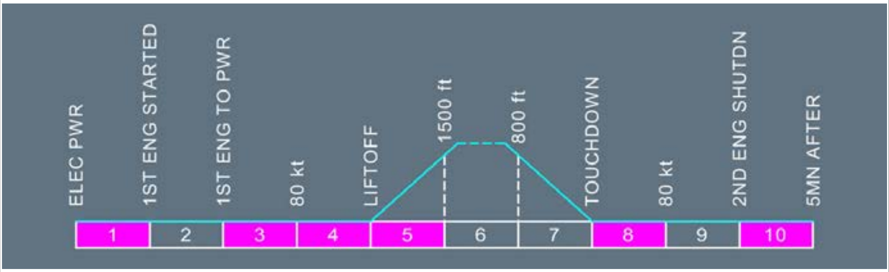
Ident.: PRO-ABN-NAV-AS-00018130.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the enhanced TCF and TAD modes of the EGPWS or the predictive function of the GPWS (for aircraft equipped with T2CAS or T3CAS) are inoperative.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-AS-00017542.0001001 / 21 MAR 16

GPWS TERR..OFF

L2 *The basic GPWS mode 1 to mode 5 are still operative if SYS pb-sw lights FAULT or OFF are not illuminated.*

Continued on the following page

NAV GPWS TERR DET FAULT (Cont'd)

Ident.: PRO-ABN-NAV-AS-00019752.0001001 / 01 JUN 16

STATUS

INOP SYS

GPWS TERR
ROW/ROP

NAV HDG DISCREPANCY

Applicable to: ALL

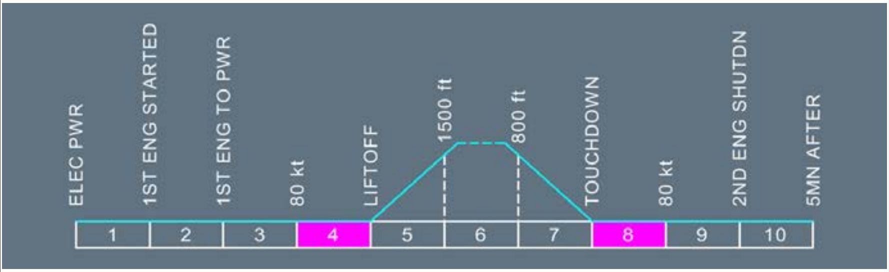
Ident.: PRO-ABN-NAV-AT-00018131.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the difference between the headings on the CAPT and F/O displays (PFD and ND) is greater than 5 °.

Flight Phase Inhibition:



Continued on the following page

NAV HDG DISCREPANCY (Cont'd)

Ident.: PRO-ABN-NAV-AT-00012409.0001001 / 19 AUG 10

HDG...X CHECK

L2 *Compare the 3 IR headings on ADIRS CDU or crosscheck with standby compass.*

L1 ATT HDG SWTG...AS RQRD

L2 *Select IR 3 (if available) to faulty side.*

NAV IAS DISCREPANCY

Applicable to: ALL

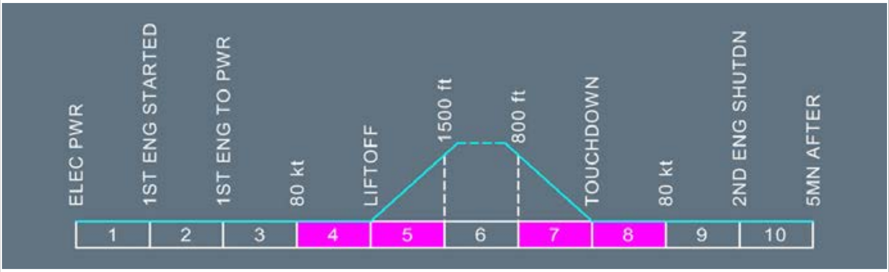
Ident.: PRO-ABN-NAV-W-00018146.0003001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the speed displayed on the CAPT and F/O PFDs are different.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-W-00017528.0001001 / 21 MAR 16

AIR SPD...X CHECK

AIR DATA SWTG...AS RQRD

Continued on the following page

NAV IAS DISCREPANCY (Cont'd)

Ident.: PRO-ABN-NAV-W-00017525.0001001 / 21 MAR 16

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	CAT 3 DUAL

NAV ILS 1(2)(1+2) FAULT

Applicable to: ALL

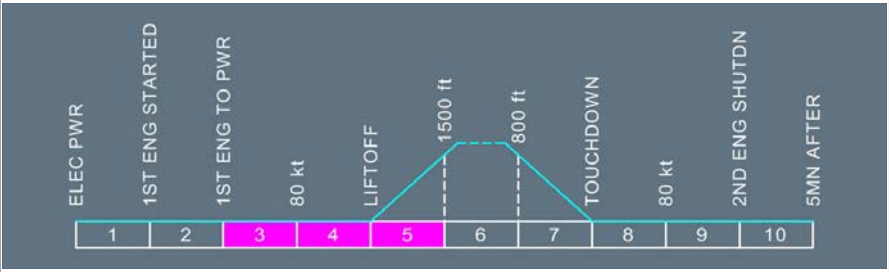
Ident.: PRO-ABN-NAV-M-00018138.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the ILS 1(2)(1+2) is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-M-00017125.0001001 / 21 MAR 16

Crew awareness.

Continued on the following page

NAV ILS 1(2)(1+2) FAULT (Cont'd)

Ident.: PRO-ABN-NAV-M-00017126.0002001 / 21 MAR 16

STATUS

INOP SYS

ILS 1(2)(1+2)
CAT 2 (1)
GPWS (2)

(1) *(If ILS 1 FAULT or if ILS 2 FAULT)*
(2) *(if ILS 1 FAULT on ground or if ILS 1+2 FAULT)*

NAV IR 1(2)(3) FAULT

Applicable to: ALL

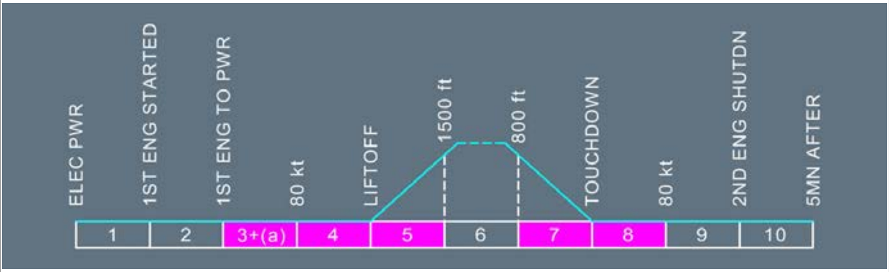
Ident.: PRO-ABN-NAV-D-00018140.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the IR 1(2)(3) is failed.

Flight Phase Inhibition:



Note: *(a) Alert not inhibited in flight phase 3 in the case of NAV IR 3 FAULT while the ADR 3 is in use.*
Alert not inhibited in flight phase 3 in the case of NAV IR 1(2) FAULT.

Continued on the following page

NAV IR 1(2)(3) FAULT (Cont'd)

Ident.: PRO-ABN-NAV-D-00017521.0003001 / 21 MAR 16

L2 *Note: In case of a simultaneous ADR and IR (same ADIRU) failure, apply the ADR FAULT procedure before the IR FAULT procedure.*

L1
- **IR 1 FAULT:**
  ATT HDG SWTG.......... CAPT 3
  ATC/XPDR.......... SYS 2
- **IR 2 FAULT:**
  ATT HDG SWTG.......... F/O 3
  ATC/XPDR.......... SYS 1
- **IR 3 FAULT:**
  ATT HDG SWTG (IF IR 3 IN USE).......... NORM

L2 *This line is not displayed on the ECAM.*

Ident.: PRO-ABN-NAV-D-00017123.0001001 / 21 MAR 16

L12

STATUS

	INOP SYS
IR MAY BE AVAIL IN ATT	IR 1(2)(3)
Refer to PRO-ABN-NAV [QRH] IR ALIGNMENT IN ATT MODE	cat 3 DUAL
CAT 3 SINGLE ONLY	GPWS TERR (1)
	TCAS (1)
	ATC/XPDR 1 (1)
	ATC/XPDR 2 (2)
	See (3)

(1) *(In case of an IR 1 fault)*
(2) *(In case of an IR 2 fault)*
(3) *Note: In Case of an IR 1 fault, the TCAS may be inoperative (depending on the TCAS manufacturer). If the IR 1 is available in ATT mode, the TCAS can be recovered by entering the aircraft magnetic heading into the CDU , as per the IR ALIGNMENT IN ATT MODE procedure.*

NAV IR 1+2(1+3)(2+3) FAULT

Applicable to: ALL

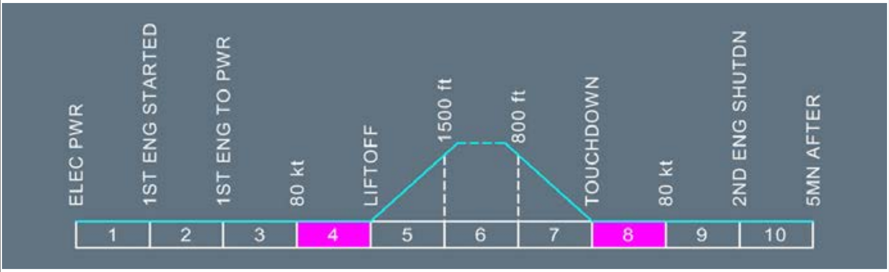
Ident.: PRO-ABN-NAV-E-00018139.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when IR 1+2(1+3)(2+3) are failed.

Flight Phase Inhibition:



Continued on the following page

NAV IR 1+2(1+3)(2+3) FAULT (Cont'd)

Ident.: PRO-ABN-NAV-E-00017111.0002001 / 22 MAR 17

L2 Note: *In case of a simultaneous ADR and IR (same ADIRU) failure, apply the ADR FAULT procedure prior to the IR FAULT procedure.*

L1
- **If IR 1 + 2 FAULT:**

  ATT HDG SWTG.. CAPT 3

L2 *Set IR 3 (If available) to the Captain's side.*
Attitude information is lost on first officer's PFD.

L1
- **If IR 1 + 3 (or 2 + 3) FAULT:**

  ATT HDG SWTG.. NORM

L2 *Attitude information is lost on one side (Captain or first officer).*

L1

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)

L2 *Flight control normal laws are lost. Pitch alternate law with static stability becomes active.*
All protections, except maneuver protections, are lost.

L1 MAX SPEED.. 320 KT

L2 *Speed is limited, due to the loss of high speed protection.*

Continued on the following page

NAV IR 1+2(1+3)(2+3) FAULT (Cont'd)

Ident.: PRO-ABN-NAV-E-00016864.0004001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT

APPR PROC

FOR LDG.. USE FLAP 3

This line is replaced by "FOR LDG : USE FLAP 3" when CONF 3 is selected, as a reminder.

GPWS LDG FLAP 3...ON

Will appear, when CONF 3 is selected.

APPR SPD : VREF + 10 KT

LDG DIST PROC.. APPLY

ALTN LAW : PROT LOST

WHEN L/G DN : DIRECT LAW

At landing gear extension, control reverts to direct law, in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).

IR (AFFECTED) MAY BE AVAIL IN ATT

Refer to PRO-ABN-NAV [QRH] IR ALIGNMENT IN ATT MODE

FLS LIMITED TO F–APP + RAW

INOP SYS

F/CTL PROT
IR 1 (2)(3)
IR 1+2 or 1+3 or 2+3
AP 1+2
A/THR
YAW DAMPER 1 (1)
YAW DAMPER 2 (2)
GPWS TERR (if IR 1 fault)
TCAS
CAT 2
ATC/XPDR 1 (3)
ATC/XPDR 2 (4)
GLS AUTOLAND
STEEP APPR (if at least 2 IRs are lost)
ROW/ROP

Note: In case of an IR 1 fault, the TCAS may be inoperative (depending on the TCAS manufacturer). If the IR 1 is available in ATT mode, the TCAS can be recovered by entering the aircraft magnetic heading into the CDU , as per IR ALIGNMENT IN ATT MODE procedure.

(1) *(In case of an IR 1+3 fault)*
(2) *(In case of an IR 2+3 fault)*
(3) *(In the case of an IR 1 or IR 1+2 or IR 1+3 failure)*
(4) *(In the case of an IR 2 or IR 1+2 or IR 2+3 failure)*

NAV IR DISAGREE

Applicable to: ALL

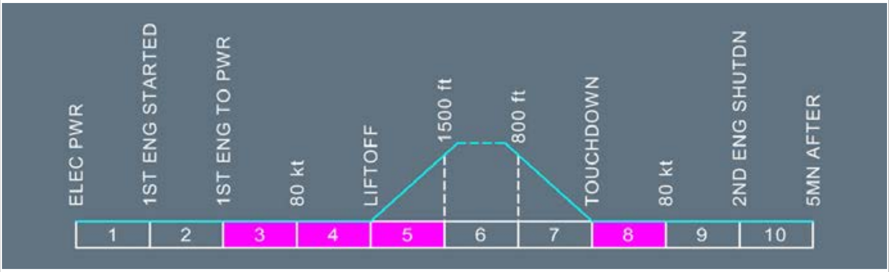
Ident.: PRO-ABN-NAV-G-00018147.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one IR is failed, and the information received from the two remaining IRs is different.

Flight Phase Inhibition:



Continued on the following page

NAV IR DISAGREE (Cont'd)

Ident.: PRO-ABN-NAV-G-00016851.0001001 / 22 MAR 17

L2 Direct law becomes active. All protections (pitch and roll) are lost.

L1 ATT..X CHECK

L2 *Use the standby horizon to determine the faulty IR.*

L1 ● **IF DISAGREE CONFIRMED:**

FAULTY IR..OFF

L2
- *If the ADIRS Control Panel has the IR pb, turn off the faulty IR using the associated IR pb.*
- *If the ADIRS Control Panel does not have the IR pb, set the ADIRS selector to OFF. This action will also switch off the associated ADR.*

L1 ELAC 2..OFF THEN ON
ELAC 1..OFF THEN ON

L2 *Note:* *When the ELAC 1 computer is reset on ground, the pitch trim returns to the ground setting position (0 °).*
After corrective action (faulty IR switched off and ELACs reset), pitch alternate law with reduced protections is recovered.

L1

ASSOCIATED PROCEDURES

F/CTL ALTN LAW
(PROT LOST)
MAX SPEED..320 KT

Continued on the following page

NAV IR DISAGREE (Cont'd)

Ident.: PRO-ABN-NAV-G-00016852.0001001 / 22 MAR 17

L12

STATUS

MAX SPEED.. 320 KT

APPR PROC

FOR LDG... USE FLAP 3

Do not select CONF FULL, so as not to degrade handling qualities.

GPWS LDG FLAP 3...ON

Will be displayed, when CONF 3 is selected.

APPR SPD..VREF + 10

LDG DIST PROC... APPLY

ALTN LAW: PROT LOST

WHEN L/G DN: DIRECT LAW

See (1)

INOP SYS

F/CTL PROT

STEEP APPR

(1) *At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).*

NAV LS TUNING DISAGREE

Applicable to: ALL

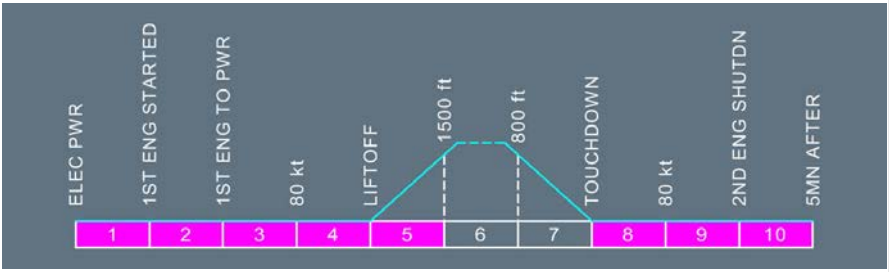
Ident.: PRO-ABN-NAV-AI-00018151.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the tuning of MMR 1 and MMR 2 are different.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-AI-00018932.0004001 / 21 MAR 16

Crew awareness.

L2 When the alert is triggered, the AP /FD:
- Inhibits APPR mode arming, or
- Disarms the APPR mode if already armed, or
- Reverts to basic AP /FD modes if APPR mode already engaged.

Ident.: PRO-ABN-NAV-AI-00014337.0001001 / 29 MAR 12

STATUS

	INOP SYS
	CAT 2

NAV PRED W/S DET FAULT

Applicable to: ALL

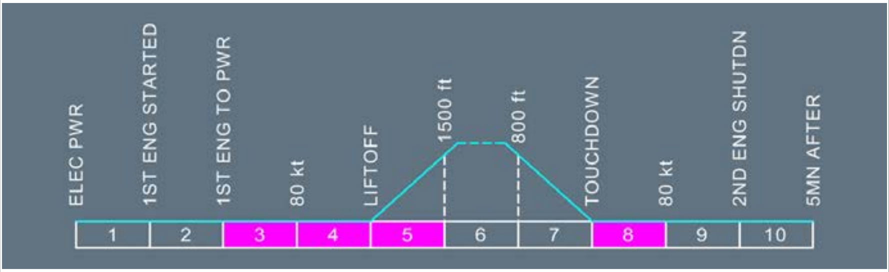
Ident.: PRO-ABN-NAV-F-00018855.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the predictive function is lost.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-F-00018853.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-NAV-F-00018854.0001001 / 21 MAR 16

STATUS

INOP SYS

PRED W/S DET

NAV RA 1 AND 2 FAULT
(DUAL RA FAILURE)

Applicable to: ALL

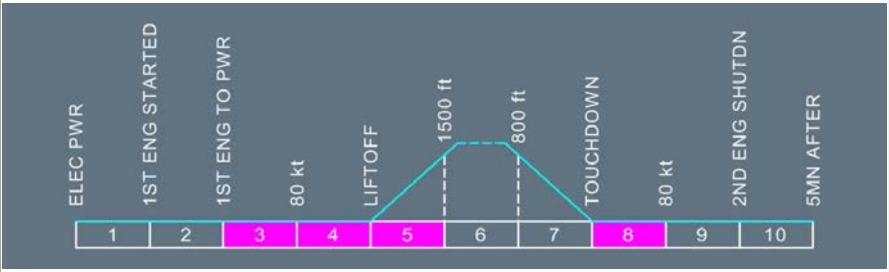
Ident.: PRO-ABN-NAV-J-00018403.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both RAs are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-J-00012432.0001001 / 25 FEB 14

Crew awareness.

Continued on the following page

NAV RA 1 AND 2 FAULT (Cont'd)
(DUAL RA FAILURE)

Ident.: PRO-ABN-NAV-J-00016850.0003001 / 01 JUN 16

L12

STATUS

WHEN L/G DN: DIRECT LAW

See (1)

INOP SYS

RA 1+2
A/CALL OUT
GPWS
CAT 2
GLS AUTOLAND
STEEP APPR
REAC W/S DET
TCAS
ROW/ROP

(1) *At landing gear extension, flight controls revert to direct law in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).*
ILS APPR mode cannot be engaged, LOC mode is available via the FCU LOC pb.

NAV RA 1(2) FAULT

Applicable to: ALL

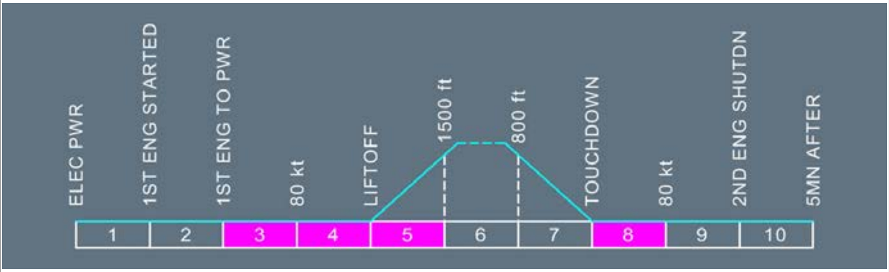
Ident.: PRO-ABN-NAV-I-00018135.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the RA 1(2) is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-I-00012430.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-NAV-I-00016849.0001001 / 01 JUN 16

STATUS

	INOP SYS
CAT 2 ONLY	RA 1(2) CAT 3 GPWS (If RA 1 fault) ROW/ROP

NAV RA DEGRADED

Applicable to: ALL

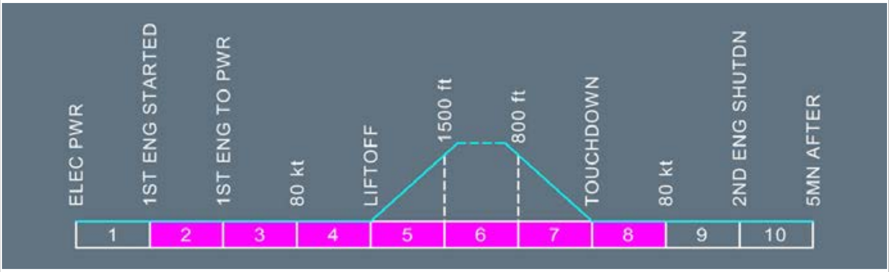
Ident.: PRO-ABN-NAV-AV-00018134.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the height that RA 1 and RA 2 provide are significantly different.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-AV-00018933.0001001 / 21 MAR 16

Crew awareness.

NAV TCAS FAULT

Applicable to: ALL

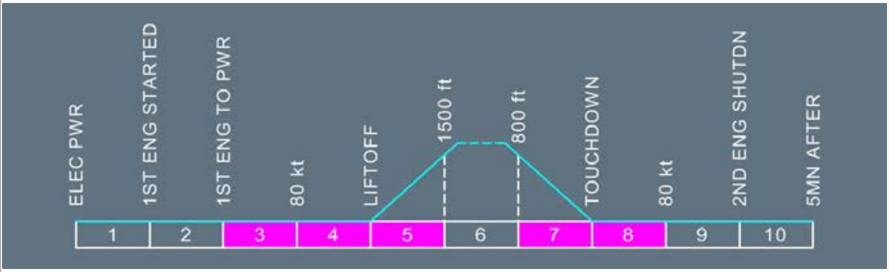
Ident.: PRO-ABN-NAV-K-00018397.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when there is an internal failure of the TCAS.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-K-00012434.0001001 / 25 FEB 14

Crew awareness.

Ident.: PRO-ABN-NAV-K-00012435.0001001 / 19 AUG 10

STATUS

INOP SYS

TCAS

NAV TCAS STBY

Applicable to: ALL

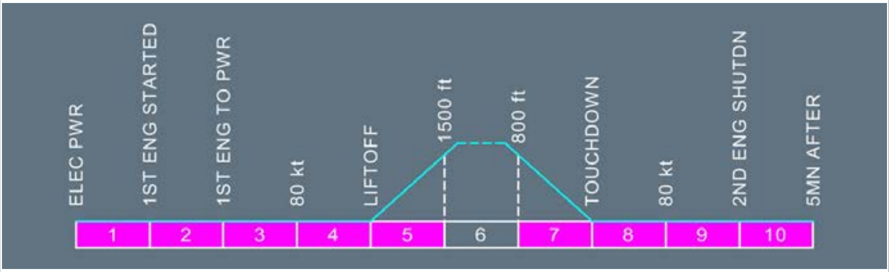
Ident.: PRO-ABN-NAV-AW-00018133.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the flight crew sets the TCAS on STBY in flight.

Flight Phase Inhibition:



Ident.: PRO-ABN-NAV-AW-00018847.0001001 / 21 MAR 16

Crew awareness.

STALL WARNING

Ident.: PRO-ABN-NAV-00013994.0001001 / 21 MAR 17
Applicable to: ALL

When the threshold is reached, a permanent aural warning is triggered "STALL + CRICKET" as long as a correct angle-of-attack is not recovered. (*Refer to PRO-ABN-MISC [MEM] Stall Recovery*).

Intentionally left blank

OVERSPEED

Applicable to: ALL

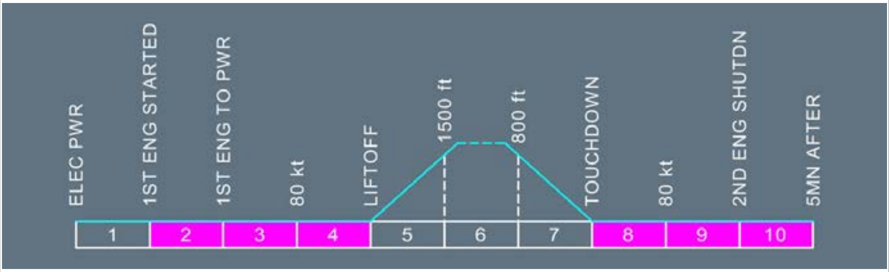
Ident.: PRO-ABN-OVERSPEED-AX-00018108.0001001 / 20 APR 17

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- The aircraft speed/mach is greater than VMO + 4 kt/MMO + 0.006, or
- The aircraft speed is greater than VLE + 4 kt, with L/G not uplocked or L/G doors not closed, or
- The aircraft speed is greater than VFE + 4 kt, with slats and/or flaps extended.

Flight Phase Inhibition:



Ident.: PRO-ABN-OVERSPEED-AX-00016848.0001001 / 21 MAR 16

VMO/MMO.. 350/.82

L2 *(235/0.60 in case of dispatch with landing gear down).*

L1 VLE.. 280/.67

VFE.. SEE BELOW

CONF	*VFE*
FULL	*177*
3	*185*
2	*200*
1+F	*215*
1	*230*

Intentionally left blank

RECORDER DFDR FAULT

Applicable to: ALL

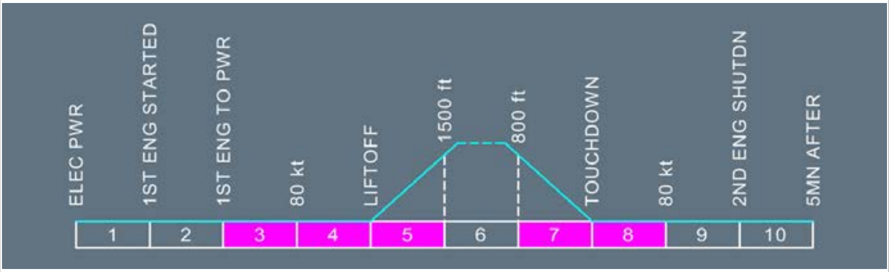
Ident.: PRO-ABN-RECORDER-A-00017312.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the DFDR is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-RECORDER-A-00010046.0001001 / 10 AUG 10

Crew awareness.

Ident.: PRO-ABN-RECORDER-A-00010047.0001001 / 10 AUG 10

STATUS

INOP SYS

DFDR

RECORDER SYS FAULT

Applicable to: ALL

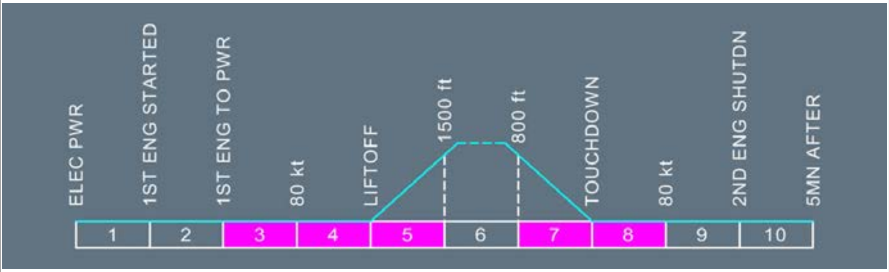
Ident.: PRO-ABN-RECORDER-B-00017313.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the FDIU is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-RECORDER-B-00010048.0002001 / 10 AUG 10

Crew awareness.

Ident.: PRO-ABN-RECORDER-B-00010049.0002001 / 10 AUG 10

STATUS

INOP SYS

RECORDER SYS

[QRH] SMOKE / FUMES / AVNCS SMOKE

Applicable to: ALL

Ident.: PRO-ABN-SMOKE-D-00012212.0004001 / 17 MAR 17

This procedure includes all the steps of the AVIONICS SMOKE ECAM procedure.

Apply this procedure when:
- The flight (cabin) crew suspect that smoke is coming from any of the following:
  - The avionics
  - The air conditioning
  - The cabin equipment
- Requested by the AVIONICS SMOKE ECAM procedure.
- There is a smell of smoke / fumes in the cockpit :
  - If the smell is similar to that of orange peels, suspect a toxic leak of rain repellent fluid.
  - If the smell is similar to that of pine needles, suspect a non-toxic leak.

If any other ECAM SMOKE alert triggers (CARGO, ...), the crew must first apply the ECAM procedure, then consider applying this procedure.
Note that these ECAM alerts may be caused by another source, that should usually first be detected by the flight crew/cabin crew/avionics smoke detectors.

The following explains the layout of this procedure:
- The procedure lines above the text boxes indicate the actions that the flight crew must immediately perform, if smoke is detected (with or without ECAM activation and regardless of the smoke source). These immediate actions correspond to the most common steps to be taken in smoke cases. In all cases, the flight crew must also be prepared to immediately perform a diversion. However, this diversion may be avoided if the smoke source is obvious, accessible and extinguishable or confirmed isolated (after completion of the immediate actions).
- The text boxes indicate the actions that the flight crew must consider, if at any time during the remainder of the procedure but always after the initial steps:
  - Smoke / fumes become the greatest threat and removal of smoke / fumes is required, and/or
  - The situation becomes critical and can no longer be controlled.
- The procedure lines below the text boxes indicate the actions that the flight crew must perform, as soon as they suspect a source of smoke. The actions will depend on whether the smoke is coming from the avionics, and/or air conditioning, and/or cabin equipment.

LAND ASAP

IF PERCEPTIBLE SMOKE APPLY IMMEDIATELY:

Continued on the following page

[QRH] SMOKE / FUMES / AVNCS SMOKE (Cont'd)

If smoke is confirmed, the following procedure must be applied.

OXY MASK / GOGGLE (if required)....USE/100%/EMERG

Ensure crew communication is established. Avoid continuous use of the interphone to minimize interference from the oxygen mask breathing noise.
Turn the emergency knob to remove condensation or smoke from the mask.

VENTILATION BLOWER....OVRD
VENTILATION EXTRACT....OVRD

Avionics ventilation air is extracted overboard.

CAB FANS....OFF

To prevent smoke from entering the cockpit and cabin.

GALY & CAB....OFF
SIGNS....ON
CKPT / CABIN COM....ESTABLISH

Communication must be established with the cabin crew in order to follow up on the smoke origin and dissipation.

- **If smoke source immediately obvious, accessible, and extinguishable:**
  FAULTY EQPT....ISOLATE

- **If smoke source not immediately isolated:**
  DIVERSION....INITIATE
  DESCENT TO FL 100 / MEA -MORA....INITIATE

- **At ANY TIME of the procedure, if SMOKE / FUMES becomes the GREATEST THREAT:**
  REMOVAL OF SMOKE / FUMES....CONSIDER
  Refer to PRO-ABN-SMOKE [QRH] REMOVAL OF SMOKE / FUMES
  ELEC EMER CONFIG....CONSIDER
  Refer to PRO-ABN-SMOKE [QRH] SMOKE / FUMES / AVNCS SMOKE - ELEC EMER CONFIG

- **At ANY TIME of the procedure, if situation becomes UNMANAGEABLE:**
  IMMEDIATE LANDING....CONSIDER
  L2 *Depending on the situation, the Captain can consider an overweight landing, a tailwind landing, a ditching, a forced landing, etc.*

Continued on the following page

[QRH] SMOKE / FUMES / AVNCS SMOKE (Cont'd)

L1

Guidelines to determine smoke source:
- If smoke initially comes out of the ventilation outlets, the crew may suspect AIR COND SMOKE. In addition, very shortly thereafter, several SMOKE warnings (cargo, lavatory, avionics) will be triggered. The displayed ECAM procedures must be applied.
- After an ENG or APU failure, smoke may come from the faulty item via the bleed system and be perceived in the cockpit and/or cabin. In such a case, it will be recirculated throughout the aircraft, until it completely disappears from the air conditioning system.
- If only the AVIONICS SMOKE warning is triggered, the crew may suspect avionics smoke.
- If the smoke is detected while an equipment is declared faulty, the crew may suspect that smoke is coming from this equipment.
- Avionics or forward galley smoke may be smelt, or may enter in the cockpit before ECAM warning activation.

Continued on the following page

[QRH] SMOKE / FUMES / AVNCS SMOKE (Cont'd)

Ident.: PRO-ABN-SMOKE-D-00012214.0007001 / 17 MAR 17

- **If Air COND smoke suspected:**

  APU BLEED.....OFF
  VENTILATION BLOWER and EXTRACT.....AUTO

  Note: *When both VENTILATION BLOWER and VENTILATION EXTRACT are in the OVRD position, a single pack may not be able to maintain the cabin pressure.*

  CARGO AFT ISOL VALVE.....OFF
  To prevent a cargo smoke warning from being triggered due to cabin smoke.
  PACK 1.....OFF

  - **If smoke continues:**

    PACK 1.....ON
    PACK 2.....OFF

    - **If smoke persists:**

      PACK 2.....ON
      Restore normal configuration if PACK 2 is not suspected to cause smoke
      VENTILATION BLOWER.....OVRD
      VENTILATION EXTRACT.....OVRD

  REMOVAL OF SMOKE / FUMES.....CONSIDER
  Refer to PRO-ABN-SMOKE [QRH] REMOVAL OF SMOKE / FUMES

- **If CABIN EQPT smoke suspected:**

  - **If smoke continues:**

    EMER EXIT LIGHT.....ON
    COMMERCIAL.....OFF
    SMOKE DISSIPATION.....CHECK
    FAULTY EQPT.....SEARCH / ISOLATE
    Once the cabin has been secured, try to find the smoke source and isolate it.
    Cabin lights, reading lights, passenger systems, galleys have dedicated control C/B in the cabin or cockpit.

    - **If smoke persists or if faulty equipment confirmed isolated:**

      COMMERCIAL.....NORM

    REMOVAL OF SMOKE / FUMES.....CONSIDER
    Refer to PRO-ABN-SMOKE [QRH] REMOVAL OF SMOKE / FUMES

Continued on the following page

[QRH] SMOKE / FUMES / AVNCS SMOKE (Cont'd)

Ident.: PRO-ABN-SMOKE-D-00012215.0001001 / 17 MAR 17

- **If smoke source cannot be determined and persists or AVNCS / ELECTRICAL smoke suspected:**

  ELEC EMER CONFIG.. CONSIDER

  Refer to the end of the procedure to set ELEC EMER CONFIG.

- **If smoke disappears within 5 min:**

  NORMAL VENTILATION.. RESTORE

Continued on the following page

[QRH] SMOKE / FUMES / AVNCS SMOKE (Cont'd)

Ident.: PRO-ABN-SMOKE-D-00012565.0019001 / 17 MAR 17

TO SET ELEC EMER CONFIG

EMER ELEC GEN 1 LINE.......................................OFF

GEN 1 LINE contactor opens. GEN 1 remains running and supplies one fuel pump in each wing tank. AC BUS 1 is supplied by GEN 2 through the bus tie contactor.

EMER ELEC PWR.......................................MAN ON

RAT is extended and the EMER GEN is connected to the aircraft network. Check emergency generator parameters on the ELEC SD page (displayed automatically).

- **When EMER GEN AVAIL:**

  APU GEN.......................................OFF
  GEN 2.......................................OFF
  ELEC EMER CONFIG

  Two different procedures can be displayed on the ECAM , depending on whether the AVIONICS SMOKE ECAM caution is triggered or not before the flight crew sets the electrical emergency configuration.

  - **If AVIONICS SMOKE not triggered:**

    APPLY ELEC EMER CONFIG PROCEDURE, BUT DO NOT RESET GEN, EVEN IF REQUESTED BY ECAM

    - **At 3 min or 2 000 ft AAL before landing:**

      Restore all generators only 3 min before landing or at 2 000 ft AAL to recover normal braking, while minimizing possible reactivation of a smoke source.

      GEN 2.......................................ON
      EMER ELEC GEN 1 LINE.......................................ON

    - **When aircraft stopped:**

      ALL GENs.......................................OFF

  - **If AVIONICS SMOKE triggered:**

    The ECAM displays a specific ELEC EMER CONFIG procedure. The flight crew must apply the following ECAM procedure.

    MIN RAT SPEED.......................................140 KT

    Note: *The electrical configuration is the same as for loss of both generators (except that one fuel pump in each wing tank remains supplied).*

Continued on the following page

[QRH] SMOKE / FUMES / AVNCS SMOKE (Cont'd)

VHF 1 / HF 1 / ATC 1.. USE

Only VHF 1, HF 1 and ATC 1 are supplied in this configuration. Notify the ATC of the nature of the emergency, and state intentions. If there is no contact with the ATC, switch to code A7700, or transmit a distress message on one of the emergency frequencies.

FAC 1.. OFF THEN ON

Rudder trim is recovered, despite the fact that no indication is available.

- **At 3 min or 2 000 ft AAL before landing:**

  Restore all generators only 3 min before landing or at 2 000 ft AAL to recover normal braking, while minimizing possible reactivation of a smoke source.

  GEN 2.. ON
  EMER ELEC GEN 1 LINE.. ON

F/CTL ALTN LAW (PROT LOST)

Flight control normal laws and associated protections are lost. Only the load factor limitation, and the high and low speed stability remain (ALTN law with reduced protection).

MAX SPEED..320 KT

Continued on the following page

[QRH] SMOKE / FUMES / AVNCS SMOKE (Cont'd)

Ident.: PRO-ABN-SMOKE-D-00012217.0057001 / 31 AUG 17

ECAM lower display is not available. STATUS SD page is displayed on the upper ECAM display, as long as the STATUS pb is pressed.

L12

STATUS

MIN RAT SPEED.. 140 KT
MAX SPEED.. 320 KT
MAX BRK PR..1000 PSI

FOR LDG..USE FLAPS 3
GPWS LDG FLAP 3...ON
APPR SPD...VREF +10 KT
LDG DIST PROC.. APPLY
ENG 1+2 APPR IDLE ONLY
ENG 1+2 N1 DEGRADED MODE
(IAE-powered aircraft)
ALTN LAW: PROT LOST
WHEN L/G DN: DIRECT LAW
CTR TK FUEL UNUSABLE
FUEL CONSUMPT INCRSD

This message is triggered when the failure (or combination of failures) affects the nominal aerodynamic characteristics of the aircraft.

FMS PRED UNRELIABLE

Disregard FMS fuel predictions and refer to QRH/OPS-Operational Data - Fuel Penalty Factors Tables in order to find the applicable Fuel Penalty Factor.

SLATS/FLAPS SLOW

- **After recovery of normal electrical supply, the following STATUS will be displayed:**
  MAX SPEED..320 KT
  APPR SPD..VREF +10 KT
  LDG DIST PROC..APPLY

INOP SYS

Refer to PRO-ABN-ELEC-[QRH] ELEC EMER CONFIG SYS REMAINING.

Continued on the following page

[QRH] SMOKE / FUMES / AVNCS SMOKE (Cont'd)

APPR PROC

- **3 MN/2000 FT BEFORE LDG:**
  GEN 2.. ON
  EMER ELEC GEN 1 LINE.. ON
- **WHEN A/C IS STOPPED:**
  ALL GEN.. OFF

ALTN LAW: PROT LOST

See (1)

WHEN L/G DN: DIRECT LAW

See (2)

(1) *Flight controls remain in alternate law, due to the loss of IR 2 and 3.*

(2) *At landing gear extension, control reverts to direct law in pitch, as well as in roll (Refer to PRO-ABN-F_CTL F/CTL DIRECT LAW).*

[QRH] REMOVAL OF SMOKE / FUMES

Ident.: PRO-ABN-SMOKE-00012218.0001001 / 17 MAR 17
Applicable to: ALL

Apply the REMOVAL OF SMOKE / FUMES QRH procedure, if smoke / fumes become the greatest threat when applying the SMOKE / FUMES / AVNCS SMOKE QRH procedure.

EMER EXIT LIGHT..ON

- **If fuel vapors:**

  CAB FANS..ON

  The recirculating air ventilates the air mixer bay and other fuselage area. This prevents fuel vapors from accumulating and the risk of explosion. Passenger health is not affected.

  PACK 1..OFF
  PACK 2..OFF

- **If no fuel vapors:**

  CAB FANS..OFF

  To prevent smoke from entering the cockpit and cabin.

  PACK FLOW..HI

  To provide maximum airflow from the packs.
  Do not shut down the air conditioning packs, and do not reduce ventilation in an attempt to smother the fire.
  Do not deploy oxygen masks, if fire is suspected in the cabin.

LDG ELEV..10 000 ft / MEA-MORA
DESCENT TO FL 100 / MEA-MORA..INITIATE

The most effective means of smoke removal is use of ram air. Therefore, descent is initiated to FL 100 or the MEA -MORA , while the cabin altitude is increased to 10 000 ft or the MEA -MORA. The increase in cabin altitude also reduces, at least temporarily, the smoke concentration. Cabin depressurization starts, when descent is initiated.

ATC..NOTIFY
SMOKE / FUMES / AVNCS SMOKE PROC..CONTINUE

Refer to PRO-ABN-SMOKE [QRH] SMOKE / FUMES / AVNCS SMOKE - GENERAL

- **At FL 100 or MEA-MORA:**
  - **If in ELEC EMER CONFIG:**

    APU MASTER sw..ON

Continued on the following page

[QRH] REMOVAL OF SMOKE / FUMES (Cont'd)

In electrical emergency configuration, when the APU MASTER sw is ON, the battery contactors will automatically close for a maximum of 3 min. This will enable the flight crew to manually control the outflow valve that is powered by the DC BAT BUS.

PACK 1 .... OFF
PACK 2 .... OFF

In electrical emergency configuration, the PACK 2 flow control valve cannot close because it is not electrically supplied. Therefore PACK 2 remains operative even when PACK 2 pb is set to OFF.

MODE SEL .... MAN
MAN V/S CTL .... FULL UP
RAM AIR .... ON

At FL 100, or MEA -MORA, it is possible to open the RAM AIR valve when ΔP is 1 PSI or below. Opening the RAM AIR enables flying with both packs OFF.

APU MASTER sw .... OFF

- **If smoke persists:**

  If there is smoke in the cockpit, open the cockpit (CKPT) window to evacuate the smoke.

  MAX SPEED: 200 kt
  COCKPIT DOOR .... OPEN
  HEADSETS .... ON
  PM SLIDING WINDOW .... OPEN

  - **When window open:**

    NON-AFFECTED PACK(s) .... ON
    VISUAL WARNINGS (noisy CKPT) .... MONITOR

    Due to the increased noise level, pay particular attention to visual warnings.

    SMOKE / FUMES / AVNCS SMOKE PROC .... CONTINUE

    Refer to PRO-ABN-SMOKE [QRH] SMOKE / FUMES / AVNCS SMOKE - GENERAL

[QRH] SMOKE / FIRE FROM LITHIUM BATTERY

Ident.: PRO-ABN-SMOKE-00016024.0001001 / 17 MAR 17
Applicable to: ALL

If necessary, transfer control to the flight crew member seated on the opposite side of the fire.

CKPT / CAB COM....................ESTABLISH
STORAGE AFTER Li BAT FIRE cabin procedure....................REQUEST INITIATION

- **If flames:**
  CREW OXY MASK (PF)....................USE
  SMOKE HOOD (PM)....................USE
  HALON EXTINGUISHER....................USE
- **If no flames or when flames extinguished:**
  - **If not possible to remove device from the cockpit:**
    WATER or NON-ALCOHOLIC LIQUID....................POUR ON DEVICE
    DEVICE....................MONITOR
  - **If possible to remove device from the cockpit:**
    DEVICE....................TRANSFER TO CABIN

- **At ANY TIME of the procedure, if SMOKE becomes the GREATEST THREAT:**
  REMOVAL OF SMOKE / FUMES procedure....................CONSIDER
  Refer to PRO-ABN-SMOKE [QRH] REMOVAL OF SMOKE / FUMES

- **At ANY TIME of the procedure, if situation becomes UNMANAGEABLE:**
  IMMEDIATE LANDING....................CONSIDER
  L2 *Depending on the situation, the Captain can consider an overweight landing, a tailwind landing, a ditching, a forced landing, etc.*

SMOKE AFT CARGO SMOKE

Applicable to: ALL

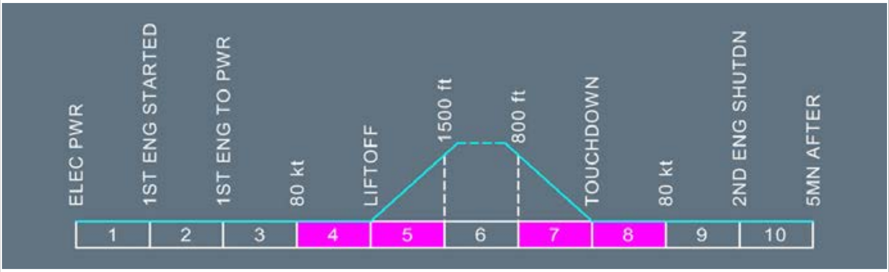
Ident.: PRO-ABN-SMOKE-O-00018698.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when smoke in the AFT cargo compartment is detected.

Flight Phase Inhibition:



Continued on the following page

SMOKE AFT CARGO SMOKE (Cont'd)

Ident.: PRO-ABN-SMOKE-O-00018589.0007001 / 21 MAR 16

LAND ASAP

AFT ISOL VALVE (IF NOT AUTOMATICALLY CLOSED)....................OFF
CAB FANS....................OFF

- **IF AFT CRG CLOSED (displayed on ground only):**

L2 Order the ground crew not to open the door of the affected cargo compartment, unless the passengers have disembarked and fire services are present. Also ensure that the AFT cargo door is closed before discharging the extinguishing agent.

L1 AGENT....................DISCH

L2 Note: *Expect the SMOKE warning to remain after agent discharge, even if the smoke source is extinguished. Gases from the smoke source are not evacuated, and smoke detectors are also sensitive to the extinguishing agent.*

L1
- **ON GROUND BEFORE OPEN CRG DOOR:**

PAX....................DISEMBARK

L2 Note: *For aircraft equipped with AFT Cargo Ventilation , if the warning has been displayed temporarily, and agent has not been discharged, normal cargo ventilation may be recovered when ventilation is required for livestock transportation:*
C/B of CARGO VENT controller (S20 on 122VU , or C7 on 49VU, as installed for AFT CARGO) ...... PULL then PUSH

Ident.: PRO-ABN-SMOKE-O-00018590.0002001 / 21 MAR 16

STATUS

- **BEFORE OPEN CRG DOORS (displayed on ground only):**

PAX....................DISEMBARK

INOP SYS

AFT CRG VENT
AFT CRG HEAT

SMOKE AFT CRG DET FAULT

Applicable to: ALL

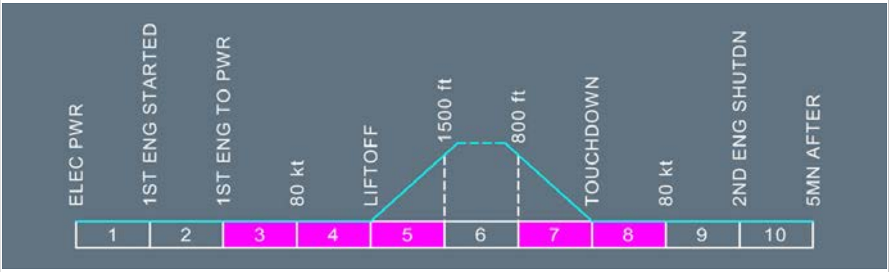
Ident.: PRO-ABN-SMOKE-P-00018699.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the AFT smoke detection is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-SMOKE-P-00018592.0001001 / 21 MAR 16

- **IF NO LIVE STOCK:**
  AFT ISOL VALVE .... OFF

Ident.: PRO-ABN-SMOKE-P-00018593.0001001 / 21 MAR 16

STATUS

INOP SYS

AFT CRG DET

SMOKE FWD CARGO SMOKE

Applicable to: ALL

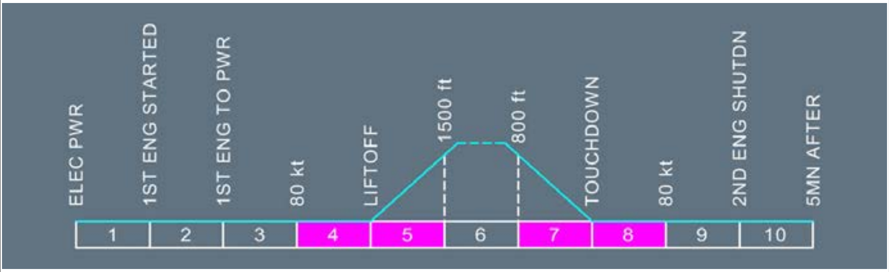
Ident.: PRO-ABN-SMOKE-E-00017408.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when smoke in the FWD cargo compartment is detected.

Flight Phase Inhibition:



Continued on the following page

SMOKE FWD CARGO SMOKE (Cont'd)

Ident.: PRO-ABN-SMOKE-E-00018287.0005001 / 21 MAR 16

LAND ASAP

FWD ISOL VALVE (IF NOT AUTOMATICALLY CLOSED).. OFF
CAB FANS..OFF

- **IF FWD CRG CLOSED (displayed on ground only):**

L2 Order the ground crew not to open the door of the affected cargo compartment, unless the passengers have disembarked and fire services are present. Also ensure that the FWD Cargo Door is closed before discharging the extinguishing agent.

L1 AGENT...DISCH

L2 _Note:_ *Expect the SMOKE warning to remain after agent discharge, even if the smoke source is extinguished. Gases from the smoke source are not evacuated, and smoke detectors are also sensitive to the extinguishing agent.*

L1
- **ON GROUND BEFORE OPEN CRG DOOR:**

PAX.. DISEMBARK

L2 _Note:_ *For aircraft equipped with FWD Cargo Ventilation , if the warning has been displayed temporarily, and agent has not been discharged, normal cargo ventilation may be recovered when ventilation is required for livestock transportation:*
C/B of CARGO VENT controller (T20 on 122VU , or C8 on 49VU , as installed for FWD CARGO) ...... PULL then PUSH

Ident.: PRO-ABN-SMOKE-E-00018588.0002001 / 21 MAR 16

STATUS

- **BEFORE OPEN CRG DOOR (displayed on ground only):**

PAX...DISEMBARK

INOP SYS

FWD CRG VENT
FWD CRG HEAT

SMOKE FWD CRG DET FAULT

Applicable to: ALL

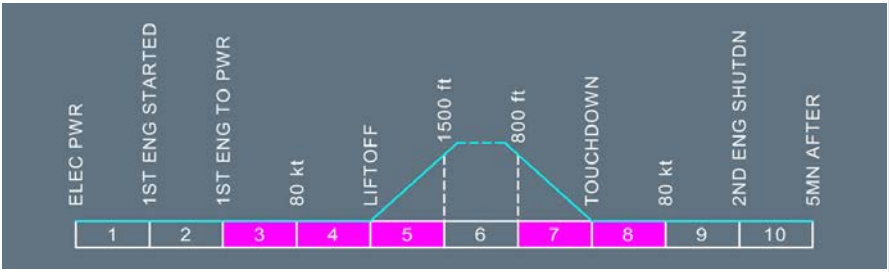
Ident.: PRO-ABN-SMOKE-F-00017689.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the FWD smoke detection is failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-SMOKE-F-00018336.0001001 / 21 MAR 16

- **IF NO LIVE STOCK:**
  FWD ISOL VALVE .... OFF

Ident.: PRO-ABN-SMOKE-F-00018337.0001001 / 21 MAR 16

STATUS

INOP SYS

FWD CRG DET

SMOKE DET FAULT

Applicable to: ALL

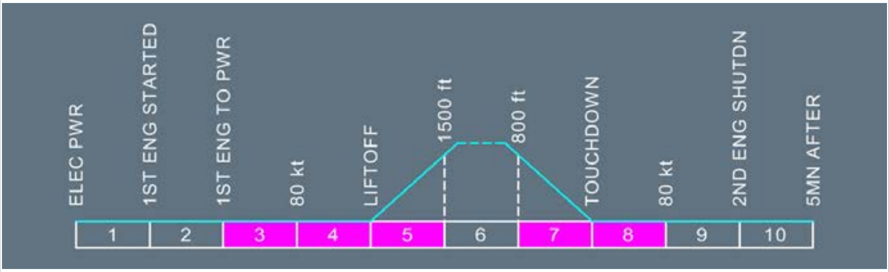
Ident.: PRO-ABN-SMOKE-G-00017400.0002001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when both SDCU or CIDS-SDF are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-SMOKE-G-00018423.0002001 / 21 MAR 16

- **IF NO LIVE STOCK:**
  - FWD ISOL VALVE .... OFF
  - AFT ISOL VALVE .... OFF

PAX SYS .... OFF

Ident.: PRO-ABN-SMOKE-G-00012226.0011001 / 01 APR 11

STATUS

INOP SYS

SMOKE DET

SMOKE LAVATORY DET FAULT

Applicable to: ALL

Ident.: PRO-ABN-SMOKE-H-00017407.0001001 / 21 MAR 16

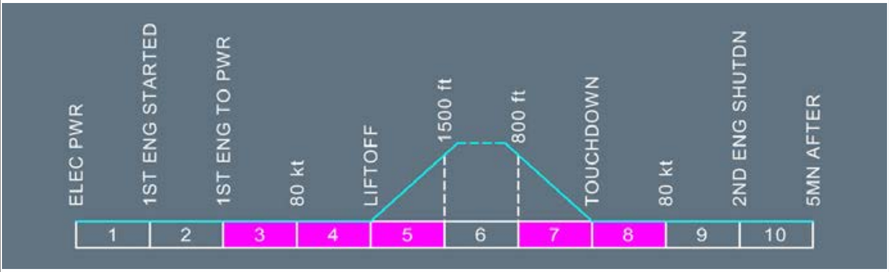
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:

- Lavatory smoke detection is failed, or
- Lavatory and galley fan are failed.

Flight Phase Inhibition:



Ident.: PRO-ABN-SMOKE-H-00018724.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-SMOKE-H-00012228.0001001 / 18 AUG 10

STATUS

INOP SYS

LAV DET

SMOKE LAVATORY SMOKE

Applicable to: ALL

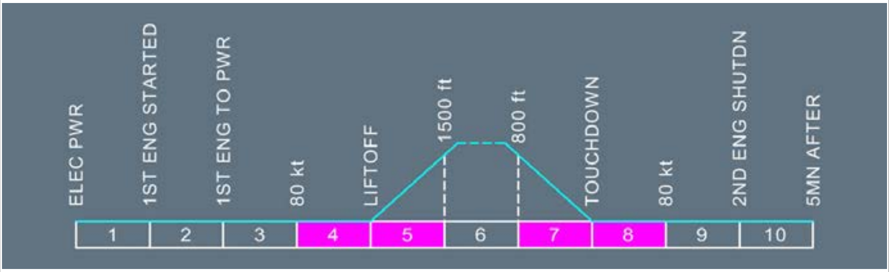
Ident.: PRO-ABN-SMOKE-N-00017406.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when smoke in one of the lavatory is detected.

Flight Phase Inhibition:



Ident.: PRO-ABN-SMOKE-N-00018427.0002001 / 21 MAR 17

L2 Communication must be established with the cabin crew in order to follow up on the smoke origin and dissipation.
Consider applying the SMOKE/FUMES/AVNCS SMOKE QRH procedure.

L1 CKPT/CAB COM...ESTABLISH

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[MEM] EGPWS CAUTIONS

Ident.: PRO-ABN-SURV-00018751.0002001 / 17 MAR 17
Applicable to: ALL

■ "TERRAIN TERRAIN" - "TOO LOW TERRAIN" - "TERRAIN AHEAD"

■ During night or IMC:

Simultaneously:

AP	OFF
PITCH	PULL UP

L2 Pull to full backstick and maintain in that position.

L1

THRUST LEVERS	TOGA
SPEED BRAKES lever	CHECK RETRACTED
BANK	WINGS LEVEL or ADJUST

L2 Aircraft achieve the best climb performance when the wings are as level as possible.

L1 *Note:* *For some airports, the operator may define a specific procedure.*

■ During daylight and VMC, with terrain and obstacles clearly in sight:

FLIGHT PATH	ADJUST

L2 Adjust pitch, bank and thrust to silence the alert.

L1 *Note:* *For some airports, the operator may define a specific procedure.*

■ "SINK RATE"

■ Above 1 000 ft AAL in IMC or above 500 ft AAL in VMC:

FLIGHT PATH	ADJUST

L2 Adjust pitch and thrust to silence the alert.

L1

■ Below 1 000 ft AAL in IMC or below 500 ft AAL in VMC:

GO-AROUND	CONSIDER

■ "DON'T SINK"

FLIGHT PATH	ADJUST

L2 Adjust pitch and thrust to silence the alert.

L1

■ "TOO LOW GEAR" - "TOO LOW FLAPS"

GO-AROUND	PERFORM

Continued on the following page

[MEM] EGPWS CAUTIONS (Cont'd)

- **"GLIDESLOPE"**
  - **Above 1 000 ft AAL in IMC or above 500 ft AAL in VMC:**

FLIGHT PATH.....ADJUST

L2

Adjust pitch and thrust to reduce the vertical deviation from the glideslope.

L1

- **When conditions require a deliberate approach below glideslope:**

G/S MODE.....OFF

- **Below 1 000 ft AAL in IMC or below 500 ft AAL in VMC:**

GO-AROUND.....CONSIDER

[MEM] EGPWS WARNINGS

Ident.: PRO-ABN-SURV-00016878.0002001 / 17 MAR 17
Applicable to: ALL

- **"PULL UP" - "TERRAIN AHEAD PULL UP"**

Simultaneously:

AP.....OFF
PITCH.....PULL UP

L2

Pull to full backstick and maintain in that position.

L1

THRUST LEVERS.....TOGA
SPEED BRAKES lever.....CHECK RETRACTED
BANK.....WINGS LEVEL or ADJUST

L2

Aircraft achieve the best climb performance when the wings are as level as possible.

If the "TERRAIN AHEAD PULL UP" aural alert triggers, a turning maneuver can be initiated if the flight crew concludes that turning is the safest action. The PULL UP maneuver must be performed before the turn towards the safe direction, as climbing increases the terrain clearance.

[MEM] TCAS WARNINGS

Ident.: PRO-ABN-SURV-00012455.0022001 / 17 MAR 17
Applicable to: ALL

- **Traffic advisory: "TRAFFIC" messages:**

  Do not perform a maneuver based on a TA alone.

- **Resolution advisory: All "CLIMB" and "DESCEND" or "MAINTAIN VERTICAL SPEED MAINTAIN" or "LEVEL OFF, LEVEL OFF" or "MONITOR VERTICAL SPEED" type messages:**

  AP (if engaged)....................OFF
  BOTH FDs....................OFF

  Respond promptly and smoothly to a RA by adjusting or maintaining the pitch, as required, to reach the green area and/or avoid the red area of the vertical speed scale.

  <u>Note:</u> *Avoid excessive maneuvers while aiming to keep the vertical speed just outside the red area of the VSI , and within the green area. If necessary, use the full speed range between Vαmax and VMAX.*

  Respect stall, GPWS, or windshear warning.

  Notify ATC.

  - **GO AROUND procedure must be performed when a RA "CLIMB" or "INCREASE CLIMB" is triggered on final approach:**

    <u>Note:</u> *Resolution Advisories (RA) are inhibited below 900 ft.*

- **When "CLEAR OF CONFLICT" is announced:**

  Resume normal navigation in accordance with ATC clearance.

  AP/FD can be reengaged as desired.

[MEM] WINDSHEAR

Ident.: PRO-ABN-SURV-00012271.0002001 / 17 MAR 17
Applicable to: ALL

A red flag “WINDSHEAR” is displayed on each PFD associated with an aural synthetic voice “WINDSHEAR” repeated three times.
If windshear is detected either by the system or by pilot observation, apply the following recovery technique:

- **At Takeoff:**
  - **If before V1:**

    The takeoff should be rejected only if significant airspeed variations occur below indicated V1 and the pilot decides that there is sufficient runway remaining to stop the airplane.
  - **If after V1:**

    THR LEVERS....................TOGA
    REACHING VR....................ROTATE
    SRS ORDERS....................FOLLOW

    If necessary the flight crew may pull the sidestick fully back.

    Note: If the FD bars are not displayed, move toward an initial pitch attitude of 17.5 °. Then, if necessary, to prevent a loss in altitude, increase the pitch attitude.

- **Airborne, initial climb or landing:**

  THR LEVERS AT TOGA....................SET OR CONFIRM
  AP (if engaged)....................KEEP ON
  SRS ORDERS....................FOLLOW

  If necessary the flight crew may pull the sidestick fully back.

  Note: 1. Autopilot disengages if the angle of attack value goes above α prot.
  2. If the FD bars are not displayed, move toward an initial pitch attitude of 17.5 °. Then, if necessary, to prevent a loss in altitude, increase the pitch attitude.

  DO NOT CHANGE CONFIGURATION (SLATS/FLAPS, GEAR) UNTIL OUT OF WINDSHEAR.
  CLOSELY MONITOR FLIGHT PATH AND SPEED.
  RECOVER SMOOTHLY TO NORMAL CLIMB OUT OF WINDSHEAR.

[MEM] WINDSHEAR AHEAD

Ident.: PRO-ABN-SURV-00012272.0001001 / 17 MAR 17
Applicable to: ALL

The “W/S AHEAD” message is displayed on each PFD. The color of the message depends on the severity and location of the windshear

Note: *When a predictive windshear alert (“WINDSHEAR AHEAD” or "GO AROUND WINDSHEAR AHEAD") is triggered, if the flight crew makes a positive verification that no hazard exists, then the alert may be disregarded, as long as:*

- *There are no other signs of possible windshear conditions, and*
- *The reactive windshear system is operational.*

Known cases of spurious predictive windshear alerts have been reported at some airports, during either takeoff or landing, due to the specific obstacle environment.
However, always rely on any reactive windshear (“WINDSHEAR”).

W/S AHEAD RED

■ **Takeoff**

Associated with an aural synthetic voice “WINDSHEAR AHEAD, WINDSHEAR AHEAD”.

● **Before takeoff:**

Delay takeoff, or select the most favorable runway.

● **During the takeoff run:**

Reject takeoff.

Note: *Predictive windshear alerts are inhibited above 100 kt until 50 ft.*

● **When airborne:**

THR LEVERS....................TOGA

As usual, the slat/flap configuration can be changed, provided the windshear is not entered.

AP (if engaged)....................KEEP ON
SRS ORDERS....................FOLLOW

If necessary the flight crew may pull the sidestick fully back.

Note: *1. Autopilot disengages if the angle of attack value goes above α prot.*
2. If the FD bars are not displayed, move toward an initial pitch attitude of 17.5 °. Then, if necessary, to prevent a loss in altitude, increase the pitch attitude.

Continued on the following page

[MEM] WINDSHEAR AHEAD (Cont'd)

■ **Landing:**

Associated with an aural synthetic voice "GO AROUND, WINDSHEAR AHEAD".

GO-AROUND	PERFORM
AP (if engaged)	KEEP ON

If necessary the flight crew may pull the sidestick fully back.

Note: *1. Autopilot disengages if the angle of attack value goes above α prot.*
2. If the FD bars are not displayed, move toward an initial pitch attitude of 17.5 °. Then, if necessary, to prevent a loss in altitude, increase the pitch attitude.

W/S AHEAD AMBER

Apply precautionary measures, as indicated in FCTM Windshear Operational Recommendations *Refer to FCTM/PR-NP-SP-10-10-3 Operational Recommendations*.

VENT AVNCS SYS FAULT

Applicable to: ALL

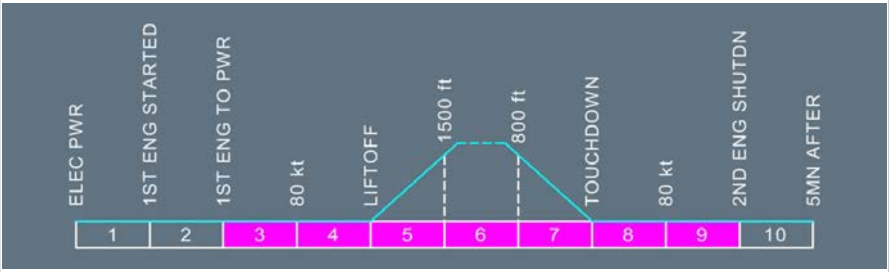
Ident.: PRO-ABN-VENT-AA-00017332.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- The power up test is not satisfactory, or
- The AEVC is not supplied, or
- The valve position disagrees with the commanded position.

Flight Phase Inhibition:



Ident.: PRO-ABN-VENT-AA-00018047.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-VENT-AA-00010775.0001001 / 05 AUG 10

STATUS

INOP SYS

AVNCS VENT
VENT BLOWER (1)
VENT EXTRACT (1)

(1) *(If AEVC not supplied)*

VENT BLOWER FAULT

Applicable to: ALL

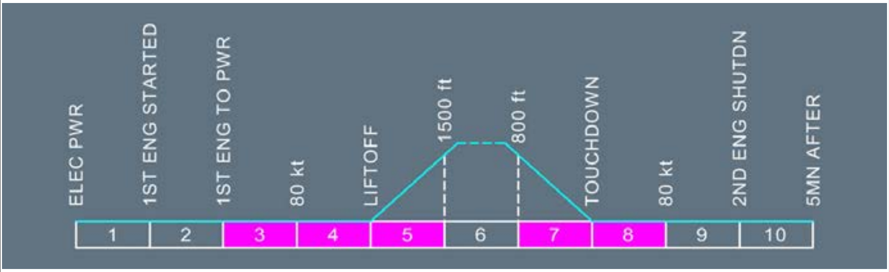
Ident.: PRO-ABN-VENT-X-00017329.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 The alert triggers when the blowing pressure is low or there is a duct overheat.

Flight Phase Inhibition:



Ident.: PRO-ABN-VENT-X-00010768.0005001 / 12 APR 16

- **If NO DC ESS BUS FAULT:**

  BLOWER..OVRD

L2 *The ventilation system is in closed circuit configuration and air from air conditioning is added to the ventilation air.*

L1 - **If DC ESS BUS FAULT:**

  LAND ASAP

Ident.: PRO-ABN-VENT-X-00010769.0005001 / 27 MAY 13

STATUS

INOP SYS

VENT BLOWER

VENT EXTRACT FAULT

Applicable to: ALL

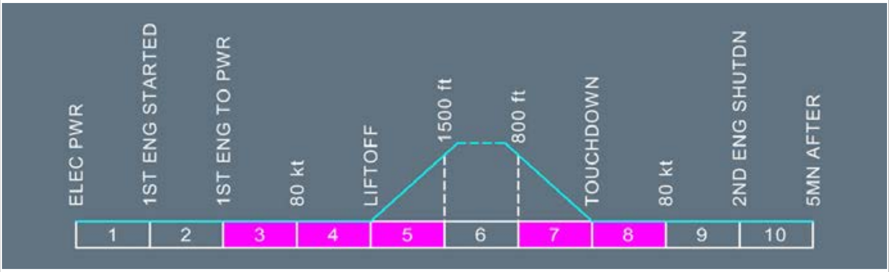
Ident.: PRO-ABN-VENT-Y-00017330.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the extract pressure is low.

Flight Phase Inhibition:



Ident.: PRO-ABN-VENT-Y-00010770.0001001 / 05 AUG 10

EXTRACT..OVRD

L2 *The ventilation system is in closed circuit configuration and air from air conditioning is added to the ventilation air.*

Ident.: PRO-ABN-VENT-Y-00010771.0001001 / 05 AUG 10

STATUS

	INOP SYS
	VENT EXTRACT

VENT SKIN VALVE FAULT

Applicable to: ALL

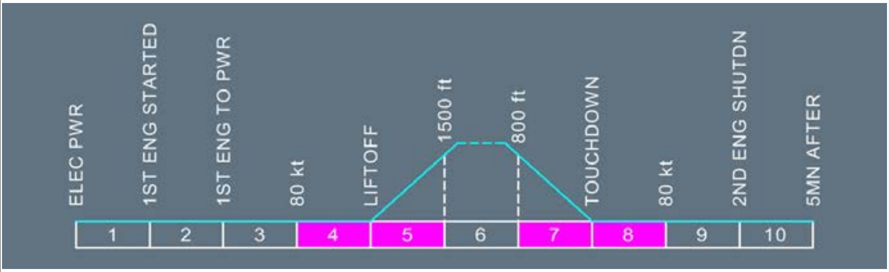
Ident.: PRO-ABN-VENT-Z-00017331.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when:
- The extract valve is fully open in phase 3, or
- The extract valve is fully open in flight, or
- The inlet valve is not fully closed in flight.

Flight Phase Inhibition:



Continued on the following page

VENT SKIN VALVE FAULT (Cont'd)

Ident.: PRO-ABN-VENT-Z-00018941.0001001 / 21 MAR 16

- **If INLET valve not fully closed in flight:**

  Crew awareness.

  L2 No action is required, since there is a non return valve in the air inlet.

- L1 **If EXTRACT valve affected:**

  BLOWER....................OVRD
  EXTRACT....................OVRD

  L2 *These actions send additional closure signals to the inlet and extract valves.*
  The weather radar image on both NDs may be lost, in case of insufficient ventilation.

  - L1 **IF UNSUCCESSFUL:**

    MAX FL....................100/MEA
    CAB PR MODE SEL....................MAN
    MAN V/S CTL....................FULL UP

    L2 *The aircraft is manually depressurized.*
    It may take 10 s in manual mode before the crew notices a change of the outflow valve position.

Ident.: PRO-ABN-VENT-Z-00018942.0002001 / 21 MAR 16

STATUS

MAX FL: 100/MEA

MAN CAB PR CTL
TGT V/S: CLIMB 500 FT/MIN
TGT V/S: DESC 300 FT/MIN

A/C FL	CAB ALT TGT
390	8 000
350	7 000
300	5 500
250	3 000
< 200	0

INOP SYS

AVNCS VALVE

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[QRH] WHEEL TIRE DAMAGE SUSPECTED

Ident.: PRO-ABN-WHEEL-00019841.0001001 / 22 MAR 17
Applicable to: ALL

LDG DIST PROC...APPLY

Performance impact of one burst tire is equivalent to one brake released.

TAXI WITH CARE

Refer to LIM-LG Taxi with Deflated or Damaged Tires

WHEEL HYD SEL FAULT

Applicable to: ALL

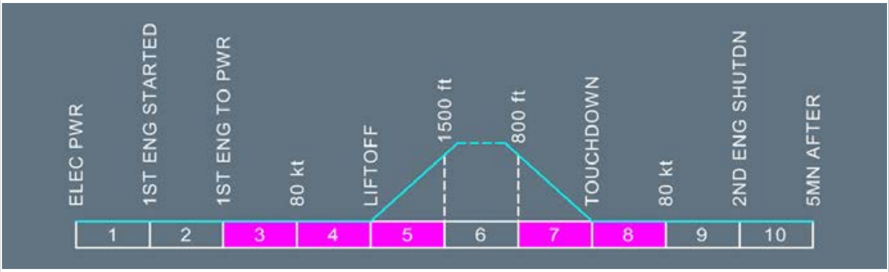
Ident.: PRO-ABN-WHEEL-AE-00017810.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the brake normal selector valve is failed, or the NWS selector valve is at open position.

Flight Phase Inhibition:



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WHEEL HYD SEL FAULT (Cont'd)

Ident.: PRO-ABN-WHEEL-AE-00018363.0001001 / 21 MAR 16

L2
- If the normal brake selector valve is failed open, full green hydraulic pressure is present at normal servovalves' entry.
  Nosewheel steering remains available.
- On ground, do not tow the aircraft with the green hydraulic system pressurized: If the steering selector valve is failed open, nosewheel steering remains pressurized, and so towing may either break the towbar shear pin, or the nose gear (if towbarless towing).
- If the steering selector valve is failed open, setting A/SKID & N/W STRG sw to OFF will cause the nosewheel to go to maximum deflection.

L1 A/SKID & N/W STRG....................KEEP ON

L2 *As long as antiskid is operative, brake pressure is regulated by normal servovalves.*

WHEEL N/W STRG FAULT

Applicable to: ALL

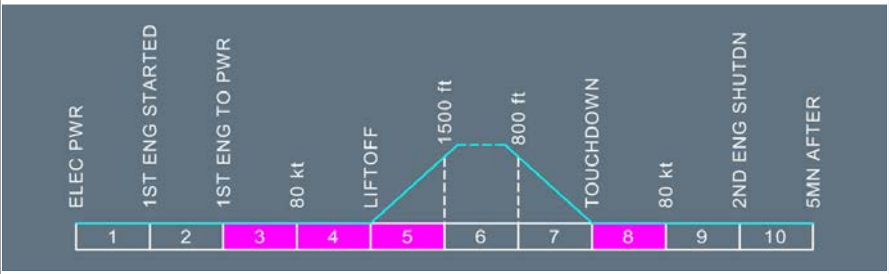
Ident.: PRO-ABN-WHEEL-AF-00017744.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the nose wheel steering system is failed.

Flight Phase Inhibition:



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WHEEL N/W STRG FAULT (Cont'd)

Ident.: PRO-ABN-WHEEL-AF-00018712.0001001 / 21 MAR 16

Crew awareness.

Ident.: PRO-ABN-WHEEL-AF-00018713.0001001 / 21 MAR 16

L12

STATUS

	INOP SYS
CAT 3 SINGLE ONLY *See [(1)]*	CAT 3 DUAL N/W STRG

(1) *Note:*
1. *If the L/G SHOCK ABSORBER FAULT is also displayed, then the nose wheels may be at maximum deflection (turned 90 ° from center). During landing, delay nose wheel touchdown as long as possible.*
2. *Automatic rollout is not permitted (Refer to QRH/OPS Required Equipment for CAT2 and CAT3).*

WHEEL TYRE LO PR

Applicable to: ALL

Ident.: PRO-ABN-WHEEL-AG-00017824.0003001 / 21 MAR 16

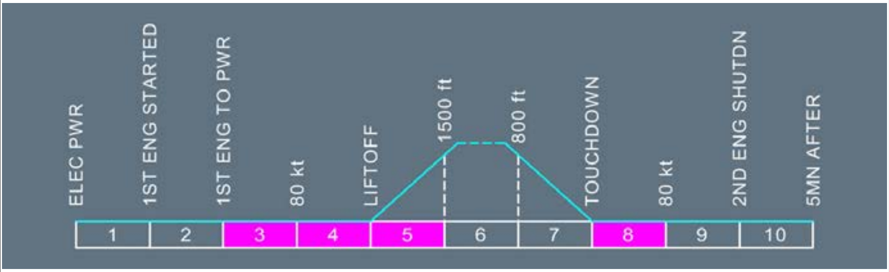
ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when one of the following cases occurs:

- One tire pressure is below:
  - 74% of nominal pressure between liftoff and engines shutdown, or
  - 89% of nominal pressure in other cases.
- There is difference of pressure between two wheels of the same axle that is above:
  - 21% of nominal pressure between liftoff and engines shutdown, or
  - 15% of nominal pressure in other cases.

Flight Phase Inhibition:



Ident.: PRO-ABN-WHEEL-AG-00018714.0001001 / 21 MAR 16

Crew awareness.

WING A.ICE L(R) HI PR

Applicable to: ALL

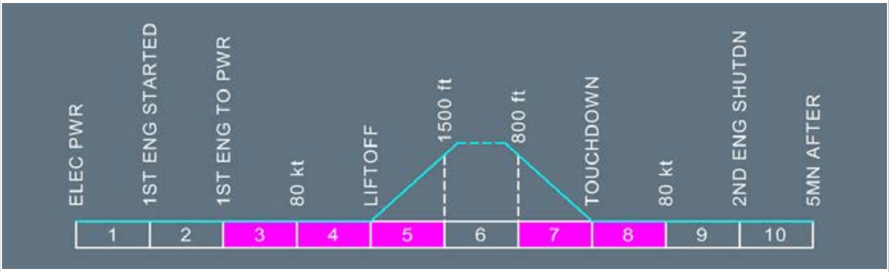
Ident.: PRO-ABN-W_A_ICE-Q-00017161.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the WING ANTI ICE pb-sw is set to ON and the pressure sensor (downstream of the valve) indicates a high pressure in the duct.

Flight Phase Inhibition:



Ident.: PRO-ABN-W_A_ICE-Q-00018328.0001001 / 21 MAR 16

THRUST LIM PENALTY

Ident.: PRO-ABN-W_A_ICE-Q-00018330.0001001 / 21 MAR 16

STATUS

	INOP SYS
THRUST LIM PENALTY	WAI REGUL

WING A.ICE L(R) VALVE OPEN
(FAILURE DETECTED IN FLIGHT)

Applicable to: ALL

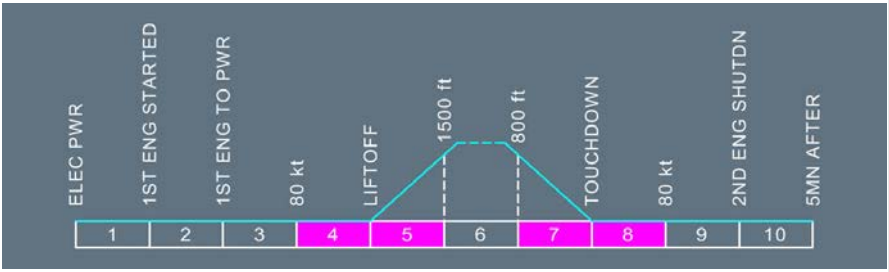
Ident.: PRO-ABN-W_A_ICE-N-00017160.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the WING ANTI ICE pb-sw is set to OFF and one wing anti ice valve remains open, in flight.

Flight Phase Inhibition:



Ident.: PRO-ABN-W_A_ICE-N-00018331.0001001 / 21 MAR 16

WAI AVAIL IN FLT
WING ANTI ICE....................AS RQRD

L2 *Wing anti-ice is available if needed and anyway is continually on, on failed side.*

L1 THRUST LIM PENALTY

- **After landing (automatic recall):**
  ENG BLEED (AFFECTED SIDE)....................OFF
  X BLEED (IF NOT CLOSED).................... SHUT
  APU BLEED (IF LEFT WING AFFECTED)....................OFF
  WING ANTI ICE....................OFF

Continued on the following page

WING A.ICE L(R) VALVE OPEN (Cont'd)
(FAILURE DETECTED IN FLIGHT)

Ident.: PRO-ABN-W_A_ICE-N-00018332.0001001 / 21 MAR 16

STATUS

- **In flight:**
  THRUST LIM PENALTY
  WAI AVAIL IN FLT

INOP SYS

ENG 1(2) BLEED (On ground only)
PACK 1(2) (On ground only)

WING A.ICE L(R) VALVE OPEN
(FAILURE DETECTED ON GROUND)

Applicable to: ALL

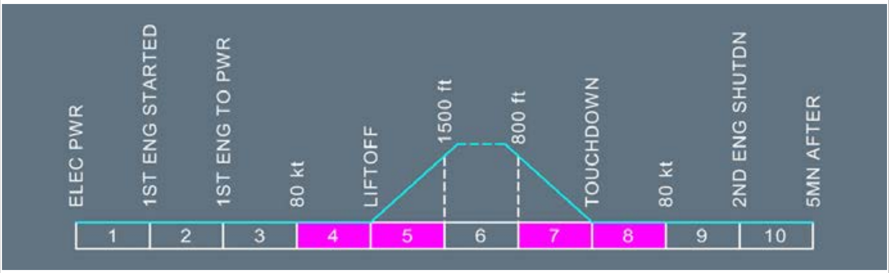
Ident.: PRO-ABN-W_A_ICE-M-00017495.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the WING ANTI ICE pb-sw is set to OFF and one wing anti ice valve remains open, on ground.

Flight Phase Inhibition:



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WING A.ICE L(R) VALVE OPEN (Cont'd)
(FAILURE DETECTED ON GROUND)

Ident.: PRO-ABN-W_A_ICE-M-00018333.0001001 / 21 MAR 16

WING ANTI ICE...OFF
ENG BLEED (AFFECTED SIDE)...OFF
X BLEED (IF NOT CLOSED)...SHUT
APU BLEED (IF LEFT WING AFFECTED AND IF APU RUNNING)...............................OFF
WAI AVAIL IN FLT

- **After takeoff when above 1 500 ft (automatic recall):**
  WAI AVAIL IN FLT
  ENG BLEED (AFFECTED SIDE)...ON
  WING ANTI ICE...AS RQRD

L2 *Wing anti ice is available if needed and anyway is continually on, on failed side.*

L1 THRUST LIM PENALTY

- **After landing (automatic recall):**
  WING ANTI ICE...OFF
  ENG BLEED (AFFECTED SIDE)...OFF
  X BLEED (IF NOT CLOSED)...SHUT
  APU BLEED (IF LEFT WING AFFECTED)...OFF

Ident.: PRO-ABN-W_A_ICE-M-00018334.0001001 / 21 MAR 16

STATUS

	INOP SYS
● **Before takeoff:** WAI AVAIL IN FLT ● **In flight:** THRUST LIM PENALTY	ENG 1 (2) BLEED (On ground only) PACK 1 (2) (On ground only)

WING A.ICE OPEN ON GND

Applicable to: ALL

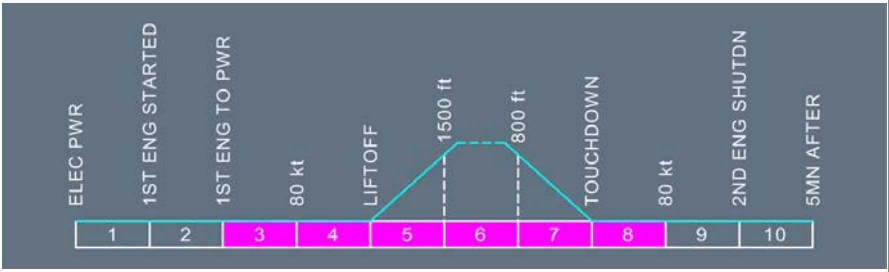
Ident.: PRO-ABN-W_A_ICE-O-00017158.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the aircraft is on ground and the wing anti ice valves remain open for more than 35 s after the WING ANTI ICE pb-sw is set to ON.

Flight Phase Inhibition:



Ident.: PRO-ABN-W_A_ICE-O-00018311.0001001 / 21 MAR 16

WING ANTI ICE.. OFF

Ident.: PRO-ABN-W_A_ICE-O-00018335.0001001 / 21 MAR 16

STATUS

WAI AVAIL IN FLT

WING A.ICE SYS FAULT
(ONE WING VALVE REMAINS CLOSED WHEN THE WING ANTI-ICE IS TURNED ON)

Applicable to: ALL

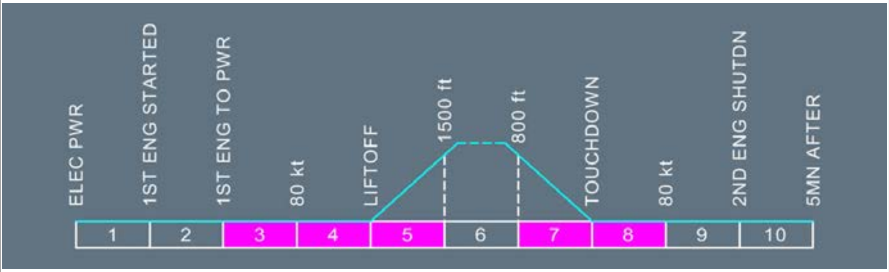
Ident.: PRO-ABN-W_A_ICE-P-00017159.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the WING ANTI ICE pb-sw is set to ON and one wing anti ice valve remains closed.

Flight Phase Inhibition:



Ident.: PRO-ABN-W_A_ICE-P-00018338.0002001 / 21 MAR 16

WING ANTI ICE..OFF
AVOID ICING CONDITIONS

Continued on the following page

WING A.ICE SYS FAULT (Cont'd)
(ONE WING VALVE REMAINS CLOSED WHEN THE WING ANTI-ICE IS TURNED ON)

Ident.: PRO-ABN-W_A_ICE-P-00018339.0004001 / 17 MAR 17

L12

STATUS

AVOID ICING CONDITIONS

- **IF SEVERE ICE ACCRETION:**

  MIN SPD...VLS +10/G DOT

  MANEUVER WITH CARE

  Note: *In the case of severe ice accretion, with wing anti-ice failed, the Angle-of-Attack (AOA) protections remain efficient. Manoeuvre with care: avoid large roll inputs at high AOA and high thrust setting. In the case of abnormal response in pitch or roll, release the backstick and reduce thrust.*

  LDG DIST PROC...APPLY

INOP SYS

WING ANTI ICE

WING A.ICE SYS FAULT
(THE WING ANTI-ICE IS TURNED ON AFTER ONE ENGINE SHUTDOWN OR AFTER THE LOSS OF ONE BLEED)

Applicable to: ALL

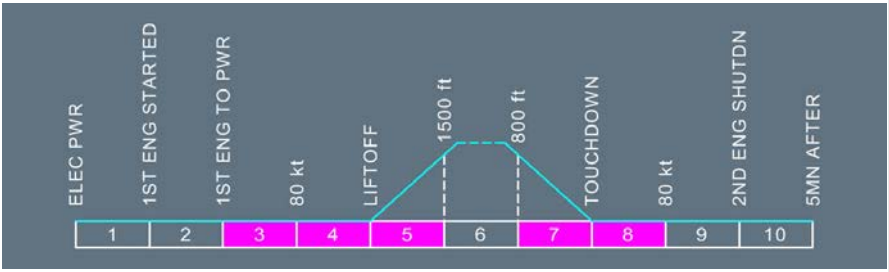
Ident.: PRO-ABN-W_A_ICE-AA-00017496.0001001 / 21 MAR 16

ANNUNCIATIONS

Triggering Conditions:

L2 This alert triggers when the WING ANTI ICE pb-sw is set to ON and one wing anti ice valve remains closed.

Flight Phase Inhibition:



Ident.: PRO-ABN-W_A_ICE-AA-00018340.0001001 / 21 MAR 16

X BLEED.. OPEN

L2 *Note:* *The affected pack has to be selected OFF due to precooler performance.*

GENERAL

Ident.: PRO-ABN-90-00010415.0001001 / 15 OCT 12
Applicable to: ALL

A successful outcome for an emergency situation depends, first of all, upon each crew member's perfect knowledge and execution of the duties assigned to him.
The captain should check frequently that all crew members know exactly their assigned positions and their specific duties, as well as the duties of the other crew members, in case of an abnormal or an emergency condition.
Since it is not possible to cover all the situations that may occur, the captain will be responsible for adapting the following instructions to obtain the best coordination of the emergency operation.
Should it be physically impossible for the captain to carry out his duties, another crew member will substitute for him according to the chain of command. The procedures in this manual are AIRBUS procedures and should be considered to be a reference.

COCKPIT-ASSIGNED DUTIES FOR EVACUATION

Ident.: PRO-ABN-90-00010416.0001001 / 05 AUG 10
Applicable to: ALL

■ **If it is NOT POSSIBLE to reach the passenger cabin:**

The cockpit crew should evacuate the aircraft via the cockpit clearview windows, by using the escape ropes.
On ground, each crewmember must help passengers, and direct them away from the aircraft.

■ **If it is POSSIBLE to reach the passenger cabin:**

CAPT	- Is the last person to leave the cockpit: Proceeds to the cabin, and helps with passenger evacuation, as necessary - Is the last person to leave the aircraft: Checks that all persons have evacuated the aircraft - Evacuates the aircraft, via the rear door, or any other available exit, if he/she cannot reach the rear door. - On ground, he/she takes command of operations until rescue units arrive.
F/O	- Proceeds to the cabin, and takes the emergency equipment. - Evacuates the aircraft, using any available exit. - Helps passengers on ground, and directs them away from the aircraft.

CABIN CREW-ASSIGNED AREAS FOR EVACUATION

Ident.: PRO-ABN-90-00010607.0003001 / 27 JUN 12
Applicable to: ALL

2 CABIN CREW FWD AND 1 AFT

CABIN CREW DESIGNATION	ASSIGNED DOOR	ASSIGNED JUMPSEAT	ASSIGNED AREA
1 PURSER	DOOR 1 RH	FWD INBOARD	FWD/MID
1 CABIN CREW	DOOR 1 LH	FWD OUTBOARD	FWD/MID
1 CABIN CREW	DOOR 2 RH /LH	AFT CENTER	MID/AFT

<u>Note:</u> *These procedures are established for the minimum required number of 3 cabin crew. At least, one crewmember must be seated on the center swivel cabin attendant seat (if installed).*

1 CABIN CREW FWD AND 2 AFT

CABIN CREW DESIGNATION	ASSIGNED DOOR	ASSIGNED JUMPSEAT	ASSIGNED AREA
1 PURSER	DOOR 1 LH / RH	FWD INBOARD	FWD/MID
1 CABIN CREW	DOOR 2 LH	AFT LH	MID/AFT
1 CABIN CREW	DOOR 2 RH	AFT CENTER	MID/AFT

<u>Note:</u> *These procedures are established for the minimum required number of 3 cabin crew. At least, one crewmember must be seated on the center swivel cabin attendant seat (if installed).*

COMMUNICATIONS

Ident.: PRO-ABN-90-00010418.0001001 / 04 JUL 17
Applicable to: ALL

1. EMERGENCY CALL			
FROM	**TO**	**COMMUNICATION METHOD(S)**	**REMARKS**
COCKPIT	CABIN	- Press EMER pb-sw on the CALLS panel, or - Passenger Address (PA) System: "PURSER TO COCKPIT PLEASE!"	Purser must immediately go to the cockpit.
CABIN	COCKPIT	- Interphone: "PRIO CAPT"	Any cabin crewmember can make such a call. The cockpit crew must reply.

2. EMERGENCY ALERT

FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	- PA System: "ATTENTION CREW! AT STATIONS!"	The cockpit crew makes a short and precise announcement to warn that an emergency evacuation may soon be required. Cabin crews must proceed to their emergency stations, and fasten their seatbelts.

3. NOTIFICATION TO PASSENGERS

FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	- SIGNS ON - PA System	For psychological reasons, the cockpit crew should be the first to inform of an intended emergency landing.
PURSER	CABIN	- CABIN LIGHTS 100 % - PA System	Purser informs passengers that they have to pay special attention to these warnings: - "FINISH PREPARATION" - "BRACE FOR IMPACT" - "PASSENGERS EVACUATE"

4. FINISH PREPARATION

FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	- Passenger Address (PA) System: "FINISH PREPARATION"	The cockpit crew gives this order a short time before an emergency landing.

5. BRACE FOR IMPACT

FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	- PA System: "BRACE FOR IMPACT!"	The cockpit crew announces to brace for impact approximately 1 min before landing.

6. INITIATE EVACUATION (RESTRICTED EXITS)

FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	- PA System: "PASSENGERS EVACUATE" - Activate EVAC signals	The cockpit crew orders an immediate evacuation, and the cabin crew directs passengers to all available exists.
CABIN	COCKPIT AND CABIN	- EVAC SIGNAL SYSTEM on FWD ATTND panel (FAP) - PA System or megaphone	Used by the cabin crew, if there is no signal or order from the cockpit, and if it is unmistakably clear that the aircraft must be evacuated.
CABIN	CABIN	- Verbal	The cabin crew stands up and shouts: - "SEATBELTS OFF!" - "LEAVE EVERYTHING!" - "GET OUT!" - "COME THIS WAY!"

7. EVACUATION NOT REQUIRED			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	- PA System: "CABIN CREW and PASSENGERS REMAIN SEATED!"	When the Captain decides that an evacuation is not required, the cockpit crew makes an immediate announcement to this effect.

ON GROUND EVACUATION

Applicable to: ALL

Ident.: PRO-ABN-90-A-00010419.0001001 / 05 AUG 10

COCKPIT CREW PROCEDURES

The cockpit crew notifies the cabin crew of the nature of the emergency, and states intentions. The cockpit crew uses the Passenger Address system to make an appropriate announcement, such as: “PASSENGERS EVACUATE”, and presses the EVAC COMMAND pb.

Ident.: PRO-ABN-90-A-00010420.0001001 / 05 AUG 10

CABIN CREW PROCEDURES

When the cabin receives the order to evacuate, each cabin crewmember must proceed as follows:

STAND UP AND SHOUT.......“UNFASTEN SEATBELTS”
OUTSIDE CONDITIONS.......CHECK

- **If outside conditions are safe:**

  DOOR IN ARMED POSITION.......OPEN FIRMLY
  SHOUT.......“COME THIS WAY”

  - **If the door does not open automatically:**

    DOOR.......PUSH AND OPEN MANUALLY

  SLIDE (or SLIDERAFT) DEPLOYMENT.......CHECK FULL DEPLOYMENT

  It takes approximately 4 s for the slide (or slideraft) to deploy.

  - **If the slide (or slideraft) does not automatically inflate:**

    RED, MANUAL INFLATION HANDLE.......PULL

    The red, manual inflation handle is located on the right-hand side of the slide (or slideraft) girt extension.

  ORDER.......“PASSENGERS EVACUATE”
  PASSENGER EVACUATION ....EXPEDITE

  - **If the slide (or slideraft) becomes unserviceable:**

    PASSENGER EVACUATION.......STOP
    PASSENGERS TO ANOTHER USABLE EXIT.......REDIRECT

  TOTAL ZONE EVACUATION.......CHECK

CABIN CREW...EVACUATE
PASSENGERS AWAY FROM THE AIRCRAFT...DIRECT

■ **If outside conditions are unsafe:**
EXIT DOOR..BLOCK
PASSENGERS TO NEAREST USABLE EXIT...REDIRECT

COCKPIT EVACUATION THROUGH WINDOW

Applicable to: ALL

Ident.: PRO-ABN-90-B-00010421.0001001 / 05 AUG 10

OPENING THE SLIDING WINDOW

HANDLE..PUSH DOWN AND PULL BACK

Pulling the handle backwards, opens the sliding window.

Ident.: PRO-ABN-90-B-00010422.0001001 / 24 NOV 15

COCKPIT EVACUATION WITH ESCAPE ROPE

ESCAPE ROPE STOWAGE..OPEN

The escape rope stowage is located above the sliding window, on either side of the overhead panel.

ESCAPE ROPE...UNROLL

Unroll the escape rope, and throw it through the window.

SEAT...STEP ON
ESCAPE ROPE...GRASP

Grasp the escape rope firmly with both hands, and slide down along the rope.

EVACUATION ON WATER

Applicable to: ALL

Ident.: PRO-ABN-90-C-00010423.0001001 / 05 AUG 10

CABIN CREW RESPONSIBLE FOR TYPE "I" DOORS

When the cabin receives the order to evacuate, each cabin crewmember must proceed as follows:

CHILDREN LIFEVESTS..DISTRIBUTE
STAND UP AND SHOUT........................“UNFASTEN SEATBELTS – PUT ON YOUR LIFEVEST”

Inflate the lifevest, only once outside the aircraft.

ORDER...“REMOVE SHOES”

- **If the Type I door is usable:**

DOOR IN ARMED POSITION.. OPEN
SLIDE.. DEPLOY
RED, MANUAL INFLATION HANDLE... PULL

Do not wait for automatic inflation of the slide.

- **If the water level is close to the door sill:**

The slide inflates on the water.

SLIDE.. LEAVE ATTACHED TO CABIN FLOOR
PASSENGER LIFEVESTS....................................INFLATE WHEN EVACUATING AIRCRAFT
PASSENGERS...EVACUATE

Evacuate passengers into the water. The slide is used as a flotation device.

TOTAL ZONE EVACUATION...CHECK
LAST CREWMEMBER...EVACUATE
SLIDE.. SEPARATE FROM DOOR SILL

The last crewmember must separate the slide from the door sill.

MOORING LINE..CUT

- **If the water level is too far away from the door sill:**

SLIDE.. DISCONNECT FROM DOOR SILL

The slide remains tied to the aircraft by a 6 m (20 ft) mooring line.

MOORING LINE...HOLD

To keep the slide close to the exit, hold the mooring line.

PASSENGER LIFEVESTS....................................INFLATE WHEN EVACUATING AIRCRAFT
PASSENGERS...EVACUATE

Evacuate passengers into the water. The slide is used as a flotation device.

TOTAL ZONE EVACUATION...CHECK
LAST CREWMEMBER...EVACUATE
MOORING LINE..CUT

PROCEDURES

NORMAL PROCEDURES

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PRO-NOR-SOP Standard Operating Procedures

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PRO-NOR-SRP-01-50 Cruise

PRO-NOR-SRP-01-60 Descent

PRO-NOR-SRP-01-70 Approach

PRO-NOR-SRP-01-80 Go-Around

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FOREWORD

Ident.: PRO-NOR-SOP-01-00010142.0001001 / 02 MAY 17
Applicable to: ALL

The procedures contained in this Chapter are recommended by Airbus, and are consistent with the other Chapters of this manual.
The Authorities do not certificate Standard Operating Procedures. The manufacturer presents them herein as the best way to proceed, from a technical and operational standpoint. They are continually updated and the revisions take into account Operator input, as well as manufacturer experience.
In addition, Operators may amend them, as needed. However, the manufacturer recommends that Operators using the FCOM as onboard operational manual submit suggested changes to expedite publication, and maintain consistency of the manual. The Operator should note that they may rewrite this Chapter, at their own responsibility; this could, however, make it difficult to update the manual and keep it consistent with the other Chapters.
The following sections contain expanded information on normal procedures.
Standard Operating Procedures consist of inspections, preparations, and normal procedures. All items of a given procedure are listed in a sequence that follows a standardized scan of the cockpit panels, unless that sequence goes against the action priority logic, to ensure that all actions are performed in the most efficient way.
These procedures assume that all systems are operating normally, and that all automatic functions are used normally.
The FCOM also contains normal procedures that are non-routine procedures in the Supplementary Procedures chapter and in the Special Operations chapter.

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TECHNICAL CONDITION OF THE AIRCRAFT

Ident.: PRO-NOR-SOP-02-00010147.0001001 / 05 AUG 10
Applicable to: ALL

The crew will verify the technical state of the aircraft (deferred defect list), with regard to airworthiness, acceptability of malfunctions (MEL), and influence on the flight plan.

WEATHER BRIEFING

Ident.: PRO-NOR-SOP-02-00010148.0001001 / 05 AUG 10
Applicable to: ALL

- The crew will get a weather briefing
- The briefing should include:
  - Actual and expected weather conditions, including runway conditions for takeoff and climb-out
  - Significant weather enroute, including winds and temperatures
  - Terminal forecasts for destination and alternate airports
  - Actual weather for destination and alternates, for short range flights and recent past weather, if available
  - Survey of the meteorological conditions at airports along the planned route.

Weather can affect the choice of routing (for example, influence which route is quickest) and the choice of flight level. The flight crew must also consider the possibility of runways being contaminated at the departure and destination airfields. The flight crew must also verify ISA deviations and enroute icing conditions, and must consider the possibility of holding due to weather at the destination.

NOTAMS

Ident.: PRO-NOR-SOP-02-00010149.0002001 / 29 MAY 13
Applicable to: ALL

- The flight crew must examine NOTAMs for changes to routings, unserviceable navaids, availability of runways and approach aids etc, all of which may affect the final fuel requirement
- In order to prevent the risks of projection of debris towards the trimmable horizontal stabilizer and the elevators, it is not recommended to takeoff from runways in bad condition (loose surface, under repair, covered with debris...)

GPS PRIMARY AVAILABILITY (IF INSTALLED)

Ident.: PRO-NOR-SOP-02-00014998.0001001 / 20 MAR 17
Applicable to: ALL

- **For RNP1 operations, RNAV(GNSS) approaches and RNAV (RNP) ⊲ approaches:**
  If required by operational regulation, an appropriate Ground-Based Prediction Program should be used to check the RAIM/AIME for each intended procedure (arrival, departure, alternate if required).

FLIGHT PLAN AND OPERATIONAL REQUIREMENTS

Ident.: PRO-NOR-SOP-02-00010150.0001001 / 18 MAR 11
Applicable to: ALL

- The crew will check the company flight plan for routing, altitudes, and flight time
- The Captain will check the ATC flight plan and ensure that:
  - It is filled in and filed, in accordance with the prescribed procedures
  - It agrees with the fuel flight plan routing.
- The crew will check the estimated load figures, and will calculate the maximum allowable takeoff and landing weights.

OPTIMUM FLIGHT LEVEL

Ident.: PRO-NOR-SOP-02-00010151.0001001 / 22 MAR 17
Applicable to: ALL

The flight crew should choose a flight level that is as close to the optimum as possible. To determine the optimum flight level, *Refer to QRH/PER-M Optimum & Maximum Altitudes (Paper Only)* or use the performance application of FlySmart with Airbus.
As a general rule, an altitude that is 4 000 ft below the optimum produces a significant penalty (approximately 5 % of fuel). Flight 8 000 ft below the optimum altitude produces a penalty of more than 10 % against trip fuel. (The usual contingency allowance is 5 %).

FUEL REQUIREMENTS

Ident.: PRO-NOR-SOP-02-00010152.0001001 / 05 AUG 10
Applicable to: ALL

COMPUTERIZED FLIGHT PLAN CHECK

In most cases the flight crew uses a computer-derived flight plan to obtain the correct fuel requirements. Although these computerized requirements are normally accurate, the flight crew must check them for gross errors.
The easiest way to do this is to use the “Quick Determination of F-PLN ” tables (*Refer to PER-FPL-FLP-QFP-40 FLIGHT PLANNING M.78*). Although the aircraft will fly at ECON MACH

that is based on the cost index, the M 0.78 table is accurate enough to permit the crew to check for gross error.
Ensure that both the captain and the first officer have verified that the fuel calculations and required fuel on board are correct and that the figure complies with the applicable regulations.

FUEL TRANSPORTATION

The flight crew must check the policy covering the “tankering” of fuel on sectors where there is a favourable fuel price differential or operational requirement.
Remember that carrying unnecessary extra fuel increases the fuel consumption for that sector and therefore reduces the economy of the operation (lower flex temperature, more tire and brake wear, more time in climb phase, lower optimum flight level etc).

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SAFETY EXTERIOR INSPECTION

Applicable to: ALL

Ident.: PRO-NOR-SOP-03-A-00010153.0001001 / 05 AUG 10

Items marked by (*) are the only steps to be completed during a transit stop.
This inspection ensures that the aircraft and its surroundings are safe for operations.
On arriving at the aircraft, check for obstructions in the vicinity, engineering activity, refueling, etc.

Ident.: PRO-NOR-SOP-03-A-00010154.0001001 / 04 MAR 14

* WHEEL CHOCKS.. CHECK

If the wheel chocks are not in position, the flight crew must check that the parking brake is set with sufficient accumulator pressure.

Ident.: PRO-NOR-SOP-03-A-00010155.0001001 / 18 MAR 11

* LANDING GEAR DOORS..CHECK POSITION

WARNING	*Do not pressurize the green hydraulic system without clearance from ground personnel, if any gear door is open. Remember that the green hydraulic system is pressurized if the yellow system is pressurized and the PTU is on AUTO.*

Ident.: PRO-NOR-SOP-03-A-00010156.0001001 / 05 AUG 10

* APU AREA... CHECK

Observe that the APU inlet and outlet are clear.

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GENERAL

Ident.: PRO-NOR-SOP-04-00010164.0001001 / 20 MAR 17
Applicable to: ALL

Items marked by asterisks (*) are the only steps to be completed after a transit stop without flight crew change. Otherwise, the new flight crew performs all the items.
The following procedure, performed by the PM, ensures that all the required checks are performed before applying electrical power to avoid inadvertent operation of systems and danger to the aircraft and personnel.
Included is APU starting and the establishment of electrical and pneumatic power.
For EFB operations, the following procedure performed by both pilots is based on the use of two EFBs/eQRH in order to reduce the risk of erroneous inputs.
Airbus recommends operating with two EFBs.

DOCUMENTATION AND MAINTENANCE

On entering the aircraft, obtain the technical (maintenance) log and verify that the certificate of maintenance and daily inspection (or similar) are up to date and signed. Check the deferred or carried-forward defects. If refueling has already been completed, check the uplift.

AIRCRAFT SETUP

Applicable to: ALL

Ident.: PRO-NOR-SOP-04-A-00021906.0001001 / 30 AUG 17

WARNING	Do not pressurize the hydraulic systems until clearance is obtained from ground personnel.

Ident.: PRO-NOR-SOP-04-A-00010165.0001001 / 03 MAR 14

ENG

ENG MASTERS 1, 2..OFF
ENG MODE selector..NORM

Ident.: PRO-NOR-SOP-04-A-00011188.0001001 / 22 APR 16

*WEATHER RADAR

* RADAR sw ....OFF
* WINDSHEAR / PWS sw ....OFF
* GAIN knob ....AUTO/CAL
* MODE selector ....AS RQRD

Ident.: PRO-NOR-SOP-04-A-00010166.0001001 / 03 MAR 14

L/G

L/G lever.......... DOWN

Ident.: PRO-NOR-SOP-04-A-00010167.0001001 / 03 MAR 14

WIPERS

Both WIPER selectors.......... OFF

BATTERY CHECK/SETUP

Ident.: PRO-NOR-SOP-04-00010168.0001001 / 30 AUG 17
Applicable to: ALL

■ **If the aircraft has not been electrically supplied for 6 h or more, perform the following check:**
BAT 1 pb and BAT 2 pb.......... CHECK OFF
BAT 1 and 2 VOLTAGE.......... CHECK ABOVE 25.5 V
Battery voltage above 25.5 V ensures a charge above 50 %.

■ **If the battery voltage is at or below 25.5 V:**

A charging cycle of about 20 min is required.

BAT 1 pb and BAT 2 pb.......... AUTO
EXT PWR pb-sw.......... ON
Check on ELEC SD page, that the battery contactor is closed and the batteries are charging.

● **After 20 min:**
BAT 1 + 2 pb.......... OFF
BAT 1 and 2 VOLTAGE.......... CHECK ABOVE 25.5 V
BAT 1 + 2 pb.......... AUTO

■ **If the battery voltage is above 25.5 V:**
BAT 1 pb and BAT 2 pb.......... AUTO
If the APU is started on batteries only, it should be started within 30 min after the selection of batteries to AUTO (35 min after battery selection to AUTO, the battery charge is less than 25 % of maximum capacity).

■ **If the aircraft has been electrically supplied during the last 6 h:**
BAT 1 pb and BAT 2 pb.......... AUTO

- **If the AVAIL light is on:**
  EXT PWR pb-sw....................ON

APU FIRE TEST/APU START

Applicable to: ALL

Ident.: PRO-NOR-SOP-04-B-00010170.0001001 / 07 JUN 16

APU FIRE

APU FIRE pb-sw....................CHECK IN and GUARDED
AGENT lights....................CHECK OFF
APU FIRE TEST pb....................PRESS and MAINTAIN

Check :
- *APU FIRE warning on ECAM + CRC + MASTER WARN light (if AC Power available).*
- *APU FIRE pb-sw lighted red.*
- *SQUIB light and DISCH light on*

Ident.: PRO-NOR-SOP-04-B-00010171.0015001 / 17 MAR 17

APU START

- **If the EXT PWR pb-sw ON light is on:**
  APU MASTER SW pb-sw....................ON
  APU START pb-sw....................ON

  Note: Wait at least 3 s before selecting APU START pb-sw.

  For more information on the APU start, Refer to DSC-49-20 Overhead Panel - Illustration.

  For more information on APU starter limitations and APU operations during refueling:
  - *Refer to LIM-APU APU Start*
  - *Refer to LIM-APU APU Start/Shutdown during Refueling/Defueling.*

  EXT PWR pb-sw....................AS RQRD
  The flight crew should keep ON the external power units to reduce the APU load, particularly in hot weather conditions.

- **If the EXT PWR pb-sw ON light is off:**
  APU MASTER SW pb-sw....................ON
  APU START pb-sw....................ON

  Note: Wait at least 3 s before selecting APU START pb-sw.

  For more information on the APU start, Refer to DSC-49-20 Overhead Panel - Illustration.

For more information on APU starter limitations and APU operations during refueling:
- *Refer to LIM-APU APU Start*
- *Refer to LIM-APU APU Start/Shutdown during Refueling/Defueling.*

AIR COND

Ident.: PRO-NOR-SOP-04-00010177.0001001 / 14 OCT 15
Applicable to: ALL

AIR COND

- **When the APU is AVAIL:**

APU BLEED pb-sw.. ON

Do not use APU BLEED, if the ground personnel confirms that a LP or HP ground air unit is connected to the aircraft.
To determine if an HP ground air unit is connected, the flight crew should also check on the BLEED SD page, if there is pressure in the bleed air system.

ALL WHITE LIGHTS.. OFF
X BLEED selector.. AUTO
Zone temperature selectors.. AS RQRD

Full range temperature 24 ± 6 °C (75 ± 11 °F).

CARGO HEAT

Ident.: PRO-NOR-SOP-04-00010178.0001001 / 03 MAR 14
Applicable to: ALL

CARGO HEAT

TEMPERATURE selector .... AS RQRD

COCKPIT LIGHTS

Ident.: PRO-NOR-SOP-04-00010172.0002001 / 23 JUN 15
Applicable to: ALL

COCKPIT LIGHTS

* COCKPIT LIGHTS.. AS RQRD

Set INT LT, FLOOD LT, INTEG LT (included glareshield and FCU).

ECAM

Ident.: PRO-NOR-SOP-04-00010204.0001001 / 04 SEP 17
Applicable to: ALL

* ECAM

* RCL pb ....PRESS 3 s

This action recalls all the warnings that the flight crew cleared or cancelled during the last flight.

* Check MEL if required.

- **On the DOOR SD page:**

  * OXY .... CHECK PRESSURE

  - **If the OXY pressure is half boxed in amber:**

    MIN FLT CREW OXY CHART.. CHECK PRESSURE

    Verify that the pressure is sufficient for the scheduled flight (Refer to LIM-OXY Minimum Flight Crew Oxygen Pressure).

- **On the HYD SD page:**

  * RESERVOIR FLUID LEVEL...CHECK WITH NORMAL RANGE

Note: *The volume of the hydraulic fluid in the reservoirs may change with Outside Air Temperature. As a result, the reservoir fluid level that appears on the HYD SD page may be outside of the normal range with no HYD RSVR LO AIR PR or HYD RSVR LO LVL warning. If the fluid level is outside of the normal range, contact maintenance to determine if service is required.*

- **On the ENG SD page:**

  * ENG OIL QUANTITY.. CHECK NORMAL

  Check that the oil quantity is at or above 9.5 qt + estimated consumption (average estimated consumption ~ 0.5 qt/h).

FMGS PRE-INITIALIZATION

Applicable to: ALL

Ident.: PRO-NOR-SOP-04-C-00014422.0001001 / 20 MAR 17

Perform FMGS Pre-Initialization in the case of ACARS operations, or EFB operations with SYNCHRO AVIONICS .

At electrical power-up, the FMGS s and FCU run through various internal tests. Allow enough time (3 min) for tests' completion, and do not start to press pushbuttons until the tests are over. If the "PLEASE WAIT" message appears, do not press any MCDU key until the message clears.

* FLT NBR..INSERT

* FROM/TO...INSERT

EFB

Applicable to: ALL

Ident.: PRO-NOR-SOP-04-F-00021232.0001001 / 21 MAR 17

EFB/EQRH START

ALL EFB/eQRH...START

- **In accordance with the Operator's policy or if required by operational regulation:**

  EFB/eQRH VERSION...CHECK

  If required, the flight crew performs this check unless a specific procedure is established as per Operator's policy to ensure that the correct version is onboard.
  On the EFB STATUS page and the eQRH My aircraft page, check the EFB VERSION number and compare it with the valid version number given as reference by the Operator (e.g. on the company flight plan).

*OPERATION ENGINEERING BULLETINS (OEB)

* OEB in eQRH...CHECK

Go to the OEB section of the eQRH and review all OEB s (particularly red OEBs) that are applicable to the aircraft.

Note: *If there is a transfer of duties during this flight, the flight crew must remind the incoming flight crew of the applicable OEB(s) during the briefing that is done when transferring the duties.*

* EFB SYNCHRO AVIONICS .... CLICK

Each flight crewmember checks (if retrieved from FMS) or enters:
- Aircraft Type
- Aircraft Registration
- Flight Number
- The departure and arrival airports

Both flight crewmembers crosscheck all the data.

REQUIRED APPLICATIONS...START

Ident.: PRO-NOR-SOP-04-F-00021234.0001001 / 20 MAR 17

*ECAM/LOGBOOK CHECK

* RCL pb...PRESS 3 s

This action recalls all the warnings that the flight crew cleared or cancelled during the last flight

* Check MEL if required.

* LOGBOOK or EFB E-LOGBOOK ....CHECK

- *In the logbook or EFB e-logbook, check the technical condition of the aircraft (deferred defect list) with regard to airworthiness, acceptability of the MEL , or the Configuration Deviation List (CDL), and influence on the flight plan.*
- *Crosscheck with ECAM recall.*

* MEL /CDL ITEMS (as appropriate).. CHECK DISPATCH CONDITIONS

Access the MEL and CDL items via the Ops Library Browser.

* MEL ITEMS (as appropriate)... ACTIVATE

As appropriate, the activated MEL items are sent to the applicable performance applications.

* CDL ITEMS (as appropriate)... ACTIVATE & COMPLETE

Complete missing items of CDL items. As appropriate, the activated CDL items are sent to the applicable performance applications.

* AIRCRAFT ACCEPTANCE...PERFORM

Ident.: PRO-NOR-SOP-04-F-00021233.0001001 / 20 MAR 17

*PRELIMINARY PERFORMANCE DATA CALCULATION

Each flight crewmember independently computes the preliminary performance data in accordance with the technical condition of the aircraft and/or any other criteria that may impact the aircraft performance (e.g. NOTAM, runway condition, aircraft configuration).

* AIRFIELD DATA..OBTAIN

Obtain data needed for initializing the system, preparing the cockpit and for preliminary takeoff performance computation. The airfield data should include: RUNWAY IN USE, ALTIMETER SETTING, and WEATHER DATA.

- **If the LOADSHEET application is used :**
  PRELIMINARY LOADING..COMPUTE AND CROSSCHECK
- **If dispatch under MEL and in accordance with the logbook:**
  * MEL /CDL ITEMS (as appropriate).. CHECK ACTIVATED
  As appropriate, check that the MEL and CDL items are activated in the applicable performance application.

PRELIMINARY TAKEOFF PERF... COMPUTE AND CROSSCHECK

BEFORE WALKAROUND

Applicable to: ALL

Ident.: PRO-NOR-SOP-04-E-00010173.0001001 / 05 AUG 10

F/CTL

FLAPS..CHECK POSITION

Check the upper ECAM display to confirm that the FLAPS position agrees with the handle position.

* SPEEDBRAKE lever..CHECK RETRACTED and DISARMED

WARNING	*If flight control surface positions do not agree with the control handle positions, check with the maintenance crew before applying hydraulic power.*

Ident.: PRO-NOR-SOP-04-E-00010174.0001001 / 18 MAY 16

* PARKING BRAKE

ACCU PRESS indicator..CHECK

The ACCU PRESS indication must be in the green band. If required use the electric pump on yellow hydraulic system to recharge the brake accumulator.

PARKING BRAKE handle..ON

When one brake temperature is above 500 °C, avoid applying the parking brake, unless operationally necessary.

BRAKES PRESS indicator..CHECK

Check for normal indications.

WARNING	Yellow and green hydraulic systems are pressurized from yellow electric pump. Get ground crew clearance before using the electric pump.

Ident.: PRO-NOR-SOP-04-E-00010175.0001001 / 30 JUN 15

ALTERNATE BRAKING SYSTEM

Note: *The purpose of this check is to verify, before the first flight of the day, the efficiency of the alternate braking system (absence of "spongy pedals").*

Y ELEC PUMP pb-sw..CHECK OFF
CHOCKS..CHECK IN PLACE
PARK BRK handle..OFF
BRAKE PEDALS..PRESS

Apply maximum pressure on both pedals.

BRAKE PRESSURE (on BRAKE press indicator)..CHECK

Pressure must build up without delay symmetrically on left and right sides for the same application simultaneously applied on left and right pedals. With full pedal deflection, the pressure must be between 2 000 and 2 700 PSI.

BRAKE PEDALS..RELEASE
PARK BRK handle...ON

The parking brake must be on during the exterior inspection to allow the flight crew to check brake wear indicators.

Ident.: PRO-NOR-SOP-04-E-00010206.0001001 / 23 JUN 15

EMERGENCY EQUIPMENT

EMER EQPT...CHECK

Check the emergency equipments as follows:
- *Life jackets stowed*
- *Axe stowed*
- *Smoke hoods or portable oxygen equipment and full face masks stowed and serviceable*
- *Portable fire extinguisher lockwired and pressure in the green area*
- *Smoke goggles stowed (smoke hoods)*
- *Oxygen masks stowed*
- *Flashlights stowed*
- *Escape ropes stowed*

Ident.: PRO-NOR-SOP-04-E-00010207.0001001 / 14 SEP 12

RAIN REPELLENT

RAIN RPLNT indicators..CHECK PRESSURE and QUANTITY

CAUTION	*Never use rain repellent to wash the windshield and never use it on a dry windshield.*

Ident.: PRO-NOR-SOP-04-E-00010208.0001001 / 05 AUG 10

REAR AND OVERHEAD CIRCUIT BREAKERS PANELS

REAR and OVERHEAD CIRCUIT BREAKERS panels...CHECK

Check that all circuit breakers are set. Reset as necessary.

Ident.: PRO-NOR-SOP-04-E-00010209.0001001 / 25 JAN 17

LANDING GEAR PINS AND COVERS

* GEAR PINS and COVERS.. CHECK ONBOARD and STOWED

Check that three are on board and stowed.

GENERAL

Ident.: PRO-NOR-SOP-05-00010360.0001001 / 17 MAY 17
Applicable to: ALL

The exterior walkaround ensures that the general condition of the aircraft is satisfactory and that the visible aircraft components and equipment are safe for the flight:
- There is no impact damage to the structure
- There is no evident fuel, oil, or hydraulic leak
- All ground access doors are closed.

The flight crew must perform a complete walkaround before each flight.
The parking brake must be set to ON during the exterior walkaround, in order to enable the flight crew to check brake wear indicators.

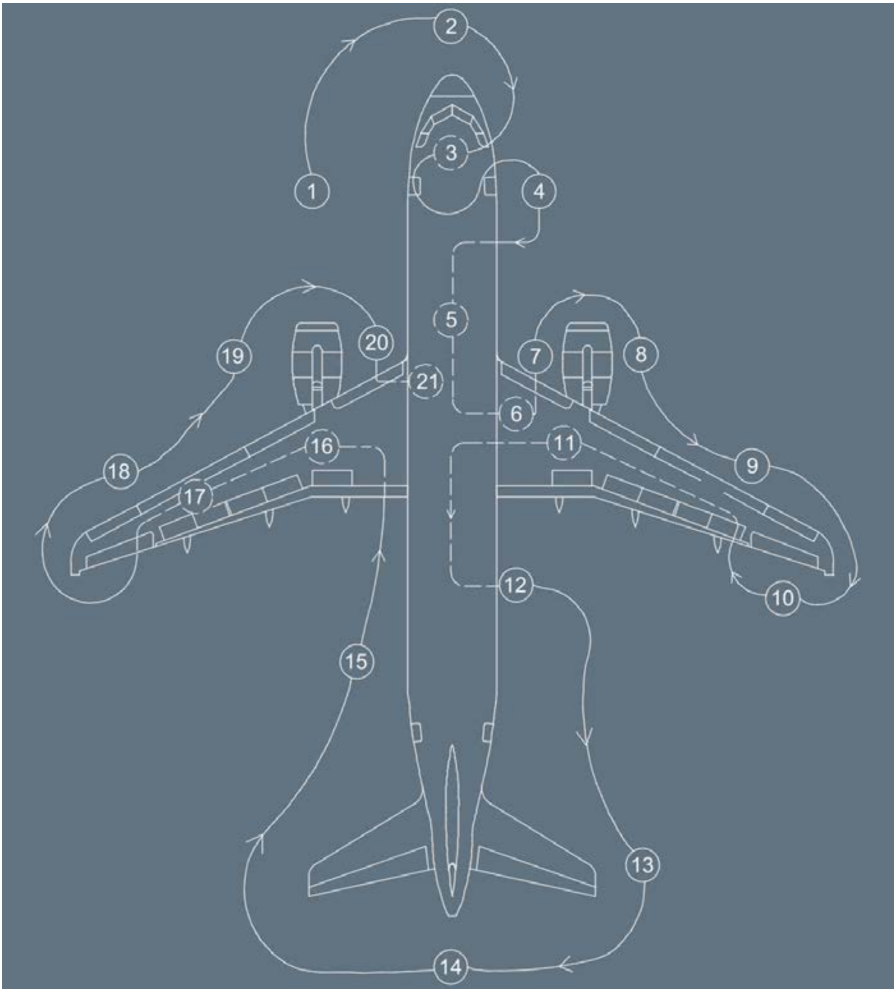
WARNING	If any landing gear door is open, do not apply hydraulic power until clearance is obtained from ground personnel.

EXTERIOR WALKAROUND

Applicable to: ALL

Ident.: PRO-NOR-SOP-05-A-00010361.0001001 / 04 MAY 15

SCHEMATIC



(1) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - LH FWD Fuselage*

(2) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - Nose Section*
(3) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - Nose L/G*
(4) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - RH FWD Fuselage*
(5) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - Lower Center Fuselage*
(6) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - RH Center Wing*
(7) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - ENG 2 LH Side*
(8) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - ENG 2 RH Side*
(9) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - RH Wing Leading Edge*
(10) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - RH Wing Trailing Edge*
(11) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - RH L/G and Fuselage*
(12) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - RH AFT Fuselage*
(13) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - TAIL*
(14) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - APU*
(15) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - LH AFT Fuselage*
(16) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - LH Landing Gear*
(17) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - LH Wing Trailing Edge*
(18) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - LH Wing Leading Edge*
(19) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - ENG 1 LH Side*
(20) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - ENG 1 RH Side*
(21) *Refer to PRO-NOR-SOP-05 Exterior Walkaround - LH Center Wing*

Ident.: PRO-NOR-SOP-05-A-00010363.0001001 / 17 MAY 17

LH FWD FUSELAGE

AOA probes.. CONDITION
F/O and CAPT static ports.. CLEAR
Avionics equipment vent air inlet valve.. CONDITION
Oxygen bay.. CLOSED
Oxygen overboard discharge indicator.. GREEN
Toilet servicing door ❄ .... CLOSED

Ident.: PRO-NOR-SOP-05-A-00010364.0001001 / 17 MAY 17

NOSE SECTION

Pitot probes....................CONDITION
STBY static ports....................CLEAR
TAT probes....................CONDITION
Radome and latches....................CONDITION/LATCHED
Forward avionics compartment door....................CLOSED
Ground electrical power door (if not required.)....................CLOSED

Ident.: PRO-NOR-SOP-05-A-00010365.0001001 / 17 MAY 17

NOSE L/G

Nose wheel chocks....................IN PLACE
Wheels and tires....................CONDITION
Nose gear structure....................CONDITION
Taxi, TO, turn-off lights....................CONDITION
Hydraulic lines and electrical wires....................CONDITION
Wheel well....................CHECK
Safety pin....................REMOVED

Ident.: PRO-NOR-SOP-05-A-00010366.0001001 / 17 MAY 17

RH FWD FUSELAGE

RH + AFT avionic compartment doors....................CLOSED
Avionic equipment vent air outlet valve....................CONDITION
F/O -CAPT static ports....................CLEAR
AOA probe....................CONDITION
Forward cargo door and selector panel....................CHECK

Ident.: PRO-NOR-SOP-05-A-00010367.0001001 / 20 DEC 16

LOWER CENTER FUSELAGE

Potable water drain panel ❄ ....CLOSED
Antennas....................CONDITION
Drain mast....................CONDITION
Emergency ram air inlet flap....................CONDITION
LP and HP ground connection doors....................CLOSED
Anticollision light....................CHECK
CTR TK magnetic fuel level....................FLUSH
Pack air intakes and outlets....................CLEAR

Ident.: PRO-NOR-SOP-05-A-00010368.0002001 / 17 MAY 17

RH CENTER WING

Yellow hydraulic bay door....CLOSED
Fuel panel....CLOSED
Inner tank magnetic fuel....FLUSH
Fuel water drain valve inner tank....NO LEAK
Landing light....CONDITION
Slat 1....CONDITION

Ident.: PRO-NOR-SOP-05-A-00010370.0015001 / 17 MAY 17

ENG 2 LH SIDE

Oil fill access door....CLOSED
Thrust reversers....CLOSED/LATCHED
Fan cowl doors....CLOSED/LATCHED
Drain mast....CONDITION/NO LEAK
Engine inlet and fan blades....CHECK

Ident.: PRO-NOR-SOP-05-A-00010371.0006001 / 17 MAY 17

ENG 2 RH SIDE

Vent inlet....CLEAR
Pressure-relief/Start valve handle access door....CLOSED
Thrust reversers....CLOSED/LATCHED
Fan cowl doors....CLOSED/LATCHED
Turbine exhaust....CLEAR
Pylon/access panel....CONDITION/CLOSED

Ident.: PRO-NOR-SOP-05-A-00010372.0001001 / 17 MAY 17

RH WING LEADING EDGE

Slats 2, 3, 4, 5....CONDITION
Inner and outer cells magnetic fuel level....FLUSH
Fuel water drain valve (outer cell, surge tank)....NO LEAK
Refuel coupling....CLOSED
Surge tank air inlet....CLEAR
Fuel ventilation overpressure disc....INTACT
Navigation light....CONDITION
Wing tip....CONDITION

Ident.: PRO-NOR-SOP-05-A-00010373.0001001 / 01 SEP 17

RH WING TRAILING EDGE

Static dischargers....................CHECK
Control surfaces....................CONDITION
Flaps and fairings....................CONDITION
ANTENNAS ON TOP OF FUSELAGE....................CHECK CONDITION

Ident.: PRO-NOR-SOP-05-A-00010374.0001001 / 17 MAY 17

RH L/G AND FUSELAGE

Chocks....................REMOVED
Wheels and tires....................CONDITION
Brakes and brake wear ind....................CONDITION
Torque link damper ❄ ....CONDITION
Hydraulic lines....................CHECK
Landing gear structure....................CHECK
Downlock springs....................CHECK
Safety pin....................REMOVED
Ground hydraulic connection yellow....................CLOSED
Shroud fuel drain....................CONDITION/NO LEAK

Ident.: PRO-NOR-SOP-05-A-00010375.0001001 / 17 MAY 17

RH AFT FUSELAGE

RA Antennas....................CONDITION

Check that the RA antennas are clean.

Cargo door and selector panel....................CHECK
Bulk door ❄ ....CHECK
Toilet service access door....................CLOSED
Outflow valve....................CONDITION
Drain mast ....CONDITION
Flight recorder access door ....CLOSED

Ident.: PRO-NOR-SOP-05-A-00010376.0001001 / 17 MAY 17

TAIL

Stabilizer, elevator, fin, and rudder....................CONDITION
Static dischargers....................CHECK
Lower fuselage structure (tail impact on runway)....................CONDITION

Ident.: PRO-NOR-SOP-05-A-00010377.0001001 / 05 AUG 10

APU

Access doors....................CLOSED
Air intake....................CONDITION
Drain....................CONDITION/NO LEAK
Oil cooler air outlet ....CLEAR
Exhaust....................CLEAR
Navigation light....................CONDITION
Fire extinguisher overpressure indication (red disc)....................IN PLACE

Ident.: PRO-NOR-SOP-05-A-00010378.0001001 / 17 MAY 17

LH AFT FUSELAGE

Stabilizer, elevator, fin, and rudder....................CONDITION
Potable water service door....................CLOSED
Ground hydraulic connection blue door....................CLOSED
Ground hydraulic connection green and reservoir filling door....................CLOSED

Ident.: PRO-NOR-SOP-05-A-00010379.0001001 / 17 MAY 17

LH LANDING GEAR

Chocks....................REMOVED
Wheels and tires....................CONDITION
Brakes and brake wear indicator....................CONDITION
Torque link damper ⊲✻ ....CONDITION
Hydraulic lines....................CHECK
Landing gear structure....................CHECK
Downlock springs....................CHECK
Safety pin....................REMOVED

Ident.: PRO-NOR-SOP-05-A-00010380.0001001 / 01 SEP 17

LH WING TRAILING EDGE

Flaps and fairing....................CONDITION
Control surfaces....................CONDITION
Static dischargers....................CHECK
ANTENNAS ON TOP OF FUSELAGE....................CHECK CONDITION

Ident.: PRO-NOR-SOP-05-A-00010381.0001001 / 17 MAY 17

LH WING LEADING EDGE

Wing tip....................CONDITION

Navigation light.......... CONDITION
Surge tank air inlet.......... CLEAR
Fuel ventilation overpressure disc.......... INTACT
Fuel water drain valve.......... NO LEAK
Inner and outer cell magnetic fuel level.......... FLUSH
Slats 2, 3, 4, 5.......... CONDITION

Ident.: PRO-NOR-SOP-05-A-00010384.0007001 / 17 MAY 17

ENG 1 LH SIDE

Oil fill access door.......... CLOSED
Thrust reversers.......... CLOSED/LATCHED
Fan cowl doors.......... CLOSED/LATCHED
Drain mast.......... CONDITION/NO LEAK
Engine inlet and fan blades.......... CHECK
Pylon/access panel.......... CONDITION/CLOSED

Ident.: PRO-NOR-SOP-05-A-00010386.0007001 / 17 MAY 17

ENG 1 RH SIDE

Vent inlet.......... CLEAR
Pressure relief/Start valve handle access door.......... CLOSED
Thrust reversers.......... CLOSED/LATCHED
Fan cowl doors.......... CLOSED/LATCHED
Turbine exhaust.......... CLEAR

Ident.: PRO-NOR-SOP-05-A-00010387.0001001 / 17 MAY 17

LH CENTER WING

Slat 1.......... CONDITION
Wing leading edge ventilation intake ⩤ .... CLEAR
Fuel water drain valves.......... NO LEAK
Inner tank magnetic fuel.......... FLUSH
Landing lights.......... CONDITION
Hydraulic reservoir pressurization door.......... CLOSED
RAT doors.......... CLOSED

INTRODUCTION

Ident.: PRO-NOR-SOP-06-00011153.0001001 / 20 MAR 17
Applicable to: ALL

Items marked by asterisks (*) are the only steps to be completed after a transit stop without flight crew change. Otherwise, the new flight crew performs all the items.
The PF and PM should perform the cockpit preparation according to the panel scan sequence defined below (*Refer to Panel Scan Sequence*), and the task sharing defined in the QRH (*Refer to QRH/Normal Procedures - Cockpit Preparation*).

OVERHEAD PANEL

Applicable to: ALL

Ident.: PRO-NOR-SOP-06-A-00011155.0001001 / 31 JUL 13

WHITE LIGHTS ON THE OVERHEAD PANEL

- **During the scan sequence of the overhead panel:**

  * ALL WHITE LIGHTS.. EXTINGUISH

  It is a general rule to turn off all the white lights during the scan sequence; therefore, these actions are not listed here.

Ident.: PRO-NOR-SOP-06-A-00015476.0001001 / 12 APR 16

RCDR

* RCDR GND CTL pb-sw.. ON

In order to perform the test, ensure that the PARK BRK is on.

LOUDSPEAKER VOLUME knob.. OFF (BOTH SIDES)
ACP INT/RAD sw (CAPT and F/O)..SET to INT
INTERPHONE VOLUME RECEPTION KNOB (CAPT and F/O)...................................... RELEASE

Turn down the volume to the minimum.

CVR TEST pb..PRESS AND MAINTAIN

The CVR test is successful when an audio test signal is heard through the loudspeakers and the CVR TEST pb is pressed and maintained.
Depending on the CVR model, the audio test signal is:

- *For CVR 30 minutes:*
  - *A continuous tone, or*
  - *A short tone.*
- *For CVR 120 minutes:*
  - *A short tone, or*
  - *A short tone and a beep every 4 s, or*
  - *Two short tones and a beep every 4 s.*

The audio test signal stops when the CVR TEST pb is released.

Note:
- *The flight crew may also hear an acoustic feedback (i.e. Larsen effect) during the test. The test is still valid even if this acoustic feedback (i.e. Larsen effect) is heard.*
- *If the flight crew cannot hear the audio test signal through the loudspeakers, and if the CVR maintenance headset (22RK headset) is available, the flight crew can perform the CVR TEST through the CVR maintenance headset.*
- *If an acoustic feedback (i.e. Larsen effect) is still heard, the flight crew can perform the CVR TEST using the 22RK headset and with the parking brake set to off. Before setting the parking brake to off, the flight crew must ensure that chocks are in place or brakes are applied. Set the parking brake to on when the CVR TEST is achieved.*

Ident.: PRO-NOR-SOP-06-A-00011158.0001001 / 06 MAR 17

EVAC

CAPT & PURS/CAPT sw ....AS RQRD

Set the CAPT & PURS/CAPT sw on the EVAC panel as per Company Policy.

Ident.: PRO-NOR-SOP-06-A-00011159.0009001 / 17 MAR 17

*ADIRS

All IR MODE selector.. NAV

Align or realign IRS as appropriate. Refer to FCTM/PR-NP-SOP-60 ADIRS Operations.

L2 A complete IRS alignment must be performed in the following cases:
- Before the first flight of the day, or
- When there is a crew change, or
- When the GPS is not available and the NAVAIDS coverage is poor on the expected route, or
- When the GPS is not available and the expected flight time is more than 3 h.

A fast IRS alignment must be performed if a complete IRS alignment is not necessary.
To perform an alignment, the aircraft must be stopped on ground. Any aircraft movement will automatically restart the IRS alignment.

Do not align IRS during engine start, or while the engines are running.

Ident.: PRO-NOR-SOP-06-A-00011160.0001001 / 05 JAN 15

EXTERIOR LIGHTS

STROBE sw....................AUTO
BEACON sw....................OFF
REMAINING EXTERIOR LIGHTS....................AS RQRD

Ident.: PRO-NOR-SOP-06-A-00011161.0001001 / 14 SEP 12

*SIGNS

* SIGNS sw....................ON/AUTO
* EMER EXIT LT selector....................ARM

Note: *Leaving the EXIT selector or NO SMOKING selector or NO PORTABLE/ELEC DEVICE selector ON prevents the emergency batteries from charging.*
If the CIDS has been programmed (option) for a non-smoking flight, NO SMOKING or NO PORTABLE/ELEC DEVICE signs are permanently on, with the EXIT sw or NO SMOKING sw or NO PORTABLE/ELEC DEVICE sw at AUTO (with permanent charge of emergency batteries).

Ident.: PRO-NOR-SOP-06-A-00010176.0001001 / 03 MAR 14

PROBE/WINDOW HEAT

PROBE/WINDOW HEAT pb....................CHECK AUTO

Ident.: PRO-NOR-SOP-06-A-00011162.0001001 / 13 AUG 10

CABIN PRESS

LDG ELEV knob....................AUTO

Ident.: PRO-NOR-SOP-06-A-00011163.0001001 / 20 SEP 16

*AIR COND

* PACK FLOW selector....................AS RQRD

Select:

LO : If the number of occupants is below 138.

HI : For abnormally hot and humid conditions.

NORM : For all other normal operating cases.

If the APU is supplying, pack controllers select HI flow automatically, independent of the selector position.

Ident.: PRO-NOR-SOP-06-A-00011164.0001001 / 09 APR 15

ELEC

Scan and check that there are no amber lights, except GEN FAULT lights.
ELEC pb (on the ECAM Control Panel)..PRESS
BAT 1 pb-sw and BAT 2 pb-sw..OFF then ON

This action initiates a charging cycle of the batteries.

10 s after setting all BAT pb-sw ON, check on the ELEC SD page that the current charge of the battery is below 60 A, and is decreasing.

- **If the charge of at least one battery is not below 60 A:**

  Wait until the end of the charging cycle of the batteries and perform this check again.

Ident.: PRO-NOR-SOP-06-A-00011166.0002001 / 23 JUN 15

*FUEL

- **If the center tank is less than 200 kg (440 lb) for the flight:**

  Apply the following procedure, if your airline is affected by FUEL CTR TK PUMPS LO PR cautions on ground or in flight when the center tank is less than 200 kg (440 lb):

  FUEL MODE SEL pb-sw..MAN
  CTR TK PUMP 1 pb-sw and CTR TK PUMP 2 pb-sw..OFF

- **If the center tank is NOT less than 200 kg (440 lb) for the flight:**

CAUTION	If the FUEL MODE SEL pb is unduly left in the MAN position on ground, when the CTR TK PUMP 1 pb & CTR TK PUMP 2 pb are not in the OFF position: There is a possibility of fuel spillage, if there are any hidden failures.

  FUEL MODE SEL pb.. CHECK AUTO

Ident.: PRO-NOR-SOP-06-A-00011167.0001001 / 21 MAR 17

ENG 1 - ENG 2 FIRE

ENG 1 FIRE pb-sw and ENG 2 FIRE pb-sw ....CHECK IN and GUARDED
AGENT 1 light and AGENT 2 light ....CHECK OFF
ENG 1 TEST pb and ENG 2 TEST pb .... PRESS and MAINTAIN

*For ENG FIRE TEST description,**Refer to DSC-26-20-20 FIRE Panel*

Ident.: PRO-NOR-SOP-06-A-00011169.0001001 / 14 SEP 12

AUDIO SWITCHING PANEL

AUDIO SWITCHING selector .... NORM

Ident.: PRO-NOR-SOP-06-A-00010185.0001001 / 26 MAY 14

VENT

ALL LIGHTS..CHECK OFF

Ident.: PRO-NOR-SOP-06-A-00011174.0001001 / 14 SEP 12

THIRD OCCUPANT AUDIO CONTROL PANEL

PA knob ....RECEPT

- *This allows cabin attendant announcements to be recorded on the CVR.*
- *For proper recording, set volume at or above medium range.*

Ident.: PRO-NOR-SOP-06-A-00011176.0001001 / 14 SEP 12

MAINTENANCE PANEL

ALL LIGHTS..CHECK OFF

CTR INSTRUMENT PANEL

Applicable to: ALL

Ident.: PRO-NOR-SOP-06-B-00011179.0001001 / 13 AUG 10

CTR INSTRUMENT PANEL - STBY INSTRUMENT

* STBY ASI..CHECK
* STBY ALTI (and STBY ALTI in meter ⧼)..CHECK
* STBY HORIZON..CHECK

Check no flag - Erect if necessary.

Ident.: PRO-NOR-SOP-06-B-00011185.0009001 / 20 SEP 16

*CLOCK

CLOCK..CHECK/SET

Note: *1. If the date is incorrect, set the date manually then set and keep the clock mode to internal (INT) mode for the whole flight.*
2. To comply with the time precision requirement (+/-1 s UTC) for ATC datalink communication, the flight crew must either:

- *Use the clock in GPS mode, or*
- *Use the clock in INT mode and synchronize the clock with the GPS at least one time per day. This synchonization ensures that the UTC time drift is below +/- 1 s UTC.*

For more information on the setting of the clock, Refer to DSC-31-55-10 General.
For more information on the use of the internal (INT) mode, Refer to DSC-31-55-20 Operation in Internal Mode.

Ident.: PRO-NOR-SOP-06-B-00011186.0001001 / 13 AUG 10

NOSEWHEEL STEERING

* A/SKID & N/W STRG sw..ON

PEDESTAL

Applicable to: ALL

Ident.: PRO-NOR-SOP-06-C-00011187.0001001 / 13 AUG 10

ACP

INT knob .... PRESS OUT / VOLUME CHECK

Make sure that INT volume is turned up to permit contact with the ground crew.

VHF ....CHECK

Check transmission and reception.

HF (if required for flight)..CHECK

- *Check transmission and reception.*
- *Do not transmit on HF during refueling.*

Ident.: PRO-NOR-SOP-06-C-00011191.0001001 / 23 JUN 15

COCKPIT DOOR

If required by local Airworthiness Authorities:

ANN LT selector... TEST

Check that the OPEN and FAULT lights (on the pedestal), and the three LED lights (on the overhead panel) come on.

ANN LT selector.. BRT

Check that all lights go off.

CKPT DOOR...CHECK CORRECT OPERATION

- *Set the COCKPIT DOOR sw to the UNLOCK position. Check that the door opens, and that the OPEN light comes on*
- *Then, with the door fully open, release the COCKPIT DOOR sw (check that it returns to NORM position). Close the door. Check that it is locked, and that the OPEN Indication goes off.*

CKPT DOOR MECHANICAL OVERRIDE.. CHECK

Check that the door opens normally, and that it closes when the mechanical override is used.

Ident.: PRO-NOR-SOP-06-C-00011189.0001001 / 14 SEP 12

SWITCHING PANEL

All selectors..CHECK NORM

Ident.: PRO-NOR-SOP-06-C-00011192.0001001 / 12 JUL 13

*ENG

* THRUST lever .... IDLE
* ENG MASTER sw .... OFF
* ENG MODE selector...NORM

Ident.: PRO-NOR-SOP-06-C-00011195.0001001 / 06 SEP 16

*PARKING BRK

ACCU PRESS indicator... CHECK

The ACCU PRESS indication must be in the green band. If required, use the electric pump on yellow hydraulic system to recharge the brake accumulator.

WARNING	Yellow and green hydraulic systems are pressurized from yellow electric pump. Get ground crew clearance before using the electric pump.

* PARK BRK handle.. CHECK ON
* BRAKES PRESS indicator..CHECK

Check for normal indications.

- **If brakes are hot and chocks are in place:**
  PARK BRK handle ....OFF
  This action increases the brake cooling.

Ident.: PRO-NOR-SOP-06-C-00011198.0001001 / 07 FEB 11

GRAVITY GEAR EXTN

GRAVITY GEAR EXTN.. CHECK STOWED

Ident.: PRO-NOR-SOP-06-C-00011199.0001001 / 21 MAR 17

ATC

* ATC .... STBY

ATC and TCAS are on standby. To prevent possible interference to radar surveillance systems, TCAS should not be selected before the holding point/lining up.

ALT RPTG ....ON
ATC SYS 1.. SELECT

For RVSM operations (Refer to PRO-SPO-50 General), select SYS 1 if AP 1 is used, and SYS 2 if AP 2 is used.
Only system 1 is available, in emergency electrical configuration.

RMP

Ident.: PRO-NOR-SOP-06-00011202.0001001 / 30 JUN 14
Applicable to: ALL

RMP..CHECK ON
Green NAV light..CHECK OFF
SEL light..CHECK OFF
COM FREQUENCIES..TUNE

Use VHF 1 for ATC (only VHF 1 is available in emergency electrical configuration), VHF 2 for ATIS and company frequencies. VHF 3 is normally devoted to ACARS.

ACARS

Ident.: PRO-NOR-SOP-06-00011224.0001001 / 24 SEP 14
Applicable to: ALL

* Initialize ACARS at that point or after FMGS PREPARATION, as per company policy.

FMGS PREPARATION

Applicable to: ALL

Ident.: PRO-NOR-SOP-06-D-00011226.0001001 / 13 AUG 10

At electrical power-up, the FMGS s and FCU run through various internal tests. Allow enough time (3 min) for tests' completion, and do not start to press pushbuttons until the tests are over. If the "PLEASE WAIT" message appears, do not press any MCDU key until the message clears.

Ident.: PRO-NOR-SOP-06-D-00011227.0001001 / 03 MAR 14

* ENGINE & AIRCRAFT TYPE.. CHECK

Press the DATA key, and display the STATUS page (if not displayed).

Ident.: PRO-NOR-SOP-06-D-00011228.0001001 / 17 JUN 14

* FM database validity... CHECK

- *Check DATA BASE validity and stored WPT /NAVAID S/RWY/ROUTES, if any.*
  If applicable, review the stored data for deletion decision.
- *On Honeywell FMS , the double AIRAC cycle of the NDB has one day in common (AIRAC#1 day 28 / AIRAC#2 day1) (Refer to DSC-22_20-50-10-25 Aircraft Status Page).*

If the CHECK DATA BASE CYCLE message triggers, the active database is no longer valid. Therefore, on Day 28 of AIRAC Cycle #1, select AIRAC Cycle#2 prior to the first flight of the day.

Ident.: PRO-NOR-SOP-06-D-00011229.0001001 / 28 MAR 11

* NAVAID DESELECTION...AS RQRD

If NOTAMs warn of any unreliable DME or VOR /DME , display DATA, then POSITION MONITOR. Access the SEL NAVAID page, and deselect the related NAVAID.

Ident.: PRO-NOR-SOP-06-D-00011231.0003001 / 20 AUG 12

* FLIGHT PLAN INITIALIZATION..COMPLETE

- *Press the INIT key*
- *Insert CO RTE or city pair, and check FROM/TO*
- *Check/modify ALTN /CO RTE*

- *Enter flight number*

  Note: For ATC needs, the crew should enter exactly the entire flight number, as shown on the ICAO flight plan, without inserting any space, on the MCDU INIT page.

- *Enter (and/or check) cost index*
- *Enter intended initial CRZ FL, or check if it was already supplied by the database. Modify it, if necessary, taking into account ATC constraints or expected gross weight*
- *Check and modify CRZ FL TEMP and tropopause level to agree with forecast*
- *Enter (and/or check) the expected ground temperature for take off (GND TEMP)*
- *PRESS IRS INIT prompt*
- *Check alignment latitude/longitude.*

Ident.: PRO-NOR-SOP-06-D-00011232.0001001 / 17 MAR 17

* ADIRS POSITION INITIALIZATION..AS APPROPRIATE

Confirm or insert position coordinates for the IRS alignment. Refer to FCTM/PR-NP-SOP-60 FMGS Preparation.

L2

IRS Alignment Based on GPS Position available:

The position initialization is automatic. The position for the initialization of the IRS is the GPS position. However, the flight crew can manually override the automatic position initialization. The IRS crosschecks the flight crew's manual entry with the GPS position.

IRS Alignment Based on GPS Position not available:

Apply the manual position initialization procedure.

Ident.: PRO-NOR-SOP-06-D-00011233.0015001 / 20 JUL 15

* F-PLN A page...COMPLETE AND CHECK

If CO RTE has been inserted, the F-PLN should automatically include the preferential or probable takeoff runway approach and landing runway, associated SID s, STAR s, transition and en-route waypoints. However some databases will only include departure and arrival airport IDENTs and en-route waypoints.

The flight crew must check, modify, or insert (as applicable) the F-PLN in the following order, according to the data given by ATIS , ATC, or MET:
- *Lateral revision at departure airport. Select RWY , then SID , then TRANS using scroll keys.*

  Note: On the MCDU departure page, select only a runway associated with an ILS or NO NAVAIDS.

- *Lateral revision at WPT for ROUTE modification if needed. (Refer to DSC-22_20-30-10-05 Lateral Revisions).*
- *Vertical revision. Check or enter climb speed limit, constraints according to ATC clearance. Enter step altitude as appropriate.*

* WINDS..AS APPROPRIATE

Choose between using trip wind and the forecast wind for CLB , CRZ and DES phases.(Refer to DSC-22_20-30-20-05 Flight Phases).

* F-PLN ....CHECK

- *Check the F-PLN using F-PLN page and ND PLAN mode versus the computer (paper) flight plan or navigation chart.*
- *Check DIST TO DEST along the F-PLN. Compare it with the total distance computed for the flight with the computer (paper) flight plan.*

Ident.: PRO-NOR-SOP-06-D-00011234.0001001 / 18 MAR 11

* SECONDARY FLIGHT PLAN..AS APPROPRIATE

This is routinely a copy of the active flight plan. However, consideration may be given to the following:

a. *Copy the active F-PLN , but modify it at a suitable WPT for an immediate return to the departure airfield in the event of, for example, engine failure*
b. *If weather is below landings minima at the departure airfield, the secondary flight plan should be that required for a diversion immediately after takeoff*
c. *If there is a chance of a change in runway or SID during taxi, prepare for it by copying the active flight plan and making the necessary modifications.*

Ident.: PRO-NOR-SOP-06-D-00011235.0001001 / 10 JUN 16

* RADIO NAV..CHECK

- *Check the VOR , ILS / GLS ⪡ / MLS ⪡ , and ADF ⪡ tuned by the FMGC*
- *Modify them if required, and check that the correct identifier is displayed on the ND and PFD (VOR , ILS / GLS ⪡ / MLS ⪡). If unsatisfactory, go through the audio check. For GLS ⪡ / MLS ⪡ , no audio check is necessary.*

CAUTION	Do not enter an IDENT or channel associated with a GLS ⪡ / MLS ⪡ .

Ident.: PRO-NOR-SOP-06-D-00011238.0003001 / 20 MAR 17

GROSS WEIGHT INSERTION (INIT B PAGE);

* ZFW/ZFWCG.. INSERT
* BLOCK FUEL..INSERT

If the LOADSHEET application is used, the PF enters the ZFWCG and ZFW as computed on his EFB.

CAUTION	The characteristic speeds displayed on the MCDU (green dot, F, S, VLS) are computed from the ZFW and ZFWCG entered by the crew on the MCDU. Therefore, this data must be carefully checked (Captain's responsibility).

- The flight crew should insert the weights after completing all other insertions. This is to avoid cycles of prediction computations at each change in flight plan, constraints, etc.
- If ZFW and ZFWCG are unavailable, it is acceptable to enter the expected values in order to obtain predictions. Similarly, the flight crew may enter the expected fuel on board, if refueling has not been completed at that time.
- If ZFW , ZFWCG, and BLOCK FUEL are inserted, the FM will provide all predictions, as well as the EXTRA fuel, if any.

Ident.: PRO-NOR-SOP-06-D-00011240.0001001 / 20 MAR 17

TAKEOFF DATA INSERTION (PERF TAKEOFF PAGE):

The PF inserts the takeoff data (computed on his EFB) in the PERF TAKEOFF page of the MCDU.

* V1 , VR , V2.. INSERT
* FLX TO TEMP.. INSERT
* THR RED/ACC altitude.. SET or CHECK
* ENG OUT ACC altitude..SET or CHECK
* FLAPS/THS reminder.. INSERT
* TO SHIFT..AS RQRD

Enter the takeoff SHIFT distance, if takeoff is to be from an intersection. This is essential for position updating at takeoff and, consequently, for navigation accuracy.

* EFB / MCDU GREEN DOT..COMPARE

Ident.: PRO-NOR-SOP-06-D-00011243.0001001 / 13 AUG 10

CLIMB, CRUISE, DESCENT, SPEED PRESELECTION

* PRESET SPEEDS..AS RQRD

If the flight is cleared for a close-in turn or close-in altitude constraint, the flight crew may preselect green dot speed on the PERF CLB page. Once the CLB phase is active, the preselected speed

will be displayed in the FCU speed window and on the PFD (blue symbol). Once the turn is completed or the altitude cleared, the pilot will resume the managed speed profile by pressing the SPD selector on the FCU.
Similarly the pilot may select a CRZ MACH number on the PERF CRZ page (constant CRZ Mach segment, for example). When the CRZ phase is active, the preselected CRZ MACH number will be displayed in the FCU speed window and on the PFD . When ECON MACH number may be resumed, the crew presses the FCU SPD selector.
In either of the above cases, the pilot may cancel the CLB or CRZ preselected SPD /MACH prior to activating the related phase, by selecting ECON on the PERF CLB or CRZ pages.
SPD LIM is defaulted to 250 kt below 10 000 ft in the managed speed profile. This may be either cleared or modified on the VERT REV page at the origin (or a climb waypoint).

Ident.: PRO-NOR-SOP-06-D-00015496.0001001 / 20 MAR 17

CHECK OF FMGS PREPARATION:

* FMS PREPARATION.. CHECK

After the PF prepared the FMS , the PM checks:
- *The airfield data.*
- *All FMS entered data.*
- *The takeoff performance data with the data computed on his EFB.*

GROSS WEIGHT INSERTION.. CHECK/CROSSCHECK

If the LOADSHEET application is used, the PM checks the ZFWCG and ZFW that the PF has entered in the FMGS with the loadsheet data computed on PM 's EFB.

TAKEOFF DATA INSERTION..CROSSCHECK

The PM crosschecks the takeoff data that the PF has entered in the FMGS , with the takeoff data computed on PM 's EFB using the TAKEOFF application.

EFB /MCDU GREEN DOT... COMPARE

The PM compares Green Dot speed computed by the FMGS and the Green Dot speed computed using the TAKEOFF application. A discrepancy indicates a difference in the TOW used in both systems (EFB /FMGS).

GLARESHIELD

Applicable to: ALL

Ident.: PRO-NOR-SOP-06-E-00020832.0001001 / 17 MAR 17

*EFIS CONTROL PANEL

* BAROMETRIC REFERENCE....................SET

- *Set QNH (or QFE) on the EFIS control panel and on the standby altimeter*
- *Check the barometric reference and altitude indications on the PFDs and on the standby altimeter.*
  The maximum difference is:
  ±20 ft between both PFDs
  And depending on the aircraft configuration:
  ±60 ft between ISIS and PFDs, or
  ±300 ft between mechanical standby altimeter and PFDs.

* FD....................CHECK ON
* ILS/LS....................AS RQRD
* ND MODE and RANGE....................AS RQRD
* ADF/VOR sw....................AS RQRD

Display VOR and ADF pointers as needed.

Ident.: PRO-NOR-SOP-06-E-00011248.0001001 / 24 SEP 14

*FCU

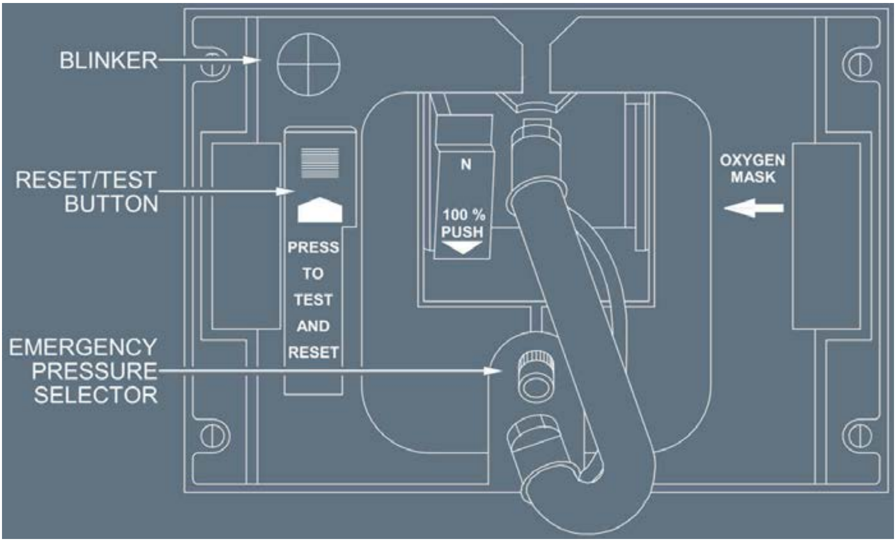
* SPD MACH window....................DASHED
* HDG V/S -TRK FPA pb....................HDG V/S
* ALT window....................INITIAL EXPECTED CLEARANCE ALT

Note: *Do not engage the autothrust on ground, as it may generate the AUTO FLT A/THR OFF warning at engine start.*

LATERAL CONSOLES

Ident.: PRO-NOR-SOP-06-00011249.0002001 / 23 JUN 15
Applicable to: ALL

OXYGEN MASK TEST



WARNING	To prevent hearing damage to ground mechanics connected to the intercom system, inform them that a loud noise may be heard in the headset when performing this test.

On the OXYGEN panel:

CREW SUPPLY pb.. CHECK ON

On the glareshield:

LOUDSPEAKERS...ON

On the audio control panel:

INT reception knob.. PRESS OUT-ADJUST
INT/RAD sw..INT

On the mask stowage box:

- Press and hold the reset/test button in the direction of the arrow.
  - Check that the blinker turns yellow for a short time, and then goes black.
- Hold the reset/test button down, and press the emergency pressure selector.
  - Check that the blinker turns yellow and remains yellow, as long as the emergency pressure selector is pressed.
  - Listen for oxygen flow through the loudspeakers. Warn any engineer, whose headset may be connected to the nose intercom, that a loud noise may be heard when performing this check.
- Check that the reset/test button returns to the up position and the N 100 % selector is in the 100 % position.
- Press the emergency pressure selector again, and check that the blinker does not turn yellow. This ensures that the mask is not supplied.

On the ECAM DOOR/OXY page:

REGUL LO PR message....................CHECK OFF

The crew must perform this check after having checked all masks. It ensures that the LP valve is open, (due to residual pressure between the LP valve and the oxygen masks, an LP valve failed in the closed position may not be detected during the oxygen mask test).

INSTRUMENT PANELS

Ident.: PRO-NOR-SOP-06-00011252.0001001 / 17 MAR 16
Applicable to: ALL

PFD and ND brightness knob....................AS RQRD

Check the ND outer ring is set to maximum brightness (radar/terrain display).

LOUDSPEAKER knob....................SET

Set the LOUDSPEAKER knob around the 1 o'clock position.

* PFD....................CHECK

- *Check PFD /ND not transferred.*
- *Check for correct display, when ATT and HDG are available.*
- *Check IAS , FMA , initial target ALT , altimeter readings, VSI, altimeter settings, heading and attitude display.*

* ND....................CHECK

- *Check for correct display.*
- *Crosscheck compass indication on the ND and DDRMI.*
- *Check heading, initial waypoint, VOR ADF indications.*

ECAM CONTROL PANEL

Ident.: PRO-NOR-SOP-06-00011190.0001001 / 24 FEB 15
Applicable to: ALL

*ECAM CONTROL PANEL

* PRESS pb .... PRESS

Check that the CAB PRESS page displays LDG ELEV AUTO, to confirm the correct position of the LDG ELEV knob.

* STS pb .... PRESS

Check that INOP SYS display is compatible with MEL.
If a message is displayed in MAINTENANCE STATUS, Refer to MMEL/MI-00-08 ECAM and MAINTENANCE STATUS.

ADIRS

Ident.: PRO-NOR-SOP-06-00011253.0002001 / 20 MAR 17
Applicable to: ALL

* IRS ALIGN.. CHECK

On the POSITION MONITOR page, check that the IRS are in NAV mode, and check that the distance between each IRS and the FMS position is lower than 5 NM. Select ND in ROSE-NAV or ARC mode, and confirm that the aircraft position is consistent with the position of the airport, the SID and the surrounding NAVAIDs.

NAV CHARTS CLIPBOARD.. PREPARE

TAKEOFF BRIEFING

Ident.: PRO-NOR-SOP-06-00011256.0001001 / 20 MAR 17
Applicable to: ALL

* TAKEOFF BRIEFING.. PERFORM

PC DEDICATED TO MAINTENANCE

Ident.: PRO-NOR-SOP-06-00011258.0001001 / 07 FEB 11
Applicable to: ALL

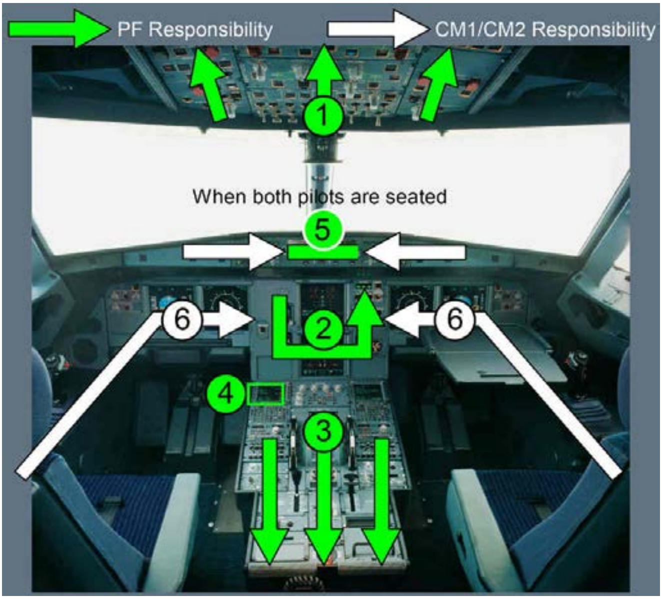
Check that the Personal Computer (PC) dedicated to maintenance use and located in front of lower stowage at RH rear corner is stowed.
Check that the light of its manual switch is off. If not, switch it off.
Check that its associated printer located in front of RH rear of the cockpit is stowed.

FLOW PATTERN

Ident.: PRO-NOR-SOP-06-00020280.0001001 / 17 MAR 17
Applicable to: ALL

COCKPIT PREPARATION - FLOW PATTERN

The scan pattern varies, depending on the pilot status, i.e PF , PM , CM1 , or CM2, and the areas of responsibility:
1. Overhead panel
2. Center instrument panel
3. Pedestal
4. FMGS preparation, and when both pilots are seated:
5. Glareshield
6. Lateral consoles and CM1/CM2 panels.



BEFORE START CLEARANCE

Applicable to: ALL

Ident.: PRO-NOR-SOP-07-A-00021624.0001001 / 19 APR 17

LOADSHEET

FINAL LOADSHEET....................................CHECK

Both crew members carefully check the Load and Trim Sheet (LTS), particularly for gross errors. Make sure that the load sheet data is correct (e.g correct flight, correct aircraft, dry operating index, configuration, Fuel on Board,etc.).

ZFW /ZFWCG....................................CHECK/REVISE

The PF compares the ZFW and the ZFWCG with the previously-entered data, and adjust if necessary.

ZFW /ZFWCG....................................CROSSCHECK

The PM crosschecks the ZFW and the ZFWCG entered in the FMS

Check that the takeoff CG is within LTS operational limits.

FINAL LOADSHEET (CM1)....................................SIGN and EXPORT

If the loadsheet is modified, or if required by the authorities or by the airline policy, the CM1 sends the loadsheet to the ground via the EXPORT function on the LOADSHEET application.

Ident.: PRO-NOR-SOP-07-A-00011255.0009001 / 09 JUN 15

FOB....................................CHECK

- *Check that ECAM fuel on board corresponds to the F-PLN.*
- *Check that fuel imbalance is within limits.*
- *Crosscheck that the sum of the Fuel On Board (FOB) recorded at the end of the last flight and the fuel uplift (if any) is consistent with the current FOB. If an abnormal discrepancy is found, a maintenance action is due.*

FOB after refuelling:	*Abnormal discrepancy above:*
Up to 6 tons (13200 lb)	*400 kg (900 lb)*
Between 6 tons (13200 lb) and 12 tons (26500 lb)	*500 kg (1100 lb)*
More than 12 tons (26500 lb)	*600 kg (1300 lb)*

Ident.: PRO-NOR-SOP-07-A-00010189.0002001 / 20 MAR 17

TAKEOFF DATA

FINAL TAKEOFF DATA.......... CONFIRM or RECOMPUTE

- *If takeoff conditions did not change, verify and confirm that the preliminary takeoff data are still valid*
- *If takeoff conditions have changed, calculate the final takeoff performance, using the T.O. PERF application on the EFB.*

FMS TAKEOFF DATA.......... CHECK/REVISE AS RQRD

The PF checks (or revises) the takeoff data on the INIT B and PERF pages of the MCDU.

REVISED FMS TAKEOFF DATA.......... CROSSCHECK

The PM crosschecks the takeoff data on the MCDU (i.e. weights, speeds, flexible temperature, takeoff configuration), with the PM 's EFB takeoff data.

EFB /MCDU GREEN DOT.......... COMPARE

The PM compares Green Dot speed computed by the FMGS and the Green Dot speed computed using the TAKEOFF application. A discrepancy indicates a difference in the TOW used in both systems (EFB /FMGS).

Ident.: PRO-NOR-SOP-07-A-00010190.0001001 / 04 MAR 14

SEATING POSITION

SEATING POSITION.......... ADJUST

The seat is correctly adjusted, when the pilot's eyes are in line with the red and white balls.

Ident.: PRO-NOR-SOP-07-A-00010192.0001001 / 23 DEC 14

MCDU

FMS PERF TO page.......... SELECT

It is recommended to display the PERF TO page on the PF side.

FMS F-PLN page.......... SELECT

It is recommended to display the F-PLN page on the PM side

Ident.: PRO-NOR-SOP-07-A-00010193.0001001 / 17 MAR 16

ELEC

EXT PWR.......... CHECK AVAIL

WARNING	Disconnection of the external power with the EXT PWR pb-sw ON may cause injury to the ground engineer. Request disconnection of the external power only with the EXT PWR pb-sw AVAIL.

EXT PWR DISCONNECTION.. REQUEST

Ident.: PRO-NOR-SOP-07-A-00021505.0001001 / 20 MAR 17

EFB/eQRH transmitting mode.. CONSIDER

In accordance with the Operator's policy or, as required by operational regulations.

Ident.: PRO-NOR-SOP-07-A-00010194.0001001 / 12 FEB 13

BEFORE START CHECKLIST DOWN TO THE LINE

BEFORE START CHECKLIST down to the line..COMPLETE

AT START CLEARANCE

Applicable to: ALL

Ident.: PRO-NOR-SOP-07-B-00010197.0001001 / 04 MAR 14

PUSHBACK/START UP CLEARANCE

PUSHBACK/START CLEARANCE.. OBTAIN

Obtain ATC pushback/startup clearance.
Obtain ground crew clearance.

Ident.: PRO-NOR-SOP-07-B-00015568.0001001 / 20 JAN 15

ATC...SET FOR OPERATION

ATC is set in accordance with airport requirements.

Ident.: PRO-NOR-SOP-07-B-00010199.0002001 / 04 MAR 14

WINDOWS AND DOORS

WINDOWS and DOORS..CHECK CLOSED

- *To ensure that the sliding window is correctly closed and locked, push the handle of the sliding window fully forward to the closed position, and check that the red indicator is visible*
- *Check, on the ECAM lower display, that all the aircraft doors are closed*
- *When required by local airworthiness authorities, check that the cockpit door is closed and locked (no cockpit door open/fault indication).*
  If entry is requested, identify the person requesting entry before unlocking the door. With the cockpit door sw on NORM, the cockpit door is closed and locked. If entry is requested from the cabin, and if no further action is performed by the pilot, the cabin crew will be able to unlock the door by using the emergency access procedure. Except for crew entry/exit, the cockpit door should remain closed until engine shutdown.

SLIDES....................CHECK ARMED

- *Check, on the ECAM lower display, that all slides are armed.*

Ident.: PRO-NOR-SOP-07-B-00010200.0001001 / 04 MAR 14

EXTERIOR LIGHTS

BEACON sw.................... ON

Ident.: PRO-NOR-SOP-07-B-00010201.0001001 / 04 MAR 14

THRUST LEVERS

THRUST LEVERS.................... IDLE

CAUTION	*Engines will start, regardless of the thrust lever position; thrust will rapidly increase to the corresponding thrust lever position, causing a hazardous situation, if thrust levers are not at IDLE.*

Ident.: PRO-NOR-SOP-07-B-00016807.0001001 / 06 SEP 16

ACCU PRESSURE

ACCU PRESS indicator.................... CHECK

The ACCU PRESS indication must be in the green band. If required, use the electric pump on yellow hydraulic system to recharge the brake accumulator.

WARNING	Yellow and green hydraulic systems are pressurized from yellow electric pump. Get ground crew clearance before using the electric pump.

Ident.: PRO-NOR-SOP-07-B-00010202.0002001 / 24 NOV 15

PARKING BRAKE AND NOSEWHEEL STEERING

- **If pushback is not required:**

  PARK BRK handle.................... CHECK ON

  BRAKES PRESS indicator.................... CHECK

  Check for normal indications.

  BEFORE START CHECKLIST below the line....................COMPLETE

Ident.: PRO-NOR-SOP-07-B-00010198.0001001 / 21 MAR 17

- **If pushback is required:**

  N/W STRG DISC MEMO.................... CHECK DISPLAYED

  In case of pushback (conventional or towbarless), the nosewheel steering selector bypass pin must be in the tow position. The ECAM NW STRG DISC, or N WHEEL STEERG DISC memos indicate this to the flight crew.

CAUTION	*If the ECAM does not display the N WHEEL STEERG DISC memo, but the ground crew confirms that the tow pin is in the towing position, the flight crew should not start the engine during pushback. This is to avoid possible nose landing gear damage upon green hydraulic pressurization.* *To dispatch the aircraft in such a case, Refer to MMEL/MI-32-51 NWS Electrical Deactivation Box.*

In case of a powerpush by the main landing gear, the nosewheel steering selector should remain in the normal position to steer the aircraft (Refer to PRO-NOR-SUP-MISC-D Pushback with Power Push Unit via the Main Landing Gear - Procedure 1/2).

BEFORE START CHECKLIST below the line.. COMPLETE
PARK BRK handle ....OFF

CAUTION	*Do not use brakes during pushback, unless required due to an emergency.*

- **When pushback is completed:**

  PARK BRK handle ....ON
  BRAKE PRESS indicator.. CHECK

  Check for normal indications.
  Ask the ground crew for towbar disconnection.

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AUTOMATIC ENGINE START

Ident.: PRO-NOR-SOP-08-00010162.0002001 / 31 AUG 17
Applicable to: ALL

Use the automatic engine start procedure in most circumstances. However, if the start aborts due to insufficient starter inlet air pressure (e.g. on high airfields, or in case of low pressure from an external pneumatic power group), it is recommended to use the manual start procedure, instead the automatic procedure.
If, during the engine start, the ground crew reports a fuel leak from the engine drain mast, run the engine at idle for 5 min. If the leak disappears during these 5 min, the aircraft can be dispatched without maintenance action. If the leak is still present after 5 min, shut down the engine and request the maintenance personnel to investigate the leakage source.

ENG MODE selector .... IGN/START

The lower ECAM displays the ENG SD page.

ENGINE 2 START.. ANNOUNCE

Engine 2 is usually started first. It powers the yellow hydraulic system, that pressurizes the parking brake.

ENG MASTER 2.. ON

- *Do not set the ENG MASTER 2 lever to ON before all amber crosses and messages have disappeared on the engine parameters (upper ECAM display).*
- *Parameter callouts are not mandatory.*
- *In case the electrical power supply is interrupted during the start sequence (indicated by the loss of ECAM DUs), abort the start by setting to OFF the ENG MASTER 2 lever. Then, perform a 30 s dry crank.*

ON ECAM UPPER DISPLAY	***ON ECAM LOWER DISPLAY***
N2 increases	*Corresponding start valve inline.* *Bleed pressure indication green.* *Oil pressure increases.*
At 16 % N2	*Indication of the active igniter (A or B).*

Continued on the following page

Continued from the previous page

ON ECAM UPPER DISPLAY	***ON ECAM LOWER DISPLAY***
At 22 % N2 *- FF increases* [(1)] *15 s (maximum) after fuel is on* *- EGT increases* *- N1 increases*	
At 50 % N2	*Start valve starts closing. (It is fully closed between 50 % and 56 % N2).* *Igniter indication off.*

(1) With the current ECU standard, the FF indication may be crossed up to approximately 200 kg/h (440 lb/h).

ENG IDLE PARAMETERS..CHECK

At ISA sea level : N1 about 19.5 %
N2 about 58.5 %
EGT about 390 °C
FF about 275 kg/h (600 lb/h)

Grey background on N2 indication disappears.

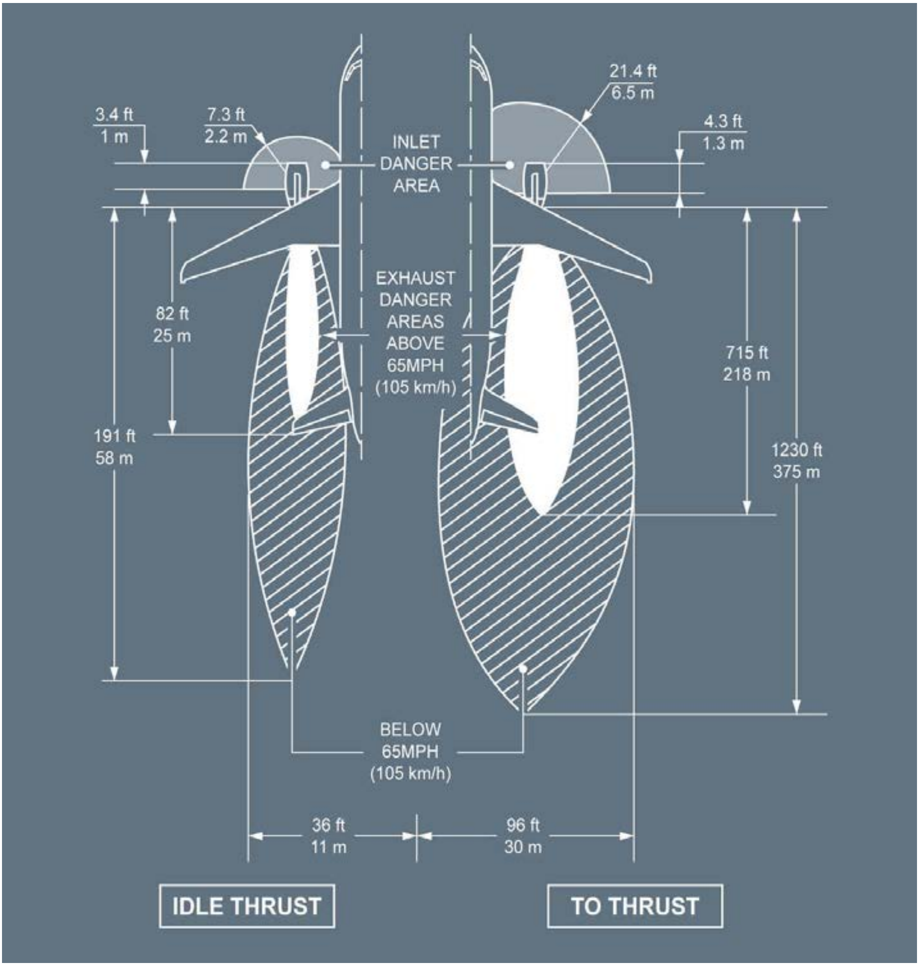
ENGINE 1 START..ANNOUNCE
ENG MASTER 1..ON

Same procedure as for engine 2.
Both pack valves reopen with 30 s delay after the second engine N2 is above 50 %.

Note: A PTU FAULT is triggered, if the last engine is started within 40 s following the end of the cargo doors operation. *Refer to PRO-ABN-HYD HYD PTU FAULT.*

GROUND RUN UP - DANGER AREAS

Ident.: PRO-NOR-SOP-08-00010163.0006001 / 06 JAN 16
Applicable to: ALL



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AFTER START

Applicable to: ALL

Ident.: PRO-NOR-SOP-09-A-00010210.0002001 / 21 MAR 17

ENG MODE

ENG MODE selector .... NORM

For additional information on the automatic starting sequence, Refer to DSC-70-80-40 Sequence of the Automatic Start.

After start, to avoid thermal shock, the pilot should operate the engine at idle or near idle for at least 2 min before advancing the thrust lever to high power. Taxi time at idle may be included in the warm-up period.
The last engine started must run for at least 2 min before takeoff initiation, to ensure that takeoff is not initiated before the center tank pumps test is finished, since takeoff on center tank is prohibited.

Ident.: PRO-NOR-SOP-09-A-00010211.0001001 / 26 OCT 12

APU BLEED

APU BLEED pb-sw .... OFF

- *This action enables to avoid ingestion of engine exhaust gases.*
- *APU BLEED valve closes, ENG BLEED valves open.*

Ident.: PRO-NOR-SOP-09-A-00010212.0005001 / 17 MAR 17

ANTI-ICE

CAUTION	In icing conditions (Refer to LIM-ICE_RAIN Definition of Icing Conditions), the flight crew must turn on the engine anti-ice and should not wait until seeing ice building up.

ENG ANTI-ICE pb-sw .... AS RQRD

Engine anti-ice must be set to ON during all ground operation, when icing conditions exist or are anticipated.
During ground operation, when in icing conditions for more than 30 min, the following procedure should be applied for ice shedding :

CAUTION	*If, during thrust increase, the aircraft starts to move, immediately retard the thrust levers to IDLE.*

If ground surface conditions and the environment permit, the flight crew should accelerate the engines to approximately 70 % of N1 for 30 s at intervals not greater than 30 min.

In addition, this engine acceleration should also be performed just before take-off, with particular attention to engine parameters to ensure normal engine operation. If ground surface or environment do not permit to accelerate the engine to 70 % N1, then power setting and dwell time should be as high as practical.
When operating in conditions of freezing rain, freezing drizzle, freezing fog or heavy snow, ice shedding may be enhanced, by additional run ups at intervals, to not exceed 10 min, advancing throttles to 70 % N1 momentarily (no hold time).

Ident.: PRO-NOR-SOP-09-A-00010213.0001001 / 21 MAR 17

WING ANTI-ICE pb-sw.................... AS RQRD

When icing conditions are encountered:
- *The flight crew may turn on the wing anti-ice to prevent ice accretion on the wing leading edge.*
- *The flight crew must turn on the wing anti-ice if there is evidence of ice accretion, such as ice on the visual indicator, or on the wipers, or with the SEVERE ICE DETECTED alert. This is to remove any ice accumulation from the wing leading edge.*

Ident.: PRO-NOR-SOP-09-A-00010214.0001001 / 04 MAR 14

APU

● **If the APU is not required:**
APU MASTER SW.................... OFF

Ident.: PRO-NOR-SOP-09-A-00010215.0001001 / 26 OCT 12

GROUND SPOILERS

GROUND SPOILERS.................... ARM

Ident.: PRO-NOR-SOP-09-A-00010216.0001001 / 26 OCT 12

RUDDER TRIM

RUD TRIM position indication.................... CHECK ZERO

● **If the RUD TRIM position indication is not at zero:**
RESET pb.................... PRESS

Note: After the reset, the flight crew may observe an indication of up to 0.3 ° (L or R) in the RUD TRIM position indication.

Ident.: PRO-NOR-SOP-09-A-00010217.0001001 / 26 OCT 12

FLAPS

FLAPS lever.................... SET FOR TAKEOFF

FLAPS...CHECK POSITION

Check the position of the flaps on the ECAM upper display.

- **If taxiing in icing conditions with rain, slush or snow:**

  Maintain the flaps retracted until the aircraft reaches the holding point of the takeoff runway.

  This action prevents contamination of the slats/flaps mechanism.

Ident.: PRO-NOR-SOP-09-A-00010218.0001001 / 26 OCT 12

PITCH TRIM

PITCH TRIM handwheel...SET

Set takeoff CG on pitch trim handwheel.

Ident.: PRO-NOR-SOP-09-A-00010220.0001001 / 01 DEC 14

ECAM STATUS

STATUS REMINDER..CHECK NOT DISPLAYED

- **If STS reminder is displayed:**

  STS pb...PRESS

  Review the ECAM Status page.

Ident.: PRO-NOR-SOP-09-A-00015495.0001001 / 23 JUN 15

N/W STEER DISC MEMO

N/W STEER DISC MEMO..CHECK NOT DISPLAYED

Ident.: PRO-NOR-SOP-09-A-00010221.0001001 / 05 NOV 15

GROUND CREW

CLEAR TO DISCONNECT...ANNOUNCE

The ground crew:
- *Removes the chocks*
- *Disconnects the interphone*
- *Makes the hand signal on the left or right side.*

Ident.: PRO-NOR-SOP-09-A-00010222.0001001 / 26 OCT 12

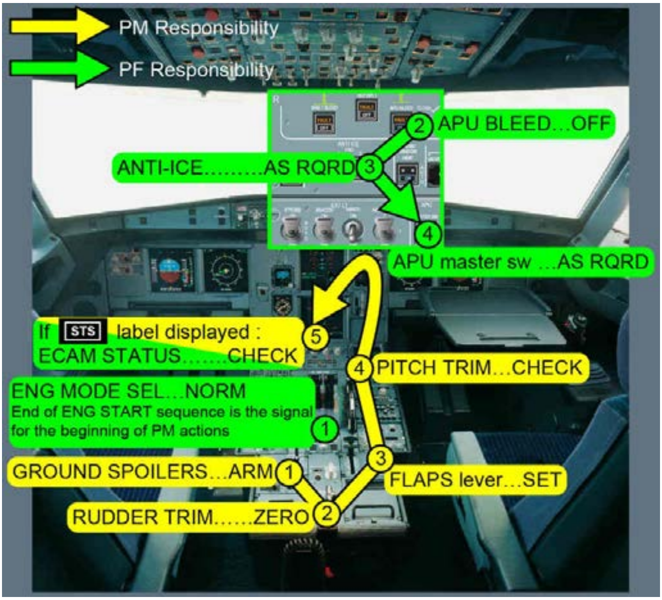
AFTER START CHECKLIST

AFTER START CHECKLIST...COMPLETE

Ident.: PRO-NOR-SOP-09-A-00020074.0001001 / 17 MAR 17

AFTER START - FLOW PATTERN

When the engines have started, the PF sets the ENG MODE selector to NORM to permit normal pack operation. At this time, the After Start Flow Pattern begins.



TAXI

Applicable to: ALL

Ident.: PRO-NOR-SOP-10-A-00010226.0001001 / 15 MAY 13

TAXI CLEARANCE

TAXI clearance....................OBTAIN

Ident.: PRO-NOR-SOP-10-A-00010227.0001001 / 21 MAR 17

EXTERIOR LIGHTS

NOSE sw....................TAXI

- **When crossing a runway:**
  STROBE sw....................ON

RWY TURN OFF & CAMERA sw ....ON

L2 *The PF may ask the PM to set the exterior lights.*

Ident.: PRO-NOR-SOP-10-A-00010228.0001001 / 15 MAY 13

PARK BRK

PARK BRK handle....................OFF
BRAKES PRESSURE....................CHECK AT ZERO

The flight crew may observe slight residual pressure on the triple indicator for a short period of time.

Ident.: PRO-NOR-SOP-10-A-00010230.0001001 / 19 APR 17

THRUST LEVER

THRUST lever ....AS RQRD

The flight crew will need a little power above idle thrust to move the aircraft.

L2 For additional information on the thrust use during taxi, *Refer to FCTM/PR-NP-SOP-100 Taxi Roll and Steering*.

Ident.: PRO-NOR-SOP-10-A-00010231.0001001 / 17 MAR 17

BRAKES

CAUTION	If the aircraft was parked in wet conditions for a long time, the first brake application at low speed is less effective.

BRAKE PEDALS....................PRESS
BRAKES ....CHECK

If an arc is displayed above the brake temperature on the WHEEL SD page, set the brake fans to ON.

BRAKES PRESSURE.. CHECK AT ZERO

L2 For more information, *Refer to FCTM/PR-NP-SOP-100 Brake Check*.

Ident.: PRO-NOR-SOP-10-A-00016023.0001001 / 17 MAR 17

NOSEWHEEL STEERING

TILLER or RUDDER PEDALS.. USE AS RQRD

L2 *For information on the nosewheel steering limitation, Refer to FCTM/PR-NP-SOP-100 Taxi Roll and Steering.*

Ident.: PRO-NOR-SOP-10-A-00010243.0001001 / 22 MAR 17

FLIGHT CONTROLS

FLIGHT CONTROLS...CHECK

L2 *For additional information on the flight controls check, Refer to FCTM/PR-NP-SOP-100 Flight Controls.*

Ident.: PRO-NOR-SOP-10-A-00010244.0001001 / 15 MAY 13

ATC CLEARANCE

ATC clearance...CONFIRM

Ident.: PRO-NOR-SOP-10-A-00010248.0001001 / 20 MAR 17

TAKEOFF DATA/CONDITIONS

If the takeoff data has changed, or in the case of a runway change, prepare updated takeoff:

FINAL TAKEOFF DATA.. CONFIRM or RECOMPUTE

If takeoff conditions changed, the PF and the PM independently compute again the takeoff data.

FMS TAKEOFF DATA...CHECK/REVISE AS RQRD

If takeoff conditions changed, the PF revises the takeoff data in the FMS.

REVISED FMS TAKEOFF DATA...CROSSCHECK

The PM crosschecks the takeoff data entered by the PF on the MCDU (i.e. weights, speeds, flexible temperature, takeoff configuration), with the PM 's EFB takeoff data.

EFB/MCDU GREEN DOT...COMPARE

The PM compares Green Dot speed computed by the FMGS and the Green Dot speed computed using the TAKEOFF application. A discrepancy indicates a difference in the TOW used in both systems (EFB /FMGS).

F-PLN (Runway).. REVISE

FLAPS lever .... AS APPROPRIATE

Select takeoff position.

V1 , VR , V2.. REINSERT
FLX TO temperature.. REINSERT

Ident.: PRO-NOR-SOP-10-A-00015301.0001001 / 17 MAR 17

AFS/FLIGHT INSTRUMENTS

F-PLN (SID ,TRANS).. REVISE or CHECK

Carefully confirm that the ATC clearance agrees with the FMS , if NAV mode is to be used.

INITIAL CLIMB SPEED AND SPEED LIMIT.. MODIFY or CHECK

Use VERT REV at departure, or at a CLB waypoint.

CLEARED ALTITUDE ON FCU .... SET
HDG ON FCU .... IF REQUIRED, PRESET

If a heading is required by the ATC after takeoff, in case of a radar vector departure, preset the heading on the FCU . NAV mode will be disarmed.
RWY TRK mode will keep the aircraft on the runway track.

BOTH FD .... CHECK ON
PFD /ND .... CHECK
TAKEOFF BRIEFING.. CONFIRM

L2 *For additional information on the takeoff briefing confirmation, Refer to FCTM/PR-NP-SOP-100 Takeoff Briefing Confirmation.*

Ident.: PRO-NOR-SOP-10-A-00015298.0001001 / 03 AUG 17

RADAR.. ON
PREDICTIVE WINDSHEAR SYSTEM ⊲✻ .... AUTO

Ident.: PRO-NOR-SOP-10-A-00010252.0001001 / 20 JAN 15

ATC

ATC code/mode.. CONFIRM/SET FOR TAKEOFF

Ident.: PRO-NOR-SOP-10-A-00010254.0001001 / 03 AUG 17

TERR ON ND

TERR ON ND ⊲✻ .... AS RQRD

Consider selecting the radar display on the PF side, and TERR ON ND on the PM side only.

Ident.: PRO-NOR-SOP-10-A-00010264.0001001 / 15 MAY 13

AUTO BRK

AUTO BRK MAX pb-sw...ON

Ident.: PRO-NOR-SOP-10-A-00010268.0001001 / 04 MAR 14

FINAL CHECK

T.O CONFIG pb...TEST

Check that ECAM upper display shows "T.O CONFIG NORMAL".

T.O MEMO...CHECK NO BLUE

CABIN REPORT...RECEIVE

Obtain cabin report from the purser, as a minimum : "CABIN SECURED FOR TAKEOFF"

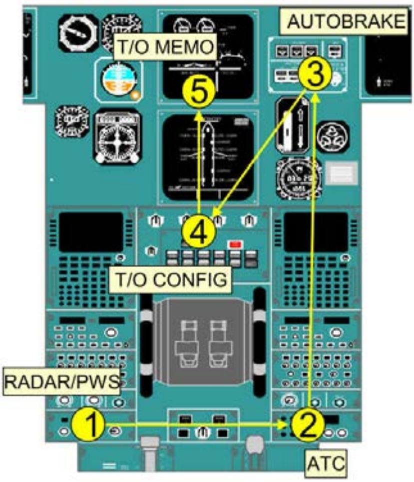
Ident.: PRO-NOR-SOP-10-A-00010271.0001001 / 15 MAY 13

BEFORE TAKEOFF CHECKLIST

BEFORE TAKEOFF CHECKLIST down to the line...COMPLETE

Ident.: PRO-NOR-SOP-10-A-00020075.0001001 / 17 MAR 17

TAXI FLOW PATTERN



BEFORE TAKEOFF

Applicable to: ALL

Ident.: PRO-NOR-SOP-11-A-00010396.0001001 / 05 AUG 10

- **If the brake fans ⩤ are running:**

  BRAKE TEMP...CHECK

  - *If brake temperature is above 150 °C, delay takeoff.*
  - *If brake temperature is below 150 °C, select brake fans off.*

Ident.: PRO-NOR-SOP-11-A-00010388.0001001 / 05 AUG 10

TAKEOFF OR LINE UP CLEARANCE...OBTAIN

Ident.: PRO-NOR-SOP-11-A-00010392.0002001 / 29 SEP 15

EXTERIOR LIGHTS

RWY TURN OFF sw...ON
NOSE sw...T.O
STROBE sw...ON

Set the STROBE sw to ON when entering the runway.

LAND LIGHTS sw...ON

Set the LAND LIGHTS sw to ON when entering the runway and takeoff clearance is received.

L2 *The PF may ask the PM to set the exterior lights.*

L1 L2 *Note: Setting the RWY TURN OFF sw, the LAND LIGHTS sw and the NOSE sw to ON/T.O minimizes bird strike hazard during takeoff.*

Ident.: PRO-NOR-SOP-11-A-00010389.0001001 / 04 MAR 14

TCAS

TCAS ⩤ Mode selector...TA or TA /RA

L2 *The flight crew should use the TA /RA mode as the default mode of the TCAS.*
The flight crew may use the TA ONLY mode in specific airports, and for specific procedures (identified by Operators) that may provide resolution advisories that are neither wanted nor appropriate (e.g. closely-spaced parallel or converging runways).

Ident.: PRO-NOR-SOP-11-A-00010390.0001001 / 04 MAR 14

APPROACH PATH CLEARED OF TRAFFIC

APPROACH PATH...CLEARED OF TRAFFIC

Check that the approach path is clear of traffic, visually and using TCAS display on ND.

Ident.: PRO-NOR-SOP-11-A-00010399.0001001 / 16 MAR 11

CABIN CREW...ADVISE

Advise the cabin crew that takeoff is imminent.

Ident.: PRO-NOR-SOP-11-A-00010397.0004001 / 16 MAR 11

ENG MODE selector...AS RQRD

Select IGN, if:

- *The runway has standing water, or*
- *Heavy rain is falling, or*
- *Heavy rain or severe turbulence is expected after takeoff.*

Ident.: PRO-NOR-SOP-11-A-00010394.0001001 / 20 MAR 17

SLIDING TABLE/EFB

SLIDING TABLE...STOW

EFB/eQRH transmitting mode.. CONSIDER

In accordance with the Operator's policy or, as required by operational regulations.

EFB/eQRH (with no mounted equipment).. STOW

In flight, both flight crewmembers should not use at the same time Flysmart with Airbus applications.

Ident.: PRO-NOR-SOP-11-A-00010393.0001001 / 21 MAR 17

TAKEOFF RUNWAY...CONFIRM

Confirm that the line up is performed on the intended runway. Useful aids are:

- *The runway markings,*
- *The runway lights,*
  Be careful that in low visibility, edge lights could be mixed up with the center line lights.
- *The ILS signal,*
  If the runway is ILS equipped, the flight crew can press the ILS pb (or LS pb): The LOC deviation should be centered after line up.
- *The runway symbol on the ND,*
- *The Runway Awareness and Advisory System .*

Ident.: PRO-NOR-SOP-11-A-00010391.0001001 / 05 AUG 10

PACK 1 and 2...AS RQRD

Consider selecting packs OFF, or APU bleed ON.
This will improve performance when using TOGA thrust.
In case of a FLEX takeoff, selecting packs OFF or APU bleed ON will reduce takeoff EGT, and thus reduce maintenance costs.

The use of flex thrust may reduce maintenance costs. The effect is particularly significant with the first degrees of FLEX.
Use of APU bleed is not authorized, if wing anti-ice is to be used.

Ident.: PRO-NOR-SOP-11-A-00010400.0001001 / 16 MAR 11

BEFORE TAKEOFF CHECKLIST below the line...COMPLETE

Read the checklist below the line, when line-up clearance is obtained.

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TAKEOFF

Applicable to: ALL

Ident.: PRO-NOR-SOP-12-A-00011559.0001001 / 28 JUL 14

The below procedure is the standard takeoff procedure. However, rolling takeoff is permitted.

TAKEOFF... ANNOUNCE

Ident.: PRO-NOR-SOP-12-A-00011560.0006001 / 23 JUN 15

THRUST SETTING

THRUST LEVERS...50 % N1 (1.05 EPR)

- **If the crosswind is at or below 20 kt and there is no tailwind:**

  To counter the nose-up effect of setting engine takeoff thrust, apply half forward sidestick until the airspeed reaches 80 kt. Release the sidestick gradually to reach neutral at 100 kt.

  BRAKES...RELEASE
  THRUST LEVERS.. FLX or TOGA

  Once the thrust levers are set to FLX or TOGA detent, the Captain keeps his hand on the thrust levers until the aircraft reaches V1.

- **In case of tailwind, or if crosswind is greater than 20 kt:**

  The PF applies full forward sidestick.

  BRAKES...RELEASE
  THRUST LEVERS.. FLX or TOGA

  - *The PF rapidly increases thrust to about 70 % N1 (1.15 EPR) then progressively to reach takeoff thrust by 40 kt ground speed, while maintaining sidestick full forward up to 80 kt. Release the sidestick gradually to reach neutral at 100 kt.*
  - *Once the thrust levers are set to FLX or TOGA detent, the Captain keeps his hand on the thrust levers until the aircraft reaches V1.*

Note: ENG SD page replaces WHEEL SD page on the ECAM lower display.

DIRECTIONAL CONTROL.. USE RUDDER

At 130 kt (wheel speed), the connection between nosewheel steering and the rudder pedals is removed. Therefore, in strong crosswinds, more rudder input will be required at this point to prevent the aircraft from turning into the wind.

CHRONO...START
PFD /ND...MONITOR

1. Check the FMA on the PFD . The following modes are displayed: MAN TOGA (or MAN FLX xx) /SRS /RWY (or blank) / A/THR (in blue).

Note: *If an ILS that corresponds to the departure runway is tuned, RWY mode appears. If not, no lateral mode appears until the aircraft lifts off.*

2. Check the FMS position on the ND (aircraft on runway centerline).

Note: *If GPS PRIMARY is not available, check the FMS position update.*

FMA.. ANNOUNCE

Ident.: PRO-NOR-SOP-12-A-00011561.0001001 / 04 MAR 14

BELOW 80 KT

TAKEOFF N1.. CHECK

Check that the actual N1 of the individual engines has reached the N1 rating limit, before the aircraft reaches 80 kt. Check EGT.

THRUST SET.. ANNOUNCE
PFD and ENG indications.. MONITOR

Scan airspeed, N1 , and EGT throughout the takeoff.

Ident.: PRO-NOR-SOP-12-A-00011562.0001001 / 13 AUG 10

REACHING 100 KT

ONE HUNDRED KNOTS.. ANNOUNCE

- *The PF crosschecks and confirms the speed indicated on the PFD*
- *Below 100 kt the Captain may decide to abort the takeoff, depending on the circumstances*
- *Above 100 kt, rejecting the takeoff is a more serious matter.*

Ident.: PRO-NOR-SOP-12-A-00011563.0001001 / 13 AUG 10

AT V1

V1.. ANNOUNCE

Ident.: PRO-NOR-SOP-12-A-00011564.0001001 / 13 AUG 10

AT VR

ROTATION .... ORDER
ROTATION.. PERFORM

- *At VR, initiate the rotation to achieve a continuous rotation with a rate of about 3 °/s, towards a pitch attitude 15 ° (12.5 °, one engine is failed)*
- *Minimize the lateral inputs on ground and during the rotation, to avoid spoiler extension*

- *In strong crosswind conditions, small lateral stick inputs may be used, if necessary, to aim at maintaining wings level*
- *After lift-off, follow the SRS pitch command bar.*

CAUTION	If a tailstrike occurs, avoid flying at an altitude requiring a pressurized cabin, and return to the originating airport for damage assessment.

Ident.: PRO-NOR-SOP-12-A-00011565.0001001 / 04 MAR 14

WHEN POSITIVE CLIMB

POSITIVE CLIMB.. ANNOUNCE
L/G UP.. ORDER
L/G.. SELECT UP
AP.. AS RQRD

Above 100 ft AGL , AP 1 or 2 may be engaged.

Ident.: PRO-NOR-SOP-12-A-00011566.0002001 / 28 JUL 15

AT THRUST REDUCTION ALTITUDE

THRUST LEVERS.. CL

Move the thrust levers to the CL detent, when the flashing LVR CLB prompt appears on the FMA . A/THR is now active.
In manual flight, the pilot must anticipate the change in pitch attitude in order to prevent the speed from decaying when thrust is reduced.

PACK 1 and 2 (if applicable).. ON

Select PACK 1 on after CLB thrust reduction.
Select PACK 2, at least 10 s after PACK 1 is selected on, for passenger comfort.

Note: 1. *Selecting pack on before reducing takeoff thrust would result in an EGT increase.*
2. *If packs are not switched on after the takeoff phase, an ECAM caution will be triggered.*

Ident.: PRO-NOR-SOP-12-A-00011567.0002001 / 04 MAR 14

AT ACCELERATION ALTITUDE

Check the target speed change from V2 + 10 to the first CLB speed (either preselected or managed).

Note: 1. *When THR RED and ACC ALT are equal, the FMA will change from MAN FLX/SRS /NAV to THR CLB /CLB /NAV.*
2. *If FCU -selected altitude is equal to or close to the acceleration altitude, then the FMA will switch from SRS to ALT*.*

Ident.: PRO-NOR-SOP-12-A-00011568.0001001 / 23 JUN 15

ABOVE ACCELERATION ALTITUDE (OR ONCE IN CLIMB PHASE)

The following procedure ensures that the aircraft is effectively accelerating toward climb speed.

- **At F speed:**

  Note: *For takeoff in CONF 1 + F, "F" speed does not appear.*

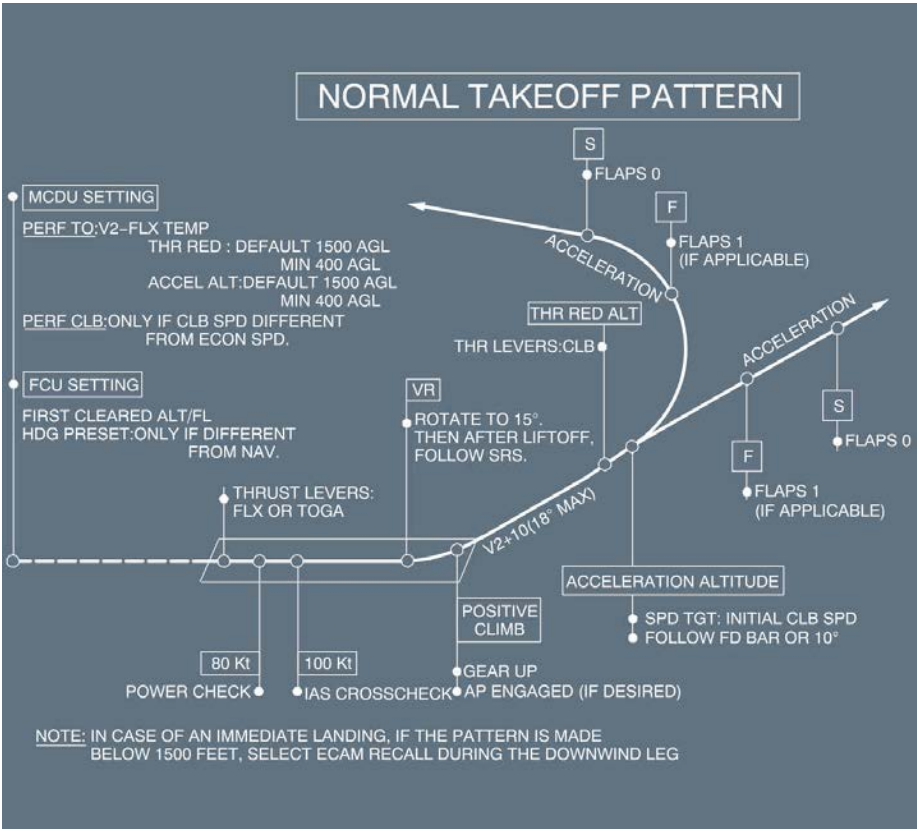
  FLAPS 1 .... ORDER
  FLAPS 1 .... SELECT

- **At S speed:**

  FLAPS 0 .... ORDER
  FLAPS 0 .... SELECT
  GND SPLRS .... DISARM
  NOSE sw .... OFF
  RWY TURN OFF sw .... OFF
  OTHER EXTERIOR LIGHTS .... AS RQRD

  The flight crew can maintain the LAND LIGHTS selector set to ON, according to airline policy or regulatory recommendations.

Note: *The CRUISE SD page replaces the ENG SD page.*


NORMAL TAKEOFF PATTERN
MCDU SETTING
PERF TO:V2-FLX TEMP
THR RED : DEFAULT 1500 AGL
MIN 400 AGL
ACCEL ALT:DEFAULT 1500 AGL
MIN 400 AGL
PERF CLB:ONLY IF CLB SPD DIFFERENT FROM ECON SPD.
FCU SETTING
FIRST CLEARED ALT/FL
HDG PRESET:ONLY IF DIFFERENT FROM NAV.
THRUST LEVERS: FLX OR TOGA
VR
ROTATE TO 15°. THEN AFTER LIFTOFF, FOLLOW SRS.
V2+10(18° MAX)
THR RED ALT
THR LEVERS:CLB
ACCELERATION
S
FLAPS 0
F
FLAPS 1 (IF APPLICABLE)
ACCELERATION
S
FLAPS 0
F
FLAPS 1 (IF APPLICABLE)
ACCELERATION ALTITUDE
SPD TGT: INITIAL CLB SPD
FOLLOW FD BAR OR 10°
POSITIVE CLIMB
GEAR UP
AP ENGAGED (IF DESIRED)
80 Kt
POWER CHECK
100 Kt
IAS CROSSCHECK
NOTE: IN CASE OF AN IMMEDIATE LANDING, IF THE PATTERN IS MADE BELOW 1500 FEET, SELECT ECAM RECALL DURING THE DOWNWIND LEG

Intentionally left blank

AFTER TAKEOFF

Applicable to: ALL

Ident.: PRO-NOR-SOP-13-A-00010157.0001001 / 21 MAR 17

APU BLEED pb .... AS RQRD

If the APU has been used to supply air conditioning during takeoff, set the APU BLEED pb to OFF. For use of the APU BLEED, Refer to LIM-APU Operational Envelope.

APU MASTER SW pb .... AS RQRD

Ident.: PRO-NOR-SOP-13-A-00010158.0001001 / 05 AUG 10

ENG MODE selector.. AS RQRD

Select IGN, if severe turbulence or heavy rain is encountered.

Ident.: PRO-NOR-SOP-13-A-00010159.0001001 / 05 AUG 10

TCAS Mode selector .... TA/RA

Select TA/RA, if the takeoff has been performed with TA only.

Ident.: PRO-NOR-SOP-13-A-00010160.0002001 / 21 MAR 17

ENG ANTI-ICE pb-sw .... AS RQRD

Engine anti-ice must be set to ON when icing conditions (Refer to LIM-ICE_RAIN Definition of Icing Conditions) exist or are anticipated, except during climb when the SAT is below -40 °C (-40 °F).

WING ANTI-ICE pb-sw .... AS RQRD

When icing conditions are encountered:

- *The flight crew may turn on the wing anti-ice to prevent ice accretion on the wing leading edge.*
- *The flight crew must turn on the wing anti-ice if there is evidence of ice accretion, such as ice on the visual indicator, or on the wipers, or with the SEVERE ICE DETECTED alert. This is to remove any ice accumulation from the wing leading edge.*

Ident.: PRO-NOR-SOP-13-A-00010161.0001001 / 05 AUG 10

AFTER TAKEOFF/CLIMB CHECKLIST down to the line.. COMPLETE

Intentionally left blank

CLIMB

Applicable to: ALL

Ident.: PRO-NOR-SOP-14-A-00010245.0002001 / 09 JUN 15

Normal vertical mode is CLB or OP CLB with managed speed active.

PF MCDU..PERF CLB

- *PF MCDU should be showing the PERF CLB page (allowing PF to monitor when the aircraft will reach the FCU selected altitude) but he may select other pages such as F-PLN page as may be tactically necessary.*
  With the AP engaged, the PF may revise the flight plan.
- *The MCDU PROG page displays OPT FL and MAX REC FL . It is worth noting that this OPT FL is a function of the cost index (CI).*
- *The displayed MAX REC FL gives the aircraft at least a 0.3 g buffet margin. The pilot may enter a cruise flight level above this level into the MCDU and the FMGS will accept it, provided that it does not exceed the level at which the margin is reduced to 0.2 g.*

PM MCDU..F-PLN

PM MCDU should be showing the F-PLN page (allowing him to enter any ATC long-term revisions to the lateral or vertical flight plan).

CLIMB SPEED MODIFICATIONS

● **If ATC, turbulence or operational considerations lead to a speed change:**

Select the new speed with FCU SPD knob and pull.

Speed target is now “selected”.

To return to managed speed mode, push FCU SPD knob.

The speed target is now “managed”.

Note: *The best speed (and rate of climb) for long-term situations lies between green dot speed and ECON speed. At high altitude, acceleration from green dot to ECON speed can take a long time.*

EXPEDITE CLIMB ⊲

● **If ATC requires a rapid climb through a particular level:**

Push the EXP pb on the FCU.

The target speed is now green dot speed. FMA :THR CLB /EXP CLB/NAV

Note: *Use EXP ⊲ only for short-term tactical situations. For the best overall economy fly at ECON IAS.*

To return to ECON CLB speed:
Push ALT knob.
Check FMA : THR CLB /CLB /NAV

BAROMETRIC REFERENCE.. SET STD/CROSSCHECK

At transition altitude (baro setting flashing on PFD) set STD on the EFIS control panel and standby altimeter.
Cross-check baro settings and altitude readings.

CRZ FL.. SET AS RQRD

- *If ATC clears the aircraft to its intended CRZ FL or above, there is no need to modify the CRZ FL entered in the INIT A page during cockpit preparation. The MCDU will automatically take into account a higher CRZ FL selected with the FCU ALT knob.*
- *If ATC limits CRZ FL to a lower level than the one entered in the INIT A page (or present on the PROG page) the flight crew must insert this lower CRZ FL in the PROG page.*
  Otherwise there is no transition into CRZ phase : the managed speed targets and Mach are not modified, and SOFT ALT mode is not available. In that case FMA will display: MACH/ALT /NAV instead of MACH/ALT CRZ /NAV.

Ident.: PRO-NOR-SOP-14-A-00010257.0001001 / 05 AUG 10

AFTER TAKEOFF/CLIMB CHECKLIST below the line.. COMPLETE

Ident.: PRO-NOR-SOP-14-A-00010258.0001001 / 17 MAR 17

ENG ANTI-ICE pb-sw ....AS RQRD

Engine anti-ice must be set to ON when icing conditions (Refer to LIM-ICE_RAIN Definition of Icing Conditions) exist or are anticipated, except during climb when the SAT is below - 40 °C (-40 °F).

Ident.: PRO-NOR-SOP-14-A-00010259.0001001 / 16 MAR 11

RADAR TILT.. ADJUST

Ident.: PRO-NOR-SOP-14-A-00010260.0001001 / 04 MAR 14

AT 10.000FT

LAND LIGHTS selector...RETRACT
SEAT BELTS sw...AS RQRD
EFIS option...AS RQRD

Select CSTR on one side, for grid MORA (if available), and ARPT on the other side.

ECAM MEMO.. REVIEW

NAVAIDS..CLEAR

Clear manually tuned VOR s from MCDU RAD NAV page.

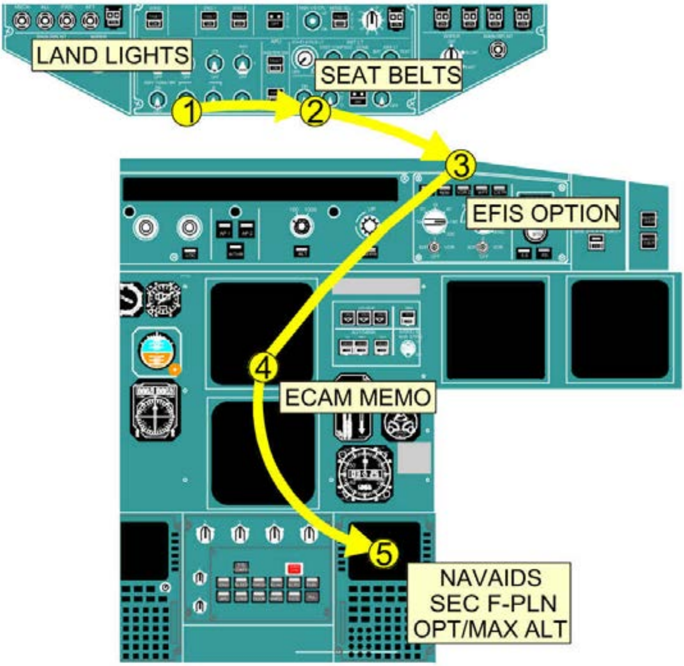
SEC F-PLN page.. AS RQRD

Recopy the active flight plan in the secondary if an immediate return flight plan has been constructed previously.

OPT/MAX ALT...CHECK

Ident.: PRO-NOR-SOP-14-A-00020076.0001001 / 17 MAR 17

10 000 ft FLOW PATTERN



EFIS Option:

The PF will select CSTR for grid MORA

The PM will select ARPT

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CRUISE

Applicable to: ALL

Ident.: PRO-NOR-SOP-15-A-00010287.0001001 / 25 AUG 16

ECAM MEMO.. REVIEW
ECAM SD PAGES...REVIEW

Periodically review system display pages and, in particular:

ENG	:	*Oil pressure and temperature*
BLEED	:	*BLEED parameters*
ELEC	:	*Parameters, GEN loads*
HYD	:	*A slight decrease in quantity is normal.* *Fluid contraction during cold soak can be expected.* *Green system is lower than on ground, following landing gear retraction.*
FUEL	:	*Fuel distribution.*
COND	:	*Duct temperature, compared with zone temperature.* *Avoid large differences for passenger comfort.*
FLT CTL	:	*Note any unusual control surface position.*
DOOR	:	*Oxygen pressure.*

Ident.: PRO-NOR-SOP-15-A-00010288.0001001 / 17 MAR 17

FLIGHT PROGRESS.. CHECK

Monitor flight progress in the conventional way.

When overflying a waypoint:
- *Check track and distance to the next waypoint.*

When overflying the waypoint, or at least every 30 min:
- *Check FUEL : Check FOB (ECAM), and fuel prediction (FMGC), and compare with the computer flight plan or the in-cruise quick-check table (Refer to QRH/PER-M In Cruise Quick Check at a Given Mach Number (Paper Only) or use the performance application of FlySmart with Airbus).*
  Check that the sum of the fuel on board and the fuel used is consistent with the fuel on board at departure. If the sum is unusually greater than the fuel on board at departure, suspect a fuel quantity over read. If the sum is unusually smaller than the fuel on board at departure, or if it decreases, suspect a fuel leak.
  For more information about fuel leak, Refer to FCTM/PR-AEP-FUEL Fuel Leak.

CAUTION	*This check must also be performed each time a FUEL IMBALANCE procedure is necessary. Perform the check before applying the FUEL IMBALANCE procedure.* *If a fuel leak is confirmed, apply the FUEL LEAK procedure.*

Ident.: PRO-NOR-SOP-15-A-00010289.0001001 / 01 DEC 14

STEP FLIGHT LEVEL...AS APPROPRIATE

Ident.: PRO-NOR-SOP-15-A-00010290.0001001 / 21 MAR 17

NAV ACCURACY...MONITOR

On aircraft equipped with GPS primary, no navigation accuracy check is required, as long as GPS PRIMARY is available.

Otherwise, a navigation accuracy check must be performed especially when any of the following occurs:

- *GPS PRIMARY LOST appears on the ND (GPS ⊲✱)*
- *IRS only navigation*
- *The PROG page displays LOW accuracy*
- *"NAV ACCUR DOWNGRAD" appears on the MCDU.*

Refer to DSC-22_20-20-20 Estimated Position Uncertainty.

Note: *Methods for checking accuracy:*

- ***If the check is positive (error ≤ 3 N.m): FM position is reliable.***
  Use ND (ARC or NAV) and managed lateral guidance.
- ***If the check is negative (error > 3 N.m): FM position is not reliable.***
  Use raw data for navigation and monitor it.
  - ***If there is a significant mismatch between the display and the real position:***
    Disengage MANAGED NAV mode and use raw data navigation (possibly switching to ROSE VOR, so as not to be misled by FM data).

Ident.: PRO-NOR-SOP-15-A-00010291.0001001 / 07 MAR 13

RADAR TILT...ADJUST

Ident.: PRO-NOR-SOP-15-A-00010296.0001001 / 21 MAR 16

- **If the oxygen mask has been used:**
  OXYGEN MASK ....CHECK
  Check that the oxygen mask has been properly stowed, *Refer to DSC-35-20-10 General.*

DESCENT PREPARATION

Applicable to: ALL

Ident.: PRO-NOR-SOP-16-A-00011551.0001001 / 30 JUN 14

Descent preparation and approach briefing should be completed before top of descent.

Ident.: PRO-NOR-SOP-16-A-00011552.0006001 / 20 MAR 17

WEATHER AND LANDING INFORMATION..OBTAIN

Check weather reports at ALTERNATE and DESTINATION airports. Airfield data should include runway in use for arrival.

Note: *When operating in cold weather conditions, consider altitude correction.* *Refer to PER-OPD-GEN ALTITUDE TEMPERATURE CORRECTION.*

NAV CHARTS CLIPBOARD..PREPARE

Ident.: PRO-NOR-SOP-16-A-00014394.0001001 / 27 APR 17

EFB LDG PERFORMANCE..CHECK

Perform an in-flight landing performance assessment if the landing conditions changed compared with the landing computation at dispatch, or with a previous computation (e.g. runway, weather conditions, in-flight failure affecting performance, diversion).

Note:
1. *If the weather conditions are expected to change at the landing airport, or in the event of significant precipitation, the flight crew should consider a second calculation of the in-flight landing distance with the worst possible runway condition.*
2. *The selection of REV MAX is the standard practice for landing.*
   However, on dry runways the flight crew may select REV IDLE.
   On WET runways (runway surface condition GOOD), the flight crew may select REV IDLE, if all the following conditions are satisfied:
   - *A landing distance assessment has been made with the following parameters:*
     - *MEDIUM TO POOR landing performance level for the in-flight landing distance computation*
     - *No reverser credit*
   - *The result of this landing distance assessment is within the LDA.*

- **If landing conditions changed:**

  LDG PERFORMANCE..(RE)COMPUTE

  In the LDG PERF application, modify the selections in accordance with the estimated arrival conditions:
  - *In the AIRPORT/RUNWAY part, select the applicable runway*
  - *In the CONDITIONS part, enter the estimated landing conditions*
  - *In the AIRCRAFT STATUS part, check the selected items, if any*
  - *Launch the computation and check the results versus Airline policy or applicable regulations.*

  LDG PERFORMANCE..CROSSCHECK

Ident.: PRO-NOR-SOP-16-A-00020100.0001001 / 17 MAY 17

ARRIVAL page..COMPLETE/CHECK

Insert APPR , STAR , APPR VIA and TRANS if applicable. (Access by lateral revision at destination.)

F-PLN A page..CHECK

- *Ensure that the inserted F-PLN agrees with planned approach and missed approach.*
- *Use the scroll key to check the F-PLN thoroughly, using ND in PLAN mode as necessary.*

Tracks and distances between waypoints are displayed on the second line from the top of the MCDU. Approach and Missed Approach tracks and distances must be checked from the appropriate navigation charts.

- *Check speed constraints. Add new speed constraints if required.*
- *Check altitude constraints. Add new altitude constraints if required.*

Note: *The FMS may have deleted the altitude constraints that are at or above the CRZ FL , or at or above any previous lower CRZ FL in the case of step climbs (Refer to DSC-22_20-30-20-05 Vertical Constraints (Speed, Altitude, Time)).*

In that case,
- *Insert again the affected procedures (STAR , APPR VIA or TRANS)*
  The FMS keeps the altitude constraints that are below the CRZ FL , and deletes again the altitude constraints that are above current CRZ FL . The FMS may also delete the altitude constraints that are at current CRZ FL , and the altitude constraint windows that have a constraint at or above current CRZ FL.
- *Manually enter the altitude constraints that are below current CRZ FL using the MCDU Vertical Revision pages.*
  It is not possible to enter an altitude constraint at the CRZ FL.
  In the case of an "AT" or "AT OR ABOVE" altitude constraint at the CRZ FL , the flight crew must select the DES mode only after the aircraft reaches the position of the altitude constraint to prevent an early descent..

- *In all cases, do not modify the final approach (FAF to runway or MAP), including altitude constraints.*
- *Identify the position and the altitude of Final Descent Point (FDP) and check the value of the FPA after this FDP,*
- *If a TOO STEEP PATH message is displayed after the FDP, do not use FINAL APP guidance for approach.*
- *Identify the Missed Approach Point.*

Ident.: PRO-NOR-SOP-16-A-00020101.0001001 / 20 SEP 16

DES WIND page... CHECK

Enter winds for descent before T/D.

Note: *With DPO , as the idle thrust margins are reduced, accurate winds have to be entered to be able to follow the computed vertical profile and thus maximize the benefits of DPO . Refer to DSC-22_20-60-150 Descent Profile Optimization (if installed).*

PERF CRUISE page.. CHECK

Modify the cabin descent rate if different pressure rate is required.

PERF DES page... CHECK

Prior to descent, access PERF DES page and check ECON MACH/SPD . If a speed other than ECON is required, insert that MACH or SPD into the ECON field. This new MACH or SPD is now the one for the descent path and T/D computation, and it will be used for the managed speed descent profile (instead of ECON).
A speed limit of 250 kt below 10 000 ft is the defaulted speed, in the managed speed descent profile. The flight crew may delete or modify it if necessary on the VERT REV at DEST page.

Ident.: PRO-NOR-SOP-16-A-00020102.0001001 / 21 MAR 17

PERF APPR page.. COMPLETE/CHECK

Enter the QNH, temperature, and wind at destination.

L13

Note: *Insert the average wind given by the ATC or ATIS. Do not insert the gust value. During approach, the Ground Speed Mini function (manage speed mode) takes into account the instantaneous gust.*
For more information: Refer to Ground Speed Mini Function.
For example, if the wind is 15020G35KT, insert 150/20.

Insert the minimum.

Note: *To avoid undershooting the published minimum during go-around, due to aircraft inertia during pull-up, some Authorities may require Operators to add a specific number of feet to the published minimum.*

CAUTION	*If the QNH altimeter setting is used for an aircraft with the QFE option, Refer to PRO-NOR-SUP-NAV QNH use for aircraft equipped with QFE option.*

Note: *Changing the RWY or the type of approach automatically erases the previous minimum.*

Note: *After the activation of the SEC F-PLN , check the VAPP, and modify if necessary.*

Check or modify the landing configuration. Always select the landing configuration on the PERF APP page: CONF FULL in the normal landing configuration. CONF 3 should be considered, depending on the available runway length and go-around performance, or if windshear/severe turbulence is considered possible during approach.
Check or modify the transition altitude.

PERF GO-AROUND page.. CHECK/MODIFY

Check THR RED ALT and ACC ALT, and modify, if necessary.

Ident.: PRO-NOR-SOP-16-A-00020103.0001001 / 20 SEP 16

RAD NAV page.. CHECK

- *Set navaids, as required, and check idents on the ND s (VOR -ADF) and PFD s (ILS , GLS , MLS). If a VOR /DME exists close to the airfield, select it and enter its ident in the BRG /DIST field of the PROG page, for NAV ACCY monitoring during descent.*
- *When the flight plan calls for an NDB approach, the system automatically tunes the ADF , only when the aircraft is passing the first fix of the approach. Therefore, it is convenient to manually tune the ADF earlier (before activating the approach phase).*

Ident.: PRO-NOR-SOP-16-A-00020104.0001001 / 20 SEP 16

SEC F-PLN page.. AS RQRD

Before the top of descent, the SEC F-PLN should either be set to an alternate runway for destination, or to the landing runway in case of circling. In all cases, routing to the alternate should be available. If there is a last-minute runway change, then the flight crew only needs to activate the secondary F-PLN , without forgetting to check/set the new minimum and navaids.

Ident.: PRO-NOR-SOP-16-A-00011554.0001001 / 03 MAR 14

GPWS LDG FLAP 3 pb-sw...AS RQRD

If the pilot plans on landing in FLAPS 3 configuration, the GPWS LDG FLAP 3 pb-sw should be set to ON.

Ident.: PRO-NOR-SOP-16-A-00015490.0001001 / 03 MAR 14

LDG ELEV...CHECK

Check that the LDG ELEV AUTO green is displayed on the ECAM CRUISE page, and check the associated value.

Ident.: PRO-NOR-SOP-16-A-00011556.0001001 / 17 MAR 17

AUTO BRK ....AS RQRD

Use of autobrake is preferable.
Use of MAX mode is not recommended at landing.
On short or contaminated runways, use MED mode.
On long runways, LO mode is recommended.
L2 *For more information, Refer to FCTM/PR-NP-SOP-160 Brakes Oxidation.*

L1 *Note: If, on very long runways, the flight crew anticipates that braking will not be needed, use of the autobrake is not necessary.*

Firmly press the appropriate pushbutton, according to the runway length and condition, and check that the related ON light comes on.

Ident.: PRO-NOR-SOP-16-A-00011555.0001001 / 10 JUL 14

APPROACH BRIEFING..PERFORM

Ident.: PRO-NOR-SOP-16-A-00011547.0001001 / 23 JUN 15

TERR ON ND ....AS RQRD

- *In mountainous areas, consider displaying terrain on ND.*
- *If use of radar is required, consider selecting the radar display on the PF side, and TERR ON ND on the PM side only.*
- *If NAV ACCURACY is LOW, do not use TERR on ND.*

Ident.: PRO-NOR-SOP-16-A-00011545.0001001 / 03 MAR 14

RADAR..ADJUST AS APPROPRIATE

Ident.: PRO-NOR-SOP-16-A-00011558.0004001 / 02 MAY 17

CAUTION	In icing conditions (*Refer to LIM-ICE_RAIN Definition of Icing Conditions*), the flight crew must turn on the engine anti-ice and should not wait until seeing ice building up.

ENG ANTI-ICE pb-sw ....AS RQRD

Engine anti-ice must be set to ON before and during descent, event if the SAT is below -40 °C (-40 °F).
When ENG ANTI ICE is ON, the FADEC selects a higher idle thrust which gives better protection against flame-out.

WING ANTI ICE pb-sw .... AS RQRD

When icing conditions are encountered:

- *The flight crew may turn on the wing anti-ice to prevent ice accretion on the wing leading edge.*
- *The flight crew must turn on the wing anti-ice if there is evidence of ice accretion, such as ice on the visual indicators, or on the wipers, or with the SEVERE ICE DETECTED alert. This is to remove any ice accumulation from the wing leading edge.*

ANTI ICE ON reduces the descent path angle (when the engines are at idle). The pilot can compensate for this by increasing the descent speed, or by extending up to half speedbrakes.

Ident.: PRO-NOR-SOP-16-A-00011557.0001001 / 03 MAR 14

DESCENT CLEARANCE.. OBTAIN
CLEARED ALTITUDE ON FCU.. SET

When clearance is obtained, set the ATC -cleared altitude (FL) on the FCU (also considering what is the safe altitude).
If the lowest safe altitude is higher than the ATC -cleared altitude, check with the ATC that this constraint applies.
If it is confirmed, set the FCU altitude to the safe altitude, until it is safe to go to the ATC-cleared altitude.

DESCENT INITIATION

Ident.: PRO-NOR-SOP-17-00011541.0001001 / 03 NOV 14
Applicable to: ALL

DESCENT.. INITIATE

The normal method of initiating the descent is to select DES mode at the FMGS calculated top of descent (T/D).

■ **If ATC requires an early descent:**

Use DES mode which will guide the aircraft down at a lower vertical speed in order to converge on the required descent path. (The pilot may use a V/S of -1 000 ft/min).

■ **If ATC delays the descent:**

Beyond T/D, the PFD and the MCDU display either "DECELERATE" or "T/D REACHED" message. This suggests to the crew that it starts reducing speed towards green dot speed (with ATC permission). When cleared to descend, select DES mode with managed speed active.

DESCENT MONITORING

Ident.: PRO-NOR-SOP-17-00011542.0003001 / 23 DEC 14
Applicable to: ALL

PF MCDU .... PROG /PERF DES

PF MCDU should be set to PROG or PERF DES page:

- *PROG page in order to get VDEV or RQD DIST TO LAND/DIRECT DIST TO DEST information*
- *PERF DES in order to get predictions down to any inserted altitude in DES /OP DES modes and EXP mode ⊲.*

PM MCDU .... F-PLN
DESCENT.. MONITOR/ADJUST

Refer to PRO-NOR-SRP-01-60 Descent Monitoring - DES Mode Engaged

- *When flying in NAV mode, use DES mode.*
  The aircraft descends along the descent flight path: the PFD and PROG page display VDEV, and so it can be monitored. All constraints of the flight plan are taken into account for the guidance.
- *When the aircraft is flying in HDG or TRK mode, and thus out of the lateral F-PLN , DES mode is not available.*

  The ND s show a level-off symbol along the flight path. Its position is based on the current active modes .AP /FD and A/THR
  The flight crew can use this symbol to monitor the descent.
  MCDU predictions assume a return to the lateral F-PLN and descent flight path.
  Note that whenever the lateral mode is changed from NAV to HDG /TRK the vertical mode reverts to V/S at the value pertaining at the time of the mode change.
- *From time to time during stabilized descent, the flight crew may select FPA to check that the remaining distance to destination is approximately the altitude change required divided by the FPA in degrees.*

FPA (°) = ∆FL/DIST (NM)

DESCENT ADJUSTMENT

Applicable to: ALL

Ident.: PRO-NOR-SOP-17-A-00011543.0002001 / 09 MAR 15

To increase the rate of descent:
- Increase descent speed (by use of selected speed) if comfort and ATC permit. It is economically better (Time/Fuel) than the following procedures.
- Maintain high speed as long as possible. (SPD LIM may be suspended, subject to ATC clearance).
- If the aircraft is high and at high speed, it is more efficient to keep the high speed to ALT* and decelerate, rather than to mix descent and deceleration.
- If the aircraft goes below the desired profile, use SPEED and the V/S mode to adjust the rate of descent.

Note: *EXPEDITE DESCENT.*
If a high rate of descent is required, push the EXPED pushbutton on the FCU . The target speed for the descent now becomes M 0.8 or 340 kt, whichever is lower. The FMA will display THRIDLE/EXP DES/NAV.
To return to DES mode, push the FCU ALT knob.
To return to SPEED/V/S modes, pull the FCU V/S knob.
In all cases, monitor the FMA to ensure that the mode engages properly.

Ident.: PRO-NOR-SOP-17-A-00011544.0001001 / 03 MAR 14

If engine anti-ice is selected in descent, the flight idle is increased. So, to maintain the rate of descent that the airplane had before engine anti-ice selection it may be necessary to use up to half speedbrakes to maintain the required rate of descent, in OPEN DES vertical mode. If the rate of descent has to be increased, full speedbrakes may be used.
In DES mode: If the aircraft is on, or below, the flight path and the ATC requires a higher rate of descent, do not use speedbrakes because the rate of descent is dictated by the planned flight path. Thus, the A/THR may increase thrust to compensate for the increase in drag. In this case, use OPEN DES with speedbrakes.

Note:
1. *If speedbrakes are used above 315 kt/M .75, with the AP engaged, their rate of retraction is low (total time for retraction from full extension is approximately 25 s). The ECAM memo page displays SPD BRAKES in amber until retraction is complete.*
2. *In order to avoid overshooting the altitude, due to speedbrake retraction in ALT* mode, retract the speedbrakes at least 2 000 ft before the selected altitude.*

Ident.: PRO-NOR-SOP-17-A-00011546.0001001 / 14 JAN 16

BAROMETRIC REFERENCE.. SET

Set QNH on the EFIS control panel and on the standby altimeter, when approaching the transition level and when cleared for an altitude.
Crosscheck BARO settings and altitude readings.

Ident.: PRO-NOR-SOP-17-A-00011548.0001001 / 13 AUG 10

ECAM STATUS.. CHECK

- *Check that there is no status reminder on the upper ECAM display.*
- *If there is a status reminder, check the aircraft STATUS.*
- *Check the ECAM status page before completing the approach checks. Take particular note of any degradation in landing capability, or any other aspect affecting the approach and landing.*

Ident.: PRO-NOR-SOP-17-A-00021715.0001001 / 04 SEP 17

AT 10 000 FT

LAND lights selector.. SET

LAND lights may be switched ON, according to the airline policy/regulatory recommendations.

SEAT BELTS sw.. ON

EFIS option pb.. CSTR

Select CSTR on both sides.

ILS/LS pb..AS RQRD

Press the ILS/LS pb, if one of the following approaches is planned:
- *ILS, GLS ⊲, MLS ⊲*
- *ILS G/S out, LOC only or LOC B/C ⊲*
- *Approach with the FLS function ⊲*

The flight crew checks that:
- *Deviation scales are displayed on the PFD*
- *The IDENT is properly displayed on the PFD*

RAD NAVAIDS..SELECTED/IDENTIFIED

Ensure that appropriate radio NAVAIDS are tuned and identified.
For NDB approaches, manually select the reference NAVAID.

Ident.: PRO-NOR-SOP-17-A-00015500.0001001 / 03 MAR 14

ENG MODE selector..AS RQRD

- *Select IGN if the runway is covered with standing water, or if heavy rain or severe turbulence is expected during approach or go-around area.*

Ident.: PRO-NOR-SOP-17-A-00015501.0001001 / 03 MAR 14

NAV ACCURACY..CHECK

On aircraft equipped with GPS primary, no navigation accuracy check is required, as long as GPS PRIMARY function is available.
Otherwise, crosscheck NAV ACCURACY using the PROG page (BRG /DIST computed data), and the ND (VOR /DME raw data).

APPROACH CHECKLIST

Ident.: PRO-NOR-SOP-17-00014491.0001001 / 03 MAR 14
Applicable to: ALL

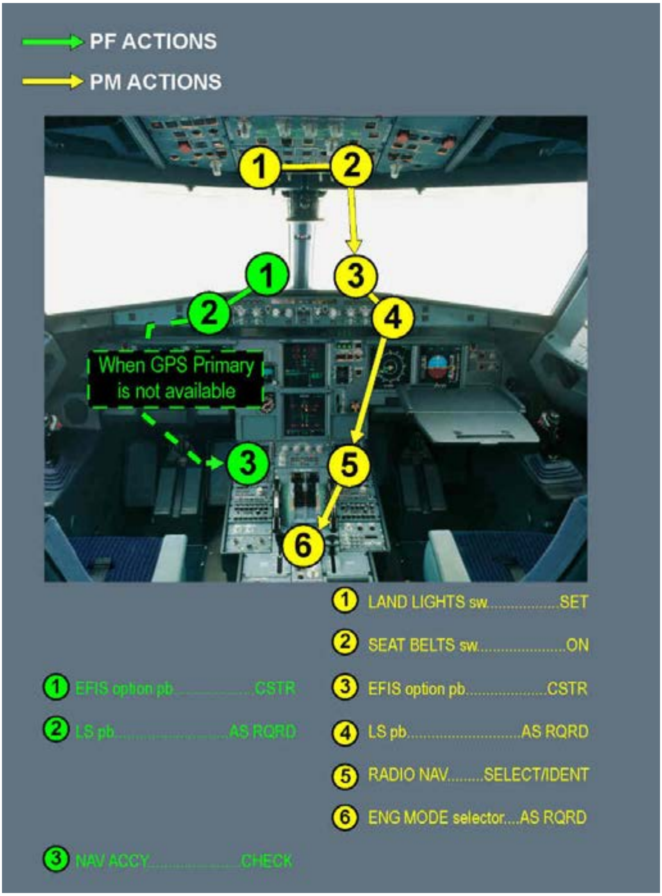
APPROACH CHECKLIST

APPROACH CHECKLIST..PERFORMED

10 000 FT FLOW PATTERN

Ident.: PRO-NOR-SOP-17-00020073.0001001 / 17 MAR 17
Applicable to: ALL

10 000 ft FLOW PATTERN



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Approach General

INTRODUCTION

Ident.: PRO-NOR-SOP-18-A-00014490.0001001 / 29 MAY 13
Applicable to: ALL

The APPROACH section provides the standard operating procedures for the following approach types:
- ILS / MLS / GLS approaches
- Conventional approaches: VOR , VOR -DME , NDB , NDB -DME
- Approaches based on a LOC signal without any G/S signal: LOC ONLY, ILS G/S OUT, LOC B/C
- RNAV approaches including:
  - RNAV (GNSS) approaches with LNAV minimum or LNAV/VNAV minimum
  - RNAV (RNP) approaches for which Authorization is Required (AR) - If capability installed.

Note: *In relation to the names in the ICAO Performance-Based Navigation (PBN) Manual:*
- *"RNP APCH operations" corresponds to RNAV (GNSS) approaches*
- *"RNP AR APCH operations" corresponds to RNAV (RNP) approaches.*

CROSS-REFERENCE TABLE

Ident.: PRO-NOR-SOP-18-A-00014489.0001001 / 29 MAY 13
Applicable to: ALL

This table provides Guidance Modes that may be used depending on the Approach Types.

	Guidance Modes per Approach Types				
	LOC G/S	**FINAL APP**	**LOC FPA**	**NAV FPA**	**TRK FPA**
ILS / MLS / GLS	*Refer to APPR using LOC G/S*	N/A	N/A	N/A	N/A
LOC ONLY ILS G/S OUT	N/A	N/A	*Refer to APPR using FPA Guidance*	N/A	N/A
LOC B/C	N/A	N/A	N/A	N/A	*Refer to APPR using FPA Guidance*
RNAV (GNSS) with LNAV/VNAV minima	N/A	*Refer to APPR using FINAL APP*	N/A	Not Authorized	Not Authorized
RNAV (GNSS) with LNAV minima	N/A	*Refer to APPR using FINAL APP (1)*	N/A	*Refer to APPR using FPA Guidance*	Not Authorized

Continued on the following page

Continued from the previous page

	Guidance Modes per Approach Types				
	LOC G/S	**FINAL APP**	**LOC FPA**	**NAV FPA**	**TRK FPA**
RNAV (GNSS) with LPV minima	N/A	Not Authorized	N/A	Not Authorized	Not Authorized
VOR **VOR -DME** **NDB** **NDB -DME**	N/A	*Refer to APPR using FINAL APP* (1)	N/A	*Refer to APPR using FPA Guidance*	*Refer to APPR using FPA Guidance*

(1) *The FINAL APP is the recommended guidance mode for this type of approach.*

For Visual Approach, *Refer to Visual Approach*
For Circling Approach, *Refer to Circling Approach*

FLYING REFERENCE

Ident.: PRO-NOR-SOP-18-A-00014488.0001001 / 29 MAY 13
Applicable to: ALL

Use the following recommended flying reference:
- In vertical managed modes: HDG -V/S reference associated with the FD crossbars
- In vertical selected modes: TRK -FPA reference associated with FPD.

STABILIZATION CRITERIA

Ident.: PRO-NOR-SOP-18-A-00014487.0001001 / 06 DEC 16
Applicable to: ALL

The stabilization height is defined as one of the following:
- 1 000 ft above airfield elevation (AAL)in Instrument Meteorological Conditions (IMC), or
- 500 ft above airfield elevation (AAL) in Visual Meteorological Conditions (VMC), or
- Any other height defined in Operator policies or regulations.

In order for the approach to be stabilized, all of the following conditions must be satisfied before, or at the stabilization height:
- The aircraft is on the correct lateral and vertical flight path
- The aircraft is in the desired landing configuration

- The thrust is stabilized, usually above idle, and the aircraft is at target speed for approach

  Note: *In IMC , if the ATC requests a speed constraint that is not compatible with the speed and thrust stabilization at 1 000 ft AAL, a later speed and thrust stabilization can be acceptable provided that:*
  - *The aircraft is in deceleration toward the target approach speed*
  - *The flight crew stabilizes speed and thrust as soon as possible and not later than 500 ft AAL.*
- The flight crew does not detect any excessive flight parameter deviation.

If one of the above-mentioned conditions is not satisfied, the flight crew must initiate a go-around, unless they estimate that only small corrections are required to recover stabilized approach conditions.

APPROACH SPEED TECHNIQUE

Ident.: PRO-NOR-SOP-18-A-00014485.0001001 / 29 MAY 13
Applicable to: ALL

DECELERATED APPROACH

The decelerated approach with FD or AP /FD guidance is the standard flying technique for ILS / MLS / GLS approaches and approaches using FLS or FINAL APP guidance.

EARLY STABILIZED APPROACH

Under certain circumstances, the flight crew may decide to reduce the speed down to VAPP in the landing configuration at the Final Descent Point (i.e. approach via selected guidance, high glide path angle, low altitude intermediate approach, etc.). In order to obtain a valuable deceleration pseudo waypoint and to ensure a timely deceleration, the flight crew should enter VAPP as a speed constraint at the Final Descent Point.

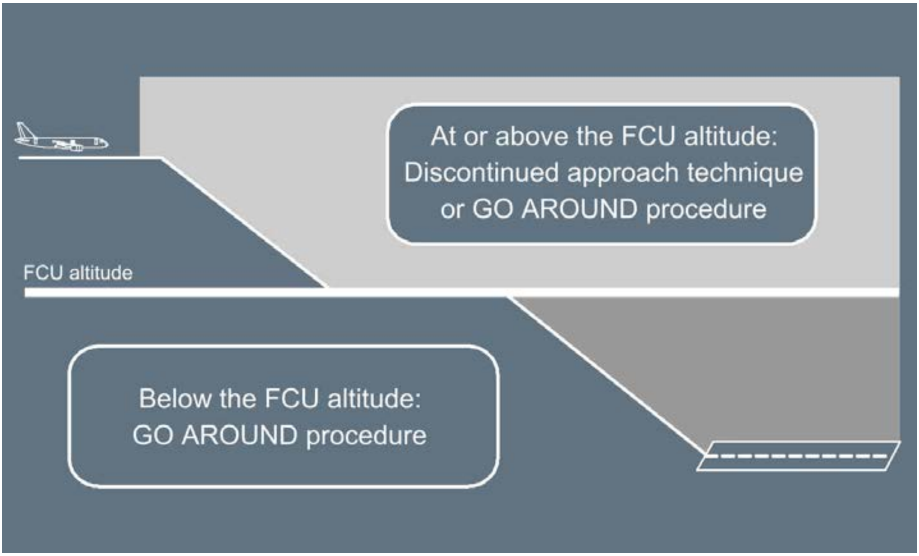
DISCONTINUED APPROACH

Ident.: PRO-NOR-SOP-18-A-00015226.0001001 / 03 DEC 13
Applicable to: ALL

In order to discontinue an approach when the aircraft is at or above the altitude selected on the FCU, the flight crew can either:

- Apply the GO AROUND procedure, or
- Apply the discontinued approach technique.

When the aircraft is below the FCU altitude, the flight crew must apply the GO AROUND procedure.



- **If at or above the FCU altitude:**
  Announce "CANCEL APPROACH".
  To disarm any AP/FD approach mode, press APPR pb or LOC pb.

  Note: Valid only for ILS / MLS / GLS / FLS or FINAL APP guidance.

  Select lateral mode as required (NAV or HDG mode).
  Select vertical mode as required (level off or adjust V/S).
  Select SPEED and adjust.

- **If F-PLN has no destination anymore:**
  Perform a LAT REV at the last waypoint and redefine the destination in the NEW DEST field.

Note:
1. *The FMS does not automatically string the previous flown approach in the active F-PLN when the aircraft overflies the last waypoint. The FMS has no more destination in the F-PLN.*
2. *Because the thrust levers are not set to TOGA detent, the FMS remains in approach phase.*

Aircraft Configuration Management

INITIAL APPROACH

Applicable to: ALL

Ident.: PRO-NOR-SOP-18-B-A-00014494.0001001 / 29 MAY 13

GENERAL

The initial approach procedure described here is a general guidance whatever the type of approach expected.

Ident.: PRO-NOR-SOP-18-B-A-00014493.0001001 / 03 MAR 14

INITIAL APPROACH

F-PLN SEQUENCING...ADJUST

- *The NAV mode will be available after GO AROUND if the F-PLN is properly sequenced. A good cue to monitor the proper F-PLN sequencing is the TO waypoint on the upper right side of the ND, which should remain meaningful.*
- *In NAV mode, the F-PLN will sequence automatically.*
- *In HDG /TRK mode, the F-PLN will sequence automatically only if the aircraft flies close to the F-PLN route.*

APPROACH PHASE...CHECK/ACTIVATE

- *If the aircraft overflies the DECEL pseudo waypoint in NAV mode, the APPR phase activates automatically.*
- *If the aircraft is in HDG /TRK mode, approximately 15 NM from touchdown, activate and confirm APPROACH phase on the MCDU (PERF DES page).*

MANAGED SPEED.. CHECK

- *If ATC requires a particular speed, use selected speed. When the ATC speed constraint no longer applies, return to managed speed.*

FLIGHT PATH...MONITOR

- *In NAV mode, use VDEV information on the PFD and PROG page.*
- *In HDG /TRK mode, use the energy circle on ND representing the required distance to land.*

SPEED BRAKES lever..AS RQRD

- *If the flight crew uses the speed brakes to increase the rate of deceleration or to increase the rate of descent, the VLS will increase as well:*
  - *The flight crew should ensure that appropriate speed margin exists before the extension of the speed brakes*
  - *If the speed brakes are extended, the flight crew should ensure that appropriate speed margin exists before the beginning of a turn.*

  This will avoid the activation of the Alpha-Floor protection.

  Note: *In clean configuration, the VLS with speed brakes fully extended may be higher than green dot speed or VFE FLAP 1.*

Ident.: PRO-NOR-SOP-18-B-A-00014647.0001001 / 29 MAY 13

RADAR

RADAR..ADJUST AS APPROPRIATE

Ident.: PRO-NOR-SOP-18-B-A-00014492.0001001 / 29 MAY 13

NAVIGATION ACCURACY

NAV ACCURACY..MONITOR

- *When GPS PRIMARY is available, no NAV ACCURACY monitoring is required.*
- *If GPS PRIMARY is lost, or GPS not installed, check on PROG page that the required navigation accuracy is appropriate to the phase of flight.*
- *If NAV ACCURACY is LOW, at least one ND must be in ROSE LS /VOR depending on the approach.*

INTERMEDIATE/FINAL APPROACH

Applicable to: ALL

Ident.: PRO-NOR-SOP-18-B-B-00014501.0001001 / 29 MAY 13

GENERAL

The intermediate and final approach procedure described here is general guidance whatever the type of approach expected.

Ident.: PRO-NOR-SOP-18-B-B-00014500.0001001 / 17 MAR 17

AT GREEN DOT SPEED

CAUTION	The flight crew should avoid extended flight in icing conditions with the slats extended.

FLAPS 1.. ORDER
FLAPS 1..SELECT

- *FLAPS 1 should be selected more than 3 NM before the Final Descent Point.*
- *Check deceleration toward "S" speed.*
- *For decelerated approaches, the aircraft must reach or be established on the final descent with FLAPS 1 and "S" speed at or above 2 000 ft AGL.*
- *If the aircraft does not decelerate on the flight path or aircraft speed is significantly higher than "S" speed, extend the landing gear in order to slow down. The use of speedbrakes is possible. The flight crew should be aware that the use of speedbrakes causes an increase in VLS.*

TCAS Mode selector.. TA or TA /RA

- *FAA recommends to select TA only mode:*
  - *In case of known nearby traffic which is in visual contact*
  - *At particular airports and during particular procedures identified by an Operator as having a significant potential for unwanted or inappropriate resolution advisories (closely spaced parallel runways, converging runway, low terrain along the final approach, etc.).*

Ident.: PRO-NOR-SOP-18-B-B-00014499.0001001 / 09 MAR 15

AT 2 000 FT AGL MINIMUM

FLAPS 2.. ORDER
FLAPS 2..SELECT

- *Check deceleration toward "F" speed.*
- *For ILS / MLS / GLS and approaches using FLS , if the aircraft intercepts the flight path below 2 000 ft AGL, select FLAPS 2 at one dot below the flight path.*
- *If the aircraft speed is significantly higher than "F" speed on the flight path, or the aircraft does not decelerate on the flight path, extend the landing gear in order to slow down the aircraft. The use of speed brakes is not recommended.*
- *When the speed brakes are deployed, extending the flaps beyond FLAPS 1 may induce a slight roll movement, and in calm conditions a small lateral control asymmetry may remain until disturbed by a control input or by an atmospheric disturbance.*

Ident.: PRO-NOR-SOP-18-B-B-00014498.0001001 / 05 JAN 15

WHEN FLAPS ARE AT 2

L/G DOWN ....ORDER
L/G lever..SELECT DOWN
AUTO BRK ....CONFIRM

- *If the runway conditions have changed from the approach briefing, consider another braking mode.*

GROUND SPOILERS .... ARM
NOSE sw........ TAXI
RWY TURN OFF sw........ ON

Ident.: PRO-NOR-SOP-18-B-B-00014497.0001001 / 20 MAR 17

WHEN LANDING GEAR IS DOWN

FLAPS 3........ ORDER
FLAPS 3........ SELECT
ECAM WHEEL SD page .... CHECK

- *WHEEL SD page appears below 15 500 ft when landing gear is extended.*
- *Check for three green indications on the landing gear indicator panel. At least one green triangle on each landing gear strut on the WHEEL SD page is sufficient to indicate that the landing gear is downlocked. Rely also on the "LDG GEAR DN " green LDG MEMO message to confirm that the landing gear is downlocked.*

● **If residual pressure is indicated on the triple indicator:**
RESIDUAL BRAKING PROC........ APPLY

FLAPS FULL........ ORDER
FLAPS FULL........ SELECT

- *Retract the speed brakes before selecting FLAPS FULL to prevent a pitch down when the speed brakes automatically retract.*
- *Check deceleration towards VAPP.*
- *Check correct TO waypoint on the ND.*

A/THR........ CHECK IN SPEED MODE OR OFF
WING ANTI-ICE pb-sw........ OFF

- *Switch the WING ANTI ICE pb-sw to ON, only in severe icing conditions.*

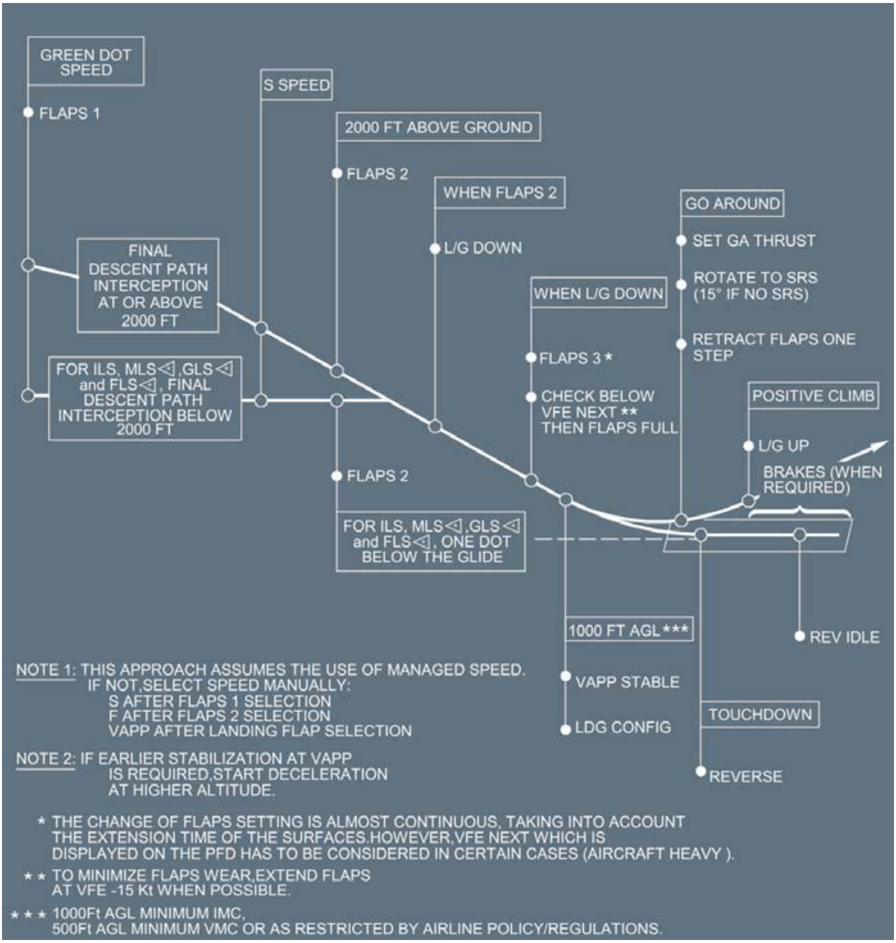
SLIDING TABLE ⊲ .... STOW
EFB/eQRH (with no mounted equipment)........ STOW
LDG MEMO........ CHECK NO BLUE
CABIN REPORT........ RECEIVE
CABIN CREW........ ADVISE
LANDING CHECKLIST........ COMPLETE

FLIGHT PARAMETERS..MONITOR

- *The PF announces any FMA modification.*
- *The PM calls out, if:*
  - *The speed goes lower than the speed target -5 kt , or greater than the speed target +10 kt*
  - *The pitch attitude goes lower than -2.5 °, or greater than +10 ° nose up*
  - *The bank angle becomes greater than 7 °*
  - *The descent rate becomes greater than 1 000 ft/min*
- *Following PM flight parameter exceedance callout, the suitable PF response will be:*
  - *Acknowledge the PM callout, for proper crew coordination purposes*
  - *Take immediate corrective action to control the exceeded parameter back into the defined stabilized conditions*
  - *Assess whether stabilized conditions will be recovered early enough prior to landing, otherwise initiate a go-around.*

Ident.: PRO-NOR-SOP-18-B-B-00014495.0001001 / 29 MAY 13

PATTERN (DECELERATED)



Aircraft Guidance Management

APPROACH USING LOC G/S GUIDANCE

Applicable to: ALL

Ident.: PRO-NOR-SOP-18-C-A-00014508.0001001 / 29 MAY 13

GENERAL

The following items are to be performed in addition to previous SOP chapters for ILS / MLS / GLS approach.

Ident.: PRO-NOR-SOP-18-C-A-00020896.0001001 / 20 MAR 17

DESCENT PREPARATION

APPROACH MINIMUM..DETERMINE

- *For CATII, CATIII approaches, always choose the lowest achievable minimum. The approach minimum is limited by:*
  - *Crew qualification*
  - *Airline Operating Manual requirement*
  - *Aircraft technical status*
  - *Airport status*
- *For CATIII with no DH, the flight crew should enter "NO" in the DH field of the MCDU to avoid false "HUNDRED ABOVE" or "MINIMUM" auto callouts which would not be applicable.*

APPROACH BRIEFING..PERFORM

For CATII, CATIII approaches, review the following items on top of the usual briefing:

- *Task sharing and callouts*
- *Management of degraded guidance*
- *Low visibility procedures at the airport*

Ident.: PRO-NOR-SOP-18-C-A-00014509.0001001 / 09 FEB 16

INITIAL/INTERMEDIATE APPROACH

APPR pb on FCU...PRESS

- *Press the APPR pb when:*
  - *Cleared for the approach*
  - *On the intercept trajectory for the final approach course*
  - *LOC deviation is available.*

  This arms the LOC and G/S modes.

  Note: In NAV mode, the aircraft may leave the F-PLN to capture the LOC.

- *LOC and/or G/S capture modes will engage no sooner than 3 s after being armed.*
- *ICAO defines the envelope where the quality of the G/S signal ensures a normal capture. This envelope is within 10 NM, ±8 ° of the centerline of the ILS glide path and up to 1.75 θ and down to 0.3 θ (θ = nominal glide path angle). When arming the approach well outside of the normal G/S capture envelope, a spurious G/S * engagement may occur due to a wrong G/S deviation signal. Whenever the pilot notices the pitch movement, or the spurious G/S *, or the trajectory deviation, he will immediately disconnect the AP , if engaged, to re-establish a normal attitude and will disengage APPR mode. It is then recommended to arm/rearm APPR (ILS) mode within the normal capture zone.*

BOTH APs...ENGAGE

- *When APPR mode is selected, AP 1 and AP2 should be engaged.*
- *Above 5 000 ft AGL , the FMA displays CAT 1.*
- *Below 5 000 ft AGL , the FMA displays the correct approach capability for the intended approach.*

LOC...CHECK ARMED
G/S...CHECK ARMED
LOC CAPTURE...MONITOR
G/S CAPTURE...MONITOR
GO AROUND ALTITUDE...SET

Ident.: PRO-NOR-SOP-18-C-A-00014510.0002001 / 03 MAR 14

GLIDE INTERCEPTION FROM ABOVE

The following procedure should only be applied when established on the localizer. The flight crew must react without delay to meet the stabilization criteria.

In order to get the best rate of descent when cleared by ATC and below the limiting speeds, the flight crew should lower the landing gear and select flaps as required (at least CONF 2 should be selected to ensure that the aircraft speed will not increase).

- **If above the glideslope:**

  APPR mode .... ARM / CHECK ARMED
  FCU ALTITUDE.................................... SET ABOVE A/C ALTITUDE
  V/S MODE.................................... SELECT

  - *Select V/S 1 500 ft/min initially. V/S in excess of 2 000 ft/min will result in the speed increasing towards VFE.*
  - *When reaching VFE , the AP maintains VFE and reduces the V/S without MODE REVERSION.*

Ident.: PRO-NOR-SOP-18-C-A-00014511.0001001 / 04 JUL 17

FINAL APPROACH

FLIGHT PARAMETERS.................................... MONITOR

- *The PM calls out if excessive deviation occurs:*
  - *LOC: ½ dot*
  - *GLIDE: ½ dot*

  Refer to PRO-NOR-SOP-90 Approach

AT 350 ft RA

LAND mode.................................... CHECK ENGAGED/ANNOUNCE

If no LAND mode, autoland is not authorized.

FOR CAT I, CAT II, CAT III WITH DH APPROACH

AT ENTERED MINIMUM +100 ft

ONE HUNDRED ABOVE.................................... MONITOR OR ANNOUNCE

AT ENTERED MINIMUM

MINIMUM.................................... MONITOR OR ANNOUNCE

Below minimum, the visual references must be the primary reference until landing.
For more information regarding transition to visual references, *Refer to FCTM/PR-NP-SOP-250 Transition to Visual References*.

- **If visual references are sufficient:**

  CONTINUE.................................... ANNOUNCE
  AP.................................... AS RQRD

  For Minimum Use Height of the AP Refer to LIM-AFS-10 Flight Management Function

For Manual Landing and Autoland procedure *Refer to PRO-NOR-SOP-19 Landing - Flare*

■ **If visual references are not sufficient:**

GO AROUND...ANNOUNCE

Initiate a go around.

FOR CAT III WITHOUT DH APPROACH

At 100 ft (Alert Height) if no failure

CONTINUE..ANNOUNCE

Ident.: PRO-NOR-SOP-18-C-A-00021062.0002001 / 31 AUG 17

MANAGEMENT OF DEGRADED GUIDANCE

EARLY/UNTIMELY FLARE MODE ENGAGEMENT

- Perform a go around (thrust levers set to TOGA), or
- Disconnect AP , set both FDs to OFF and continue the approach using raw data or external visual references.

In association to an early/untimely FLARE mode engagement on the FMA, the following effects may occur:

- On the Primary Flight Display (PFD):
  - The RA height indication may be frozen at a positive or negative value,
  - Discrepancies between both PFDs may happen on the following indications:
    - ■ RA heights,
    - ■ FD orders,
    - ■ FMA indications when both APs are engaged.
- Warnings and/or Callouts:
  - Untimely activation of the AUTOLAND warning light. *Refer to DSC-22_30-30 Autoland Warning*,
  - Untimely Terrain Awareness and Warning System (TAWS) alerts,
  - Untimely or absence of “RETARD" callout,
  - Untimely L/G GEAR NOT DOWN ECAM warning,
  - Absence or interruption of RA automatic callout (height announcement),
- On the System Display (SD): A pulsing cabin differential pressure advisory may appear on the ECAM - CAB PRESS PAGE

Note: *This ECAM advisory has no consequence on the real cabin pressure.*

FOR CAT II, CAT III OPERATIONS

- **In the case of:**

  - Amber caution (single chime), or
  - Landing capability degradation.

  Above 1000 ft:

  ECAM / QRH PROCEDURE....................COMPLETE
  REQUIRED EQUIPMENT....................CHECK
  Refer to QRH/OPS Required Equipment for CAT2 and CAT3
  APPROACH AND LANDING CAPABILITY....................CHECK

  If required:

  RVR....................CHECK
  DH....................ADJUST
  BRIEFING....................CONFIRM

  - **If the flight crew does not complete all the above actions at 1 000 ft:**
    GO AROUND....................PERFORM

  Below 1000 ft:

  - **If external visual references are not sufficient:**
    GO AROUND....................PERFORM

  Below 100 ft (Alert Height) for CAT 3 DUAL:

  Approach may be continued unless autoland light comes on.

- **In the case of Autoland warning light:**
  - **Visual references not sufficient:**
    GO AROUND....................PERFORM
  - **Visual references sufficient:**

    Approach may be continued manually

APPROACH USING FINAL APP GUIDANCE

Applicable to: ALL

Ident.: PRO-NOR-SOP-18-C-C-00014521.0002001 / 29 MAY 13

GENERAL

The following items are to be performed in addition to previous SOP chapters in the following cases:
- RNAV (GNSS) approaches with LNAV and LNAV/VNAV minima
- Conventional approaches based on VOR or NDB using FINAL APP guidance.

Ident.: PRO-NOR-SOP-18-C-C-00014522.0003001 / 09 SEP 14

AIRCRAFT EQUIPMENT

For RNAV (GNSS) approaches, *Refer to PRO-SPO-51 RNP APCH / RNAV(GNSS) - Required RNP APCH Equipment*

Ident.: PRO-NOR-SOP-18-C-C-00015860.0001001 / 09 SEP 14

FLIGHT PREPARATION

For RNAV (GNSS) approaches, GPS PRIMARY availability should be confirmed.
Refer to PRO-NOR-SOP-02 GPS PRIMARY Availability (If Installed)

Ident.: PRO-NOR-SOP-18-C-C-00014524.0002001 / 08 AUG 17

DESCENT PREPARATION

WEATHER AND LANDING INFORMATION...OBTAIN

- *The FMS vertical profile does not take into account the effect of low OAT. Therefore, vertical managed guidance:*
  - *Must not be used when the actual OAT is below the minimum temperature indicated on the approach chart or defined by the Operator, or*
  - *May not be used when temperature corrections are required (FINAL APP mode may not engage).*
- *For RNAV (GNSS) approach with LNAV VNAV minima, use of QNH from a remote station is prohibited.*

F-PLN A page.. CHECK

- *If a TOO STEEP PATH is displayed after the Final Descent Point (FDP), do not use FINAL APP guidance for approach. Use NAV FPA , TRK FPA or FLS for approach.*
- *0.1 degree of difference between the MCDU and the charted final vertical path is acceptable*

- *1 degree of difference between the MCDU and the charted final lateral track is acceptable*

  Note: *A higher lateral track value can be acceptable if the navigation database has been validated to exclude potential coding error.*

- *3 degree of difference between the MCDU and the charted final lateral track is acceptable for conventional radio NAVAID approach.*

PROG page...COMPLETE

- *Insert the reference RWY threshold in the BRG /DIST field for position monitoring during approach.*

GO AROUND STRATEGY...REVIEW

- *The briefing should include a review of the "Management of Degraded Navigation" chapter.*

Ident.: PRO-NOR-SOP-18-C-C-00014525.0003001 / 23 JUN 15

DESCENT

At 10 000 ft:

NAV ACCURACY..CHECK

- *If NAV accuracy is LOW, use TRK FPA mode for approach (Refer to APPR using FPA guidance).*

● **For RNAV(GNSS) approach:**

  GPS PRIMARY...CHECK

  - *GPS PRIMARY must be available on at least 1 FMS.*

BARO REF..SET

- *The vertical guidance requires a precise baro setting. The maximum acceptable discrepancy between altimeters is 100 ft.*

Ident.: PRO-NOR-SOP-18-C-C-00014526.0002001 / 08 AUG 17

INITIAL/INTERMEDIATE/FINAL APPROACH

POSITION...MONITOR

- *Check that ATC clearances allow the aircraft to fly through the capture area of vertical profile. After a radar vectoring, consider a DIR TO RDL IN to sequence the F-PLN.*

APPR pb on FCU .... PRESS

Press the APPR pb when all of the following conditions are satisfied:
- *The aircraft is cleared for approach*
- *TO waypoint is the Final Descent Point.*

APP NAV .... CHECK ARMED or ENGAGED
FINAL .... CHECK ARMED

- *Check that the V/DEV scale is displayed on the PFD.*
- *At the Final Descent Point, a blue arrow on ND indicates that FINAL APP engagement conditions are met.*

At the Final Descent Point :

FINAL APP .... CHECK ENGAGED
GO AROUND ALTITUDE .... SET
FLIGHT PARAMETERS .... MONITOR

- *Monitor XTK error on ND.*
- *Monitor V/DEV on PFD.*
- *Crosscheck distances versus altitudes as published on the charts.*
- *If approaching on a conventional radio NAVAID procedure, monitor the lateral and vertical guidance using raw data.*
- *The PM calls out if excessive deviation occurs:*
  - *XTK > 0.1 NM*
  - *V/DEV > ½ dot*

L2 *On the vertical scale, one dot corresponds to 100 ft. Thus ½ dot is 50 ft.*

L1 *Refer to PRO-NOR-SOP-90 Approach*

Ident.: PRO-NOR-SOP-18-C-C-00015015.0001001 / 29 MAY 13

AT ENTERED MINIMUM +100 FT

ONE HUNDRED ABOVE .... MONITOR OR ANNOUNCE

Ident.: PRO-NOR-SOP-18-C-C-00014527.0010001 / 04 JUL 17

AT ENTERED MINIMUM

MINIMUM .... MONITOR OR ANNOUNCE

Below minimum, the visual references must be the primary references until landing.
For more information regarding transition to visual references, *Refer to FCTM/PR-NP-SOP-250 Transition to Visual References*.

■ **If visual references are sufficient:**
CONTINUE .... ANNOUNCE

At the latest at the MAP or Minimum Use Height of the AP (whichever occurs first):

AP ....OFF

- *For Minimum Use Height of the AP,* *Refer to LIM-AFS-10 Autopilot Function*

FD ....AS RQRD

CAUTION	- *From minima down to the MAP the FD provides an additional guidance. The FD must be switched off if the guidance is not relevant or not followed.* - *After the MAP , disregard the FD as it reverts to HDG V/S.*

■ **If visual references are not sufficient:**

GO AROUND..ANNOUNCE

- *Initiate a go around.*

Ident.: PRO-NOR-SOP-18-C-C-00014528.0002001 / 23 JUN 15

MANAGEMENT OF DEGRADED NAVIGATION

- **For VOR and NDB approaches, be prepared to continue the approach with reference to appropriate raw data by reverting to:**
  - NAV FPA, if the vertical guidance is not satisfactory
  - TRK FPA, if the lateral guidance is not satisfactory.
- **For RNAV(GNSS) approaches with LNAV minima and LNAV/VNAV minima:**
  - Use the appropriate remaining AP /FDin the following cases:
    - GPS PRIMARY LOST on one ND
    - NAV ACCUR DOWNGRAD on one FMGS.
  - Discontinue the approach in the following cases, if external visual references are not sufficient to proceed visually:
    - GPS PRIMARY LOST on both NDs
    - XTK > 0.3 NM
    - NAV FM /GPS POS DISAGREE on ECAM
    - NAV ACCUR DOWNGRAD on both FMGS.
- **For RNAV(GNSS) approaches with LNAV/VNAV minima:**
  - Discontinue the approach in the case of deviation of 75 ft below the vertical path (V/DEV>¾ dot).

APPROACH USING FPA GUIDANCE

Applicable to: ALL

Ident.: PRO-NOR-SOP-18-C-E-00014561.0002001 / 29 MAY 13

GENERAL

The following items are to be performed in addition to previous SOP chapters in the following cases:

- RNAV (GNSS) approaches using mixed NAV FPA guidance with LNAV minima only
- Conventional approaches based on VOR and NDB using selected TRK FPA or mixed NAV FPA guidance
- ILS G/S OUT, LOC ONLY and back course localizer approaches.

The approach is flown in TRK FPA when:

- The approach is not stored in the database or
- NAV accuracy is LOW.

Ident.: PRO-NOR-SOP-18-C-E-00014560.0003001 / 09 SEP 14

AIRCRAFT EQUIPMENT

For RNAV (GNSS) approaches, *Refer to PRO-SPO-51 RNP APCH / RNAV(GNSS) - Required RNP APCH Equipment*

Ident.: PRO-NOR-SOP-18-C-E-00015861.0001001 / 09 SEP 14

FLIGHT PREPARATION

For RNAV (GNSS) approaches, GPS PRIMARY availability should be confirmed.
Refer to PRO-NOR-SOP-02 GPS PRIMARY Availability (If Installed)

Ident.: PRO-NOR-SOP-18-C-E-00014558.0002001 / 20 SEP 16

DESCENT PREPARATION

F-PLN A page... CHECK

- *If a TOO STEEP PATH message is displayed after the Final Descent Point (FDP), disregard the V/DEV or yoyo information on the PFD.*
- *For approaches using NAV FPA:*
  - *1 degree of difference between the MCDU and the charted final lateral track is acceptable.*
  - *3 degree of difference between the MCDU and the charted final lateral track is acceptable for conventional radio NAVAID approach.*
- *In all other cases, use TRK FPA mode for approach.*

PROG page...COMPLETE

- *Insert the reference RWY threshold in the BRG /DIST field for position monitoring during approach.*

GO AROUND STRATEGY...REVIEW

- *The briefing should include a review of the "Management of Degraded Navigation" chapter.*

Ident.: PRO-NOR-SOP-18-C-E-00014557.0003001 / 03 MAR 14

DESCENT

At 10 000 ft:

NAV ACCURACY...CHECK

- *If NAV accuracy is LOW, use TRK mode for approach.*

- **For RNAV(GNSS) approach:**
  GPS PRIMARY...CHECK
  - *GPS PRIMARY must be available on at least 1 FMS.*

Ident.: PRO-NOR-SOP-18-C-E-00014556.0002001 / 21 MAR 17

INITIAL/INTERMEDIATE/FINAL APPROACH

LATERAL GUIDANCE MODE...SET FOR APPROACH

- *Arm NAV or LOC mode as appropriate.*

- **For LOC ONLY and ILS G/S OUT:**
  LOC pb-sw ....PRESS
  - *Press the LOC pb-sw when cleared for approach and on the intercept trajectory for the final approach course.*

    Note: In NAV mode, the aircraft may leave the F-PLN to capture the LOC.

  LOC ....CHECK ARMED

CAUTION	Do not press the APPR pb

- **For back course localizer approaches:**
  TRK FPA MODE..USE FOR APPROACH
  - *Refer to FCTM/PR-NP-SOP-190-GUI Back Course Localizer Approach.*

LATERAL PATH...INTERCEPT

- *Monitor NAV or LOC engagement as appropriate.*

TRK FPA pb (Bird)....................................SELECT
FPA FOR FINAL APPROACH....................................SET

<u>At 0.3 nm from the Final Descent Point:</u>

FPA selector ....PULL
FPA MODE....................................CHECK ENGAGED

- *Check NAV FPA , TRK FPA or LOC FPA is engaged.*

POSITION/FLIGHT PATH ....MONITOR/ADJUST
GO AROUND ALTITUDE....................................SET

- *Set when below the go around altitude to avoid unexpected altitude capture.*

FLIGHT PARAMETERS....................................MONITOR

- *Crosscheck distances versus altitudes as published on the charts.*
- *If approaching on a conventional radio NAVAID procedure, monitor the lateral and vertical guidance using raw data.*
- *For approaches using NAV FPA , monitor XTK error on ND to check the lateral guidance.*
- *The PM calls out if excessive lateral deviation occurs:*
  - *Approach using NAV MODE: XTK > 0.1 NM*
  - *Approach using LOC MODE: LOC ½ dot*
  - *Approach using TRK MODE:*
    - *VOR: ½ dot or 2.5 °*
    - *NDB: 5 °*

  Refer to PRO-NOR-SOP-90 Flight Parameters in Approach

Ident.: PRO-NOR-SOP-18-C-E-00015017.0001001 / 29 MAY 13

<u>AT ENTERED MINIMUM +100 FT</u>

ONE HUNDRED ABOVE....................................MONITOR OR ANNOUNCE

Ident.: PRO-NOR-SOP-18-C-E-00014555.0002001 / 04 JUL 17

<u>AT ENTERED MINIMUM</u>

MINIMUM....................................MONITOR OR ANNOUNCE

Below minimum, the visual references must be the primary references until landing.
For more information regarding transition to visual references, *Refer to FCTM/PR-NP-SOP-250 Transition to Visual References*.

■ **If visual references are sufficient:**

CONTINUE....................................ANNOUNCE
AP ....OFF

FD ....OFF

- *The PF orders the PM to set both FDs OFF.*

RUNWAY TRACK...CHECK/SET

- *If needed, the PF orders the PM to set the runway track.*

■ **If visual references are not sufficient:**

GO AROUND..ANNOUNCE

- *Initiate a go around.*

Ident.: PRO-NOR-SOP-18-C-E-00014554.0002001 / 23 JUN 15

MANAGEMENT OF DEGRADED NAVIGATION

● **For VOR and NDB approaches in NAV FPA, if lateral guidance is not satisfactory:**

- Be prepared to continue the approach with reference to appropriate raw data by reverting to TRK FPA.

● **For RNAV(GNSS) approaches, with LNAV minima:**

- Use the appropriate remaining AP FD in the following cases:
  - GPS PRIMARY LOST on one ND
  - NAV ACCUR DOWNGRAD on one FMGS
- Discontinue the approach in the following cases, if external visual references are not sufficient to proceed visually:
  - GPS PRIMARY LOST on both NDs
  - XTK > 0.3 NM
  - NAV FM /GPS POS DISAGREE on ECAM
  - NAV ACCUR DOWNGRAD on both FMGS

CIRCLING APPROACH

Applicable to: ALL

Ident.: PRO-NOR-SOP-18-C-F-00014570.0001001 / 29 MAY 13

GENERAL

The circling approach is the visual phase of an instrument approach to bring an aircraft into position for landing on a runway which is not suitably located for a straight-in approach.

CAUTION	The flight crew must conduct the flight within the circling area, while maintaining required visual references at all times.

Ident.: PRO-NOR-SOP-18-C-F-00014569.0001001 / 29 MAY 13

APPROACH PREPARATION

For a circling approach, the approach preparation should include the following additional items in the FMS programming.

F-PLN

Introduce the instrument approach procedure, including the missed approach procedure for instrument approach.

SEC F-PLN

The landing runway must be inserted into the SEC F-PLN.

Update the SEC F-PLN as follows:
- Copy the active F-PLN
- Revise the landing runway.

Ident.: PRO-NOR-SOP-18-C-F-00014568.0001001 / 29 MAY 13

INSTRUMENT APPROACH

The flight crew flies a stabilized approach at "F" speed, configuration 3 and landing gear down.

Ident.: PRO-NOR-SOP-18-C-F-00014567.0001001 / 29 MAY 13

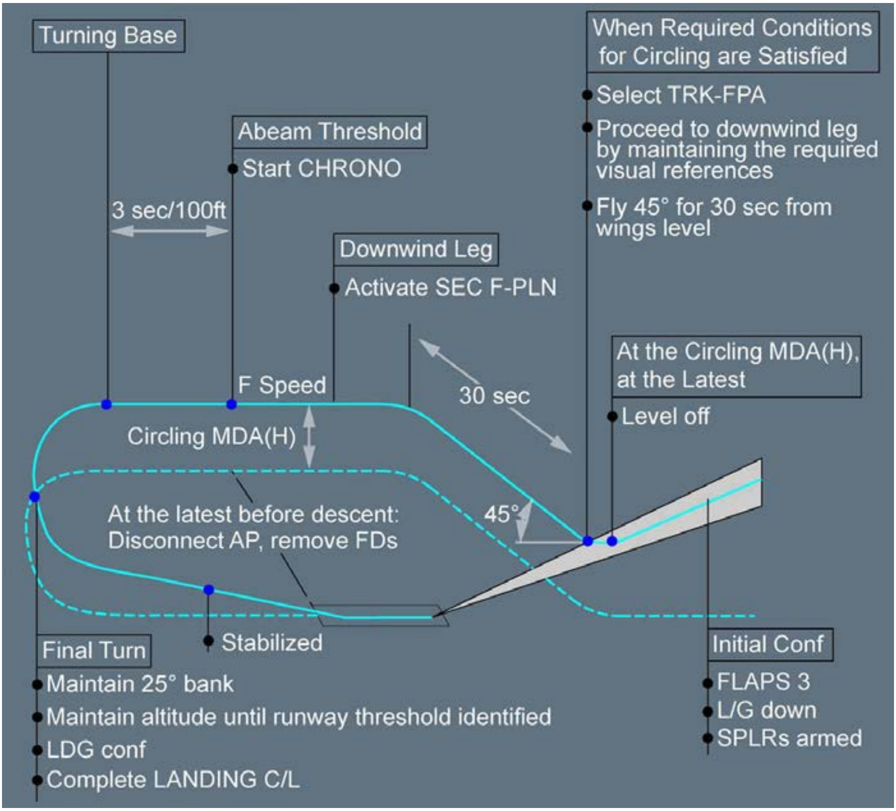
CIRCLING APPROACH

- **At the Circling MDA(H) at the latest:**
  Perform a level off
- **At MAP, if the flight crew finds no visual reference:**
  Initiate a go around
- **When required conditions for circling are satisfied:**
  Select TRK FPA
  Proceed to downwind leg
  At any time in the downwind leg, activate the SEC F-PLN
  Disconnect the AP and remove the FDs at the latest before starting the descent toward the runway
  Set the landing configuration when appropriate, but ensure early stabilization in final.

If, at any time during the circling procedure, the required visual references are lost, initiate a go around following the missed approach of the initial instrument approach (unless otherwise specified).

Ident.: PRO-NOR-SOP-18-C-F-00014566.0001001 / 30 JUN 16

CIRCLING APPROACH PATTERN



RNAV VISUAL APPROACH

Applicable to: ALL

Ident.: PRO-NOR-SOP-18-C-G-00016048.0001001 / 23 DEC 14

GENERAL

The aircraft navigates using the RNAV system, but the position is monitored by visual reference to the ground, obstacles and other traffic.
RNAV visual approach must be stored and retrievable from the Navigation Database.

Ident.: PRO-NOR-SOP-18-C-G-00016049.0001001 / 23 DEC 14

EQUIPMENT REQUIRED

- 1 FMS
- 1 GPS or 2 DME to update FM position
- Additional requirement if indicated on the approach chart.

Ident.: PRO-NOR-SOP-18-C-G-00016050.0001001 / 17 MAR 17

FMGC GUIDANCE MODE

- **If no required accuracy is published:**

  The use of FMGC guidance mode is at flight crew discretion.

- **If RNAV 1 or RNP 1 is required on the published approach chart:**

  The flight crew should use adequate FMGC guidance modes.

Note: *The use of lateral and vertical managed guidance modes reduces the crew workload and improves energy management.*

For RNAV VISUAL approach including RF legs, *Refer to FCTM/PR-NP-SP-30 General*for RF leg flying technic.

Ident.: PRO-NOR-SOP-18-C-G-00016051.0001001 / 23 DEC 14

DESCENT PREPARATION

For approach data insertion in the FMS , keep the BARO /MDA field empty on the PERF APPR Page.

Ident.: PRO-NOR-SOP-18-C-G-00016052.0001001 / 23 DEC 14

DESCENT

For RNAV VISUAL approaches requiring GPS , check that GPS PRIMARY is available on at least 1 FMS.

Ident.: PRO-NOR-SOP-18-C-G-00016053.0001001 / 21 MAR 17

FINAL APPROACH

The flight crew must disconnect the AP at the latest at the Minimum Use Height of the AP.
Refer to LIM-AFS-10 Autopilot Function

VISUAL APPROACH

Applicable to: ALL

Ident.: PRO-NOR-SOP-18-C-H-00014574.0001001 / 29 MAY 13

GENERAL

Perform the approach on a nominal 3 ° glideslope using visual references. Approach to be stabilized by 500 ft AGL on the correct approach path, in the landing configuration, at VAPP.

Method:
- The AP is not used
- Both FDs are OFF
- FPV use is recommended
- A/THR use is recommended with managed speed.

Bear in mind the possible risk of optical illusions due to hindered night vision.

Ident.: PRO-NOR-SOP-18-C-H-00014573.0001001 / 08 AUG 13

INITIAL/INTERMEDIATE APPROACH

The flight plan selected on the MCDU should include the selection of the landing runway. The downwind leg may also be part of the flight plan. This may be a useful indication of the aircraft position in the circuit on the ND.
However, visual references must be used.
Therefore, at the beginning of the downwind leg:

Manually ACTIVATE APPR
Select FDs to OFF
Select TRK FPA to have FPV displayed
Check A/THR active.
Extend the downwind leg to 3 s/100 ft (± 1 s/1 kt of headwind / tailwind).
Turn into base leg with a maximum of 30 ° of bank. Descent with approximate FPA, in FLAPS 2, at F speed.

Ident.: PRO-NOR-SOP-18-C-H-00014572.0001001 / 29 MAY 13

FINAL APPROACH

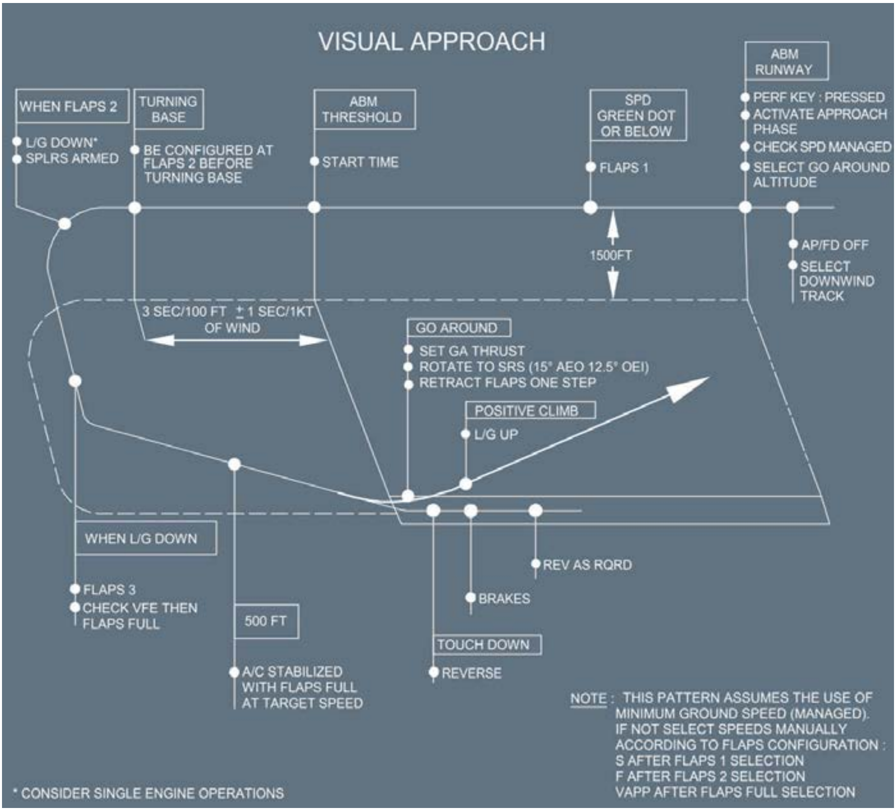
The speed trend arrow and FPV help the flight crew make timely and correct thrust settings (if in manual thrust), and approach path corrections.

Avoid descending through the correct approach path with idle thrust. (Late recognition of this situation without a prompt thrust increase may lead to considerable speed decay and altitude loss).

Ensure that the aircraft is stabilized on the final descent path at VAPP (or ground speed mini) in the landing configuration with the thrust stabilized (usually above idle) at 500 ft above airfield elevation or as restricted by Operator policies/regulations.
If the aircraft is not stabilized, the flight crew must initiate a go around, unless they think that only small corrections are necessary to rectify minor deviations from stabilized conditions due, amongst others, to external perturbations.
Avoid any tendency to “duck under” in the late stages of the approach.
Avoid destabilizing the approach in the last 100 ft, in order to have the best chance of performing a good touchdown at the desired position.

Ident.: PRO-NOR-SOP-18-C-H-00014571.0001001 / 08 DEC 14

VISUAL APPROACH (1 OR 2 ENGINES) PATTERN



MANUAL LANDING

Applicable to: ALL

Ident.: PRO-NOR-SOP-19-A-00010351.0011001 / 25 APR 17

FLARE

The cockpit cut-off angle is 20 °.

- **In stabilized approach conditions, the flare height is approximately 30 ft:**

  FLARE.. PERFORM

  Avoid flaring high. *Refer to Ground Clearance Diagram.*

  ATTITUDE.. MONITOR

  THRUST levers.. IDLE

  If autothrust is engaged, it automatically disconnects when the pilot sets both thrust levers to the IDLE detent.

  In manual landing conditions, the "RETARD" callout is triggered at 20 ft radio height, in order to remind the pilot to retard the thrust levers.

  Note: *The ground spoilers extension is inhibited if:*
  - *Both thrust levers remain above the idle detent, or*
  - *One thrust lever is above idle and one thrust lever is at idle detent.*

Ident.: PRO-NOR-SOP-19-A-00010352.0001001 / 30 JUN 15

AT TOUCHDOWN

DEROTATION.. INITIATE

- *Lower the nosewheel without undue delay.*
- *The PM continues to monitor the attitude.*

ALL THRUST LEVERS.. REV MAX or REV IDLE

The flight crew must select reverse thrust immediately after main landing gear touchdown.

The flight crew must immediately select REV MAX, if any of the following occurs at any time during the landing:
- *An emergency*
- *The deceleration is not as expected*
- *A failure affects the landing performance*
- *A long flare or a long touchdown*
- *An unexpected tailwind.*

A small pitch up may occur during thrust reversers deployment before nose landing gear touchdown. However, the flight crew can easily control this pitch up.
As soon as the flight crew selects reverse thrust, they must perform a full-stop landing.

GROUND SPOILERS.. CHECK/ANNOUNCE

Check that the WHEEL SD page displays the ground spoilers extended after touchdown.

If no ground spoilers are extended:
- *Verify and confirm that both thrust levers are set to IDLE or REV detent.*
- *Set both thrust reverser levers to REV MAX, and fully press the brake pedals.*

Note: If ground spoilers are not armed, ground spoilers extend at reverser thrust selection.

REVERSERS.. CHECK/ANNOUNCE

Check that the ECAM E/WD displays that the reverse deployment is as expected (REV green).

DIRECTIONAL CONTROL...MONITOR/ENSURE

- *Monitor directional control, if the rollout is automatic.*
- *Ensure directional control, if rollout is manual. Use rudder pedals for directional control.*
- *Do not use the nosewheel steering control handle before reaching taxi speed.*
- *During rollout, the flight crew should avoid sidestick inputs (either lateral or longitudinal).*
- *If directional control problems are encountered, the flight crew should reduce thrust to reverse idle until directional control is satisfactory.*

BRAKES... AS RQRD

- *Monitor the autobrake, if it is ON. When required, brake with the pedals*
- *Although the green hydraulic system supplies the braking system, if pedals are pressed rapidly, a brake pressure indication appears briefly on the BRAKE PRESS indicator.*
- *Braking may begin before the nosewheel has touched down, if required for performance reasons. However, when comfort is the priority, the flight crew should delay braking until the nosewheel has touched down.*

Note: If no ground spoilers are extended, the autobrake is not activated.

DECELERATION.. CHECK/ANNOUNCE

The deceleration is felt by the flight crew, and confirmed by the speed trend on the PFD.

Ident.: PRO-NOR-SOP-19-A-00010353.0001001 / 17 JUL 13

AT 70 KT

SEVENTY KNOTS.. ANNOUNCE
BOTH THRUST LEVERS.. REV IDLE

It is better to reduce thrust when passing 70 kt. However, high levels of reverse thrust may be used in order to control aircraft speed in the case of an emergency.

CAUTION	*Avoid the use of high levels of reverse thrust at low airspeed, unless required due to an emergency. The distortion of the airflow, caused by gases reentering the compressor, can cause engine stalls that may result in excessive EGT.*

Ident.: PRO-NOR-SOP-19-A-00010354.0001001 / 17 MAR 11

AT TAXI SPEED

BOTH THRUST LEVERS....................FWD IDLE

- *When reaching taxi speed, and before leaving the runway, deselect the reversers.*
- *On snow-covered grounds, the reversers should be stowed when the aircraft speed reaches 25 kt.*
- *When deselecting the reversers, be careful not to apply forward thrust by moving the thrust levers beyond the FWD IDLE position.*

CAUTION	*Except in an emergency, do not use the reverse thrust to control the aircraft speed while on taxiways.*

On taxiways, the use of reversers, even when restricted to idle thrust, would have the following effects:
- *The engines may ingest fine sand and debris that may be detrimental to the engines and airframe systems.*
- *On snow–covered areas, snow will recirculate into the air inlet, and may cause an engine flameout or rollback.*

Ident.: PRO-NOR-SOP-19-A-00010355.0001001 / 30 MAR 15

BEFORE 20 KT

AUTO BRK.................... DISENGAGE

Disengage the autobrake to avoid some brake jerks at low speed.
The flight crew should use brake pedals to disengage the autobrake.

AUTOLAND

Applicable to: ALL

Ident.: PRO-NOR-SOP-19-B-00020897.0001001 / 20 MAR 17

The following items must be performed in addition to previous *Refer to PRO-NOR-SOP-APPROACH USING LOC G/S*.

Ident.: PRO-NOR-SOP-19-B-00020898.0001001 / 20 MAR 17

AT 350 FT RA

ILS /GLS /MLS COURSE on PFD....................CHECK

If the ILS /GLS /MLS course pointer and the runway track differ by more than 5 °, autoland is not authorized.

Ident.: PRO-NOR-SOP-19-B-00020899.0001001 / 20 MAR 17

AT 40 FT RA

FLARE mode....................CHECK ENGAGED/ANNOUNCE

Monitor flare by flight instrument.
If NO FLARE mode at 30 ft, discontinue the approach or perform a manual landing if visual references are acquired.

Ident.: PRO-NOR-SOP-19-B-00020900.0001001 / 20 MAR 17

AT 30 FT RA

THRUST IDLE....................CHECK

Monitor thrust reduction.

Ident.: PRO-NOR-SOP-19-B-00020901.0001001 / 20 MAR 17

AT 10 FT RA

BOTH THRUST LEVERS....................IDLE

Retard thrust levers at the "RETARD" autocallout.

LATERAL GUIDANCE....................MONITOR

Monitor the lateral guidance by using external references.

Ident.: PRO-NOR-SOP-19-B-00020902.0001001 / 11 JUL 17

AT TOUCHDOWN

Note: In the case of NWS or Anti-Skid failure, set the AP OFF at touchdown.

ROLL OUT mode....................CHECK ENGAGED/ANNOUNCE
BOTH THRUST LEVERS....................REV MAX or REV IDLE

The flight crew must select reverse thrust immediately after main landing gear touchdown.

The flight crew must immediately select REV MAX, if any of the following occurs at any time during the landing:
- *An emergency*
- *The deceleration is not as expected*
- *A failure affects the landing performance*

- *A long flare or a long touchdown*
- *An unexpected tailwind.*

A small pitch up may occur during thrust reversers deployment before nose landing gear touchdown. However, the auto-flight system will control this pitch up.
As soon as the flight crew selects reverse thrust, they must perform a full-stop landing.

GROUND SPOILERS.. CHECK/ANNOUNCE

Check that the WHEEL SD page displays the ground spoilers extended after touchdown.

If no ground spoilers are extended:
- *Verify and confirm that both thrust levers are set to IDLE or REV detent.*
- *Set both thrust reverser levers to REV MAX, and fully press the brake pedals.*

Note: If ground spoilers are not armed, ground spoilers extend at reverser thrust selection.

REVERSERS... CHECK/ANNOUNCE

Check that the ECAM E/WD displays that the reverse deployment is as expected (REV green).

DIRECTIONAL CONTROL..MONITOR/ENSURE

- *Monitor directional control, if the rollout is automatic.*
- *Ensure directional control, if rollout is manual. Use rudder pedals for directional control.*
- *Do not use the nosewheel steering control handle before reaching taxi speed.*
- *During rollout, the flight crew should avoid sidestick inputs (either lateral or longitudinal).*
- *If directional control problems are encountered, the flight crew should reduce thrust to reverse idle until directional control is satisfactory.*

BRAKES.. AS RQRD

- *Monitor the autobrake, if it is ON. When required, brake with the pedals*
- *Although the green hydraulic system supplies the braking system, if pedals are pressed rapidly, a brake pressure indication appears briefly on the BRAKE PRESS indicator.*
- *Braking may begin before the nosewheel has touched down, if required for performance reasons. However, when comfort is the priority, the flight crew should delay braking until the nosewheel has touched down.*

Note: If no ground spoilers are extended, the autobrake is not activated.

DECELERATION.. CHECK/ANNOUNCE

The deceleration is felt by the flight crew, and confirmed by the speed trend on the PFD.

Ident.: PRO-NOR-SOP-19-B-00020904.0001001 / 11 JUL 17

AT 70 KT

SEVENTY KNOTS.. ANNOUNCE

BOTH THRUST LEVERS... REV IDLE

It is better to reduce thrust when passing 70 kt. However, high levels of reverse thrust may be used in order to control aircraft speed in the case of an emergency.

CAUTION	*Avoid the use of high levels of reverse thrust at low airspeed, unless required due to an emergency. The distortion of the airflow, caused by gases reentering the compressor, can cause engine stalls that may result in excessive EGT.*

Ident.: PRO-NOR-SOP-19-B-00020905.0001001 / 20 MAR 17

BEFORE 20 KT

AUTO BRK... DISENGAGE

Disengage autobrake before 20 kt to avoid some brake jerks at low speed.
The flight crew should use brake pedals to disengage the autobrake.

Ident.: PRO-NOR-SOP-19-B-00020906.0001001 / 20 MAR 17

END OF ROLL OUT

BOTH THRUST LEVERS...FWD IDLE

- *When reaching taxi speed, and before leaving the runway, deselect the reversers.*
- *On snow-covered grounds, the reversers should be stowed when the aircraft speed reaches 25 kt.*
- *When deselecting the reversers, be careful not to apply forward thrust by moving the thrust levers beyond the FWD IDLE position.*

CAUTION	*Except in an emergency, do not use the reverse thrust to control the aircraft speed while on taxiways.*

On taxiways, the use of reversers, even when restricted to idle thrust, would have the following effects:
- *The engines may ingest fine sand and debris that may be detrimental to the engines and airframe systems.*
- *On snow–covered areas, snow will recirculate into the air inlet, and may cause an engine flameout or rollback.*

AP...OFF

Disengage the APs at the end of the roll out (when leaving the runway at the latest).

GO AROUND WITH FD

Applicable to: ALL

Ident.: PRO-NOR-SOP-20-A-00011576.0006001 / 30 JUN 15

Apply the following three actions simultaneously:

THRUST LEVERS..TOGA

If TOGA thrust is not required, set the thrust levers to TOGA detent then retard the thrust levers as required. This enables to engage the GO-AROUND phase, with associated AP /FD modes.
The flight crew may use CL detent to have benefit of A/THR.

Note: *If the thrust levers are not set briefly to TOGA detent, the FMS does not engage the GO-AROUND phase, and flying over, or close to the airport will sequence the Destination waypoint in the F-PLN.*

ROTATION...PERFORM

Initiate rotation towards 15 ° of pitch with all engines operative (approximately 12.5 ° if one engine is out) to get a positive rate of climb, then follow the SRS Flight Director pitch bars orders.
When near the ground, avoid excessive rotation rate in order to prevent a tail strike.

GO AROUND ....ANNOUNCE
FLAPS lever...SELECT AS RQRD

Retract one step of flaps.

FMA...ANNOUNCE

The following modes are displayed: MAN TOGA / SRS / GA TRK / A/THR (in blue).

POSITIVE CLIMB ....ANNOUNCE
L/G UP ....ORDER
L/G...SELECT UP
NAV or HDG mode...AS RQRD

Reselect NAV or HDG, as required (minimum height 100 ft).

AP...AS RQRD

Note: *Go-around may be flown with both autopilots engaged. Whenever any other mode engages, AP 2 disengages.*

Ident.: PRO-NOR-SOP-20-A-00011579.0002001 / 13 AUG 10

AT GO-AROUND THRUST REDUCTION ALTITUDE

THRUST levers... CL

LVR CLB flashing on FMA.

Ident.: PRO-NOR-SOP-20-A-00011581.0001001 / 23 JUN 15

AT GO-AROUND ACCELERATION ALTITUDE

Monitor that the target speed increases to green dot.

- **If the target speed does not increase to green dot:**
  ALT knob...CHECK and PULL
- **At F speed:**
  FLAPS 1...ORDER
  FLAPS 1...SELECT
- **At S speed:**
  FLAPS 0...ORDER
  FLAPS 0...SELECT
  GND SPLRS...DISARM
  NOSE sw...OFF
  RWY TURN OFF sw...OFF
  OTHER EXTERIOR LIGHTS...AS RQRD
  The flight crew can maintain the LAND LIGHTS selector set to ON, according to airline policy or regulatory recommendations.

Note: *Consider the next step:*
- *Engage NAV mode, to follow the published missed approach procedure, or*
- *Prepare for a second approach by selecting the ACTIVATE APP PHASE, and CONFIRM on the PERF page.*

AFTER TAKEOFF/CLIMB CHECKLIST down to the line...COMPLETE

AFTER LANDING

Applicable to: ALL

Ident.: PRO-NOR-SOP-21-A-00011841.0001001 / 06 DEC 16

GRND SPLRS.. DISARM

Ident.: PRO-NOR-SOP-21-A-00011840.0001001 / 29 SEP 15

LAND LIGHTS selector .... RETRACT
OTHER EXTERIOR LIGHTS... AS RQRD

External lights can be turned off, unless they are needed.
Set the NAV & LOGO to ON, as required, to turn on the navigation and logo lights .
L2 *The PF may ask the PM to set the exterior lights.*

Ident.: PRO-NOR-SOP-21-A-00011842.0001001 / 22 APR 16

RADAR...OFF

Ident.: PRO-NOR-SOP-21-A-00011843.0001001 / 06 JAN 16

PREDICTIVE WINDSHEAR SYSTEM ....OFF

Switching the radar and predictive windshear system to OFF after landing avoids risk of radiating persons at the gate area.

Ident.: PRO-NOR-SOP-21-A-00011844.0001001 / 13 DEC 10

ENG MODE selector..NORM

Ident.: PRO-NOR-SOP-21-A-00011845.0001001 / 08 AUG 13

FLAPS..RETRACT

Set the FLAPS lever to position 0.
If the approach was made in icing conditions, or if the runway was contaminated with slush or snow, do not retract the flaps and slats until after engine shutdown and after the ground crew has confirmed that flaps and slats are clear of obstructing ice.
On ground, hot weather conditions may cause overheating to be detected around the bleed ducts in the wings, resulting in "AIR L (R) WING LEAK" warnings. Such warnings may be avoided during transit by keeping the slats in Configuration 1 when the OAT is above 30 °C.
To avoid damage on the RTLU (Rudder Travel Limit Unit) mechanical stop, the SLATS/FLAPS should be retracted before all ADIRS are set to OFF simultaneously.

Ident.: PRO-NOR-SOP-21-A-00011846.0001001 / 04 JUL 17

TCAS.. STBY

Ident.: PRO-NOR-SOP-21-A-00011847.0001001 / 20 JAN 15

ATC.. AS RQRD

ATC is set in accordance with airport requirements.

Ident.: PRO-NOR-SOP-21-A-00011848.0001001 / 17 MAR 15

APU.. START

APU START may be delayed until just prior to engine shutdown.

Note: Prolonged use of the APU may cause a fuel imbalance. Pay particular attention to the fuel imbalance limitation for the next take-off.

Ident.: PRO-NOR-SOP-21-A-00011849.0005001 / 17 MAR 17

CAUTION	In icing conditions (*Refer to LIM-ICE_RAIN Definition of Icing Conditions*), the flight crew must turn on the engine anti-ice and should not wait until seeing ice building up.

ANTI ICE.. AS RQRD

- *If engine anti-ice is used, take care to control taxi speed, especially on wet or slippery surfaces. (N1 ground idle is increased).*
- *During ground operation, when in icing conditions for more than 30 min, the following procedure should be applied for ice shedding:*

CAUTION	*If, during thrust increase, the aircraft starts to move, immediately retard the thrust levers to IDLE.*

If ground surface conditions and the environment permit, the flight crew should accelerate the engines to approximately 70 % of N1 for 30 s at intervals not greater than 30 min.
If ground surface or environment do not permit to accelerate the engine to 70 % N1, then power setting and dwell time should be as high as practical.
When operating in conditions of freezing rain, freezing drizzle, freezing fog or heavy snow, ice shedding may be enhanced, by additional run ups at intervals, to not exceed 10 min, advancing throttles to 70 % N1 momentarily (no hold time).

Ident.: PRO-NOR-SOP-21-A-00011850.0001001 / 17 MAR 17

BRAKE TEMPERATURE..CHECK

- *Check brake temperature on the WHEEL SD page for discrepancies and high temperature*
- *Maintenance action is due in the following cases:*
  - *The temperature difference between two brakes of a gear is more than 150 °C, and the temperature of one of these brakes is above or equal to 600 °C, or*
  - *The temperature difference between two brakes of a gear is more than 150 °C, and the temperature of one of these brakes is below or equal to 60 °C, or*
  - *The difference between the average temperature of the left gear brakes (combination of body and wing L/G s) and right brakes (combination of body and wing L/Gs) is above or equal to 200 °C, or*
  - *The temperature of one brake exceeds 900 °C.*

BRK FAN pb-sw ....AS REQUIRED

When the turnaround time is short or if the temperature of any brake is likely to exceed 500 °C, use the brake fans without delay. In other cases, the flight crew should delay brake fans selection to 5 min after landing, or approaching the gate, whichever occurs first.

L2 *For more information, Refer to FCTM/PR-NP-SOP-270 Use of Brake Fans.*

Ident.: PRO-NOR-SOP-21-A-00011851.0001001 / 10 AUG 10

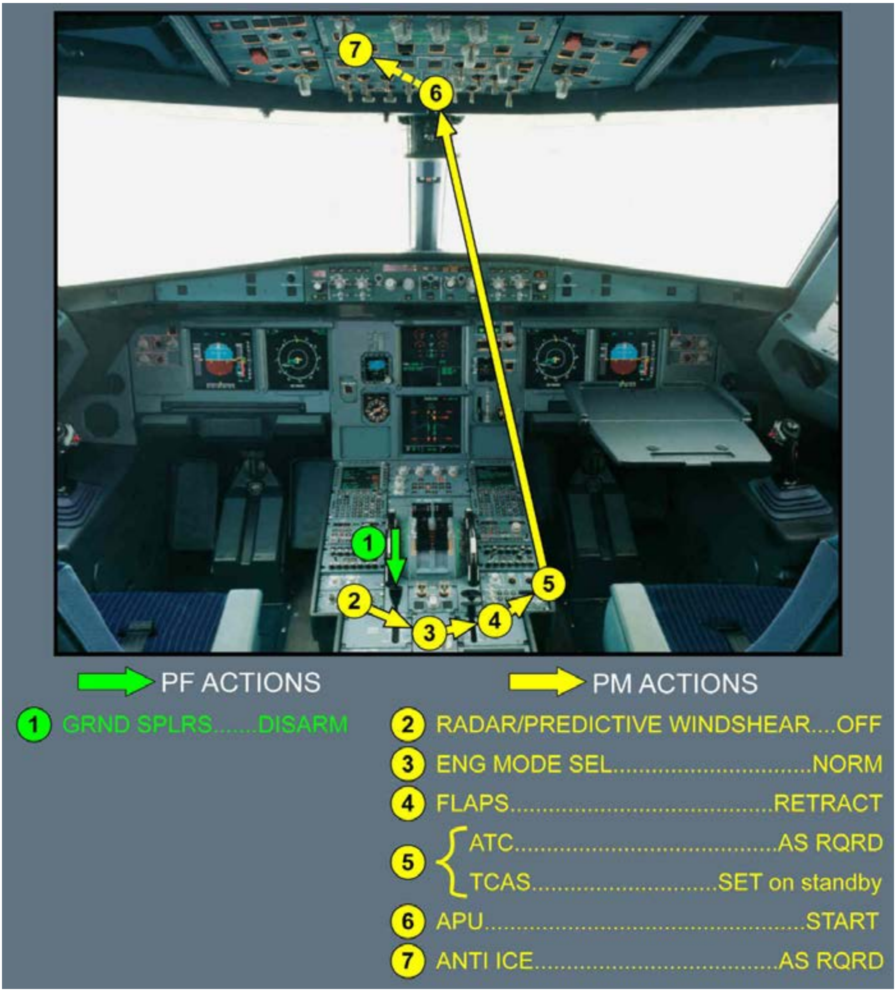
AFTER LANDING CHECKLIST..COMPLETE

Ensure that the after-landing checks are completed, once the aircraft has cleared the runway.

Ident.: PRO-NOR-SOP-21-A-00020077.0001001 / 17 MAR 17

AFTER LANDING - FLOW PATTERN

After Landing Flow Pattern



PARKING

Applicable to: ALL

Ident.: PRO-NOR-SOP-22-A-00011852.0001001 / 21 MAR 17

Prior to performing this check, consider “GROUND OPERATIONS IN HEAVY RAIN” (*Refer to PRO-NOR-SUP-ADVWXR Ground Operations in Heavy Rain*).

Ident.: PRO-NOR-SOP-22-A-00011853.0003001 / 20 JUL 15

ACCU PRESS indicator .... CHECK

The ACCU PRESS indication must be in the green band. In case of low accumulator pressure, chocks are required before engine 1 shutdown.

PARKING BRAKE handle .... ON

When one brake temperature is above 500 °C (or 350 °C with brake fans ON), avoid applying the parking brake, unless operationally necessary.

BRAKES PRESS indicator .... CHECK

Check for normal indications.

Ident.: PRO-NOR-SOP-22-A-00011854.0001001 / 13 AUG 10

ANTI-ICE .... OFF

Ident.: PRO-NOR-SOP-22-A-00011855.0001001 / 13 AUG 10

APU BLEED pb-sw .... ON

Select APU bleed ON, just before engine shutdown, to prevent engine exhaust fumes from entering the air conditioning.

Ident.: PRO-NOR-SOP-22-A-00011856.0004001 / 17 MAR 17

- **If the APU is not available:**
  EXT PWR pb .... ON
- **No less than 3 min after high thrust operations:**
  ALL ENG MASTERS .... OFF

CAUTION	*If JP4 fuel is used at ambient temperatures higher than 10 °C, dry motor the engines for 2 min after engine shutdown. This dry motor period should start approximately 90 s after the master lever is selected OFF.*

Check that engine parameters decrease.

The DOOR/OXY SD page is displayed on the lower ECAM display.

L2 <u>Note:</u> *The flight crew should operate the engines at or near idle thrust for a cooling period of 3 min before engine shutdown, in order to thermally stabilize the engines.*

Idle reverse thrust and normal thrust to maneuver during taxi (i.e. at or near idle), are not considered as high thrust operations. Therefore, both of the following applies:
- *If the flight crew uses idle reverse thrust for landing and normal thrust to maneuver during taxi after landing, the cooling period starts when the flight crew retards the thrust lever during the flare*
- *If the flight crew uses maximum reverse for landing, the cooling period starts when the flight crew sets the thrust lever to idle reverse during the landing rollout.*

However, if operationally necessary, all engines can be shut down when the aircraft arrives at the gate, regardless of the time necessary for landing.
Before engine shutdown, routine cooling periods that last less than the recommended time, can result in engine degradation.

Ident.: PRO-NOR-SOP-22-A-00011858.0001001 / 04 MAR 14

SLIDES...CHECK DISARMED

Check slides disarmed on the <u>DOOR/OXY</u> SD page. Warn the cabin crew, if any slide is not disarmed.

Ident.: PRO-NOR-SOP-22-A-00011860.0001001 / 04 MAR 14

SEAT BELTS sw...OFF

Ident.: PRO-NOR-SOP-22-A-00011859.0001001 / 23 JUN 15

BEACON lights...OFF

Turn off the BEACON lights, when all engines are spooled down.

OTHER EXTERIOR LIGHTS...AS RQRD

Ident.: PRO-NOR-SOP-22-A-00011857.0001001 / 13 AUG 10

GROUND CONTACT...ESTABLISH

Establish ground communication.
Check chocks in place.

Ident.: PRO-NOR-SOP-22-A-00011862.0001001 / 13 AUG 10

FUEL PUMPS...OFF

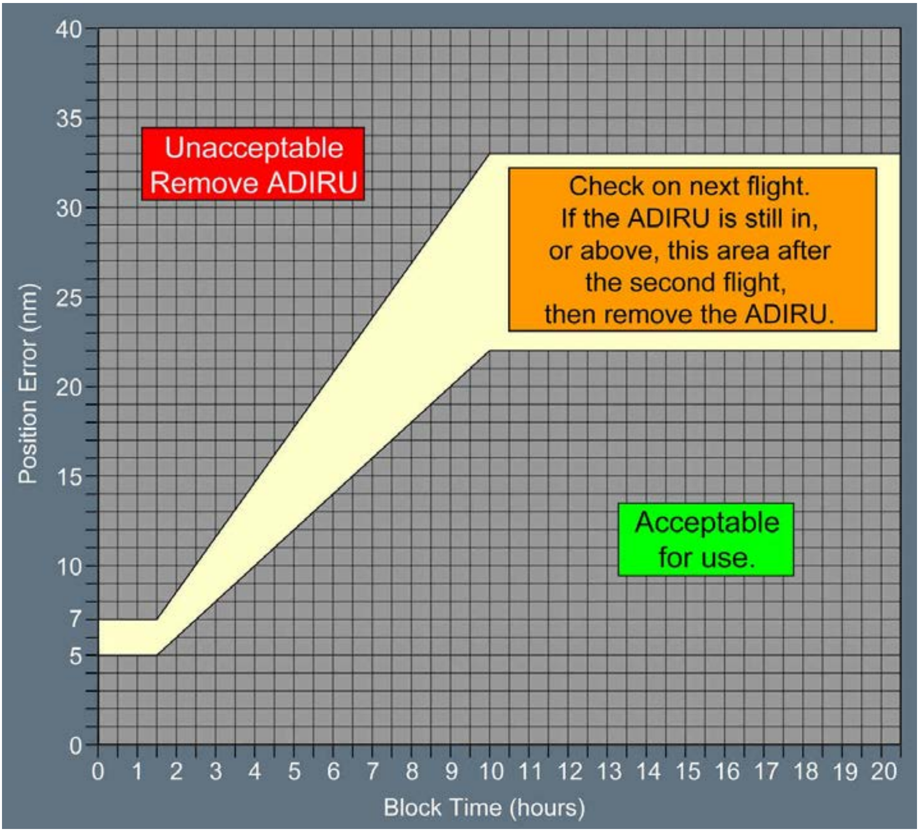
Ident.: PRO-NOR-SOP-22-A-00011864.0001001 / 04 JUL 17

ATC...STBY

Ident.: PRO-NOR-SOP-22-A-00011865.0001001 / 20 OCT 16

IRS PERFORMANCE..CHECK

- *The NAV TIME is the cumulated block time since the latest IRS alignment (fast or complete).*
- *On the MCDU POSITION MONITOR page, read the deviation of each IRS position from the FMGC position and check that the value does not exceed the following:*



Ident.: PRO-NOR-SOP-22-A-00011866.0001001 / 13 AUG 10

FUEL QUANTITY..CHECK

Check that the sum of the fuel on board and the fuel used is consistent with the fuel on board at departure. If an unusual discrepancy is found, maintenance action is due.

Ident.: PRO-NOR-SOP-22-A-00011867.0001001 / 24 FEB 15

STS pb (ECAM Control panel)....................................PRESS

Check the STATUS page.

Ident.: PRO-NOR-SOP-22-A-00011868.0001001 / 13 AUG 10

(BRAKE FAN)....................................OFF

Switch off, when not required.

Ident.: PRO-NOR-SOP-22-A-00011869.0002001 / 13 AUG 10

PARKING BRAKE....................................AS RQRD

The parking brake should be released after chocks are in place, if one brake temperature is above 300 °C (or above 150 °C with brake fans ON).
Releasing the parking brake prevents the critical structures from being exposed to high temperature levels for an extended time. However, if operational conditions dictate (e.g. slippery tarmac), the parking brake may remain applied.
When parking with a flat tire on the nose gear, keep the parking brake on, to avoid aircraft yawing at parking brake release.

Ident.: PRO-NOR-SOP-22-A-00011870.0001001 / 13 AUG 10

DUs....................................DIM

Dim EFIS , ECAM and MCDU display units.

Ident.: PRO-NOR-SOP-22-A-00014395.0001001 / 20 MAR 17

EFB

EFB/eQRH transmitting mode....................................CONSIDER

In accordance with the Operator's policy or, as required by operational regulations.

- **If performing transit stop:**
  eQRH My Aircraft/FLIGHT....................................CLEAR

Ident.: PRO-NOR-SOP-22-A-00011873.0001001 / 13 AUG 10

PARKING CHECKLIST....................................COMPLETE

Ident.: PRO-NOR-SOP-22-A-00011874.0001001 / 13 AUG 10

REPORT SEVERE ICING CONDITIONS

Report severe icing conditions in the log book, requiring inspections of the fan accoustic panels of the engines during the walkaround.

SECURING THE AIRCRAFT

Applicable to: ALL

Ident.: PRO-NOR-SOP-23-A-00010336.0001001 / 17 MAR 17

GENERAL

Prior to performing this check, the following SUP Adverse Weather procedures should be taken into account when appropriate:

- Securing the aircraft for cold soak (*Refer to PRO-NOR-SUP-ADVWXR Securing the Aircraft for Cold Soak*).
- Water system draining (*Refer to PRO-NOR-SUP-ADVWXR For Draining Water Procedure - Introduction*).
- Ground operations in heavy rain (*Refer to PRO-NOR-SUP-ADVWXR Ground Operations in Heavy Rain*).
- Operations on contaminated airports (*Refer to PRO-NOR-SUP-ADVWXR Parking*).
- Operations with volcanic ash, sand or dust (*Refer to PRO-NOR-SUP-ADVWXR Securing the Aircraft*).

Ident.: PRO-NOR-SOP-23-A-00010337.0001001 / 30 JUN 15

PARKING BRAKE

PARK BRK handle..CHECK ON

To reduce hydraulic leak rate in the brake accumulator, keep the parking brake on.

Ident.: PRO-NOR-SOP-23-A-00010338.0001001 / 05 AUG 10

OXYGEN CREW SUPPLY

OXYGEN CREW SUPPLY pb..OFF

Ident.: PRO-NOR-SOP-23-A-00010339.0001001 / 21 AUG 15

ADIRS

ALL IR MODE selectors..OFF

After the shutdown of the ADIRS , the flight crew must wait 10 s before the shutdown of the electrical supply. This time ensures that the ADIRS memorize the most recent data.

Ident.: PRO-NOR-SOP-23-A-00010340.0001001 / 05 AUG 10

EXTERIOR LIGHTS

EXTERIOR LIGHTS..OFF

Ident.: PRO-NOR-SOP-23-A-00010341.0001001 / 05 AUG 10

MAINTENANCE BUS

MAINT BUS sw..AS RQRD

Should electrical power be required for the crew or servicing personnel, consider setting the overhead MAINT BUS sw (in the forward cabin) to the ON position, prior to setting aircraft power to off.

Ident.: PRO-NOR-SOP-23-A-00010342.0001001 / 04 MAR 14

APU

APU BLEED pb-sw..OFF
APU MASTER SW..OFF

Switch off the APU after the passengers have disembarked.

Ident.: PRO-NOR-SOP-23-A-00010343.0002001 / 04 MAR 14

EMER EXIT LT sw..OFF
SIGNS sw..OFF

Ident.: PRO-NOR-SOP-23-A-00010344.0001001 / 05 AUG 10

EXTERNAL POWER

EXT PWR pb..AS RQRD

Ident.: PRO-NOR-SOP-23-A-00010345.0001001 / 05 AUG 10

BAT 1 AND 2

BAT 1 pb-sw and BAT 2 pb-sw..OFF

Wait until the APU flap is fully closed (about 2 min after the APU AVAIL light goes out), before switching off the batteries. Switching the batteries off before the APU flap is closed may cause smoke in the cabin during the next flight.
If the batteries are off while the APU is running, APU fire extinguishing is not available.

Ident.: PRO-NOR-SOP-23-A-00010346.0001001 / 05 AUG 10

SECURING THE AIRCRAFT CHECKLIST

SECURING THE AIRCRAFT CHECKLIST..COMPLETE

Ident.: PRO-NOR-SOP-23-A-00014412.0001001 / 20 MAR 17

ELECTRONIC FLIGHT BAG EFB

EFB/eQRH LAPTOPS..SWITCH OFF

COMMUNICATIONS AND STANDARD TERMS

Ident.: PRO-NOR-SOP-90-00011900.0001001 / 13 AUG 10
Applicable to: ALL

Standard phraseology is essential to ensure effective crew communication. The phraseology should be concise and exact. The following Chapter lists the callouts that should be used as standard. They supplement the callouts identified in the SOP.
These standard Airbus callouts are also designed to promote situational awareness, and to ensure crew understanding of systems and their use in line operation.

CHECKLIST CALLOUTS

Ident.: PRO-NOR-SOP-90-00011901.0001001 / 20 DEC 10
Applicable to: ALL

- “CHECK”: A command for the other pilot to check an item.
- “CHECKED”: A response that an item has been checked.
- “CROSSCHECKED”: A callout verifying information from both pilot stations.

If a checklist needs to be interrupted, announce: “HOLD CHECKLIST AT ___” and “RESUME CHECKLIST AT ___” for the continuation.
Upon completion of a checklist announce: “__CHECKLIST COMPLETE”.

ACTIONS COMMANDED BY PF

Applicable to: ALL

Ident.: PRO-NOR-SOP-90-A-00011902.0001001 / 13 AUG 10

GENERAL

The following commands do not necessarily initiate a guidance mode change, eg.: selected to managed/managed to selected. The intent is to ensure clear, consistent, standard communication between crewmembers.
All actions performed on the FCU and MCDU must be checked on the PFD and ND (eg.: “FL 350 blue”, “FL 200 magenta"). Ensure that the correct FCU knob is used, then verify indications on the PFD /ND.

Ident.: PRO-NOR-SOP-90-A-00011904.0001001 / 09 JUN 15

SET

The “SET” command means using an FCU knob to set a value, but not to change a mode.
SET is accomplished by only rotating the appropriate selection knob.

Example:
- ”SET GO AROUND ALTITUDE__FT”
- “SET FL __”
- “SET HDG __”

Ident.: PRO-NOR-SOP-90-A-00011905.0001001 / 20 DEC 10

MANAGE/PULL

The “MANAGE” command means pushing an FCU knob to engage, or arm, a managed mode or target.

The “PULL” command means pulling an FCU knob to engage a selected mode or target. Example:

- "PULL HDG 090”	(HDG/TRK knob is pulled and turned).
- “MANAGE NAV”	(HDG/TRK knob is pushed).
- “FL 190 PULL”	(ALT knob is turned and pulled).
- “FL 190 MANAGE”	(ALT knob is turned and pushed).
- “PULL SPEED 250 KNOTS”	(SPD/MACH knob is pulled and turned).
- “MANAGE SPEED”	(SPD/MACH knob is pushed).

Note: *If the value was previously set, there is no requirement to repeat the figure. Simply call e.g. PULL HDG: PULL SPEED: FL PULL.*

The VS/FPA knob has no managed function. The standard callouts for the use of this knob are as follows:
V/S Plus (or Minus) 700 PULL, or

FPA Minus 3 ° PULL	(V/S/FPA knob is turned and pulled)
PUSH TO LEVEL OFF	(V/S/FPA knob is pushed)

Ident.: PRO-NOR-SOP-90-A-00011906.0001001 / 13 AUG 10

ARM

The “ARM __” command means arming a system by pushing the specified FCU button.
e.g. : “ARM APPROACH”
e.g. : “ARM LOC.”

Ident.: PRO-NOR-SOP-90-A-00011907.0001001 / 13 AUG 10

ON/OFF

The simple ON or OFF command is used for the autopilot, flight directors, autothrust and the bird (flight path vector).
e.g.: BIRD ON (The HDG-V/S / TRK-FPA pb is pushed.)

FMA

Ident.: PRO-NOR-SOP-90-00011908.0001001 / 23 DEC 14
Applicable to: ALL

The PF should call out any FMA change, unless specified differently (e.g. CAT II & III task sharing). Therefore, the PF should announce:
- All armed modes with the associated color (e.g. blue, magenta): "G/S blue", "LOC blue".
- All active modes without the associated color (e.g. green, white): "NAV", "ALT".

The PM should check and respond, "CHECKED" to all FMA changes called out by the PF.

ALTITUDE

Ident.: PRO-NOR-SOP-90-00011909.0001001 / 23 DEC 14
Applicable to: ALL

The PM calls out "one thousand to go" when passing 1 000 ft before the cleared altitude or FL , and the PF calls out "checked".

FLAPS OR GEAR CALLOUTS

Applicable to: ALL

Ident.: PRO-NOR-SOP-90-B-00011910.0001001 / 23 DEC 14

FLAPS' CALLOUTS

FLAPS' CONFIGURATION	CALLOUT
1	"FLAPS ONE"
1 + F	"FLAPS ONE"
0	"FLAPS ZERO"

The reply will be given when selecting the new flap position.
e.g.:

	CALLOUT	REMARK
PF	"FLAPS ONE"	
PM	"SPEED CHECKED"	PM checks the speed: - Above the S or F speed and accelerating (Takeoff) - Below VFE next and decelerating (Approach)
	"FLAPS ONE"	PM selects the FLAPS lever position and replies after checking the blue number on the ECAM flaps indicator to confirm the correct selection has been made.

Ident.: PRO-NOR-SOP-90-B-00011911.0001001 / 23 DEC 14

GEAR CALLOUTS

	CALLOUT	REMARKS
PF	"GEAR UP (DOWN)"	
PM	"GEAR UP (DOWN)"	The PM selects the L/G lever position and replies after checking the red lights on the LDG GEAR indicator to confirm gear operation.

FLIGHT PARAMETERS

Applicable to: ALL

Ident.: PRO-NOR-SOP-90-C-00011912.0001001 / 22 MAR 17

APPROACH

During approach, the PM announces:
- "SPEED" if the speed decreases below the speed target -5 kt or increases above the speed target +10 kt.
- "SINK RATE" when the descent rate exceeds 1 000 ft/min
- "BANK" when bank angle becomes greater than 7 °
- "PITCH" when pitch attitude becomes lower than -2.5 ° or higher than +10 °
- "LOC" or "GLIDE" when either localizer or glide slope deviation is:
  - ½ dot LOC
  - ½ dot GS.
- "CROSS TRACK" when the XTK is greater than 0.1 NM
- "V/DEV" when the vertical deviation is greater than ½ dot
- "COURSE" when greater than ½ dot or 2.5 ° (VOR) or 5 ° (ADF).
- "__ FT HIGH (LOW)" at altitude checks points.

Note: The PM announces the attitude deviations until landing.

Ident.: PRO-NOR-SOP-90-C-00021570.0001001 / 22 MAR 17

LANDING

During landing, the PM announces:
- "PITCH PITCH", if the pitch attitude approaches the tail strike pitch limit indicator ⋞ , or reaches 10 °
- "BANK BANK", if the bank angle reaches 7 °.

Ident.: PRO-NOR-SOP-90-C-00011913.0001001 / 22 MAR 17

GO-AROUND

During a go-around, the PM announces:
- "BANK", if the bank angle becomes greater than 7 °
- "PITCH", if the pitch attitude becomes greater than 20 ° up or less than 10 ° up
- "SINK RATE", if there is no climb rate.

PF/PM DUTIES TRANSFER

Ident.: PRO-NOR-SOP-90-00011914.0001001 / 23 DEC 14
Applicable to: ALL

To transfer control, flight crewmembers must use the following callouts:
- To give control : The pilot calls out "YOU HAVE CONTROL". The other pilot accepts this transfer by calling out "I HAVE CONTROL", before assuming PF duties.
- To take control : The pilot calls out "I HAVE CONTROL". The other pilot accepts this transfer by calling out "YOU HAVE CONTROL", before assuming PM duties.

SUMMARY FOR EACH PHASE

Applicable to: ALL

Ident.: PRO-NOR-SOP-90-D-00011917.0001001 / 23 DEC 14

TO REMOVE GROUND SUPPLY		
EVENT	**PF or PM**	**GND Mech**
Initial ground contact	GROUND (from) COCKPIT	COCKPIT (from) GROUND
External __ disconnection	REMOVE EXTERNAL __	EXTERNAL__ REMOVED

Ident.: PRO-NOR-SOP-90-D-00011918.0001001 / 23 DEC 14

BEFORE ENGINE START/PUSH BACK		
EVENT	**PF**	**PM**
Before start up clearance received	BEFORE START C/L	DOWN TO THE LINE
After start up clearance received	BELOW THE LINE	BEFORE START C/L COMPLETE

Ident.: PRO-NOR-SOP-90-D-00011919.0001001 / 17 MAR 16

PUSH BACK/ENGINE START		
EVENT	**PF**	**GND Mech.**
When ready for pushback, and pushback clearance received from ATC	GROUND (from) COCKPIT, CLEARED FOR PUSH	COCKPIT (from) GROUND, RELEASE BRAKES
Start of push	BRAKES RELEASED READY TO PUSH	
When ready to start engines	CLEAR TO START ? STARTING ENG(S)__	CLEAR TO START
When pushback completed	BRAKES SET	SET BRAKES
When ready to disconnect (after engine started, and parameters are stabilized)	CLEAR TO DISCONNECT (hand signals on left/right)	DISCONNECTING (hand signals on left/right)

Ident.: PRO-NOR-SOP-90-D-00011920.0001001 / 23 DEC 14

AFTER ENGINE START		
EVENT	**PF**	**PM**
All engines started and stabilized and GND is disconnected	AFTER START C/L	AFTER START C/L COMPLETE

Ident.: PRO-NOR-SOP-90-D-00011921.0001001 / 23 DEC 14

TAXI		
EVENT	**PF**	**PM**
When taxi clearance obtained	CLEAR LEFT (RIGHT) SIDE	CLEAR RIGHT (LEFT) SIDE
Brake transfer check	BRAKE CHECK	PRESSURE ZERO
Flight control check in the following sequence (can be done before start of taxi)	FLIGHT CONTROL CHECK	
1. Elevators		FULL UP, FULL DOWN, NEUTRAL
2. Ailerons/Spoilers		FULL LEFT, FULL RIGHT, NEUTRAL
3. Rudder(1)	RUDDER	FULL LEFT, FULL RIGHT, NEUTRAL
During taxi	BEFORE TAKEOFF C/L	DOWN TO THE LINE
Lining up on the runway	BELOW THE LINE	BEFORE TAKEOFF C/L COMPLETE

(1) *The PM should follow pedal movement with his/her feet*

Ident.: PRO-NOR-SOP-90-D-00011922.0001001 / 23 DEC 14

TAKEOFF		
EVENT	**PF**	**PM**
Setting thrust levers to initial stabilization value	TAKEOFF	
Before passing 80 kt		THRUST SET
At 100 kt	CHECKED	ONE HUNDRED KNOTS
At V1		V1
At VR		ROTATE
Gear retraction	GEAR UP	POSITIVE CLIMB GEAR UP
If AP is engaged by PM	AP 1(2) ON	
Checklist	AFTER TAKEOFF/CLIMB C/L	DOWN TO THE LINE
At transition altitude	BELOW THE LINE	AFTER TAKEOFF/CLIMB C/L COMPLETE

Ident.: PRO-NOR-SOP-90-D-00011923.0001001 / 17 MAR 16

MALFUNCTION BEFORE V1 AT TAKEOFF		
EVENT	**CAPT**	**F/O**
If GO decision	GO	
If RTO decision - REV green on EWD - Deceleration	STOP	REVERSE GREEN(1) DECEL(2)

(1) *If the reverse deployment is not as expected, call NO REVERSE ENGINE__or NO REVERSE, as appropriate*

(2) *In case of failure or no positive deceleration, NO DECEL*
DECEL callout means that the deceleration is felt by the crew, and confirmed by the speed trend on the PFD.

Ident.: PRO-NOR-SOP-90-D-00011924.0001001 / 12 MAY 16

ALTIMETER SETTING CHANGES TO/FROM QNH /QFE-STD		
EVENT	**PF**	**PM**
Barometric setting change and subsequent altimeter cross-check	SET STANDARD (SET QNH/QFE) CHECKED	STANDARD (QNH/QFE) CROSS-CHECKED PASSING FL__(__FT) NOW

Ident.: PRO-NOR-SOP-90-D-00011925.0001001 / 17 MAR 16

APPROACH AND LANDING

EVENT	PF	PM
Approach checklist	APPROACH C/L	APPROACH C/L COMPLETE
Activation of approach Phase	ACTIVATE APPROACH PHASE	APPROACH PHASE ACTIVATED
RA alive	CHECKED	RADIO ALTIMETER ALIVE(1)(2)
At G/S *, FINAL APP engagement, or below GA altitude for approach using FPA guidance	SET GA ALTITUDE __FT	GA ALTITUDE - SET,
FAF	CHECKED	PASSING__(Fix Name),__ FT,
Landing checklist	LANDING C/L	LANDING C/L COMPLETE
1 000 ft RA	CHECKED	ONE THOUSAND(2)
100 ft above MDA /DH	CHECKED	ONE HUNDRED ABOVE(2)
MDA /DH visual reference	CONTINUE	MINIMUM(2)
MDA /DH no visual reference	GO AROUND-FLAPS	MINIMUM(2)
		ONE HUNDRED(2) FIFTY(2)
After touchdown Ground spoilers extended REV green on EWD		SPOILERS(3) REVERSE GREEN(4)
Deceleration		DECEL(5)
At 70 kt	CHECKED	SEVENTY KNOTS

(1) *Crew awareness, crew should now keep RA in scan to landing*

(2) *PM monitors pin-programmed auto callout, or announces if inoperative.*

(3) *If the spoilers are not extended, call NO SPOILERS*

(4) *If the reverse deployment is not as expected, call NO REVERSE ENGINE__ or NO REVERSE, as appropriate.*

(5) *DECEL Callout means that the deceleration is felt by the crew, and confirmed by the speed trend on the PFD .If no positive deceleration, NO DECEL.*

Ident.: PRO-NOR-SOP-90-D-00015353.0001001 / 23 DEC 14

DISCONTINUED APPROACH		
EVENT	**PF**	**PM**
DISCONTINUED APPROACH decision	CANCEL APPROACH	

Ident.: PRO-NOR-SOP-90-D-00011926.0001001 / 17 MAR 16

GO AROUND		
EVENT	**PF**	**PM**
GO AROUND decision	GO AROUND - FLAPS	
Flaps retraction		FLAPS__
Gear retraction	GEAR UP	POSITIVE CLIMB GEAR UP
Checklist	AFTER TAKEOFF/CLIMB C/L	DOWN TO THE LINE
At transition altitude	BELOW THE LINE	AFTER TAKEOFF/CLIMB C/L COMPLETE

Ident.: PRO-NOR-SOP-90-D-00011927.0001001 / 23 DEC 14

AFTER LANDING		
EVENT	**PF**	**PM**
Checklist	AFTER LANDING C/L	AFTER LANDING C/L COMPLETE

Ident.: PRO-NOR-SOP-90-D-00011928.0001001 / 23 DEC 14

PARKING		
EVENT	**PF**	**PM**
Checklist	PARKING C/L	PARKING C/L COMPLETE

Ident.: PRO-NOR-SOP-90-D-00011929.0001001 / 23 DEC 14

SECURING THE AIRCRAFT		
EVENT	**PF**	**PM**
Checklist	SECURING THE AIRCRAFT C/L	SECURING THE AIRCRAFT C/L COMPLETE

Intentionally left blank

SUPPLEMENTARY PROCEDURES

Applicable to: ALL

Ident.: PRO-NOR-SUP-SUP-SUP-00-00020244.0001001 / 17 MAR 17

ADVERSE WEATHER

Ident.: PRO-NOR-SUP-SUP-SUP-00-00020245.0001001 / 20 MAR 17

COMMUNICATION

Ident.: PRO-NOR-SUP-SUP-SUP-00-00020248.0001001 / 17 MAR 17

ENGINE

Ident.: PRO-NOR-SUP-SUP-SUP-00-00020249.0001001 / 17 MAR 17

FUEL

Ident.: PRO-NOR-SUP-SUP-SUP-00-00020251.0001001 / 17 MAR 17

LANDING GEAR

Ident.: PRO-NOR-SUP-SUP-SUP-00-00020254.0001001 / 17 MAR 17

MISCELLANEOUS

Ident.: PRO-NOR-SUP-SUP-SUP-00-00020252.0001001 / 17 MAR 17

NAVIGATION

Ident.: PRO-NOR-SUP-SUP-SUP-00-00020253.0002001 / 17 MAR 17

SURVEILLANCE

AIRFRAME DEICING/ANTI-ICING PROCEDURE ON GROUND

Applicable to: ALL

Ident.: PRO-NOR-SUP-ADVWXR-A-00020694.0001001 / 21 MAR 17

BEFORE FLUID SPRAYING

In all situations, it is the captain's responsibility to decide if the ground crew must deice/anti-ice the aircraft, and/or if additional deicing/anti-icing treatment are required.

CAUTION	- Make sure that the low or high-pressure ground connectors do not supply any external air to the aircraft. - If it is necessary for the ground crew to repeatedly anti-ice the aircraft, they must deice the surfaces with a hot fluid mixture before applying a new layer of anti-icing fluid.

COMMUNICATION WITH GROUND CREW....................ESTABLISH

L2 Establish communication with the crew that will apply the procedure.

L1 DEICING/ANTI-ICING FLUIDS TYPE....................CHECK APPROPRIATE

L2 Check that the ground crew uses the correct deicing/anti-icing fluids, in accordance with the applicable operator requirements and aircraft maintenance manual (AMM).

L1 DO NOT START THE ENGINES DURING FLUID SPRAYING

L2 Engines and APU can be either stopped or running during deicing/anti-icing.

L1

CAUTION	- The ground crew should take care when spraying deicing fluid, and make sure that the engines and APU do no ingest any fluid. - Do not move flaps, slats, ailerons, spoilers or elevators if they are not free of ice. - Always ensure that both left and right side of the aircraft receive the same complete and symmetrical deicing/anti-icing treatment.

L2 *Note:* *In case of frost formation on one or several areas of the wing, the Captain can request a local deicing application only on the affected areas. The Captain shall take care that both wings receive the same symmetrical treatment, even if frost formation does not affect both wing symmetrically. For more information, refer to AMM.*

L1 CAB PRESS MODE SEL....................CHECK AUTO
ENG 1 BLEED....................OFF
ENG 2 BLEED....................OFF
APU BLEED....................OFF

DITCHING pb.. ON

L2 *Outflow valve, pack valves, and avionic ventilation inlet and extract valves close.*
This prevents deicing/anti-icing fluid from entering the aircraft. Avionic ventilation is in a closed circuit with both fans running. In view of the low OAT, there is no time limit for this configuration.

L1 *Note:* *For passenger comfort reason, it is not recommended to operate on ground with both PACKS set to OFF for more than 20 min.*

Note: *If the "VENT AVNCS SYS FAULT" alert appears, reset the AEVC circuit breaker at the end of the aircraft deicing/anti-icing procedure.*
AIR COND /AVNCS VENT/CTL D06 on 49VU.
AIR COND /AVNCS /VENT/MONG Y17 on 122 VU.

THRUST LEVERS...CHECK IDLE
"AIRCRAFT PREPARED FOR SPRAYING".. INFORM GROUND CREW

Ident.: PRO-NOR-SUP-ADVWXR-A-00002311.0001001 / 20 SEP 16

UPON COMPLETION OF THE SPRAYING OPERATION

DITCHING pb..OFF
OUTFLOW VALVE...CHECK OPEN

On the ECAM PRESS page, confirm that the outflow valve indication reaches the open green position to avoid any unexpected aircraft pressurization.

ENG BLEED 1 + 2..ON
PITOTS and STATICS (ground crew)..CHECK

CAUTION	When the OAT is low (below -5 °C) during snow/freezing rain precipitations , melted snow or raindrops may drip from the cockpit windshields and freeze on the fuselage below. This could create ice build up on the forward fuselage that could possibly disturb the airflow around the static/pitot/angle-of-attack probes, and result in unreliable air data measurements during takeoff. Therefore, during taxi out before takeoff, beware of this possible build up of ice. The area around static/pitot/angle-of-attack probes must be free of ice/snow before starting takeoff.

GROUND EQUIPMENT.. REMOVE
DEICING/ANTI-ICING REPORT...RECEIVED

The information from ground personnel, who performed the deicing/anti-icing and post-application check, must include (ANTI-ICING CODE):
- *Type of fluid used*
- *The mix ratio of fluid to water (for example 75/25)*
- *When the holdover time began.*

- **At least 5 minutes after completion of spraying operation:**

  APU BLEED....................AS RQRD

  Note: *There is a risk of de-icing fluid ingestion by the APU air intake, resulting in specific odors, or smoke warnings. Therefore:*

  - *Keep the APU running with the APU BLEED OFF for 5 min after spraying completion before setting the APU BLEED to ON (if required),*
  - *Consider APU BLEED OFF for takeoff.*

NORMAL PROCEDURE.................... RESUME

Apply appropriate normal procedures. Pay special attention to the flight control check. In freezing precipitation, perform the appropriate checks to evaluate aircraft icing. Base the decision on whether to takeoff, or to re-protect the aircraft, on the amount of ice that has built up on the critical surfaces since the last deicing/anti-icing, as revealed by a personal inspection from the inside and outside of the aircraft. Make this inspection before the holdover time expires, or just before takeoff.

GROUND OPERATIONS IN COLD WEATHER CONDITIONS

Applicable to: ALL

Ident.: PRO-NOR-SUP-ADVWXR-B-00020703.0001001 / 21 MAR 17

GENERAL

For ground operations on contaminated runways, *Refer to PER-TOF-CTA-10 GENERAL* and *Refer to PRO-NOR-SUP-ADVWXR General*.
The following procedures supplement the normal operating procedures.

Ident.: PRO-NOR-SUP-ADVWXR-B-00020698.0001001 / 21 MAR 17

SAFETY EXTERIOR INSPECTION

PROTECTIVE COVERS....................REMOVED
APU INTAKE....................CHECK FREE OF SNOW AND ICE
PACKS INLET/OUTLET DOORS....................CHECK FREE OF SNOW AND ICE
OUTFLOW VALVES....................CHECK FREE OF SNOW AND ICE
PRESSURE RELIEF VALVES....................CHECK FREE OF SNOW AND ICE
ABOVE ITEMS....................DEICE IF NECESSARY

Ident.: PRO-NOR-SUP-ADVWXR-B-00020699.0001001 / 21 MAR 17

PRELIMINARY COCKPIT PREPARATION

PRELIMINARY COCKPIT PREPARATION - SOP....................COMPLETED

L2 APU is started and the air conditioning is on.

Note: - *Ground power should be used to start the APU if the OAT is -15 °C (5 °F) or below.*
- *With cockpit temperatures below -15 °C (5 °F), the display units may not be available.*

L1 ● **If the avionics bay is cold soaked:**

L2 The aircraft was parked without electrical ground supply or without air conditioning.

L1 IRS....................INITIATE ALIGNMENT

L2 For temperatures at or below -15 °C (5 °F) in the avionics bay, the IRS alignment requires 15 min.

L1 WINDSHIELD AND UPPER COCKPIT FUSELAGE....................ICE/SNOW REMOVED

CAUTION	With ice or snow accumulated on the windshield and/or the upper cockpit fuselage, and if the PROBE/WINDOW HEAT is on, melted ice or snow running down from these areas could re-freeze on the fuselage area below, if the temperature is very low. This could create ice build-up on the forward fuselage that could possibly disturb the airflow around the static/pitot/angle-of-attack probes.

PROBE COVERS....................CHECK REMOVED

L2 Ensure that the probe covers are removed in order to prevent the covers from melting.

L1 PROBE/WINDOW HEAT....................ON

Ident.: PRO-NOR-SUP-ADVWXR-B-00020700.0001001 / 21 MAR 17

EXTERIOR WALKAROUND

SURFACES ....CHECK FREE OF FROST, ICE AND SNOW

L2 Check critical surfaces: leading edges, upper wing surfaces, vertical and horizontal stabilizers, all control surfaces, slats and flaps.

Note: *Thin hoarfrost is acceptable on the upper surface of the fuselage.* *Refer to LIM-ICE_RAIN Definition of Thin Hoarfrost*

On the underside of the wing tank areas, a maximum layer of 3 mm (0.125 in) of frost is acceptable.

L1 LANDING GEAR....................CHECK FREE OF FROST, ICE AND SNOW

L2 Check gear assemblies, lever locks, tires and doors

L1 ENGINES....................CHECK FREE OF FROST, ICE AND SNOW

L2 Check inlets, inlet lips, fans, spinners, fan exhaust ducts, reversers assemblies.

L1 ENGINE FANS....................CHECK FREE ROTATION

L2 Check that engine fans are not stuck and can rotate freely.

L1 DRAINS, BLEEDS, PROBES....................................CHECK FREE OF FROST, ICE AND SNOW

L2 Probes: pitot tubes, static ports, TAT sensors and AOA sensors.

L1 FUEL TANK VENTS.. CHECK FREE OF FROST, ICE AND SNOW
RADOME.. CHECK FREE OF FROST, ICE AND SNOW
WATER SUPPLIES.. CHECK NOT FROZEN AND REFILLED

L2 Commercial water supplies should have been previously emptied prior to aircraft cold soak.

Ident.: PRO-NOR-SUP-ADVWXR-B-00020701.0001001 / 21 MAR 17

AFTER START

- **After first engine start:**

  PROBE/WINDOW HEAT..AUTO

  L2 Heating will continue to operate automatically.

  L1 NORMAL PROCEDURE...RESUME

GROUND OPERATIONS IN HEAVY RAIN

Ident.: PRO-NOR-SUP-ADVWXR-00020720.0001001 / 21 MAR 17
Applicable to: ALL

On ground (Aircraft taxiing or parked) in case of heavy rain, water may enter the avionics ventilation system via the skin air inlet valve.

- **When on ground:**

  EXTRACT...OVRD

  L2 This closes the skin air inlets, preventing rainwater from entering the avionics bay.

  L1 PACK 1 ON.. CHECK
  PACK 2 ON.. CHECK

  L2 Air conditioning compensates the avionics cooling reduction when the skin air inlet is closed.

  L1
  - **If air conditioning not available:**

    L2 When the aircraft avionics are powered, closing the skin air inlet valve reduces avionics cooling capability. With air conditioning not available, the reduced cooling is efficient for a limited period of time, depending on the outside temperature.

L1

Aircraft should not remain powered more than:
- OAT ≤ 39 °C (102 °F): no limit
- 39 °C (102 °F) < OAT ≤ 45 °C (113 °F): 3 h
- 45 °C (113 °F) < OAT: 30 min

- **After takeoff:**
  EXTRACT.. AUTO

MINIMUM SPEED WITH ICE ACCRETION

Ident.: PRO-NOR-SUP-ADVWXR-00020722.0002001 / 21 MAR 17
Applicable to: ALL

Evidence of ice accretion can be ice on the visual indicator (between the two cockpit windshields) or on the windshield wipers.

CAUTION	Extended flight in icing conditions with the slats extended should be avoided.

- **If wing anti ice is operative:**
  - **In CONF clean, 1, 2 or 3:**
    MIN SPEED: VLS + 10 kt
  - **In CONF FULL:**
    MIN SPEED: VLS + 5 kt

  The minimum speed takes into account ice accretion on non-heated structure.

- **If wing anti ice is not operative:**
  MIN SPEED: VLS + 10 kt/GREEN DOT

  The minimum speed takes into account ice accretion on the entire airframe when anti-ice is inoperative.

OPERATIONS ON CONTAMINATED AIRPORTS

Applicable to: ALL

Ident.: PRO-NOR-SUP-ADVWXR-C-00020729.0001001 / 21 MAR 17

GENERAL

If the ground surfaces are not contaminated but the weather corresponds to icing conditions with falling rain, slush or snow, anticipate a probable resulting runway/surfaces contamination.
There is a low probability of fluid ingestion by the engines which should anyway not degrade the safety. The risk of ingestion is independent of the depth of the contaminant.

Ident.: PRO-NOR-SUP-ADVWXR-C-00020726.0002001 / 21 MAR 17

SPURIOUS ALERTS

The radio altimeter indication may fluctuate on contaminated surfaces and trigger auto callouts or GPWS warnings. These alerts can be disregarded.

Note: *Spurious GPWS warnings may trigger at the apron, during taxi, takeoff and landing runs.*

The radio altimeter may also not compute valid data:
- On surfaces covered with snow, ice or deicing fluid, and/or
- Due to deicing fluid on the antenna.

Note: *As a result, the "NAV RA 1(2)(1+2) FAULT" ECAM alert may be triggered. This alert may disappear when the radio altimeter provides valid data again, when:*

- The aircraft is on a non-contaminated surface, or
- The antenna is cleaned, or
- A period of time elapses after deicing, allowing the fluid covering the antenna to dry. The taxi time between deicing spot and holding point may be sufficient.

In case of invalid LGCIU information, disregard the following alerts if triggered:
- ENG DUAL FAILURE
- ANTI-ICE CAPT(F/O) TAT FAULT
- L/G SHOCK ABSORBER FAULT

Ident.: PRO-NOR-SUP-ADVWXR-C-00020725.0001001 / 21 MAR 17

PARKING

- **After engine shutdown and before shutting down electrical supply:**

  FLAPS/SLATS.. CONFIRM FREE OF CONTAMINATION

L2 Perform a visual inspection to determine if the flaps/slats mechanism is free of contamination. If necessary, perform decontamination.

L1 YELLOW ELEC PUMP pb..ON
BLUE ELEC PUMP pb..AUTO
BLUE PUMP OVRD pb..ON
SLATS/FLAPS..RETRACT

L2 *Monitor slats/flaps retraction on ECAM upper display.*

L1
  - **When slats and flaps are retracted:**

    YELLOW ELEC PUMP pb..OFF
    BLUE PUMP OVRD pb..OFF
    NORMAL PROCEDURE..RESUME

OPERATIONS WITH VOLCANIC ASH, SAND OR DUST

Applicable to: ALL

Ident.: PRO-NOR-SUP-ADVWXR-G-00020733.0001001 / 21 MAR 17

PRELIMINARY COCKPIT PREPARATION

APU .... AVOID USE

L2 *Request ground power for air conditioning and electricity. If ground power is not available, the APU should be used only to start the engines.*

L1 WINDSHIELD WIPERS .... DO NOT USE

L2 *Do not use the windshield wipers to remove ash, sand or dust.*

L1
- **For takeoff performance:**

  BRAKING PERFORMANCE MAY BE DEGRADED

  L2 A layer of volcanic ash, sand or dust on the runway may degrade the braking efficiency.

Ident.: PRO-NOR-SUP-ADVWXR-G-00020734.0001001 / 21 MAR 17

EXTERIOR WALKAROUND

SURFACES AND EQUIPMENT .... CHECK FREE OF DEPOSITS

L2 *Ground maintenance should remove ash, sand or dust that has settled on exposed lubricated surfaces and could penetrate seals or enter the engine gas path, air conditioning system, air data probes, access doors and panels and other orifices on the aircraft.*

L1 ENGINE/APU INLETS .... CHECK FREE OF DEPOSITS

L2 Inspect the inlets and order them cleaned of deposit. Have the area within 8 m (25 ft) of the engine inlet cleaned of volcanic ash, as much as practical.

Ident.: PRO-NOR-SUP-ADVWXR-G-00020735.0001001 / 21 MAR 17

ENGINE START

Use external pneumatic supply, if available, to start the engines. *Refer to PRO-NOR-SUP-ENG Engine Start with External Pneumatic Power*.

ENGINE .... CRANK

L2 *Before starting the engines, ventilate them by dry cranking at maximum motoring speed for two minutes. This will blow away any contaminant ash that may have entered the booster area.*

Ident.: PRO-NOR-SUP-ADVWXR-G-00020736.0001001 / 21 MAR 17

TAXI

ONE ENGINE TAXI....................DO NOT PERFORM

L2 *Minimize the thrust during taxi.*

L1 ENG 1 BLEED....................OFF
ENG 2 BLEED....................OFF

L2 Keep engine bleed valves closed for taxiing, especially in volcanic ash.

L1 FOR 180 ° TURN ON RUNWAY: INITIATE THE TURN DOWNWIND

L2 In order to prevent ash, sand or dust ingestion.

Ident.: PRO-NOR-SUP-ADVWXR-G-00020737.0001001 / 21 MAR 17

TAKEOFF

ASH, SAND OR DUST....................ALLOW TO SETTLE

L2 *Allow ash, sand or dust to settle on runway before starting the takeoff roll.*

L1 PACK OFF TAKEOFF....................CONSIDER

L2 *This will prevent air conditioning system contamination.*

L1 ROLLING TAKEOFF....................CONSIDER

Ident.: PRO-NOR-SUP-ADVWXR-G-00020738.0001001 / 21 MAR 17

AFTER TAKEOFF

MINIMIZE TIME IN SAND OR DUST CLOUD

L2 *Climb to quickly exit the sand/dust cloud. If possible, altitude constraints may be disregarded in coordination with ATC.*

L1 ENG 1 BLEED....................ON
ENG 2 BLEED....................ON

Ident.: PRO-NOR-SUP-ADVWXR-G-00020739.0001001 / 21 MAR 17

IN FLIGHT

AVOID ASH, SAND OR DUST CLOUD

- **If sand or dust cloud encounter:**

  MINIMIZE TIME IN SAND OR DUST CLOUD

  L2 *If possible and in coordination with ATC, adapt flight path (route and altitude) to exit the cloud.*

L1
- **If ash cloud encounter:**

  VOLCANIC ASH ENCOUNTER PROCEDURE....................APPLY

Refer to PRO-ABN-MISC [QRH] VOLCANIC ASH ENCOUNTER .

Ident.: PRO-NOR-SUP-ADVWXR-G-00020740.0001001 / 21 MAR 17

DESCENT PREPARATION

AUTOLAND RECOMMENDED

L2 *Deposits on the windshield and landing lights may significantly reduce visibility during approach and landing. Consider a diversion to an airport where autoland is possible.*

L1
- **For landing performance:**

  CONSIDER IDLE REVERSE

  BRAKING PERFORMANCE MAY BE DEGRADED

L2 *A layer of volcanic ash, sand or dust on the runway may degrade the braking efficiency.*

Ident.: PRO-NOR-SUP-ADVWXR-G-00020741.0001001 / 21 MAR 17

DESCENT

AVOID LEVEL FLIGHT IN ASH, SAND OR DUST CLOUD

If possible and in coordination with ATC, perform holding patterns and last level off before final descent outside of the cloud.

Ident.: PRO-NOR-SUP-ADVWXR-G-00020742.0001001 / 21 MAR 17

LANDING

- **Before Landing:**

  ENG 1 BLEED.. OFF

  ENG 2 BLEED.. OFF

  PACK 1 and 2.. AS REQUIRED

L2 *Consider to set the packs OFF in order to avoid contamination of the air conditioning system.*

L1
- **During Landing:**

  REVERSERS.. AS REQUIRED

L2 *If it appears that maximum reverse thrust is needed, apply reverse thrust when the main landing gear touches down. Limit the use of reverse thrust as much as possible, because reverse flow may throw up ash, sand or dust and impair visibility.*

Ident.: PRO-NOR-SUP-ADVWXR-G-00020744.0001001 / 21 MAR 17

AFTER LANDING

ONE ENGINE TAXI.. DO NOT PERFORM

L2 *Minimize thrust during taxi.*

L1 APU.. AVOID USE

FOR 180 ° TURN ON RUNWAY: INITIATE THE TURN DOWNWIND

Ident.: PRO-NOR-SUP-ADVWXR-G-00020745.0001001 / 21 MAR 17

SECURING THE AIRCRAFT

If the aircraft is parked at an airport covered with volcanic ash, sand or dust, install engine inlet covers and other protective covers and plugs.
In addition:

- **After switching off all bleeds and before switching off the electrical AC power:**
  DITCHING pb..ON
  L2 *This closes the outflow valve, pack valves and avionics ventilation inlet and extract valves.*

L1
- **After switching off the electrical AC power and the batteries:**
  DITCHING pb..OFF
  L2 *All the applicable valves will open at the next power-up.*
  L1 PROTECTIVE COVERS..INSTALL
  L2 Request ground crew to install protective covers and plugs, in order to protect the aircraft and engines from volcanic ash, sand or dust.
  L1 LOGBOOK..REPORT ASH, SAND OR DUST CLOUD ENCOUNTER

SECURING THE AIRCRAFT FOR COLD SOAK

Ident.: PRO-NOR-SUP-ADVWXR-00020772.0001001 / 21 MAR 17
Applicable to: ALL

WHEN SECURING THE AIRCRAFT

- **After switching off all bleeds and before switching off the electrical AC power:**
  DITCHING pb .... ON
  L2 *This closes the outflow valve, pack valves and avionics ventilation inlet and extract valves.*

L1
- **When the chocks are in place:**
  PARKING BRAKE pb .... OFF
  L2 *Releasing the parking brake prevents the brakes from freezing.*

L1
- **After switching off the electrical AC power and the batteries:**
  DITCHING pb ....OFF
  L2 *All the applicable valves will open at the next power-up.*
  L1 PROTECTIVE COVERS..INSTALL
  L2 *Request ground crew to install protective covers and plugs, in order to protect the wheels, the engines and the probes from snow and ice.*

L1 WATER SYSTEM DRAINING.....REQUEST

L2 *Request maintenance actions to drain the water system for cold soak prevention purposes.*
Refer to PRO-NOR-SUP-ADVWXR Water System Draining.

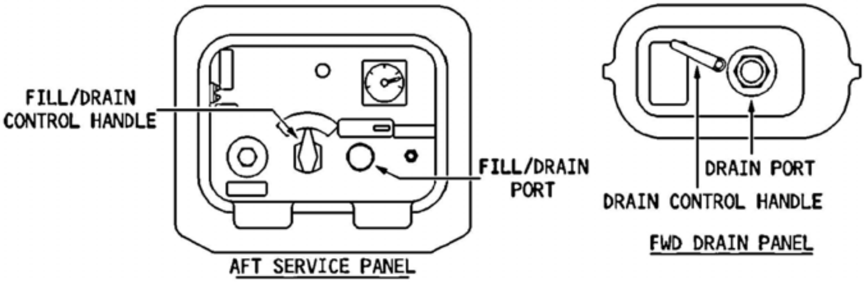
FOR DRAINING WATER PROCEDURE

Applicable to: ALL

Ident.: PRO-NOR-SUP-ADVWXR-D-00002313.0001001 / 21 MAR 17

INTRODUCTION

This procedure uses electrical power.



ACCESS PLATFORM(S).....PUT IN POSITION
SHUTOFF VALVE IN GALLEYS/TOILETS.....CHECK OPEN
FWD/AFT ACCESS PANEL DOORS.....OPEN
DRAIN PORT CAPS.....REMOVE

Remove drain port caps on forward drain and aft service panels.

DRAIN HOSES.....CONNECT

Connect drain hoses to :
- *the drain port on the forward drain panel.*
- *the full/drain port on the aft service panel.*

Ident.: PRO-NOR-SUP-ADVWXR-D-00002314.0001001 / 21 MAR 17

ON THE FORWARD DRAIN PANEL

DRAIN CONTROL HANDLE.....TURN LEFT

Turn the control handle to drain.

Ident.: PRO-NOR-SUP-ADVWXR-D-00002315.0001001 / 21 MAR 17

ON THE AFT SERVICE PANEL

FILL/DRAIN CONTROL HANDLE....................TURN TO “DRAIN” AND PULL

Turn the handle to the “DRAIN” position and pull it out to its mechanical stop to drain.
The indicator light comes on.

Ident.: PRO-NOR-SUP-ADVWXR-D-00002316.0001001 / 21 MAR 17

WHEN THE WATER SYSTEM IS DRAINED

In freezing conditions, the drain valves must stay open to prevent damage to the system. Do not put on the caps and leave the access door open.

DRAIN HOSES....................DISCONNECT
PANELS....................CLEAN AND DRY
ACCESS PLATFORM(S)....................REMOVE

WATER SYSTEM DRAINING

Ident.: PRO-NOR-SUP-ADVWXR-00002205.0001001 / 21 MAR 17
Applicable to: ALL

Drain the water system, if the OAT requires it, as shown below :

Configuration			**Exposure time**	**Water tank drain**
Air Conditioning	**Cabin temperature**	**Outside Air Temperature**		
ON	Above 10 °C (50 °F)	Between 0 °C and -15 °C (32 °F and 5 °F)	None	Not required
		Below -15 °C (5 °F)	1 h 15 min	Required
OFF		Between 0 °C and -7 °C (32 °F and 19.4 °F)	1 h 30 min	
		Between -7 °C and -15 °C (19.4 °F and 5 °F)	0 h 30 min	
		Below -15 °C (5 °F)	Any	

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VHF, HF UTILIZATION

Applicable to: ALL

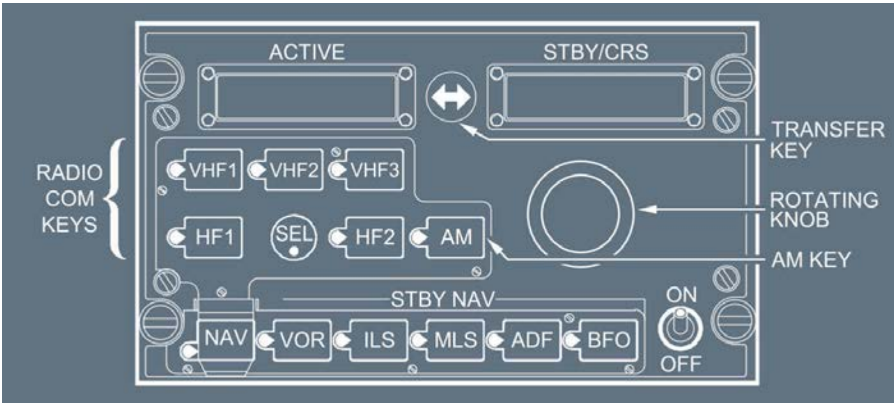
Ident.: PRO-NOR-SUP-COM-A-00002210.0001001 / 21 MAR 17

Note: 1. *Reception of some frequencies could be noisy, on one or more VHFs. In such cases, try selecting an unaffected one.*
2. *If two frequencies are closer than 2 MHz (between VHF 1 and 2, or between VHF 3 and 2), or closer than 6 MHz (between VHF1 and 3), some interference may occur.*

Ident.: PRO-NOR-SUP-COM-A-00002211.0002001 / 22 MAR 17

TUNING

The pilot should normally use his onside RMP to tune any one of the VHF or HF radios. If the SEL lights come on, when tuning the radio, the pilot should turn them off by selecting the appropriate radio system dedicated to his RMP.



ON/OFF switch.. CHECK ON
VHF or HF key.. PRESS

The green light comes on.
ACTIVE and STBY/CRS windows display active and preset frequencies, respectively.

Note: *When an RMP tunes a transceiver that is normally associated with another RMP , the SEL lights on both RMPs come on.*

TO CHANGE FREQUENCY

Rotating knob.. TURN

Make the STBY/CRS window display the new frequency.

Outer knob is for units, inner knob for decimals.

Transfer key...PRESS

This interchanges the ACTIVE and STBY frequencies.
The receiver is now tuned to the new ACTIVE frequency.

AM key (if necessary)...PRESS

Green light comes on.

SEL lt.. CHECK OFF

If SEL light is on, select the appropriate radio systems dedicated to the on side RMP.

FAILURE CASES

When an RMP fails :
- The affected RMP no longer controls the selected receiver.
- The frequency displays disappear and the green VHF or HF lights go out.

Affected RMP.. SWITCH OFF

One RMP can control all receivers.

- *if RMP 1 fails tune VHF 1 through RMP 3*
- *if RMP 2 fails tune VHF 2 through RMP 3*
- *if RMP 3 fails tune, HF1 ⊲ through RMP 1, HF2 ⊲ through RMP 2*
- *if two RMP 's fail, tune all receivers through the remaining RMP.*

Ident.: PRO-NOR-SUP-COM-A-00002212.0004001 / 03 JAN 11

TRANSMISSION AND RECEPTION

Note: *If the VHF3 VOICE DIRECTORY page is customized with user frequencies:*
- *Use it as a pure directory*
- *Do not press the key adjacent to the desired frequency for direct turning*
- *VHF 3 in VOICE mode should either be tuned using the MANUAL FREQ field, or using the RMP.*

VHF or HF transmission key .... PRESS

Green bars on the selected system key light up.
Microphones and PTT command are connected to the selected system.

VHF or HF reception key .... PRESS

The integrated white light comes on.
The receiver brings in the selected system.
To adjust the volume, turn the key.

<u>*Note:*</u> *Do not use VHF 3 for communications with ATC , if ACARS is installed, unless VHF 1 and VHF 2 are inoperative.*

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MANUAL ENGINE START

Applicable to: ALL

Ident.: PRO-NOR-SUP-ENG-A-00009443.0001001 / 21 MAR 17

Pilots normally use automatic starting to start an engine.

However, manual starting is recommended in the following cases:

- **After aborting a start, because of:**
  - Engine stall
  - Engine EGT overlimit
  - Low start air pressure
- **When expecting a start abort, because of:**
  - Degraded bleed performance, due to hot conditions, or at a high-altitude airfields.
  - An engine with a reduced EGT margin, in hot conditions, or at a high-altitude airfields.
  - Marginal performance of the external pneumatic power group.

Ident.: PRO-NOR-SUP-ENG-A-00020858.0003001 / 17 MAR 17

MANUAL ENGINE START PROCEDURE

Note: *During a manual engine start, if the flight crew suspects an engine start malfunction, or if an engine-related ECAM alert is triggered, the PF must abort the start sequence as follows:*

- *Before the PF sets the ENG MASTER lever to ON, the PF must set the ENG MAN START pb-sw to OFF*
- *After the PF sets the ENG MASTER lever to ON, the PF must set the ENG MASTER lever to OFF, and then the ENG MAN START pb-sw to OFF.*
  In that case, the flight crew should consider a dry crank cycle of the affected engine before they perform another start attempt (Refer to PRO-NOR-SUP-ENG Engine Ventilation (Dry Cranking)).

Then, in the case of an ECAM alert, the PF must announce "ECAM actions", in accordance with the ECAM management philosophy.

THR LEVERS...IDLE

CAUTION	The engines start regardless of the thrust lever position. If the thrust levers are not set to IDLE, the thrust rapidly increases to the corresponding thrust lever position, causing a hazardous situation.

ENG MODE sel...NORM THEN IGN/START

L2 *The lower ECAM displays the engine page.*

L1 *Note: If both engines are started manually, the following procedure applies one engine at a time.*

- **When all engines parameters are available on the upper ECAM display (no amber crosses displayed):**

ENG MAN START pb-sw.............................. ON
START VALVE.............................. CHECK IN-LINE
OIL PRESS INCREASE.............................. CHECK
N2 INCREASE.............................. CHECK

- **If the N2 does not reach 20 %:**

PACK VALVES.............................. CHECK CLOSED

- **If the APU bleed is used for engine start and the pack valves are closed, shed the APU electrical loads as follows:**

L2 Shedding APU electrical loads enables to increase bleed air pressure.

L1 GALY & CAB.............................. OFF

- **If needed, shed also:**

BLUE ELEC PUMP (on ground only).............................. OFF
FUEL X FEED.............................. ON
FUEL PUMPS (except R TK PUMP 2).............................. OFF
BLOWER.............................. OVRD
CAB FANS.............................. OFF

- **When N2 reaches 22 % or the maximum motoring speed (20 % minimum):**

Note: The maximum motoring speed is defined as the speed at which N2 acceleration is less than 1 % in approximately 5 s.

ENG MASTER.............................. ON
CHRONO.............................. START

L2 *The PM starts the timing in order to monitor the light-up duration.*

L1 IGNITERS A AND B.............................. CHECK ON
FUEL FLOW INCREASE.............................. CHECK

- **15 s maximum after fuel flow increase:**

EGT INCREASE.............................. CHECK
N1 INCREASE.............................. CHECK

If the electrical power supply is interrupted during the start sequence (indicated by loss of ECAM displays), abort the start by setting the ENG MASTER lever to OFF. Then perform a 30 s dry crank (*Refer to PRO-NOR-SUP-ENG Engine Ventilation (Dry Cranking)*).

- **When N2 reaches 50 %:**
  START VALVE (between 50 and 56 % N2).. CHECK CROSS LINE
  IGNITERS A AND B..CHECK OFF
  MAIN ENG PARAMETERS..CHECK NORMAL
  SECONDARY ENG PARAMETERS...CHECK NORMAL

L2 *The gray background on the N2 indication disappears.*

L1 *Note: CFM 56-5B1/B2 engines, N2 accelerates slowly from 50 % to idle. Start abort is not required as long as N2 increases.*

  ENG MAN START pb-sw...OFF
  ENG MODE sel...NORM

  - **When no other engine requires to be started manually:**
    SHEDDED SYSTEMS...RESTORE
    SOP - ENGINE START...RESUME

ENGINE START WITH EXTERNAL PNEUMATIC POWER

Ident.: PRO-NOR-SUP-ENG-00020859.0002001 / 17 MAR 17
Applicable to: ALL

- **Before connecting external pneumatic power :**
  PACK 1..OFF
  PACK 2..OFF

L2 Packs are selected off to prevent any possible contamination of the packs by the external pneumatic power.

L1 APU BLEED.. OFF
  ENG 1 BLEED.. OFF
  ENG 2 BLEED.. OFF
  X BLEED...OPEN

EXTERNAL PNEUMATIC POWER CONNECTION...REQUEST

- **When cleared to start :**
  ENG 2...START

Note: As necessary, engine 1 can also be started by using the external pneumatic power.
If engine 1 is started first, check the brake ACCU pressure prior to engine start.
The minimum recommended starter air supply pressure is 30 PSI, when the start valve is open.
Two external pneumatic power units may be used in parallel if necessary.

- **After Engine 2 is started :**

EXT PWR...CHECK AVAIL

WARNING	Disconnection of the external power with the EXT PWR pb-sw ON may cause injury to the ground engineer. Request disconnection of the external power only with the EXT PWR pb-sw AVAIL.

EXT PWR DISCONNECTION... REQUEST

Note: The external electrical power can be removed after the second engine start.

- **If external pneumatic power is used to start engine 1 :**

ENG 1...START

- **When engine 1 is started:**

  EXTERNAL PNEUMATIC POWER REMOVAL... REQUEST
  X BLEED..AUTO
  ENG 1 BLEED...ON
  ENG 2 BLEED...ON
  PACK 1...ON
  PACK 2...ON

- **If the crossbleed engine start procedure is used to start engine 1 :**

EXTERNAL PNEUMATIC POWER REMOVAL...REQUEST
PACK 1.. ON
PACK 2.. ON
ENG 2 BLEED.. ON
CROSSBLEED ENGINE START PROC..APPLY

Refer to PRO-NOR-SUP-ENG Crossbleed Engine Start

CROSSBLEED ENGINE START

Ident.: PRO-NOR-SUP-ENG-00020860.0001001 / 17 MAR 17
Applicable to: ALL

CAUTION	Do not perform the crossbleed engine start procedure during pushback. Simultaneous use of engine bleed supply and external pneumatic power supply is prohibited.

One engine must be running in order to supply air for other engine start.

- **Before second engine start :**

APU BLEED...OFF

L2 *The BLEED valve of the supplying engine reopens and the cross bleed valve closes.*

L1 ENG BLEED (supplying engine)...ON

ENG BLEED (receiving engine)....................OFF

L2 *The bleed valve of receiving engine is closed to avoid reverse flow leakage.*

L1 X BLEED....................OPEN

- **When cleared to start :**

AREA CLEAR OF OBSTACLES....................CONFIRM

L2 *Ensure increased power jet wake does not constitute any hazard to people or installation behind the aircraft.*

L1 THR LEVER (supplying engine)....................ADJUST FOR BLEED PRESSURE

Adjust thrust of supplying engine to obtain an engine bleed pressure of 30 PSI before start initiation, and at least 25 PSI during the start sequence.
If the thrust required to obtain the appropriate engine bleed pressure exceeds 40 % N1, pay particular attention to the surrounding area.

Note: *If the supplying engine is a DAC engine, preset a 30 % N1 before launching the start sequence.*

RECEIVING ENGINE....................START

Apply the normal engine start procedure.

- **After start :**

THR LEVER (supplying engine)....................IDLE
X BLEED....................AUTO
ENG BLEED (receiving engine)....................ON
PACK 1....................ON
PACK 2....................ON

ENGINE START VALVE MANUAL OPERATION

Ident.: PRO-NOR-SUP-ENG-00020861.0001001 / 17 MAR 17
Applicable to: ALL

BEFORE ENGINE START

Advise ground crew to prepare for manual engine start valve operation.

WARNING	To ensure safety of the ground crew when starting an engine with manual operation of the start valve, the flight crew should start the affected engine first.

ENGINE START

AUDIO CONTROL PANEL....................CAB
GROUND CREW CLEARANCE....................OBTAIN

- **When the ground crew is ready:**
  "ENGINE 1(2) START"............ ANNOUNCE
  ENG MODE sel............ IGN/START
  ENG MASTER............ ON
  "OPEN START VALVE AND KEEP OPEN"............ ORDER
  If not maintained in the OPEN position by the ground crew, the start valve closes.
- **When N2 at 50 %:**
  "CLOSE START VALVE"............ ORDER
  SOP – ENGINE START............ RESUME

ENGINE VENTILATION (DRY CRANKING)

Ident.: PRO-NOR-SUP-ENG-00020943.0001001 / 17 MAR 17
Applicable to: ALL

On ground, after:
- An unsuccessful manual engine start, or
- An unsuccessful automatic start not followed by an automatic dry crank,

the flight crew can perform a dry crank cycle on the affected engine to remove the fuel vapors.

- **Before dry crank:**
  ENG MASTER (affected engine)............ CHECK OFF
  ENG MODE sel............ CHECK NORM
  ENG MAN START pb-sw (affected engine)............ CHECK OFF
- **Dry crank:**
  ENG MODE sel............ CRANK
  ENG MAN START pb-sw (affected engine)............ ON

Note: *To clear fuel vapors, a 30 seconds dry crank cycle is the minimum required.*

L2 Note: *A manual start sequence can be initiated following a dry crank cycle (Refer to PRO-NOR-SUP-ENG Manual Engine Start - Procedure). The flight crew should consider the starter limitations (Refer to LIM-ENG Starter).*

L1
- **When the dry crank is completed:**
  ENG MAN START pb-sw (affected engine)............ OFF
  ENG MODE sel............ NORM

ONE ENGINE TAXI - GENERAL

Applicable to: ALL

Ident.: PRO-NOR-SUP-ENG-CA-00021004.0001001 / 17 MAR 17

Except in some operational conditions (e.g. uphill slopes, slippery taxiways or high gross weights), brake life and fuel savings may govern company policy on permitting aircraft to taxi with one engine shut down.

Before applying this procedure, the flight crew should be aware of the following:
- Taxi with one engine shut down may require higher thrust than usual. Caution must therefore be exercised to avoid excessive jet-blast and the risk of Foreign Object Damage (FOD)
- Slow or tight turns in the direction of the operating engine may not be possible at high gross weights
- When one engine taxi is planned, pay particular attention to the fuel imbalance limitation for the next take-off.

ONE ENGINE TAXI - AT DEPARTURE

Applicable to: ALL

Ident.: PRO-NOR-SUP-ENG-CB-00021005.0001001 / 17 MAR 17

BRAKE ACCU PRESS..CHECK

L2 *If necessary, use the Y ELEC PUMP to pressurize the brake accumulator.*

L1 ENG 1.. START

L2 *Engine 1 pressurizes the green hydraulic system, providing nosewheel steering and normal braking without using the PTU.*

L1 X BLEED..OPEN

L2 *Open the cross bleed valve in order to supply both packs with engine 1.*

L1 APPLY THE “AFTER START” NORMAL PROCEDURE, BUT:
- Keep the APU running and switch the APU BLEED to OFF.

L2 The APU generator provides power to the engine fire extinguisher, prevents electrical transients and enables galley operation. Closing the APU BLEED prevents engine exhaust gases ingestion in the air conditioning system.

L1 - Delay the ECAM STATUS check and the wing anti-ice setting until all engines are started.

Ident.: PRO-NOR-SUP-ENG-CB-00021007.0001001 / 17 MAR 17

BEFORE RELEASING THE PARKING BRAKE

Y ELEC PUMP.. ON

L2 *This pressurizes the yellow hydraulic system.*

L1

APPLY THE “TAXI” NORMAL PROCEDURE, BUT:
- Delay the flight controls check until all engines are started
- Arm the autobrake after the flight controls check.

Ident.: PRO-NOR-SUP-ENG-CB-00021008.0006001 / 01 JUN 17

BEFORE TAKEOFF

ENGINE WARM-UP TIME BEFORE TAKEOFF (remaining engine)...............................CONSIDER

The second engine must be started soon enough before takeoff, in order to take into account the engine start time and ensure the applicable engine warm-up time (Refer to PRO-NOR-SOP-09 After Start - ENG Mode Selector).

- **For ENG 2 start and when taxiing in a straight line:**

  Note: *During the engine start, a slight jerk forward may occur if the brakes are applied while the aircraft is moving.*

  Note: *Maintain taxi in a straight line during at least 5 s after the selection of the ENG 2 master lever to ON, in order to ensure the PTU auto-test is completed.*

  Y ELEC PUMP..OFF

  L2 *The yellow electric pump must be set to OFF to enable PTU automatic test during engine 2 start.*

  L1 APU BLEED..ON
  ENG 2..START

APU.. AS RQRD
X BLEED..AUTO

APPLY THE “AFTER START” NORMAL PROCEDURE, INCLUDING:
- ECAM STATUS check
- Selection of the ENG 2 anti-ice and wing anti-ice, as required.

AFTER START CHECKLIST.. COMPLETE
FLIGHT CONTROLS..CHECK
AUTO BRK..MAX

ONE ENGINE TAXI - AT ARRIVAL

Applicable to: ALL

Ident.: PRO-NOR-SUP-ENG-CC-00021009.0001001 / 17 MAR 17

APU.. START

L2 *Start the APU before shutting down one engine, in order to provide power to the engine fire extinguisher and avoid electrical transients.*

Ident.: PRO-NOR-SUP-ENG-CC-00021010.0001001 / 17 MAR 17

- **After high thrust operations:**
  ENGINE MINIMUM COOLING TIME.. CONSIDER
  Refer to PRO-NOR-SOP-22 Parking - ENG MASTER Levers.

- **When the APU indicates AVAIL and taxiing in a straight line:**

  Note: *During engine shutdown, a slight jerk forward may occur if the brakes are applied while the aircraft is moving.*

  ENG 2.. SHUT DOWN
  Y ELEC PUMP.. ON

L2 *This avoids running the PTU.*

Ident.: PRO-NOR-SUP-ENG-CC-00021011.0001001 / 17 MAR 17

- **At parking:**
  Y ELEC PUMP.. OFF
  ENG 1.. SHUT DOWN

Intentionally left blank

REFUELING

Applicable to: ALL

Ident.: PRO-NOR-SUP-FUEL-A-00021256.0002001 / 25 JUL 17

WARNING	
	1. Prior initiation of any ground fuel operations, obey the below fuel safety precautions. This will prevent injury to people and/or damage to the aircraft. 2. Do not request or perform any ground fuel operations if a fire or engine overheat warning is displayed. 3. f the APU fails during any ground fuel operations, do not restart the APU. For APU use during refueling/defueling *Refer to LIM-APU APU Start/Shutdown during Refueling/Defueling*. 4. Do not refuel in bad weather conditions and electrical storms.

PREPARATION

SAFETY PRECAUTIONS...APPLY

During refueling operations, ensure that:
- *HF transmission (including HF transmission via the HF DATA LINK pb) is not performed*
- *The aircraft is properly bonded to the tanker*
- *The tanker and the aircraft grounding requirement is based on local regulations. Always connect the ground cable to the parking ground point (or to the tanker) before connecting it to the aircraft.*
- *The external lighting is not operated (except for NAV & LOGO).*

In the cockpit, check that the PARK BRK is ON and that the ACCU PRESS has sufficient pressure. If the PARK BRK cannot be set to ON, check that the chocks are in place.

ACCESS PLATFORM...IN POSITION

MAX REFUELING PRESSURE: 50 PSI (3.5 bar)

- **On refueling control panel:**

  TEST sw...LTS

  Lights on the panel come on. FUEL QTY and the PRESELECTED and ACTUAL displays show 8's.

  TEST sw...HI.LVL

  HI LVL lights change state if the high level sensors and their circuits are serviceable.

Ident.: PRO-NOR-SUP-FUEL-A-00021257.0002001 / 21 MAR 17

AUTOMATIC REFUELING

- **On cockpit refueling control panel:**

  REFUEL PWR pb-sw....................ON

  Cockpit panel takes priority. The CKPT light comes on and REFUELG is displayed on the ECAM MEMO.

  [PRESELECTOR sw] REQUESTED BLOCK FUEL....................SET
  REFUEL CTL pb-sw....................ON

  Refueling starts. When refueling is finished, the END light comes on.

  REFUEL CTL pb-sw....................OFF
  REFUEL PWR pb-sw....................OFF

- **On refueling control panel:**

  REFUEL VALVES sel....................CHECK NORM and GUARDED
  [PRESELECTOR sw] REQUESTED BLOCK FUEL....................SET
  MODE SELECT sw....................REFUEL

  START REFUELING

  When the refueling is finished the END light comes on.

  ACTUAL QUANTITY....................CHECK

  The actual quantity must be within 100 kg (220 lb) of the preselected quantity.

  MODE SELECT sw....................OFF and GUARDED

Ident.: PRO-NOR-SUP-FUEL-A-00021260.0001001 / 21 MAR 17

MANUAL REFUELING

REFUEL VALVES sel....................SHUT
MODE SELECT sw....................REFUEL
REFUEL VALVES sel (tanks to be filled)....................OPEN
START REFUELING
FUEL QTY....................MONITOR

- **When the contents of the tanks reach the required level :**

  Corresponding REFUEL VALVES sel....................SHUT
  MODE SELECT sw....................OFF and GUARDED
  REFUEL VALVES sel....................NORM and GUARDED

REFUELING WITH ONE ENGINE RUNNING

Ident.: PRO-NOR-SUP-FUEL-00001677.0003001 / 21 MAR 17
Applicable to: ALL

- Refuel with one engine running only at airports where no external ground pneumatic power is available and only when APU is unserviceable.
- Only the RH fuel couplings can be used.
- Overwing gravity filling is not permitted.
- Disembark all passengers.
- Obtain airport authorization.
  The Airport Fire Department should standby at the aircraft during the entire refueling procedure.
- Point the aircraft into the wind at a location where the slope is negligible.
  Set the parking brake and check its pressure.
  Run engine n° 1 at ground idle with its generator connected.
- Do not start engine n° 2, do not shut down engine n° 1 or do not attempt to start the APU before all fueling operations have been completed.
- Position the fuel truck under the extremity of the right wing. Its pressure should not exceed 30 PSI.
- Follow manual refueling procedure.

OPERATION MONITORING

DURING THE ENTIRE REFUELING PROCEDURE :

- Monitor the fuel truck shut off valve.
- Be sure that the fueling company is keeping permanent control of the emergency fuel shut off device.
- Have a flight crew member in the cockpit monitoring all systems and the running engine.
- Have a qualified ground crew member at the fueling station to operate the refuel valve switches.
- Monitor the refueling closely and be prepared to close the refuel valves in order not to exceed the following fuel quantities :

DENSITY (kg/l)	0.77	0.78	0.79	0.8	0.81	0.82	0.83
L(R) WING (kg)	5 710	5 780	5 860	5 930	6 005	6 080	6 160
CENTER (kg)	6 030	6 110	6 190	6 270	6 350	6 430	6 500

AFTER SECOND ENGINE START :

● **Reset the 3DMCs in order to reinitialize the fuel used values :**
DMC 1 SPLY C/B (E11 on 49VU).. PULL
DMC 2 SPLY C/B (Q8 on 121 VU)..PULL
DMC 3 SPLY C/B (Q9 on 121 VU)..PULL
DMC 3 SPLY STBY (E10 on 49 VU)..PULL

- **After 5 s :**

  All C/B's...PUSH

  Note: *The T.O MEMO does not appear automatically since one engine is kept running.*

GROUND FUEL TRANSFER

Ident.: PRO-NOR-SUP-FUEL-00021258.0001001 / 25 JUL 17
Applicable to: ALL

WARNING	1. Prior initiation of any ground fuel operations, obey the below fuel safety precautions. This will prevent injury to people and/or damage to the aircraft. 2. Do not request or perform any ground fuel operations if a fire or engine overheat warning is displayed. 3. If the APU fails during any ground fuel operations, do not restart the APU. For APU use during refueling/defueling *Refer to LIM-APU APU Start/Shutdown during Refueling/Defueling*.

SAFETY PRECAUTIONS...APPLY

During ground operations, ensure that:
- *HF transmission is not performed (including HF transmission via the HF DATA LINK pb)*
- *If connected :*
  - *The aircraft is properly bonded to the tanker*
  - *The tanker and the aircraft grounding requirement is based on local regulations. Always connect the ground cable to the parking ground point (or to the tanker) before connecting it to the aircraft*
- *The external lighting is not operated (except for NAV & LOGO).*

In the cockpit, check that the PARK BRK is ON and that the ACCU PRESS has sufficient pressure. If the PARK BRK cannot be set to ON, check that the chocks are in place.

ACCESS PLATFORM...IN POSITION

- **On cockpit overhead FUEL panel:**

  PUMPS (of the tanks not to be defueled)...OFF
  MODE SEL pb-sw...MAN
  PUMPS (of the tank to be defueled)...ON

  - **if left wing and/or center tanks is (are) to be defueled :**

    X FEED...ON

    OPEN light comes on.

- **On refueling control panel :**

  REFUEL VALVES sel (of tanks not to be filled)...SHUT
  REFUEL VALVES sel (of tanks to be filled)...OPEN

MODE SELECT sw .... DEFUEL/XFR

OPEN light comes on.

FUEL QTY.. MONITOR

- **When the tank contents reach the required level :**

  Corresponding REFUEL VALVES sel.. SHUT

  MODE SELECT sw ....OFF and GUARDED

  OPEN light goes out.

  REFUEL VALVES sel..NORM and GUARDED

  Set cockpit FUEL panel to normal configuration.

DEFUELING

Ident.: PRO-NOR-SUP-FUEL-00021259.0001001 / 25 JUL 17
Applicable to: ALL

WARNING	
	1. Prior initiation of any ground fuel operations, obey the below fuel safety precautions. This will prevent injury to people and/or damage to the aircraft. 2. Do not request or perform any ground fuel operations if a fire or engine overheat warning is displayed. 3. If the APU fails during any ground fuel operations, do not restart the APU. For APU use during refueling/defueling *Refer to LIM-APU APU Start/Shutdown during Refueling/Defueling*. 4. Do not defuel in bad weather conditions and electrical storms. 5. Defueling by suction is not possible

SAFETY PRECAUTIONS..APPLY

During defueling operations, ensure that:
- *HF transmission (including HF transmission via the HF DATA LINK pb) is not performed*
- *The aircraft is properly bonded to the tanker*
- *The tanker and the aircraft grounding requirement is based on local regulations. Always connect the ground cable to the parking ground point (or to the tanker) before connecting it to the aircraft*
- *The external lighting is not operated (except for NAV & LOGO).*

In the cockpit, check that the PARK BRK is ON and that the ACCU PRESS has sufficient pressure. If the PARK BRK cannot be set to ON, check that the chocks are in place.

ACCESS PLATFORM..IN POSITION

MAX DEFUELING PRESSURE: 11 PSI (0.75 bar)

- **<u>On cockpit overhead FUEL panel:</u>**

  PUMPS..OFF

- **<u>On refueling control panel:</u>**
  REFUEL VALVES sel.. NORM
  MODE SELECT sw .... DEFUEL/XFR
  OPEN light comes on
- **<u>On cockpit overhead FUEL panel :</u>**
  MODE SEL pb-sw ....MAN
  PUMPS (of the tank(s) to be defueled)..ON
  X FEED..ON
  OPEN light comes on
  FUEL QTY..MONITOR
  - **When tank contents reach required level**
    Corresponding PUMPS.. OFF
- **<u>On refueling control panel:</u>**
  MODE SELECT sw ....OFF and GUARDED
  OPEN light goes out
  REFUEL VALVES sel..NORM and GUARDED
  Set cockpit FUEL panel to normal configuration.

Flight with Landing Gear Down

GENERAL

Ident.: PRO-NOR-SUP-LG-LG_DN-00001997.0001001 / 04 SEP 17
Applicable to: ALL

It is possible to perform a flight with the landing gear locked down and the doors closed.

This chapter applies to either of the following two situations:
- The dispatch of an aircraft with the landing gear down, or
- The continuation of the flight when a landing gear retraction failure happens after takeoff.

The limitations, procedures and performance associated to a flight with the landing gear down are described below.

LIMITATIONS

Ident.: PRO-NOR-SUP-LG-LG_DN-00001999.0002001 / 04 SEP 17
Applicable to: ALL

For a flight with the landing gear down, all of the following supplementary limitations apply:
- Consider a VMO /MMO of 235 kt/M 0.60
- Landing gear doors must be closed
- Avoid icing conditions
- Do not use managed speeds, except during the approach
- Do not use CLB and DES autopilot modes
- Disregard FMS fuel, altitude, speed, and time prediction. Time prediction is valid on waypoints in cruise only
- Use the TCAS in TA ONLY mode
- The ALTITUDE ALERT feature is not available
- Do not perform ETOPS flight.

Note: *Ditching with the landing gear down is not assessed.*

PROCEDURES

Applicable to: ALL

Ident.: PRO-NOR-SUP-LG-LG_DN-B-00002000.0002001 / 04 SEP 17

PREFLIGHT

In addition to the SOPs apply the following:

- **VMO/MMO setting:**

  VMO-MMO sw...L/G DOWN

L2 *The switch is located in the avionics compartment (on the 188VU panel). This switch changes the VMO/MMO to 235 kt/M 0.60. As a result, an alert is triggered if the speed exceeds the flight with gear down speed limitation.*

L1

CAUTION	*In the case of continuation of the flight after a gear retraction failure, the flight crew can not access the VMO/MMO switch. Therefore, the airspeed/Mach number must be carefully monitored in order not to exceed 235 kt/M 0.60 as there is no alert if the aircraft exceeds this limitation.*

Ident.: PRO-NOR-SUP-LG-LG_DN-B-00002003.0012001 / 04 SEP 17

FLIGHT CONTROLS

Failure cases, which would normally lead to ALTN law, will degrade F/CTL laws down to DIRECT law, if the landing gear is extended.

FAILURE OF BOTH ENGINES

When both engines are failed, to ease the handling of all the different ECAM procedures resulting from this all engine flame out situation, it is recommended to use the ENG DUAL FAILURE QRH procedure, and if time permits, to clear the ECAM.
Follow all the steps of the QRH procedure, except those that are modified by the procedure below :

- **If APU is not available**
  - Attempt an APU start
  - . If APU start is unsuccessful, a windmilling relight can be performed, as long as the speed is above 300 kt (corresponding N2 above 12 %). In this case, increase the aircraft speed and disregard VMO warning.
- **If APU is available :** perform an assisted relight, when below FL 200.
  - Flight controls are in direct laws. Use manual pitch trim as necessary (not indicated on PFD if APU GEN not available).

TAKEOFF

Applicable to: ALL

Ident.: PRO-NOR-SUP-LG-LG_DN-C-00021928.0006001 / 04 SEP 17

GENERAL

The recommended takeoff configuration is 1 + F, as this provides the best climb gradient.

It is not recommended to takeoff with tailwind.
To take into account the most limiting aspects of the takeoff, the second segment condition and the final segment condition are considered.
Once the takeoff weight determined, read the corresponding speeds in the RTOW chart.

Ident.: PRO-NOR-SUP-LG-LG_DN-C-00002006.0006001 / 04 SEP 17

SECOND SEGMENT CONDITIONS

The MTOW for a flight with gear down can be determined with use of the basic RTOW chart published for a normal flight.
To simplify calculations, a weight reduction percentage is applied for each configuration, regardless of the limitation. This weight reduction takes into account the most critical case which is obstacle clearance.

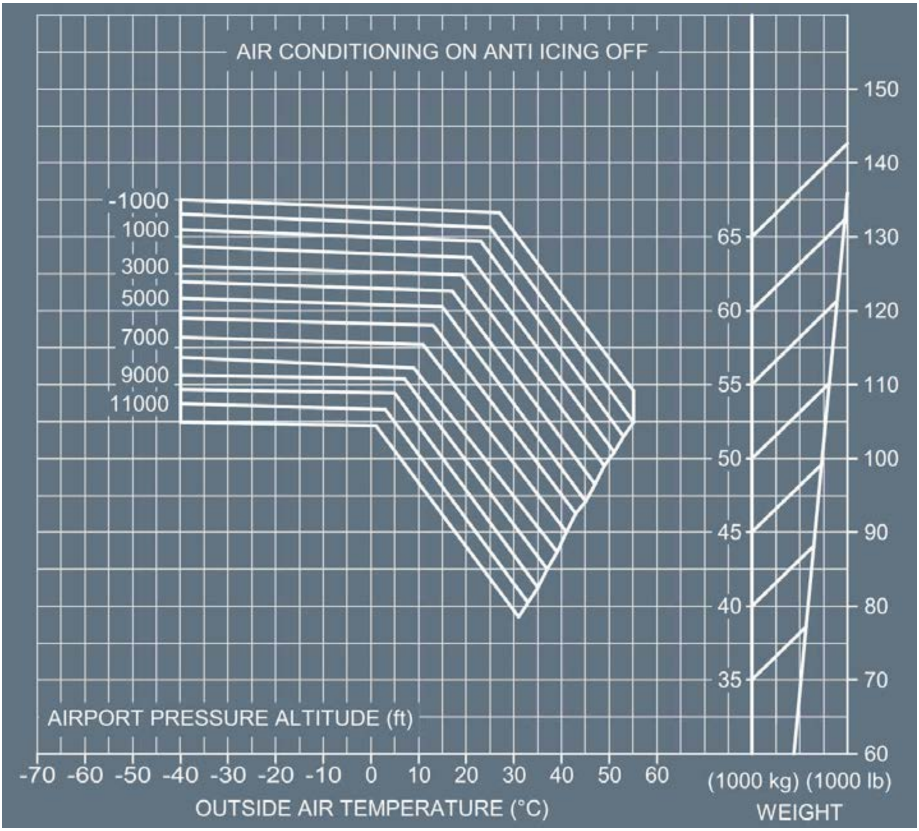
Takeoff configuration	1 + F	2	3
Weight reduction	20 %	17 %	16 %

MTOW DETERMINATION

Enter the basic RTOW chart with the runway conditions (temperature, pressure, etc.) desired aircraft configuration, and obtain the basic MTOW.
Obtain the weight reduction percentage corresponding to the desired takeoff configuration from the above table.
Reduce the previous basic MTOW by this percentage to obtain the MTOW, limited by the second segment condition.

Ident.: PRO-NOR-SUP-LG-LG_DN-C-00002007.0008001 / 04 SEP 17

FINAL SEGMENT CONDITIONS - LANDING GEAR DOWN - ONE ENGINE INOP	
MAX. CLIMB THRUST SPEED VLS AIR CONDITIONING ON ANTI ICING OFF	GROSS GRADIENT 1.2 %



MTOW DETERMINATION

Enter the chart with the airport's OAT . Move up to the position corresponding to the airport's pressure altitude. Then, move right and obtain the MTOW limited by the final segment condition.

FLIGHT PLANNING

Ident.: PRO-NOR-SUP-LG-LG_DN-00002011.0001001 / 04 SEP 17
Applicable to: ALL

GENERAL

Flying with the gear down induces additional drag and therefore deteriorates aircraft performance. This drag affects all phases of the flight where the landing gear is normally retracted.

MAXIMUM TAKEOFF WEIGHT DETERMINATION

The MTOW for the flight with gear down is determined by keeping the lowest of the weights given by:
- The second segment condition
- The final segment condition
- The en-route conditions
- The go-around conditions.

To determine the MTOW for a flight with the gear down, perform all following steps:
1. Determine the MTOW limited by the second segment condition (*Refer to PRO-NOR-SUP-LG-LG_DN Second Segment Conditions*).
2. Determine the MTOW limited by the final segment condition (*Refer to PRO-NOR-SUP-LG-LG_DN Final Segment Conditions*).
3. Keep the lowest of the above weights as the MTOW.
4. With the MTOW determined in step 3, check the obstacle clearance along the planned route (en-route).

   To determine the One Engine Inoperative (OEI) obstacle clearance:
   - *Refer to PRO-NOR-SUP-LG-LG_DN Driftdown Net Flight Path - One Engine Inoperative*
   - *Refer to PRO-NOR-SUP-LG-LG_DN Gross Ceilings - One Engine Inoperative*.

   If necessary, reduce the takeoff weight, in order to obtain the appropriate obstacle clearance.
5. Determine the go-around limiting weight (*Refer to PRO-NOR-SUP-LG-LG_DN Go-Around*). If necessary, reduce the MTOW to comply with this requirement.
6. Keep the lowest MTOW from steps 3, 4, and 5.

FLIGHT PLAN

The flight planning can be performed with the use of the tables provided in this procedure, or with a planning software (PEP, FlySmart, etc.).

FUEL BURN CORRECTION

The climb, cruise, and descent tables are determined for ISA conditions. For each degree Celsius above ISA and per nautical mile of air distance, add a fuel burn correction of 0.05 kg/°C/NM air distance (0.11 lb/°C/NM air distance).

CLIMB

Climb at 230 kt/M 0.50 with the use of maximum climb thrust.
Refer to PRO-NOR-SUP-LG-LG_DN Climb.

CRUISE

The recommended cruise speed is 230 kt/M 0.50.
Refer to PRO-NOR-SUP-LG-LG_DN Cruise.

HOLDING

The holding configuration is CONF 1.
Refer to PRO-NOR-SUP-LG-LG_DN Holding.

DESCENT

The recommended descent speed is 230 kt/M 0.50.
Refer to PRO-NOR-SUP-LG-LG_DN Descent.

GO-AROUND

Refer to PRO-NOR-SUP-LG-LG_DN Go-Around.

LANDING

The landing is standard.

ENGINE FAILURE

In case of engine failure, select maximum continuous thrust (MCT) on the remaining engine and adopt the specified driftdown speed.

For obstacle clearance and depending on the chosen strategy:
- *Refer to PRO-NOR-SUP-LG-LG_DN Driftdown Net Flight Path - One Engine Inoperative*
- *Refer to PRO-NOR-SUP-LG-LG_DN Gross Ceilings - One Engine Inoperative*.

Note: *The OEI required obstacle clearances are 1 000 ft in climb or level flight, and 2 000 ft in descent.*

For fuel burn calculations with one engine inoperative and landing gear down, use the standard OEI cruise fuel flow and apply the fuel penalty as per QRH/OPERATIONAL DATA/FUEL PENALTY FACTORS.

CLIMB

Ident.: PRO-NOR-SUP-LG-LG_DN-00002012.0013001 / 14 FEB 11
Applicable to: ALL

CLIMB - 230KT/M.50 - ALL ENGINES - L/G DOWN		
MAX. CLIMB THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG=25.0%	**FROM BRAKE RELEASE** **TIME (MIN)** **FUEL (KG)** **DISTANCE (NM)** **TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG) 44	48	52	56	60	64	68	72	76
290	17 1336 78 277	19 1528 90 279	22 1761 105 280	27 2054 125 282	32 2450 152 284				
270	15 1228 69 275	17 1396 79 276	20 1594 91 278	23 1835 106 279	27 2144 126 281	33 2570 154 283			
250	13 1121 60 271	15 1268 69 273	17 1437 78 274	20 1638 90 276	23 1886 106 278	27 2211 126 280			
240	12 1067 56 269	14 1204 64 271	16 1361 73 272	18 1544 83 274	21 1767 96 276	25 2052 114 278	30 2441 138 280		
220	11 958 48 265	12 1075 54 266	14 1209 61 267	16 1361 70 269	18 1540 80 270	20 1762 92 272	24 2048 109 275		
200	9 844 40 258	10 944 45 259	12 1055 50 260	13 1179 57 262	15 1322 64 263	17 1491 73 265	19 1699 84 267		
180	8 720 32 248	9 802 35 249	9 891 39 250	11 989 44 251	12 1098 49 252	13 1224 55 254	15 1370 62 255	17 1545 71 257	19 1755 82 259
160	6 615 25 238	7 683 28 239	8 756 31 240	9 835 35 241	9 922 38 242	11 1020 43 243	12 1131 48 245	13 1258 53 246	14 1405 60 248
140	5 526 20 228	6 582 22 229	6 642 25 231	7 708 27 232	8 779 30 233	9 857 33 234	9 944 37 235	10 1043 41 236	11 1153 46 238
120	4 447 16 218	5 493 18 219	5 543 20 221	6 597 22 222	6 655 24 223	7 719 26 224	8 789 29 225	8 867 32 227	9 952 35 228
100	4 374 12 207	4 413 14 208	4 454 15 210	5 498 17 211	5 545 18 212	6 596 20 213	6 652 22 215	7 714 24 216	7 780 27 218
50	2 212 6 168	2 233 6 170	2 255 7 172	3 278 7 173	3 303 8 175	3 330 9 176	3 358 10 178	4 389 11 180	4 421 12 182
15	1 108 2 105	1 118 2 107	1 128 2 109	1 139 2 110	1 151 3 112	2 163 3 113	2 176 3 115	2 189 3 118	2 203 4 120

CRUISE

Ident.: PRO-NOR-SUP-LG-LG_DN-00002014.0013001 / 14 FEB 11
Applicable to: ALL

CRUISE - 230KT/M.50 - ALL ENGINES - L/G DOWN

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG=25.0%

N1 (%) / **MACH**
KG/H/ENG / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL100		FL200		FL220		FL240		FL270		FL290	
44	73.6	.417	83.0	.500	82.7	.500	82.5	.500	82.5	.500	82.5	.500
	1747	230	1780	228	1652	219	1537	210	1386	197	1302	188
	76.1	266	86.3	307	92.2	305	98.3	302	107.7	298	113.7	296
48	74.0	.417	83.3	.500	83.1	.500	83.1	.500	83.1	.500	83.4	.500
	1769	230	1805	228	1681	219	1570	210	1428	197	1352	188
	75.2	266	85.1	307	90.6	305	96.3	302	104.5	298	109.4	296
52	74.4	.417	83.7	.500	83.6	.500	83.7	.500	83.9	.500	84.3	.500
	1795	230	1834	228	1714	219	1608	210	1478	197	1408	188
	74.1	266	83.7	307	88.9	305	94.0	302	101.0	298	105.1	296
56	74.8	.417	84.2	.500	84.2	.500	84.3	.500	84.8	.500	85.5	.500
	1823	230	1867	228	1752	219	1652	210	1533	197	1481	188
	72.9	266	82.3	307	87.0	305	91.4	302	97.3	298	99.9	296
60	75.3	.417	84.7	.500	84.8	.500	85.0	.500	85.8	.500	86.8	.500
	1855	230	1904	228	1795	219	1705	210	1599	197	1570	188
	71.7	266	80.7	307	84.9	305	88.6	302	93.3	298	94.2	296
64	75.9	.417	85.2	.500	85.4	.500	85.8	.500				
	1892	230	1946	228	1846	219	1761	210				
	70.3	266	78.9	307	82.6	305	85.8	302				
68	76.5	.417	85.8	.500	86.1	.500	86.6	.500				
	1933	230	1994	228	1901	219	1825	210				
	68.8	266	77.0	307	80.1	305	82.8	302				
72	77.3	.417										
	1978	230										
	67.2	266										
76	78.0	.417										
	2025	230										
	65.7	266										

HOLDING

Ident.: PRO-NOR-SUP-LG-LG_DN-00002017.0013001 / 04 SEP 17
Applicable to: ALL

RACE TRACK HOLDING PATTERN - S SPEED - ALL ENGINES - L/G DOWN								
MAX. CRUISE THRUST LIMITS CONFIGURATION 1 NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG=25.0%		N1 (%) FF (KG/H/ENG)	
WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL160	FL180	FL200
44	55.3 1207	58.1 1181	61.9 1160	63.5 1157	65.4 1152	67.2 1148	69.0 1145	70.7 1141
46	56.5 1257	59.3 1232	63.1 1215	64.9 1210	66.7 1205	68.5 1201	70.2 1197	72.0 1193
48	57.7 1307	60.4 1283	64.3 1269	66.2 1262	68.0 1258	69.7 1254	71.4 1249	73.3 1245
50	58.9 1357	61.4 1336	65.5 1321	67.4 1316	69.1 1311	70.8 1306	72.6 1302	74.5 1299
52	59.9 1408	62.5 1390	66.8 1373	68.5 1368	70.2 1364	71.9 1359	73.8 1355	75.7 1353
54	61.0 1459	63.5 1444	67.9 1427	69.6 1422	71.3 1417	73.0 1412	74.9 1409	76.9 1408
56	61.9 1512	64.5 1498	69.0 1480	70.6 1474	72.3 1470	74.1 1465	76.0 1464	78.0 1465
58	62.8 1565	65.6 1551	70.0 1533	71.6 1528	73.3 1523	75.2 1519	77.1 1519	79.0 1520
60	63.7 1618	66.6 1603	70.9 1586	72.6 1581	74.4 1577	76.2 1575	78.2 1576	79.9 1577
62	64.6 1671	67.6 1655	71.8 1639	73.5 1635	75.4 1631	77.2 1630	79.2 1631	80.9 1634
64	65.6 1725	68.6 1709	72.7 1693	74.5 1689	76.3 1686	78.2 1686	80.1 1688	81.8 1691
66	66.5 1777	69.5 1763	73.6 1747	75.4 1743	77.3 1742	79.2 1744	80.9 1745	82.7 1751
68	67.4 1830	70.4 1815	74.5 1801	76.4 1798	78.2 1798	80.1 1800	81.8 1803	83.5 1811
70	68.3 1884	71.3 1868	75.4 1856	77.3 1854	79.1 1856	80.9 1858	82.6 1862	84.3 1873
72	69.2 1937	72.0 1922	76.3 1911	78.1 1911	80.0 1913	81.7 1916	83.4 1922	85.0 1935
74	70.0 1990	72.8 1977	77.2 1967	79.0 1968	80.8 1970	82.5 1974	84.2 1983	85.8 1996
76	70.8 2043	73.6 2031	78.0 2023	79.8 2026	81.6 2028	83.3 2033	84.9 2045	86.6 2063

DESCENT

Ident.: PRO-NOR-SUP-LG-LG_DN-00002016.0023001 / 14 FEB 11
Applicable to: ALL

DESCENT - M.50/230KT - ALL ENGINES - L/G DOWN									
IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG=25.0%		MAXIMUM CABIN RATE OF DESCENT 350FT/MIN				
WEIGHT (1000KG)	45				65				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
290	7.1	67	33	IDLE	9.2	86	42	IDLE	188
270	6.6	63	30	IDLE	8.5	82	39	IDLE	197
250	6.1	60	28	IDLE	7.9	78	36	IDLE	205
240	5.8	58	26	IDLE	7.6	76	35	IDLE	210
220	5.4	55	24	IDLE	7.0	72	32	IDLE	219
200	4.9	51	22	IDLE	6.5	67	29	IDLE	228
180	4.5	47	20	IDLE	5.9	61	26	IDLE	230
160	4.0	41	17	IDLE	5.2	54	23	IDLE	230
140	3.4	34	15	IDLE	4.5	45	19	IDLE	230
120	2.9	28	12	IDLE	3.8	36	16	IDLE	230
100	2.3	21	10	IDLE	3.1	28	13	IDLE	230
50	1.0	9	4	IDLE	1.3	12	5	IDLE	230
15	.0	0	0	IDLE	.0	0	0	IDLE	230

GO-AROUND

Ident.: PRO-NOR-SUP-LG-LG_DN-00002010.0005001 / 04 SEP 17
Applicable to: ALL

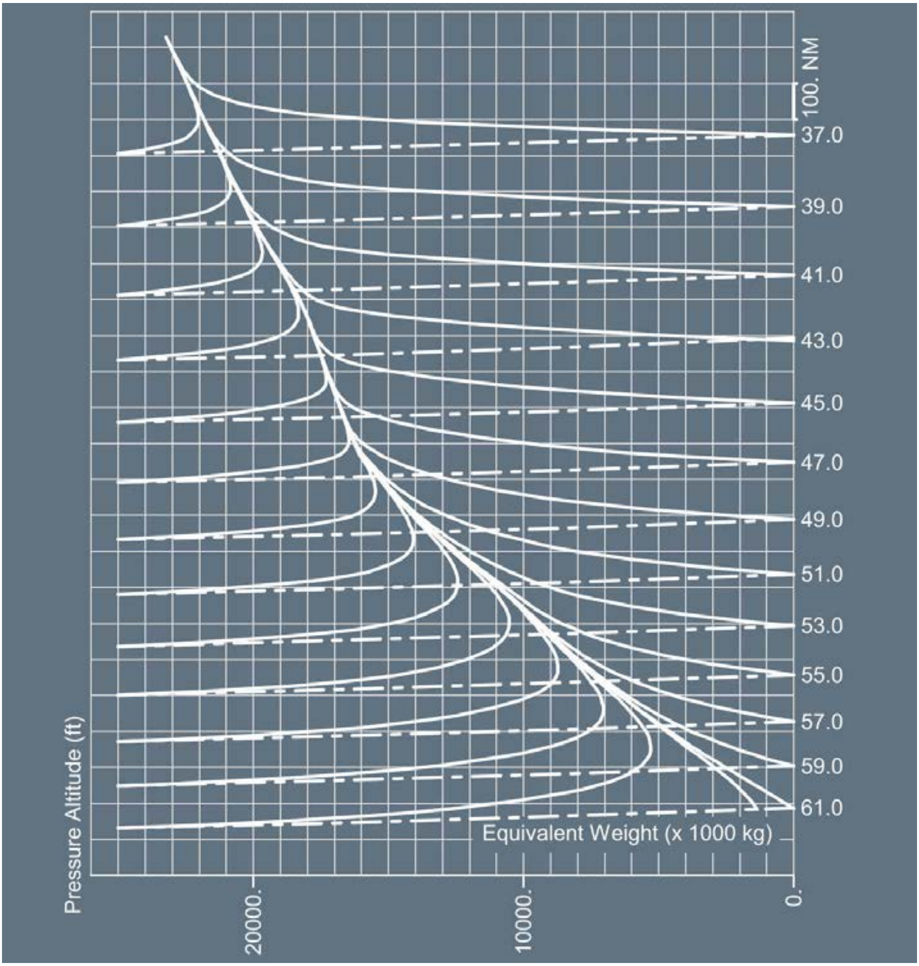
Refer to PER-GOA-GEN GENERAL for go-around requirements.
Further decrease the basic limiting weight by 11 %.

ONE ENGINE INOPERATIVE

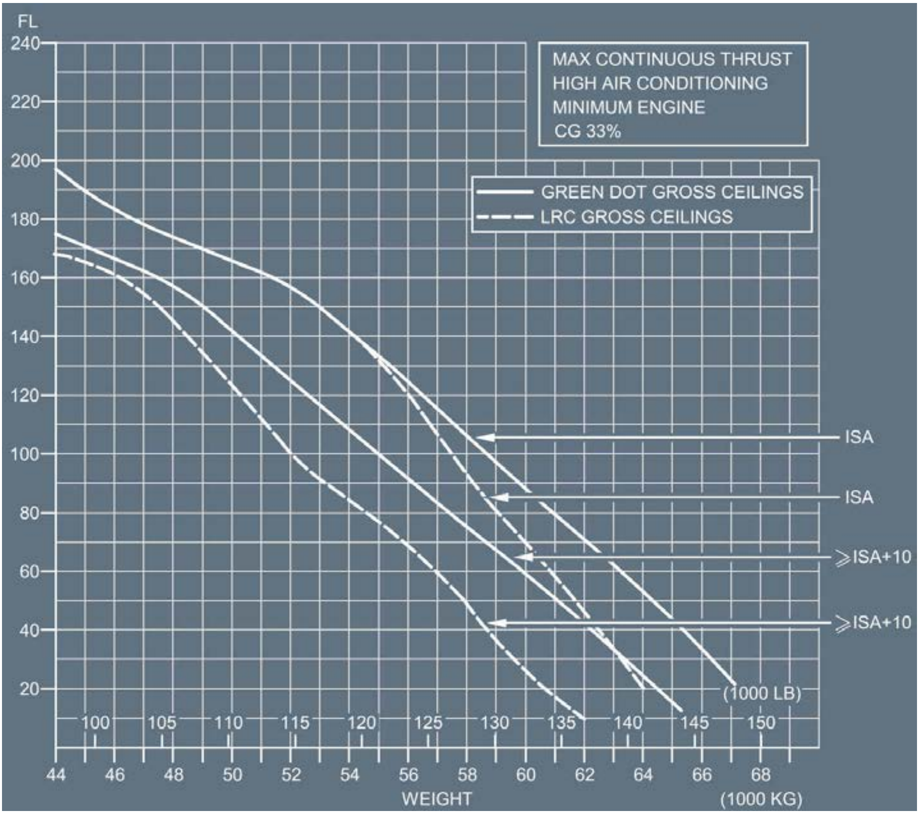
Applicable to: ALL

Ident.: PRO-NOR-SUP-LG-LG_DN-D-00002019.0017001 / 04 SEP 17

EN ROUTE NET FLIGHT PATH - L/G DOWN - ONE ENGINE INOP		
MAX. CONTINUOUS THRUST GREEN DOT SPEED HIGH AIR CONDITIONING ANTI ICE OFF	ISA CG = 25 %	MINIMUM ENGINE


100. NM
37.0
39.0
41.0
43.0
45.0
47.0
49.0
51.0
53.0
55.0
57.0
59.0
61.0
Equivalent Weight (x 1000 kg)
Pressure Altitude (ft)
20000.
10000.
0.

Ident.: PRO-NOR-SUP-LG-LG_DN-D-00004080.0006001 / 04 SEP 17



BLEED CORRECTIONS

		ISA	≥ ISA + 10
LONG RANGE	ENGINE ANTI ICE ON	-1 200 ft	-3 200 ft
	TOTAL ANTI ICE ON	-2 000 ft	-6 400 ft
GREEN DOT	ENGINE ANTI ICE ON	-300 ft	-2 000 ft
	TOTAL ANTI ICE ON	-800 ft	-4 300 ft

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Operation with Nosewheel Steering Offset

OPERATION WITH NOSEWHEEL STEERING OFFSET

Applicable to: ALL

Ident.: PRO-NOR-SUP-LG-LG-A-00020945.0001001 / 17 MAR 17

During taxi in a straight line, the crew may notice aircraft veering tendency. This can be due to external conditions (crosswind, slope....), or to a nosewheel steering offset.
A nosewheel steering offset is usually notified through consecutive crew reports. The NWS offset value is determined regarding the necessary rudder trim input used to cancel the veering tendency.

Ident.: PRO-NOR-SUP-LG-LG-A-00020946.0001001 / 17 MAR 17

When the NWS offset is within admissible limits, the flight crew can operate the aircraft as follows:

CAUTION	A rudder trim reset must be performed before takeoff. When the rudder trim adjustment is above the maintenance tolerance (±0.5 ° NWS offset corresponding to ±3 ° rudder trim necessary to taxi straight), the flight crew must systematically and accurately report the rudder trim value in the logbook.

NWS Offset	Necessary Rudder Trim Input	Procedure
Offset ≤ 0.5 °	Trim ≤ 3 °	● **Taxi:** RUDDER TRIM....................ADJUST Adjust trim until the aircraft taxies in a straight line. Check input value. ● **Before takeoff:** RUDDER TRIM....................RESET
0.5 ° < Offset ≤ 1.5 °	3 ° < Trim ≤ 8.8 °	● **Taxi:** RUDDER TRIM....................ADJUST Adjust trim until the aircraft taxies in a straight line. Check input value. ● **Before takeoff:** RUDDER TRIM....................RESET ● **Landing:** ● **For autoland:** MAX CROSSWIND....................10 kt
Offset > 1.5 °	Trim > 8.8 °	MAINTENANCE ACTION....................REQUEST Do not attempt takeoff. Request for troubleshooting.

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Pushback with Power Push Unit

PUSHBACK WITH POWER PUSH UNIT VIA THE MAIN LANDING GEAR

Applicable to: ALL

Ident.: PRO-NOR-SUP-MISC-D-A-00020472.0002001 / 17 MAR 17

When pushback is performed with a Power Push Unit (PPU) via the main landing gear, this procedure replaces the BEFORE PUSHBACK OR START SOP.

- **Before start clearance**

SOP - BEFORE START CLEARANCE....................PERFORM

L2 *Refer to PRO-NOR-SOP-07 Before Start Clearance.*

L1 BEFORE START CHECKLIST down to the line....................COMPLETE

NW STRG DISC MEMO....................CHECK NOT DISPLAYED

L2 *The ground crew should check that the towing lever is in the normal position.*

L1
- **At start clearance**

PUSHBACK/START CLEARANCE....................OBTAIN

L2 *Obtain ATC pushback/start clearance.*
Obtain ground crew clearance.

L1 ATC....................SET FOR OPERATION

L2 *ATC is set in accordance with airport requirements.*

L1 WINDOWS AND DOORS....................CHECK CLOSED

L2 *- To ensure that the sliding window is correctly closed, push the handle of the sliding window fully forward to the closed position, and check that the red indicator is visible.*
- Check, on the ECAM lower display, that all the aircraft doors are closed.
- When required by local airworthiness authorities, check that the cockpit door is closed and locked (no cockpit door open/fault indication).
If entry is requested, identify the person requesting entry before unlocking the door. With the cockpit door sw on NORM, the cockpit door is closed and locked. If entry is requested from the cabin, and if no further action is performed by the pilot, the cabin crew will be able to unlock the door by using the emergency access procedure. Except for crew entry/exit, the cockpit door should remain closed until engine shutdown.

L1 SLIDES....................CHECK ARMED

L2 *- Check, on the ECAM lower display, that all slides are armed.*

L1 BEACON sw....................ON

THRUST LEVERS...IDLE

CAUTION	*Engines will start, regardless of the thrust lever position; thrust will rapidly increase to the corresponding thrust lever position, causing a hazardous situation, if thrust levers are not at IDLE.*

ACCU PRESS indicator...CHECK

L2 *The ACCU PRESS indication must be in the green band. If required, use the electric pump on yellow hydraulic system to recharge the brake accumulator.*

L1 PARK BRK handle...CHECK ON

BRAKES PRESS indicator...CHECK

L2 *Check for normal indication.*

L1 BEFORE START CHECKLIST below the line...COMPLETE

Ident.: PRO-NOR-SUP-MISC-D-A-00020473.0001001 / 17 MAR 17

ENG 2...START

L2 *Engine 2 is usually started first to pressurize the yellow hydraulic system, making the parking brake available.*

L1 PTU...CHECK AUTO

L2 *The green hydraulic system is pressurized via PTU, making the nosewheel steering available.*

Ident.: PRO-NOR-SUP-MISC-D-A-00020474.0001001 / 17 MAR 17

PUSHBACK

Due to a face-to-face situation between the ground personnel and the flight crew, a clear understanding of directional phraseology is essential.

PARK BRK handle...OFF

BRAKES PRESS indicator...CHECK ZERO

L2 *A slight residual pressure may remain for a short period of time on the triple indicator. Advise the ground crew that the parking brake is off and that the pushback can be started.*

L1

CAUTION	*Do not use the brakes during pushback, except in case of emergency.* *Do not move flight controls or flap lever.*

L2 *In case of emergency, order the ground crew to separate the PPU and move it away from the evacuation areas. Nevertheless, evacuation is possible with the PPU in place.*

L1 STEERING HANDWHEEL...AS REQUIRED

L2 *Steer the aircraft using guidance from the ground crew.*

L1 ● **When pushback is completed:**

PARK BRK handle...ON

BRAKES PRESS indicator.. CHECK
GROUND CREW.. ADVISED TO REMOVE PPU

- **When PPU is removed and ground crew clearance obtained:**

  ENG 1...START
  SOP - AFTER START.. RESUME
  Refer to PRO-NOR-SOP-09 After Start

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Hight Altitude Airport Operations

HIGH ALTITUDE AIRPORT OPERATIONS

Applicable to: ALL

Ident.: PRO-NOR-SUP-MISC-A-A-00020650.0017001 / 20 MAR 17

TAKEOFF ON AIRPORT WITH AN ELEVATION OF 9 200 FT OR ABOVE

COCKPIT PREPARATION

HIGH ALT LDG pb-sw (for all on ground operation)....................ON

BEFORE PUSHBACK OR START

ACCU PRESS....................CHECK

L2 If required, use the HYD YELLOW ELEC PUMP to recharge the brake accumulator.

L1 GEN 1....................OFF
GEN 2....................OFF
G ENG PUMP....................OFF
Y ENG PUMP....................OFF

ENGINE START

- **When idle is reached**
  GEN 1....................ON
  GEN 2....................ON
  G ENG PUMP....................ON
  Y ENG PUMP....................ON

TAKEOFF

Note: *For A/C operating under FAA requirements, as long as the cabin altitude is above 12 000 ft in flight, at least one pilot must use the oxygen mask continuously.*

APU BLEED....................AS RQRD

L2 Packs may be supplied for takeoff by the engine bleed, or by the APU bleed up to 17 000 ft depending on the takeoff performance requirement.

L1 CRUISE

LDG ELEV AUTO [CRUISE page]....................CHECK

- **When cabin altitude below 12 000 ft and decreasing:**
  HIGH ALT LDG pb-sw....................OFF
  CHECK THAT CABIN ALTITUDE DECREASES BELOW 9 550 ft +/- 350 ft

L2 This will allow the CAB PR EXCESS CAB ALT alert to trigger again if necessary despite the clear action.

L1 LANDING ON AIRPORTS WITH AN ELEVATION OF 9 200 FT OR ABOVE

CRUISE

- **If CAB ALT exceeds 8 000 ft:**
  LDG ELEV: 8 000 ft:..SET

L2 Manually selecting a landing field elevation overrides the FMGS landing field elevation for the remaining time of cruise.

L1 *Note: A step descent or turbulence conditions may trigger an early CPC descent mode detection, leading the CPC to start controlling to the landing field elevation pressure.*

DESCENT PREPARATION

Note: For A/C operating under FAA requirements, at least one pilot must use the oxygen mask continuously until landing.

HIGH ALT LDG pb-sw..ON

L2 Passengers oxygen masks would drop when cabin altitude is above 14 000 ft +250/-750 ft if HIGH ALT LDG pushbutton switch is OFF.

L1 *Note: Passengers oxygen masks drop above 16 000 ft +250/-750 ft cabin altitude if HIGH ALT LDG pushbutton switch is ON.*

LDG ELEV..AUTO

L2 CPC starts controlling the pressure to the landing field elevation at beginning of descent.

L1 AFTER LANDING

HIGH ALT LDG pb-sw (for all on ground operation)..ON

INSERTION OF APPROACH MINIMA

Applicable to: ALL

Ident.: PRO-NOR-SUP-NAV-A-00015220.0001001 / 21 MAR 17

QNH USE FOR AIRCRAFT NOT EQUIPPED WITH QFE OPTION

This table explains how the flight crew must insert the approach minimum on the MCDU PERF APPR page.

		Guidance Modes			
		LOC G/S CAT II & CAT III approaches	LOC G/S CAT I approaches	FINAL APP	NAV FPA LOC FPA LOC B/C FPA TRK FPA
MCDU PERF APPR page	MDA field	---	DA	DA or MDA	MDA
	DH field	DH or RA	---		
FMA display		“DH XXX”	“MDA XXXX”		

Ident.: PRO-NOR-SUP-NAV-A-00015222.0001001 / 21 MAR 17

QFE USE FOR AIRCRAFT NOT EQUIPPED WITH QFE OPTION

The crew should not use QFE on aircraft with a “QNH only” pin programming (incorrect profile computation of the managed vertical modes CLB , DES and FINAL APPR, possible false GPWS warnings in mountainous areas).

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ENHANCED GROUND PROXIMITY WARNING SYSTEM (EGPWS)

Ident.: PRO-NOR-SUP-SURV-00020960.0004001 / 17 MAR 17
Applicable to: ALL

During climb, descent, approach and go-around phases:

- **If GPS PRIMARY is not available and FMS navigation accuracy check prevents the flight crew from using NAV mode in a phase of flight:**
  TERR pb-sw..OFF

  Note: When the TERR pb-sw is switched OFF, the ECAM message "NAV GPWS TERR DET FAULT" is displayed.
  Only the basic GPWS modes 1 to 5 remain operative.

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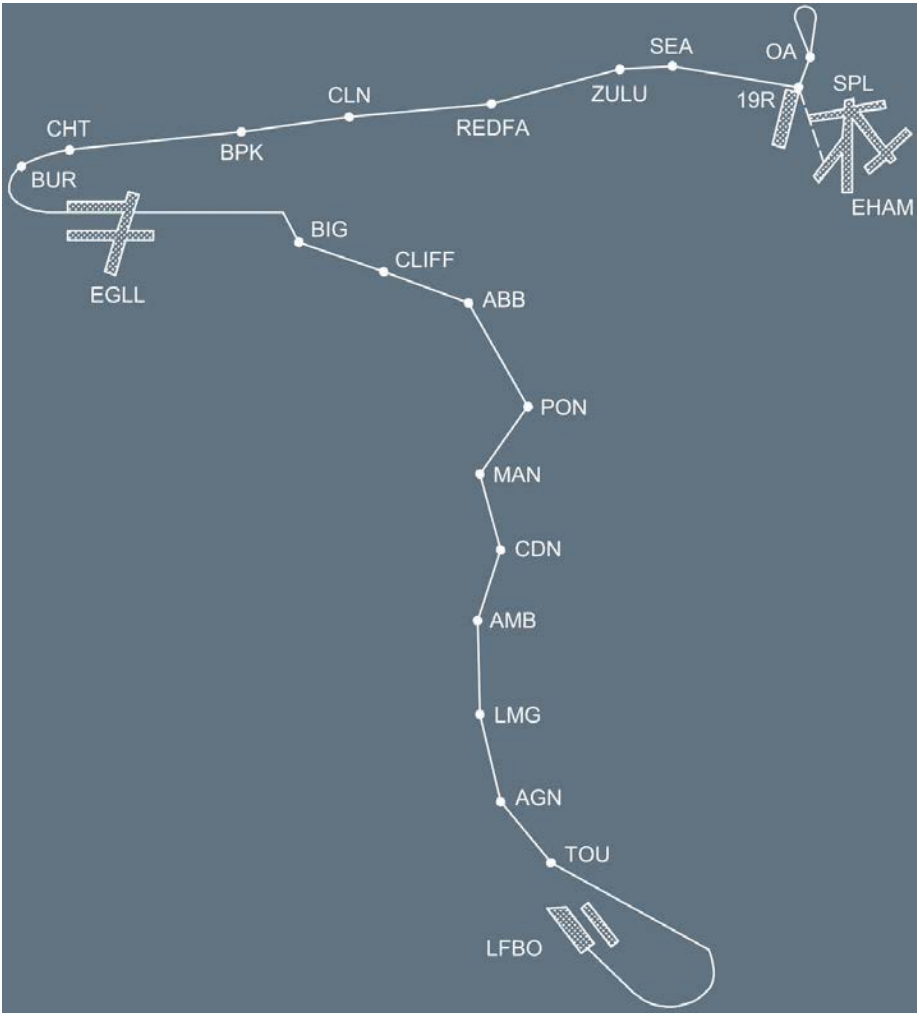
Introduction

INTRODUCTION

Ident.: PRO-NOR-SRP-01-05-00003959.0001001 / 09 OCT 12
Applicable to: ALL

<u>Note:</u> *This chapter is an amplification of the SOP. Anytime it was feasible, the same chapters and the same titles of paragraph were retained.*

The following discussion of the FMGS uses this flight plan as an example.


SEA
OA
CLN
ZULU
SPL
19R
CHT
REDFA
BPK
BUR
EHAM
BIG
CLIFF
EGLL
ABB
PON
MAN
CDN
AMB
LMG
AGN
TOU
LFBO

Cockpit Preparation

FMGS INITIALIZATION

Ident.: PRO-NOR-SRP-01-10-00003960.0002001 / 22 MAY 12
Applicable to: ALL

CHECKING THE CLOCK DATE

CHECK the CLOCK DATE and ADJUST, if necessary.

If the date in the active database does not match the clock date, the MCDU displays "CHECK DATA BASE CYCLE". If this message appears, check the period of validity in the second database and select it, if required.

CAUTION	*Cycling the navigation database deletes the active and secondary flight plans. Do not cycle it while airborne because doing so will delete the flight plan, eliminate all speed predictions, and blank the ND. If the aircraft is in managed speed, Green Dot becomes the speed target.*

CHECKING STORED WAYPOINTS, NAVAIDS, RUNWAYS, OR ROUTES

PRESS the DATA key.
PRESS the next page key.

SELECT, successively, as required:
- STORED WAYPOINT
- STORED NAVAIDS
- STORED RUNWAYS
- STORED ROUTES

CHECK the contents of each of these data storages and DELETE items, as appropriate.

NAVAIDS DESELECTION

- **If NOTAMS indicate that selected NAVAIDs are unreliable or unserviceable, deselect them as follows:**

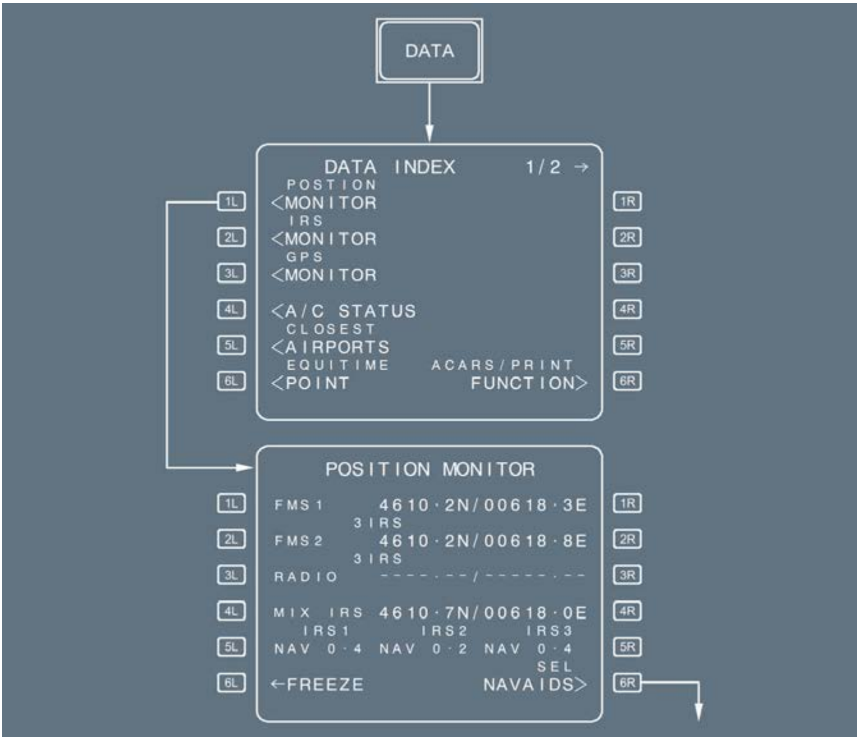
  PRESS the DATA key.

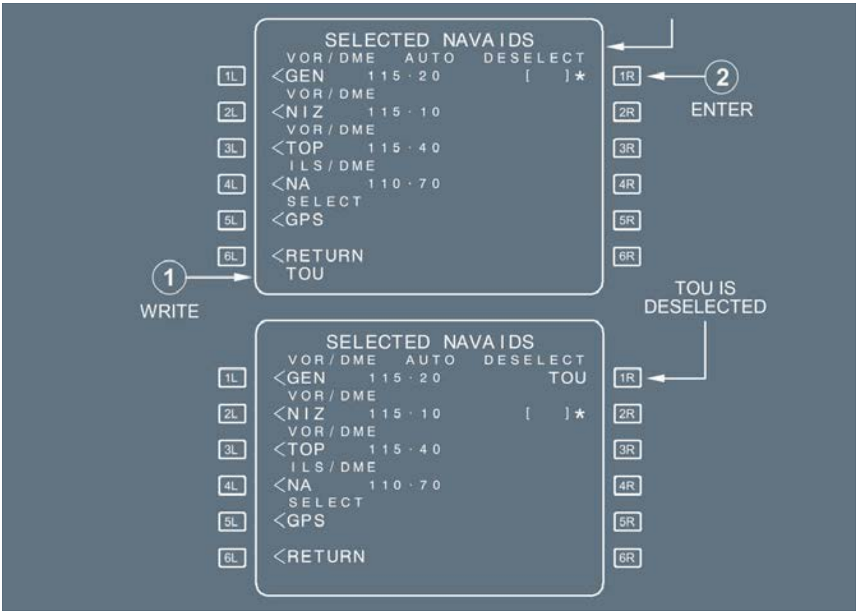
  SELECT the POSITION MONITOR page.

  SELECT the SELECTED NAVAIDS page.

  Under “DESELECT”, INSERT the NAVAID identifier in the brackets.

  The pilot can only make six deselections.





FLIGHT PLAN INITIALIZATION

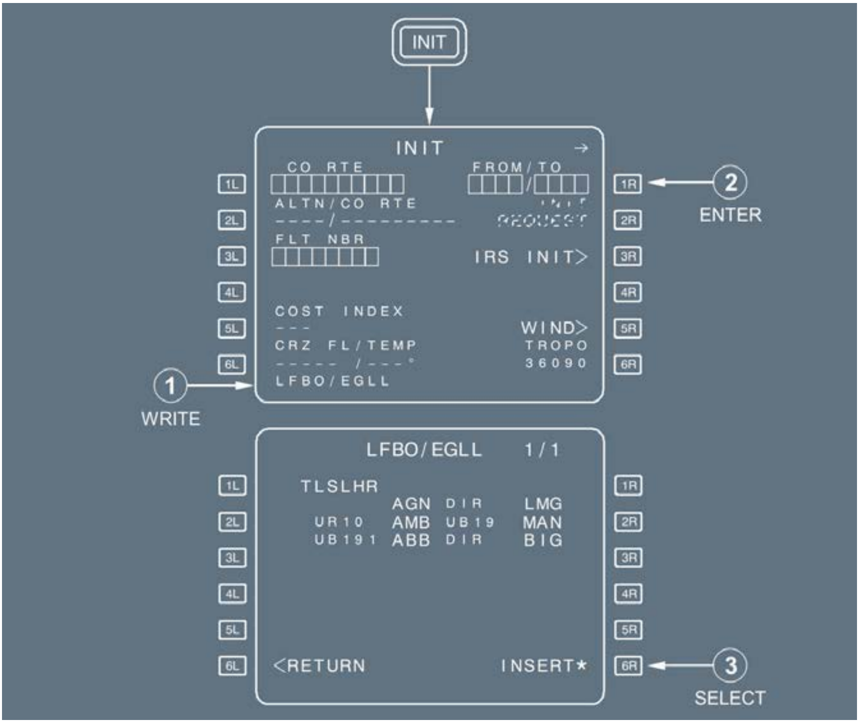
Applicable to: ALL

Ident.: PRO-NOR-SRP-01-10-A-00003961.0025001 / 22 MAY 12

GENERAL

Follow SOP instructions, when the route is a company route stored in the database.

- **If the company route is unknown, proceed as follows:**



WRITE a “FROM/TO” city pair, then ENTER it:

If one or more company routes run between the cities, the ROUTE SELECTION page appears and defines them.

INSERT the preferred company route.

- **If the database does not contain a company route:**

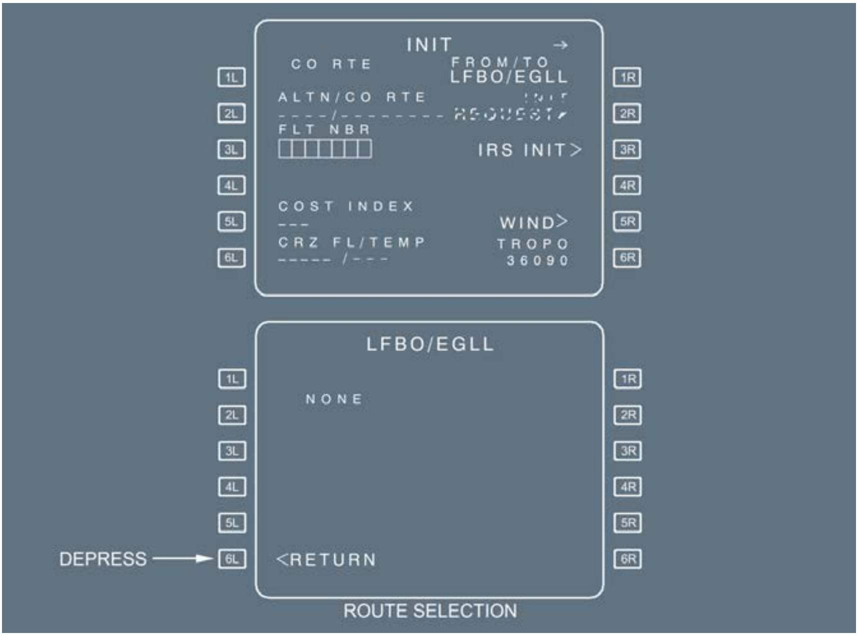
The flight plan must be constructed manually:

PRESS the INIT key

ENTER a city pair in the FROM/TO field.

The ROUTE SELECTION page comes up with “NONE”

SELECT RETURN [6L] key then construct the flight plan manually.



If waypoints, NAVAIDs or airports are not in the NAV database, the crew must define and store them manually, using the “data stored” function.

Ident.: PRO-NOR-SRP-01-10-A-00003962.0037001 / 23 JUN 15

ALIGNING IRS

PRESS the INIT key, and then the IRS INIT prompt.

IRS INIT page is displayed with the airport reference point as default coordinates.

If necessary, PRESS [1L] and/or [1R] and use scroll keys to adjust the latitude and/or longitude values.

For example, this can be used to enter the gate precise coordinates when the aircraft is intended to fly without GPS on long segments without radio coverage.

PRESS the ALIGN ON REF prompt and CONFIRM ALIGN* prompt.

The displayed coordinates are sent to ADIRS for initialization.
The alignment status changes to ALIGNING ON REF.

- **If the “CHECK IRS/AIRPORT POS” or "REF/GPS POS DIF" or "REF/LAST IRS POS DIF" message is displayed:**

  CHECK the departure airport on INIT A page and CORRECT it if necessary.

REALIGN the IRS per the procedure described previously.

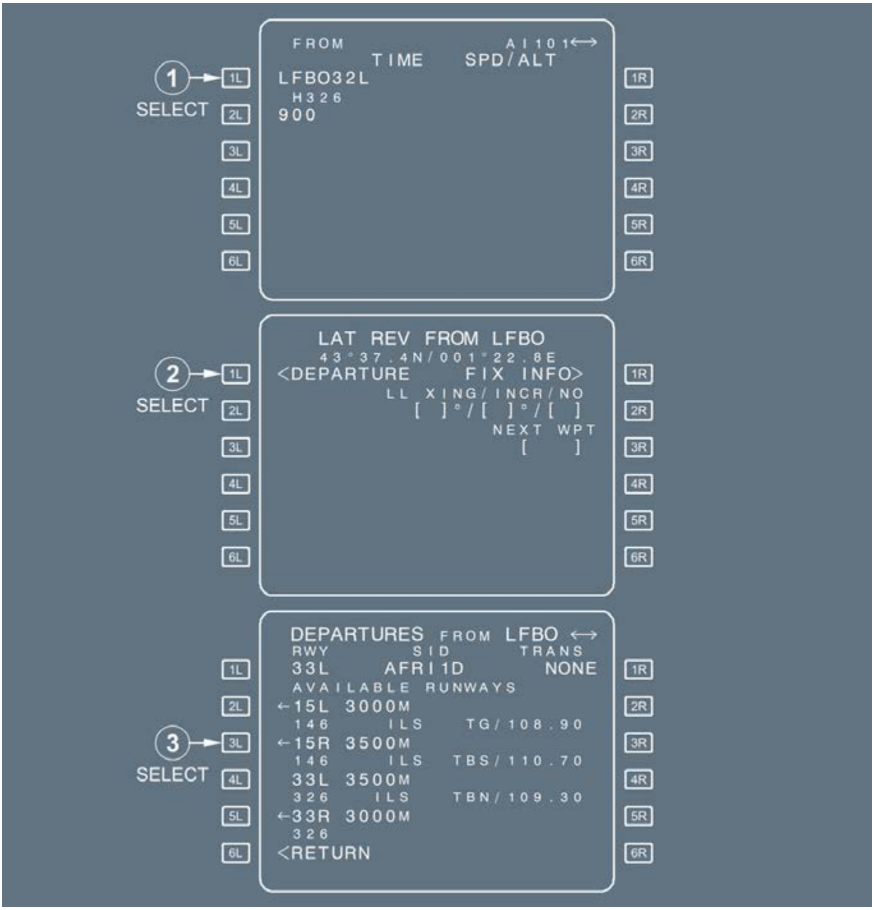
- **If a new FROM or a new CO RTE is entered after IRS alignment is already completed, the ALIGN ON REF prompt is displayed in [6R]:**

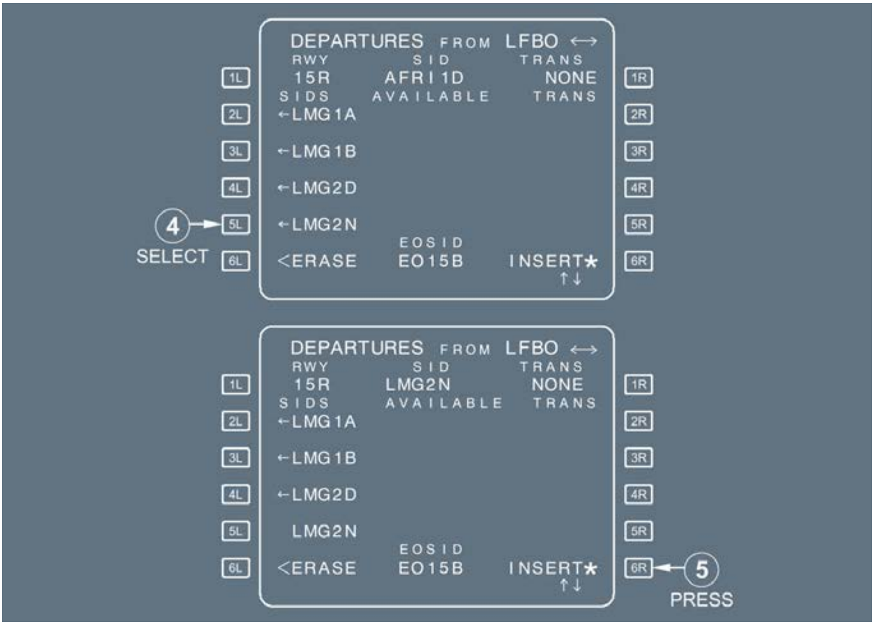
  REALIGN the IRS per the procedure described previously.

Ident.: PRO-NOR-SRP-01-10-A-00003963.0010001 / 22 MAY 12

LATERAL FLIGHT PLAN

SELECTING A DEPARTURE





You may use the ”NEXT PAGE” , or the “←” or “→” keys to gain access to the listings of runways, SIDs, and transitions.

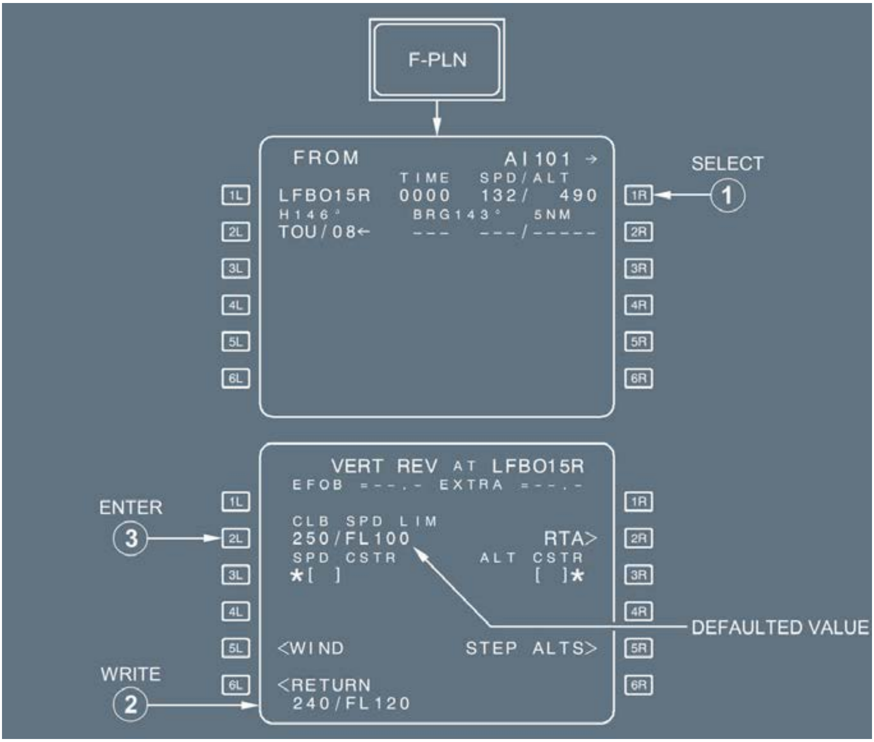
Procedure

PRESS the F-PLN key on MCDU
SELECT the DEPARTURE prompt [1L] key
SELECT the RWY in USE, SID and TRANS
CHECK the resulting temporary F-PLN
If it is correct, INSERT it using [6R] key.
If it is not correct, ERASE it using [6L] key.

Ident.: PRO-NOR-SRP-01-10-A-00003964.0004001 / 22 MAY 12

VERTICAL FLIGHT PLAN

ENTERING/MODIFYING A SPEED LIMIT

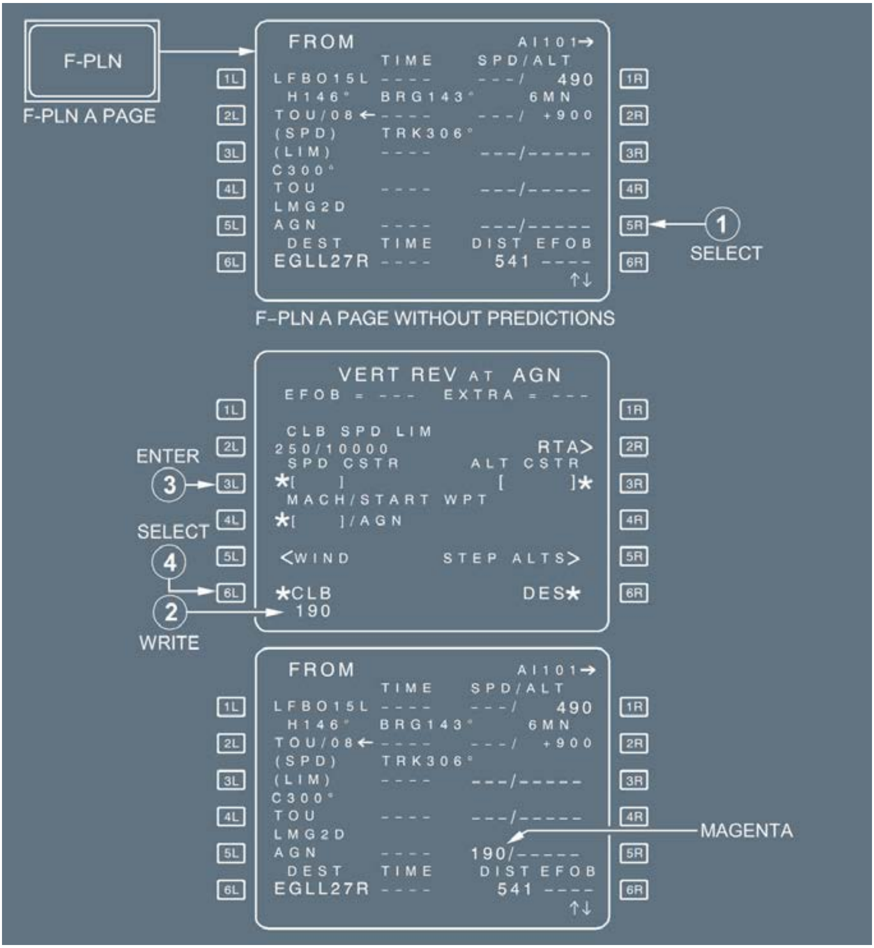


PRESS the F-PLN key on the MCDU.
SELECT VERTICAL REVISION at the FROM waypoint.
WRITE a new speed limit/altitude and ENTER.

The crew can insert one climb speed limit and one descent speed limit into the vertical flight plan, or modify or clear the limits that are already in it.
The speed limit is defined by a speed and an altitude (for example, 230/9 000), which means that the managed speed target will be limited by the speed limit when the aircraft flies below the specified altitude.
In both climb and descent, 250 kt at 10 000 ft is the default speed limit in the vertical flight plan.
The vertical revision page presents the climb speed (CLB SPD) limit if the revised waypoint is between departure and top of descent.

The vertical revision page shows the descent speed (DES SPD) limit, if the revised waypoint is between top of descent and destination.
It can be deleted by a clear action, the field reverts to brackets. It can also be cleared directly on the F-PLN A page by clearing the SPD LIM pseudo-waypoint.

ENTERING A SPEED CONSTRAINT



Procedure

PRESS the F-PLN key on the MCDU.

SELECT the VERT REV page at the revised waypoint.
WRITE the speed constraint value into the scratchpad and ENTER it in 3L.
INSERT the constraint using the appropriate *CLB or DES * prompt when displayed. If CLB and DES are not displayed, insertion occurs when the value is entered in 3L.

The system displays the climb (CLB) or the descent (DES) prompt at [6L] or [6R] when the predictions are not yet available or when the waypoint is part of the cruise phase as originally defined.
When predictions are not yet available, the constraints are displayed on the F-PLN A page in magenta.

When predictions are available, the speed constraint is highlighted by a star (*).
** If the predicted speed matches the constraint, the star is magenta.*
** If the prediction is that the aircraft will miss the speed constraint, the star is amber.*
If a speed constraint cannot be met (by more than 10 kt), the FMGS generates the message “SPD ERROR AT WPT XX”.

A speed constraint may be assigned to any waypoint in the climb or the descent phase except the FROM, origin, or destination waypoints, and any pseudo waypoint.

When a speed constraint is assigned to a waypoint, the constraint will limit the managed speed target as follows:
- *In takeoff or climb phase until you pass the constrained waypoint.*
- *In descent an approach phase, after passing the constrained waypoint.*

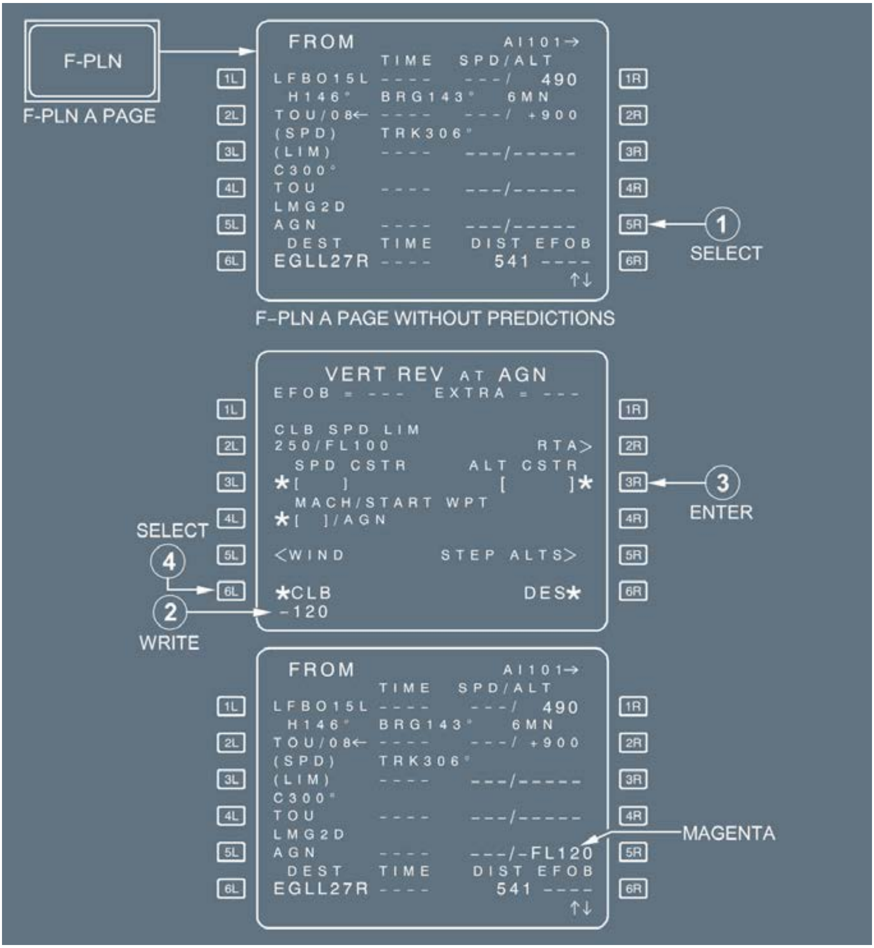
Speed constraints are observed by the FMGS when NAV mode and speed managed are active.

ENTERING A SPEED CONSTRAINT THROUGH F-PLN A PAGE

You may also enter a speed constraint through the F-PLN A page.

Note: *You may delete the constraint using the clear key on the relevant right hand key. However if there is an altitude constraint assigned at that point, the clear action deletes it too.*

ENTERING AN ALTITUDE CONSTRAINT



Procedure

PRESS the F-PLN key on the MCDU.

SELECT the “VERT REV” page at the revised waypoint.
WRITE an altitude constraint in the scratchpad and ENTER it in 3R.
INSERT the constraint using *CLB or DES* prompt when it is displayed. Otherwise the value is inserted when it is entered in 3R field.

*The system displays the *CLB or DES* prompt, when the predictions are not yet available, or when the waypoint is part of the cruise phase as originally defined.*

Note: *In case of QFE operations, the altitude constraints must be converted and entered as an altitude in feet.*

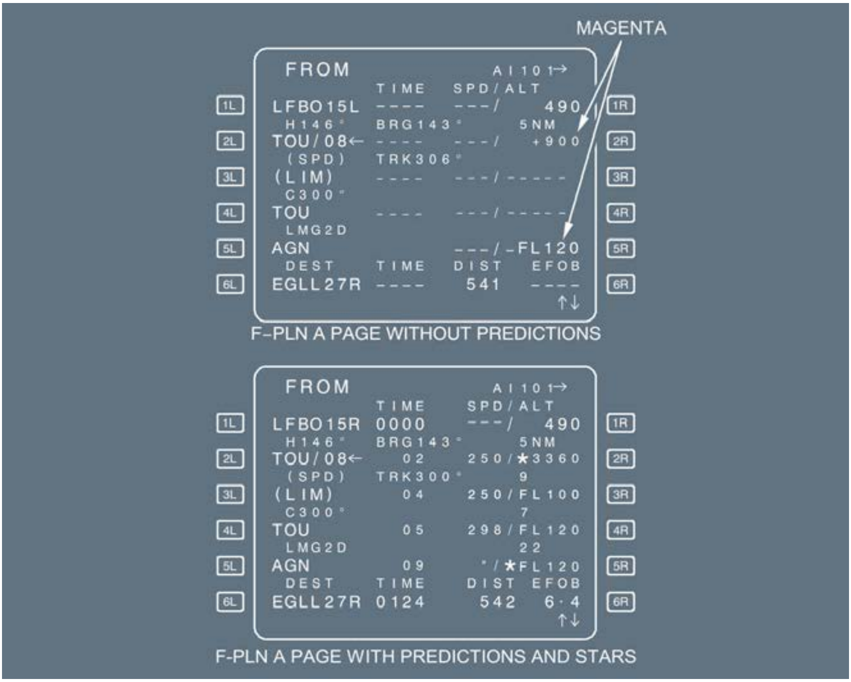
You or the database may assign an altitude constraint to any waypoint in the climb or descent phases except the FROM, origin, or destination waypoints, or any pseudo waypoint.
An altitude constraint may be defined as an “at”, an “at or above”, or an “at or below” constraint. In certain procedures, the database may define an altitude constraint as a window in which the aircraft should fly.

Enter “AT” constraints with no sign.
Enter “AT or ABOVE” constraints preceded by a + sign (+FL 130, for example).
Enter “AT or BELOW” constraints preceded by a – sign (-15 000, for example).
enter four or five-digit number when entering altitude. Include the lead zero (0 500 ft , for example).

For flight level, enter a two- or three-digit number, with or without the letters “FL”. The lead zero is optional. (Examples : +FL 120 or +120 ; -FL 090 or -90 or -090)

Enter the altitude value as either altitude or flight level ; the MCDU displays the selected value as an “ALT ” or “FL,” as appropriate for the transition altitude.

The constraint must be higher than the thrust reduction altitude and lower than the cruise flight level.
Once inserted in the flight plan, the altitude constraint (ALT CSTR) is displayed in magenta as long as predictions are not available.
When predictions are available, the altitude constraints are replaced by the predicted altitude at relevant waypoints highlighted by a star.
** If the predicted altitude matches the constraint the star is magenta. If the predicted altitude is missed (by more than 250 ft), the star is amber.*

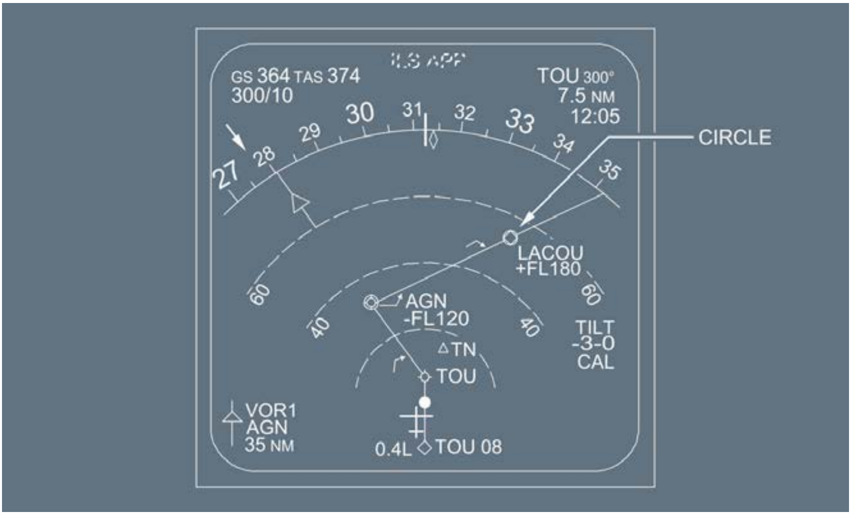


The vertical revision page displays “ALT ERROR”, along with the difference between the constraint and the predicted altitude at the revised waypoint.

ND Display

An altitude-constrained waypoint is marked by a circle ( ) on the navigation display.

This circle is white when the guidance does not take the altitude constraint into account. It is magenta if the guidance system takes the altitude constraint into account and predicts that it will be matched.
It is amber if the guidance system takes the altitude constraint into account and predicts that it will not be matched.



The aircraft should be at or below FL 120 at AGN and above FL 180 at LACOU.

Entering an Altitude Constraint Through F-PLN A Page

The pilot may also enter an altitude constraint directly through the F-PLN A page.
When entering the value into the scratchpad do not forget the slash e.g. /-120 or /-FL 120.
If the slash is omitted the value will be considered as a speed constraint if it is within the range value.

Use CLR to delete them directly from the flight plan page, as well. However, if there is also a speed constraint assigned at that waypoint, the clear action deletes it too.

ENTERING AN ESTIMATED TIME OF TAKEOFF (ETT)

In Preflight Phase:

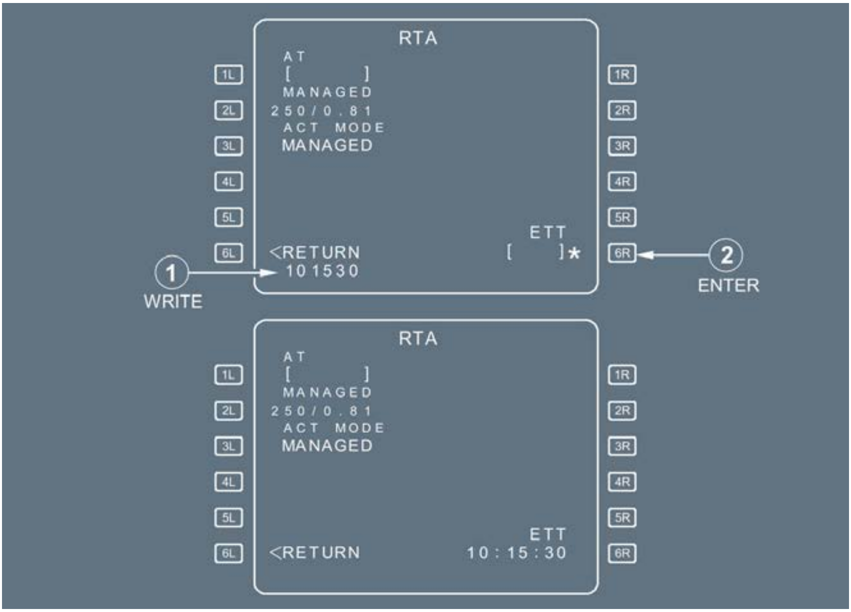
SELECT the SEC F-PLN key on the MCDU.
SELECT a VERT REV at any waypoint.
SELECT the Required Time of Arrival (RTA) prompt (2R).

The MCDU displays the RTA page.

ENTER the Estimated Takeoff Time in the [6R] field.

The format is HHMMSS (entry of seconds is not mandatory).

ENTER it in the 6R field



If the aircraft has not taken off by the time entered as estimated takeoff time, the MCDU displays the “CLK IS TAKE OFF TIME” message, meaning that the system will replace your estimated takeoff time with the actual time.
When beginning the takeoff roll, the system automatically adopts that clock time as the takeoff time.
If the origin airport is changed, or the clock time is invalid, the system automatically deletes the estimated takeoff time.

Ident.: PRO-NOR-SRP-01-10-A-00003965.0001001 / 15 FEB 11

FLIGHT PLAN CHECK

CHECK the EOSID on the ND plan mode (yellow line).

Note: *If the details of the EOSID require review, select the EOSID as a TMPY F-PLN and review it as TMPY. Then ERASE it.*

Ident.: PRO-NOR-SRP-01-10-A-00003966.0001001 / 09 DEC 09

SECONDARY F-PLN

For details : *Refer to DSC-22_20-60-50 Secondary Flight Plan*.

Ident.: PRO-NOR-SRP-01-10-A-00003967.0001001 / 15 FEB 11

RADIO NAV

Whenever a NAVAID IDENT is correctly decoded, in agreement with that published, no audio check is necessary.
Morse decoding is displayed on the ND for VOR/DME, VOR/TAC, DME , ADF , and on the PFD for ILS.
Preferably use the identifier for NAVAID entry.
If the ADF IDENT is not in the database, be sure to include a decimal point when tuning the frequency (e.g 315. or 325.7).

Note: *Whenever, the runway ILS is intented to be retained for guidance after the takeoff phase, it is recommended to manually tune the ILS by its identifier.*

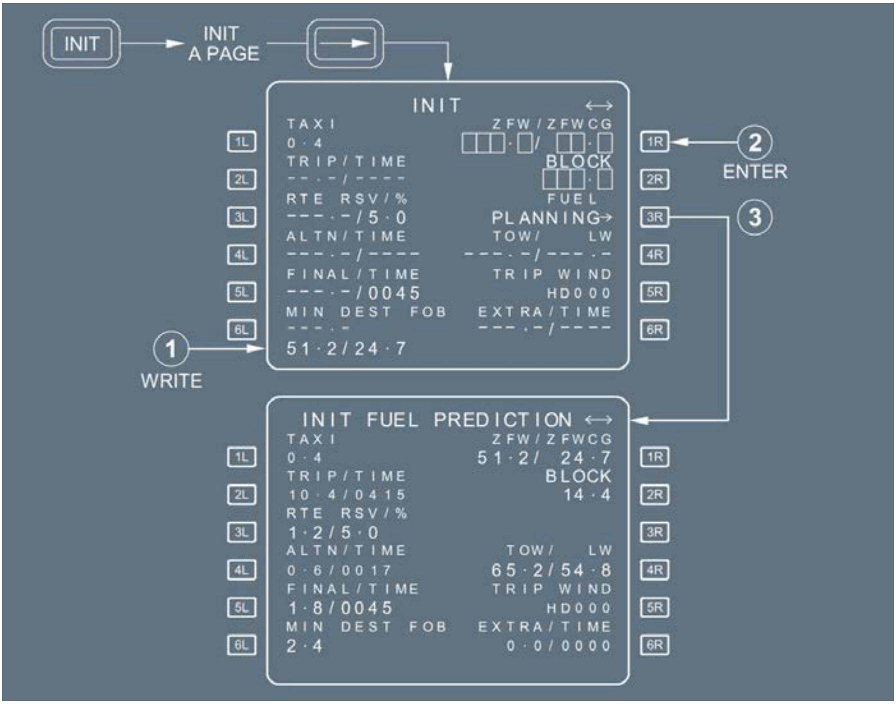
FMGS DATA INSERTION

Applicable to: ALL

Ident.: PRO-NOR-SRP-01-10-B-00003968.0024001 / 05 OCT 16

WEIGHT/CG INSERTION AND FUEL PLANNING

The flight crew must enter the Zero Fuel Weight (ZFW) and Zero Fuel Weight Center of Gravity (ZFWCG) values on the INIT B page, to allow the FMS to perform the fuel planning computations.



PROCEDURE

PRESS the INIT key, and the Next ("→") key to access the INIT B page.
ENTER the ZFW and ZFWCG value in the [1R] field.

The "FUEL PLANNING →" prompt appears in the [3R] field.

<u>Note:</u> *As long as the final Load and Trim Sheet is not available, the crew should insert the estimated ZFW /ZFWCG in order to get fuel estimates. The ZFW and ZFWCG values must be updated with the final Load and Trim Sheet values.*

CHECK/MODIFY the TAXI [1L], RTE RSV [3L] and FINAL TIME [5L] values.

The TAXI, RTE RSV and FINAL TIME fields display the default values specified in the AMI file (for example, "0.4 t" for TAXI, "5.0 %" for RTE RSV and "0045" for FINAL TIME). The flight crew may modify these values.

<u>Note:</u> *At takeoff, the RTE RSV field will automatically be reset to 0. The RTE RSV fuel is then added to the EXTRA fuel, which ensures that the EXTRA fuel and MIN DEST FOB values are consistent in flight.*

ENTER an ALTN fuel value in the [4L] field, as necessary.

The flight crew may enter the ALTN fuel value planned on the Computerized Flight Plan (CFP), as necessary.

ENTER a MIN DEST FOB value in the [6L] field, as necessary.

<u>Note:</u> *MIN DEST FOB (equal to ALTN + FINAL) can be increased at flight crew discretion (e.g. when HOLD is expected at destination).*

ENTER the TRIP WIND value in the [5R] field, as necessary.

In no wind profile has been entered in the F-PLN, the crew may enter an average TRIP WIND in this field, to obtain more realistic fuel/time predictions before departure.

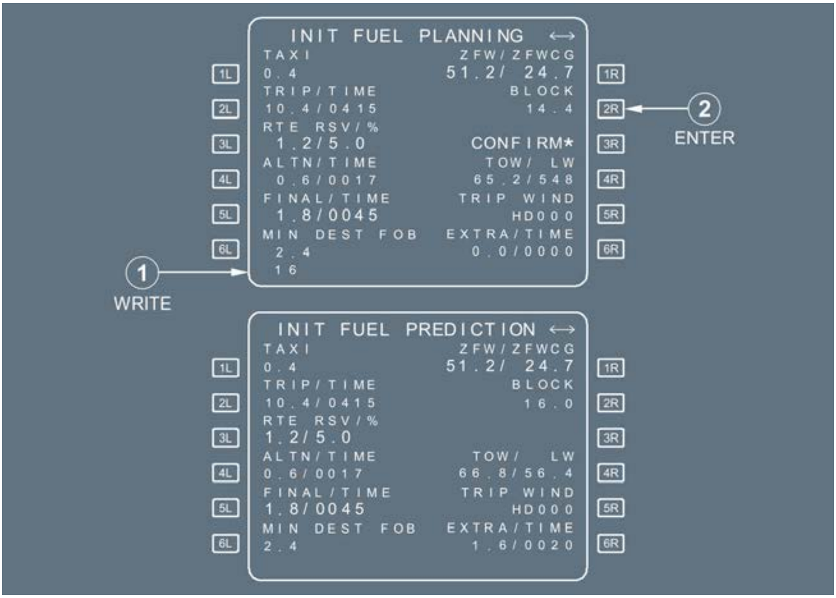
<u>Note:</u>
1. *The flight crew should only enter a TRIP WIND to obtain realistic fuel/time predictions, on ground. Then, the flight crew should enter a wind profile using the WIND pages, for fuel/time predictions in flight. As soon as flight crew has entered a wind profile on the WIND pages, the TRIP WIND will be erased.*
2. *If the crew has already defined a wind profile, even partially (such as climb wind), it is not possible to enter a TRIP WIND.*

ENTER the planned BLOCK fuel, as indicated in the computerized flight plan (CFP)

If the planned BLOCK fuel is not available, the crew may obtain a prediction of the <u>minimum</u> BLOCK fuel required for the flight by pressing the FUEL PLANNING prompt [3R].
Pressing this prompt makes the FMS compute the minimum required BLOCK fuel, which is the BLOCK fuel required to have EXTRA fuel = 0, based on the parameters entered on the INIT and F-PLN pages.
The computed BLOCK fuel value is displayed in the [2R] field, and a BLOCK CONFIRM prompt appears in the [3R] field.

<u>Note:</u> *In order to obtain a realistic fuel computation, the flight crew should ensure that the F-PLN initialization has been completed (including insertion of the ALTN F-PLN and/or ALTN fuel and/or MIN DEST FOB if necessary), and that flight parameters, such as CRZ FL, steps climbs (if any), and winds, have been inserted.*

- **When the final Load and Trim Sheet (LTS) data are available:**



ENTER the final ZFW/ZFWCG [1R], and the required BLOCK fuel [2R].

The FMS computes the predictions, based on the entered BLOCK fuel, and estimates the EXTRA fuel value.

CHECK the resulting computed data, against the data planned on the CFP: TRIP fuel, RTE RSV fuel, ALTN fuel, FINAL and EXTRA fuel values.

If necessary, the flight crew may modify the ALTN or FINAL fuel values.

PRINT the PREFLIGHT REPORT, if necessary.

When the final Load and Trim Sheet values (ZFW /ZFWCG /BLOCK) have been entered, the crew may print the pre-flight report, which provides a copy of the F-PLN with the associated FMS predictions.

Ident.: PRO-NOR-SRP-01-10-B-00003969.0010001 / 15 FEB 11

TAKEOFF WITH NO WEIGHT/CG DATA

If the crew does not enter ZFW /ZFWCG data prior takeoff, or if the FMGC looses these values due to a power interruption, the following will occur:

- At takeoff, the Speed Reference System (SRS) mode is available (provided a V2 has been inserted)
- When the aircraft leaves the SRS mode, the target speed becomes the current speed and reverts to selected.

Note: *If the AP /FD has reverted to ALT or V/S (FPA) mode, the associated A/THR mode is SPEED. In this case, the system will probably reduce thrust, because the speed will be equal to, or greater than, the target speed.*

● **When appropriate, to regain FMS predictions and associated managed modes:**

INSERT the ZFW/ZFWCG values on the FUEL PRED page.

Ident.: PRO-NOR-SRP-01-10-B-00003970.0007001 / 15 FEB 11

INSERTING WEIGHT/CG DATA AFTER ENGINE START

The flight crew must enter the ZFW /ZFWCG values on INIT B page prior to engine start. If these data have not been entered at engine start, the MCDU displays the “INITIALIZE WEIGHTS” amber message in the scratchpad. After engine start, the crew should enter the ZFW /ZFWCG values on the FUEL PRED page.

PRESS to the FUEL PRED key.
INSERT the ZFW /ZFWCG values in the [4R] field.

This allows predictions and performance computation.

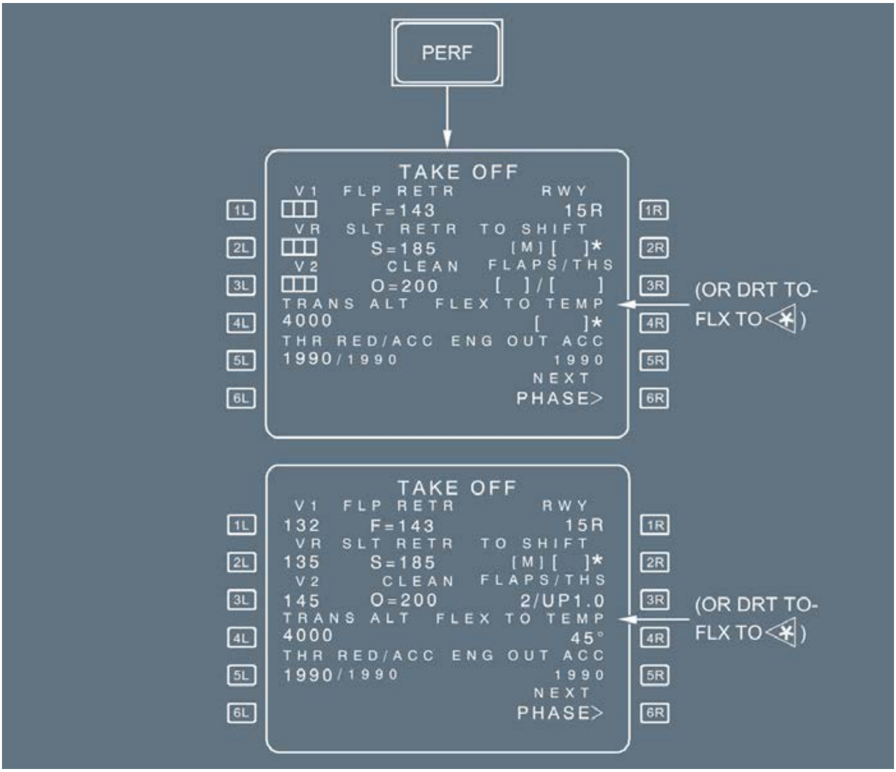
CHECK the resulting computed data, against the data planned on the CFP: TRIP fuel, RTE RSV fuel, ALTN fuel, FINAL and EXTRA fuel values.

If necessary, the flight crew may modify the ALTN or FINAL fuel values.

PRINT the PREFLIGHT REPORT, if necessary.

When the final load sheet values (ZFW /ZFWCG /BLOCK) have been entered, the crew may print the pre-flight report, which provides a copy of the F-PLN with the associated FMS predictions.

TAKEOFF DATA INSERTION



PROCEDURE

PRESS the PERF key on the MCDU.
WRITE successively and ENTER : V1 , VR , V2.
WRITE and ENTER FLX TEMP or DRT TO ⊲✱ .
CHECK/MODIFY the THR RED ALT (Thrust reduction altitude) See *.
CHECK/MODIFY the ACC ALT (acceleration altitude) See *.
CHECK/MODIFY the ENG OUT ACC (engine out acceleration altitude) See *.
CHECK/MODIFY the TRANS ALT (transition altitude) See *
WRITE and ENTER T.O. SHIFT.

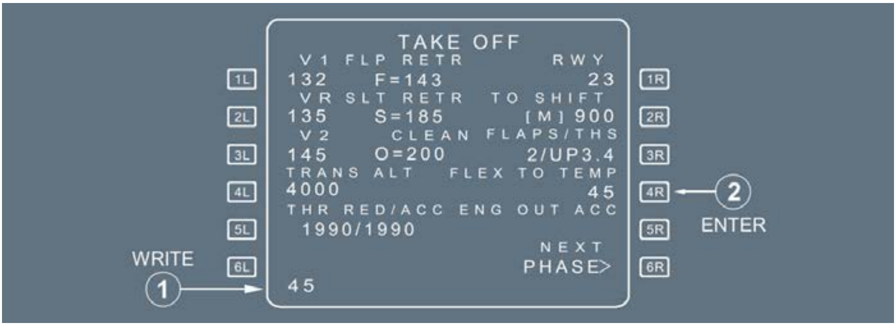
CHECK V1 , V2 on PFD See **

* *Altitudes less than 400 ft above airfield elevation cannot be selected.*

** *If the PFD does not display V2 at the top of its speed scale, check that at least one FD is ON.*

ENTERING A FLEX TEMPERATURE

WRITE the desired flex temperature in the scratchpad and ENTER using the [4R] key.

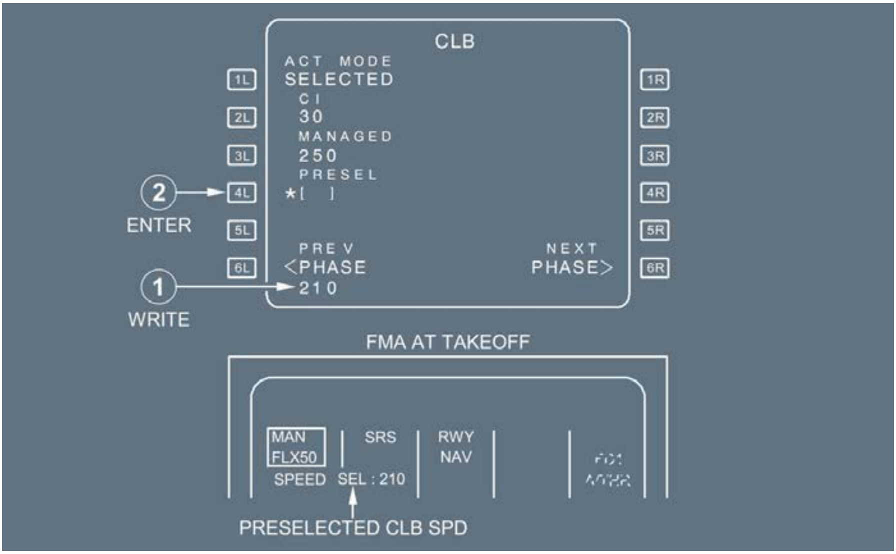


Ident.: PRO-NOR-SRP-01-10-B-00003972.0003001 / 22 MAY 12

CLIMB SPEED PRESELECTION

If the managed speeds for the initial climb are not suitable, the pilot can preselect an appropriate climb speed on the “PERF CLB” page, as long as the climb phase is not active.

The CLB SPD preselection applies, when the:
- ATC specifies an initial climb speed.
- Initial climb speed must be lower than normal because:
  - There are to be turns greater than 120 ° in the initial climb out.
  - Obstacle clearance, or some other situation, requires a high climb angle.
  - The airfield has a risk area to be quickly cleared (birds reported, for example).



PROCEDURE

PRESS the PERF key on the MCDU.

The PERF TAKE OFF page is displayed.

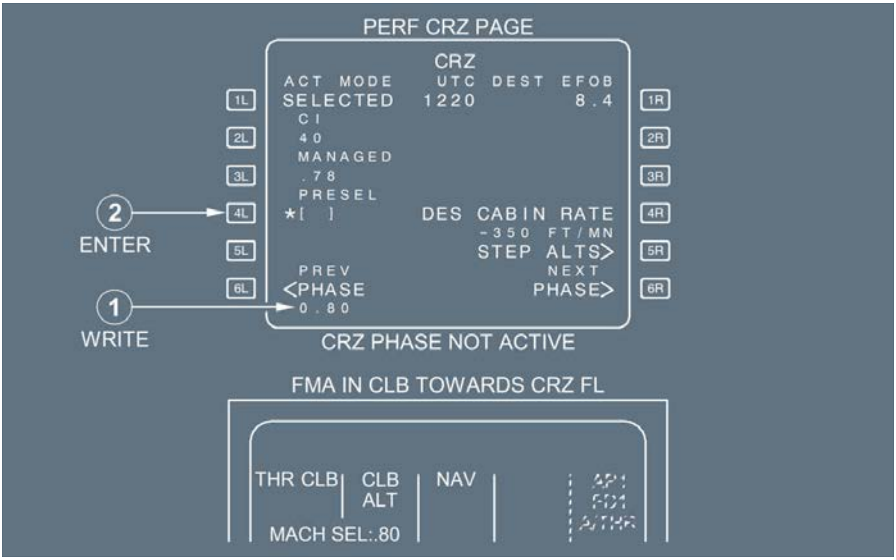
SELECT the “NEXT PHASE” [6R] key to display the CLB page.
WRITE a climb speed and ENTER it.
To revert to managed speed, select MANAGED by pressing [3L].

When the aircraft is transitioning into the climb phase, the preselected value becomes the target speed:
- The selected speed target is active.
- The primary flight display shows the target speed in blue.
- The FCU’s speed window displays the new speed or Mach number.

Ident.: PRO-NOR-SRP-01-10-B-00003973.0003001 / 09 OCT 12

CRUISE MACH (SPEED) PRESELECTION

The pilot preselects a cruise Mach, when a Mach number other than the ECON cruise Mach number is required.
When the aircraft transitions to the cruise phase, the speed target symbol goes to the preselected value and “SELECTED” becomes the active speed mode (blue target on PFD , target MACH shown in the speed/Mach window of the FCU).



PROCEDURE

PRESS the PERF key on the MCDU.
PRESS the “NEXT PHASE” [6R] key on the MCDU , until the CRZ page is accessed.
WRITE a cruise Mach (or speed) in the scratchpad and ENTER it in [4L].
To revert to managed speed, PRESS [3L].
When the cruise phase is active, you cannot preselect a cruise Mach or speed.

Ident.: PRO-NOR-SRP-01-10-B-00004095.0001001 / 09 OCT 12

ENTERING A HEADING/TRACK PRESET FUNCTION

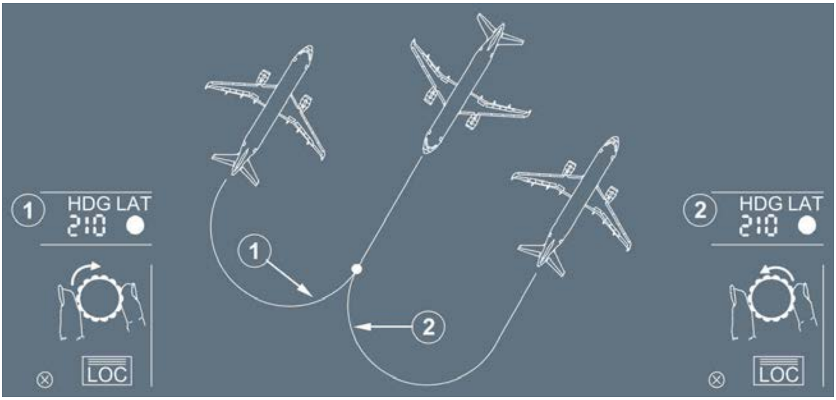
Tfhe heading/track preset allows the pilot to preset a takeoff or go-around heading or track before commanding the aircraft to take up that heading or track (manual activation).
The flight crew can enter a heading or a track preset while the aircraft is on the ground and until takeoff.

PROCEDURE

- **Before takeoff:**

  SET the appropriate HDG or TRK in the FCU window.
  This disarms the navigation mode and allows the runway mode to remain engaged after takeoff.

- **After takeoff:**
  PULL HDG/TRK knob.
  The heading or track mode engages on the preset value.



The direction in which the pilot rotates the HDG/TRK selection knob usually determines the direction of the turn. A left rotation (decreasing heading) produces a left turn; a right rotation produces a right turn.

However, when a heading has been preset before takeoff or go-around, the direction of the turn will be such as to cause the shortest turn at the moment of engagement.

CANCELLING THE HEADING/TRACK PRESET FUNCTION

The pilot can cancel the heading preset by pushing the HDG/TRK knob back in again. This engages or arms the NAV mode.

FMGS RE-INITIALIZATION AFTER A CANCELED FLIGHT

Ident.: PRO-NOR-SRP-01-10-00013064.0001001 / 16 NOV 11
Applicable to: ALL

If the flight crew initially prepared a flight with all the data associated with this flight (takeoff speeds, winds, etc.), and if this flight is later canceled and replaced by another flight, the flight crew may use the following procedure to initialize the FMGS again:

PREPARE the new flight data in the secondary flight plan, using SEC INIT A, SEC INIT B, and SEC PERF pages
ACTIVATE the secondary flight plan.

Note: *When the flight crew activates the secondary flight plan, the following data of the primary flight plan is lost if the secondary flight plan does not include any replacement data:*
- *Alternate data*
- *Winds and cruise TEMP at waypoints as inserted on CRZ WIND pages*
- *Departure and arrival selection (STAR , APP, RWY) and approach parameters (QNH , TEMP , WIND, TRANS ALT , VAPP , MDA /MDH , DH , LDG CONF)*
- *Altitude, speed, and time constraints*
- *Steps*
- *CMS*
- *Offsets*
- *Flaps/THS*
- *Preselected cruise and descent speeds.*

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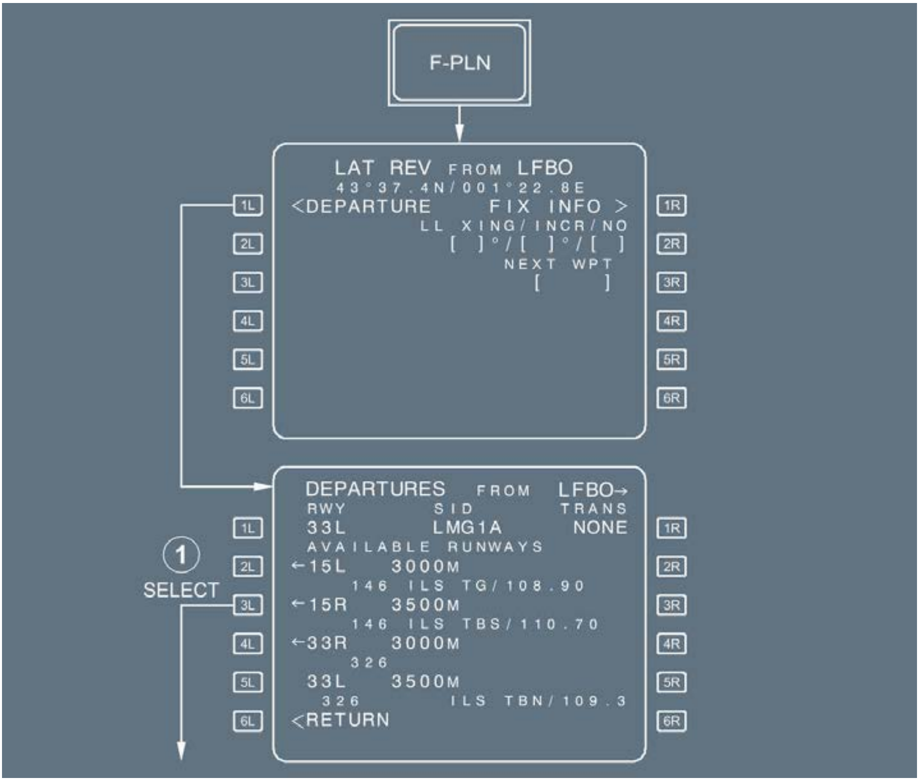
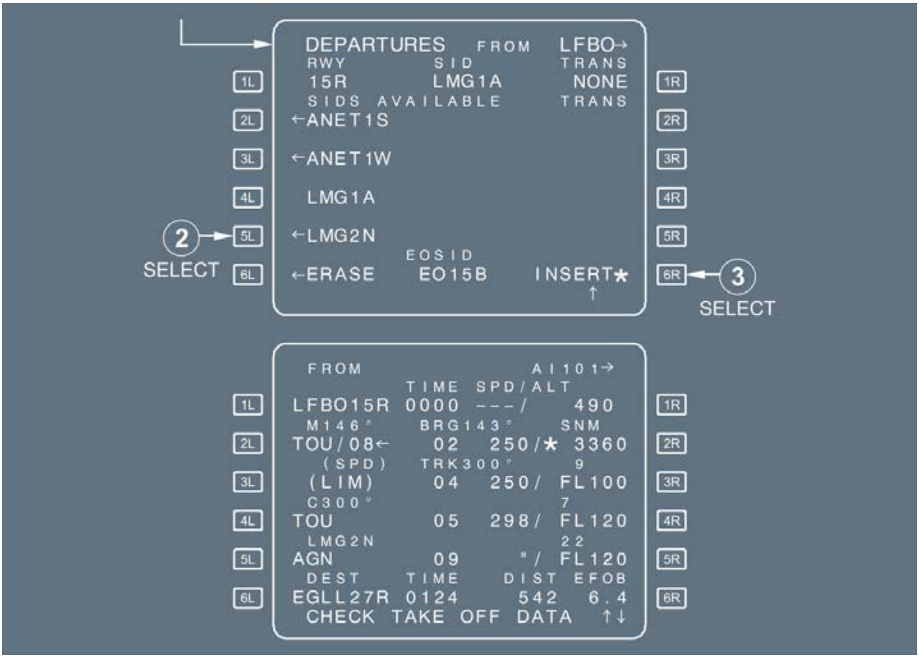
Before Pushback or Start

CHANGE OF RUNWAY

Ident.: PRO-NOR-SRP-01-15-00003975.0003001 / 22 MAY 12
Applicable to: ALL





PRESS the F-PLN key on the MCDU.
SELECT the LAT REV at origin.
SELECT the DEPARTURE prompt [1L].
SELECT the new RWY in use.
SELECT the appropriate SID and TRANS.
CHECK the resulting temporary F-PLN and INSERT it.
CHECK TAKE OFF DATA comes up in the scratchpad if the PERF TO page had been filled in.
ENTER the new V1 , VR , V2 , FLEX TEMP or CONF, as appropriate.

Note: *If the previously selected SID is compatible with the new runway, it automatically appears in the temporary flight plan. Any revision the pilot may have made to the previous SID will not be transferred.*
If the pilot still wants it, he has to reenter it.

TAKEOFF FROM INTERSECTION

Ident.: PRO-NOR-SRP-01-15-00003976.0001001 / 09 DEC 09
Applicable to: ALL

Use RTOW or FCOM to revise takeoff parameters :
PRESS the [PERF] key on MCDU
ENTER the takeoff shift
ENTER the new V1 , VR , V2 , FLX TEMP, or CONF, as appropriate

Note: *The insertion of the shift in takeoff position permits the system to make an accurate revision to its navigation data at takeoff.*

Intentionally left blank

Taxi

FCU SELECTION FOR TAKEOFF

Ident.: PRO-NOR-SRP-01-20-00003978.0004001 / 09 OCT 12
Applicable to: ALL

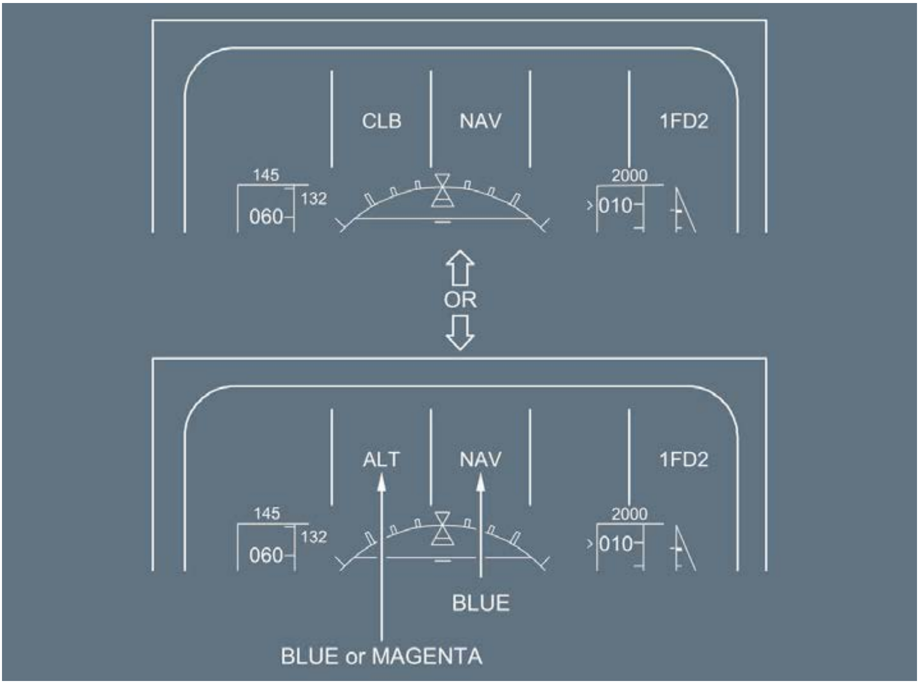
PROCEDURE

ENSURE that HDG – V/S modes are selected (change over pb).
CONFIRM or SELECT the first cleared altitude
CROSS CHECK on PFD the target altitude
CONFIRM both FDs ON

FMA MODE CHECK

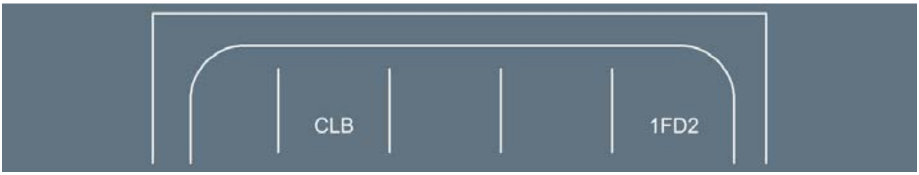
Ident.: PRO-NOR-SRP-01-20-00003979.0002001 / 22 MAY 12
Applicable to: ALL

CHECK that the FMA CLB (or ALT) mode is armed



<u>Note:</u> *ALT (in blue or magenta) may be displayed instead of CLB if the FCU altitude or a constraint is set at or below the acceleration altitude.*

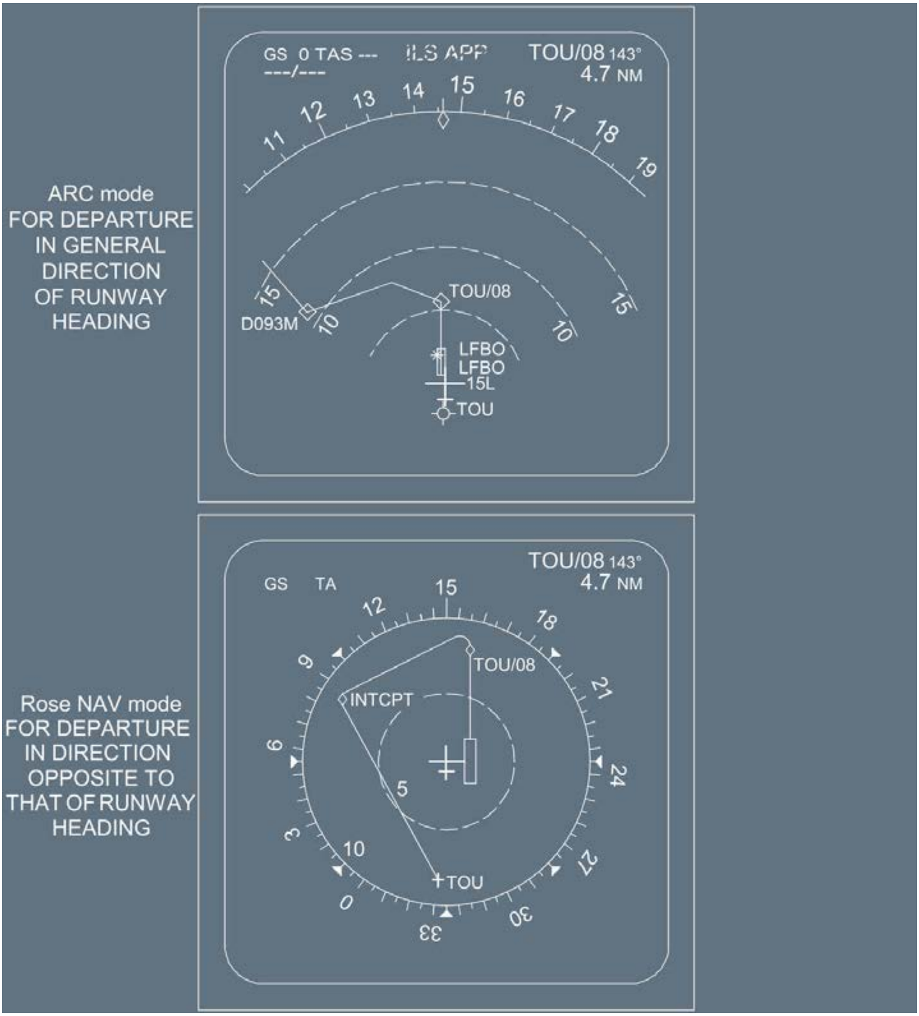
If a HDG /TRK was preset, NAV is disarmed.



SELECTING A NAVIGATION DISPLAY

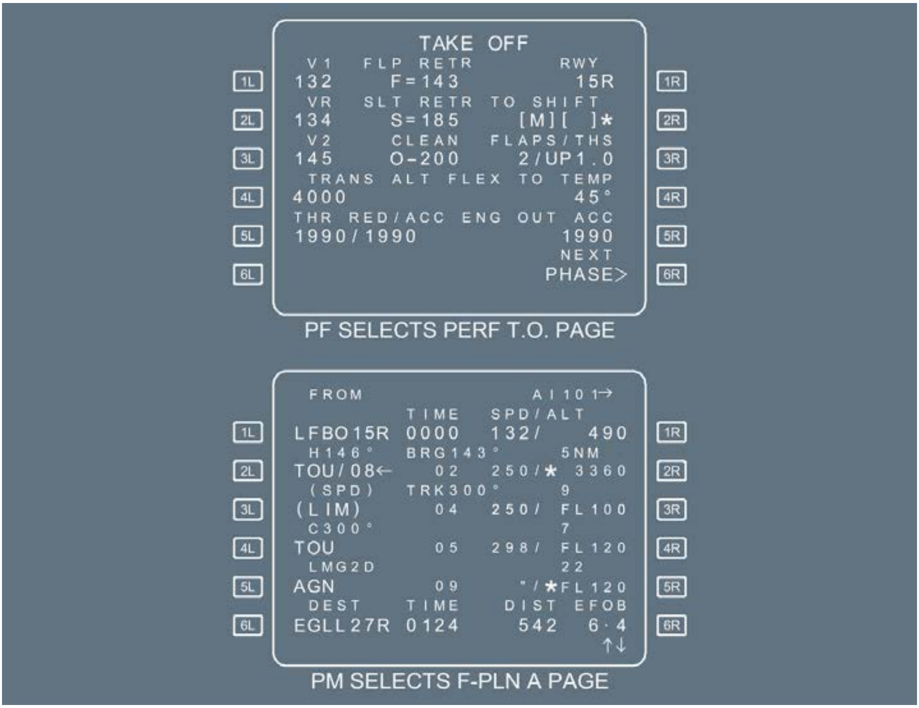
Ident.: PRO-NOR-SRP-01-20-00003980.0001001 / 22 MAY 12
Applicable to: ALL

SET the minimum range to display the first waypoint after departure or as required for weather radar.


ARC mode
FOR DEPARTURE
IN GENERAL
DIRECTION
OF RUNWAY
HEADING
GS 0 TAS ---
---/---
ILS APP
TOU/08 143°
4.7 NM
D093M
TOU/08
LFBO
LFBO
15L
TOU
Rose NAV mode
FOR DEPARTURE
IN DIRECTION
OPPOSITE TO
THAT OF RUNWAY
HEADING
GS TA
TOU/08 143°
4.7 NM
TOU/08
INTCPT
TOU

SELECTING TAKEOFF DISPLAYS FOR PILOT'S AND COPILOT'S MCDU

Ident.: PRO-NOR-SRP-01-20-00003981.0001001 / 23 DEC 14
Applicable to: ALL



Takeoff

MONITORING THE TAKEOFF

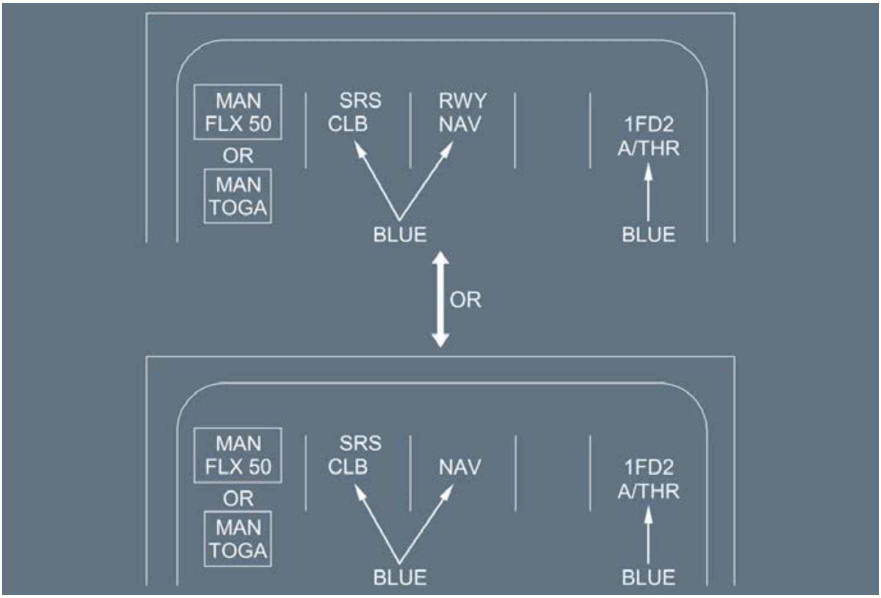
Ident.: PRO-NOR-SRP-01-30-00003983.0007001 / 09 OCT 12
Applicable to: ALL

- **At power set (thrust levers in FLX or TOGA position)**

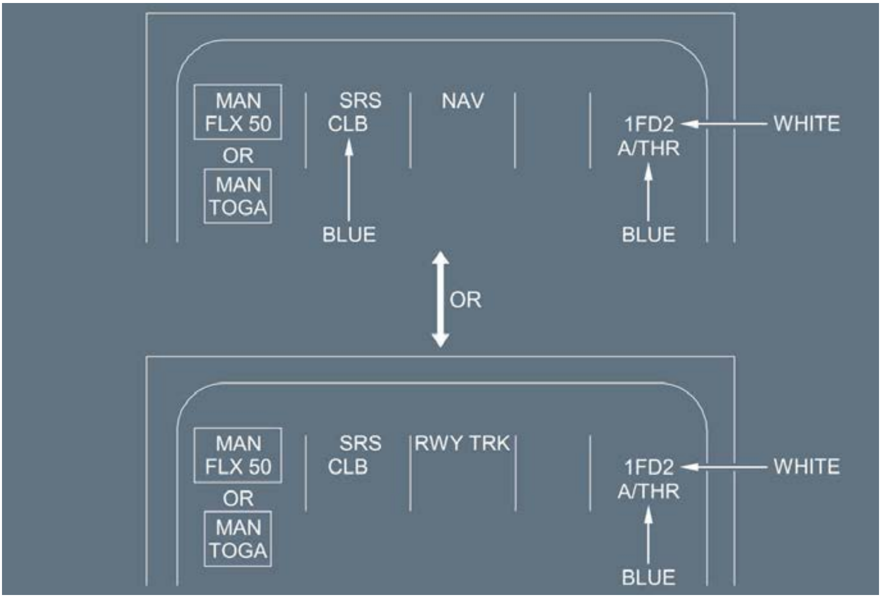
  CHECK that the navigation is updated to the runway threshold by verifying that the aircraft symbol is centered on the runway threshold of the navigation display.

  CHECK the FMA for appropriate mode selection

  Note: - *RWY mode appears if an ILS is tuned to a station corresponding to the departure runway. Otherwise no lateral mode comes up until the aircraft has lifted off.*



- **At 30 ft**
  - **If NAV is armed,** it engages automatically.
  - **If NAV is not armed,** RWY TRK mode engages and remains displayed until the crew selects another lateral mode.



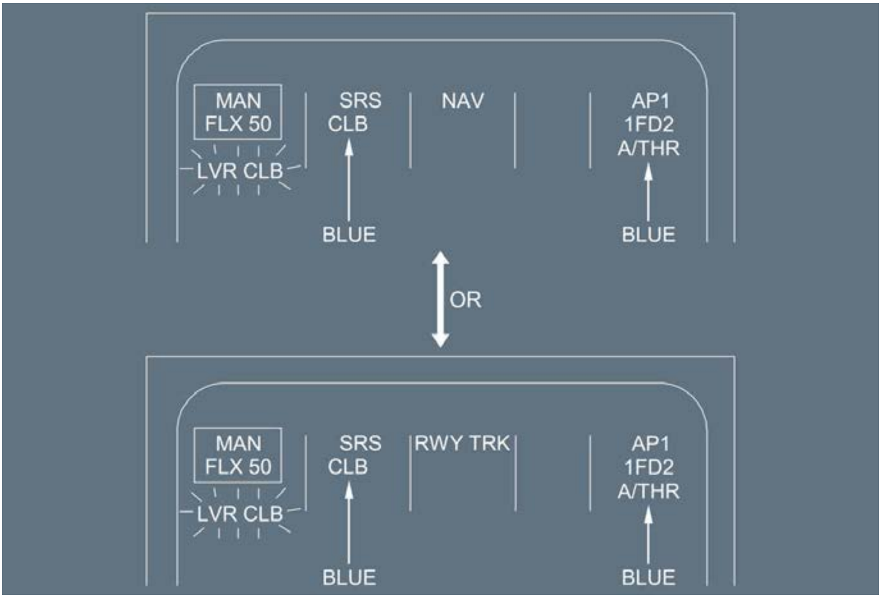
- **At 100 ft**

  Engage AP1 or AP2.

  The FMGS has an internal delay that prevents the AP from engaging 5 s after liftoff and if the aircraft is below 100 ft.

- **At thrust reduction altitude**

  "LVR CLB" flashes in the first column of the FMA



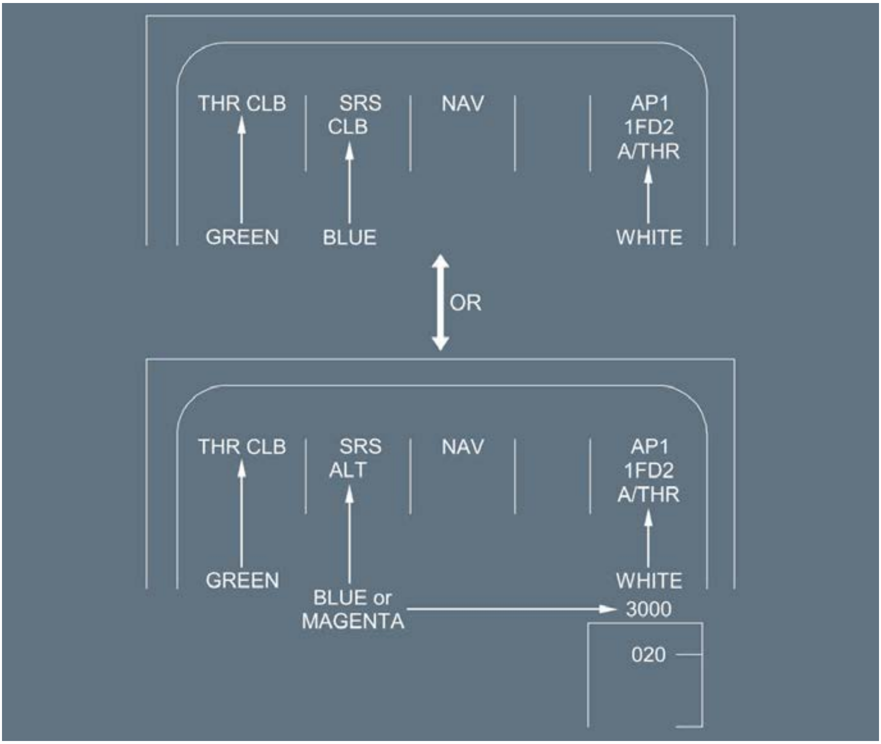
Procedure

SET the thrust levers to the CL detent

A/THR activates automatically

CHECK that A/THR turns to white in the 5th FMA column.

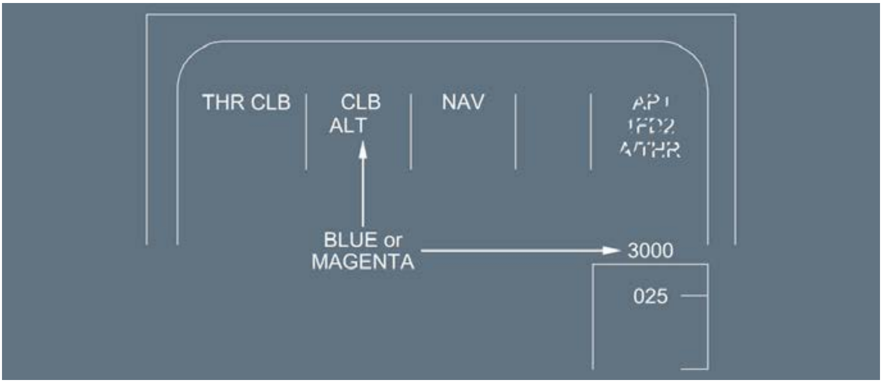
CHECK that THR CLB appears in green in the first column.



Depending on the next level off altitude, CLB or ALT is armed and displayed in the second column.

ALT is armed:
- *in blue if the next predicted level-off is the FCU -selected altitude (target altitude blue at the top of the ALT scale)*
- *in magenta if the next predicted level-off is an ALT CSTR (target altitude magenta at the top of the ALT scale)*

- **At acceleration altitude**
  The vertical phase automatically switches to climb.
  CLB mode engages. The target speed jumps to initial climb speed on the PFD.



Procedure

CHECK that "CLB" appears in green in the second FMA column.

- *The speed reference system (SRS) mode remains engaged until CLB phase is engaged, which occurs at ACCEL ALT or at any other vertical mode engagement, whichever comes first.*
- *If during takeoff the FCU altitude is set below the current aircraft altitude, the system ignores the FCU altitude and the aircraft remains in SRS mode until the pilot selects an altitude above the aircraft altitude or engages any other mode.*

PRESELECTING A HDG OR A TRK

Ident.: PRO-NOR-SRP-01-30-00003984.0001001 / 16 NOV 11
Applicable to: ALL

PROCEDURE

● **If a HDG or a TRK was preselected on the ground :**

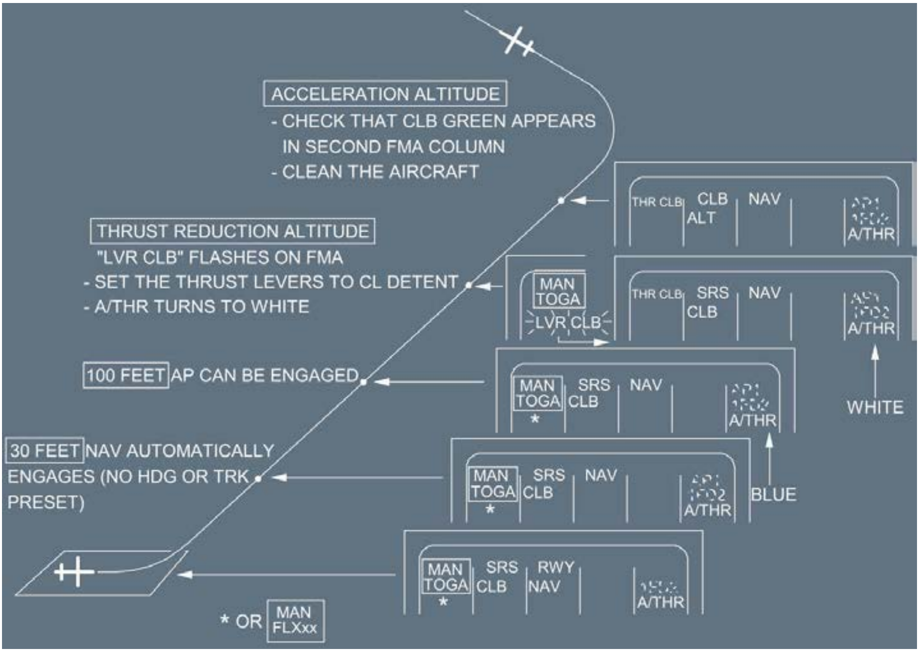
PULL OUT the HDG/TRK selector knob when required

CHECK that the HDG/TRK mode is active and displayed on the FMA

When a HDG or TRK is preset, OP CLB mode will engage at the acceleration altitude. (CLB mode is not available in HDG/TRK mode).

NORMAL TAKEOFF PROFILE

Ident.: PRO-NOR-SRP-01-30-00003985.0002001 / 22 MAY 12
Applicable to: ALL

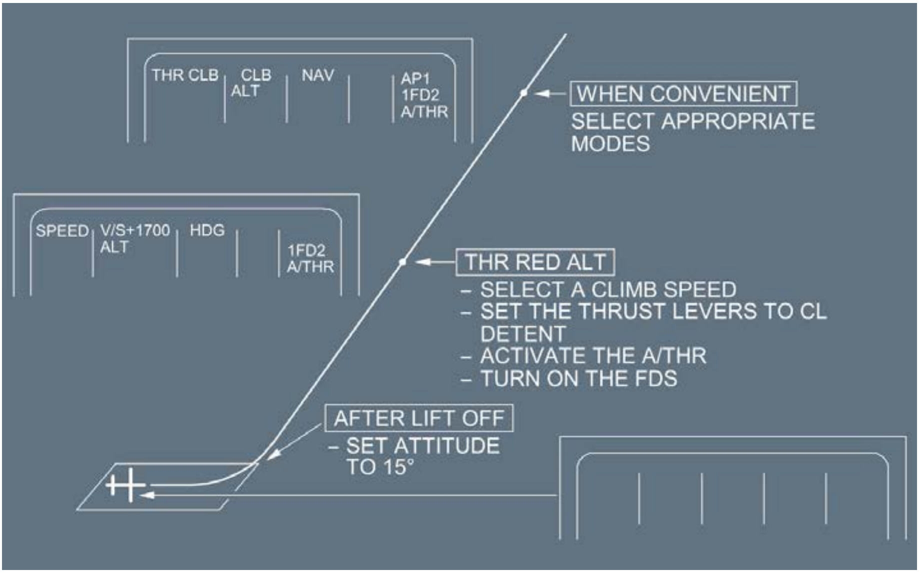


NO FLIGHT DIRECTOR TAKEOFF

Ident.: PRO-NOR-SRP-01-30-00003986.0004001 / 09 OCT 12
Applicable to: ALL

If a takeoff is initiated without FDs, the system responds as follow:
- There are no FD bars.
- There is no A/THR arming.
- There is no guidance available.
- The target speed on the PFD is that selected on the FCU or is defaulted to 100 kt.
- Setting the thrust levers to the CL detent does not activate A/THR.

Note: *Do not engage the autothrust prior to selecting a target speed on the FCU.*



PROCEDURE

Establish initial climb of 15 °

- **When reaching the thrust reduction altitude (THR RED ALT):**

  SELECT a climb speed.

  SET the thrust levers to CL detent.

  ACTIVATE the autothrust.

  TURN ON the FDs (basic modes engage).

  SELECT appropriate mode.

  Failure of both FDs after the start of takeoff:

  - *The FD bars disappear.*
  - *The FCU window displays the target speed, which synchronizes on V2, or the current speed (if it is higher).*
  - *The autothrust remains armed.*
  - *At thrust reduction altitude, LVR CLB flashes. If the pilot set the thrust levers to the CLB detent, the autothrust becomes active in selected SPD mode (no FDs selected).*
    If the current speed is greater than the target speed, the thrust decreases.
  - *At acceleration altitude the target speed does not change, since it is selected.*

TAKEOFF WITH NO V2 ENTRY

Ident.: PRO-NOR-SRP-01-30-00003987.0001001 / 16 NOV 11
Applicable to: ALL

If V2 is not inserted, the speed reference system (SRS) will not engage for takeoff.
5 s after lift off, V/S mode will engage. When V/S engages the current airspeed becomes the FCU target speed.

To regain a normal speed target, the pilot must :

SELECT the appropriate climb speed on the FCU and PULL out the knob.

- **At ACC ALT :**

  PUSH the A/THR pb on the FCU.

  SET the thrust levers to CL detent.

  PUSH in the SPD selector knob to get a managed speed target.

TAKEOFF USING THE LOCALIZER OF THE OPPOSITE RUNWAY

Ident.: PRO-NOR-SRP-01-30-00003988.0003001 / 09 OCT 12
Applicable to: ALL

- **If the localizer, of the ILS associated with the opposite runway, must be used for takeoff:**

  SELECT the RAD NAV PAGE.

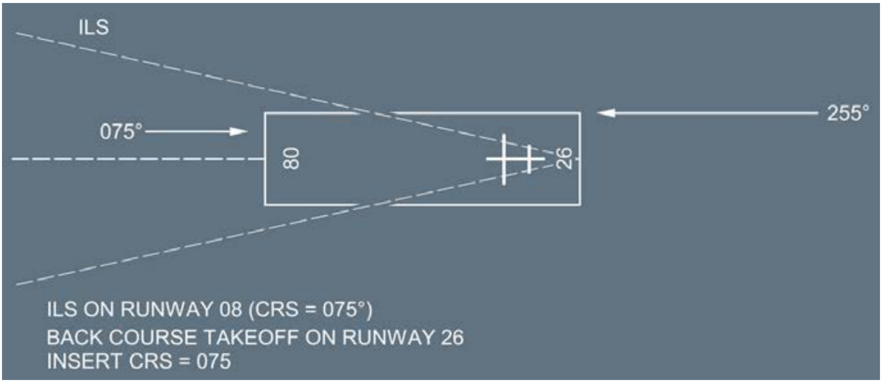
  ENTER the ILS IDENT.

  If the ILS is in the database, the system tunes the proper frequency.
  Check that the ILS front course is displayed in the CRS field.

  Note: *This may trigger the "RWY /ILS MISMATCH" message. Disregard it.*

- **If the ILS is not in the database:**

  SET the appropriate frequency, and SET the ILS front course in the CRS field.



DESELECT the LS pb on the FCU.

Since the PFD displays reverse deviation.

SELECT ROSE ILS on one ND.

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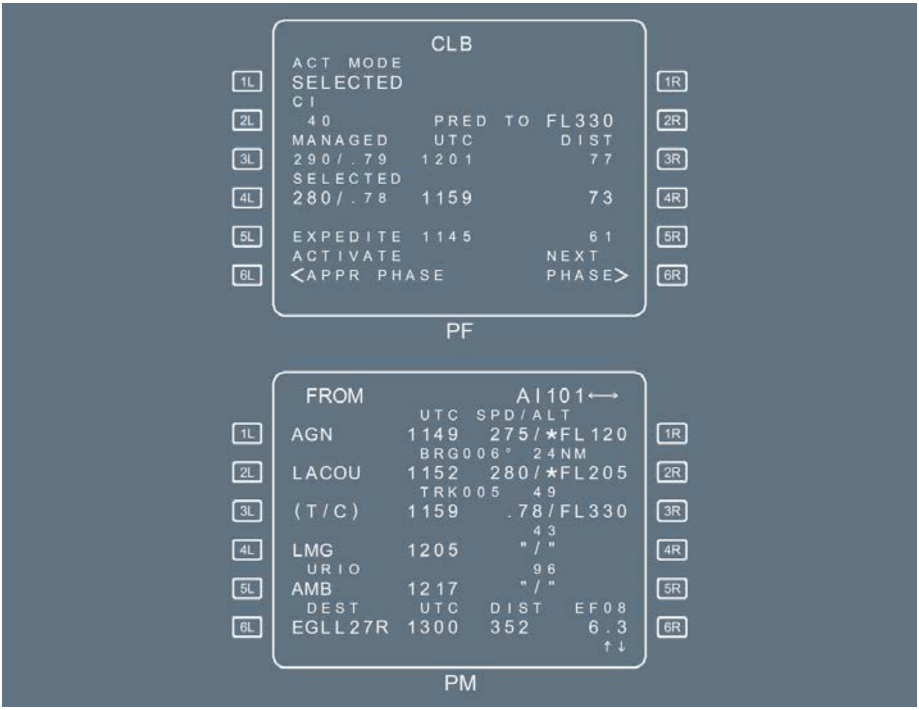
Climb

MONITORING THE CLIMB PHASE

Ident.: PRO-NOR-SRP-01-40-00003989.0031001 / 23 DEC 14
Applicable to: ALL

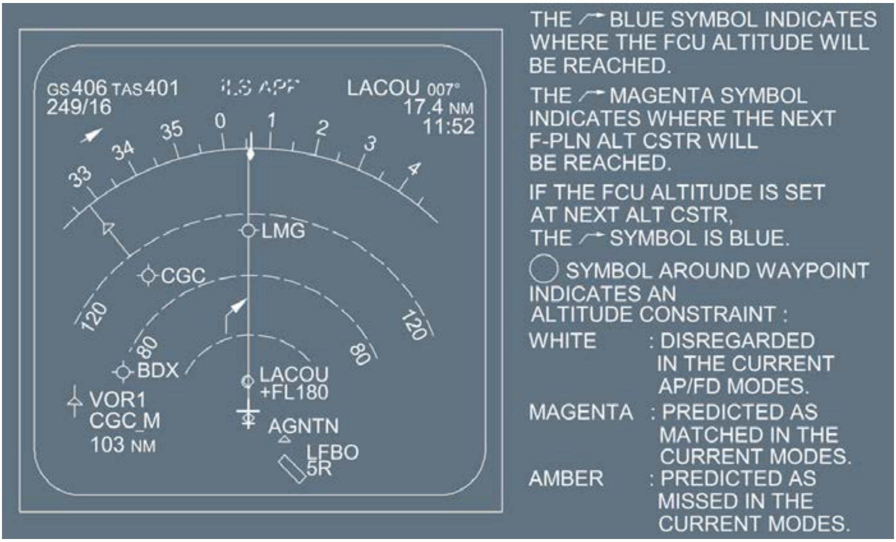
The PF MCDU should display the PERF CLB page allowing him to monitor the climb.
The PM MCDU should display the F-PLN page to allow the pilot to monitor time, speed and altitude predictions. This page also displays matched or missed information for constraints.



CHECK vertical mode CLB if NAV is engaged.
CHECK vertical mode OP CLB if HDG /TRK is engaged.

MONITORING THE ND (ROSE NAV OR ARC)

Displays the lateral and vertical paths, in the current AP /FD active modes.

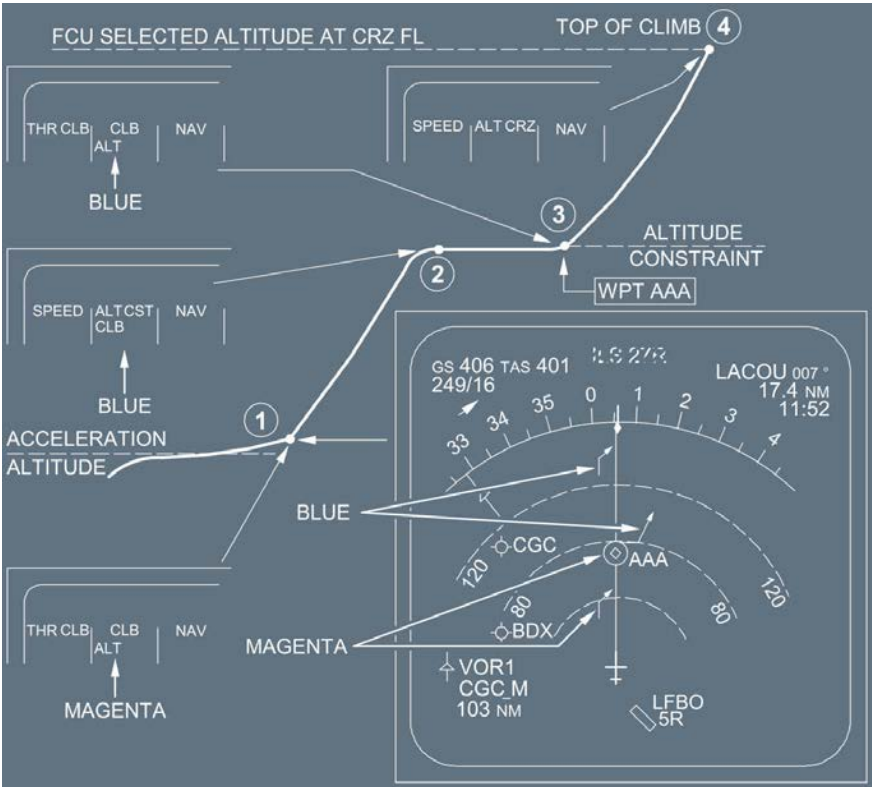


MONITORING THE AP /FD MODES AND FMA

If CLB mode is engaged, the flight mode annunciator (FMA) and the navigation display (ND) show the tactical situation as follows:

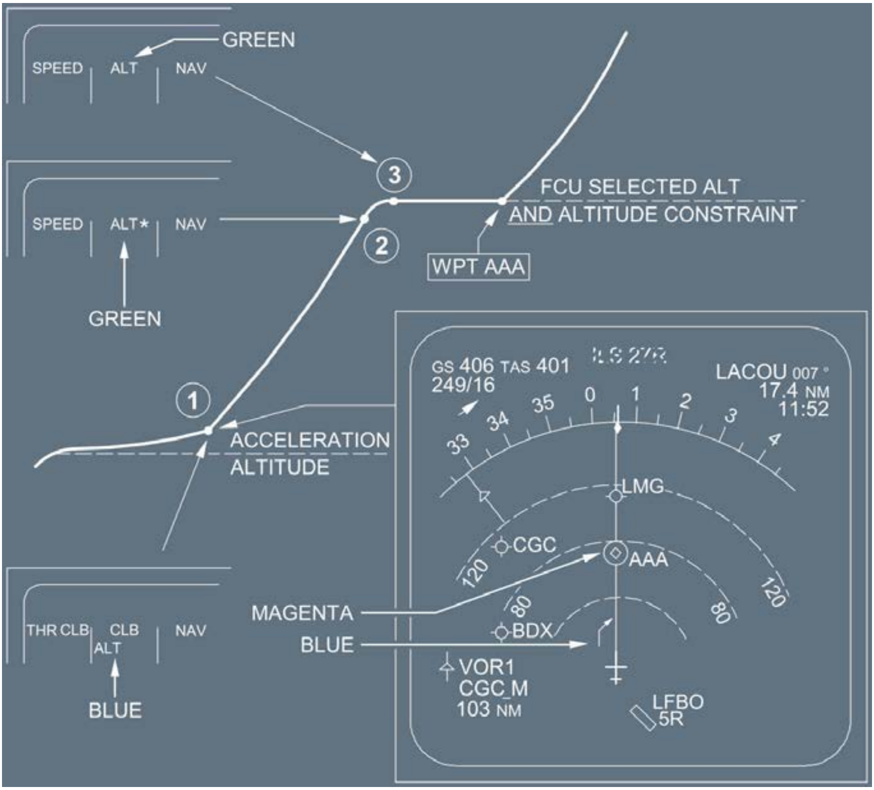
CASE 1

The FCU selected altitude is set above the next altitude constraint



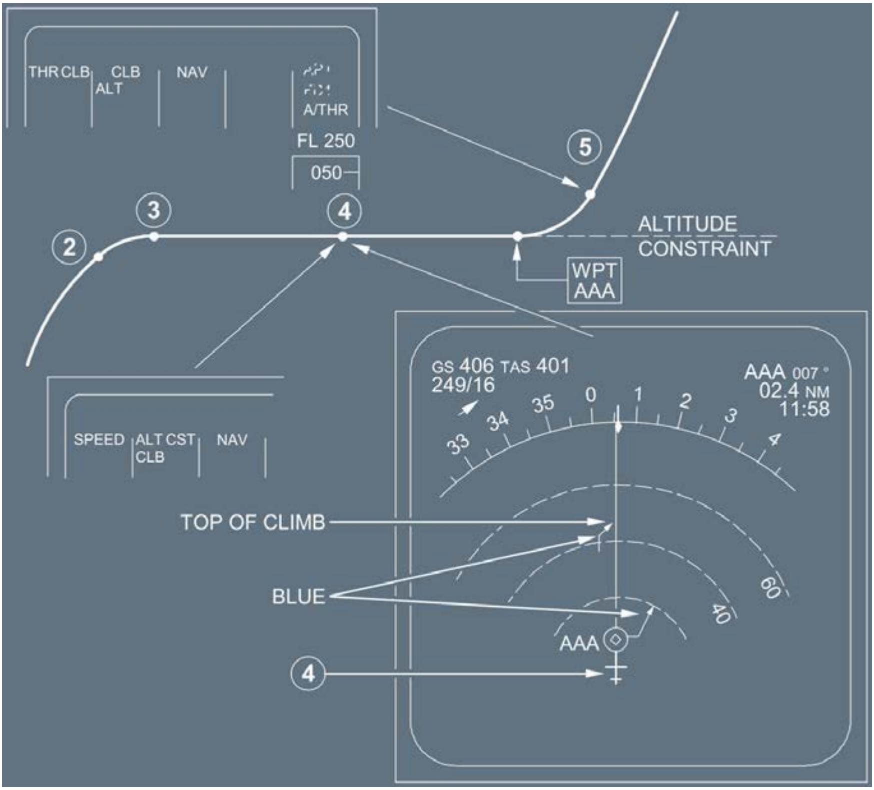
CASE 2

The FCU selected altitude is set at the next altitude constraint
The aircraft will automatically levels off at this altitude.



To resume the climb automatically when the waypoint AAA is reached, apply the following procedure during the level off (Position 4):

SELECT the FCU altitude to the next constraint (if any) or the cruise FL.
PUSH the FCU ALT selector knob to arm CLB mode.



RECOMMENDATION:

To ensure that you will not miss the next constraint, it is recommended to select the FCU altitude to the next constraint as described above.

MONITORING THE CONSTRAINTS

SPEED, ALTITUDE and TIME constraint can be checked using MCDUs. Each constraint is preceded by a star that indicates if the constraint is matched (magenta star) or missed (amber star).

ALTITUDE CONSTRAINT

- **If an altitude constraint is predicted as missed,** use the following procedure:

SET the FCU ALT to the next ALT CSTR
CHECK the position of the level off symbol on the ND (blue arrow) with respect to the waypoint with the constraint.
DECREASE the target speed until the constraint is met.

SPEED CONSTRAINT

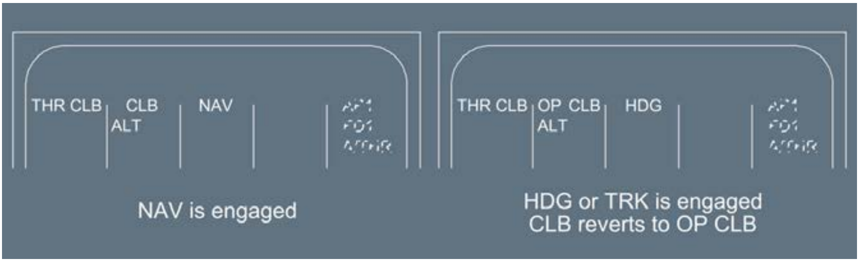
CHECK the SPD CSTR predictions on the MCDU.
A magenta or amber star (*) indicates that the aircraft will match or miss the constraint.
If the aircraft is to miss the constraint by more than 10 kt, the MCDU scratchpad displays "SPD ERROR AT WPT ---- ".

"CHECK WEIGHT" MESSAGE.

Refer to DSC-22_20-90-20 "CHECK WEIGHT" Message

HDG /TRK MODE ENGAGEMENT

- **If HDG/TRK is engaged,** the guidance does not consider any F-PLN constraint. Therefore if the flight crew disengages NAV, CLB mode reverts to OP CLB.



SPEED SELECTION

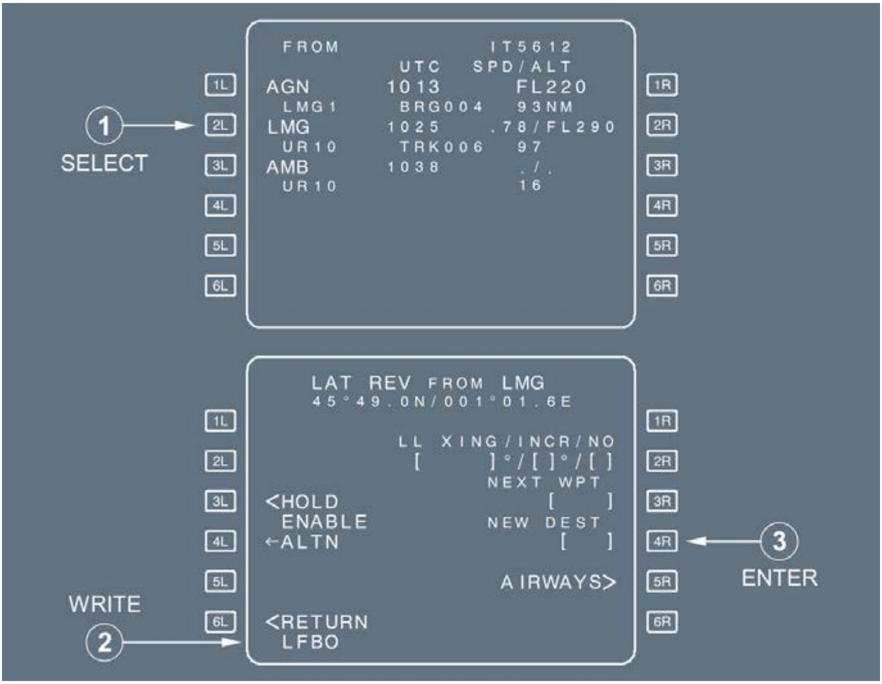
- **If a specific speed is required:**
  TURN and PULL the SPD selector knob. (This changes the target speed to blue on the PFD speed scale).
  Predictions on the F-PLN page assume that the speed remains selected until the next SPD LIM or SPD CSTR, or the next phase, whichever comes first.

IMMEDIATE RETURN TO ORIGIN AIRPORT

Ident.: PRO-NOR-SRP-01-40-00003991.0003001 / 23 JUN 15
Applicable to: ALL

■ **If the SEC F-PLN has been prepared for an immediate return to the airport of origin:**
ACTIVATE the SEC F-PLN.
PERFORM a DIR TO the appropriate waypoint.

■ **If the SEC F-PLN has not been prepared for an immediate return to the airport of origin:**



PERFORM a lateral revision at TO waypoint
ENTER the departure airport ident in the NEW DEST field and INSERT the temporary flight plan.
PERFORM a lateral revision at the new destination
SELECT: APPR – STAR – VIA – TRANS and INSERT

- **When cleared to divert:**

  PERFORM a DIR TO the suitable waypoint.

  ENTER QNH, WIND, MDA/MDH, LDG CONF.

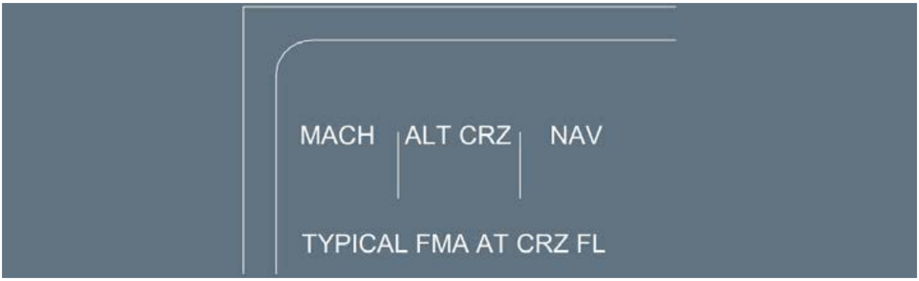
  CHECK RAD NAV page.

Cruise

REACHING CRUISE FLIGHT LEVEL

Ident.: PRO-NOR-SRP-01-50-00003992.0002001 / 03 NOV 14
Applicable to: ALL

On reaching the cruise flight level, the flight crew should be sure that the FMA displays “ALT CRZ ” in its second column, which ensures that the aircraft is at cruise flight level and at Economy Cruise Mach (ECON CRZ MACH).



The FMGS engages the “soft altitude” (SOFT ALT) mode 2 min after the cruise flight level is captured and Mach stabilized. (SOFT ALT) mode allows the aircraft to deviate ± 50 ft from the target altitude to minimize the thrust variation and reduce the fuel consumption.

- **If the FMA does not display ALT CRZ at the assigned flight level,** soft altitude mode will not engage and the predictions will be computed at the preplanned flight level. This will occur when the ATC assigned flight level is lower than the preplanned flight level entered on the PROG page.

- **If the FMA does not display ALT CRZ at the assigned FL (as may occur when the ATC-assigned FL is lower than the preplanned FL selected initially):**
  PRESS the [PROG].
  ENTER the current cruise flight level.

  Note: *If the current cruise flight level is above the preplanned FL , selecting the FCU updates it automatically.*

“SET SPD AUTO” OR “SET MANAGED SPD” OR “CHECK SPEED MODE”

- **If the climb phase was flown in selected speed and if the cruise phase is planned to be flown in managed speed (ECON MACH/SPEED)** , “SET SPD AUTO” or “SET MANAGED SPEED” or "CHECK SPEED MODE" appears on the PFD and MCDU as a reminder.

PRESS the FCU speed selector knob to activate the managed Mach.

MONITORING THE NAVIGATION ACCURACY

Applicable to: ALL

Ident.: PRO-NOR-SRP-01-50-A-00003993.0001001 / 22 MAY 12

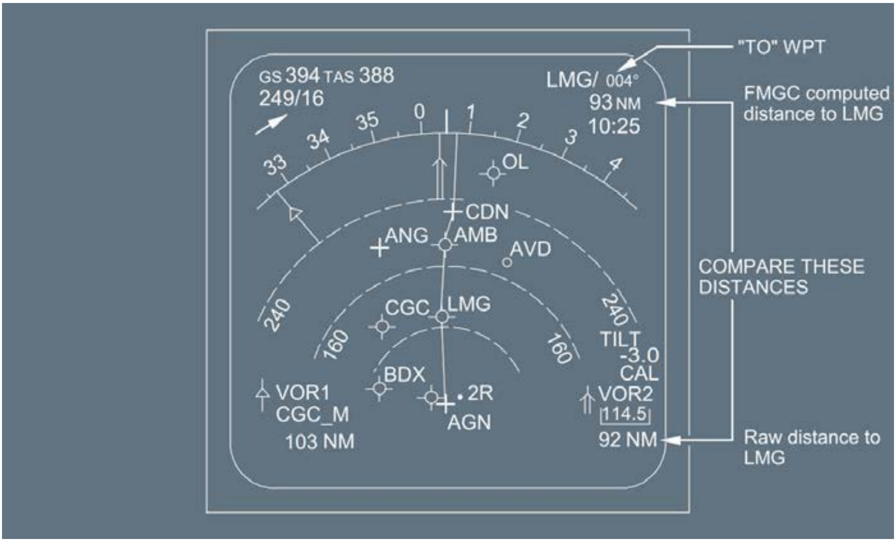
GENERAL

On aircraft equipped with GPS PRIMARY, the navigation accuracy check is not required as long as GPS PRIMARY ⊲ is available.
Otherwise, navigation accuracy shall be checked periodically in cruise.

The PROG page displays an estimated accuracy as being high or low (center of sixth line):
- “HIGH” means that the FMGS estimates the FM position accurate enough to meet the EN ROUTE criteria,
- “LOW” means that the pilot must compare raw data from tuned navaids with corresponding data computed by FM and shown on the ND or MCDU PROG page. The appearance of the message “NAV ACCUR DOWNGRAD” on the MCDU calls for a similar crosscheck.

Note: *The pilot should make such a comparison periodically, even if the PROG page is displaying “HIGH” and navaids are available: this allows him to quantify the FM position error.*

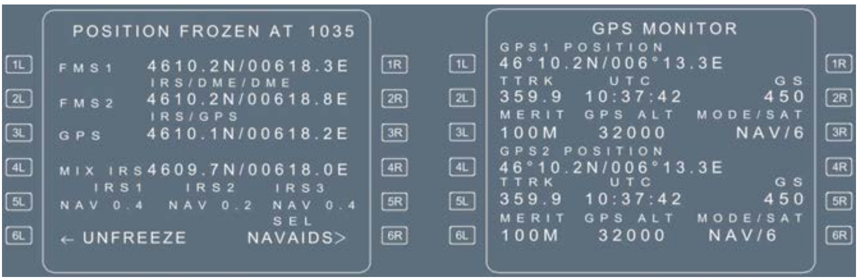
The method for checking the accuracy is explained in the SOP and in Evaluation of position accuracy chapter (*Refer to DSC-22_20-20-20 General*).
A quick check is explained here below when the TO waypoint is a DME type. (VOR /DME or VOR /TAC or DME or TAC)



Ident.: PRO-NOR-SRP-01-50-A-00003994.0013001 / 22 NOV 11

POSITION DISCREPANCY

- **If there is a discrepancy between the raw data position and the FM position:**
  PRESS the DATA key on the MCDU.
  SELECT the POSITION MONITOR page.
  SELECT "FREEZE".
  On the other MCDU : Select the GPS MONITOR page.



MONITORING THE FUEL PREDICTIONS

Ident.: PRO-NOR-SRP-01-50-00003995.0013001 / 14 FEB 11
Applicable to: ALL

The F-PLN and FUEL PRED pages display fuel and time predictions throughout the flight. These predictions are meaningful if the lateral and vertical flight plan, and the entered winds are kept accurate enough as the flight progresses.

PROCEDURE

In addition to the Fuel Management procedure described in the SOPs (*Refer to PRO-NOR-SOP-15 Cruise - Flight Progress*), periodically apply the following actions:

KEEP ACCURATE FMS PREDICTIONS

Periodically UPDATE the F-PLN elements (F-PLN waypoints, step altitudes, predicted winds).

CHECK the MIN DEST FOB value on the FUEL PRED page

The MIN DEST FOB value is computed by the FMS and by default it is equals to ALTN + FINAL. ALTN , FINAL and MIN DEST FOB can be modified by the flight crew.
At the beginning of the CRZ phase, and/or after any change of destination or alternate airport, check that the MIN DEST FOB value is meaningful. Otherwise, update the MIN DEST FOB value, as appropriate.

CHECK the DEST EFOB value on the F-PLN or FUEL PRED page

MONITOR the EFOB at destination on the F-PLN or FUEL PRED page. If necessary, ADAPT the flight strategy.

"DEST EFOB BELOW MIN" MESSAGE

If the predicted EFOB at destination becomes less than the MIN DEST FOB value displayed on the FUEL PRED page:
- The destination EFOB turns to amber on the F-PLN , FUEL PRED and PERF (CLB , CRZ , DES) pages, and REPORT page.
- The “DEST EFOB BELOW MIN ” amber message is displayed on the MCDU scratchpad, after 2 min (if the FMS is in CRZ or DES phase).

<u>Note:</u> *If the flight crew has cleared the “DEST EFOB BELOW MIN ” message, and if the predicted EFOB at destination is still less than the MIN DEST FOB value, the “DEST EFOB BELOW MIN” message will appear again at the beginning of the descent phase.*

PROCEDURE

● **If the “DEST EFOB BELOW MIN” message is triggered on the MCDU:**
CHECK the DEST EFOB value on the F-PLN or FUEL PRED page,

CHECK the hypothesis used by the FMS to compute the fuel predictions,

Check that the F-PLN elements (F-PLN waypoints, step altitudes, predicted winds) are up-to-date, to ensure that the FMS predictions are accurate.
Check that the MIN DEST FOB fuel value is meaningful and corresponds to the planned fuel strategy.

ADAPT the flight strategy as required.

ENTERING A STEP CLIMB OR A STEP DESCENT

Ident.: PRO-NOR-SRP-01-50-00003996.0002001 / 22 MAY 12
Applicable to: ALL

The crew may use the STEP ALTS page to enter up to four geographic step points or one optimal step (computed by the FMGS) at any waypoint of the cruise.

PROCEDURE

PRESS the PERF key.
SELECT “STEP ALTS” prompt.

The PERF PAGE displays this prompt in cruise phase. The crew may also call up the STEP ALTS page using a vertical revision at any cruise waypoint.

ENTERING AN OPTIMAL STEP (ONLY STEP CLIMB)

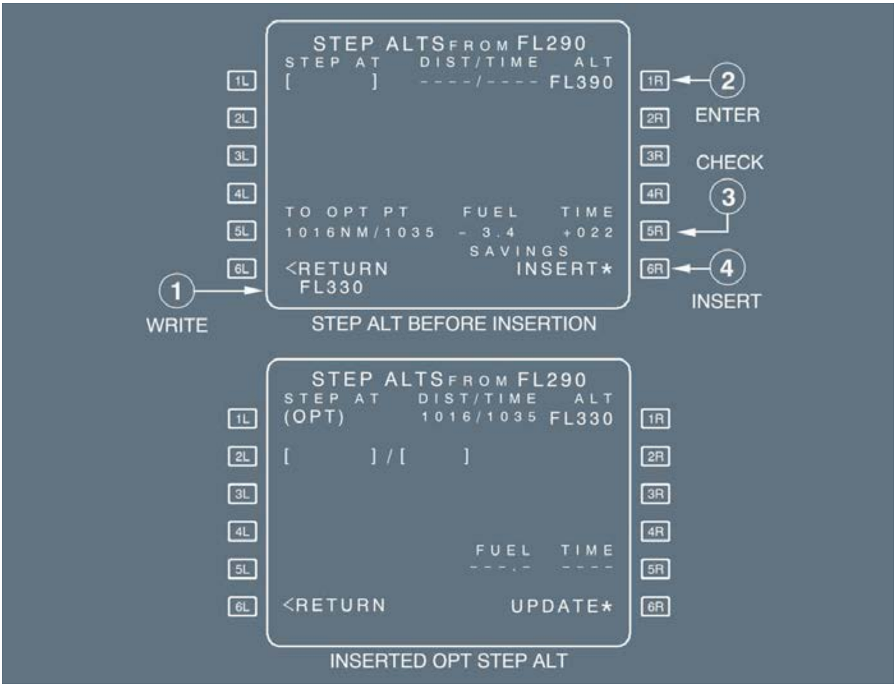
WRITE a step altitude or FL into the scratchpad.
ENTER the step altitude or FL in the [1R] field.
CHECK the FUEL and TIME SAVINGS predictions on the 5L and 5R fields.
PUSH the INSERT prompt [6R] if adequate.

After insertion, the optimum step climb is updated only when the flight crew presses the UPDATE prompt [6R].
The ND shows symbols for the start of climb (S/C) and the top of climb (T/C). The MCDU shows the associated pseudo-waypoints.
It is possible to convert an optimum step to a geographic step by overwriting the [1L] field (see geographic step).

- **When reaching the step climb pseudo-waypoint:**

  REQUEST climb clearance.

  ADJUST the FCU altitude to the STEP ALT, and PUSH.



ENTERING A GEOGRAPHIC STEP

WRITE a step altitude into the scratchpad.

The format is position/altitude (or FL). The position can be a waypoint or waypoint/distance to waypoint. The waypoint/distance is an along track offset waypoint.

ENTER it in [1L] to [4L] field.

The entry of the initial geographic step point requires both a valid waypoint and altitude entries. When a step has been entered, the flight crew may change the position and the altitude independently. The flight crew cannot modify the position and the altitude in a single entry: To modify both, they should modify the position first, and then the altitude.

CHECK the predictions

- **When reaching the step climb or descent pseudo-waypoint (S/C or S/D):**

  REQUEST climb or descent clearance.

  ADJUST the FCU altitude to the STEP ALT, and PUSH.

The DIST/TIME field may display the following messages:
- ABOVE MAX if the step altitude exceeds the MAX ALT.
- IGNORED if the start step point is less than 50 NM from the top of descent.
- STEP NOW when the aircraft is within 20 NM of the step point.
  If the aircraft overflies the step waypoint without commencing a climb or a descent, the system deletes the step from the vertical F-PLN automatically (a “STEP DELETED” message is displayed on the MCDU scratchpad), and recomputes the predictions.
  A step is not deleted if the FCU altitude is moved only partially towards the step altitude.
  The flight phase remains “cruise” whenever a step is initiated.

Note: *For an altitude restriction defined at a waypoint less than 50 NM before the top of descent and lower than the CRZ FL, it is recommended to enter an altitude constraint rather than a step.*

IMMEDIATE CHANGE OF LEVEL IN CRUISE

Ident.: PRO-NOR-SRP-01-50-00003997.0001001 / 14 FEB 11
Applicable to: ALL

When the pilot changes his flight level without inserting a step:
- If the FCU -selected altitude is above the previous CRZ FL , the CRZ FL on the PROG page changes to the new flight level.
- If the FCU -selected altitude is lower than the previous CRZ FL and if the distance to DEST is more than 200 NM, the CRZ FL on the PROG page changes.

  In that case Mach target is managed as follows:
  - At the start of the descent, the Mach target is the managed Mach number at the initial cruise flight level.
  - When the aircraft reaches the new flight level, the Mach target switches either to the Mach number for the lower CRZ FL , or to the speed for the lower CRZ FL if the aircraft reaches the crossover altitude. This logic prevents the aircraft from exceeding VMO during descent.
- If the FCU -selected altitude is lower than the previous CRZ FL and the aircraft is within 200 NM of its destination, the system activates the descent phase.

The pilot may reactivate the cruise phase by entering a new cruise flight level in the PROG page.

PREPARATION FOR DESCENT AND APPROACH

Applicable to: ALL

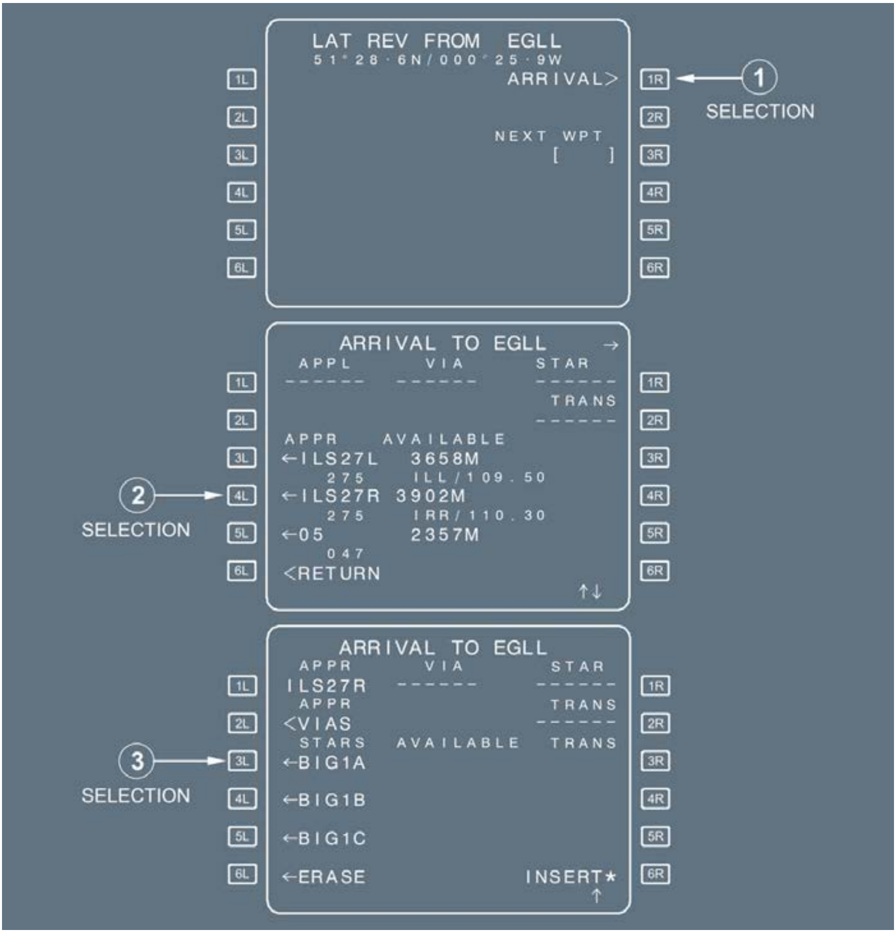
Ident.: PRO-NOR-SRP-01-50-B-00003998.0001001 / 09 DEC 09

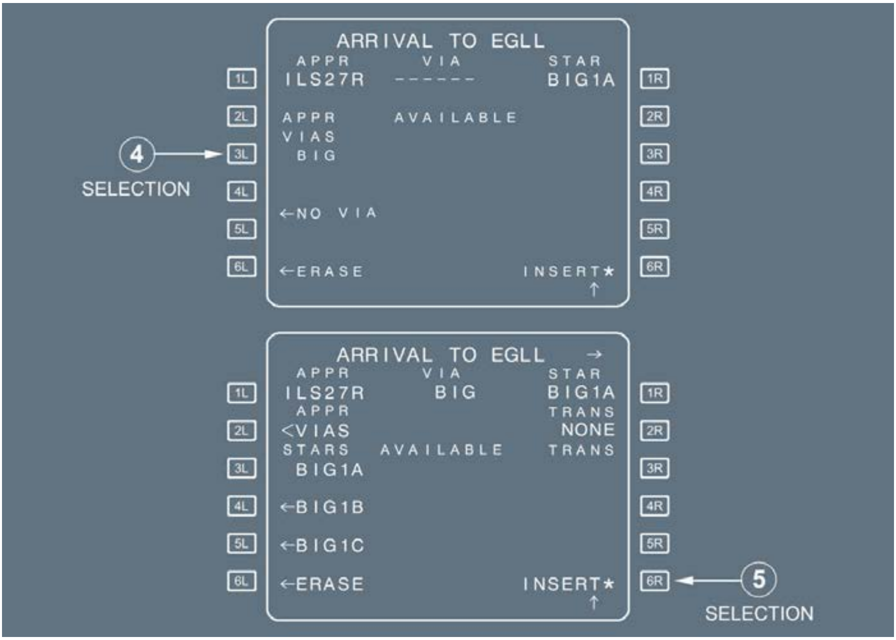
GENERAL

The preparation for descent and approach consists of :
- Entering PERF and WIND data
- Defining the lateral and vertical F-PLN
- Checking the tuning (auto or manual) of the appropriate navaids

After receiving the arrival information, the flight crew should use the following procedure.

REVISION OF LATERAL F-PLN





PERFORM a lateral revision at destination
SELECT an ARRIVAL
SELECT an APPROACH, a STAR, a TRANSITION, a VIA.

When the pilot selects successive items, the page are automatically sequenced. But pressing "NEXT PAGE" key brings up the APPR and STAR page successively.

CHECK the temporary revision including the missed approach.
INSERT the temporary revision, [6R] key.

Ident.: PRO-NOR-SRP-01-50-B-00004000.0001001 / 22 MAY 12

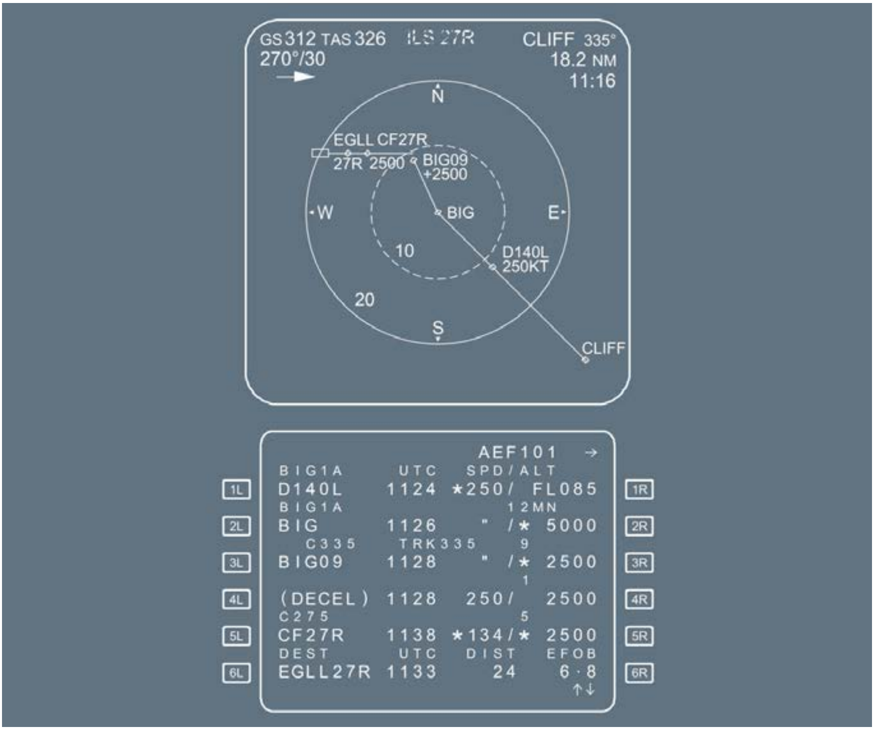
REVISION OF VERTICAL FLIGHT PLAN

CHECK that the speed and altitude constraints as displayed on the ND . (Use the CSTR pusbutton).
ENTER any additional speed or altitude constraints using the vertical revision page.

In order not to be too fast when commencing the approach, you may insert a speed constraint at the FAF (Final Approach Fix).
When all computations are completed.

REVIEW the flight plan, using the approach chart.

When the destination runway changes and if the previously selected STAR is compatible with the new runway, the system selects it automatically in the temporary F-PLN . If the flight crew has entered any revision or constraint on this STAR, it will not be transferred.
The pilot must reenter it in order to retain it for this approach.



Ident.: PRO-NOR-SRP-01-50-B-00004001.0002001 / 14 FEB 11

ENTERING THE WINDS FOR DESCENT

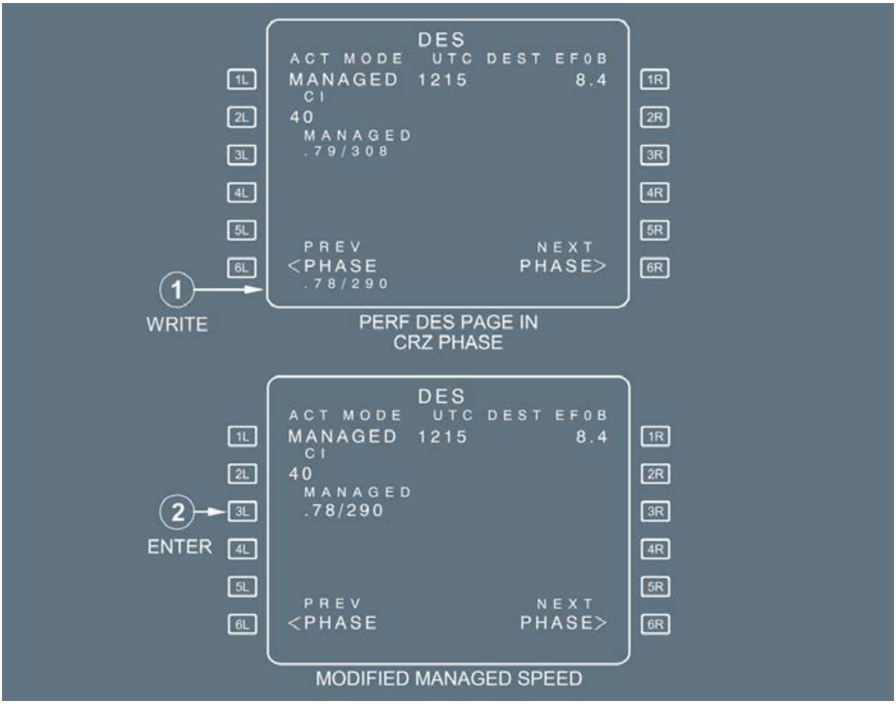
Refer to DSC-22_20-30-20-25 Wind - Temperature - QNH - General.

Ident.: PRO-NOR-SRP-01-50-B-00004002.0002001 / 22 MAY 12

PRESELECTING A MANAGED SPEED/MACH

As long as the descent phase is not active, the PERF DES page may either be used to select a speed, or a Mach number, or both, to replace the optimum descent speed.

The Flight Guidance Computer then uses the entered speed, instead of the optimum speed for computing the descent profile.
When the system switches to the descent phase, it sets the MANAGED target speed to the entered speed. From there, the speed may only be modified by using the FCU selector knob.
Once in descent phase, the pilot cannot modify the MANAGED speed again.

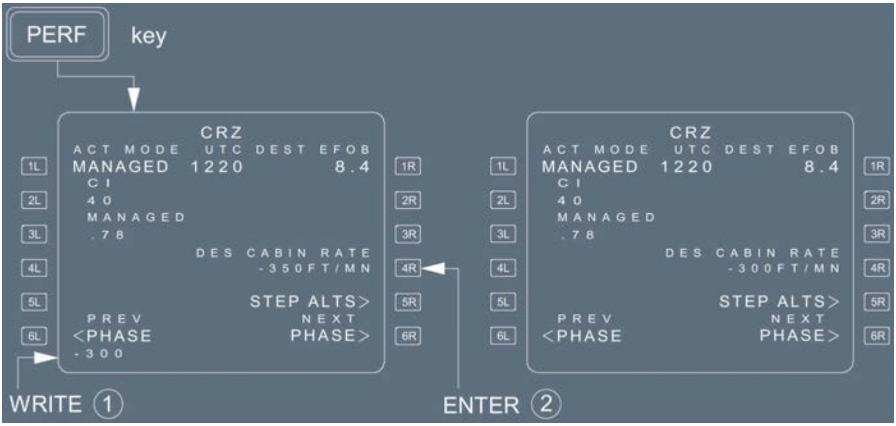


PROCEDURE

PRESS the PERF on MCDU.
SELECT the “NEXT PHASE” prompt.
WRITE the descent speed into the scratchpad and ENTER it.
The 3L field displays the imposed managed speed value.

Ident.: PRO-NOR-SRP-01-50-B-00004003.0003001 / 16 NOV 11

MODIFICATION OF THE CABIN RATE



PROCEDURE

PRESS the MCDU's PERF.
WRITE the new cabin rate in the scratchpad.
ENTER it in the [4R] field.

Ident.: PRO-NOR-SRP-01-50-B-00004004.0002001 / 22 MAY 12

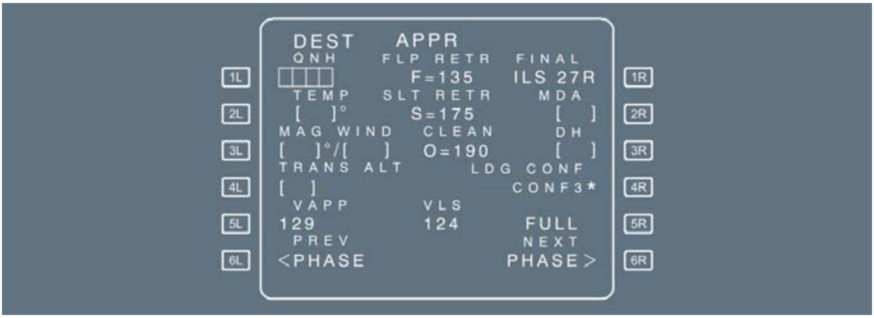
ENTERING THE APPROACH DATA

From PERF DES page, SELECT “NEXT PHASE” [6R] key to display the APPR page.
ENTER QNH , TEMP , WIND at destination (magnetic north reference), DH or MDA (MDH depending on the OPC option).

(The PFD displays the MDA /MDH or DH only when the distance to destination is less than 250 NM).

CHECK and, if necessary, MODIFY

- LDG CONF (landing configuration),
- VAPP (the FM-computed value may be modified),
- TRANS ALT (transition altitude).



The scratchpad displays "ENTER DEST DATA" if the approach page is not completed when the aircraft is 180 NM from destination.

SELECT "NEXT PHASE" in order to display the GO AROUND page.
CHECK and, if necessary, MODIFY the THR RED ALT and the ACC ALT.

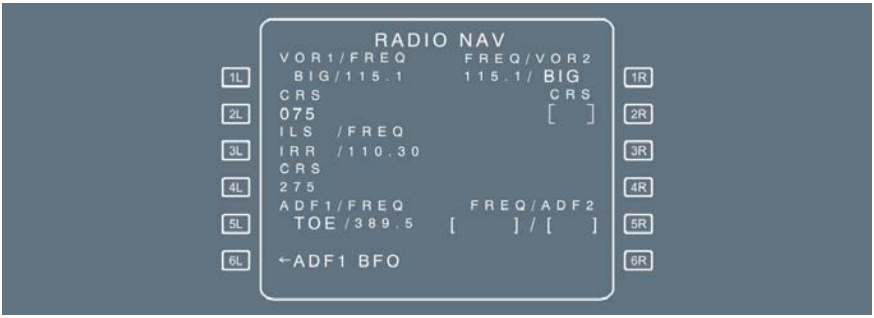
Ident.: PRO-NOR-SRP-01-50-B-00004005.0001001 / 22 MAY 12

SELECTING THE RADIO NAVAIDS

CHECK or SELECT the NAVAIDS appropriate for the approach.

For an ILS procedure, the ILS will be autotuned.
NDBs must be manually entered.

Note: *When the destination has a VOR /DME , ENTER it manually in the VOR field. ENTER its identifier in the BRG /DIST field of the PROG page. This allows you to perform a permanent NAV accuracy check.*



Ident.: PRO-NOR-SRP-01-50-B-00004006.0003001 / 08 DEC 16

COST INDEX FOR LONG-RANGE CRUISE

The flight crew can use the table below to find an approximate Cost Index value that is calculated for cruise at long-range cruise speed. This value is valid for CRZ FL = OPT ALT ± 1 000 ft.

AIRCRAFT	ENGINE	CILRC	
		kg/min	100 lb/h
A318/A319/A320/A321	CFM 56-5-A1/A3	45	60
	CFM 56-5-A4/A5	40	55
	CFM 56-5-B1/B2/B3	65	85
	CFM 56-5-B4 (A321)	65	85
	CFM 56-5-B4 (A320)	55	75
	CFM 56-5-B4/P	25	35
	CFM 56-5-B5/B6/B7	25	35
	CFM 56-5-B5/2P CFM 56-5-B6/2P CFM 56-5-B7/2P	30	40
	CFM 56-5-B8/B9	15	20
	CFM LEAP-1A	40	55
	PW6122/PW6124	20	30
	PW1100G-JM	40	55
	V2500-A1	45	60
	V2522-A5/V2524-A5/ V2527M-A5	50	70
	V2530-A5/V2533-A5	50	70
	V2527-A5/V2527E-A5	40	55

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Descent

DESCENT INITIATION

Ident.: PRO-NOR-SRP-01-60-00004007.0001001 / 14 FEB 11
Applicable to: ALL

The top of descent, displayed on the F-PLN page (T/D) and on the ND ( ), is a position that the system calculates, assuming that the aircraft will begin its descent in DES mode with managed speed, and that the system will guide the aircraft along the descent profile computed with all the vertical F-PLN data (ALT CSTR, ECON or AUTO MACH/SPD, SPD CSTR, SPD LIMIT) to reach VAPP at 1 000 ft AGL.

Note: *The ND does not display the top of descent when HDG (or TRACK) mode is engaged.*

PROCEDURES

- **When the aircraft reaches the top of descent (F/D) :**

  SELECT the altitude target.

  PUSH the ALT selector knob. DES mode engages.

  CHECK the FMA annunciators.

DESCENT MONITORING

Applicable to: ALL

Ident.: PRO-NOR-SRP-01-60-A-00004008.0004001 / 06 JUN 16

DES MODE ENGAGED

When DES mode is engaged, NAV mode is engaged, and the system takes into account all altitude and speed constraints of the F-PLN.
The key parameter for monitoring the descent is the vertical deviation (VDEV) displayed on the PFD and on the PROG page, which indicates whether the aircraft is on, above, or below the descent profile.

PROCEDURE

SET the ATC -cleared altitude on the FCU (considering also what is the safe altitude).

If the lowest safe altitude is higher than the ATC -cleared altitude, check with ATC that this constraint applies.
If it is confirmed, SET the FCU altitude to the safe altitude until it is safe to go to the ATC-cleared altitude.

MONITOR the vertical deviation (VDEV) on the PFD and the PROG page.

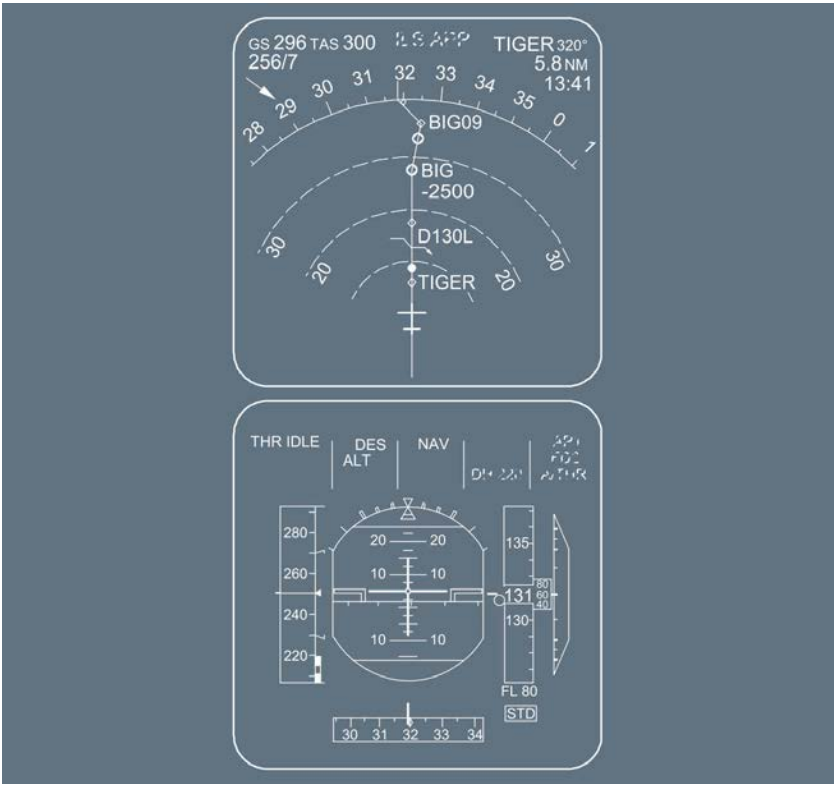
MONITOR the speed change that occurs, when the aircraft reaches a speed change symbol (magenta ball) under managed speed.
MONITOR the FMA (ALT *, ALT CST*, ALT , ALT CST) when the aircraft reaches level symbols.

■ **If the aircraft is on the descent profile:**

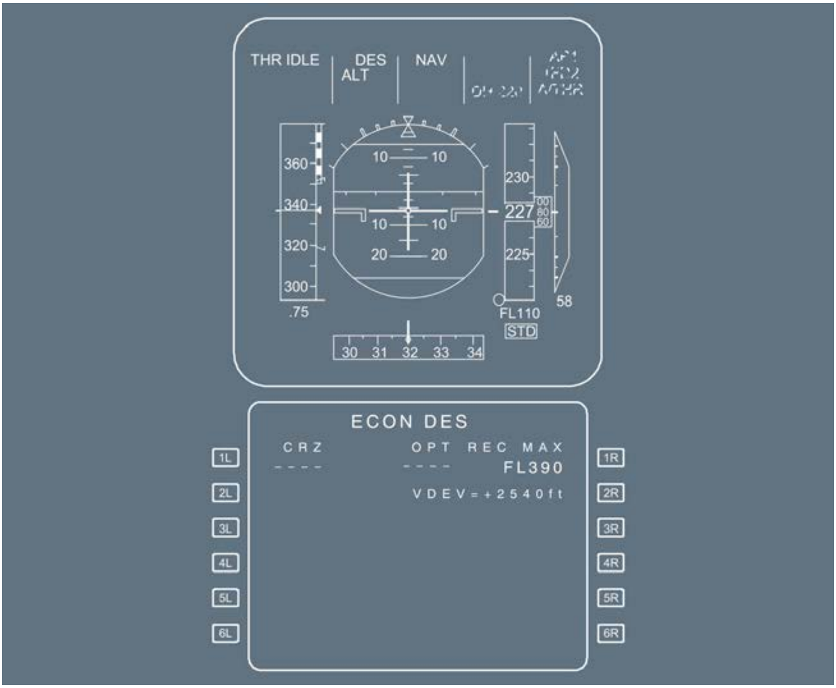
The aircraft is considered to be on the vertical profile, when it is within 50 ft of it. VDEV is close to zero, and the system predicts that it will match constraints until the aircraft levels off at the next FCU altitude.

MONITOR the predicted descent point after the next level-off.

The A/THR adjusts the thrust for the particular segment. The first FMA column may display “THR IDLE” or “SPEED”.



- **If the aircraft is above the descent profile:**
  VDEV is down on the PFD and positive on the PROG page.
  The A/THR sets IDLE thrust and the AP increases speed by calling for down elevator. If the aircraft reaches the upper limit of the managed speed range, the aircraft diverges and maintains the upper limit speed.



Procedure

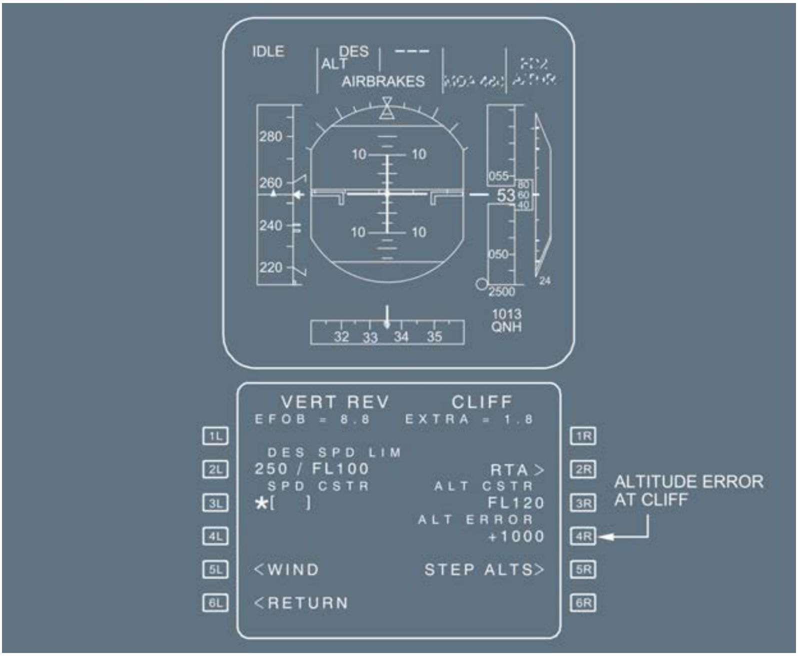
SELECT a descent speed higher than the upper limit when possible.

MONITOR the intercept symbol .

When this symbol reaches the next ALT CSTR waypoint "MORE DRAG" appears on the PFD indicating that speedbrakes must be extended in order to match the next altitude constraint. This is an advisory message.

Note: *With DPO , when above the descent profile, the flight crew may have to extend the speed brakes in order to go back on the descent profile.*

- **If an <u>altitude constraint</u> is predicted to be missed by more than 250 ft,** the vertical revision page shows ALT ERROR at the waypoint.



- **If a <u>speed constraint</u> is predicted to be missed by more than 10 kt:**

  SELECT an appropriate speed.

  RESUME managed speed when the aircraft is back on the descent path.

■ **If the aircraft is below the descent profile:**

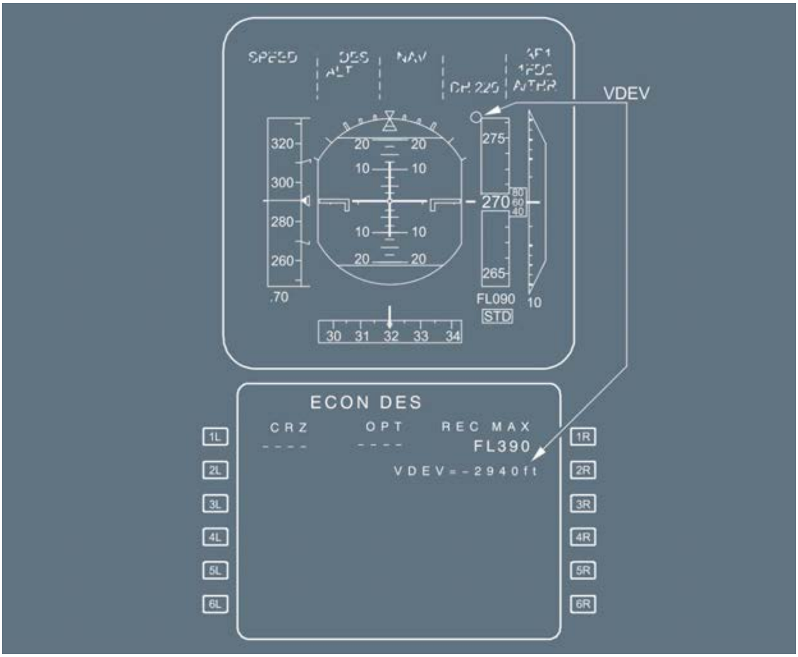
VDEV is up on the PFD and negative on the PROG page. The system maintains the target speed (managed or selected speed).

MONITOR the intercept symbol ([]) on the ND and any leveling off at the next ALT CSTR.

- **If the aircraft is flying at an altitude that is higher than both the descent speed limit altitude and the destination elevation +5 000 ft:**

  The FMGS maintains the V/S at -1 000 ft/min and the target speed, until the aircraft reaches the altitude constraint or intercepts the descent profile.

- **If the aircraft is flying at an altitude that is lower than either the descent speed limit altitude, or the destination elevation +5 000 ft:**
  The FMGS maintains the V/S at -500 ft/min and the target speed, until the aircraft reaches the altitude constraint or intercepts the descent profile.

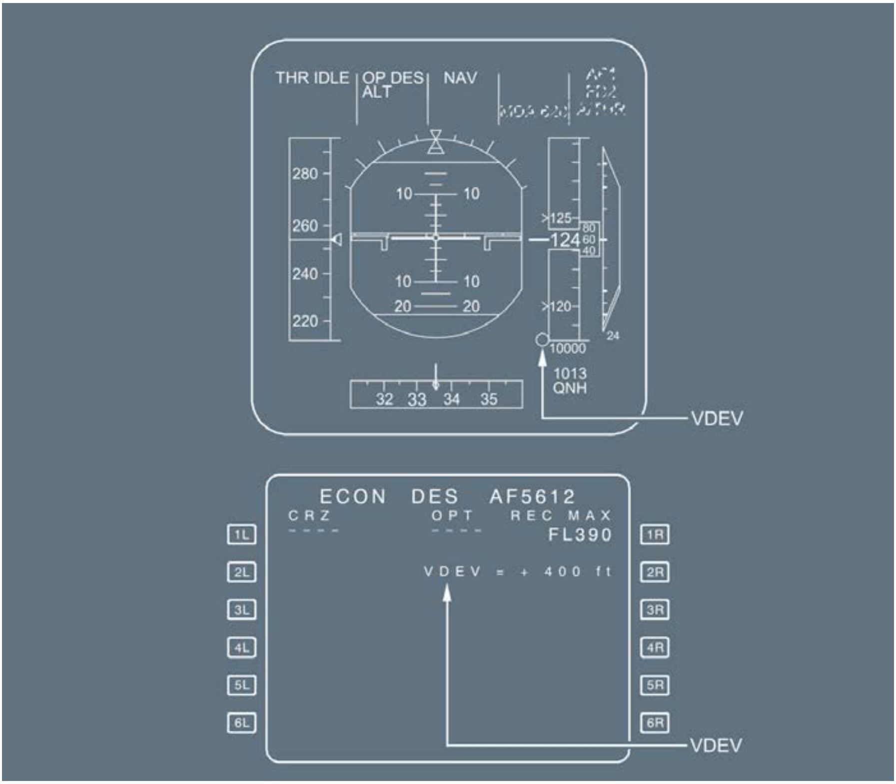


- **<u>If the rate of descent has to be increased (ATC requirement):</u>**
  SELECT OP DES mode
  Increase the target speed or extend the speedbrakes.

Ident.: PRO-NOR-SRP-01-60-A-00004009.0002001 / 22 MAY 12

OP DES , V/S OR FPA MODE ENGAGED

- In either case, the aircraft is no longer guided on the descent profile and altitude constraints are disregarded. If NAV mode is engaged the ND displays a white circle on waypoint with an altitude constraint. If NAV mode is disengaged, the circle is removed.
- The PFD still shows VDEV for reference purposes.
- The target altitude is always the FCU selected altitude (shown in blue).
  On the ND , level-off symbol is blue (no constraint). If NAV mode is engaged and the speed target managed, speed constraints are considered.



When HDG or TRK mode is engaged, vertical position may also be assessed on the ND using the energy circle. It is displayed as a green arc oriented on the current track and centered on the aircraft current position.

Note: *Altitude and speed predictions displayed on the F-PLN page assume an immediate return to DES mode.*

PROCEDURE

SET the FCU altitude as cleared by ATC, while considering the applicable safe altitude.

If the next safe altitude is higher than the ATC -cleared altitude, check with the ATC to verify that this constraint applies.
If confirmed, set the FCU altitude to the safe altitude, until it is safe to fly at the cleared altitude.

MONITOR the speed target, when the aircraft reaches the speed change symbol.
MONITOR the FMA ALT *, ALT, upon reaching the level symbol.
When in HDG /TRK mode, MONITOR the energy circle on the ND.

The MCDU F-PLN page presents SPD /ALT constraint-matching predictions, which assume that DES mode is immediately re-engaged.

CHECK the predictions before re-engaging DES mode (in order to resume the descent profile).

Note: *VDEV is available on the PFD even in HDG mode; it is a valuable tool for monitoring the descent, as long as crosstrack error (XTK) is less than 5 NM.*
*The aircraft automatically decelerates for approach, only if it flies over the DECEL pseudo waypoint with NAV mode engaged (or LOC *, LOC).*

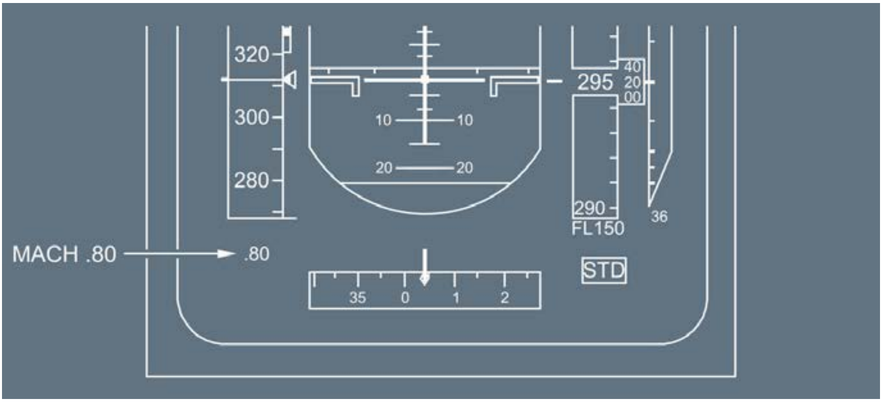
EXPEDITE DESCENT (IF INSTALLED)

Ident.: PRO-NOR-SRP-01-60-00004010.0001001 / 22 MAY 12
Applicable to: ALL

- **When ATC requires a rapid descent:**

  DEPRESS THE EXPED pushbutton

  Flight guidance (FG) pitches the aircraft to acquire and maintain 0.80/340. FG orders a pitch rate that produces no more than 0.15 g. The pilot can use this mode to initiate an emergency descent. To resume normal descent, PUSH the ALT selection knob or engage any other vertical mode.



MONITORING THE NAVIGATION IN THE TERMINAL CONTROL AREA

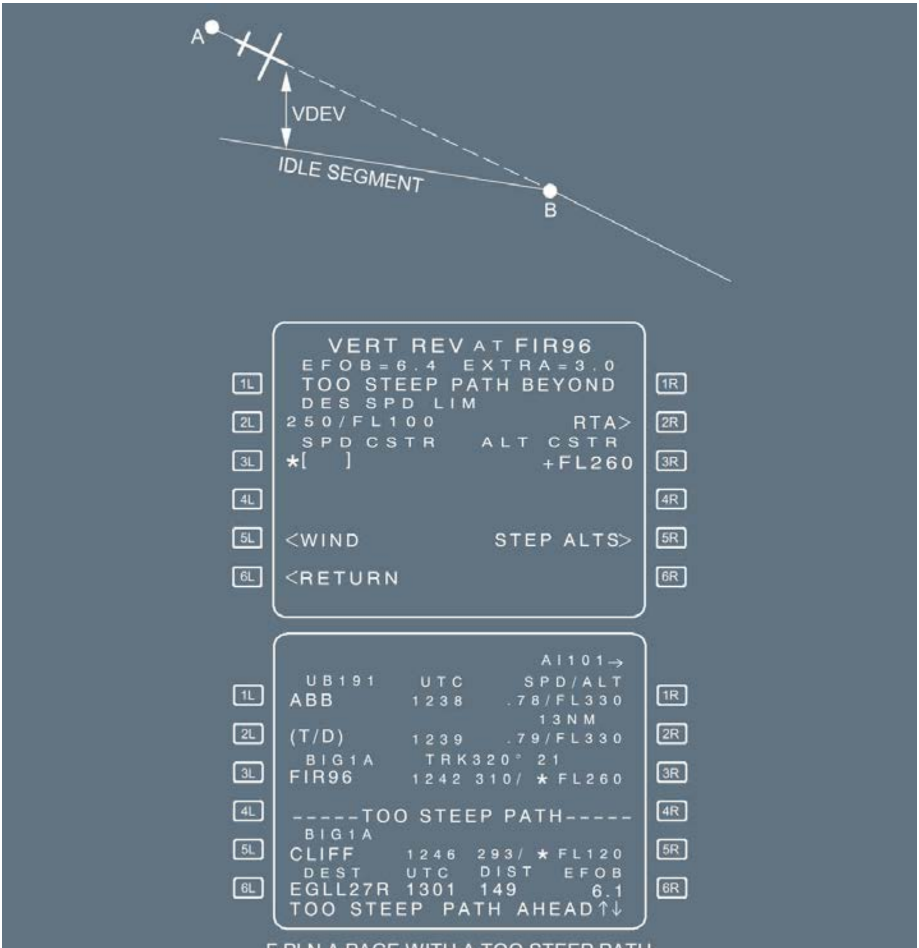
Ident.: PRO-NOR-SRP-01-60-00004012.0002001 / 14 FEB 11
Applicable to: ALL

If the MCDU “AREA RNP IS XX.X” message or “PROCEDURE RNP IS XX.X” message is displayed, the pilot will manually-entered RNP value in the REQUIRED field of the PROG page and clear or modify it, if it is not in accordance with the RNP value specified in the area (NAV or approach chart).

TOO STEEP PATH

Ident.: PRO-NOR-SRP-01-60-00004013.0007001 / 22 MAY 12
Applicable to: ALL

“TOO STEEP PATH AHEAD” appears on the MCDU scratchpad, when the system predicts this situation, and TOO STEEP PATH is displayed on the F-PLN page.
When the aircraft is crossing the first waypoint of a TOO STEEP PATH, the system computes a flyable descent profile (with an idle segment). The VDEV makes a jump because it is related to a new profile.



F.PLN A PAGE WITH A TOO STEEP PATH

PROCEDURE

- **When passing the first waypoint of the TOO STEEP PATH:**
  MONITOR VDEV and predictions at the next CSTR waypoint.
  If required, EXTEND the speedbrakes before seeing the “MORE DRAG” message.
  CONSIDER using a holding pattern, if necessary.

HOLDING PATTERN

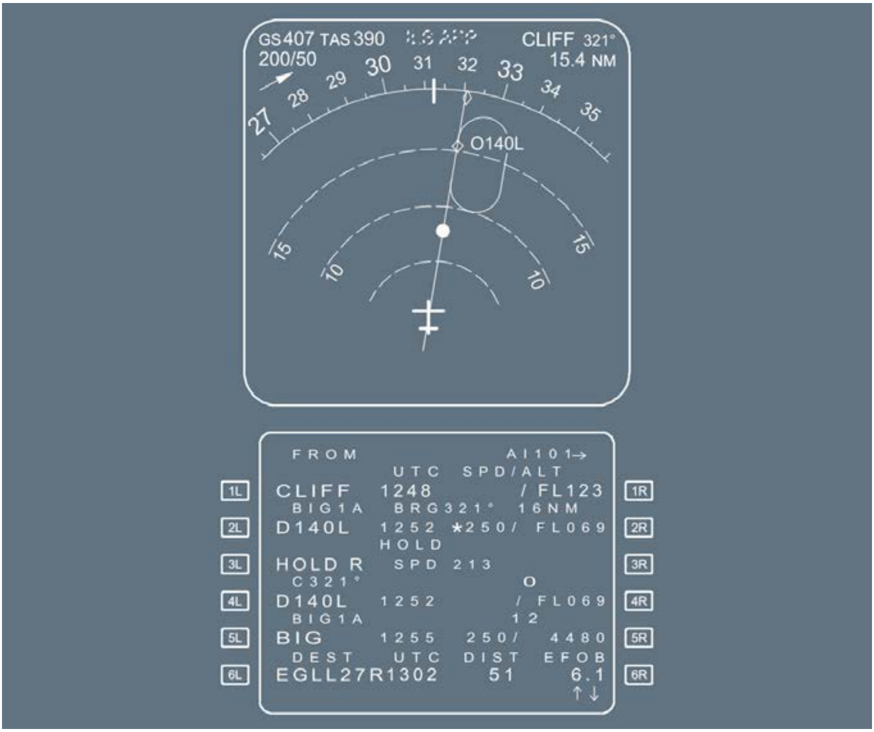
Ident.: PRO-NOR-SRP-01-60-00004014.0001001 / 09 OCT 12
Applicable to: ALL

A hold may be required during the descent, and may be manually inserted.

PROCEDURE

PRESS the F-PLN key.
SELECT the lateral revision page.
SELECT the HOLD prompt.
CHECK the HOLDING data, and MODIFY it if necessary.
CHECK the temporary flight plan and INSERT the holding pattern in it.

Note: *If the holding fix is close to the DECEL pseudo waypoint and the speed is managed, manually activate the approach phase to change the managed target speed to approach speed (VAPP). This will avoid having an increase of speed not appropriate.*



MANUAL TERMINATION

Ident.: PRO-NOR-SRP-01-60-00004016.0001001 / 09 DEC 09
Applicable to: ALL

You should not use DES mode when entering a leg with manual termination. Manual termination, which is defined as a track or a heading with no termination, is always part of a database procedure. The computed descent flight profile may not be adequate when flying this type of leg.

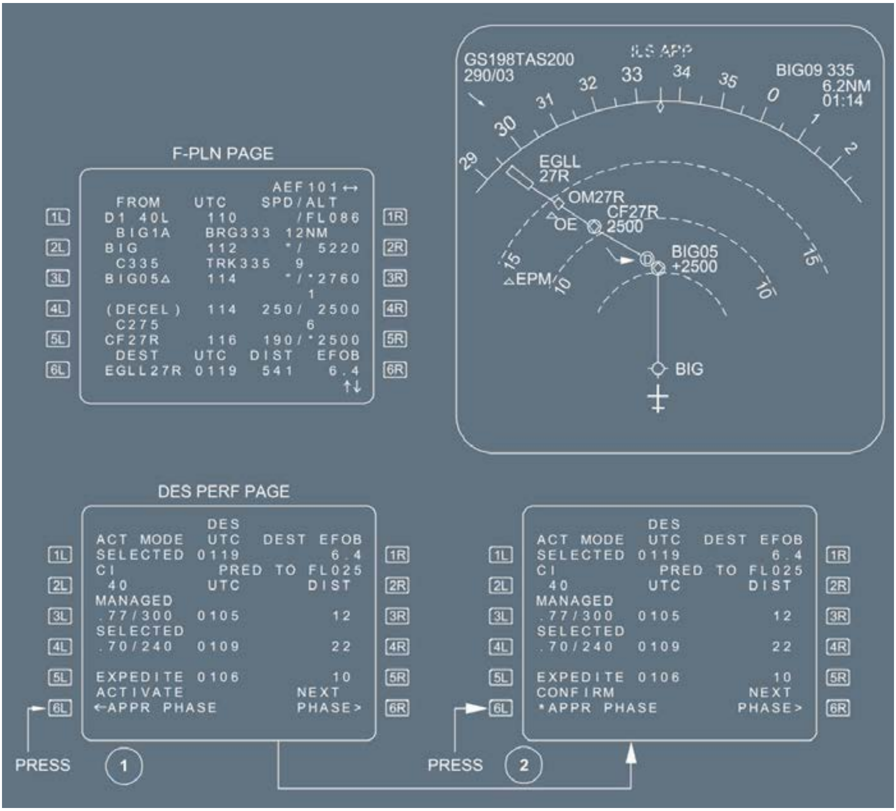
Approach

INITIAL APPROACH

Ident.: PRO-NOR-SRP-01-70-00004017.0002001 / 17 MAR 11
Applicable to: ALL

UPON REACHING THE INITIAL APPROACH AREA

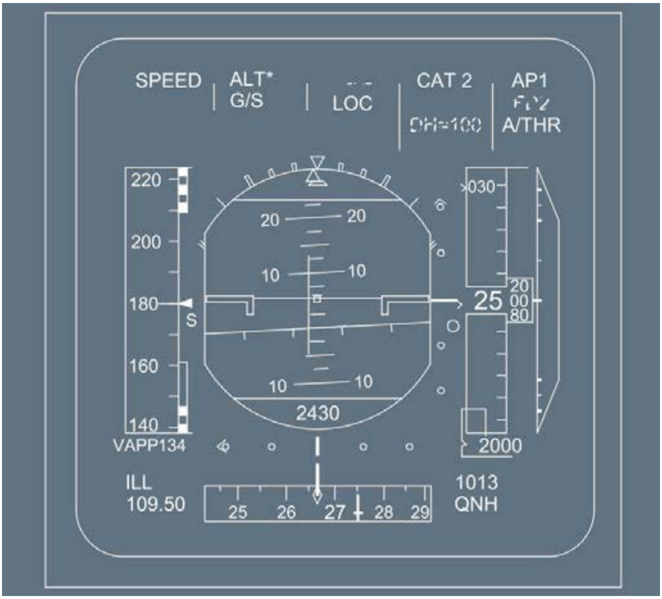
- Approach phase will activate automatically when flying over the DECEL pseudo waypoint with NAV , APPR NAV or LOC * or LOC mode engaged.
- You will activate manually the approach phase on the PERF page if:
  - HDG or TRK mode is engaged, or
  - You are flying a go around, or
  - An early deceleration is required



MANAGED SPEED

CHECK that managed speed is active: MONITOR the target speed.

During the approach, the autothrust limits the speed of the current configuration. (GD, S, F, VAPP).



- **If ATC requires a specific speed:**
  SWITCH to selected speed (turn and pull the speed selector knob on the FCU).
  ADJUST the aircraft configuration accordingly.
- **If ATC orders successive step descents down to the final approach flight path:**
  Use the V/S or FPA mode.
  MONITOR VDEV.

NAV ACCURACY

As required by the SOP.
Without installed GPS and when no DME is available for the accuracy check, use HIGH/LOW on the PROG page.
In this case, consider a “HIGH” to be equivalent to a positive crosscheck.

ATC CLEARANCE

MODIFY the F-PLN , RAD NAV , and PERF APPR data to agree with the latest clearance and landing information.

ILS/MLS/GLS/FLS APPROACH

Applicable to: ALL

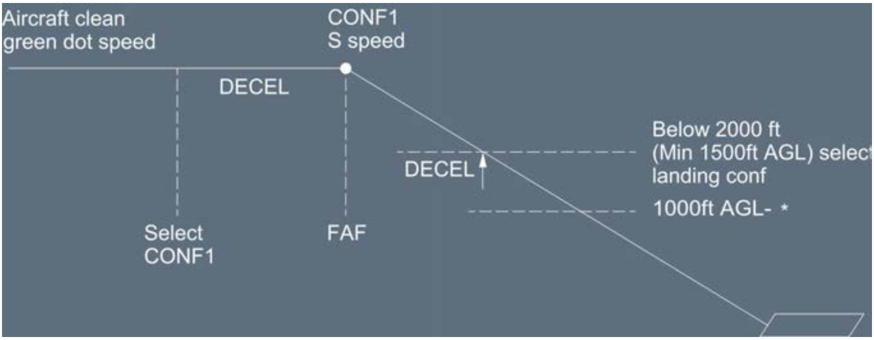
Ident.: PRO-NOR-SRP-01-70-A-00004018.0001001 / 17 MAR 11

INTERMEDIATE/FINAL APPROACH (ILS APPROACH ENTERED IN THE F-PLN)

The preferred technique for flying an ILS approach is to fly a decelerated approach using the AP /FD s, the LOC and G/S modes, A/THR in the SPEED mode, managed speed target is recommended.

DECELERATED APPROACH

The decelerated approach technique brings the aircraft down to 1 000 ft, at VAPP . In most cases, the interception of the final descent path is achieved with CONF 1 at S speed.



(*) The approach must be stabilized at approach speed (minimum ground speed) in the landing configuration before reaching 1 000 ft AGL.

Ident.: PRO-NOR-SRP-01-70-A-00004019.0008001 / 17 MAR 11

APPROACH MODE ACTIVATION (LOC -G/S)

- **When cleared by ATC and when appropriate:**

  DEPRESS the APPR pushbutton to arm the APPR mode for the approach entered in the flight plan.

  Note: *If a NON PRECISION approach is selected in the active flight plan and if the flight crew manually tunes an ILS on the RAD NAV page, the MCDU displays "CHECK APPR SELECTION" and the PFD displays "CHECK APP GUIDANCE" or "CHECK APP SEL" (if CPIP3 installed). These messages are a reminder to the flight crew that, although an ILS is tuned on RAD NAV page, the available approach guidance modes are APP NAV -FINAL when the APPR pushbutton is pressed in on the FCU.*

The FCU APPR pushbutton arms or engages LOC and G/S modes, if:
- An ILS approach is entered in the flight plan, or
- No approach, or only a runway, is entered in the flight plan, and an ILS is manually-tuned on the RAD NAV page, or
- Both RMP s are set to NAV , and an ILS is selected.

Ident.: PRO-NOR-SRP-01-70-A-00004020.0012001 / 17 MAR 11

AUTOLAND

CHECK that the FMA displays the aircraft capability (CAT 2 or CAT 3) for the intended ILS approach.
MONITOR the radio automatic callout.

- **At 350 ft RA:**

  CHECK that “LAND” is displayed on the FMA.

  CHECK ILS course.

  If LAND is not displayed or if the ILS course is not correct, do not perform an autoland. The flight crew should perform a go-around, if visual references are not sufficient.

- **Between 50 and 40 ft RA:**

  CHECK that “FLARE” is displayed on the FMA.

- **At approximately 30 ft RA:**

  CHECK that “IDLE” is displayed on the FMA, and that autothrust starts to reduce thrust toward IDLE.

- **At 10 ft, “RETARD” callout comes up:**

  MOVE the thrust levers to IDLE.

  Autothrust disconnects.

- **At touchdown:**

  CHECK that “ROLL OUT” appears on the FMA.

- **At the end of the Rollout:**

  Disconnect the autopilot.

  If the flight crew does not disconnect the AP at the end of the rollout, and uses the nosewheel steering handwheel to taxi the aircraft off the runway, the following will occur:
  - *The AP will try to steer the aircraft back to the runway centerline, if the nosewheel steering handwheel is released and the aircraft heading is less than 20 ° off the runway centerline.*
  - *The AP will automatically disconnect, if the aircraft heading is 20 ° or more off the runway centerline.*

Ident.: PRO-NOR-SRP-01-70-A-00004021.0001001 / 17 MAR 11

MANUAL LANDING

- **At DH:**

  DISCONNECT the APs. SPEED mode remains engaged.
- **At 20 ft "RETARD" automatic call out comes up:**

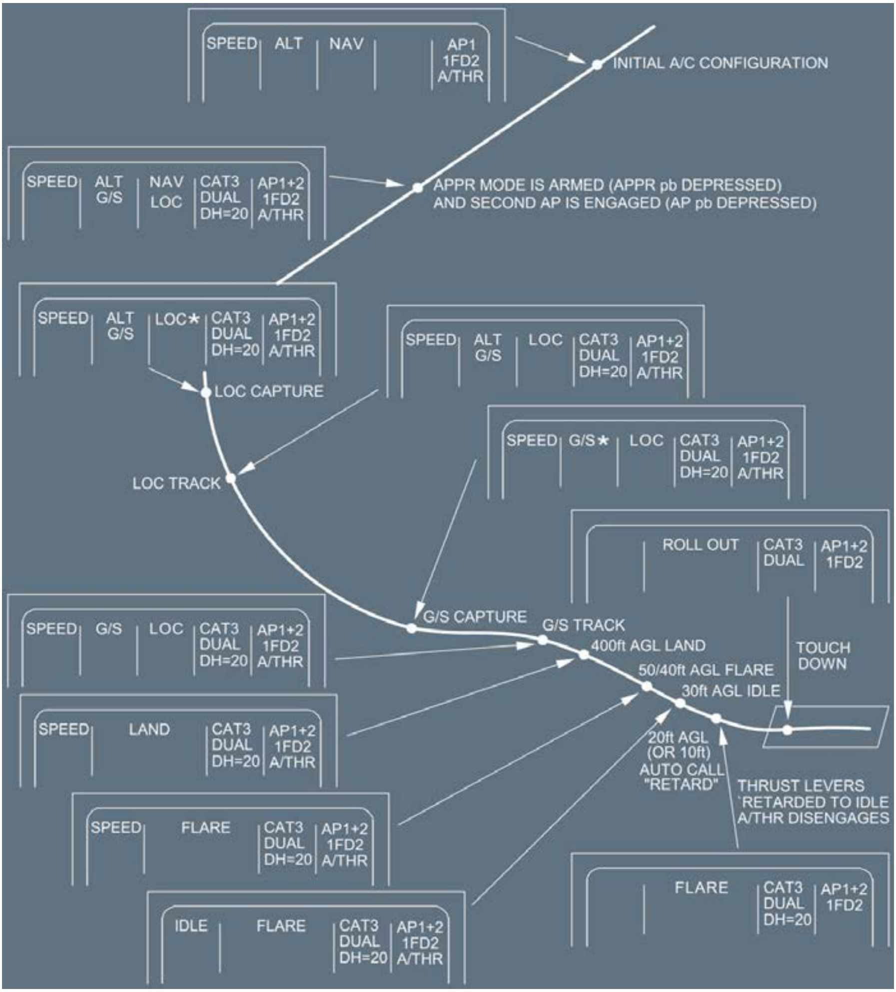
  MOVE the thrust levers to IDLE if they are not there already. (The A/THR disconnects).
- **At touch down:**

  "ROLL OUT" appears on the FMA and the yaw bar comes up on the PFD.

  Note: The retard call out is only a reminder when a manual landing is performed.

Ident.: PRO-NOR-SRP-01-70-A-00004022.0004001 / 22 MAY 12

STANDARD ILS AUTOMATIC APPROACH



Ident.: PRO-NOR-SRP-01-70-A-00004023.0001001 / 26 NOV 13

EARLY SELECTION OF APPROACH MODE LOC -G/S

Pressing the APPR pushbutton arms LOC and G/S.

When the aircraft is above 5 000 ft AGL , the Radio altimeter signals may not be valid. As long as the Radio altimeter signals are invalid, the FMA displays CAT 1.

- **When the aircraft is cleared for an ILS/MLS /GLS approach:**
  PRESS the APPR pb on the FCU.
- **When the aircraft is below 5 000 ft AGL:**
  Check that the FMA displays the correct capability for the intended approach.

Ident.: PRO-NOR-SRP-01-70-A-00004024.0002001 / 29 MAY 13

GLIDESLOPE INTERCEPTION FROM ABOVE

If the aircraft is above the glideslope, the system will not capture the G/S automatically.
The pilot must bring the aircraft onto the glideslope beam, and select an appropriate V/S to intercept it. *Refer to PRO-NOR-SOP-18-C Approach using LOC G/S Guidance - General*.

Ident.: PRO-NOR-SRP-01-70-A-00004025.0001001 / 17 MAR 11

DATA LOCK

When the aircraft reaches 700 ft RA with APPR mode (LOC and G/S) armed or engaged, the ILS FREQ and course are frozen in the receiver.
This function (ILS tune inhibit) is available, when at least one AP /FD is engaged. Any attempt to change the ILS frequency or CRS , via the MCDU or RMP, does not affect the receiver.
If the speed is managed, the system does not accept any modifications the pilot may enter on the PERF APPR page (surface wind, selected landing configuration, or VAPP) for speed guidance purposes below this altitude.
When the aircraft reaches 400 ft RA, LAND mode engages. The flight crew can only disengage this mode by engaging the GO AROUND mode.

Ident.: PRO-NOR-SRP-01-70-A-00004026.0001001 / 17 MAR 11

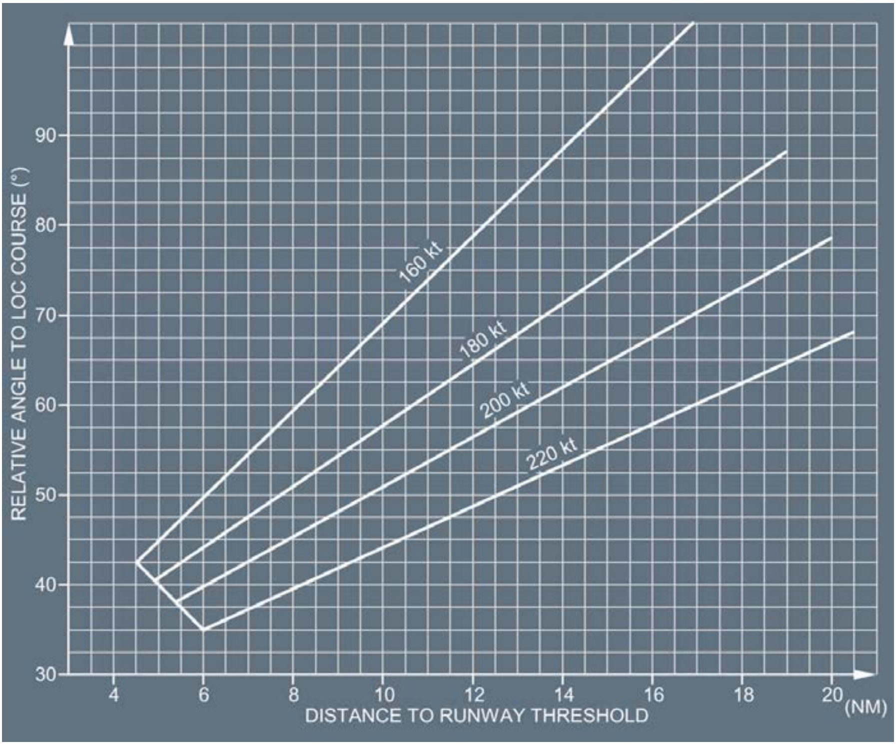
USE OF RMP S FOR ILS /DME

If both FMGC s fail, the flight crew can use the RMP s (Radio Management Panels 1 and 2) for back up tuning. Either RMP controls ILS . Prior to select an ILS frequency on one of the RMP s, the flight crew has to select “NAV ” button from RMP 1 and RMP 2.
If the ILS has a DME , the PFD will not display the DME distance. In this situation, the flight crew will fly without DME information. If necessary, increase the Decision height (DH) accordingly.

Ident.: PRO-NOR-SRP-01-70-A-00004027.0001001 / 22 MAY 12

LOCALIZER (LOC) BEAM CAPTURE

The flight crew must always monitor the capture of a LOC beam. During this evolution, the PFD and ND must indicate that associated deviation indications move toward the centre of the scale. To avoid performing a false capture, the flight crew must be careful not to arm the LOC too early. The following graph shows the angle of interception versus distance to the runway threshold that ensures that the aircraft will not overshoot the axis by more than one and a half dot.



The capture begins when the deviation is two dots or less. It is programmed to line the aircraft up on the beam with a single overshoot, even if the intercept angle is large.

Note: *ICAO requires LOC beam to ensure a normal capture within 10 NM and plus or minus 35 ° from the course centerline. Some ILS systems just meet the requirement and are subject to false capture outside these limits.*

SWITCHING FROM NON ILS TO ILS APPROACH

Ident.: PRO-NOR-SRP-01-70-00004028.0002001 / 17 MAR 11
Applicable to: ALL

If an ILS approach is possible when a non ILS was previously scheduled, use one of the following procedures:

USE OF SECOND FLIGHT PLAN

Use a secondary flight plan to prepare the alternate ILS approach, time permitting.

COPY the ACTIVE flight plan.
REVISE the ARRIVAL: insert the ILS approach and the applicable STAR/VIA.
On the RAD NAV page, TUNE in the ILS manually.
REVISE the PERF APPR page.

CHANGE OF THE CLEARANCE

ATC changes the clearance from the non-ILS to the ILS approach.

- **If a secondary flight plan has been prepared:**
  ACTIVATE the SEC F-PLN and adjust.
  Follow subsequent standard procedures.
- **If a secondary flight plan has not been prepared:**
  REVISE the ARRIVAL on the primary F-PLN, inserting the ILS approach.
  REVISE the PERF APPR page.
  Follow subsequent standard procedures.

CAUTION	If the pilot decides to fly the ILS approach without revising the arrival of the primary flight plan (a non ILS approach is in the F-PLN), LOC and G/S modes will not be available when he presses the APPR pushbutton. Consequently, he should: • Manually TUNE in the ILS on the RAD NAV page: CHECK that the "CHECK APPR SELECTION" message comes up. • Press the ILS pushbutton and select ROSE ILS on the EIS CONTROL panel. • Use HDG , V/S or TRK , FPA modes to fly the ILS.

LANDING CATEGORIES

Ident.: PRO-NOR-SRP-01-70-00004038.0001001 / 16 NOV 11
Applicable to: ALL

Each FMGC computes its own landing category : CAT 1, CAT 2, CAT 3 single, and CAT 3 dual and displays the corresponding landing category on the FMAs.
Each category depends upon the availability of aircraft systems and functions.
When the landing capability downgrades, a triple click aural warning is activated.

FAIL-OPERATIONAL AUTOMATIC LANDING SYSTEM

An automatic landing system is fail-operational if, in the event of a failure below alert height, the remaining part of the automatic system allows the aircraft to complete the approach, flare, and landing. A CAT 3 DUAL system is a fail-operational automatic landing system.

Note: *In the event of a failure, the automatic landing system operates as a fail-passive system.*

FAIL-PASSIVE AUTOMATIC LANDING SYSTEM

An automatic landing system is fail-passive if, in the event of a failure, there is no significant out-of-trim condition or deviation of flight path or attitude, but the landing is not completed automatically. A CAT3 single system is a fail-passive automatic landing system.

Note: *With a fail-passive automatic landing system the pilot assumes control of the aircraft after a failure.*

Below 100 ft (radio altimeter), the FMGS freezes the landing capability until LAND mode is disengaged or both APs are off.
Therefore a failure occurring below 100 ft does not change the category of the system.

ALERT HEIGHT

The alert height is the height above touch down, above which a CAT3 autoland would be discontinued and a missed approach executed, if a failure occurred in either the airplane systems or the relevant ground equipments.
Below the alert height, if such a failure occurs, the flare, touchdown and roll out may be accomplished using the remaining automatic system.

WARNINGS FOR ILS APPROACH

Ident.: PRO-NOR-SRP-01-70-00004039.0010001 / 17 MAR 17
Applicable to: ALL

AUTOLAND WARNING

With “LAND” or “FLARE” green on the FMA and at least one AP engaged, the AUTOLAND red light appears on the glareshield when the aircraft is below 200 ft RA and one of the following events occurs:
- The autopilots are lost, or
- The aircraft gets too far off the beam (LOC or G/S flash on PFD), or
- Loss of LOC signal above 15 ft, or loss of glide signal above 100 ft (transmitter or receivers), or
- The difference between both radio altimeter indications is greater than 15 ft, or
- The FMGS detects a long flare.

WARNING OF EXCESSIVE BEAM DEVIATION

This warning is a flashing of the LOC and G/S scales on the PFD and ND ROSE ILS. It occurs whenever:
- G/S deviation is greater than 1 dot (above 100 ft RA).
- LOC deviation is greater than 1/4 dot (above 15 ft RA).

WARNING ASSOCIATED WITH ILS "LANDING CAPABILITY"

Any downgrading in the aircraft’s capability for automatic approach and landing sounds a triple-click aural warning.

FAILURE OF BOTH LOCALIZER AND GLIDESLOPE RECEIVERS

The PFD and ND (rose ILS mode) display red LOC and G/S flags (if the ILS pushbutton has been pressed green). LOC and G/S scales disappear from the PFD.

If LOC or G/S modes are engaged and at least one AP /FD is engaged
- The AP disengages.
- The FD reverts to its HDG -V/S or TRK -FPA modes.

FAILURE OF LOCALIZER OR GLIDESLOPE TRANSMITTER (WHEN CAPTURED)

- The corresponding index is lost.
- The LOC and G/S scales flash.
- The corresponding FD bar flashes.

The FMA retains the LOC and G/S modes: If the transmitter failure is temporary, the AP s are able to regain these modes. If the failure is long-term, or if it occurs when the aircraft is below 200 ft RA, this allows the aircraft to perform a GO AROUND with one or 2 autopilots engaged.

Go-Around

MONITORING THE GO-AROUND

Ident.: PRO-NOR-SRP-01-80-00004054.0005001 / 09 JUL 13
Applicable to: ALL

Engage the GO-AROUND phase and GO-AROUND modes by setting the thrust levers to the TOGA position, if at least CONF1 is selected.
When the GO-AROUND phase is engaged, the previously-flown approach is automatically strung back into the flight plan at the end of the missed approach procedure.
In the GO-AROUND phase, the system makes no predictions. Consequently, CLB and DES modes are not available, and the flight crew must monitor constraints.
When the aircraft leaves the GO-AROUND phase, all predictions and modes become available again. During a GO-AROUND phase, the managed speed is Green Dot.

HEADING/TRACK PRESET FUNCTION IN GO-AROUND PHASE

The flight crew can use the heading/track preset, when LOC *, LOC , LAND or GA is engaged.

SET the appropriate heading, or track value, in the window of the FCU.
When necessary, PULL the HDG/TRK selection knob to engage the mode on the preset value.

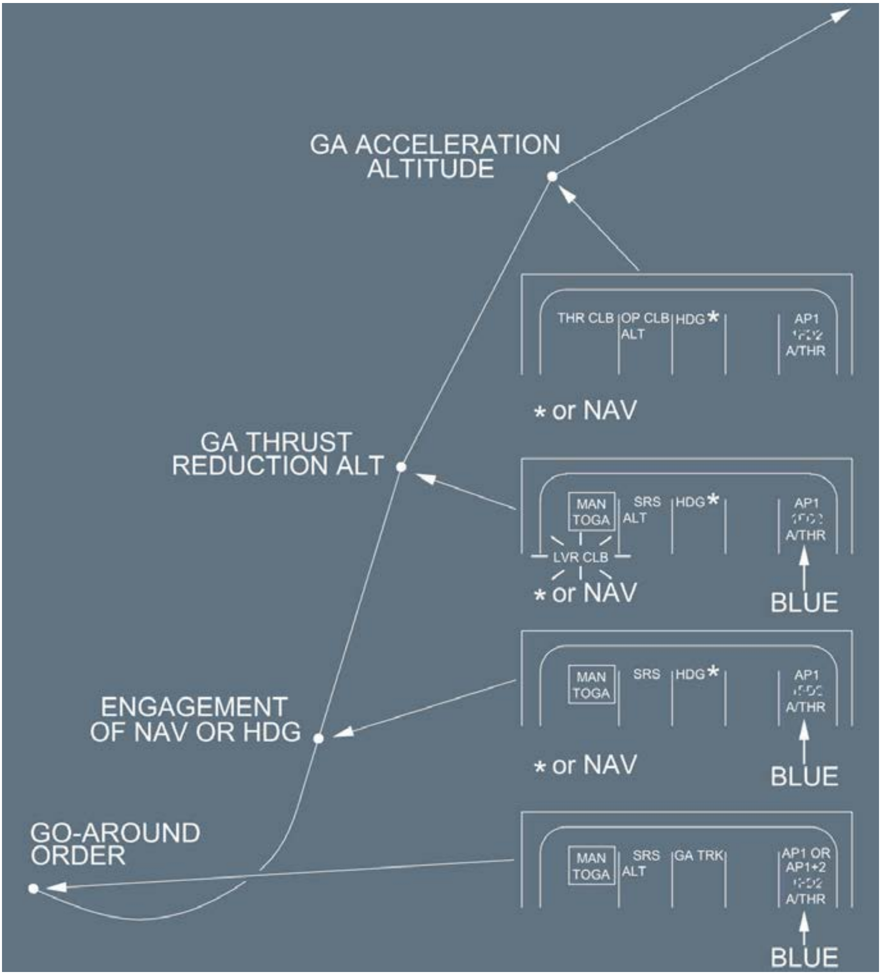
Note: *The heading/track preset is not available in non precision approach in AP /FD FINAL mode.*

GO-AROUND PROFILE

Ident.: PRO-NOR-SRP-01-80-00004055.0014001 / 22 MAY 12
Applicable to: ALL

- **WITH FD ON:**

  Apply SOP procedures



MISSED APPROACH: TRY AGAIN

Ident.: PRO-NOR-SRP-01-80-00004057.0001001 / 14 FEB 11
Applicable to: ALL

If the pilot intends to fly another approach to the destination:
- The flight plan has all the necessary data for the missed approach
- Green Dot is the target speed.

- **When cleared by the ATC to follow the missed approach procedure:**
  ENGAGE NAV mode, or
  TURN and PULL the HDG selector knob to set a heading
  HDG , or TRK , or NAV modes can only be engaged above 100 ft.
- **When entering the initial approach area:**
  Activate the approach phase on the MCDU's PERF GO AROUND page
  - **If the APPR phase is not activated:**
    - Managed approach speed will not be available
    - The system will not furnish predictions
    - MDA /MDH /DH displays will not appear on the PFD.

MISSED APPROACH: DIVERT

Ident.: PRO-NOR-SRP-01-80-00004058.0001001 / 14 FEB 11
Applicable to: ALL

- **If the crew decides to divert to the alternate:**
  ENABLE ALTN, preferably at the TO waypoint.
- **When cleared to a waypoint:**
  PERFORM a DIRECT TO.

  The system automatically reverts to CLB phase, and modifies the target speed from Green Dot to initial speed.
  The system automatically sets the CRZ FL to the defaulted alternate CRZ FL (FL 220 or 310), and retains the previous cost index.
  The pilot may adjust these as necessary.

  <u>Note:</u> *Diversion may also be initiated by entering a NEW DEST in the LAT REV page at the TO waypoint, or by using the secondary F-PLN, if prepared.* *Refer to DSC-22_20-60-30 General.*

TASK SHARING DURING A GO-AROUND

Ident.: PRO-NOR-SRP-01-80-00004059.0002001 / 20 JUL 15
Applicable to: ALL

PF	PM
-Announce "GO AROUND, FLAPS". Simultaneously set thrust levers to TO GA. -Monitor the flight path.	-Announce "FLAPS_". Retract flaps one step, and monitor engine parameters.

When rate of climb is positive:

PF	PM
-Announce "GEAR UP"	-Announce "POSITIVE CLIMB". -Retract the gear and confirm "GEAR UP ".

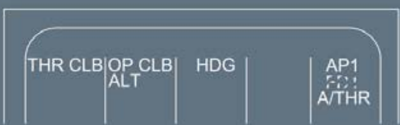
When LVR CLB flashes on FMA:

-Set thrust levers to CL detent.

-Push or Turn/pull HDG/TRK sel knob on FCU, according to ATC clearance.

At go-around acceleration altitude:

-Monitor that the target speed increases to Green Dot.



● If the speed target does not increase to Green Dot:
-CHECK and PULL the altitude selector knob to engage OP CLB
The speed target increases to Green Dot
-Retract flaps on schedule.

PROCEDURES

SPECIAL OPERATIONS

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Continued on the following page

Continued from the previous page

PRO-SPO-45 Engine Intermix Operations

PRO-SPO-50 Reduced Vertical Separation Minimum - RVSM

PRO-SPO-51 Required Navigation Performance (RNP)

PRO-SPO-60 Operations on Narrow Runways

PRO-SPO-85 ILS PRM Approach

GENERAL

Ident.: PRO-SPO-20-00001883.0001001 / 12 NOV 15
Applicable to: ALL

Flight without cabin pressurization can result of:
- Dispatch under MEL
- Departure following a structural damage
- Depressurization in flight

The flight crew must decide the flight level and the airspeed depending on:
- The cause of the depressurization
- The distance to fly
- The topographic conditions
- The meteorological conditions, and
- The passengers on board the aircraft.

Revenue flight is permitted without cabin pressurization, provided that the oxygen requirements below are achieved.
After a MEL dispatch with both PACKs inoperative, the flight without cabin pressurization is permitted provided the flight is performed without passengers.

OXYGEN REQUIREMENTS

Ident.: PRO-SPO-20-00001884.0001001 / 21 MAR 17
Applicable to: ALL

CREW MEMBERS

See FAR 121.329 or AIR-OPS CAT.IDE.A.235

PASSENGERS

For flight at cabin pressure altitudes above 10 000 ft, up to and including 14 000 ft, there must be enough oxygen to supply 10 % of the passengers for the flight at those altitudes that lasts more than 30 min.
For flight at cabin pressure altitudes above 14 000 ft, up to and including 15 000 ft, there must be enough oxygen for 30 % of the passengers.
For flight at cabin pressure altitudes above 15 000 ft, there must be enough oxygen for all passengers.

FLIGHT PLANNING AND EXECUTION

Applicable to: ALL

Ident.: PRO-SPO-20-A-00001981.0001001 / 21 MAR 17

ALTITUDE

Flight route planning should consider the above-stated restriction in cabin altitude. If cabin altitude exceeds 9 550 ± 350 ft, the EXCESS CAB ALT warning on the ECAM will be activated. When above 14 000 ft, the passenger oxygen masks will drop automatically. Therefore, the recommended maximum altitude for prolonged flight is FL 100. The minimum altitude should be selected by respecting :
- The Minimum Safe Altitude (MSA),
- Turbulence, which is uncomfortable for passengers and,
- Low Outside Air Temperature (OAT), which can be uncomfortable for passengers when the cabin is ventilated by ram air only.

Ident.: PRO-SPO-20-A-00001983.0001001 / 21 MAR 17

AIRSPEED

If decompression is due to structural damage, consider airspeed reduction. Use slats and flaps, as necessary, to establish low speed conditions. In addition, turbulent conditions are uncomfortable for passengers, and gust response should be minimized by reducing airspeed.

Ident.: PRO-SPO-20-A-00001984.0001001 / 21 MAR 17

CLIMB AND DESCENT RATE

Takeoff must be performed normally, and the rate of climb must be limited to about 500 ft/min, to ease the pressure change felt by passengers and crew.
Likewise, the rate of descent must be limited to about 1 000 ft/min, except for the final approach which must be performed normally. Notify the ATC of any performance deficiency by a remark in the flight plan.

Ident.: PRO-SPO-20-A-00001985.0004001 / 21 MAR 17

EMER DESCENT IN CASE OF RAPID DEPRESSURIZATION

In the event of depressurization, oxygen is supplied to passengers through an individual mask. The capacity of the units is such that the aircraft must descend and remain below the following profile.

SYSTEMS

Ident.: PRO-SPO-20-00001990.0001001 / 23 JUN 15
Applicable to: ALL

FAILURE OCCURRING IN FLIGHT

Apply the abnormal and emergency procedures required by ECAM.

FAILURE PRESENT AT DISPATCH

- **If flight with both packs inoperative**

  In this case, the flight must be performed with no passengers

  PACK 1 and 2..OFF
  RAM AIR..ON

  Note: *If the "AVIONICS SMOKE" procedure has to be applied, the following flight time limitations have to be considered to protect the avionic equipment :*
  At ISA +40 : 0.5 h
  At ISA +30 : 1.5 h
  At ISA +20 : 4 h
  At ISA +10 and below : No limitation.

  MAX FL ....100 or MSA

- **If both CAB PRESS systems are inoperative, or if there is structural damage :**

  PACK 1 and 2..ON
  MODE SEL..MAN
  V/S CTL ....AS RQRD

  Use V/S CTL pb to set the outflow valve opening to 50 %.

  OUTFLOW VALVE HALF OPEN..CHECK

  The outflow valve opening is limited to 50 %, to prevent the cabin air suction effect.

MAX FL ....100 or MSA

*Between FL 80 and FL 150, oxygen must be provided for 2 % of the passengers. This is provided by the portable oxygen system. When it is no longer available, descend to FL 80. For performance at FL 80/250 kt : Use data for FL 100/LRC (**Refer to PER-CRZ-CRT-30 LONG RANGE CRUISE - ISA**) and increase fuel consumption by 6 %.*

TAKEOFF

Limit the aircraft's rate of climb to about 500 ft/min.

CLIMB

<u>Note:</u> *The EXCESS CAB ALT warning may occur.*
Use the ECAM CLR pb to clear the warning.

DESCENT

Limit the aircraft's rate of descent to about 1 000 ft/min. Perform the final approach normally.

PERFORMANCE DATA

Ident.: PRO-SPO-20-00001991.0004001 / 10 JAN 11
Applicable to: ALL

The following table enables the fuel consumption and the time needed from takeoff to landing to be determined in case of flight without cabin pressurization.

The table is established for :
- Takeoff
- Climb from 1 500 ft at 250 kt
- Long range cruise speed at FL 100
- Descent to 1 500 ft at 250 kt
- Approach and landing : IMC procedure 110 kg or 240 lb (6 min)
- ISA temperature
- CG = 25 %
- Normal air conditioning
- Anti ice OFF

The table (*Refer to PRO-SPO-20 Ground Distance/Air Distance Conversion*) gives the conversion from ground distance to air distance

<u>Note:</u> *For each degree Celcius above ISA temperature apply a correction of 0.01 (kg/°C/NM) or 0.022 (lb/°C/NM).*

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING

Ident.: PRO-SPO-20-00001992.0006001 / 10 JAN 11
Applicable to: ALL

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250 KT - CRUISE : LONG RANGE - DESCENT : 250KT
IMC PROCEDURE : 110 KG (6MIN)
FL100

NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG = 25.0%		FUEL CONSUMED (KG) TIME (H.MIN)		
AIR DIST. (NM)	INITIAL WEIGHT (1000KG)						
	45	50	55	60	65	70	75
220	1820 0.56	1883 0.55	1954 0.54	2026 0.51	2093 0.51	2163 0.50	2235 0.50
240	1958 1.00	2027 1.00	2104 0.58	2182 0.55	2254 0.54	2327 0.54	2402 0.54
260	2095 1.05	2170 1.04	2254 1.03	2339 0.59	2414 0.58	2491 0.57	2570 0.57
280	2233 1.10	2314 1.09	2404 1.07	2494 1.02	2574 1.01	2655 1.00	2737 1.00
300	2370 1.14	2457 1.13	2553 1.11	2650 1.06	2735 1.05	2819 1.04	2905 1.04
320	2507 1.19	2600 1.18	2703 1.16	2806 1.10	2895 1.08	2983 1.07	3072 1.07
340	2644 1.23	2742 1.22	2852 1.20	2961 1.13	3055 1.12	3146 1.11	3239 1.10
360	2780 1.28	2885 1.27	3001 1.24	3117 1.17	3214 1.15	3310 1.14	3406 1.14
380	2917 1.32	3027 1.31	3149 1.29	3272 1.21	3374 1.19	3473 1.17	3572 1.17
400	3053 1.37	3169 1.36	3298 1.33	3427 1.25	3533 1.22	3636 1.21	3739 1.20
420	3190 1.42	3311 1.40	3446 1.37	3582 1.28	3693 1.26	3799 1.24	3906 1.24
440	3326 1.46	3453 1.44	3594 1.42	3737 1.32	3852 1.29	3962 1.28	4072 1.27
460	3462 1.51	3595 1.49	3742 1.46	3892 1.36	4011 1.33	4125 1.31	4238 1.30
480	3598 1.55	3736 1.53	3889 1.50	4046 1.39	4170 1.36	4288 1.34	4405 1.34
500	3733 2.00	3878 1.58	4037 1.55	4201 1.43	4329 1.40	4450 1.38	4571 1.37
520	3869 2.05	4019 2.02	4184 1.59	4354 1.47	4488 1.43	4613 1.41	4737 1.40
540	4004 2.09	4160 2.07	4331 2.03	4508 1.51	4647 1.47	4775 1.45	4903 1.44
560	4139 2.14	4301 2.11	4478 2.08	4661 1.55	4805 1.50	4937 1.48	5069 1.47
580	4274 2.18	4441 2.16	4624 2.12	4814 1.58	4964 1.54	5099 1.52	5234 1.50
600	4409 2.23	4582 2.21	4771 2.17	4967 2.02	5122 1.57	5261 1.55	5400 1.54
620	4544 2.28	4722 2.25	4917 2.21	5120 2.06	5280 2.01	5423 1.59	5566 1.57
640	4679 2.32	4862 2.30	5063 2.25	5273 2.10	5439 2.04	5584 2.02	5731 2.01
660	4813 2.37	5002 2.34	5208 2.30	5425 2.14	5596 2.08	5746 2.05	5896 2.04
680	4948 2.41	5142 2.39	5354 2.34	5577 2.18	5754 2.12	5907 2.09	6061 2.07
700	5082 2.46	5282 2.43	5499 2.39	5729 2.22	5911 2.15	6069 2.12	6226 2.11
AIR CONDITIONING OFF ΔFUEL = − 2.5 %			ENGINE ANTI ICE ON ΔZFUEL = + 4.5 %		TOTAL ANTI ICE ON ΔFUEL = + 8.5 %		

GROUND DISTANCE/AIR DISTANCE CONVERSION

Ident.: PRO-SPO-20-00001994.0003001 / 21 MAR 17
Applicable to: ALL

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	–50	–100	–150
40	27	30	34	**40**	48	59	77
60	41	45	52	**60**	71	88	115
80	54	61	69	**80**	95	117	153
100	68	76	86	**100**	119	147	192
120	81	91	103	**120**	143	176	230
140	95	106	121	**140**	167	206	268
160	108	121	138	**160**	190	235	307
180	122	136	155	**180**	214	264	345
200	135	152	172	**200**	238	294	384
220	149	167	190	**220**	262	323	422
240	162	182	207	**240**	286	352	460
260	176	197	224	**260**	309	382	499
280	189	212	241	**280**	333	411	537
300	203	227	259	**300**	357	441	575
320	216	243	276	**320**	381	470	614
340	230	258	293	**340**	405	499	652
360	243	273	310	**360**	428	529	690
380	257	288	328	**380**	452	558	729
400	271	303	345	**400**	476	587	767
420	284	318	362	**420**	500	617	805
440	298	334	379	**440**	524	646	844
460	311	349	397	**460**	547	675	882
480	325	364	414	**480**	571	705	920
500	338	379	431	**500**	595	734	959
520	352	394	448	**520**	619	764	997
540	365	409	466	**540**	642	793	1036
560	379	425	483	**560**	666	822	1074
580	392	440	500	**580**	690	852	1112
600	406	455	517	**600**	714	881	1151

GENERAL

Ident.: PRO-SPO-40-10-00002029.0001001 / 23 JUN 15
Applicable to: ALL

The system design and the reliability of the engine installation of this airplane comply with the criteria for Extended Twin Operations (ETOPS) flights set forth in AMC 20-6 rev. 2 (EASA) or FAR 25.1535 (FAA), when the aircraft is configured, maintained and operated in accordance with the Airbus CMP (Configuration, Maintenance and Procedure) document.
This statement of ability does not constitute an approval to conduct Extended-Range Operations.
The ETOPS EXTENDED OPERATIONS Chapter of the AFM APPENDICES AND SUPPLEMENTS Section refers to the approved Standard for Extended-Range Operations and the applicable limitations, procedures and performance references.
The operator is responsible for showing that he is complying with the regulation of his nation and for obtaining operational approval from his national authorities. The operator may amend this chapter, as needed.
The airplane must be configured in accordance with the Airbus Standard for Extended-Range Operations. However, the authorities may under certain conditions allow the operator to conduct ETOPS flights with limited maximum diversion time (for example, 75 min diversion time in a benign area of operation) without showing full compliance with these standards.

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DEFINITIONS

Ident.: PRO-SPO-40-20-00002031.0001001 / 23 JUN 15
Applicable to: ALL

For the purpose of EU-OPS 1-245 and FAR 121-161, Extended-Range Operations are those intended to be conducted over a route that contains a point beyond 60 min from an adequate airport at the selected one-engine-inoperative speed in still air and ISA (or prevailing delta ISA) conditions.
An adequate airport is an airport which satisfies the aircraft performance requirements applicable at the expected landing weight, and sufficiently equipped to be safely used. In particular, at the anticipated time of use, it should be available and equipped with the necessary services, including ATC, weather information, navaids and emergency services.
An ETOPS (en-route) alternate airport is a confirmed adequate airport which satisfies the dispatch weather minima requirements for ceiling and visibility within the required validity period.

AREA OF OPERATION

Ident.: PRO-SPO-40-20-00002032.0001001 / 21 MAR 17
Applicable to: ALL

The ETOPS area of operations is the airspace within which the distance to an ETOPS adequate airport is less than the ETOPS Max Diversion distance.
The ETOPS maximum diversion distance from an adequate airport must be determined for ISA (or prevailing delta ISA) and no-wind conditions, taking into account aircraft performance with one engine inoperative and the remaining engine operating at MCT.
To determine the ETOPS maximum diversion distance from an adequate airport, the operator must define a One Engine Inoperative diversion speed for performance computation.

The same approved one-engine-inoperative diversion speed (*Refer to PER-OEI-GEN STRATEGY*) must be considered for :
- Establishing the area of operation,
- Calculating the single-engine fuel planning,
- Conducting the diversion in case of engine failure (conditions permitting).

The operator has to define an aircraft weight at diversion that is considered for the ETOPS Maximum Diversion Distance calculation. This aircraft weight can be taken as a representative but conservative value of the aircraft gross weight at the critical point of the route or at the various critical points of all the routes included in a given sector.
The approved one-engine-inoperative descent and cruise speed must be chosen so that the associated net flight path clears the en-route obstacles with the regulatory margin. However, a speed other than the approved one-engine-inoperative speed may be used as the basis for obstacle clearance as long as the fuel required with that speed is covered by the critical fuel scenario.
Refer to PER-OEI-GEN STRATEGY for these two one-engine-inoperative speeds.

When the one-engine-inoperative diversion speed is chosen, the maximum distance from a diversion airport, can be directly determined for different maximum diversion times, with the help of the tables provided in this section. The area of possible ETOPS operation can then be drawn on plotting charts.
Another way to determine the maximum distance to a diversion airport is to read the one-engine-inoperative cruise TAS (for the reference gross weight and at the FL for best TAS) in the cruise tables (*Refer to PER-OEI-GEN STRATEGY*) taking into consideration the appropriate speed strategy and the minimum altitude for clearing possible obstacles. The maximum distance the aircraft can travel to a diversion airport is this one-engine-inoperative-TAS multiplied by the maximum allowed diversion time granted to the operator.
Operators whose authorities require that an approved one-engine-inoperative speed be published in the Flight Manual must use this approved speed.

MMEL

Ident.: PRO-SPO-40-30-00002035.0001001 / 03 DEC 13
Applicable to: ALL

The MMEL has been approved taking into consideration the duration of the average ETOPS flight and the maximum diversion time granted to the airframe/engine combination.
The MMEL published by Airbus and approved by the EASA can be used to establish the airline MEL, which must be approved by the operator's national authorities.
This MEL will probably be adapted to the airline network, environment and organization.

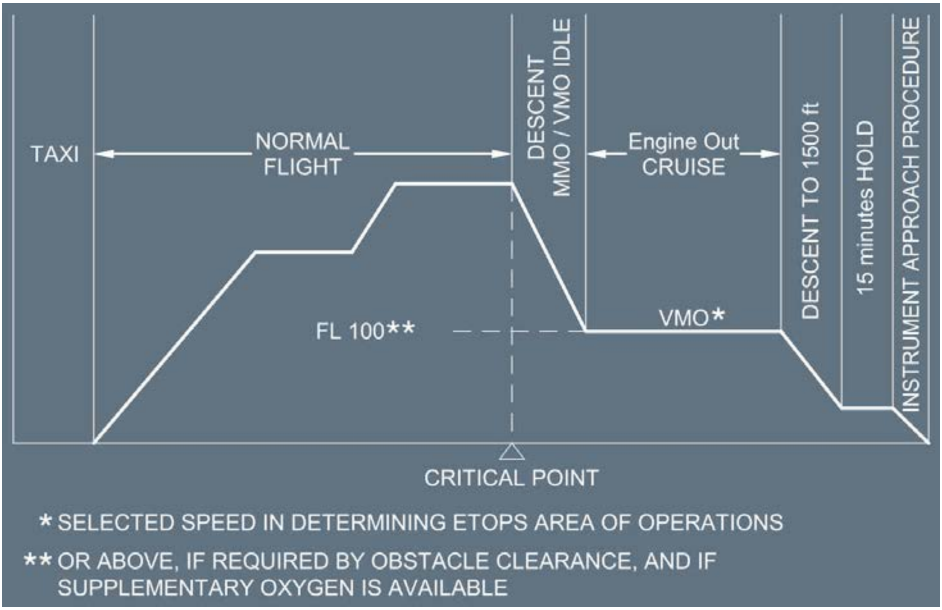
Other determining parameters will be :
- The maximum and the average diversion times on the route.
- The equipment of the enroute alternates.
- The navigation and communication facilities.
- The average meteorological conditions.

ETOPS FUEL SCENARIOS

Ident.: PRO-SPO-40-30-00012899.0001001 / 23 JUN 15
Applicable to: ALL

According to EASA AMC20-6 rev 2 and FAA 121.646 for establishing the ETOPS critical fuel reserves, the operator must consider three diversion scenarios:

- Pressurization Failure + Engine Failure



- Pressurization Failure
  Same Flight Profile as above, but all engines operating and Diversion Cruise Speed* set to LRC.
- Engine Failure
  Same Flight Profile as above, but standard descent speed and Diversion Cruise at the FL ** appropriate to gross engine out ceiling at the selected ETOPS diversion speed.
- FAA Fuel Requirements
  For the first two scenarios, involving depressurization, the required block fuel must be calculated in accordance with the operator's ETOPS fuel policy and using the regulatory ETOPS critical fuel reserves *Refer to PRO-SPO-40-30 ETOPS Critical Fuel Reserves*.
  Depending on the approved one-engine-inoperative speed selected for the single-engine diversion strategy, either of these two scenarios may result in the higher fuel requirement.
  The scenario resulting in the higher fuel requirement is called the ETOPS critical fuel scenario, and the associated minimum block fuel requirement is the ETOPS critical fuel plan.
  Note that, it is not necessary to calculate the 3rd scenario (engine failure), as this scenario is never critical, due to the higher diversion flight level.

ETOPS CRITICAL FUEL RESERVES

Ident.: PRO-SPO-40-30-00012901.0001001 / 23 JUN 15
Applicable to: ALL

For the computation of the ETOPS critical fuel reserves and of the complete ETOPS critical fuel planning according to EASA AMC 20-6 rev 2 and FAR 121.646, the diversion fuel must include the following fuel provisions:

- Fuel burn-off from the critical point to the end of descent at the alternate airport
- Fuel for 15 min of holding at 1 500 ft and green dot speed at the alternate
- Fuel for an instrument approach and landing
- Fuel to account for errors in wind forecasting (5 % wind speed factor on actual forecast wind speeds or 5 % fuel if actual forecast wind speeds are not used)
- Fuel to account for aircraft deterioration (use a demonstrated performance factor or 5 %)
- Fuel to account for any Configuration Deviation List (CDL) or MEL item
- Fuel to account for Icing Effects (if forecast) for the critical mission
- Fuel to account for APU use (only for the one-engine-inoperative scenario, if APU is operative)

WIND ERRORS

A 5 % wind speed factor (i.e. an increment to headwind or a decrement to tailwind) on the actual forecast wind should be used to account for potential errors. However if the operator is not using the actual forecast wind based on a wind model acceptable to the certification authorities then 5 % of the fuel for the critical scenario is required as a reserve fuel.

ICING

The most critical scenario must be compensated for the greater of:

A. The effect of airframe icing during 10 % of the time during which icing is forecast, including ice accumulation on unprotected surfaces, and the fuel used by engine and wing anti-ice during this period.

B. Fuel for engine and wing anti-ice for the entire time during which icing is forecast.

Note: The ETOPS icing fuel reserve is always limited by (B)

Unless a reliable icing forecast is available, icing may be presumed to occur when the Total Air Temperature (TAT) is less than +10 °C, or if the outside air temperature is between 0 °C and -20 °C with a relative humidity of 55 % or more.

APU

Fuel consumption of 80 kg/h / or 176 lb/h (APU GEN ON, APU BLEED OFF).

In view of our experience, Airbus recommends that the operator includes a contingency fuel provision from departure to the Critical Point (CP), when computing the ETOPS critical fuel planning.

ETOPS FUEL REQUIREMENTS

Ident.: PRO-SPO-40-30-00012902.0001001 / 17 NOV 11
Applicable to: ALL

The operator must compare the entire ETOPS critical fuel planning for the ETOPS critical fuel scenario with the standard fuel planning computed in accordance with the company fuel policy and applicable operational requirements. The higher of the two fuel requirements must be considered as the minimum required block fuel for the flight.

WEATHER MINIMA

Ident.: PRO-SPO-40-30-00002046.0001001 / 23 JUN 15
Applicable to: ALL

Weather forecasts for en-route alternates must meet the operator's applicable weather minimum requirements.
This paragraph provides the applicable minima required by EASA (EU-OPS 1/AMC 20-6 rev. 2) and FAA (AC120-42B).

A. EASA DISPATCH WEATHER MINIMA (EU-OPS 1/AMC 20-6 REV. 2)

An airplane cannot be dispatched unless the meteorological forecasts at ETOPS en-route alternate airports meet the weather minima listed here for a period commencing at the earliest potential time of landing and ending one hour after the latest expected time of landing:

Approach Type	Min ETOPS Ceiling	Min ETOPS Visibility
Precision approach	DH /DA +200 ft	Authorised visibility +800 m
Non-Precision or Circling approach	MDH /MDA +400 ft	Authorised visibility +1 500 m
CAT II/CAT III approach	Specific approval required	Specific approval required

B. FAA DISPATCH WEATHER MINIMA (AC 120-42B)

An airplane cannot be dispatched unless the meteorological forecasts at ETOPS en-route alternate airports meet the weather minima listed here for a period commencing at the earliest potential time of landing and ending at the latest expected time of landing:

Approach Type	Min ETOPS Ceiling	Min ETOPS Visibility
Two or more instrument approaches	Higher of the two (M)DH /DA +200 ft	Higher of the two authorised visibility +800 m
Single Precision approach or Non-Precision approach or Circling approach	(M)DH /DA +400 ft	Authorised visibility +1 600 m
CAT II approach	300 ft	1 200 m or RVR1 200 m
CAT III approach	200 ft	800 m or RVR550 m

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DIVERSION DECISION MAKING

Ident.: PRO-SPO-40-40-00002048.0001001 / 21 MAR 17
Applicable to: ALL

The technical criteria governing a re-routing or diversion decision can be classified into four categories, as follows :
- Loss of MNPS capability, before entering the MNPS area (as applicable).
- Weather minima at diversion airport(s) going below the company/crew en-route minima, before reaching the ETOPS Entry Point, or diversion airport(s) becoming unsuitable for any reason.
- Failure cases requiring a diversion to the nearest airport (cases leading to a LAND ASAP message on the ECAM and/or in the QRH).
- Failure cases resulting in increased fuel consumption, exceeding the available fuel reserves.

Comments and Recommendations

- Electrical generation

  If one IDG fails, a diversion is required in case of :
  - Blue hydraulic circuit low level, low pressure or overheat, or
  - APU no start, or
  - APU or APU generator inoperative, or
  - Second IDG failure.

- Fuel system
  Some failure cases may lead to fuel gravity feeding which implies flight at lower altitude or to some fuel being unusable. The flight crew's evaluation of the actual situation and the fuel remaining may lead to the decision that a diversion is required.
- Hydraulic system :

  If low level, low pressure or overheat on blue hydraulic circuit, a diversion is required in case of :
  - One IDG failure, or
  - APU no start, or
  - APU/APU GEN failure.

- APU :

  If APU/APU GEN fails, a diversion is required in case of :
  - Blue hydraulic circuit low level, low pressure or overheat, or
  - One IDG failure.

DIVERSION PERFORMANCE DATA

Ident.: PRO-SPO-40-40-00002049.0001001 / 21 MAR 17
Applicable to: ALL

Chapter PER-OEI-GEN contains three single engine descent and cruise procedures:
1. The standard strategy,
2. The obstacle strategy,
3. Fixed speed strategies (ETOPS).

For ETOPS operations, any one of the above diversion strategies can be used provided that the selected strategy and speed schedule are used in :
- Establishing the area of operation (maximum diversion distance),
- Calculating the diversion fuel requirements for the single-engine ETOPS fuel scenario,
- Demonstrating the applicable obstacle clearance requirements (net flight path and net ceiling).

During the diversion, the flight crew is expected to use the planned speed schedule.
However, based on the evaluation of the actual situation, the pilot in command has the authority to deviate from this planned one-engine-inoperative speed.

GUIDELINES FOR DIVERSION PROCEDURE

Ident.: PRO-SPO-40-40-00002050.0001001 / 21 MAR 17
Applicable to: ALL

- Complete the related failure procedure,
- Inform ATC,
- Initiate the descent,
- Determine which en route alternate is the most suitable (per company procedure),
- Divert to the chosen en route alternate,
- Comply with the pre-planned diversion strategy and speed schedule, or adjust the speed schedule, as dictated by the evaluation of the actual situation.

Note: *For detailed guidelines and procedures for conducting the diversion (lateral and vertical navigation),* *Refer to DSC-22_20-60-30 - How to Execute a Diversion.*

GENERAL

Ident.: PRO-SPO-40-50-00002051.0001001 / 26 JUN 17
Applicable to: ALL

For ETOPS flights, the flight crew must apply the below procedures, in addition to the SOP (refer to chapter PRO-NOR-SOP) and the ABNORMAL and EMERGENCY procedures (refer to chapter PRO-ABN).

NORMAL PROCEDURES

Applicable to: ALL

Ident.: PRO-SPO-40-50-A-00021794.0002001 / 26 JUN 17

COCKPIT PREPARATION

FUEL

Before each ETOPS flight, the flight crew must check that the fuel crossfeed valve is operating correctly :

FUEL X FEED ....ON

On the ECAM FUEL page, check that the fuel crossfeed valve is open (indication is inline green).

FUEL X FEED.. OFF

Check that the fuel crossfeed valve is closed.

ABNORMAL AND EMERGENCY PROCEDURES

Ident.: PRO-SPO-40-50-00002053.0004001 / 21 MAR 17
Applicable to: ALL

ELECTRICAL EMERGENCY CONFIGURATION

The flight crew must complete the ECAM procedure using the following:

AIR CONDITIONING

As cockpit and cabin temperature control is lost, it is recommended to open the cockpit door.

FUEL

As all fuel pumps are lost, the engines are fed by gravity. *Refer to GRVTY FUEL FEEDING Procedure*.

ENGINE ANTI-ICE

Engine anti-ice valves are permanently open, although the ECAM memo ENG A. ICE is not displayed on the ECAM (except if the ENG A. ICE pb is at ON).

WING ANTI-ICE

If only one ENG BLEED is available, PACK 1 must be switched OFF, to avoid having both packs and wing anti-ice supplied by a single bleed source.

BLUE HYDRAULIC CIRCUIT LOW LEVEL OR LOW PRESSURE OR OVERHEAT

Start the APU to ensure availability of the APU generator.

ENGINE OR IDG FAILURE

Start the APU and use the APU electrical channel.

GENERAL

Ident.: PRO-SPO-40-60-00002054.0001001 / 25 AUG 15
Applicable to: ALL

The two following cases result in a fuel consumption increase:
- RAT extended
- In electrical emergency configuration, the engine anti-ice valves are permanently open.

MAXIMUM DIVERSION DISTANCE

Ident.: PRO-SPO-40-60-00002055.0037001 / 21 MAR 17
Applicable to: ALL

The following computation conditions have been used in accordance with the interpretation of the EU-OPS 1.245 and FAR 121.161:
- ISA conditions
- No wind
- Optimum diversion level after engine failure
- Single engine diversion speed schedule.

Note: Obstacles have not to be considered to determine if a route is or is not an ETOPS route.

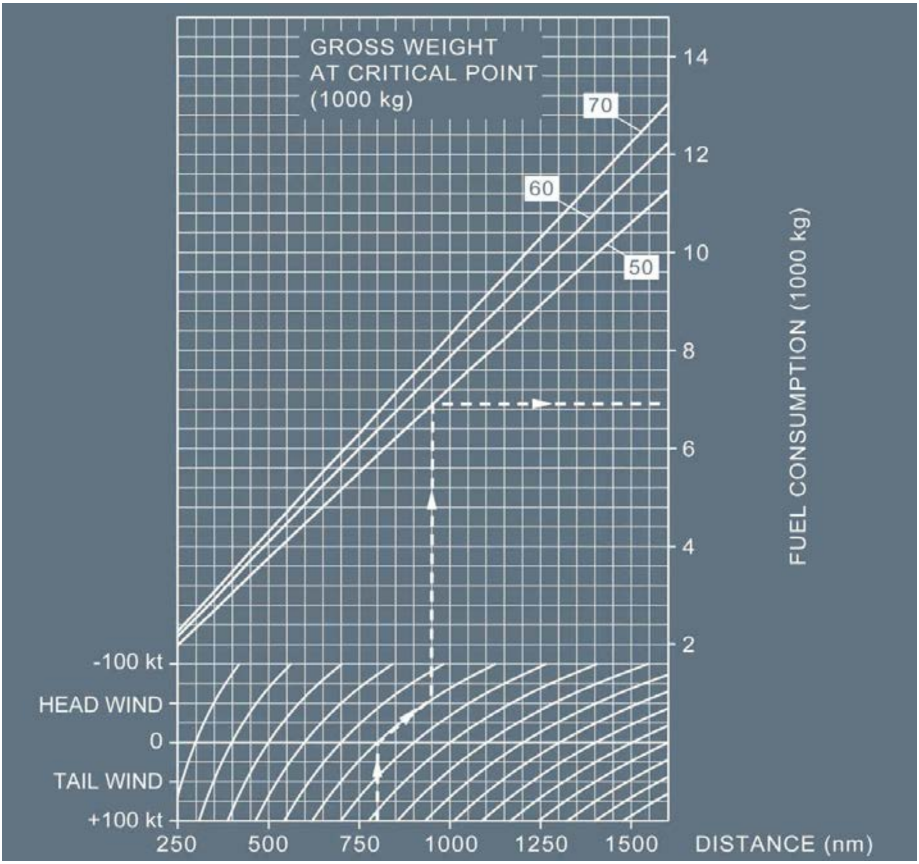
MAXIMUM DIVERSION DISTANCE							
SPEED SCHEDULE	**A/C WEIGHT AT CRITICAL POINT (KG)**	**FL FOR DIVERSION**	**DIVERSION TIME (MIN)**				
			60	**90**	**120**	**150**	**180**
MCT /VMO	50 000	160	409	607	806	1 005	1 204
	55 000	160	407	604	801	999	1 197
	60 000	150	406	601	797	993	1 190
	65 000	120	407	601	795	989	1 184
	70 000	110	406	598	791	984	1 178
	75 000	100	405	595	786	978	1 170
MCT/320 kt	50 000	160	409	607	806	1 005	1 204
	55 000	160	407	604	801	999	1 197
	60 000	150	406	601	797	993	1 190
	65 000	150	403	597	791	986	1 181
	70 000	130	404	596	788	980	1 172
	75 000	120	402	592	781	970	1 160

ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING - ALL ENGINES - CRUISE AT LRC

Ident.: PRO-SPO-40-60-00002056.0022001 / 21 MAR 17
Applicable to: ALL

Assumptions:
- EMER descent
- Long range cruise at FL 100
- Final descent 250 kt
- Holding 15 min at FL 15
- IFR procedure

Not included: 5 % correction on wind value - Anti icing if icing is forecast - performance factor.



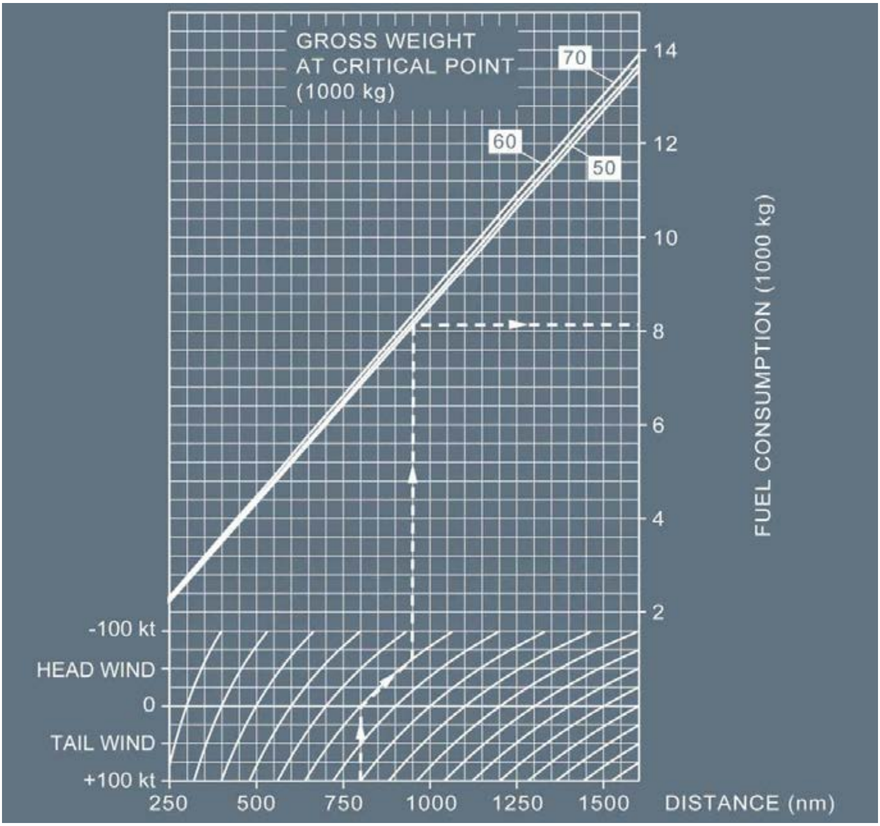
ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING - ONE ENGINE OUT - CRUISE AT 350KT

Ident.: PRO-SPO-40-60-00002057.0025001 / 21 MAR 17
Applicable to: ALL

Assumptions:
- EMER descent
- Cruise 350 kt at FL 100
- Final descent 250 kt
- Holding 15 min at FL 15

- IFR procedure
- APU fuel burn.

Not included: 5 % correction on wind value - Anti icing if icing is forecast - performance factor.



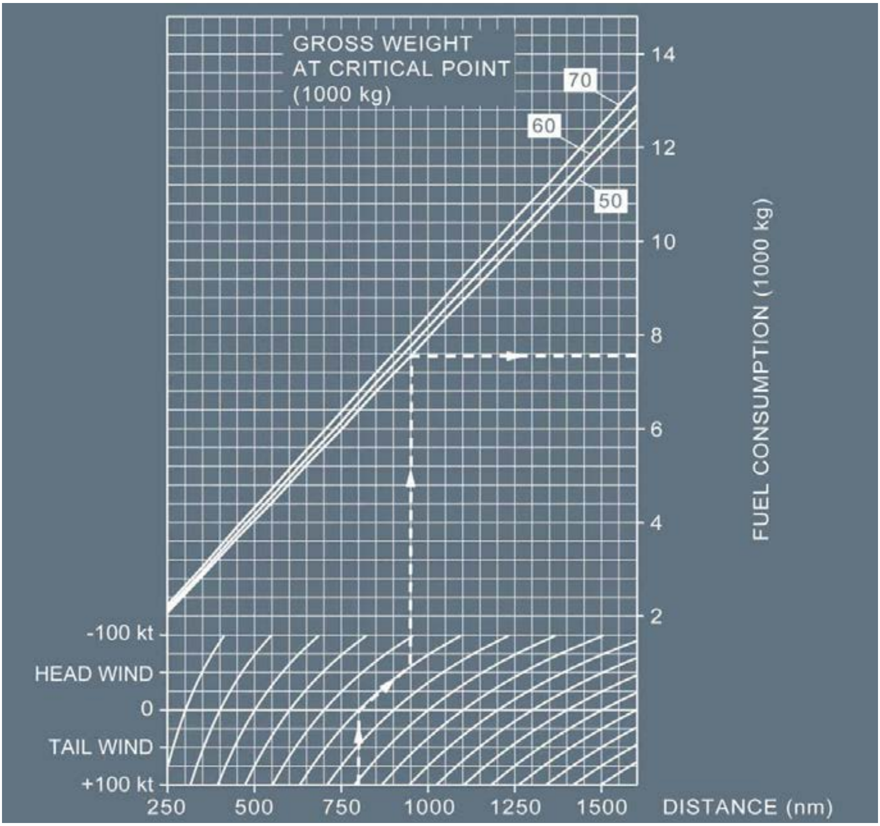
ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING - ONE ENGINE OUT - CRUISE AT 320KT

Ident.: PRO-SPO-40-60-00002058.0022001 / 21 MAR 17
Applicable to: ALL

Assumptions:
- EMER descent
- Cruise 320 kt at FL 100

- Final descent 250 kt
- Holding 15 min at FL 15
- IFR procedure
- APU fuel burn.

Not included: 5 % correction on wind value - Anti icing if icing is forecast - performance factor.



ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING - EXAMPLE

Ident.: PRO-SPO-40-60-00014769.0001001 / 21 MAR 17
Applicable to: ALL

<u>Note:</u> *The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg”, the same method can be applied for “lb”.*

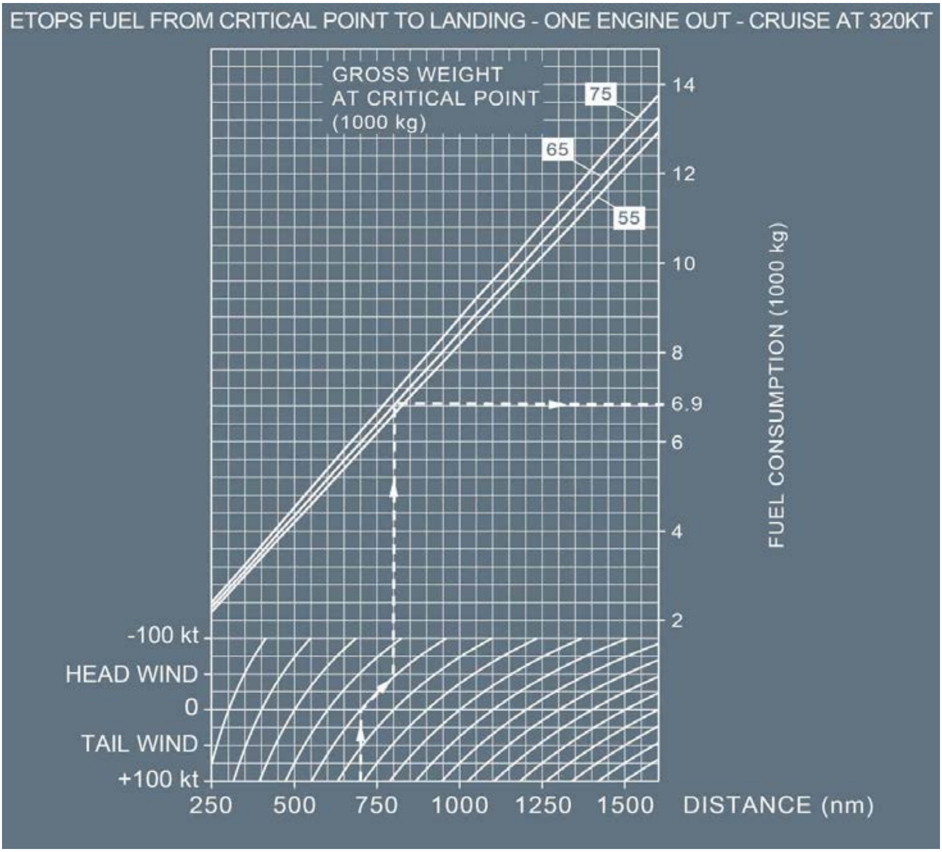
Assumptions:

- Aircraft weight at critical point: 65 000 kg
- Diversion speed: 320 kt
- Diversion time: 120 min
- Distance from Critical point to diversion airport: 700 NM
- Wind: 50 kt headwind
- Forecasted icing condition on diversion: 40 min
- Aircraft perf factor: 5 %

For the determination of the ETOPS fuel requirement, the greatest fuel quantity of the two following scenarios must be considered (the scenario Engine failure only, without pressurization failure, is never limiting):

1. Pressurization failure - One Engine Inoperative - 320 kt

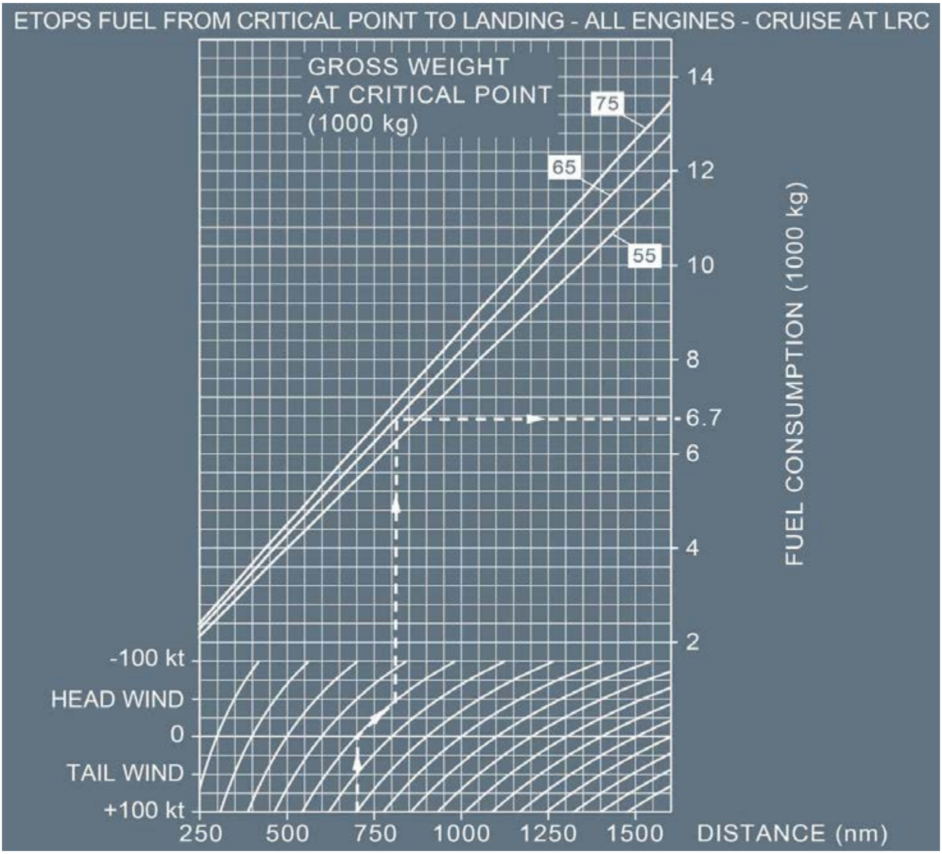
- Determine the corrected wind for diversion taking into account the 5 % wind speed factor: 50 x 1.05 = 52.5 kt
- Enter the ETOPS Fuel from Critical Point to Landing - One Engine Out - Cruise at 320kt graph to determine the corresponding fuel consumption: 6 900 kg



- Determine the final ETOPS fuel requirement, sum of perf factor fuel, icing fuel and fuel determined the step before:
  - Fuel for icing condition (Total anti-ice scenario is limiting): 3.5 % x 40 / 120 = 1.17 %
  - Fuel for perf factor: 5 %
  - Final ETOPS fuel requirement: 6 900 x 1.0117 x 1.05 = 7 330 kg

2. Pressurization failure - All Engines Operative - LRC speed

- Determine the corrected wind for diversion taking into account the 5 % wind speed factor: 50 x 1.05 = 52.5 kt
- Enter the ETOPS Fuel from Critical Point to Landing - All Engines - Cruise at LRC graph to determine the corresponding fuel consumption: 6 700 kg



- Determine the final ETOPS fuel requirement, sum of perf factor fuel, icing fuel and fuel determined the step before:

  - Fuel for icing condition (total anti-ice scenario is limiting): 6 % x 40 / 120 = 2 %
  - Fuel for perf factor: 5 %
  - Final ETOPS fuel requirement: 6 700 x 1.02 x 1.05 = 7 176 kg

The final ETOPS fuel requirement for this diversion is 7 330 kg. The limiting scenario is a pressurization failure and One Engine Out at a diversion speed of 320 kt.

ENGINE INTERMIX TYPE 1

Applicable to: ALL

Ident.: PRO-SPO-45-A-00002059.0001001 / 30 JUN 14

The following information provides the conditions and procedures necessary in order to temporarily operate an A318/A319/A320/A321 aircraft when a CFM56–5B Single Annular Combustor (SAC) engine is intermixed with a CFM56–5B Double Annular Combustor (DAC) engine.
This engine intermix configuration is indicated in the cockpit with the following placard: “CAUTION: ENGINE INTERMIX TYPE 1” or "CAUTION: ENGINE INTERMIX".

Ident.: PRO-SPO-45-A-00002060.0001001 / 07 DEC 10

ENGINE PARAMETERS

Engine parameters differ significantly, when the engines are at idle:

EGT	:	Up to 250 °C higher on the DAC engine.
FUEL FLOW	:	Up to 25 % higher on the DAC engine.
N1	:	Higher on the DAC engine.
N2	:	Lower on ground on the DAC engine; higher in flight on the DAC engine.

Ident.: PRO-SPO-45-A-00002061.0001001 / 07 DEC 10

CROSSBLEED ENG START

The DAC engine has insufficient acceleration capability to sustain idle speed with a large bleed offtake, when it operates with only 20 injectors. Therefore, it is necessary to preset a 30 % N1 on the supplying engine before launching the start sequence.

Ident.: PRO-SPO-45-A-00004068.0001001 / 07 DEC 10

TAKEOFF PROCEDURE

- The PF must progressively adjust engine thrust in two steps:
  - Step 1 : Idle to 50 % N1.
    Brakes released, when the 50 % N1 is stabilized on both engines.
  - Step 2 : Both engines N1 to takeoff thrust.

  This procedure enables a significantly slower acceleration from ground idle to N1 = 50 % for the double annular combustor.
- Other standard operating procedures apply for takeoff.

Ident.: PRO-SPO-45-A-00002062.0001001 / 07 DEC 10

ENGINE RESPONSE

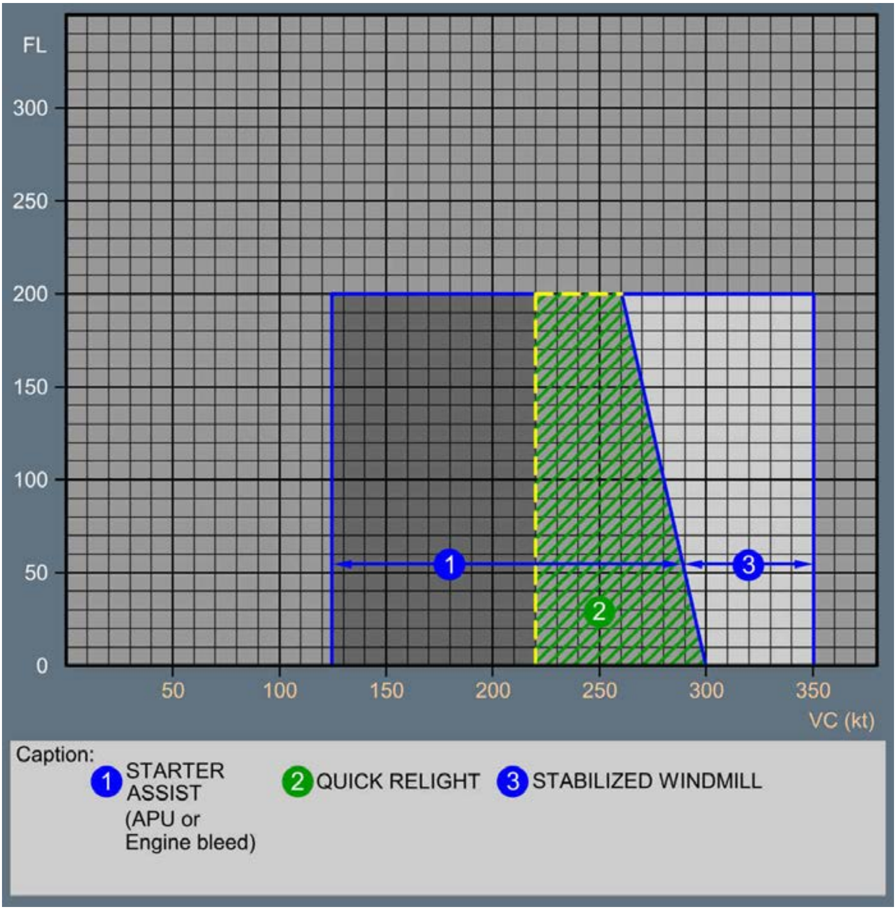
In flight, when the aircraft is in clean configuration, the DAC engine may accelerate from idle more slowly than the SAC engine. This is particularly evident, if the acceleration follows a deceleration.

There is no significant effect on aircraft handling. This difference in engine response disappears when the slats are extended.

Ident.: PRO-SPO-45-A-00004067.0001001 / 09 OCT 12

ENGINE RELIGHT

The DAC engine relight envelope is more restrictive than the SAC engine relight envelope. Therefore, in case of engine intermix, the flight crew must use the DAC engine relight procedure with the corresponding chart (See chart below).



ENGINE INTERMIX TYPE 2

Applicable to: ALL

Ident.: PRO-SPO-45-B-00012731.0007001 / 06 MAR 17

The following information provides the necessary conditions and procedures in order to temporarily operate an A318/A319/A320/A321 with engine intermix configuration between two different SAC engines among CFM56–5Bx classic, the CFM56–5Bx/P, the CFM56-5Bx/3 and the CFM56-5Bx/P “TI HPC kit”.
FADEC intermix configuration 5BM software (installed on CFM56-5B classic) with FADEC 5BR software is indicated in the cockpit with the following placard: “CAUTION: ENGINE INTERMIX TYPE 2”.

Note: *When FADEC Standard “5BR” or subsequent is installed on both engines, engine thrust behavior is harmonized (transient thrust dissymmetry no longer exist). Therefore, a placard is not necessary and is not displayed.*

Ident.: PRO-SPO-45-B-00012732.0001001 / 07 DEC 10

ENGINE PARAMETERS

In the case of only one operative pack configuration (only one pack OFF):
- N1 : At idle up to 9 % higher on the CFM56-5B/3 TI engine, on ground or in flight in clean configuration.
- N2 : At idle up to 11 % higher on the CFM56-5B/3 TI engine, on ground or in flight in clean configuration.

Ident.: PRO-SPO-45-B-00012733.0001001 / 07 DEC 10

TAKEOFF PROCEDURE

In the case of only one operative pack configuration, due to the difference in N2 at idle between engines, the following takeoff procedure is recommended:
- The PF progressively adjusts engine thrust in two steps:
  - Step 1 : From idle to about 50 % N1 on brakes.
  - Step 2 : From both engines at similar N1 to takeoff thrust after brakes release.
- Other standard operative procedures apply for takeoff.

Ident.: PRO-SPO-45-B-00012734.0007001 / 14 MAY 12

ENGINE RESPONSE

In the case of only one operative pack configuration, due to the difference in N2 at idle between engines, the CFM56–5B/3 TI engine may accelerate from idle to high thrust faster than the CFM56–5B/P SAC engine when the aircraft is on ground or in flight in clean configuration. There is no significant effect on aircraft handling.

The difference in engine response disappears in flight when the slats are extended.

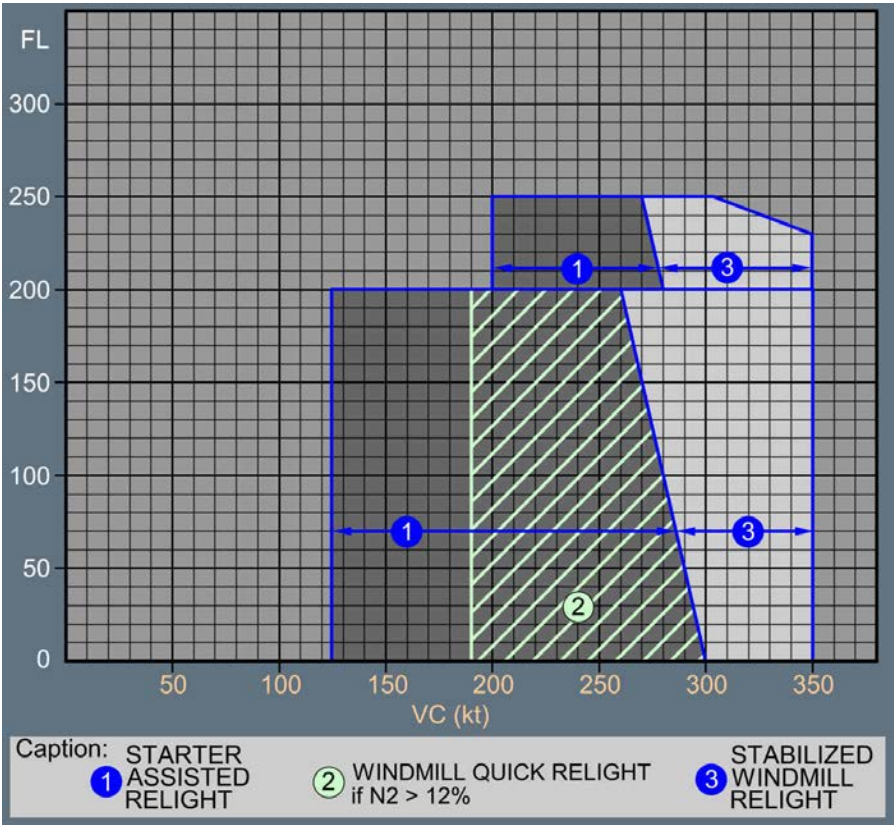
Note: *Depending on the FADEC standard, the flight crew may observe a different deceleration between the two engines (CFM56–5B/P engine is faster to decelerate) when the aircraft is above FL 100 and in unsymmetrical bleed configuration or with the APU BLEED ON.*

Ident.: PRO-SPO-45-B-00016162.0010001 / 02 MAY 17

ENGINE RELIGHT

For SAC-TI engine the maximum altitude for the engine relight envelope is reduced, compared with the SAC engine relight envelope. Therefore, in case of engine intermix, the flight crew must use the SAC-TI engine relight envelope below.

Engine Relight Envelope



GENERAL

Ident.: PRO-SPO-50-00020828.0001001 / 17 MAR 17
Applicable to: ALL

The A318/A319/A320/A321 aircraft systems are designed to comply with the design criteria of the EASA and FAA regulations (documents references provided in the AFM) for the RVSM capability. In addition, operators must obtain an operational approval from their national airworthiness authorities, in order to operate within the RVSM airspace. The EASA and FAA regulations (documents references provided in the AFM) also indicate the requirements for obtaining operational approval.

REQUIRED EQUIPMENTS/FUNCTIONS FOR RVSM

Ident.: PRO-SPO-50-00020955.0002001 / 17 MAR 17
Applicable to: ALL

RVSM regulations require the following equipment/functions in order to be operative:
- 2 ADR s + 2 DMCs
- 1 transponder
- 1 Autopilot function
- 1 FCU channel (for altitude target selection and OP CLB /OP DES mode engagement)
- 2 PFD functions (for altitude indication)
- 1 FWC (for altitude alert function).

RVSM NORMAL PROCEDURE

Ident.: PRO-SPO-50-00020830.0002001 / 17 MAR 17
Applicable to: ALL

For flights in RVSM airspace, the flight crew must apply the standard procedures, in addition to the following RVSM procedures.

FLIGHT PREPARATION

The flight crew must take into account the conditions that may affect operations in RVSM airspace, including:

RVSM APPROVAL...CHECK

L2 *Verify that the aircraft is approved for RVSM operations.*

L1 WEATHER...CHECK

L2 *Review the weather forecasted for the flight route. If severe turbulence is expected, this may affect the ability to maintain aircraft altitude.*

L1 REQUIRED EQUIPMENT FOR RVSM...CHECK

L2 *Check that the required equipment is operative (MEL).*

The flight crew should review the maintenance logs and forms, in order to ensure that the equipment required for RVSM is satisfactory.

L1 ALTITUDES.. CHECK

L2 *Check that the difference between each altitude indication (in the QNH reference) displayed on PFDs and the airport elevation is less than 75 ft.*
Check that the difference between the two primary altitude indications on the PFDs is less than the tolerance specified in SOP. *Refer to PRO-NOR-SOP-06 Glareshield - EFIS Control Panel.*

L1 **IN FLIGHT**

BEFORE ENTERING RVSM AIRSPACE

REQUIRED EQUIPMENT FOR RVSM ....OPERATIVE

L2 *If any of the required equipment fails before the aircraft enters RVSM airspace, the flight crew must request new clearance, to avoid this airspace.*

L1 ALTITUDES.. CHECK

L2 *Check on the PFDs that the difference between altitude indications (in the standard baro setting) is less than the specified tolerance in the table below.*
If only two ADR s are operative, the altimeter indications on PFD and standby altimeter should be recorded. This information may be useful in case of subsequent PFD altitude discrepancy, or loss of both remaining ADRs.

L1

		Comparison of Altitude Indication (ft)		
Flight Level	**Speed or Mach Number**	**Difference between ADR 1 and ADR 2 (on PFDs)**	**Difference between ADR 3 and ADR 1/2 (on PFDs)**	**Difference between STBY ALTI and ADRs**
FL 50	250 kt	50 (15 m)	65 (20 m)	130 (40 m)
FL 100	250 kt	55 (17 m)	80 (24 m)	185 (56 m)
FL 200	300 kt	90 (27 m)	135 (41 m)	295 (90 m)
FL 300	M 0.78	130 (40 m)	195 (59 m)	390 (119 m)
FL 390	M 0.78	130 (40 m)	195 (59 m)	445 (136 m)

IN RVSM AIRSPACE

AP...KEEP ENGAGED

L2 *Ensure that autopilot is engaged for cruise, and for flight level changes.*

L1 AP GUIDANCE.. MONITOR

L2 *During flight level transitions, do not exceed or go below the assigned flight level by more than 150 ft.*

L1 ● **Approximately every hour:**
ALTITUDES...CHECK

L2 *Check that the difference between the altitude indications on PFD s is less than the specified tolerance. For more information, See table in "Before Entering RVSM airspace".*

Regular check of the flight deck instruments should be sufficient.

L1 AT THE END OF THE FLIGHT

ANY MALFUNCTIONS or DEVIATIONS..REPORT

L2 *Report any malfunction of the systems that enable the aircraft to maintain altitude, including:*
- *Any malfunction or loss of required equipment*
- *Any deviation involving the functions that enable the aircraft to maintain altitude.*

RVSM ABNORMAL AND EMERGENCY PROCEDURE

Ident.: PRO-SPO-50-00020831.0002001 / 17 MAR 17
Applicable to: ALL

ATC...NOTIFY

When the aircraft is in RVSM airspace, the flight crew must notify the ATC of the following situations, because they may affect the aircraft's ability to maintain the flight level:
- *The failure of both autopilots*
- *The loss of altimeter system redundancy (only one PFD indication remaining)*
- *An excessive discrepancy in altitude indications, and no way to identify the valid indication*
- *The failure of any other equipment, that affects the aircraft's ability to maintain flight level*
- *The encounter of greater than moderate turbulence.*

If the flight crew cannot notify the ATC or obtain the ATC clearance before deviating from the assigned flight level, they should follow the established contingency procedure and obtain the ATC clearance as soon as possible.

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GENERAL

Applicable to: ALL

Ident.: PRO-SPO-51-A-00015857.0001001 / 20 MAR 17

GENERAL

The Performance Based Navigation (PBN) concept implies that the aircraft follows the defined track with a requested navigation performance. The PBN includes RNAV and RNP operations.
For RNAV and RNP operations, an operational approval from the airline's national authorities may be required.
The AFM provides regulatory compliances associated with PBN operations.

Ident.: PRO-SPO-51-A-00015859.0001001 / 09 SEP 14

RNAV/RNP CAPABILITY

Before the aircraft enters an RNAV /RNP airspace, RNAV /RNP capability is based on:
- The required RNAV /RNP equipment that is described in each RNAV /RNP section of the FCOM
- Navigation Accuracy HIGH displayed on the MCDU PROG page
- Any specific local requirements published in the Aeronautical Information Publication (AIP).

When the aircraft flies in RNAV /RNP airspace, RNAV /RNP capability is based on:
- Navigation Accuracy HIGH displayed on the MCDU PROG page
- Any specific local requirements published in the Aeronautical Information Publication (AIP).

RNAV 10 / RNP 10

Applicable to: ALL

Ident.: PRO-SPO-51-B-00015854.0001001 / 09 SEP 14

GENERAL

RNAV 10 operations correspond to RNP 10 operations.
In RNAV 10 airspace, the aircraft is expected to fly for a long period of time outside radio navaid coverage.

Ident.: PRO-SPO-51-B-00015855.0001001 / 09 SEP 14

REQUIRED RNAV 10 EQUIPMENT

The minimum navigation equipment required to enter RNAV 10 airspace is:
- Two FMGC s (or one FMGC and one BACK UP NAV ◁)
- Two MCDUs
- Two IRS

- Two ND s (the temporary display of ND information via the PFD /ND switch is permitted on one side)
- One GPS if the flight time outside radio navaid coverage is longer than:
  - 6.2 hr from the time of IRS ground alignment, or
  - 5.7 hr from the time of the last FM position update.

Ident.: PRO-SPO-51-B-00015863.0001001 / 11 APR 17

PROCEDURE

MANAGEMENT OF DEGRADED NAVIGATION

- **If one of the following messages is displayed, the flight crew should resume navigation with the FMGC that provides the correct position:**
  - GPS PRIMARY LOST on one ND /MCDU
  - NAV ACCUR DOWNGRAD on one ND /MCDU.
- **If the GPS PRIMARY LOST message is displayed on both NDs/MCDUs, RNAV 10 operations can be continued:**
  - With no time restriction if radio navaids update is available
  - For 5.7 hr from the time of the last position update if radio navaids update is not available. After 5.7 hr, the navigation accuracy must be considered LOW regardless of the navigation accuracy that is displayed on the MCDU PROG page.
- **If one of the following MCDU or ECAM messages is displayed, the flight crew should crosscheck the position data using the POSITION MONITOR page, the IRS 1(2)(3) pages, and the GPS MONITOR page in order to identify which FMGC position is correct:**
  - FMS 1/FMS 2 POS DIFF
  - CHECK IRS 1(2)(3)/FM POSITION
  - CHECK A/C POSITION
  - NAV FM/GPS POS DISAGREE

  The flight crew should resume navigation with the FMGC that provides the correct position.
- **If NAV ACCUR DOWNGRAD is displayed on both sides:**
  - As per design FMS REQ ACCUR is set by default; this default value (e.g. 2 NM in cruise, 1 NM in terminal area) is more restrictive than overflown airspace required navigation performance.
  - Any change on FMS REQ ACCUR to be in accordance with airspace requirement is at flight crew's discretion; and should be set back to default value when leaving intended airspace.

If NAV ACCUR DOWNGRAD remains displayed, the flight crew should inform ATC that the RNAV 10 capability is lost.

RNAV 5 / BRNAV

Applicable to: ALL

Ident.: PRO-SPO-51-C-00015851.0001001 / 20 MAR 17

GENERAL

RNAV 5 operations correspond to European BRNAV operations.

Ident.: PRO-SPO-51-C-00015852.0001001 / 06 JUL 17

REQUIRED RNAV 5 EQUIPMENT

The minimum navigation equipment required to enter RNAV 5 airspace is:
- One FMGC
- One MCDU
- One GPS or one DME receiver to update FM position
- Two ND s (the temporary display of ND information via the PFD /ND switch is permitted on one side)
- One IRS.

Ident.: PRO-SPO-51-C-00015864.0001001 / 11 APR 17

PROCEDURE

MANAGEMENT OF DEGRADED NAVIGATION

- **If one of the following messages is displayed, the flight crew should resume navigation with the FMGC that provides the correct position:**
  - GPS PRIMARY LOST on one ND /MCDU
  - NAV ACCUR DOWNGRAD on one ND /MCDU.
- **If one of the following MCDU or ECAM messages is displayed, the flight crew should check the navigation accuracy with navaid raw data via the MCDU PROG page in order to identify which FMGC position is correct:**
  - GPS PRIMARY LOST on both ND s/MCDUs
  - FMS 1/FMS 2 POS DIFF
  - CHECK IRS 1(2)(3)/FM POSITION
  - CHECK A/C POSITION
  - NAV FM/GPS POS DISAGREE

  The flight crew should resume navigation with the FMGC that provides the correct position.

● **If NAV ACCUR DOWNGRAD is displayed on both sides:**

- As per design FMS REQ ACCUR is set by default; this default value (e.g. 2 NM in cruise, 1 NM in terminal area) is more restrictive than overflown airspace required navigation performance.
- Any change on FMS REQ ACCUR to be in accordance with airspace requirement is at flight crew's discretion; and should be set back to default value when leaving intended airspace.

If NAV ACCUR DOWNGRAD remains displayed, the flight crew should inform ATC that the RNAV 5 capability is lost.

RNAV 1 RNAV 2 / P-RNAV - TERMINAL RNAV

Applicable to: ALL

Ident.: PRO-SPO-51-D-00015848.0001001 / 20 MAR 17

GENERAL

RNAV 1(2) operations correspond to P-RNAV TERMINAL RNAV operations.
The AIP may specify that GPS equipment is required.

Ident.: PRO-SPO-51-D-00015849.0001001 / 06 JUL 17

REQUIRED RNAV 1(2) EQUIPMENT

The minimum navigation equipment required to enter RNAV 1/RNAV2 airspace is:
- One FMGC
- One MCDU
- One GPS or one DME receiver to update the FM position
- Two IRS
- One FD in NAV mode
- Two ND s (the temporary display of ND information via the PFD /ND switch is permitted on one side).

Ident.: PRO-SPO-51-D-00015865.0001001 / 20 MAR 17

PROCEDURE

BEFORE ENTERING RNAV 1(2) AIRSPACE

The FMS navigation database provides the terminal procedure (RNAV SID , RNAV STAR , RNAV TRANSITION, etc.) of the flight plan. The flight crew must crosscheck the terminal procedure from the published charts with the FMS navigation database on the F-PLN page (waypoint sequences, tracks, distances, and altitude or speed constraints). The flight crew must not modify the procedure that is provided by the navigation database, unless required by the ATC (DIR TO, radar vectoring, insertion of waypoints from the navigation database).

MANAGEMENT OF DEGRADED NAVIGATION

- **If one of the following messages is displayed, the flight crew should resume navigation with the FMGC that provides the correct position:**
  - GPS PRIMARY LOST on one ND /MCDU
  - NAV ACCUR DOWNGRAD on one ND /MCDU.
- **If one of the following messages is displayed, the flight crew should check the navigation accuracy with navaid raw data via the MCDU PROG page in order to identify which FMGC position is correct:**
  - GPS PRIMARY LOST on both ND s/MCDUs
  - FMS 1/FMS 2 POS DIFF
  - CHECK IRS 1(2)(3)/FM POSITION
  - CHECK A/C POSITION
  - NAV FM/GPS POS DISAGREE

  The flight crew should resume navigation with the FMGC that provides the correct position.
- **If NAV ACCUR DOWNGRAD is displayed on both sides:**

  The flight crew should inform the ATC that the RNAV 1(2) capability is lost.

RNP 4

Applicable to: ALL

Ident.: PRO-SPO-51-E-00015845.0001001 / 09 SEP 14

GENERAL

In this airspace, the aircraft is expected to fly for a long period of time outside radio navaid coverage.

Ident.: PRO-SPO-51-E-00015846.0001001 / 09 SEP 14

REQUIRED RNP 4 EQUIPMENT

The minimum navigation equipment required to enter RNP 4 airspace is:
- Two FMGC s (or one FMGC and one BACK UP NAV)
- Two MCDUs
- Two IRS

- One GPS
- Two ND s (the temporary display of ND information via the PFD /ND switch is permitted on one side).

Ident.: PRO-SPO-51-E-00015866.0001001 / 11 APR 17

PROCEDURE

MANAGEMENT OF DEGRADED NAVIGATION

- **If one of the following messages is displayed, the flight crew should resume navigation with the FMGC that provides the correct position:**
  - GPS PRIMARY LOST on one ND /MCDU
  - NAV ACCUR DOWNGRAD on one ND /MCDU.
- **If one of the following MCDU or ECAM messages is displayed, the flight crew should crosscheck the position data using the POSITION MONITOR page, the IRS 1(2)(3) pages, and the GPS MONITOR page in order to identify which FMGC position is correct:**
  - GPS PRIMARY LOST on both ND s/MCDUs
  - FMS 1/FMS 2 POS DIFF
  - CHECK IRS 1(2)(3)/FM POSITION
  - CHECK A/C POSITION
  - NAV FM /GPS POS DISAGREE

  The flight crew should resume navigation with the FMGC that provides the correct position.
- **If NAV ACCUR DOWNGRAD is displayed on both sides:**
  - As per design FMS REQ ACCUR is set by default; this default value (e.g. 2 NM in cruise, 1 NM in terminal area) is more restrictive than overflown airspace required navigation performance.
  - Any change on FMS REQ ACCUR to be in accordance with airspace requirement is at flight crew's discretion; and should be set back to default value when leaving intended airspace.

  If NAV ACCUR DOWNGRAD remains displayed, the flight crew should inform ATC that the RNAV 4 capability is lost.

RNP 2 IN OCEANIC AND REMOTE CONTINENTAL AREA

Applicable to: ALL

Ident.: PRO-SPO-51-I-00021541.0001001 / 20 MAR 17

GENERAL

In this airspace, the aircraft is expected to fly for a long period of time outside radio navaid coverage.

Ident.: PRO-SPO-51-I-00021542.0001001 / 20 MAR 17

REQUIRED RNP 2 IN OCEANIC AND REMOTE CONTINENTAL AREA EQUIPMENT

The minimum navigation equipment required to enter RNP 2 oceanic and remote continental airspace is:
- Two FMGC s (or one FMGC and one BACK UP NAV)
- Two MCDUs
- Two IRS
- One GPS
- Two ND s (the temporary display of ND information via the PFD /ND switch is permitted on one side).

Ident.: PRO-SPO-51-I-00021544.0001001 / 20 MAR 17

PROCEDURE

FLIGHT PREPARATION

RAIM /AIME availability should be confirmed for RNP 2 in oceanic and remote continental area operations.
Refer to PRO-NOR-SOP-02 GPS PRIMARY Availability (If Installed)

MANAGEMENT OF DEGRADED NAVIGATION

- **If one of the following messages is displayed, the flight crew should resume navigation with the FMGC that provides the correct position:**
  - GPS PRIMARY LOST on one ND /MCDU
  - NAV ACCUR DOWNGRAD on one ND /MCDU.
- **If one of the following MCDU or ECAM messages is displayed, the flight crew should crosscheck the position data using the POSITION MONITOR page, the IRS 1(2)(3) pages, and the GPS MONITOR page in order to identify which FMGC position is correct:**
  - GPS PRIMARY LOST on both ND s/MCDUs
  - FMS 1/FMS 2 POS DIFF

- CHECK IRS 1(2)(3)/FM POSITION
- CHECK A/C POSITION
- NAV FM /GPS POS DISAGREE

The flight crew should resume navigation with the FMGC that provides the correct position.

● **If NAV ACCUR DOWNGRAD is displayed on both sides:**

The flight crew should inform the ATC that the RNP 2 capability is lost.

RNP 2 IN DOMESTIC AREA

Applicable to: ALL

Ident.: PRO-SPO-51-J-00021545.0001001 / 20 MAR 17

REQUIRED RNP 2 IN DOMESTIC AREA EQUIPMENT

The minimum navigation equipment required to enter RNP 2 domestic airspace is:
- One FMGC
- One MCDU
- One GPS
- Two IRS
- Two ND s (the temporary display of ND information via the PFD /ND switch is permitted on one side).

Ident.: PRO-SPO-51-J-00021546.0001001 / 20 MAR 17

PROCEDURE

FLIGHT PREPARATION

RAIM /AIME availability should be confirmed for RNP 2 in domestic area operations.
Refer to PRO-NOR-SOP-02 GPS PRIMARY Availability (If Installed)

MANAGEMENT OF DEGRADED NAVIGATION

● **If one of the following messages is displayed, the flight crew should resume navigation with the FMGC that provides the correct position:**

- GPS PRIMARY LOST on one ND /MCDU
- NAV ACCUR DOWNGRAD on one ND /MCDU.

● **If one of the following MCDU or ECAM messages is displayed, the flight crew should check the navigation accuracy with navaid raw data via the MCDU PROG page in order to identify which FMGC position is correct:**

- GPS PRIMARY LOST on both ND s/MCDUs
- FMS 1/FMS 2 POS DIFF

- CHECK IRS 1(2)(3)/FM POSITION
- CHECK A/C POSITION
- NAV FM/GPS POS DISAGREE

The flight crew should resume navigation with the FMGC that provides the correct position.

- **If NAV ACCUR DOWNGRAD is displayed on both sides:**

The flight crew should inform the ATC that the RNP 2 capability is lost.

RNP 1 / TERMINAL RNP 1- BASIC RNP 1

Applicable to: ALL

Ident.: PRO-SPO-51-F-00015842.0001001 / 20 MAR 17

GENERAL

RNP 1 operations correspond to RNP 1 Terminal operations.

Ident.: PRO-SPO-51-F-00015843.0001001 / 17 MAR 16

REQUIRED RNP 1 EQUIPMENT

The minimum navigation equipment required to enter RNP 1 airspace is:
- One FMGC
- One MCDU
- One GPS
- Two IRS
- One FD in NAV mode
- Two ND s (the temporary display of ND information via the PFD /ND switch is permitted on one side).

Ident.: PRO-SPO-51-F-00015867.0001001 / 20 MAR 17

PROCEDURE

FLIGHT PREPARATION

RAIM/AIME availability should be confirmed for RNP 1 operations.
Refer to PRO-NOR-SOP-02 GPS PRIMARY Availability (If Installed)

BEFORE ENTERING RNP 1 AIRSPACE

The FMS navigation database provides the terminal procedure (RNAV SID , RNAV STAR , RNAV TRANSITION, etc.) of the flight plan. The flight crew must check the terminal procedure from the published charts with the FMS navigation database on the F-PLN page (waypoint sequences, tracks, distances, and altitude or speed constraints). The flight crew must not modify the procedure that is provided by the navigation database, unless required by the ATC (DIR TO, radar vectoring, insertion of waypoints from the navigation database).

MANAGEMENT OF DEGRADED NAVIGATION

- **If one of the following messages is displayed, the flight crew should resume navigation with the FMGC that provides the correct position:**
  - GPS PRIMARY LOST on one ND /MCDU
  - NAV ACCUR DOWNGRAD on one ND /MCDU.
- **If one of the following MCDU or ECAM messages is displayed, the flight crew should check the navigation accuracy with navaid raw data via the MCDU PROG page in order to identify which FMGC position is correct:**
  - GPS PRIMARY LOST on both ND s/MCDUs
  - FMS 1/FMS 2 POS DIFF
  - CHECK IRS 1(2)(3)/FM POSITION
  - CHECK A/C POSITION
  - NAV FM/GPS POS DISAGREE

  The flight crew should resume navigation with the FMGC that provides the correct position.
- **If NAV ACCUR DOWNGRAD is displayed on both sides:**

  The flight crew should inform the ATC that the RNP 1 capability is lost.

RNP APCH / RNAV(GNSS)

Applicable to: ALL

Ident.: PRO-SPO-51-G-00015839.0001001 / 20 MAR 17

GENERAL

RNP APCH operations correspond to RNAV (GNSS) or RNAV (GPS) operations.

Ident.: PRO-SPO-51-G-00015840.0001001 / 11 JUL 17

REQUIRED RNP APCH EQUIPMENT

The minimum equipment required to start RNP APCH operations is:
- One FMGC
- One GPS
- Two IRS
- One MCDU
- One FD
- One PFD on the PF side

- Two ND s (the temporary display of ND information via the PFD /ND switch is permitted on PM side)
- Two FCU channels.

Ident.: PRO-SPO-51-G-00015868.0001001 / 09 SEP 14

PROCEDURE

Refer to PRO-NOR-SOP-18-C Approach using FINAL APP Guidance - General
Refer to PRO-NOR-SOP-18-C Approach using FPA Guidance - General

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GENERAL

Ident.: PRO-SPO-60-00002094.0002001 / 03 JAN 11
Applicable to: ALL

This chapter gives the limitations, procedures and performance for operations from/to runways with a width below 45 m .
This chapter does not constitute an operational approval to operate on narrow runways.
Such authorization must be obtained by the operator from the appropriate authorities.

LIMITATIONS

Ident.: PRO-SPO-60-00006122.0002001 / 21 MAR 17
Applicable to: ALL

Minimum runway width..30 m

The dispatch from/to narrow runways is not allowed in case of :
- Nose wheel steering inoperative
- One brake or more inoperative

Autoland is not allowed.

PROCEDURES

Ident.: PRO-SPO-60-00006123.0002001 / 21 MAR 17
Applicable to: ALL

Diversion to a 45 m wide runway is recommended in case of :
- Rudder jam
- Rudder pedal jam
- Yaw damper system fault
- Rudder Travel Limit system fault
- All failures leading to the loss of the nose wheel steering (HYD Green system loss, double hydraulic failure, double BSCU fault, double LGCIU fault)

Maximum demonstrated crosswind for takeoff and landing:

Dry runway....................................38 kt (gust included) for takeoff and landing
Wet runway....................................33 kt (gust included) for takeoff and landing
Contaminated runway.......................10 kt (gust included) for takeoff and landing

Note: *These maximum demonstrated crosswind values are based on the assumption that the crew have been trained accordingly.*

Operations on icy runways have not been demonstrated.

PERFORMANCE

Ident.: PRO-SPO-60-00006124.0001001 / 23 JUN 15
Applicable to: ALL

For runways with a width above or equal to 40 m ., the basic takeoff performance remains unchanged.
For runways with a width below 40 m , the VMCG must be increased by the values indicated in the following table :

Runway Width	30 m	35 m	40 m
Δ VMCG(kt)	+ 2.5	+ 1.5	+ 0

No correction is required, when takeoff performance is determined by using the applicable approved data.
The minimum V1 values, published in the *Refer to PER-TOF-TOD-25-10 SPEEDS LIMITED BY VMCG/VMCA*, must be increased by 3 kt .
When using the takeoff performance for contaminated runways *Refer to PER-TOF-CTA-10 GENERAL*, the resulting V1 must be crosschecked with the corrected minimum V1.
Further decrease the takeoff weight by 3 t per knot increase in V1.

OVERVIEW

Ident.: PRO-SPO-85-00020844.0001001 / 17 MAR 17
Applicable to: ALL

The Precision Runway Monitor (PRM) system enables simultaneous close parallel ILS approaches. The air traffic controllers use the PRM system to monitor the aircraft position. If necessary, the ATC orders a break out, turn and climb or descent.

To perform PRM operations:
- The air traffic controllers and the flight crew must satisfy specific training requirements
- The ATC and the aircraft equipment must comply with specific requirements.

BREAK OUT TURN AND CLIMB PROCEDURE

Ident.: PRO-SPO-85-00020845.0001001 / 17 MAR 17
Applicable to: ALL

Simultaneously:

AP.. OFF
BREAK OUT LEFT(RIGHT), HDG___, ALT___.. ANNOUNCE
THRUST LEVERS..TOGA, and back to CL

L2 *The SRS GA and the GA TRK modes engage. The THR CLB mode engages.*
The speed is managed. The speed target is the aircraft speed at SRS GA engagement.
The FMS GO-AROUND phase becomes active. Therefore, the FMS reinserts the approach.

L1 TURN LEFT(RIGHT) AND CLIMB

L2 *As the situation is urgent, the flight crew should temporarily disregard the FD orders.*

Then

L1 HDG___.. TURN AND PULL

L2 *The GA TRK mode disengages, and the HDG mode engages.*

L1 ALT___..TURN AND PULL

L2 *The SRS GA mode disengages, and the OP CLB mode engages. The speed target becomes the FMS speed target of the CLIMB phase.*

L1 SPEED..PULL AND ADJUST

L2 *For the initial break out procedure, adjust the speed (e.g. 160 kt), in order to avoid a significant acceleration, and an increase in workload.*

L1 ● **When established on the break out path:**
AP..ON

L2 *Before engaging the AP , ensure that the FD bar orders correspond to the aircraft current path.*

L1 SPEED...SELECT AS RQRD
FLAPS...AS RQRD
GEAR...AS RQRD
TCAS MODE SEL...TA/RA AS RQRD

BREAK OUT TURN AND DESCENT PROCEDURE

Ident.: PRO-SPO-85-00020846.0001001 / 17 MAR 17
Applicable to: ALL

Simultaneously:

AP... OFF
TURN LEFT(RIGHT) AND MAINTAIN RATE OF DESCENT
BREAK OUT LEFT(RIGHT), HDG___, ALT___... ANNOUNCE

L2 *As the situation is urgent, the flight crew should temporarily disregard the FD orders.*

Then

L1 HDG___... TURN AND PULL

L2 *The HDG mode engages. The vertical mode reverts to the V/S mode. The vertical speed target is the aircraft vertical speed at V/S engagement.*

L1 ALT___...TURN AND PULL

L2 *This action defines an altitude target. The OP DES mode and the THR IDLE mode engage. The speed target does not change.*

L1 V/S...MONITOR

CAUTION	*Depending on the speed target, the vertical speed may become excessive. If the rate of descent exceeds 1 000 ft/min, engage the V/S mode and limit the rate of descent to 1 000 ft/min.*

- **When established on the break out path:**

  AP...ON

L2 *Before engaging the AP , ensure that the FD bar orders correspond to the aircraft current path.*

L1 - **When cleared by ATC:**

  ALT___... TURN

L2 *Select an altitude target for go-around, in accordance with the ATC clearance.*

L1 THRUST LEVERS... TOGA, and back to CL

L2 *The SRS GA and the GA TRK modes engage. The THR CLB mode engages.*
The speed is managed. The speed target is the aircraft speed at SRS GA engagement.
The FMS GO-AROUND phase becomes active.

L1 HDG___ .... PULL

L2 *The GA TRK mode disengages, and the HDG mode engages. The SRS GA mode remains engaged, until ALT* engagement.*

L1 SPEED .... SELECT AS RQRD
FLAPS .... AS RQRD
GEAR .... AS RQRD
TCAS MODE SEL .... TA/RA AS RQRD

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LIMITATIONS

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M (1)	Localization	DU Title	DU identification	DU date
	LIM-AFS-20	**Automatic Landing in Johannesburg**	00013685.0001001	25 APR 13
	Criteria: A319 **Applicable to: ALL** *Impacted DU: NONE*			
	LIM-AFS-20	**Autoland Databases with Honeywell ADIRU**	00016880.0003001	25 NOV 15
	Criteria: P3996, P4419, P4425, P6125, SA **Applicable to: ALL** *Impacted DU: NONE*			

(1) Evolution code : N=New, R=Revised, E=Effectivity

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LIMITATIONS

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INTRODUCTION

Ident.: LIM-INT-00019839.0001001 / 04 SEP 17
Applicable to: ALL

This FCOM chapter contains operational limitations, related to the aircraft and associated systems.
All references to airspeed, Mach and altitude relate to indicated airspeed, indicated Mach, and pressure altitude, unless otherwise noted.

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LIMITATIONS

AIRCRAFT GENERAL

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LIM-AG-F_CTL Flight Maneuvering Load Acceleration Limits

LIM-AG-OPS Operational Parameters

LIM-AG-SPD Speeds

LIM-AG-WGHT Weights

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FLIGHT MANEUVERING LOAD ACCELERATION LIMITS

Ident.: LIM-AG-F_CTL-00020793.0001001 / 17 MAR 17
Applicable to: ALL

Clean configuration..........-1 g to +2.5 g
Other configurations..........0 g to +2 g

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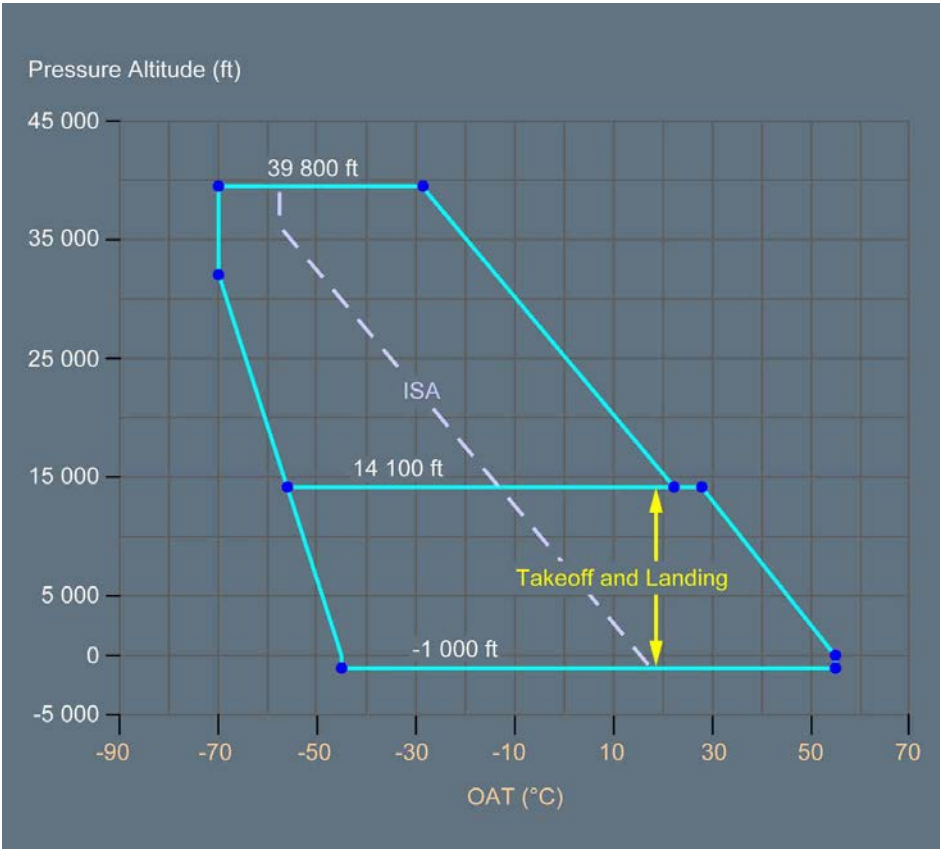
ENVIRONMENTAL ENVELOPE

Ident.: LIM-AG-OPS-00021817.0057001 / 27 JUL 17
Applicable to: ALL



AIRPORT OPERATIONS AND WIND LIMITATIONS

Applicable to: ALL

Ident.: LIM-AG-OPS-ARPT_WIND-00020145.0001001 / 17 MAR 17

RUNWAY SLOPE

Runway slope (mean).. ±2 %

Ident.: LIM-AG-OPS-ARPT_WIND-00020135.0009001 / 17 MAR 17

RUNWAY ALTITUDE

Runway altitude.. 14 100 ft

Ident.: LIM-AG-OPS-ARPT_WIND-00020146.0002001 / 17 MAR 17

NOMINAL RUNWAY WIDTH

Nominal runway width.. 45 m
Minimal runway width.. 30 m

Ident.: LIM-AG-OPS-ARPT_WIND-00020148.0001001 / 17 MAR 17

WIND FOR TAKEOFF AND LANDING

Maximum demonstrated crosswind (takeoff and landing)................................. 38 kt (gust included)

Note:
- *The maximum demonstrated crosswind value is not an Airplane Flight Manual (AFM) limitation : It is the maximum crosswind condition experienced during the aircraft certification campaign.*
- *Airbus recommends that operators should not intentionally operate in crosswinds that exceed this value.*

Ident.: LIM-AG-OPS-ARPT_WIND-00020157.0001001 / 17 MAR 17

TAILWIND TAKEOFF

Maximum tailwind for takeoff .... 10 kt

Ident.: LIM-AG-OPS-ARPT_WIND-00020159.0001001 / 21 MAR 17

TAILWIND LANDING

Maximum tailwind for landing .... 10 kt

Note: *For maximum tailwind for automatic landing and rollout,* *Refer to LIM-AFS-20 Maximum Wind Conditions for ILS/MLS (If Installed) CAT II or CAT III and for GLS (If Installed) CAT I.*

Ident.: LIM-AG-OPS-ARPT_WIND-00020166.0001001 / 04 JUL 17

PASSENGER AND CARGO DOORS OPERATION

The following are the wind limitations for passenger and cargo doors operation:
- The maximum wind for passenger door operation is 65 kt
- The maximum wind for FWD and AFT cargo door operation is 40 kt (or 50 kt, if the aircraft nose is into the wind, or if the FWD and AFT cargo doors are on the leeward side)
- The FWD and AFT cargo doors must be closed before the wind speed exceeds 65 kt.

Ident.: LIM-AG-OPS-ARPT_WIND-00020046.0003001 / 17 MAR 17

MAXIMUM RECOMMENDED CROSSWIND ON WET AND CONTAMINATED RUNWAYS

Runway Surface Conditions		Maximum Crosswind for Takeoff (Gust included)	Maximum Crosswind for Landing (Gust included)
Runway State or / and Runway Contaminant	**ESF(1) or PIREP(2)**		
Damp **Wet** Up to 3 mm (1/8") of water **Slush** Up to 3 mm (1/8") **Dry snow** Up to 3 mm (1/8") **Wet snow** Up to 3 mm (1/8") **Frost**	**Good**	38 kt	38 kt
Compacted snow OAT at or below -15 °C	**Good to Medium**	29 kt	29 kt
Dry snow More than 3 mm (1/8"), up to 100 mm (4") **Wet snow** More than 3 mm (1/8"), up to 30 mm (6/5") **Compacted snow** OAT above -15 °C **Dry snow over compacted snow** **Wet snow over compacted snow** **Slippery when wet**	**Medium**	25 kt	25 kt
Water More than 3 mm (1/8"), up to 12.7 mm (1/2") **Slush** More than 3 mm (1/8"), up to 12.7 mm (1/2")	**Medium to Poor**	20 kt	20 kt
Ice (cold & dry)	**Poor**	15 kt	15 kt

(1) *ESF: Estimated Surface Friction*

(2) *PIREP: Pilot Report of Braking Action*

Note: *The maximum crosswind values given in the above table are recommended values based on computations.*

Ident.: LIM-AG-OPS-ARPT_WIND-00014451.0001001 / 22 MAY 12

TAKEOFF LIMITATIONS ON CONTAMINATED RUNWAYS

Takeoff is not recommended on the following runway conditions:

- Wet ice
- Water on top of Compacted Snow
- Dry Snow or Wet Snow over Ice

COCKPIT WINDOW OPEN MAXIMUM SPEED

Ident.: LIM-AG-SPD-00001904.0001001 / 17 MAR 17
Applicable to: ALL

Maximum speed...200 kt

MAXIMUM FLAPS/SLATS SPEEDS

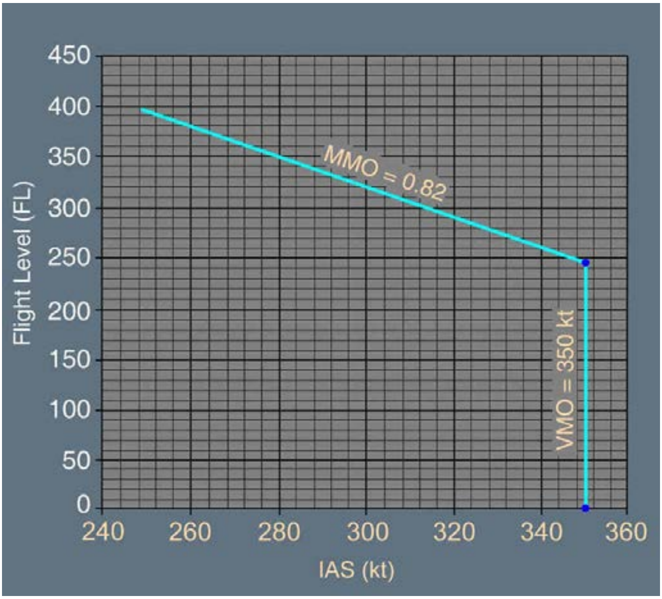
Ident.: LIM-AG-SPD-00020087.0001001 / 17 MAR 17
Applicable to: ALL

Flaps Lever Position	Configuration on Slat/Flap Display	Max Speed	Flight Phase
0		VMO /MMO	CRUISE
1	1	230 kt	HOLDING
	1 + F	215 kt	TAKEOFF
2	2	200 kt	TAKEOFF/APPROACH
3	3	185 kt	TAKEOFF/APPROACH/LANDING
FULL	FULL	177 kt	LANDING

MAXIMUM OPERATING SPEED VMO/MMO

Ident.: LIM-AG-SPD-00019991.0002001 / 17 MAR 17
Applicable to: ALL

VMO...350 kt
MMO...M 0.82



MAXIMUM SPEEDS WITH THE LANDING GEAR EXTENDED

Ident.: LIM-AG-SPD-00001901.0001001 / 17 MAR 17
Applicable to: ALL

Maximum speed with the landing gear extended (VLE)..280 kt /M 0.67
Maximum speed at which the landing gear may be extended (VLO extension) .... 250 kt /M 0.60
Maximum speed at which the landing gear may be retracted (VLO retraction) .... 220 kt /M 0.54

MAXIMUM TIRE SPEED

Ident.: LIM-AG-SPD-00001902.0001001 / 17 MAR 17
Applicable to: ALL

Maximum ground speed.. 195 kt

MINIMUM CONTROL SPEEDS

Ident.: LIM-AG-SPD-00020161.0006001 / 17 MAR 17
Applicable to: ALL

MINIMUM CONTROL SPEED FOR LANDING (VMCL)

VMCL.. 111 kt

MINIMUM CONTROL SPEEDS IN THE AIR (VMCA) AND ON THE GROUND (VMCG)

Altitude (ft)	VMCA (kt IAS)	VMCG (kt IAS)		
		CONF 1 + F	CONF 2	CONF 3
-2 000	110	108	108	108
0	120	107	107	107
2 000	108	106	106	106
4 000	106	104	104	104
6 000	104	103	103	103
8 000	101	100	100	100
10 000	99	98	98	98
12 000	96	96	96	96
14 100	93	94	94	94

WIPERS MAXIMUM OPERATING SPEED

Ident.: LIM-AG-SPD-00001903.0001001 / 17 MAR 17
Applicable to: ALL

Maximum speed..230 kt

L2 *Note:* *This limitation is applicable when the wipers are sweeping. It is not applicable if the wipers are not sweeping for any reasons.*

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WEIGHT LIMITATIONS

Ident.: LIM-AG-WGHT-00001893.0109001 / 18 MAR 11
Applicable to: ALL

Maximum taxi weight..70 400 kg (155 205 lb)
Maximum takeoff weight (brake release)..70 000 kg (154 323 lb)
Maximum landing weight..61 000 kg (134 481 lb)
Maximum zero fuel weight..57 000 kg (125 663 lb)
Minimum weight..35 400 kg (78 044 lb)

In exceptional cases (in flight turn back or diversion), an immediate landing at weight above maximum landing weight is permitted, provided the pilot follows the overweight landing procedure.

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LIMITATIONS

AIR BLEED/COND/PRESS/VENT

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GENERAL

Ident.: LIM-AIR-00020807.0001001 / 17 MAR 17
Applicable to: ALL

With passengers on board, it is not recommended to exceed 20 min without air conditioning supply. The lack of fresh air supply will significantly reduce the cabin's air quality.

APU BLEED USE WITH HP AIR START UNIT

Ident.: LIM-AIR-00020084.0001001 / 17 MAR 17
Applicable to: ALL

The flight crew must not use bleed air from the APU BLEED and from the HP Air Start Unit at the same time, to prevent any adverse effect on the Bleed Air System.

AVIONICS VENTILATION

Ident.: LIM-AIR-00020086.0001001 / 17 MAR 17
Applicable to: ALL

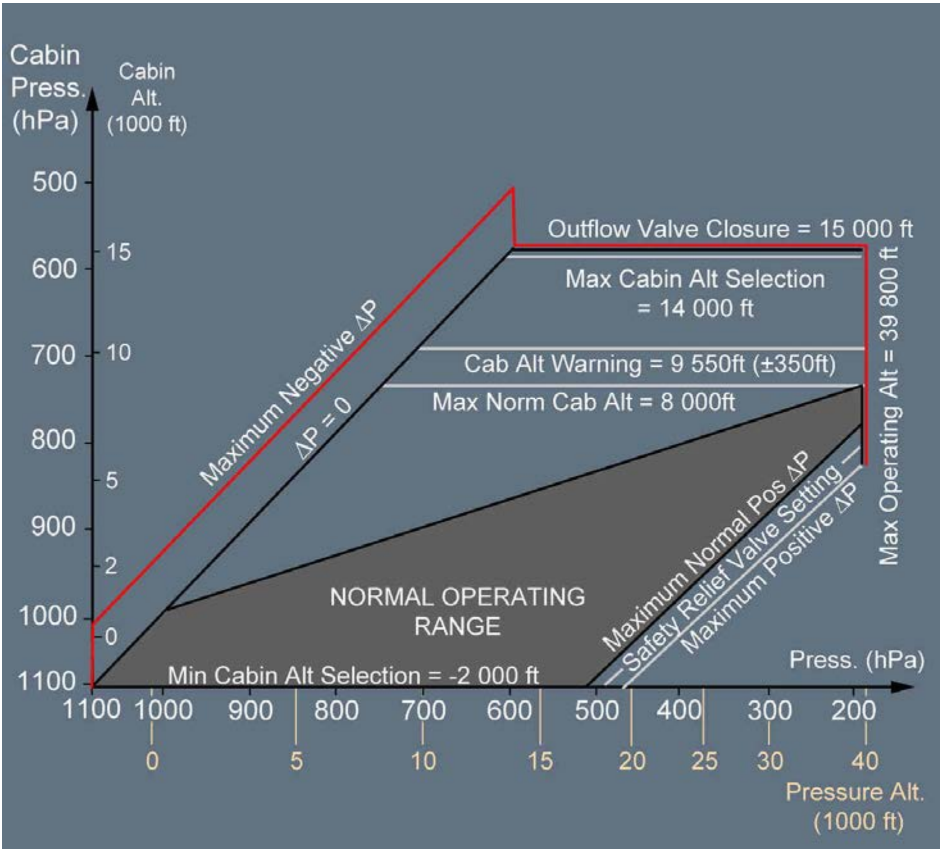
During ground operations and depending on the Outside Air Temperature (OAT), the flight crew must limit the time that the aircraft electric power supply is used, in normal avionics ventilation system configuration, as follows:

OAT ≤ 49 °C	No limitation
49 °C < OAT ≤ 55 °C	2 h
55 °C < OAT ≤ 60 °C	1 h
60 °C < OAT ≤ 64 °C	0.5 h

CABIN PRESSURE

Ident.: LIM-AIR-00020085.0003001 / 17 MAR 17
Applicable to: ALL

Maximum positive differential pressure.......... 9.0 PSI
Maximum negative differential pressure.......... -1.0 PSI
Safety relief valve setting.......... 8.6 PSI



Note: *Maximum differential pressure (Δp) and safety valve setting tolerance = ± 7 hPa (0.1 PSI).*

PACKS USE WITH LP AIR CONDITIONING UNIT

Ident.: LIM-AIR-00020083.0001001 / 17 MAR 17
Applicable to: ALL

The flight crew must not use conditioned air from the packs and from the LP Air Conditioning Unit at the same time, to prevent any adverse effect on the Air Conditioning system.

LIMITATIONS

AUTO FLIGHT SYSTEM

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LIM-AFS-10 General

LIM-AFS-20 Automatic Approach, Landing and Rollout

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AUTOPILOT FUNCTION

Applicable to: ALL

Ident.: LIM-AFS-10-10-00019567.0001001 / 17 MAR 17

The autopilot can be used with the following minimum values:

Ident.: LIM-AFS-10-10-00019753.0001001 / 17 MAR 17

At takeoff	100 ft AGL or 5 s after liftoff

Ident.: LIM-AFS-10-10-00019568.0001001 / 03 AUG 17

In non-precision approach using F-LOC or F-G/S (FLS function)	200 ft AGL
In non-precision approach using FINAL APP , NAV FPA , NAV V/S , TRK FPA , HDG V/S , LOC V/S , LOC FPA	250 ft AGL

Ident.: LIM-AFS-10-10-00019746.0005001 / 09 JUN 17

In circling approach	500 ft AGL for aircraft category C (600 ft AGL for aircraft category D).

Ident.: LIM-AFS-10-10-00019747.0001001 / 17 MAR 17

ILS /MLS approach when CAT1 is displayed on the FMA	160 ft AGL
GLS approach when AUTOLAND is not displayed on the FMA	160 ft AGL
ILS /MLS approach when CAT2 or CAT3 (single or dual) is displayed on the FMA	0 ft AGL if autoland

Ident.: LIM-AFS-10-10-00019750.0001001 / 17 MAR 17

After a manual go-around	100 ft AGL

Ident.: LIM-AFS-10-10-00019751.0001001 / 06 JUL 17

In all other phases	500 ft AGL
The AP or FD in OP DES or DES mode can be used in approach. However, its use is only permitted if the FCU selected altitude is set to, or above, the higher of the two: MDA /MDH or 500 ft AGL.	

FLIGHT MANAGEMENT FUNCTION

Applicable to: ALL

Ident.: LIM-AFS-10-20-00020069.0001001 / 17 MAR 17

FMGS lateral and vertical navigation is certified for:
- After takeoff, en route, and terminal area operations
- Navigation within RNAV /RNP airspace

- Instrument approach procedures (except ILS , LOC , LOC B/C , LDA , SDF, GLS , MLS and FLS final approaches)
- Missed approach procedures.

The FLS function is certified for:
- RNAV , RNAV (GNSS), GPS , VOR , VOR /DME , NDB , NDB /DME instrument approach procedures, using FMS navigation for lateral and vertical navigation
- LOC , ILS (GS out), or LOC B/C instrument approaches, using FMS navigation for vertical navigation, associated with LOC or LOC B/C for lateral navigation.

Approval of the FMGS is based on the assumption that the navigation database is validated for intended use.
Obstacle clearance and adherence to airspace constraints remains a flight crew responsibility.
Fuel, time predictions/performance information is provided for advisory purposes only.

TAKEOFF IN GPS PRIMARY

For certain airports, where the difference between the local coordinate system and WGS 84 (geodesic standard used by GPS , FMS) is not negligible, a map shift may occur after takeoff. The flight crew must deselect the GPS for takeoff from these airports, until a safe altitude is reached.

Ident.: LIM-AFS-10-20-00020070.0002001 / 17 MAR 17

NAVIGATION PERFORMANCE

The navigation accuracy depends on:
- IRS drift, or
- One of the following:
  - Radio navaid availability, or
  - Elapsed time since last computation of radio navaid position.

RNP accuracy with GPS PRIMARY is:

	With AP ON (1)	With AP OFF and FD ON (1)	With AP OFF and FD OFF
En route	1 NM	1 NM	1.1 NM
In terminal area	0.5 NM	0.51 NM	0.51 NM
In approach	0.3 NM	0.3 NM	0.3 NM with F-LOC deviation Not authorized without F-LOC deviation

(1) - *In NAV (all phases), or*
- *In F-LOC (approach phase)*

Ident.: LIM-AFS-10-20-00020389.0001001 / 17 MAR 17

DEGRADED SITUATION

If GPS PRIMARY LOST is displayed on the PFD , the navigation accuracy remains sufficient for RNP operations provided that, the RNP value is checked or entered on the MCDU and HIGH ACCURACY is displayed.

USE OF NAV MODE

Applicable to: ALL

Ident.: LIM-AFS-10-30-00020334.0001001 / 17 MAR 17

AFTER TAKEOFF

NAV mode may be used after takeoff provided that:
- GPS PRIMARY is available, or
- The flight crew checked the FMGS takeoff updating.

Ident.: LIM-AFS-10-30-00020335.0001001 / 17 MAR 17

IN TERMINAL AREA

NAV mode may be used in terminal area provided that:
- GPS PRIMARY is available, or
- the appropriate RNP is checked or entered on the MCDU, and HIGH accuracy is displayed, or
- FMS navigation is crosschecked with navaid raw data.

Ident.: LIM-AFS-10-30-00020336.0001001 / 17 MAR 17

APPROACH BASED ON RADIO NAVAIDS

A navaids approach may be performed in NAV , APP NAV or FINAL APP , with AP or FD engaged, provided that:
- If GPS PRIMARY is available, the reference navaid may be unserviceable, or the airborne radio equipment may be inoperative, or not installed, provided that an operational approval is obtained
- If GPS PRIMARY is not available, the reference navaid and the corresponding airborne radio equipment must be serviceable, tuned and monitored during the approach.

Note: *FLS is the recommended managed lateral and vertical guidance mode for radio navaids approach.*

Ident.: LIM-AFS-10-30-00020337.0001001 / 17 MAR 17

RNAV APPROACH

An RNAV (RNP) approach may be performed, with GPS PRIMARY not available, only if the radio navaid coverage supports the RNP value and HIGH accuracy is displayed on the MCDU with the specified RNP, and an operational approval is obtained.
An RNAV (GNSS) approach may be performed provided that GPS PRIMARY is available.
Refer to Guidance Modes per Approach Types

Note: FLS is the recommended managed lateral and vertical guidance mode for RNAV approach.

USE OF FLS

Ident.: LIM-AFS-10-00020808.0001001 / 17 MAR 17
Applicable to: ALL

APPROACH BASED ON RADIO NAVAIDS

A navaids approach may be flown with the FLS provided that:
- F-APP capability is displayed on FMA
  In this case, the reference navaids may be unserviceable, or the airborne radio equipment may be inoperative, or not installed, provided that an operational approval is obtained.
- F-APP + RAW capability is displayed on FMA.
  In this case, the reference navaids and the corresponding airborne radio equipment must be serviceable, tuned and monitored during the approach.

An ILS (G/S out), LOC , or LOC -B/C approach may be flown with the lateral LOC (LOC -B/C) mode and with the F-G/S mode of FLS function provided that:
- F-APP capability is displayed on FMA
  In this case, the reference navaids may be unserviceable, or the airborne radio equipment may be inoperative, or not installed, provided that an operational approval is obtained.
- F-APP + RAW capability is displayed on FMA.
  In this case, the reference navaids and the corresponding airborne radio equipment must be serviceable, tuned and monitored during the approach.

RNAV (GNSS) APPROACH

An RNAV (GNSS) approach with LNAV minimum may be flown with the FLS provided that the F-APP capability is displayed on FMA.
An RNAV (GNSS)approach with LNAV /VNAV minimum must be flown with the FLS provided that the F-APP capability is displayed on FMA.

NON-PRECISION APPROACHES WITH ENGINE-OUT

Ident.: LIM-AFS-10-00006519.0001001 / 09 FEB 11
Applicable to: ALL

If one engine is inoperative, it is not permitted to use the autopilot to perform NPAs in the following modes: FINAL APP , NAV V/S , NAV /FPA.
Only FD use is permitted.

NAVIGATION DATABASE VALIDATION

Applicable to: ALL

Ident.: LIM-AFS-10-40-00021656.0002001 / 08 AUG 17

RNAV (GNSS) APPROACHES AND APPROACHES BASED ON VOR /NDB

To fly an approach in lateral managed mode or lateral and vertical managed mode, the approach stored in the Navigation database must be either:
- Produced by an approved supplier compliant with ED76/DO200A requirements, or
- Validated and approved by the Operator.

Note: *RNAV (GNSS) approaches lateral trajectories are geometrically based on waypoints coordinates. Thus, validating waypoints coordinate ensure no coding error on the approach and correct lateral trajectory. Observed lateral track degree of difference between MCDU F-PLN page display and charts may come from inconsistency between FMS MagVar and charted MagVar, which has no effect on lateral trajectory.*

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ILS CATEGORY II

Ident.: LIM-AFS-20-00020136.0001001 / 17 MAR 17
Applicable to: ALL

Minimum decision height.. 100 ft AGL
At least one autopilot must be engaged in APPR mode, and CAT 2 or CAT 3 SINGLE or CAT 3 DUAL must be displayed on the FMA.
For manual landing, AP should be disconnected no later than 80 ft AGL.

SPECIAL AUTHORIZATION CAT II (SA CAT II)

Ident.: LIM-AFS-20-00020138.0001001 / 17 MAR 17
Applicable to: ALL

Minimum decision height.. 100 ft AGL
At least one autopilot must be engaged in APPR mode, and CAT 2 or CAT 3 SINGLE or CAT 3 DUAL must be displayed on the FMA.
With HUD ✈, the flight crew must use the HUD to monitor the approach and perform an automatic landing or a manual landing. If the flight crew performs an automatic approach without automatic landing, the autopilot must be disengaged no later than at 80 ft AGL.
Without HUD, the flight crew must perform an automatic landing.

OTHER THAN STANDARD CAT II (OTS CAT II)

Ident.: LIM-AFS-20-00020139.0001001 / 17 MAR 17
Applicable to: ALL

Minimum decision height.. 100 ft AGL
At least one autopilot must be engaged in APPR mode, and CAT 2 or CAT 3 SINGLE or CAT 3 DUAL must be displayed on the FMA.
With HUD ✈, the flight crew must use the HUD to monitor the approach and perform an automatic landing or a manual landing. If the flight crew performs an automatic approach without automatic landing, the autopilot must be disengaged no later than at 80 ft AGL.
Without HUD, the flight crew must perform an automatic landing.

ILS CATEGORY III FAIL PASSIVE (SINGLE)

Ident.: LIM-AFS-20-00020140.0001001 / 17 MAR 17
Applicable to: ALL

Minimum decision height.. 50 ft AGL
A/THR must be used in selected or managed speed.
At least one autopilot must be engaged in APPR mode, and CAT 3 SINGLE or CAT 3 DUAL must be displayed on the FMA.

ILS CATEGORY III FAIL OPERATIONAL (DUAL)

Ident.: LIM-AFS-20-00020141.0001001 / 17 MAR 17
Applicable to: ALL

Alert height....................................100 ft AGL
A/THR must be used in selected or managed speed.
Both autopilots must be engaged in APPR mode, and CAT 3 DUAL must be displayed on the FMA.

- **CAT III without DH:**
  Minimum Runway Visual Range....................................75 m

ENGINE-OUT

Ident.: LIM-AFS-20-00020142.0003001 / 17 MAR 17
Applicable to: ALL

CAT II and CAT III fail passive autoland are only approved in configuration 3 and FULL, and if engine-out procedures are completed before reaching 1 000 ft in approach.

MAXIMUM WIND CONDITIONS FOR ILS/MLS ⪇ CAT II OR CAT III AND FOR GLS ⪇ CAT I

Ident.: LIM-AFS-20-00020144.0013001 / 17 MAR 17
Applicable to: ALL

- **CONF FULL with airport elevation at or below 5750ft:**
  Headwind : 20 kt (15 kt with One Engine Inoperative (OEI))
  Tailwind : 10 kt
  Crosswind: 20 kt (10 kt with One Engine Inoperative (OEI))
- **CONF FULL with airport elevation above 5750ft or CONF 3:**
  Headwind : 20 kt (15 kt with One Engine Inoperative (OEI))
  Tailwind : 5 kt
  Crosswind: 20 kt (10 kt with One Engine Inoperative (OEI))

<u>Note:</u> *Wind limitation is based on the surface wind reported by ATC . If the wind displayed on the ND exceeds the above-noted autoland limitations, but the tower reports surface wind within the limitations, then the autopilot can remain engaged. If the tower reports a surface wind that exceeds the limitations, only CAT I automatic approach without autoland can be performed.*

AUTOMATIC LANDING

Applicable to: ALL

Ident.: LIM-AFS-20-10-00020149.0001001 / 17 MAR 17

ILS /MLS CAT II and CAT III autoland and GLS CAT I autoland are approved in CONF 3 and CONF FULL.

Ident.: LIM-AFS-20-10-00020150.0001001 / 17 MAR 17

Automatic landing is demonstrated:
- With CAT II and CAT III ILS /MLS beam and CAT I GLS beam.

Ident.: LIM-AFS-20-10-00020151.0001001 / 17 MAR 17

- With a glide slope angle between -2.5 ° and -3.15 °

Ident.: LIM-AFS-20-10-00020152.0003001 / 17 MAR 17

- With an airport elevation at or below 9 200 ft

Ident.: LIM-AFS-20-10-00020155.0001001 / 17 MAR 17

Automatic landing is not allowed below -1 000 ft pressure altitude.

Ident.: LIM-AFS-20-10-00020156.0002001 / 17 MAR 17

Automatic rollout performance is approved on dry and wet runways, but performance on snow-covered or icy runways was not demonstrated.
During automatic rollout with one engine inoperative or one thrust reverser inoperative , the flight crew can use the remaining thrust reverser, provided that only IDLE reverse thrust is used.

Ident.: LIM-AFS-20-10-00020158.0001001 / 17 MAR 17

Automatic landing system performance is demonstrated with CAT II or CAT III ILS /MLS airport installation. However, automatic landing in CAT I or better weather conditions is possible on CAT I ground installations or on CAT II/III ground installations when ILS/MLS sensitive areas are not protected, if the following precautions are taken:
- The airline checked that the ILS /MLS beam quality, and the effect of the terrain profile before the runway have no adverse effect on AP /FD guidance. Particularly, the effect of terrain profile within 300 m before the runway threshold must be evaluated
- The flight crew is aware that LOC or G/S beam fluctuations, independent of the aircraft system, may occur. The PF is prepared to immediately disconnect the autopilot, and to take the appropriate action, should not satisfactory guidance occur
- At least CAT2 capability is displayed on the FMA and the flight crew uses CAT II/III procedures
- Visual references are obtained at an altitude appropriate for the CAT I approach. If not, a go-around must be performed.

Ident.: LIM-AFS-20-10-00021180.0002001 / 17 MAR 17

Note: *Depending on the situation (e.g. emergency or other) and provided that the runway is approved for automatic landing, the flight crew can decide to perform an autoland up to 69 t (152 118 lb).*

AUTOMATIC LANDING IN JOHANNESBURG

Ident.: TDU / LIM-AFS-20-00013685.0001001 / 25 APR 13
Applicable to: ALL
Impacted DU: NONE

Automatic landing is not permitted on Johannesburg 03R/21L runways.

AUTOLAND DATABASES WITH HONEYWELL ADIRU

Ident.: TDU / LIM-AFS-20-00016880.0003001 / 25 NOV 15
Applicable to: ALL
Impacted DU: NONE

The below table provides for each concerned airport, the dates when the following limitations begin:
- AUTOLAND is not allowed
- ROLLOUT is not allowed.

CAT II approaches without AUTOLAND are still allowed.

Airport Code	Airport location	Month/year
FAEL	EAST LONDON BEN SCHOEMAN SOUTH AFR REP	August 2018
PAFA	FAIRBANKS INTL AK USA	January 2015
PANC	ANCHORAGE INTL AK USA	October 2015
BIKF	KEFLAVIK ICELAND	January 2015
EGAA	BELFAST ALDERGROVE UNITED KINGDOM	September 2020
EGPF	GLASGOW UNITED KINGDOM	July 2020
EGPH	EDINBURGH UNITED KINGDOM	September 2020
EFRO	ROVANIEMI FINLAND	September 2019
EFOU	OULU FINLAND	August 2020

Note: *This limitation is applicable until end of 2020. From 2021, without a revision of this limitation, AUTOLAND and ROLLOUT will not be allowed on any airport.*

The above limitations do not apply if three new ADIRU with updated magnetic variation tables are installed and Operators ensure previous standards are not installed.

LIMITATIONS

AUXILIARY POWER UNIT

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GENERAL

Applicable to: ALL

Ident.: LIM-APU-10-00020088.0001001 / 17 MAR 17

APU START

After three consecutive APU start attempts, the flight crew must wait 60 min before a new start attempt.

Ident.: LIM-APU-10-00020089.0001001 / 17 MAR 17

ROTOR SPEED

Maximum N speed.. 107 %

Ident.: LIM-APU-10-00020090.0003001 / 17 MAR 17

EGT

Maximum EGT for APU start (below 35 000 ft)........................ 1 090 °C
Maximum EGT for APU start (above 35 000 ft)........................ 1 120 °C
Maximum EGT for APU running.. 675 °C

APU START/SHUTDOWN DURING REFUELING/DEFUELING

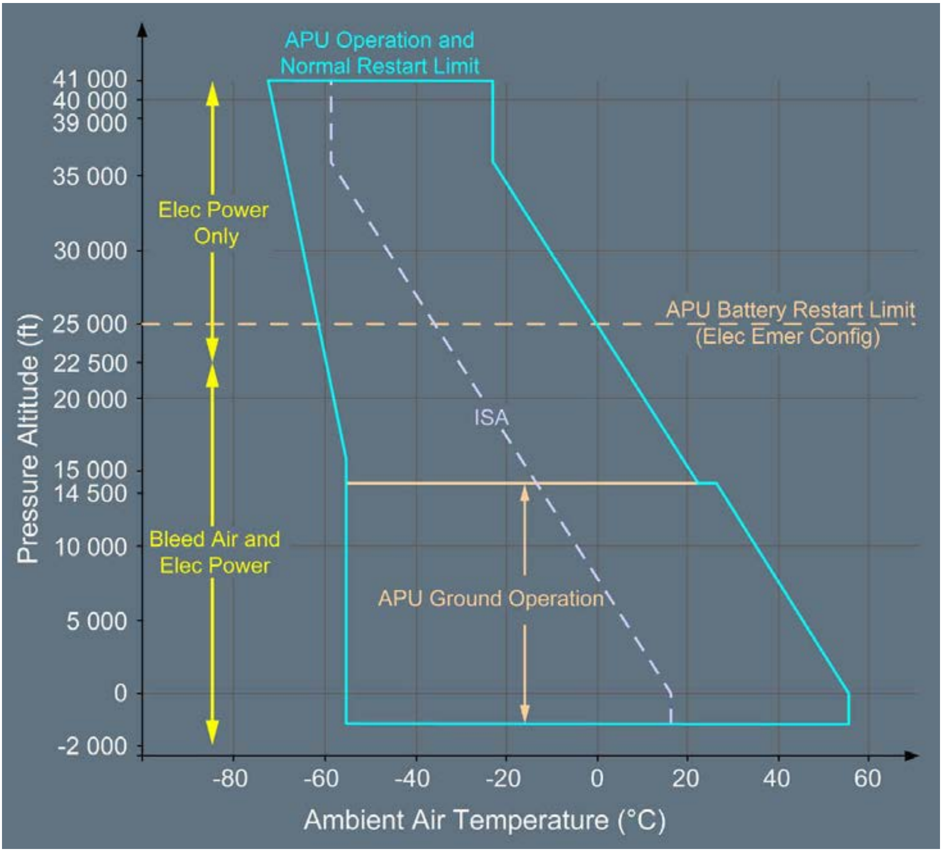
Ident.: LIM-APU-00020091.0001001 / 17 MAR 17
Applicable to: ALL

During refuel/defuel procedures, APU starts or shutdown are permitted with the following restrictions:
- If the APU failed to start or following an automatic APU shutdown, do not start the APU
- If a fuel spill occurs, perform a normal APU shutdown.

OPERATIONAL ENVELOPE

Applicable to: ALL

Ident.: LIM-APU-20-00019832.0003001 / 01 JUN 17



Ident.: LIM-APU-20-00021771.0002001 / 04 JUL 17

APU BLEED

Max altitude to assist engine start.. 20 000 ft
Max altitude for air conditioning and pressurization (single pack operation)........................ 22 500 ft
Max altitude for air conditioning and pressurization (dual pack operation)...........................15 000 ft
Use of APU bleed air for wing anti-ice is not permitted.

LIMITATIONS

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GSM ONBOARD

Ident.: LIM-COM-00020293.0001001 / 17 MAR 17
Applicable to: ALL

The use of mobile phones is prohibited in the toilets and the cockpit.

It is prohibited to use the GSM Onboard System:
- Below 3 000 m AGL (approximately 10 000 ft)
- In some geographical areas (refer to the "Regional Operation Data for the Onboard Mobile Telephony System" document for the identification of these geographical areas).

Note: *The GSM Onboard System is able to identify the above-mentioned flight conditions. If the system identifies any of these conditions, it automatically turns off.*

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LIMITATIONS

ENGINES

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THRUST SETTING/EGT LIMITS

Ident.: LIM-ENG-00019960.0004001 / 20 MAR 17
Applicable to: ALL

Operating Conditions		Time Limit	EGT Limit
Takeoff[(1)] and Go-around	All engines operative	5 min	950 °C
	One engine inoperative	10 min	
Maximum Continuous Thrust (MCT)		Not limited	915 °C
Starting	On ground		725 °C
	In flight		

(1) *Includes TOGA, FLEX, and DERATE thrust modes.*

SHAFT SPEEDS

Ident.: LIM-ENG-00020355.0002001 / 20 MAR 17
Applicable to: ALL

Maximum N1 .... 104 %

Note: *The N1 limit depends on the ambient conditions and on the configuration of the engine air bleed. These parameters may limit N1 to a value that is less than the above-mentioned N1 value (Refer to PER-THR-MTO MAXIMUM TAKEOFF).*

Maximum N2 .... 105 %

OIL

Ident.: LIM-ENG-00020354.0001001 / 20 MAR 17
Applicable to: ALL

OIL TEMPERATURE

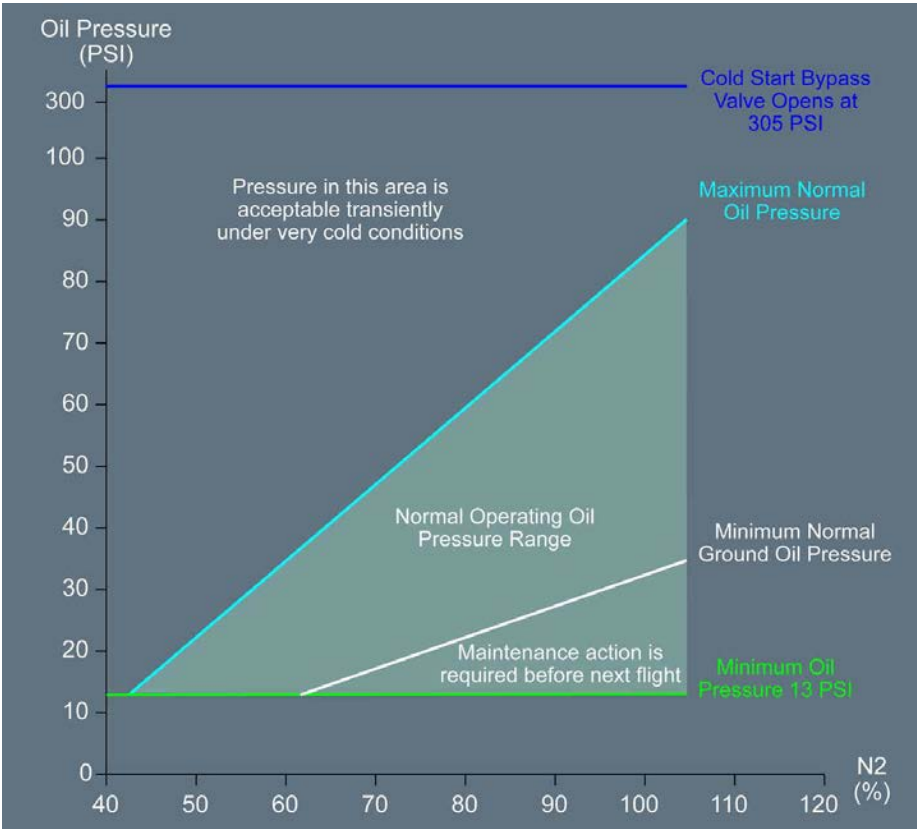
Maximum continuous temperature........ 140 °C
Maximum transient temperature (15 min)........ 155 °C
Minimum starting temperature........ -40 °C
Minimum temperature before takeoff........ -10 °C

OIL QUANTITY

Minimum oil quantity........ *Refer to PRO-NOR-SOP-04 ECAM*

OIL PRESSURE

MIN/MAX Oil Pressure (ECAM Indication)



STARTER

Ident.: LIM-ENG-00020356.0001001 / 20 MAR 17
Applicable to: ALL

- A standard automatic start that includes up to three start attempts, is considered one cycle
- For ground starts (automatic or manual), a 20 s pause is required between successive cycles
- A 15 min cooling period is required, subsequent to four failed cycles
- The starter must not be run when N2 is above 20 %.

REVERSE THRUST

Ident.: LIM-ENG-00020357.0002001 / 20 MAR 17
Applicable to: ALL

Selection of the reverse thrust is prohibited in flight.
Backing the aircraft with reverse thrust is not permitted.
Maximum reverse should not be used below 70 kt.

REDUCED THRUST TAKEOFF

Applicable to: ALL

Ident.: LIM-ENG-10-00020358.0021001 / 20 MAR 17

FLEX TAKEOFF

Takeoff at reduced thrust, so-called as FLEX takeoff, is permitted only if the airplane meets all performance requirements at the takeoff weight, with the operating engines at the thrust available for the flexible temperature (TFLEX).
Takeoff at reduced thrust is permitted with any inoperative item affecting the performance only if the associated performance shortfall has been applied to meet the above requirements.
FLEX takeoff is not permitted on contaminated runways.

TFLEX cannot be:
- Higher than TMAXFLEX, equal to ISA + 60 °C.
- Lower than the flat temperature (TREF).
- Lower than the actual OAT.

Ident.: LIM-ENG-10-00020359.0001001 / 20 MAR 17

DERATED TAKEOFF

Selection of TOGA thrust is not permitted when a derated takeoff is performed, except when requested in any abnormal or emergency procedures.
The use of reduced thrust takeoff (FLEX takeoff) is not permitted in association with derated takeoff.
The use of derated takeoff is permitted regardless of the runway condition (dry, wet, or contaminated).

SOFT GO-AROUND

Ident.: LIM-ENG-00020363.0001001 / 20 MAR 17
Applicable to: ALL

The use of soft go-around is prohibited with one engine inoperative.

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LIMITATIONS

FLIGHT CONTROLS

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FLIGHT MANEUVERING LOAD ACCELERATION LIMITS

Ident.: LIM-F_CTL-00020162.0001001 / 17 MAR 17
Applicable to: ALL

Refer to LIM-AG-F_CTL Flight Maneuvering Load Acceleration Limits.

MAXIMUM ALTITUDE FLAPS/SLATS EXTENDED

Ident.: LIM-F_CTL-00020160.0001001 / 17 MAR 17
Applicable to: ALL

Maximum operating altitude with slats and/or flaps extended..20 000 ft

MAXIMUM FLAPS/SLATS SPEEDS

Ident.: LIM-F_CTL-00020163.0001001 / 17 MAR 17
Applicable to: ALL

Refer to LIM-AG-SPD Maximum Flaps/Slats Speeds.

USE OF FLIGHT CONTROLS

Ident.: LIM-F_CTL-00020000.0001001 / 17 MAR 17
Applicable to: ALL

CAUTION	Rapid and large alternating control inputs, especially in combination with large changes in pitch, roll or yaw (e.g. large sideslip angles) may result in structural failures at any speed.

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LIMITATIONS

FUEL

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CERTIFIED FUEL

Ident.: LIM-FUEL-00019707.0001001 / 17 MAR 17
Applicable to: ALL

The fuel system is certified with: JET A, JET A1, JET B, JP4, JP5, JP8, N° 3 JET, RT, and TS-1, in accordance with engine manufacturers and fuel specifications.

FUEL MIXABILITY

Ident.: LIM-FUEL-00012852.0001001 / 03 JAN 11
Applicable to: ALL

The various types of fuel can be mixed in all proportions.
The freezing point of a fuel mixture varies, based on non-linear laws. If required, determine the fuel freezing point of the fuel mixture.

FUEL TEMPERATURE

Ident.: LIM-FUEL-00019708.0001001 / 17 MAR 17
Applicable to: ALL

	JET A1/JP8/ N°3 JET	JET A	JP5	RT	TS-1	JET B	JP4
MINI	-43 °C	-36 °C (1)	-42 °C	-45 °C	-45 °C	-46 °C	-54 °C
MAXI	54 °C					49 °C	

(1) *For JET A only, if TAT reaches -34 °C, monitor the fuel temperature on the FUEL SD page, to ensure that it remains above -36 °C.*

FUEL TEMPERATURE LIMITS WHEN JP4 AND JET B FUELS ARE USED

Ident.: LIM-FUEL-00019709.0001001 / 17 MAR 17
Applicable to: ALL

If the wing fuel temperature exceeds 30 °C at engine start, the altitude must be limited to 35 000 ft until the center tank is empty.
If the wing fuel temperature exceeds 40 °C at engine start, the altitude must be limited to 30 000 ft until the center tank is empty.
If the wing fuel temperature exceeds 49 °C at engine start, the altitude must be limited to 25 000 ft until the center tank is empty.

Reason : At high altitude with high fuel temperature, the pressure supplied by the center tank pumps becomes lower than the pressure supplied by the wing tank pumps.

MAXIMUM ALLOWED FUEL IMBALANCE

Ident.: LIM-FUEL-00020435.0001001 / 17 MAR 17
Applicable to: ALL

The following tables indicate the maximum allowed wing imbalance at takeoff, in flight, and at landing.

FUEL IMBALANCE AT TAKEOFF

INNER TANKS (OUTER TANKS BALANCED)

Tank Fuel Quantity (Heavier Tank)	Maximum Asymmetry
Full	500 kg (1 102 lb)
3 000 kg (6 613 lb)	1 050 kg (2 314 lb)
1 450 kg (3 196 lb)	1 450 kg (3 196 lb)

The variation is linear between these values.

OUTER TANKS (INNER TANKS BALANCED)

Maximum Asymmetry	370 kg (815 lb)

FUEL IMBALANCE IN FLIGHT AND AT LANDING

INNER TANKS (OUTER TANKS BALANCED)

Tank Fuel Quantity (Heavier Tank)	Maximum Asymmetry
Full	1 500 kg (3 306 lb)
4 300 kg (9 479 lb)	1 600 kg (3 527 lb)
2 250 kg (4 960 lb)	2 250 kg (4 960 lb)

The variation is linear between these values, and there is no limitation below 2 250 kg (4 960 lb).

OUTER TANKS

Maximum Asymmetry	690 kg (1 521 lb)(1)

(1) *The maximum fuel imbalance in the outer wing fuel tanks (one full/one empty) is allowed provided that:*
- *The fuel quantity of the outer and inner wing fuel tanks of one side is equal to the fuel quantity of the outer and inner wing fuel tanks on the other side, or*
- *On the side of the lighter outer tank, the fuel quantity of the inner tank is more than the fuel quantity of the opposite inner tank. The difference between the fuel quantity in the inner tanks should not be more than 3 000 kg (6 613 lb).*

Note: *In exceptional conditions (i.e. fuel system failure), the above-mentioned values for maximum fuel imbalance may be exceeded without significant effect to the aircraft handling qualities. The aircraft remains fully controllable in all flight phases.*

MINIMUM FUEL QUANTITY FOR TAKEOFF

Ident.: LIM-FUEL-00019771.0001001 / 17 MAR 17
Applicable to: ALL

Minimum fuel quantity for takeoff..1 500 kg (3 307 lb)
The ECAM alerts that are related to fuel low level in the wing tanks (FUEL WING TK LO LVL, etc.) must not appear for takeoff.

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LIMITATIONS

ICE AND RAIN PROTECTION

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DEFINITION OF ICING CONDITIONS

Ident.: LIM-ICE_RAIN-00020608.0001001 / 17 MAR 17
Applicable to: ALL

- Icing conditions exist when the OAT (on ground or after takeoff) or the TAT (in flight) is at or below 10 °C and visible moisture in any form is present (such as clouds, fog with visibility of one nautical mile or less, rain, snow, sleet or ice crystals).
- Icing conditions also exist when the OAT on the ground and for takeoff is at or below 10 °C and operating on ramps, taxiways or runways where surface snow, standing water or slush may be ingested by the engines, or freeze on engines, nacelles or engine sensor probes.

DEFINITION OF SEVERE ICE ACCRETION

Ident.: LIM-ICE_RAIN-00020609.0001001 / 17 MAR 17
Applicable to: ALL

Ice accretion is considered severe when the ice accumulation on the airframe reaches approximately 5 mm (0.2 in) thick or more.

DEFINITION OF THIN HOARFROST

Ident.: LIM-ICE_RAIN-00020610.0001001 / 17 MAR 17
Applicable to: ALL

Thin hoarfrost is typically a white crystalline deposit which usually develops uniformly on exposed surfaces on cold and cloudless nights.
It is so thin that surface features (lines or markings) can be distinguished beneath it.

RAIN REPELLENT

Ident.: LIM-ICE_RAIN-00020224.0001001 / 17 MAR 17
Applicable to: ALL

The flight crew should only use the rain repellent in the case of moderate to heavy rain.

WIPERS MAXIMUM OPERATING SPEED

Ident.: LIM-ICE_RAIN-00020225.0001001 / 17 MAR 17
Applicable to: ALL

Refer to LIM-AG-SPD Wipers Maximum Operating Speed.

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LIMITATIONS

LANDING GEAR

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BRAKING SYSTEM

Ident.: LIM-LG-00020233.0001001 / 17 MAR 17
Applicable to: ALL

The braking system is not designed to hold the aircraft in a stationary position when a high thrust level is applied on at least one engine.
During ground procedures that require a thrust increase with braking, the flight crew must ensure that the aircraft remains stationary, and must be ready to immediately retard the thrust levers to IDLE.

BRAKE TEMPERATURE

Ident.: LIM-LG-00020255.0001001 / 17 MAR 17
Applicable to: ALL

Maximum brake temperature for takeoff (brake fans off)..300 °C

MAXIMUM SPEEDS WITH THE LANDING GEAR EXTENDED

Ident.: LIM-LG-00020237.0001001 / 17 MAR 17
Applicable to: ALL

Refer to LIM-AG-SPD Maximum Speeds with the Landing Gear Extended.

MAXIMUM TIRE SPEED

Ident.: LIM-LG-00020238.0001001 / 17 MAR 17
Applicable to: ALL

Refer to LIM-AG-SPD Maximum Tire Speed.

NOSEWHEEL STEERING (NWS)

Ident.: LIM-LG-00020236.0001001 / 17 MAR 17
Applicable to: ALL

For NWS angle limit, *Refer to DSC-20-30 Taxiing*.
Towbarless operation on the nose landing gear (towing and pushback) is approved when using the accepted towbarless towing vehicles listed in the Airbus WISE ISI 09.11.00001, with the following information:
Maximum NWS angle.. 85 °

TAXI WITH DEFLATED OR DAMAGED TIRES

Ident.: LIM-LG-00020235.0001001 / 01 JUN 17
Applicable to: ALL

To vacate the runway or taxi at low speed with tire(s) deflated (not damaged), all of the following limitations apply:
- If maximum one tire per gear is deflated (consider three gears)
  Maximum taxi speed during turn... 7 kt
- If two tires are deflated on the same main gear (maximum one main gear)
  Maximum taxi speed.. 3 kt
- For the nosewheel steering (NWS) angle
  Maximum NWS angle.. 30 °

In addition, if tire damage is suspected, the flight crew must ask for an aircraft inspection prior to vacate the runway or taxi. If the ground crew suspects that a tire burst may damage the landing gear, maintenance action is due.
For more information, *Refer to FCTM/PR-AEP-LG Taxi with Deflated or Damaged Tires*.

LIMITATIONS

NAVIGATION

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INERTIAL REFERENCE SYSTEM (IRS)

Ident.: LIM-NAV-00020081.0001001 / 17 MAR 17
Applicable to: ALL

IR GROUND ALIGNMENT

Ground alignment of the IRS is possible in latitudes between 73 ° North and 73 ° South.

MAGNETIC (MAG) REFERENCE

■ **If all ADIRUs have the same magnetic variation table:**

In NAV mode, the IR will not provide valid magnetic heading and magnetic track angle:
- North of 73 ° North, and
- South of 60 ° South.

Flying at latitudes beyond these limits is prohibited.

■ **If one ADIRU has a different magnetic variation table:**

In NAV mode, the IR will not provide valid magnetic heading and magnetic track angle:
- North of 60 ° North, between 30 ° West and 160 ° West, and
- North of 73 ° North, and
- South of 55 ° South.

Flying at latitudes beyond these limits is prohibited.

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LIMITATIONS

<u>OXYGEN</u>

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MINIMUM FLIGHT CREW OXYGEN PRESSURE

Ident.: LIM-OXY-00020232.0004001 / 17 MAR 17
Applicable to: ALL

REF Temperature (1)		°C	-10	0	10	20	30	40	50
		°F	14	32	50	68	86	104	122
MIN Bottle Pressure (PSI)(2)	2 Crewmembers		716	744	771	798	826	853	880
	2 Crewmembers + 1 OBS		874	907	940	974	1 007	1 040	1 073
	2 Crewmembers + 2 OBS		1 103	1 145	1 187	1 229	1 270	1 312	1 354

(1) *REF Temperature :*
- *On ground* : *REF Temperature = (OAT + Cockpit TEMP) / 2*
- *In flight* : *REF Temperature = CAB TEMP (°C) - 10 °C, or*
  REF Temperature = CAB TEMP (°F) - 18 °F

(2) *Minimum Bottle Pressure to Cover:*
- *Preflight checks*
- *The use of oxygen, when only one flight crewmember is in the cockpit*
- *Unusable quantity (to ensure regulator operation with minimum pressure)*
- *Normal system leakage*
- *The most demanding case among the following:*
  - *Protection after loss of cabin pressure, with mask regulator on NORMAL (diluted oxygen):*
    - *During emergency descent for all flight crewmembers and observers for 22 min*
    - *During cruise at FL 100 for two flight crewmembers for 98 min.*
  - *Protection against smoke with 100 % oxygen for all flight crewmembers and observers during 15 min at 8 000 ft cabin altitude.*

Note: *The above times that are based on the use of a sealed mask may be shorter for bearded crew (in terms of performance, pressure, or duration).*

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LIMITATIONS

SURVEILLANCE

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GPWS / PREDICTIVE GPWS

Ident.: LIM-SURV-00019775.0001001 / 17 MAR 17
Applicable to: ALL

Aircraft navigation must not be based on the use of the terrain display .
The terrain display is intended to serve as a situation awareness tool only, and may not provide the accuracy on which to solely base terrain avoidance maneuvering.

The predictive GPWS functions should be inhibited (TERR pushbutton to OFF, on the GPWS panel) when the aircraft position is less than 15 NM from the airfield:
- For operations from/to runways not incorporated in the predictive GPWS database.
- For specific approach procedures, which were previously identified as potentially causing false terrain alerts.

Only aircraft with Man-made Obstacle Function can display obstacles on ND and trigger alerts, based on a dedicated database which includes artificial obstacles worldwide.

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OPERATIONS ENGINEERING BULLETINS

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LIST OF EFFECTIVE OPERATIONS ENGINEERING BULLETIN

M(1)	Identification	T(2)	E(3)	Rev. Date	Title
	OEB48 issue 2	R	N	19 JAN 17	Abnormal V Alpha Prot
	Criteria: 27-1244, 34-1444, P5834, SA **Applicable to: ALL**				
	OEB41 issue 3	W	N	15 OCT 15	Erroneous Alternate Fuel Predictions Upon Modification of a Company Route in the Alternate Flight Plan
	Criteria: 22-1269 **Applicable to: ALL**				
	OEB46 issue 1	W	N	05 NOV 13	No Engagement of Guidance Mode
	Criteria: 27-1238 **Applicable to: ALL**				
	OEB47 issue 1	W	Y	20 DEC 13	HYD ENG PUMP LO PR followed by HYD RSVR OVHT
	Criteria: SA **Applicable to: ALL**				

(1) Evolution code : N=New, R=Revised, E=Effectivity
(2) Type of OEB: R=Red, W=White
(3) Affects ECAM: Y=Yes, N=No

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M	Localization	DU Title	DU identification	DU date

No Temporary Documentary Unit

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OPERATIONS
ENGINEERING BULLETINS

GENERAL DESCRIPTION

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GENERAL DESCRIPTION

Applicable to: ALL

Ident.: OEB-GEN-A-00014181.0001001 / 23 NOV 11

An Operations Engineering Bulletin (OEB) is issued to rapidly inform operators of any deviations from initial design objectives that have a significant operational impact. An OEB provides the operators with technical information and temporary operational procedures that address these deviations.

Ident.: OEB-GEN-A-00014182.0001001 / 23 NOV 11

TYPE OF OEB

OEBs can either be red or white, depending on their level of priority.

- RED OEBs are issued to indicate that non-compliance with the recommended procedures may have a significant impact on the safe operation of the aircraft.
- WHITE OEBs are issued to indicate that non-compliance with the recommended procedures may have a significant impact on aircraft operation.

Airbus strongly recommends that all Operators rapidly apply the OEB corrective actions as soon as they become available, particularly for red OEBs.

Ident.: OEB-GEN-A-00014183.0001001 / 23 JUN 15

OEB CONTENT AND MANAGEMENT

An OEB:
- Is temporary and usually focuses on one operational subject only,
- Is included in the OEB section of both the FCOM and QRH . The procedural part of each white or red OEB (OEB PROC) is provided in the OEB section of the QRH, so that the flight crew can easily access the procedures,
- Remains applicable until the appropriate corrective actions are completed.

Note: *After installation of the OEB corrective modification/Service Bulletins (SB): if an Operator reinstalls any spare equipment for which there was an associated OEB , it is Operator's responsibility to ensure that this OEB be applied again for the applicable aircraft.*

OEB IN THE FCOM

The content of each OEB includes:
- The reason for issue,
- Technical explanations of the deviation from the initial design objectives,
- The operational impact if the flight crew does not apply the OEB procedure,

Continued on the following page

GENERAL DESCRIPTION (Cont'd)

- The conditions for applying the OEB procedures :
  - ECAM warning/caution affected by the OEB,
  - Cockpit effects,
  - Flight phases,
  - Specific event.
- The OEB operational procedure(s) to be applied,
- The corrective actions that cancel the OEB (if available),
- The OEB REMINDER codes, (if applicable).

OEB IN THE QRH

Each FCOM OEB has an associated “OEB PROC ” in the OEB section of the QRH, that includes:
- The title of the OEB PROC,
- The “ECAM ENTRY" field:
  This section identifies whether or not one of the possible conditions for applying the OEB PROC is an ECAM warning/caution.
  The flight crew must disregard the ECAM procedure and/or STATUS of the ECAM alerts listed in the "ECAM ENTRY" field and must apply the QRH ’s OEB procedure instead.
- The OEB operational procedure(s) that the flight crew must apply.

FCOM LIST OF EFFECTIVE OEB

The List of Effective Operations Engineering Bulletins (LEOEB) enables to review all the Operations Engineering Bulletins (OEB s) that are applicable to the fleet. Each time an OEB is issued or revised, the LEOEB is updated.

M (1)	Identification	T (2)	E (3)	REV. Date	Title
	OEB38 issue 1	R	N	18 MAR 11	Erroneous Radio Altimeter Height Indication
	Criteria: SA Applicable to: ALL				

(1) Evolution code: N=New, R=Revised, E=Effectivity
(2) Type of OEB: R=Red, W=White
(3) Affects ECAM: Y=Yes, N=No

The FCOM LEOEB consists of:

Continued on the following page

GENERAL DESCRIPTION (Cont'd)

The "M" field that may provide the following Evolution Code:
- The "N" letter indicates a new OEB, or
- The "R" letter indicates a revised OEB, or
- The "E" letter indicates an aircraft validity change on the OEB.

The "Identification" field which identifies the OEB with its identification number.

Note: *The FCOM OEB and associated QRH OEB PROC have the same OEB number in order to be consistent. However, the issue number of the QRH OEB PROC and the FCOM OEB may be different, because a revision of an FCOM OEB does not necessarily result in a revision of the corresponding QRH OEB PROC, that only provides the procedure part.*

The "T" field indicates the Type of OEB:
- The "W" letter indicates a white OEB, or
- The "R" letter indicates a red OEB.

Note: *OEB s are listed by type of OEB (RED OEB s first, then WHITE OEB s), and in numerical order for each type of OEB . This enables the flight crew to easily review the OEBs before flight.*

The "E" field indicates whether or not the OEB affects ECAM procedure(s). This enables the flight crew to easily review the OEB s before flight particularly for Operators that use the OEB REMINDER function:
- The "Y" letter indicates that the OEB affects only ECAM procedure(s),
- The "N" letter indicates that at least one of the procedures provided in the OEB does not affect ECAM procedure(s).

CAUTION	When Airbus provides the Operator with the LEOEB , the information “AFFECTS ECAM : Y” ("E" field) does not necessarily mean that (for Operators using the OEB REMINDER function) the Operator’s maintenance personnel has activated the OEB REMINDER codes for this OEB onboard the aircraft. It is the Operator’s responsibility to define a suitable process for providing the flight crew with confirmation that the OEB REMINDER codes are activated for the ECAM alerts affected by OEBs.

The "Rev Date" field indicates the date at which the OEB content was issued/changed
The "Title" field provides the OEB title.

Continued on the following page

GENERAL DESCRIPTION (Cont'd)

QRH LIST OF EFFECTIVE OEB

The List of Effective Operations Engineering Bulletins (LEOEB) enables to review all the Operations Engineering Bulletins (OEB s) that are applicable to the fleet. Each time an OEB is issued or revised, the LEOEB is updated.

Identification	Title
OEB26 **Issue 1**	**Erroneous Radio Altimeter (RA) Height Indication** ECAM Entry None
OEB33 Issue 1	Pack Flow Monitoring ECAM Entry None
OEB34 Issue 1	NAV ADR 1+2+3 FAULT ECAM Warning Undue Activation ECAM Entry NAV ADR 1+2+3 FAULT
OEB35 **Issue 2**	**Loss of AP and A/THR Associated with Alternate Law Reversion** ECAM Entry None

The QRH LEOEB consists of:
The "Identification" field which identifies the OEB with its identification and issue number.

Note: *The FCOM OEB and associated QRH OEB PROC have the same OEB number in order to be consistent. However, the issue number of the QRH OEB PROC and the FCOM OEB may be different, because a revision of an FCOM OEB does not necessarily result in a revision of the corresponding QRH OEB PROC, that only provides the procedure part.*

Red OEB identification number and title are in bold font. White OEB identification number and title are in regular font. This enables the flight crew to easily review the OEBs before flight.

Note: *OEBs are listed in numerical order regardless of the type of OEB (red or white).*

The "Title" field provides the OEB title and the "ECAM Entry " part of the OEB PROC. This enable the flight crew to easily review the OEB s before flight particularly for Operators that use the OEB REMINDER function.

Continued on the following page

GENERAL DESCRIPTION (Cont'd)

CAUTION	When Airbus provides the Operator with the LEOEB , the information "ECAM Entry " does not necessarily mean that (for Operators using the OEB REMINDER function) the Operator's maintenance personnel has activated the OEB REMINDER codes for this OEB onboard the aircraft. It is the Operator's responsibility to define a suitable process for providing the flight crew with confirmation that the OEB REMINDER codes are activated for the ECAM alerts affected by OEBs.

A vertical bar in the margin of the QRH LEOEB identifies that the OEB is either new, revised or has an aircraft validity change.

Ident.: OEB-GEN-A-00014184.0001001 / 23 NOV 11

REVIEW OF THE OEB

In accordance with the Standard Operating Procedures, and before each flight, the flight crew must review all OEB s that are applicable to their aircraft. If the OEB conditions are applicable, the flight crew must apply the operational procedure(s) that is in the QRH OEB section.

Ident.: OEB-GEN-A-00014185.0001001 / 23 NOV 11

DISTRIBUTION

OEB are distributed to all affected Operators. The Operators shall provide flight crews with the content of the OEB without delay.

Ident.: OEB-GEN-A-00014186.0001001 / 23 JUN 15

OEB REMINDER FUNCTION

The OEB reminder function provides operational help to the flight crew by enabling them to clearly identify on the ECAM all procedures and STATUS messages superseded by an OEB procedure.
When a situation causes an ECAM warning/caution to trigger, a message informs the flight crew in real time that there is an OEB for the displayed ECAM warning/caution and/or STATUS, and as a result, that the ECAM procedure and/or STATUS is changed. In this case, a specific ECAM message informs the flight crew to refer to the QRH. For more information *Refer to FCOM DSC-31-OEB Reminder*.
The OEB reminder function may not be activated for some OEB s. For example, when an OEB procedure supersedes an ECAM procedure, under specific conditions only, the OEB reminder function is not activated, in order to let the flight crew assess the need to apply the OEB procedure or the ECAM procedure.
The OEB reminder function does not relieve the flight crew of their responsibility to review the applicable OEBs during the cockpit preparation.

Continued on the following page

GENERAL DESCRIPTION (Cont'd)

OEB REMINDER CODE

The maintenance personnel must enter specific OEB REMINDER code(s) in the FWC OEB database in order to update the ECAM.
These OEB REMINDER codes are provided in the FCOM OEB chapter only, and are sent to the Operator's Flight Operations department along with the associated QRH OEB PROC . This is to ensure that the OEB database is not updated before the OEB procedure is available in the QRH and FCOM onboard documentation.

Good coordination between the Airline's/Operator's Flight Operations department and the Airline's/Operator's Engineering department must be established, in order to:
- Ensure that the QRH OEB section is updated onboard the aircraft before the activation of the OEB REMINDER function for a specific OEB.
- Rapidly send information about the OEB REMINDER codes to the Engineering department for a rapid update of the ECAM.
- Provide the flight crew with confirmation that the OEB REMINDER codes are activated onboard the aircraft for the ECAM alerts affected by OEBs.

CAUTION	As soon as the maintenance personnel has embodied the corrective action that cancels the OEB on a specific aircraft, the Operator must ensure that: 1. Maintenance personnel has deactivated the OEB REMINDER function for the specific OEB , before informing their Flight Operations department of the installation of the OEB correction action. 2. The QRH OEB section onboard the aircraft is updated to remove the specific OEB from the applicable aircraft.

OPERATIONS ENGINEERING BULLETINS

ERRONEOUS ALTERNATE FUEL PREDICTIONS UPON MODIFICATION OF A COMPANY ROUTE IN THE ALTERNATE FLIGHT PLAN

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OEB41 Issue 3
Associated with QRH OEB Proc N°: OEB41/1.0
ERRONEOUS ALTERNATE FUEL PREDICTIONS UPON MODIFICATION OF A COMPANY ROUTE IN THE ALTERNATE FLIGHT PLAN

Ident.: OEB-41-00013609.0001001 / 15 OCT 15
Applicable to: ALL

Approved by: Head of Airbus Flight Operations & Training Support

- This OEB covers a significant operational issue. Non-compliance with this OEB may have a significant impact on the operations of the aircraft. The Operators shall distribute its content to all flight crews without delay. An extract of this OEB is provided for insertion in the QRH.
- It is recommended that all Operators accelerate the incorporation of all corrective Service Bulletins as soon as they become available.

Reason for issue:

Issue 3:
This OEB is reissued to update the "Cancelled by" section with the name of the FMS standards cancelling the OEB. There is no technical change.
Issue 2:
This OEB is reissued to enhance the display of the MCDU FUEL PRED page (without technical change).
The objective is to address format standardization and enhanced readability.
Issue 1:
This OEB replaces the A320 OEB 204
This OEB is issued to inform the operators of the following: Erroneous alternate (ALTN) fuel predictions are experienced when the flight crew modifies a company route (CO RTE) previously inserted in the alternate Flight Plan (F-PLN).
This OEB provides an explanation and operational recommendations in case of erroneous ALTN fuel predictions.

Applicable to:

Aircraft with Honeywell FMGC Release 1A "H2" (MOD 38778, Airbus SB A320 22-1269 and MOD 38779, Airbus SB A320 22-1270)

Cancelled by:

FMS Honeywell standard H2C and subsequent.
The FMS standard H2C is installed by the following FMGC standards:

- FMGC standard H2CC14 (MOD 157166)
- FMGC standard H2CPC14 (MOD 161459)
- FMGC standard H2CI14 (MOD 156957)
- FMGC standard H2CPI13 (MOD 155494)

Note: The interchangeability code, given in the Illustrated Part Catalog (IPC), indicates the conditions for interchangeability of equipment. After installation of corrective modification(s)/SB(s), if an Operator reinstalls any equipment affected by this OEB, it is the Operator's responsibility to ensure that the recommendations given in this OEB are applied again for the applicable aircraft.

Operations Engineering Bulletins are issued by Airbus, as the need arises, to quickly transmit technical and procedural information. They are distributed to all FCOM holders and to others who need advice of changes to operational information.
The information in the OEB is recommended by Airbus, but may not be approved by Airworthiness Authorities. If the procedures contained in this OEB differ from the procedures in the AFM, the AFM remains the reference.

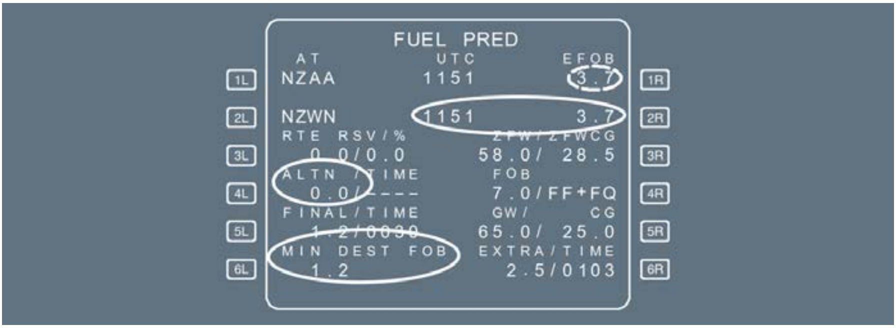
M	Localization	T	DU Title	DU identification	DU date
	OEB-41		**Erroneous Alternate Fuel Predictions Upon Modification of a Company Route in the Alternate Flight Plan**	00013609.0001001	15 OCT 15
	Criteria: 22-1269 **Applicable to: ALL**				
	OEB-41		**Erroneous Alternate Fuel Predictions Upon Modification of a Company Route in the Alternate Flight Plan**	00013610.0001001	15 OCT 15
	Criteria: 22-1269 **Applicable to: ALL**				

ERRONEOUS ALTERNATE FUEL PREDICTIONS UPON MODIFICATION OF A COMPANY ROUTE IN THE ALTERNATE FLIGHT PLAN

Ident.: OEB-41-00013610.0001001 / 15 OCT 15
Applicable to: ALL

EXPLANATION

When the flight crew modifies the CO RTE in the ALTN F-PLN , the FMS no longer computes the ALTN fuel predictions (refer to the below illustration).
This CO RTE could be extracted from the Navigation database or stored by the flight crew.
The modification of the CO RTE by the flight crew could be for example an entry of a departure or an arrival procedure.



The consequences of the CO RTE modification are:
- The fuel predictions are set to zero for the ALTN (solid circles) on FUEL PRED page (also on INIT FUEL PRED if done on ground)
  This condition is sufficient to apply the operational recommendations provided in the "PROCEDURE" paragraph.
- The Estimated Fuel On Board (EFOB) and the predicted UTC (solid circles) at ALTN destination becomes equal to the EFOB and the UTC at the Primary Destination
- If the ALTN fuel and the MIN DEST FOB values on FUEL PRED page are both at their default value (i.e. have not been modified by the crew), the MIN DEST FOB (solid circle) becomes erroneous (equal to FINAL instead of FINAL+ ALTN). Therefore, the MCDU scratchpad message "DEST EFOB BELOW MIN", is no longer triggered on the expected threshold
- If the flight crew had entered a value for the ALTN fuel, the entry is correctly used (but no more modifiable unless a new ALTN is entered)

Continued on the following page

ERRONEOUS ALTERNATE FUEL PREDICTIONS UPON MODIFICATION OF A COMPANY ROUTE IN THE ALTERNATE FLIGHT PLAN (Cont'd)

- If the flight crew had manually entered the MIN DEST FOB value on FUEL PRED page (but not the ALTN fuel value), then the message "CHECK MIN DEST FOB" is no longer triggered at the correct threshold

However, the new ALTN F-PLN is correctly displayed on the F-PLN page, the Navigation Display (ND) and the INIT page correctly shows the ALTN identifier.

Note: *The EFOB of the primary destination remains correctly computed (dashed circle).*

The reason for the anomaly is that when the ALTN CO RTE is modified, the FMS erroneously assumes there is no alternate F-PLN anymore for the fuel predictions. An additional modification of the ALTN F-PLN enables to recover correct ALTN fuel predictions.

PROCEDURE

This procedure only applies when a CO RTE is used for ALTN F-PLN . In the case of ALTN fuel predictions erroneously set to zero further to a modification of this ALTN F-PLN:

ENTER manually a waypoint in the en-route F-PLN (neither in the departure, nor in the arrival), to start a new computation of ALTN fuel predictions
Maintain or delete the entered waypoint at convenience
Check the ALTN fuel predictions are correct

CORRECTIVE ACTION

Honeywell FMS standard H2C cancels this OEB (*Refer to OEB-41 Erroneous Alternate Fuel Predictions Upon Modification of a Company Route in the Alternate Flight Plan - Approval* "Cancelled by" section).

END OF OEB41

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OPERATIONS
ENGINEERING BULLETINS

NO ENGAGEMENT OF GUIDANCE MODE

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OEB46 Issue 1
Associated with QRH OEB Proc N°: OEB46/1.0
NO ENGAGEMENT OF GUIDANCE MODE

Ident.: OEB-46-00015286.0001001 / 05 NOV 13
Applicable to: ALL

Approved by: Head of Airbus Flight Operations & Training Support

- This OEB covers a significant operational issue. Non-compliance with this OEB may have a significant impact on the operations of the aircraft. The Operators shall distribute its content to all flight crews without delay. An extract of this OEB is provided for insertion in the QRH.
- It is recommended that all Operators accelerate the incorporation of all corrective Service Bulletins as soon as they become available.

Reason for issue: The objective of this OEB is to highlight that in the event of an erroneous Radio Altimeter (RA) height indication, guidance modes may not engage as expected.

Applicable to: All A318/A319/A320/A321 aircraft equipped with the ELAC L97 standard (or subsequent ELAC standards).

Cancelled by: FG C14 or FG PC14 or FG I15 or FG PI13 standards.

Note: The interchangeability code, given in the Illustrated Part Catalog (IPC), indicates the conditions for interchangeability of equipment. After installation of corrective modification(s)/SB(s), if an Operator reinstalls any equipment affected by this OEB, it is the Operator's responsibility to ensure that the recommendations given in this OEB are applied again for the applicable aircraft.

Operations Engineering Bulletins are issued by Airbus, as the need arises, to quickly transmit technical and procedural information. They are distributed to all FCOM holders and to others who need advice of changes to operational information.
The information in the OEB is recommended by Airbus, but may not be approved by Airworthiness Authorities. If the procedures contained in this OEB differ from the procedures in the AFM, the AFM remains the reference.

M	Localization	T	DU Title	DU identification	DU date
	OEB-46		**No Engagement of Guidance Mode**	00015286.0001001	05 NOV 13
	Criteria: 27-1238 **Applicable to: ALL**				
	OEB-46		**No Engagement of Guidance Mode**	00015287.0001001	05 NOV 13
	Criteria: 27-1238 **Applicable to: ALL**				

NO ENGAGEMENT OF GUIDANCE MODE

Ident.: OEB-46-00015287.0001001 / 05 NOV 13
Applicable to: ALL

EXPLANATION

If a RA transmits an erroneous height indication, this may have any of the following effects on the auto flight system depending on the flight phase. However, these effects may not necessarily occur in every case of an erroneous RA height indication.

Auto Flight System mode changes (indicated on FMA):

- NAV mode engagement is not possible after takeoff,
- In case of go-around and if the RA is still frozen at a very low height indication:
  - SRS and GA TRK modes engage,
  - NAV, HDG or TRK lateral modes cannot be selected,
  - LVR CLB will not be displayed on the FMA at THR RED ALT,
  - ALT* and ALT will not engage at FCU altitude.

  Disconnecting AP and resetting both FDs enable to recover basic mode (HDG and V/S).

PROCEDURE

■ **During go-around**

● **If SRS and GA TRK modes remain engaged and other guidance modes cannot be selected or engaged as expected:**

Note: - *At the thrust reduction altitude, LVR CLB will not be displayed on the FMA,*
- *ALT* and ALT will not engage at the FCU altitude.*

Disconnect APs.
Set both FD s to OFF then ON. FDs revert to basic modes (HDG - V/S).
Re-engage guidance modes as appropriate.

■ **For the approach that follows the go-around:** Do not arm the G/S mode.

Flight crews must report, in the technical logbook, any of the above-listed consequences of erroneous RA height.

CORRECTIVE ACTION

FG C14 or FG PC14 or FG I15 or FG PI13.

END OF OEB46

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OPERATIONS
ENGINEERING BULLETINS

HYD ENG PUMP LO PR FOLLOWED BY
HYD RSVR OVHT

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OEB47 Issue 1
Associated with QRH OEB Proc N°: OEB47/2.0
HYD ENG PUMP LO PR FOLLOWED BY HYD RSVR OVHT

Ident.: OEB-47-00015327.0001001 / 20 DEC 13
Applicable to: ALL

Approved by: Head of Airbus Flight Operations & Training Support

- This OEB covers a significant operational issue. Non-compliance with this OEB may have a significant impact on the operations of the aircraft. The Operators shall distribute its content to all flight crews without delay. An extract of this OEB is provided for insertion in the QRH.
- It is recommended that all Operators accelerate the incorporation of all corrective Service Bulletins as soon as they become available.

Reason for issue:

This OEB is issued to provide operational recommendations in the case of a :
- HYD G ENG 1 PUMP LO PR ECAM caution followed by a HYD Y RSVR OVHT ECAM caution
- HYD Y ENG 2 PUMP LO PR ECAM caution followed by a HYD G RSVR OVHT ECAM caution

Applicable to: All A318/A319/A320/A321 Aircraft.

Cancelled by: Power Transfer Unit (PTU) inhibition logic (MOD 35938 or MOD153173)

Note: The interchangeability code, given in the Illustrated Part Catalog (IPC), indicates the conditions for interchangeability of equipment. After installation of corrective modification(s)/SB(s), if an Operator reinstalls any equipment affected by this OEB, it is the Operator's responsibility to ensure that the recommendations given in this OEB are applied again for the applicable aircraft.

Operations Engineering Bulletins are issued by Airbus, as the need arises, to quickly transmit technical and procedural information. They are distributed to all FCOM holders and to others who need advice of changes to operational information.
The information in the OEB is recommended by Airbus, but may not be approved by Airworthiness Authorities. If the procedures contained in this OEB differ from the procedures in the AFM, the AFM remains the reference.

M	Localization	T	DU Title	DU identification	DU date
	OEB-47		**HYD ENG PUMP LO PR followed by HYD RSVR OVHT**	00015327.0001001	20 DEC 13
	Criteria: SA **Applicable to: ALL**				
	OEB-47		**HYD ENG PUMP LO PR followed by HYD RSVR OVHT**	00015328.0001001	20 DEC 13
	Criteria: SA **Applicable to: ALL**				

HYD ENG PUMP LO PR FOLLOWED BY HYD RSVR OVHT

Ident.: OEB-47-00015328.0001001 / 20 DEC 13
Applicable to: ALL

REASON FOR ISSUE

A fluid leakage from the green (yellow) hydraulic system causes a decrease in hydraulic pressure. When the difference in pressure between the green and yellow systems reaches 500 PSI, the PTU is automatically activated to transfer hydraulic power between the two systems. However, due to the fluid leakage, the PTU cannot pressurize the green (yellow) system and starts to run at high speed, heating up the hydraulic fluid in the yellow (green) hydraulic system. This results in an overheat of the yellow (green) hydraulic reservoir and the associated ECAM caution triggers. When the flight crew applies the successive ECAM procedures, both yellow and green hydraulic systems are lost and the Flight Warning Computer (FWC) triggers the HYD G+Y SYS LO PR ECAM warning.
The purpose of this OEB is to inform operators about the operational effect of such a failure, and to provide an operational procedure to prevent a dual hydraulic system loss in the described conditions.

EXPLANATION

The main cause of these dual hydraulic loss events is a fluid leakage from the green hydraulic system during landing gear retraction. The decrease in pressure due to this leakage triggers the HYD G ENG 1 PUMP LO PR ECAM caution and automatically activates the PTU . However, because of the leakage, the PTU operates at high speed due to its inability to pressurize the green hydraulic system. This causes the yellow hydraulic reservoir to overheat, and the FWC to trigger the HYD Y RSVR OVHT ECAM caution.
The ECAM HYD G ENG 1 PUMP LO PR and HYD Y RSVR OVHT procedures specify to set their respective pumps to off. When the flight crew applies these procedures, this results in a loss of the yellow and green hydraulic systems and a HYD G+Y SYS LO PR ECAM warning.
During the initial climb, the HYD G RSVR LO LVL ECAM caution is inhibited. Therefore the action requested by this procedure to turn off the PTU may appear when the overheat is already present.
A similar scenario may occur, in the case of a slow fluid leakage from the green (yellow) hydraulic system.
In all cases, the HYD Y(G) RSVR OVHT ECAM caution is triggered between 2 to 10 min after the triggering of the HYD G(Y) ENG 1(2) PUMP LO PR ECAM caution.

Continued on the following page

HYD ENG PUMP LO PR FOLLOWED BY HYD RSVR OVHT (Cont'd)

PROCEDURE

- **If a HYD G ENG 1 PUMP LO PR ECAM caution is followed by a HYD Y RSVR OVHT ECAM caution, disregard the HYD Y RSVR OVHT ECAM procedure, and apply the following procedure to stop the overheat situation:**

HYD Y RSVR OVHT

PTU .... OFF
YELLOW ENG 2 PUMP .... KEEP ON

- **If a HYD Y ENG 2 PUMP LO PR ECAM caution is followed by a HYD G RSVR OVHT ECAM caution, disregard the HYD G RSVR OVHT ECAM procedure, and apply the following procedure to stop the overheat situation:**

HYD G RSVR OVHT

PTU .... OFF
GREEN ENG 1 PUMP .... KEEP ON

CORRECTIVE ACTION

Installation of the automatic PTU inhibition logic as per MOD 35938 (SB A320–29–1126, or SB A320–29–1145), or MOD 153173 (SB A320–29–1156) cancels this OEB . The PTU inhibition logic detects a low pressure situation for more than 6 s of the green or yellow hydraulic system and, consequently, automatically turns off the PTU . This prevents PTU high speed situation and subsequent hydraulic system overheat.

END OF OEB47

OPERATIONS
ENGINEERING BULLETINS

ABNORMAL V ALPHA PROT

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OEB48 Issue 2
Associated with QRH OEB Proc N°: OEB48/2.0
ABNORMAL V ALPHA PROT

Ident.: OEB-48-00016058.0001001 / 19 JAN 17
Applicable to: ALL

Approved by: Head of Flight Operations and Training Support

- This OEB covers a significant operational issue. Non-compliance with this OEB may have a significant impact on the safe operations of the aircraft. The Operators shall distribute its content to all flight crews without delay. An extract of this OEB is provided for insertion in the QRH.
- In addition, it is recommended that all Operators rapidly incorporate applicable corrective Service Bulletins as soon as they become available.

Reason for issue:

Issue 2:
This OEB is revised in order to provide the technical configuration necessary for OEB cancellation.
Issue 1:
An Airbus aircraft encountered a blockage of two Angle Of Attack (AOA) probes during climb. With the Mach number increasing, the blockage led to the activation of the alpha protection.

Applicable to:

All A318/A319/A320/A321 aircraft.

Cancelled by:

This OEB is cancelled for aircraft fitted with the following configuration for AOA probes and for ELAC:
- At least two Thales AOA probes PN C16291AB.
  Note: Thales AOA probes PN C16291AA with repetitive check of heating element (per SB A320-34-1415) can be considered as an equivalent to PN C16291AB.
- ELAC Standard:
  - For A320 aircraft: ELAC Standard L97+ or subsequent
  - For A318/A319/A321 aircraft: ELAC Standard L99 or subsequent.

Note: The interchangeability code, given in the Illustrated Part Catalog (IPC), indicates the conditions for interchangeability of equipment. After installation of corrective modification(s)/SB(s), if an Operator reinstalls any equipment affected by this OEB, it is the Operator's responsibility to ensure that the recommendations given in this OEB are applied again for the applicable aircraft.

Operations Engineering Bulletins are issued by Airbus, as the need arises, to quickly transmit technical and procedural information. They are distributed to all FCOM holders and to others who need advice of changes to operational information.
The information in the OEB is recommended by Airbus, but may not be approved by Airworthiness Authorities. If the procedures contained in this OEB differ from the procedures in the AFM, the AFM remains the reference.

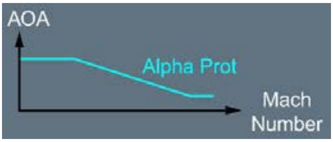
M	Localization	T	DU Title	DU identification	DU date
	OEB-48		**Abnormal V Alpha Prot**	00016058.0001001	19 JAN 17
	Criteria: 27-1244, 34-1444, P5834, SA **Applicable to: ALL**				
	OEB-48		**Abnormal V Alpha Prot**	00016059.0001001	19 JAN 17
	Criteria: 27-1244, 34-1444, P5834, SA **Applicable to: ALL**				

ABNORMAL V ALPHA PROT

Ident.: OEB-48-00016059.0001001 / 19 JAN 17
Applicable to: ALL

EXPLANATION

In normal law, if two or three AOA probes are blocked at the same angle value, an increase in the Mach number may result in the activation of the high Angle-Of-Attack protection (Alpha Prot). This is due to the fact that the AOA value of the Alpha Prot decreases as the Mach number increases. When the AOA value of the Alpha Prot decreases, the Alpha Prot strip on the PFD moves upward.



In the case of Alpha Prot undue activation due to blocked AOA probes, the flight control laws order a continuous nose down pitch rate that may not be stopped with backward sidestick inputs, even in the full backward position. If the Mach number increases during a nose down order, the AOA value of the Alpha Prot will continue to decrease. As a result, the flight controls laws will continue to order a nose down pitch rate, even if the speed is above VLS.

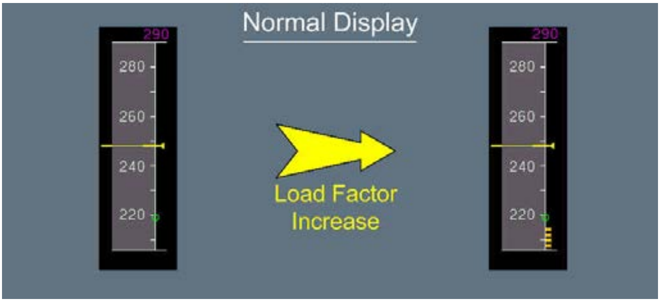
Two or three blocked AOA probes may induce the following visible effects in the cockpit:

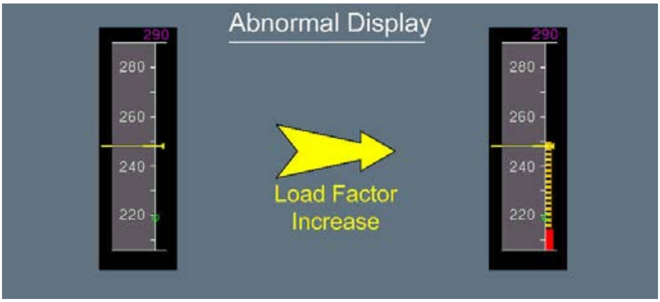
- The Alpha Max strip (red) on the speed scale of the PFD may completely hide the Alpha Prot strip (black and amber) in a stabilized wings-level flight path (without an increase in load factor), or

Continued on the following page

ABNORMAL V ALPHA PROT (Cont'd)

- The Alpha Prot strip (black and amber) may rapidly move by more than 30 kt during flight maneuvers (with an increase in load factor, for example turns or pitch variations), with the Auto Pilot (AP) engaged and the speed brakes in the retracted position.





Blocked AOA probes do not affect the current speed indication on the PFD.
In addition, in OP CLB or CLB with blocked AOA probes, the pitch order of the flight guidance may be affected by the value of the blocked AOA probes. Therefore, the aircraft may not be able to accelerate in order to reach the target speed.

PROCEDURE

CAUTION	Monitor the Alpha Prot strip and the Alpha max strip when they are visible.

Continued on the following page

ABNORMAL V ALPHA PROT (Cont'd)

- **AT ANY TIME, with a speed above VLS, if the aircraft goes to a CONTINUOUS NOSE DOWN PITCH RATE that cannot be stopped with backward sidestick inputs, IMMEDIATELY APPLY:**

  ONE ADR....................KEEP ON
  TWO ADRs....................OFF

- **If the Alpha Max strip (red) hides completely the Alpha Prot strip (black and amber) in a stabilized wings-level flight path (without an increase in load factor):**

  ONE ADR....................KEEP ON
  TWO ADRs....................OFF

  The AP , FD s and ATHR are lost for the remainder of the flight.
  Switch two ADRs to OFF for the remainder of the flight in order to revert to alternate law and to prevent undue Alpha Prot activation.
  In case of dispatch with one ADR inoperative, switch only one ADR to OFF.

CAUTION	RISK OF ERRONEOUS DISPLAY OF THE VSW STRIP (RED AND BLACK)

  FPV USE....................CONSIDER

- **If the Alpha Prot strip (black and amber) rapidly moves by more than 30 kt during flight maneuvers (with an increase in load factor), with AP ON and speed brakes retracted:**

  ONE ADR....................KEEP ON
  TWO ADRs....................OFF

  The AP , FD s and ATHR are lost for the remainder of the flight.
  Switch two ADRs to OFF for the remainder of the flight in order to revert to alternate law and to prevent undue Alpha Prot activation.
  In case of dispatch with one ADR inoperative, switch only one ADR to OFF.

CAUTION	RISK OF ERRONEOUS DISPLAY OF THE VSW STRIP (RED AND BLACK)

  FPV USE....................CONSIDER

Continued on the following page

ABNORMAL V ALPHA PROT (Cont'd)

CORRECTIVE ACTION

This OEB is cancelled for aircraft fitted with the following configuration for AOA probes and for ELAC:

- At least two Thales AOA probes PN C16291AB.
  Note: Thales AOA probes PN C16291AA with repetitive check of heating element (per SB A320-34-1415) can be considered as an equivalent to PN C16291AB.
- ELAC Standard:
  - For A320 aircraft: ELAC Standard L97+ or subsequent
  - For A318/A319/A321 aircraft: ELAC Standard L99 or subsequent.

END OF OEB48

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PERFORMANCE

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TABLE OF CONTENTS

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LIST OF EFFECTIVE TEMPORARY DOCUMENTARY UNITS

M	Localization	DU Title	DU identification	DU date

No Temporary Documentary Unit

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PERFORMANCE

LOADING

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DEFINITIONS

Ident.: PER-LOD-GEN-00001661.0001001 / 09 DEC 09
Applicable to: ALL

MANUFACTURER'S EMPTY WEIGHT (MEW)

The weight of the structure, power plant, furnishings, systems and other items of equipment that are considered as integral part of the aircraft. It is essentially a "dry" weight, including only those fluids contained in closed systems (e.g. hydraulic fluid).

OPERATIONAL EMPTY WEIGHT (OEW)

The manufacturer's weight empty plus the operator's items i.e. the flight and cabin crew and their baggage, unusable fuel, engine oil, emergency equipment, toilet chemicals and fluids, galley structure, catering equipment, seats, documents etc.

DRY OPERATING WEIGHT (DOW)

The total weight of an aircraft ready for a specific type of operation excluding all usable fuel and traffic load.
Operational Empty Weight plus items specific to the type of flight i.e. catering, newspapers, pantry equipment etc.

TAKEOFF FUEL

The weight of the fuel onboard at takeoff.

OPERATING WEIGHT

The weight obtained by addition of the operational empty weight and the takeoff fuel.

TOTAL TRAFFIC LOAD

The weight of the payload including cargo loads, passengers and passengers bags.

ZERO FUEL WEIGHT (ZFW)

The weight obtained by addition of the total traffic load and the dry operating weight.

TAKEOFF WEIGHT (TOW)

The weight at takeoff. It is equal to the addition of the zero fuel weight and takeoff fuel.

TRIP FUEL

The weight of the fuel necessary to cover the normal leg without reserves.

LANDING WEIGHT

The weight at landing. It is equal to takeoff weight minus trip fuel.

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GENERAL

Ident.: PER-LOD-CGO-00001662.0002001 / 09 DEC 09
Applicable to: ALL

The aircraft has two lower deck cargo compartments :
- Forward cargo compartment, compartment 1.
- Aft cargo compartment, subdivided into compartments 3, 4 and 5.

The main access doors to forward and aft compartments are hydraulically operated.
A bulk cargo door ⊲✻ gives additional access to the aft cargo compartment. It is manually operated.

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USE OF MANUAL MAGNETIC INDICATORS (MMI)

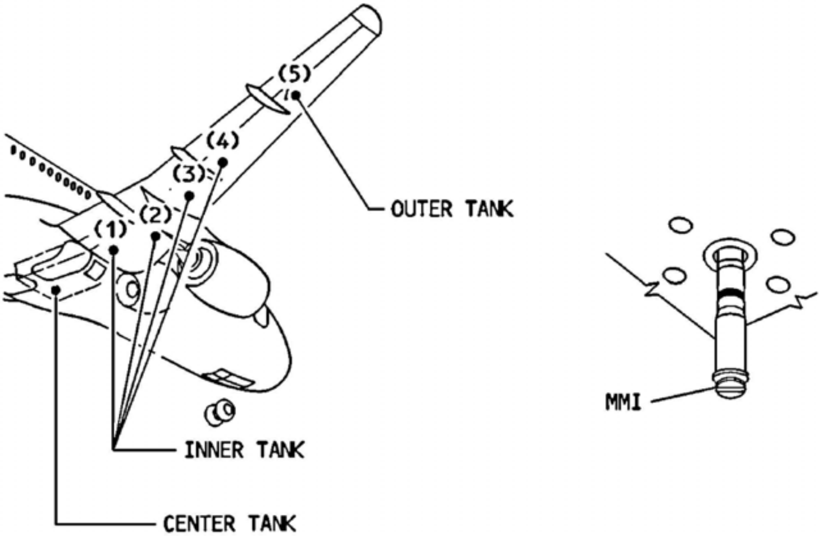
Applicable to: ALL

Ident.: PER-LOD-FUL-C-00001679.0005001 / 23 JUN 15

GENERAL

Indicators are disposed as follows:

- five in each wing tank, four in inner tank and one in outer tank
- one in the center tank



TO DETERMINE AIRCRAFT ATTITUDE

Set ADIRS 1, 2, 3 to the NAV position.
On the LH or RH MCDU, press MCDU MENU pushbutton.
Select CFDS line key (LSK 4L).
Select SYSTEM REPORT/TEST line key (LSK 5L).
Select the line key adjacent to the FUEL indication.
On the MCDU control panel, push the NEXT PAGE key to display the FUEL Main Menu second page.
Select the line key adjacent to the INPUT PARAMETERS VALUES indication.
Use the Table given on the next page to determine the equivalent number and letter from PITCH and ROLL data.
Select RETURN line key (LSK 6L) until CFDS main menu appears.
Press MCDU MENU pushbutton.

PITCH	REF	ROLL	REF
Minus 1.5	1	**Minus 1.5**	A
Minus 1.0	2	**Minus 1.0**	B
Minus 0.5	3	**Minus 0.5**	C
0.0	4	**0.0**	D
Plus 0.5	5	**Plus 0.5**	E
Plus 1.0	6	**Plus 1.0**	F
Plus 1.5	7	**Plus 1.5**	G

Note: *1. This procedure can only be used if:*

- *The PITCH and ROLL data is taken from the ADIRS (identified by an “A” after the PITCH and ROLL title).*
- *The PITCH data displayed for the LEFT, CTR, and RIGHT is no more or less than 0.1 of each other.*
- *The ROLL data displayed for the LEFT, CTR, and RIGHT is no more or less than 0.1 of each other.*

2. The FQIS input parameters are not automatically updated. Use the NEXT PAGE control on the MCDU to cycle the pages to update the screen.

ACCESS PLATFORM..IN POSITION

Ident.: PER-LOD-FUL-C-00001692.0001001 / 13 JAN 14

TO DETERMINE FUEL QUANTITY IN THE OUTER TANK

MMI number 5 .... UNLOCK and WITHDRAW

The crewmember must withdraw the MMI slowly until he feels the magnetic attraction between the rod and float magnets.
Do not use force when withdrawing the MMI as this will disengage the float magnet from the rod magnet and bring the rod down onto the mechanical stop.

ROD GRADUATION (which aligns with bottom wing surface) .... READ
MMI .... IN PLACE and LOCKED

Use the table for the applicable aircraft wing side, aircraft attitude (grid square letter and number), and the MMI stick number 5, to find the volume of fuel in the outer tank (See below).
Multiply the result by the specific gravity to find the fuel weight.

Note: *The manual magnetic indication accuracy is around 5 %.*

Ident.: PER-LOD-FUL-C-00001680.0001001 / 13 JAN 14

TO DETERMINE FUEL QUANTITY IN THE INNER TANK

MMI (from number 4 to number 1) .... UNLOCK and WITHDRAW

The crewmember must withdraw the MMI slowly until he feels the magnetic attraction between the rod and float magnets.
Do not use force when withdrawing the MMI as this will disengage the float magnet from the rod magnet and bring the rod down onto the mechanical stop.

ROD GRADUATION (which aligns with bottom wing surface) .... READ
MMI .... IN PLACE and LOCKED

MMIs shall be withdrawn from number 4 to number 1 until one MMI measures fuel.

Use the table for the applicable aircraft wing side, aircraft attitude (grid square letter and number), and the applicable MMI stick number to find the volume of fuel in the inner tank (Refer to FCOM - PER.LOD.FUL FUEL. C.USE OF MANUAL MAGNETIC INDICATORS (MMI) - WING TANKS).
Multiply the result by the specific gravity to find the fuel weight.

Note: *The manual magnetic indication accuracy is around 5 %.*

Ident.: PER-LOD-FUL-C-00009658.0001001 / 13 JAN 14

TO DETERMINE FUEL QUANTITY IN THE CENTER TANK

CENTER TANK MMI .... UNLOCK and WITHDRAW

The crewmember must withdraw the MMI slowly until he feels the magnetic attraction between the rod and float magnets.

Do not use force when withdrawing the MMI as this will disengage the float magnet from the rod magnet and bring the rod down onto the mechanical stop.

ROD GRADUATION (which aligns with bottom wing surface)..READ

MMI...IN PLACE and LOCKED

Use the table for the center tank, and for the applicable aircraft attitude (grid square letter and number) to find the volume of fuel in the center tank (See below).

Multiply the result by the specific gravity to find the fuel weight.

<u>Note:</u> *The manual magnetic indication accuracy is around 5 %.*

WING TANKS (LITERS)

MMI N°	MMI READING	LITERS ATTITUDE MONITOR READING							MMI READING	LITERS ATTITUDE MONITOR READING						
		A* LEFT WING				G RIGHT WING				A RIGHT WING				G LEFT WING		
		1	2	3	4	5	6	7		1	2	3	4	5	6	7**
1	2	50	50	50	50	50	50	50	2	50	50	50	50	50	50	50
	4	100	100	100	100	100	100	100	4	50	50	50	50	50	50	50
	6	100	100	100	100	100	100	100	6	100	100	100	100	100	100	100
	8	150	150	150	150	150	150	150	8	150	150	150	150	150	150	150
	10	200	200	200	200	200	200	200	10	200	200	200	200	200	200	150
	12	250	250	250	250	250	250	250	12	250	250	250	250	250	250	200
	14	300	300	300	300	300	300	300	14	300	300	300	300	300	300	250
	16	350	350	350	350	350	350	350	16	350	350	350	350	350	350	300
	18	450	450	450	450	450	400	400	18	400	400	400	400	400	400	350
	20	500	500	500	500	500	500	500	20	450	450	450	450	450	450	400
	22	550	550	550	550	550	550	550	22	500	500	500	500	500	500	450
	24	650	650	650	650	650	650	600	24	550	550	550	550	550	550	550
	26	750	750	750	750	750	700	700	26	650	650	650	650	650	650	600
	28	800	800	800	800	800	800	800	28	700	700	700	700	700	700	700
	30	900	900	900	900	900	900	900	30	800	800	800	800	800	800	750
	32	1050	1050	1050	1050	1050	1000	1000	32	900	900	900	900	850	850	850
	34	1150	1150	1150	1150	1150	1150	1100	34	950	950	950	950	950	950	950
	36	1250	1250	1250	1250	1250	1250	1250	36	1050	1050	1050	1050	1050	1050	1050
	38	1350	1350	1350	1350	1350	1350	1350	38	1150	1150	1150	1150	1150	1150	1150
	40	1500	1500	1500	1500	1500	1500	1500	40	1250	1250	1250	1250	1250	1250	1250
	42	1600	1600	1600	1600	1600	1600	1600	42	1350	1350	1350	1350	1350	1350	1350
	44	1750	1750	1750	1750	1750	1750	1750	44	1450	1450	1450	1450	1450	1450	1450
	46	1900	1900	1900	1900	1900	1900	1900	46	1550	1550	1550	1550	1550	1550	1550
	48	2000	2000	2000	2000	2000	2000	2050	48	1700	1700	1700	1700	1700	1700	1700
	50	2200	2200	2200	2200	2200	2200	2200	50	1800	1800	1800	1800	1800	1800	1800
	52	2350	2350	2350	2350	2350	2350	2400	52	1950	1950	1950	1950	1950	1950	1950
	54	2500	2500	2500	2500	2500	2550	2550	54	2000	2000	2050	2050	2050	2050	2050
	56	2650	2650	2700	2700	2700	2650	2700	56	2200	2200	2200	2200	2200	2200	2200
	58	2800	2800	2800	2800	2850	2850	2850	58	2300	2300	2300	2300	2300	2350	2350
	60	2950	2950	2950	3000	3000	3050	3050	60	2450	2500	2500	2500	2500	2500	2500
	62	3100	3100	3150	3150	3150	3200	3250	62	2600	2600	2650	2650	2650	2650	2650
	63	3150	3150	3200	3200	3250	3300	3350	63	2650	2650	2700	2700	2700	2700	2700
	MAX	3450	3450	3450	3500	3500	3600	3600	MAX	2950	2950	2950	2950	2950	3000	3000

*   GRID SQUARE LETTER

**   GRID SQUARE NUMBER

MMI N°	MMI READING	LITERS ATTITUDE READING A LEFT WING 1	2	3	4	G 5	RIGHT WING 6	7	MMI READING	LITERS ATTITUDE READING A RIGHT WING 1	2	3	4	G 5	LEFT WING 6	7
2	2	2300	2250	2200	2200	2200	2200	2200	2	2850	2850	2850	2850	2850	2850	2800
	4	2500	2450	2400	2400	2350	2350	2350	4	3050	3050	3050	3050	3050	3000	3000
	6	2650	2600	2600	2600	2550	2500	2500	6	3200	3200	3200	3200	3200	3200	3150
	8	2750	2750	2750	2700	2700	2650	2650	8	3300	3300	3300	3300	3300	3300	3250
	10	2900	2900	2900	2900	2850	2850	2850	10	3500	3500	3500	3500	3450	3450	3400
	12	3100	3100	3100	3100	3100	3050	3000	12	3650	3650	3600	3600	3600	3600	3600
	14	3250	3250	3250	3250	3250	3250	3200	14	3800	3800	3750	3750	3750	3750	3750
	16	3450	3450	3450	3450	3450	3400	3400	16	3950	3900	3900	3900	3900	3900	3900
	18	3700	3650	3650	3650	3650	3600	3600	18	4050	4050	4050	4050	4050	4050	4050
	20	3900	3900	3900	3900	3850	3850	3850	20	4200	4200	4200	4200	4200	4200	4200
	22	4100	4100	4050	4050	4050	4050	4050	22	4250	4250	4250	4300	4300	4300	4300
	24	4300	4300	4300	4300	4300	4300	4300	24	4400	4400	4400	4400	4450	4450	4450
	26	4500	4500	4500	4500	4500	4500	4550	26	4500	4500	4550	4550	4550	4600	4600
	28	4700	4700	4750	4750	4750	4750	4750	28	4600	4650	4650	4700	4700	4750	4800
	30	4950	4950	4950	4950	5000	5000	5000	30	4750	4750	4800	4800	4850	4850	4900
	32	5100	5100	5150	5150	5150	5200	5200	32	4850	4850	4900	4900	4950	5000	5000
	MAX								MAX							
3																
	2	4400	4350	4300	4250	4200	4150	4050	2	5050	5050	5100	5100	5100	5100	5100
	4	4700	4700	4650	4600	4500	4400	4300	4	5150	5150	5200	5200	5200	5200	5200
	6	4950	4950	4900	4850	4800	4700	4550	6	5250	5250	5300	5300	5300	5300	5300
	8	5150	5100	5100	5050	5000	4950	4800	8	5350	5350	5400	5400	5400	5400	5400
	10	5250	5250	5250	5250	5200	5150	5050	10	5450	5450	5500	5500	5500	5500	5500
	12	5400	5400	5400	5400	5350	5300	5250	12	5500	5500	5550	5600	5600	5600	5650
	14	5600	5600	5550	5550	5500	5500	5450	14	5600	5650	5650	5700	5700	5700	5750
	16	5750	5750	5700	5700	5700	5650	5600	16	5650	5700	5700	5750	5750	5800	5800
	18	5900	5900	5850	5850	5850	5850	5800	18	5800	5800	5850	5850	5900	5900	5950
	20	6000	6000	6000	6000	6000	6000	6000	20	5900	5900	5950	5950	6000	6000	6050
4																
	2	5700	5600	5550	5500	5450	5400	5300	2	6000	6050	6100	6100	6100	6100	6100
	4	5850	5750	5700	5650	5600	5550	5500	4	6100	6100	6150	6150	6150	6200	6200
	6	6000	5900	5850	5800	5750	5700	5650	6	6200	6200	6200	6250	6250	6250	6300
	8	6150	6100	6050	6000	5950	5900	5850	8	6250	6300	6300	6350	6350	6350	6400
	10	6300	6300	6250	6200	6150	6150	6100	10	6350	6400	6400	6400	6450	6450	6450
	12	6450	6400	6400	6400	6350	6300	6250	12	6450	6450	6450	6500	6500	6550	6550
	14	6550	6500	6500	6500	6500	6450	6450	14	6500	6550	6550	6550	6600	6600	6650
	16	6600	6600	6600	6600	6600	6600	6550	16	6600	6600	6600	6650	6650	6700	6750
	18	6650	6650	6650	6650	6650	6650	6650	18	6650	6700	6700	6750	6750	6750	6800
	MAX								MAX							
5																
	2	650	600	550	550	550	500	500	2	700	700	700	700	700	700	700
	4	700	650	650	600	600	550	550	4	750	750	750	750	750	750	750
	6	750	700	700	650	650	650	600	6	800	800	800	800	750	750	750
	8	750	750	750	750	700	700	700	8	800	800	800	800	800	800	800
	10	800	800	800	750	750	750	750	10	850	850	850	850	850	850	850
	12	800	800	800	800	800	800	800	12	850	850	850	850	850	850	850
	14	850	850	850	850	850	850	850	14	850	850	850	850	850	850	850
	MAX	850	850	850	850	850	850	850	MAX	850	850	850	850	850	850	850

MMI N°	MMI READING	LITERS ATTITUDE MONITOR READING B* LEFT WING 1	2	3	4	F RIGHT WING 5	6	7
1	2	50	50	50	50	50	50	50
	4	50	50	50	50	50	50	50
	6	100	100	100	100	100	100	100
	8	150	150	150	150	150	150	150
	10	200	200	200	200	200	200	200
	12	250	250	250	250	250	250	250
	14	300	300	300	300	300	300	300
	16	350	350	350	350	360	350	350
	18	400	400	400	400	400	400	400
	20	450	450	450	450	450	450	450
	22	550	550	550	550	550	550	550
	24	600	600	600	600	600	600	600
	26	700	700	700	700	700	700	700
	28	800	800	800	800	800	800	800
	30	900	900	900	900	900	900	850
	32	1000	1000	1000	1000	1000	1000	950
	34	1100	1100	1100	1100	1100	1100	1100
	36	1200	1200	1200	1200	1200	1200	1200
	38	1300	1300	1300	1300	1300	1300	1300
	40	1450	1450	1450	1450	1450	1450	1450
	42	1550	1550	1550	1550	1550	1550	1550
	44	1700	1700	1700	1700	1700	1700	1700
	46	1800	1800	1800	1800	1800	1800	1800
	48	1950	1950	1950	1950	1950	1950	1950
	50	2100	2100	2100	2100	2100	2100	2100
	52	2250	2250	2250	2250	2250	2250	2250
	54	2400	2400	2400	2400	2400	2400	2450
	56	2550	2550	2600	2600	2600	2600	2600
	58	2750	2750	2750	2750	2750	2750	2750
	60	2850	2850	2850	2850	2900	2900	2950
	62	3000	3000	3000	3050	3050	3050	3100
	63	3050	3050	3050	3100	3150	3150	3200
	MAX	3350	3350	3350	3350	3400	3450	3500

MMI READING	LITERS ATTITUDE MONITOR READING B RIGHT WING 1	2	3	4	F LEFT WING 5	6	7**
2	50	50	50	50	50	50	50
4	50	50	50	50	50	50	50
6	100	100	100	100	100	100	100
8	150	150	150	150	150	150	150
10	200	200	200	200	200	200	150
12	250	250	250	250	250	250	200
14	300	300	300	300	300	300	250
16	350	350	350	350	350	350	300
18	400	400	400	400	400	400	350
20	450	450	450	450	450	450	450
22	500	500	500	500	500	500	500
24	550	550	550	550	550	550	550
26	650	650	650	650	650	650	650
28	700	700	700	700	700	700	700
30	800	800	800	800	800	800	800
32	900	900	900	900	900	900	850
34	1000	1000	1000	1000	950	950	950
36	1100	1100	1100	1100	1050	1050	1050
38	1200	1200	1200	1200	1200	1150	1150
40	1300	1300	1300	1300	1300	1300	1300
42	1400	1400	1400	1400	1400	1400	1400
44	1500	1500	1500	1500	1500	1500	1500
46	1600	1600	1600	1600	1600	1600	1600
48	1700	1700	1700	1700	1700	1700	1700
50	1850	1850	1850	1850	1850	1850	1850
52	1950	1950	1950	1950	1950	1950	1950
54	2100	2100	2100	2100	2100	2100	2100
56	2250	2250	2250	2250	2250	2250	2250
58	2400	2400	2400	2400	2400	2400	2400
60	2550	2550	2550	2550	2550	2550	2550
62	2700	2700	2700	2700	2700	2700	2700
63	2750	2750	2750	2750	2750	2750	2750
MAX	3000	3000	3000	3000	3000	3000	3000

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

MMI N°	MMI READING	LITERS ATTITUDE MONITOR READING B	LEFT WING			F	RIGHT WING		MMI READING	LITERS ATTITUDE MONITOR READING B	RIGHT WING			F	LEFT WING	
		1	2	3	4	5	6	7		1	2	3	4	5	6	7
2	2	2350	2350	2300	2300	2250	2200	2200	2	2800	2750	2750	2750	2700	2700	2650
	4	2550	2500	2500	2450	2450	2400	2400	4	2950	2950	2900	2900	2900	2900	2850
	6	2750	2700	2700	2650	2650	2600	2600	6	3100	3100	3100	3100	3100	3050	3050
	8	2850	2850	2800	2800	2800	2750	2750	8	3200	3200	3200	3200	3200	3200	3150
	10	3000	3000	3000	3000	3000	2950	2900	10	3400	3400	3350	3350	3350	3350	3300
	12	3150	3150	3200	3150	3150	3150	3100	12	3550	3550	3550	3550	3500	3500	3450
	14	3350	3350	3350	3350	3350	3300	3300	14	3750	3700	3700	3700	3650	3650	3650
	16	3550	3550	3550	3550	3500	3500	3450	16	3900	3850	3850	3850	3850	3800	3800
	18	3750	3750	3750	3750	3700	3700	3650	18	4050	4000	4000	4000	4000	4000	3950
	20	4000	3950	3950	3950	3950	3900	3900	20	4200	4150	4150	4150	4150	4150	4150
	22	4150	4100	4100	4100	4100	4100	4100	22	4250	4250	4250	4250	4250	4250	4250
	24	4300	4300	4300	4300	4300	4300	4300	24	4400	4400	4400	4400	4400	4400	4400
	26	4500	4500	4500	4500	4500	4500	4500	26	4500	4500	4500	4550	4550	4550	4550
	28	4700	4700	4700	4700	4700	4750	4750	28	4650	4650	4650	4650	4700	4700	4750
	30	4850	4900	4900	4900	4950	4950	4950	30	4750	4750	4800	4800	4850	4850	4900
	32	5050	5100	5100	5100	5100	5150	5150	32	4850	4900	4900	4950	4950	5000	5050
	MAX								MAX							
3	2	4550	4500	4500	4450	4400	4350	4300	2	5000	5000	5000	5000	5000	5000	4950
	4	4800	4800	4800	4750	4650	4600	4500	4	5100	5100	5100	5100	5100	5100	5100
	6	5050	5000	5000	5000	4900	4850	4750	6	5200	5200	5200	5250	5200	5200	5200
	8	5150	5150	5150	5150	5100	5000	5000	8	5300	5300	5350	5350	5350	5350	5350
	10	5300	5300	5300	5300	5250	5200	5150	10	5400	5400	5450	5450	5450	5450	5450
	12	5450	5450	5450	5450	5400	5400	5350	12	5500	5500	5550	5550	5550	5550	5550
	14	5600	5600	5600	5550	5550	5550	5500	14	5600	5600	5650	5650	5650	5650	5700
	16	5700	5700	5700	5700	5700	5700	5700	16	5700	5700	5700	5750	5750	5750	5800
	18	5850	5850	5850	5850	5850	5850	5850	18	5800	5800	5800	5850	5850	5850	5900
	20	6000	6000	6050	6050	6050	6000	6000	20	5900	5900	5950	5950	6000	6000	6000
	MAX								MAX							
4	2								2	5950	5950	6100	6000	6050	6050	6050
	4	5850	5750	5700	5650	5600	5600	5600	4	6050	6050	6100	6100	6100	6100	6150
	6	6000	6000	5950	5900	5850	5800	5800	6	6150	6150	6200	6200	6200	6200	6200
	8	6150	6150	6100	6100	6050	6000	6000	8	6250	6250	6250	6300	6300	6300	6300
	10	6300	6300	6250	6250	6250	6200	6150	10	6350	6350	6350	6400	6400	6400	6400
	12	6400	6400	6400	6400	6350	6350	6300	12	6400	6450	6450	6450	6500	6500	6500
	14	6500	6500	6500	6500	6500	6450	6450	14	6500	6500	6550	6550	6600	6600	6600
	16	6600	6600	6600	6600	6550	6550	6550	16	6600	6600	6600	6650	6650	6700	6700
	18	6760	6770	6770	6770	6770	6770	6760	18	6750	6770	6800	6830	6850	6870	6880
	MAX								MAX							
5	2	650	650	600	600	600	550	550	2	750	700	700	700	700	700	700
	4	750	700	700	650	650	600	600	4	750	750	750	750	750	750	750
	6	750	750	750	700	700	650	650	6	800	800	800	800	750	750	750
	8	800	800	750	750	750	750	700	8	800	800	800	800	800	800	800
	10	800	800	800	800	800	750	750	10	850	850	850	850	800	800	800
	12	850	850	800	800	800	800	800	12	850	850	850	850	850	850	850
	14	850	850	850	850	850	850	850	14	850	850	850	850	850	850	850
	MAX	850	850	850	850	850	850	850	MAX	850	850	850	850	850	850	850

MMI N°	MMI READING	LITERS ATTITUDE MONITOR READING							MMI READING	LITERS ATTITUDE MONITOR READING						
		C*	LEFT WING			E	RIGHT WING			C	RIGHT WING			E	LEFT WING	
		1	2	3	4	5	6	7		1	2	3	4	5	6	7**
1	2	50	50	50	50	50	50	50	2	50	50	50	50	50	50	50
	4	50	50	50	50	50	50	50	4	50	50	50	50	50	50	50
	6	100	100	100	100	100	100	100	6	100	100	100	100	100	100	100
	8	150	150	150	150	150	150	150	8	150	150	150	150	150	150	150
	10	200	200	200	200	200	200	200	10	200	200	200	200	200	200	150
	12	250	250	250	250	250	250	250	12	250	250	250	250	250	250	200
	14	300	300	300	300	300	300	300	14	300	300	300	300	300	300	250
	16	350	350	350	350	350	350	350	16	350	350	350	350	350	350	350
	18	400	400	400	400	400	400	400	18	400	400	400	400	400	400	400
	20	450	450	450	450	450	450	450	20	450	450	450	450	450	450	450
	22	550	550	550	550	500	500	500	22	500	500	500	500	500	500	500
	24	600	600	600	600	600	600	600	24	600	600	600	600	600	550	550
	26	700	700	700	700	650	650	650	26	650	650	650	650	650	650	650
	28	750	750	750	750	750	750	750	28	750	750	750	750	750	700	700
	30	850	850	850	850	850	850	850	30	800	800	800	800	800	800	800
	32	950	950	950	950	950	950	950	32	900	900	900	900	900	900	900
	34	1050	1050	1050	1050	1050	1050	1050	34	1000	1000	1000	1000	1000	1000	1000
	36	1200	1150	1150	1150	1150	1150	1150	36	1100	1100	1100	1100	1100	1100	1100
	38	1300	1300	1300	1250	1250	1250	1250	38	1200	1200	1200	1200	1200	1200	1200
	40	1400	1400	1400	1400	1400	1400	1400	40	1300	1300	1300	1300	1300	1300	1300
	42	1500	1500	1500	1500	1500	1500	1500	42	1400	1400	1400	1400	1400	1400	1400
	44	1600	1600	1600	1600	1600	1600	1600	44	1550	1550	1500	1500	1500	1500	1500
	46	1750	1750	1750	1750	1750	1750	1750	46	1650	1650	1650	1650	1650	1650	1650
	48	1850	1850	1850	1850	1900	1900	1900	48	1800	1750	1750	1750	1750	1750	1800
	50	2000	2000	2000	2000	2000	2000	2050	50	1900	1900	1900	1900	1900	1900	1900
	52	2150	2150	2150	2150	2150	2150	2200	52	2000	2000	2000	2000	2000	2000	2050
	54	2300	2300	2300	2300	2300	2300	2350	54	2150	2150	2150	2150	2150	2150	2200
	56	2450	2500	2500	2500	2500	2500	2500	56	2300	2300	2300	2300	2300	2300	2350
	58	2600	2650	2650	2650	2650	2650	2700	58	2450	2450	2450	2450	2450	2500	2500
	60	2800	2800	2800	2800	2850	2850	2850	60	2600	2600	2600	2600	2600	2650	2650
	62	2900	2950	2950	2950	2950	2950	3000	62	2750	2750	2750	2750	2800	2800	2800
	63	2950	3000	3000	3000	3050	3050	3100	63	2800	2800	2800	2800	2850	2850	2850
	MAX	3250	3250	3300	3350	3350	3350	3400	MAX	3100	3100	3100	3100	3100	3100	3100

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

MMI N°	MMI READING	LITERS ATTITUDE READING						
		C	LEFT WING			E	RIGHT WING	
		1	2	3	4	5	6	7
2	2	2450	2400	2400	2400	2350	2350	2350
	4	2650	2600	2600	2600	2550	2550	2500
	6	2800	2800	2800	2800	2750	2750	2700
	8	2900	2900	2900	2900	2900	2850	2850
	10	3100	3100	3100	3100	3100	3050	3000
	12	3250	3250	3250	3250	3250	3250	3200
	14	3450	3450	3450	3450	3400	3400	3350
	16	3650	3650	3650	3600	3600	3550	3550
	18	3850	3850	3800	3800	3800	3750	3750
	20	4050	4050	4000	4000	4000	3950	3950
	22	4200	4200	4150	4150	4150	4100	4100
	24	4350	4350	4300	4300	4300	4300	4300
	26	4500	4500	4500	4500	4500	4500	4500
	28	4650	4650	4650	4700	4700	4700	4700
	30	4850	4850	4850	4850	4900	4900	4900
	32	5000	5000	5000	5050	5050	5050	5100
	MAX							
3	2	4650	4650	4650	4600	4600	4500	4500
	4	4900	4900	4900	4900	4800	4750	4650
	6	5100	5100	5100	5050	5050	5000	4900
	8	5200	5200	5200	5200	5200	5150	5100
	10	5300	5350	5350	5350	5300	5300	5250
	12	5450	5450	5450	5450	5450	5450	5400
	14	5600	5600	5600	5600	5600	5600	5550
	16	5700	5700	5700	5700	5700	5700	5700
	18	5800	5850	5850	5850	5850	5850	5850
	20	5950	5950	6000	6000	6000	6000	6000
4	2	5800	5750	5750	5700	5700	5700	5700
	4	5950	5900	5900	5850	5850	5800	5800
	6	6050	6050	6000	6000	6000	5950	5950
	8	6200	6150	6150	6150	6150	6100	6100
	10	6300	6300	6300	6300	6300	6250	6250
	12	6400	6400	6400	6400	6400	6400	6400
	14	6500	6500	6500	6500	6500	6500	6500
	16	6600	6600	6600	6600	6600	6600	6600
	18	6730	6740	6750	6750	6760	6760	6770
	MAX							
5	2	700	700	650	650	600	600	600
	4	750	750	700	700	650	650	650
	6	750	750	750	750	700	700	700
	8	800	800	800	750	750	750	750
	10	800	800	800	800	800	800	800
	12	850	850	850	800	800	800	800
	14	850	850	850	850	850	850	850

MMI N°	MMI READING	LITERS ATTITUDE MONITOR READING						
		C	RIGHT WING			E	LEFT WING	
		1	2	3	4	5	6	7
2	2	2700	2650	2650	2600	2600	2550	2550
	4	2850	2800	2800	2800	2800	2750	2750
	6	3000	3000	3000	3000	3000	2950	2900
	8	3100	3100	3100	3100	3100	3100	3050
	10	3300	3300	3300	3250	3250	3250	3200
	12	3450	3450	3450	3450	3450	3400	3350
	14	3650	3650	3600	3600	3600	3550	3550
	16	3800	3800	3800	3750	3750	3750	3700
	18	4000	3950	3950	3950	3900	3900	3900
	20	4150	4100	4100	4100	4100	4100	4100
	22	4250	4250	4200	4200	4200	4200	4200
	24	4350	4350	4350	4350	4350	4350	4350
	26	4500	4500	4500	4500	4500	4500	4550
	28	4650	4650	4650	4650	4700	4700	4700
	30	4750	4800	4800	4800	4850	4850	4850
	32	4900	4900	4950	4950	5000	5000	5050
	MAX							
3	2	4900	4900	4900	4900	4900	4850	4800
	4	5050	5100	5100	5100	5100	5050	5000
	6	5150	5200	5200	5200	5200	5150	5150
	8	5250	5300	5300	5300	5300	5300	5300
	10	5350	5400	5400	5400	5400	5400	5400
	12	5500	5500	5500	5500	5550	5550	5550
	14	5600	5600	5600	5650	5650	5650	5650
	16	5700	5700	5750	5750	5750	5750	5800
	18	5800	5800	5850	5850	5900	5900	5900
	20	5900	5950	5950	6000	6000	6000	6000
4	2	5900	5900	5900	5900	5950	5950	5950
	4	6000	6000	6000	6050	6050	6050	6050
	6	6100	6100	6150	6150	6150	6150	6150
	8	6200	6250	6250	6250	6250	6250	6250
	10	6300	6350	6350	6350	6350	6350	6350
	12	6400	6400	6450	6450	6450	6450	6450
	14	6500	6500	6500	6550	6550	6550	6550
	16	6550	6600	6600	6600	6600	6600	6600
	18	6750	6750	6770	6790	6800	6810	6820
	MAX							
5	2	750	700	700	700	700	650	650
	4	750	750	750	750	700	700	700
	6	800	800	750	750	750	750	750
	8	800	800	800	800	800	800	800
	10	850	850	850	800	800	800	800
	12	850	850	850	850	850	850	850
	14	900	900	850	850	850	850	850

MMI Nº	MMI READING	LITERS ATTITUDE MONITOR READING D* BOTH WINGS 1	2	3	4	5	6	7	MMI READING	LITERS ATTITUDE MONITOR READING D BOTH WINGS 1	2	3	4	5	6	7**	MMI Nº
1	2	50	50	50	50	50	50	50	18	3950	3900	3900	3850	3850	3850	3800	2
	4	100	100	100	100	100	100	100	20	4100	4100	4050	4050	4050	4000	4000	
	6	100	100	100	100	100	100	100	22	4200	4200	4150	4150	4150	4150	4150	
	8	150	150	150	150	150	150	150	24	4350	4350	4350	4300	4300	4300	4300	
	10	200	200	200	200	200	200	200	26	4500	4500	4500	4500	4500	4500	4500	
	12	250	250	250	250	250	250	250	28	4650	4650	4650	4650	4650	4700	4700	
	14	300	300	300	300	300	300	300	30	4800	4800	4800	4850	4850	4850	4900	
	16	350	350	350	350	360	350	350	32	4950	4950	5000	5000	5000	5050	5100	
	18	400	400	400	400	400	400	400	MAX								
	20	450	450	450	450	450	450	450									3
	22	500	500	500	500	500	500	500	2	4800	4800	4800	4800	4750	4750	4600	
	24	600	600	600	600	600	600	600	4	5000	5000	5000	5000	4950	4900	4850	
	26	650	650	650	650	650	650	650	6	5100	5150	5150	5100	5100	5100	5050	
	28	750	750	750	750	750	750	750	8	5250	5250	5250	5250	5250	5200	5200	
	30	850	850	850	850	850	850	850	10	5350	5350	5350	5400	5400	5350	5350	
	32	950	950	950	950	950	950	950	12	5450	5500	5500	5500	5500	5500	5500	
	34	1050	1050	1050	1050	1050	1000	1000	14	5600	5600	5600	5600	5600	5600	5600	
	36	1150	1150	1150	1150	1150	1100	1100	16	5700	5700	5700	5750	5750	5750	5750	
	38	1250	1250	1250	1250	1250	1250	1250	18	5800	5800	5850	5850	5850	5900	5900	
	40	1350	1350	1350	1350	1350	1350	1350	20	5900	5900	5950	5950	5950	6000	6000	
	42	1450	1450	1450	1450	1450	1450	1450	MAX								
	44	1550	1550	1550	1550	1550	1550	1550									4
	46	1700	1700	1700	1700	1700	1700	1700	2	5900	5850	5800	5800	5800	5800	5800	
	48	1800	1800	1800	1800	1800	1800	1800	4	6000	5950	5950	5950	5950	5950	5950	
	50	1950	1950	1950	1950	1950	1950	1950	6	6100	6100	6050	6050	6050	6050	6050	
	52	2100	2100	2100	2100	2100	2100	2100	8	6200	6200	6200	6200	6200	6200	6200	
	54	2250	2250	2250	2250	2250	2250	2250	10	6300	6300	6300	6300	6300	6300	6300	
	56	2400	2400	2400	2400	2400	2400	2400	12	6400	6400	6400	6400	6400	6400	6400	
	58	2550	2550	2550	2550	2550	2600	2600	14	6500	6500	6500	6500	6500	6500	6500	
	60	2700	2700	2700	2700	2700	2750	2750	16	6600	6600	6600	6600	6600	6600	6600	
	62	2850	2850	2850	2850	2850	2900	2900	18	6750	6750	6770	6800	6800	6810	6820	
	63	2900	2900	2900	2900	2900	2950	2950	MAX								
	MAX	3050	3050	3100	3100	3100	3150	3150									
2																	5
	2	2550	2550	2500	2500	2450	2450	2450	2	700	700	700	650	650	650	600	
	4	2750	2700	2700	2700	2650	2650	2600	4	750	750	750	700	700	700	650	
	6	2900	2900	2850	2850	2850	2800	2800	6	800	800	750	750	750	750	700	
	8	3000	3000	2950	2950	2950	2950	2900	8	800	800	800	800	800	750	750	
	10	3200	3150	3150	3150	3150	3100	3050	10	850	800	800	800	800	800	800	
	12	3350	3350	3350	3350	3300	3300	3250	12	850	850	850	850	850	850	850	
	14	3550	3550	3550	3500	3500	3450	3450	14	850	850	850	850	850	850	850	
	16	3750	3750	3700	3700	3650	3650	3600	MAX	850	850	850	850	850	850	850	

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

CENTER TANK (LITERS)

MMI READING	LITERS ATTITUDE MONITOR READING LINES A AND G*						
	1	2	3	4	5	6	7
2	300	300	350	350	350	350	350
4	400	450	450	500	500	500	500
6	600	600	650	650	650	650	650
8	750	750	750	750	750	750	750
10	900	850	850	850	850	850	900
12	1050	1000	1000	1000	1000	1000	1050
14	1250	1250	1200	1200	1200	1200	1200
16	1450	1450	1400	1400	1400	1400	1400
18	1650	1650	1600	1600	1600	1600	1600
20	1900	1850	1850	1850	1850	1800	1800
22	2100	2050	2050	2050	2050	2000	2000
24	2300	2250	2250	2250	2200	2200	2150
26	2450	2450	2450	2450	2450	2400	2350
28	2700	2650	2650	2650	2600	2550	2550
30	2900	2850	2850	2850	2800	2800	2750
32	3050	3050	3050	3050	3000	3000	2950
34	3250	3250	3250	3250	3200	3200	3150
36	3500	3500	3450	3450	3450	3400	3400
38	3700	3700	3700	3700	3650	3650	3600
40	3900	3900	3900	3900	3900	3850	3800
42	4100	4100	4100	4100	4100	4050	4050
44	4350	4350	4350	4300	4300	4250	4250
46	4550	4550	4550	4550	4500	4500	4450
48	4750	4750	4750	4700	4700	4650	4650
50	4950	4950	4950	4950	4900	4900	4850
52	5150	5150	5150	5150	5100	5100	5050
54	5400	5400	5400	5400	5350	5300	5250
56	5600	5600	5600	5600	5550	5500	5450
58	5800	5800	5800	5750	5750	5700	5650
60	6000	6000	6000	5950	5950	5900	5900
62	6200	6200	6200	6150	6150	6100	6100
64	6400	6400	6400	6400	6350	6300	6300
66	6600	6600	6600	6600	6550	6550	6500
68	6800	6800	6750	6750	6750	6700	6700
70	7000	6950	6950	6950	6900	6900	6900
72	7200	7200	7150	7150	7100	7100	7050
74	7400	7400	7350	7350	7300	7300	7300
76	7600	7600	7600	7550	7550	7500	7500
78	7850	7800	7800	7800	7750	7700	7700
MAX	7950	7900	7900	7900	7850	7800	7800

MMI READING	LITERS ATTITUDE MONITOR READING LINES B AND F						
	1	2	3	4	5	6	7**
2	300	300	300	300	300	300	350
4	400	450	450	450	500	500	500
6	600	600	650	650	650	650	600
8	750	750	750	750	750	750	750
10	900	850	850	850	850	850	900
12	1050	1000	1000	1000	1000	1000	1050
14	1250	1200	1200	1200	1200	1200	1200
16	1450	1450	1450	1450	1400	1400	1400
18	1700	1700	1650	1650	1600	1600	1600
20	1900	1900	1900	1850	1850	1850	1800
22	2100	2100	2100	2050	2050	2000	2000
24	2300	2300	2250	2250	2200	2200	2150
26	2500	2500	2450	2450	2400	2350	2350
28	2700	2700	2650	2650	2600	2550	2500
30	2900	2900	2900	2850	2800	2800	2750
32	3100	3100	3100	3050	3050	3000	2950
34	3300	3300	3300	3250	3250	3200	3150
36	3500	3500	3500	3450	3450	3400	3400
38	3700	3700	3700	3700	3650	3650	3600
40	3950	3950	3950	3900	3900	3850	3800
42	4150	4150	4150	4100	4100	4050	4000
44	4350	4350	4350	4300	4300	4250	4200
46	4550	4550	4550	4550	4500	4500	4450
48	4750	4750	4750	4750	4700	4700	4650
50	4950	4950	4950	4950	4900	4900	4850
52	5150	5150	5150	5150	5150	5100	5050
54	5400	5400	5400	5400	5350	5300	5250
56	5600	5600	5600	5600	5550	5500	5450
58	5800	5800	5800	5800	5750	5750	5700
60	6000	6000	6000	6000	5950	5950	5900
62	6200	6200	6200	6200	6150	6150	6100
64	6400	6400	6400	6400	6350	6350	6300
66	6600	6600	6600	6600	6550	6550	6500
68	6800	6800	6800	6800	6750	6750	6700
70	7000	7000	7000	6950	6950	6950	6900
72	7200	7200	7150	7150	7150	7100	7100
74	7400	7400	7350	7350	7350	7300	7300
76	7600	7600	7600	7550	7550	7500	7500
78	7800	7800	7800	7750	7750	7700	7700
MAX	7900	7900	7850	7850	7850	7800	7800

MMI READING	LITERS ATTITUDE MONITOR READING LINES C AND E						
	1	2	3	4	5	6	7
2	250	300	300	300	300	300	300
4	400	450	450	500	500	500	450
6	600	600	650	650	650	600	600
8	750	750	750	750	750	750	750
10	850	850	850	850	850	850	850
12	1050	1000	1000	1000	1000	1000	1000
14	1250	1200	1200	1200	1200	1200	1200
16	1450	1450	1450	1400	1400	1400	1400
18	1650	1650	1650	1650	1600	1600	1600
20	1900	1900	1900	1900	1900	1850	1800
22	2100	2100	2100	2100	2050	2050	2000
24	2300	2300	2250	2250	2250	2200	2200
26	2500	2500	2450	2450	2400	2400	2350
28	2700	2650	2650	2650	2600	2600	2550
30	2900	2900	2850	2850	2800	2800	2750
32	3100	3100	3100	3100	3050	3050	3000
34	3300	3300	3300	3250	3250	3200	3200
36	3500	3500	3500	3500	3450	3450	3400
38	3700	3700	3700	3700	3700	3650	3600
40	3950	3950	3950	3950	3900	3900	3850
42	4150	4150	4150	4150	4100	4100	4050
44	4350	4350	4350	4350	4300	4300	4250
46	4550	4550	4550	4550	4500	4500	4450
48	4750	4750	4750	4750	4750	4700	4650
50	4950	4950	4950	4950	4900	4900	4850
52	5150	5150	5150	5150	5100	5100	5050
54	5400	5400	5400	5400	5350	5300	5250
56	5600	5600	5600	5600	5550	5500	5450
58	5800	5800	5800	5800	5750	5700	5650
60	6000	6000	6000	6000	5950	5950	5900
62	6200	6200	6200	6200	6150	6100	6100
64	6400	6400	6400	6400	6350	6300	6300
66	6600	6600	6600	6600	6550	6550	6500
68	6800	6800	6800	6750	6750	6700	6700
70	7000	7000	7000	6950	6950	6900	6900
72	7200	7200	7150	7150	7150	7150	7100
74	7400	7400	7400	7350	7350	7300	7300
76	7600	7600	7600	7550	7550	7500	7500
78	7800	7800	7800	7750	7750	7700	7700
MAX	7900	7900	7850	7850	7850	7800	7800

MMI READING	LITERS ATTITUDE MONITOR READING LINES D						
	1	2	3	4	5	6	7
2	300	300	300	300	300	300	300
4	450	450	500	500	500	500	500
6	600	600	650	650	650	650	600
8	750	750	750	750	750	750	750
10	900	900	900	900	900	900	900
12	1050	1000	1000	1000	1000	1000	1050
14	1250	1250	1200	1200	1200	1200	1200
16	1500	1450	1450	1450	1400	1400	1400
18	1700	1700	1700	1650	1650	1650	1600
20	1900	1900	1900	1900	1900	1850	1850
22	2100	2100	2100	2100	2050	2050	2000
24	2300	2300	2300	2250	2250	2200	2200
26	2500	2500	2450	2450	2400	2400	2350
28	2700	2700	2700	2650	2600	2600	2550
30	2900	2900	2900	2900	2850	2800	2750
32	3100	3100	3100	3100	3050	3050	3000
34	3300	3300	3300	3300	3250	3250	3200
36	3500	3500	3500	3500	3450	3450	3400
38	3700	3750	3750	3700	3700	3650	3650
40	3950	3950	3950	3950	3900	3900	3850
42	4150	4150	4150	4150	4100	4100	4050
44	4350	4350	4350	4350	4300	4300	4250
46	4550	4550	4550	4550	4500	4500	4450
48	4750	4750	4750	4750	4700	4700	4650
50	4950	4950	4950	4950	4900	4900	4850
52	5200	5200	5200	5150	5100	5100	5050
54	5400	5400	5400	5400	5350	5300	5250
56	5600	5600	5600	5600	5550	5500	5450
58	5800	5800	5800	5800	5750	5700	5650
60	6000	6000	6000	6000	5950	5950	5900
62	6200	6200	6200	6200	6150	6150	6100
64	6400	6400	6400	6400	6350	6350	6300
66	6600	6600	6600	6600	6550	6550	6500
68	6800	6800	6800	6800	6750	6750	6700
70	7000	7000	7000	7000	6950	6950	6900
72	7200	7200	7200	7150	7150	7150	7100
74	7400	7400	7400	7350	7350	7350	7300
76	7600	7600	7600	7550	7550	7550	7500
78	7800	7800	7800	7750	7750	7700	7700
MAX	7900	7900	7900	7900	7850	7850	7800

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

GENERAL

Ident.: PER-LOD-WBA-LTS-00001685.0001001 / 09 DEC 09
Applicable to: ALL

This chart allows the determination of Aircraft CG location (MAC) function of dry operating weight, pantry adjustment, cargo loads, passengers and fuel on board.
The operational limits shown on the load and trim sheet are more restrictive than the certified limits because error margins have been taken into account.

The load and trim sheet needs to be updated when :
- a modification which changes the aircraft certified limits is included or
- a modification (cabin layout, cargo arrangement ...) which influences the operational limits is made.

It is the airline responsibility to define a load and trim sheet and to keep it up to date. *Refer to PER-LOD-WBA-LTS DESCRIPTION* is a description of the Load and Trim Sheet utilization (*Refer to PER-LOD-WBA-LTS LOAD AND TRIM SHEET*), for a typical passenger arrangement.
Refer to customized load and trim sheet for preparing a revenue flight.

DATA

Ident.: PER-LOD-WBA-LTS-00001686.0006001 / 23 JUN 15
Applicable to: ALL

Dry Operating Weight = 40 500 kg and CG = 25.5 % (H-arm = 17.27 m)
Deviation or adjustment = +100 kg in zone F
Cargo = 4 000 kg with the following distribution:
cargo 1 = 1 500 kg; cargo 4 = 2 000 kg; cargo 5 = 500 kg
Passengers = 120 PAX with the following distribution:
cabin OA = 50; cabin OB = 70
Ramp Fuel = 14 200 kg
Taxi Fuel = 200 kg
Fuel Density = 0.785 kg/l

DESCRIPTION

Ident.: PER-LOD-WBA-LTS-00001687.0006001 / 12 FEB 11
Applicable to: ALL

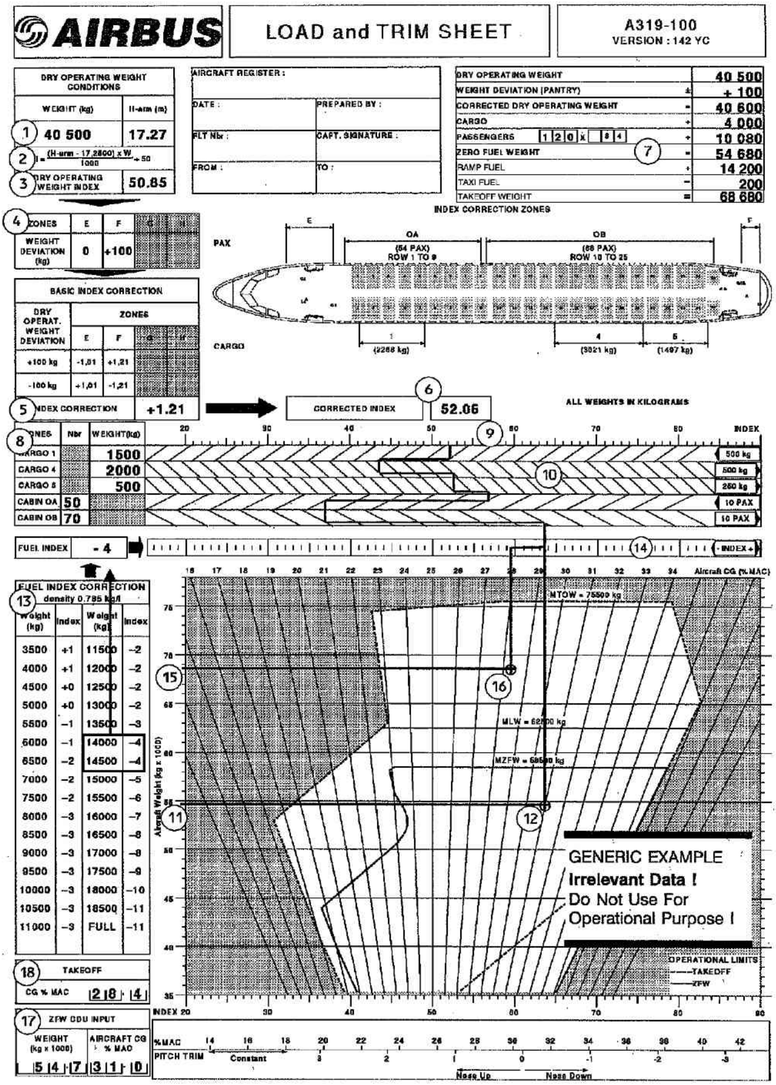
a. Enter Master data in (1).
b. Compute Dry Operating Weight Index using the formula indicated in (2) and report in (3).
c. Dry Operating Index = 50.85.
d. Enter weight deviation or adjustment in (4) and read corresponding index variation in (5): +1.21.
e. Calculate corrected index and report in (6): 51.06.
f. Enter master data in table (7) and determine Zero Fuel Weight: 54 680 kg and Takeoff Weight: 68 680 kg.
g. Enter cargo weight and passenger number per compartment in (8).
h. Enter index scale (9) with corrected index and proceed through cargo and passenger scales (10).
i. From the final point draw a vertical line which intersects (12) the zero fuel weight horizontal line (11).
j. Check if the intersection point is within the Zero Fuel Weight operational limits, if not rearrange cargo loading.
k. Read in table (13) the fuel index correction corresponding to Ramp Fuel Weight (14 200 kg) and Fuel Density (0.785 kg/l).
   This example will be continued assuming the FUEL INDEX = –4 was found.
   Carry in fuel scale (14).
l. From this point draw a vertical line which intersects (16) the takeoff weight horizontal line (15).
m. Check if the intersection point is within the Takeoff Weight operational limits.
n. Read zero fuel weight and CG position: 31 % and fill in table (17).
o. Read takeoff CG position: 28.4 % and fill in table (18).

CAUTION	If there is no customized trim sheet for your airline in this section, do not use the information enclosed herein for day to day operation as margins and load CG vary with cabin and cargo layout.

LOAD AND TRIM SHEET

Ident.: PER-LOD-WBA-LTS-00001688.0006001 / 23 FEB 11

Applicable to: ALL



FUEL INDEX TABLE

GENERAL

Ident.: PER-LOD-WBA-FIT-10-00012775.0006001 / 21 MAR 17
Applicable to: ALL

The fuel index table has been established assuming a fuel distribution in accordance with refuel distribution given in section*Refer to DSC-28-10-70 Refueling - Defueling* of this volume.
If after refueling the actual distribution deviates from the chart values, the actual and the trim sheet CG will show a discrepancy. The following tables allow to determine the fuel index taking into account the actual fuel quantity in each tank. To determine the actual takeoff CG enter the tables with the actual fuel quantities in each tank, read the fuel index for each tank and use their sum to enter the trim sheet. Check that the actual CG is inside the operational limits. If the CG is outside the limits transfer fuel to achieve a distribution in accordance with the chart or rearrange the load.

Note: *These tables are valid only when used with the following formula for the index:*
$I = W \times (H\text{-arm} - 17.25)/1\,000 + K$ *or* $I = [(CG - 25) \times W \times 0.000042] + K$
(Weight in kg, H-arm in m)

DATA : Fuel in left inner fuel tank = 4 500 kg
Fuel in right inner fuel tank = 4 500 kg
Fuel in left outer fuel tank = 200 kg
Fuel in right outer fuel tank = FULL
Fuel in center tank = 0 kg

		Weight	Index	
Inner tank	**Left**	4 500	-	3
	Right	4 500	-	3
Outer tank	**Left**	200		0
	Right	691	+	2
Center tank		0		0
TOTAL		9 891	-	4

Enter the trim sheet with a fuel index of –4

FUEL INDEX TABLE FOR INNER TANK

Ident.: PER-LOD-WBA-FIT-10-00012776.0003001 / 25 JUL 12
Applicable to: ALL

Note: These tables are valid only when used with the following formulae for the index: I=W×(H-arm–17.25)/1 000+K or I=[(CG–25)×W×0.000042]+K (Weight in kg, H-arm in m)

Weight	Index
400	0
800	-1
1 200	-1
1 600	-2
2 000	-2
2 400	-2
2 800	-3
3 200	-3
3 600	-3
4 000	-3
4 400	-3
4 800	-3
5 200	-3
FULL	-2

FUEL INDEX TABLE FOR OUTER TANK

Ident.: PER-LOD-WBA-FIT-10-00012777.0003001 / 25 JUL 12
Applicable to: ALL

Note: These tables are valid only when used with the following formulae for the index: I=W×(H-arm–17.25)/1 000+K or I=[(CG–25)×W×0.000042]+K (Weight in kg, H-arm in m)

Weight	Index
200	0
400	1
600	1
FULL	2

FUEL INDEX TABLE FOR CENTER TANK

Ident.: PER-LOD-WBA-FIT-10-00012778.0005001 / 25 JUL 12
Applicable to: ALL

Note: These tables are valid only when used with the following formulae for the index:
I=W×(H-arm–17.25)/1 000+K or I=[(CG–25)×W×0.000042]+K (Weight in kg, H-arm in m)

Weight	Index
400	0
800	-1
1 200	-1
1 600	-2
2 000	-3
2 400	-3
2 800	-4
3 200	-5
3 600	-5
4 000	-6
4 400	-6
4 800	-7
5 200	-8
5 600	-8
6 000	-9
6 400	-10
FULL	-10

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PERFORMANCE

OPERATING DATA

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PER-OPD-GEN GENERAL

PER-OPD-CON GROUND DISTANCE/AIR DISTANCE CONVERSION

PER-OPD-CON-AEO ALL ENGINES OPERATIVE

PER-OPD-CON-OEI ONE ENGINE INOPERATIVE

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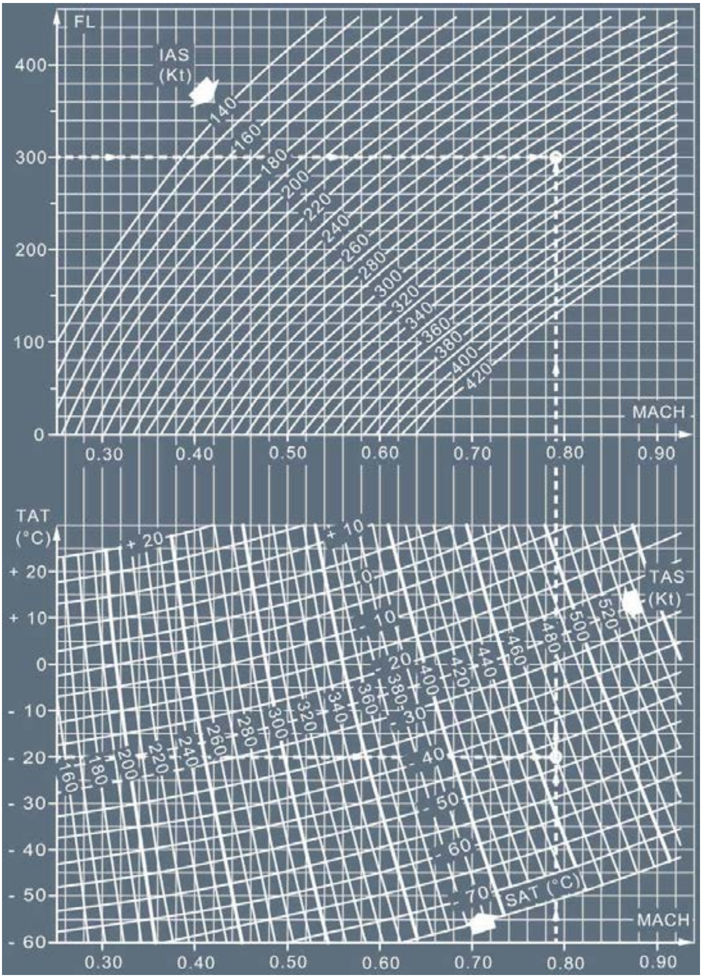
CONVERSIONS - IAS . MACH - TAS . MACH - SAT . TAT

Ident.: PER-OPD-GEN-00001962.0001001 / 23 FEB 11
Applicable to: ALL



INTERNATIONAL STANDARD ATMOSPHERE (ISA)

Ident.: PER-OPD-GEN-00001963.0001001 / 09 DEC 09
Applicable to: ALL

ALTITUDE (Feet)	TEMP. (°C)	PRESSURE hPa	PRESSURE P.S.I.	PRESSURE in. Hg.	PRESSURE RATIO $\delta = P / Po$	DENSITY $\sigma = \rho / \rho o$	SPEED OF SOUND (a) (kt)	ALTITUDE (meters)
40,000	− 56.5	188	2.72	5.54	0.1851	0.2462	573	12.192
39,000	− 56.5	197	2.85	5.81	0.1942	0.2583	573	11.887
38,000	− 56.5	206	2.99	6.10	0.2038	0.2710	573	11.582
37,000	− 56.5	217	3.14	6.40	0.2138	0.2844	573	11.278
36,000	− 56.3	227	3.30	6.71	0.2243	0.2981	573	10.973
35,000	− 54.3	238	3.46	7.04	0.2353	0.3099	576	10.668
34,000	− 52.4	250	3.63	7.38	0.2467	0.3220	579	10.363
33,000	− 50.4	262	3.80	7.74	0.2586	0.3345	581	10.058
32,000	− 48.4	274	3.98	8.11	0.2709	0.3473	584	9.754
31,000	− 46.4	287	4.17	8.49	0.2837	0.3605	586	9.449
30,000	− 44.4	301	4.36	8.89	0.2970	0.3741	589	9.144
29,000	− 42.5	315	4.57	9.30	0.3107	0.3881	591	8.839
28,000	− 40.5	329	4.78	9.73	0.3250	0.4025	594	8.534
27,000	− 38.5	344	4.99	10.17	0.3398	0.4173	597	8.230
26,000	− 36.5	360	5.22	10.63	0.3552	0.4325	599	7.925
25,000	− 34.5	376	5.45	11.10	0.3711	0.4481	602	7.620
24,000	− 32.5	393	5.70	11.60	0.3876	0.4642	604	7.315
23,000	− 30.6	410	5.95	12.11	0.4046	0.4806	607	7.010
22,000	− 28.6	428	6.21	12.64	0.4223	0.4976	609	6.706
21,000	− 26.6	446	6.47	13.18	0.4406	0.5150	611	6.401
20,000	− 24.6	466	6.75	13.75	0.4595	0.5328	614	6.096
19,000	− 22.6	485	7.04	14.34	0.4791	0.5511	616	5.791
18,000	− 20.7	506	7.34	14.94	0.4994	0.5699	619	5.406
17,000	− 18.7	527	7.65	15.57	0.5203	0.5892	621	5.182
16,000	− 16.7	549	7.97	16.22	0.5420	0.6090	624	4.877
15,000	− 14.7	572	8.29	16.89	0.5643	0.6292	626	4.572
14,000	− 12.7	595	8.63	17.58	0.5875	0.6500	628	4.267
13,000	− 10.8	619	8.99	18.29	0.6113	0.6713	631	3.962
12,000	− 8.8	644	9.35	19.03	0.6360	0.6932	633	3.658
11,000	− 6.8	670	9.72	19.79	0.6614	0.7156	636	3.353
10,000	− 4.8	697	10.10	20.58	0.6877	0.7385	638	3.048
9,000	− 2.8	724	10.51	21.39	0.7148	0.7620	640	2.743
8,000	− 0.8	753	10.92	22.22	0.7428	0.7860	643	2.438
7,000	+ 1.1	782	11.34	23.09	0.7716	0.8106	645	2.134
6,000	+ 3.1	812	11.78	23.98	0.8014	0.8359	647	1.829
5,000	+ 5.1	843	12.23	24.90	0.8320	0.8617	650	1.524
4,000	+ 7.1	875	12.69	25.84	0.8637	0.8881	652	1.219
3,000	+ 9.1	908	13.17	26.82	0.8962	0.9151	654	914
2,000	+ 11.0	942	13.67	27.82	0.9298	0.9428	656	610
1,000	+ 13.0	977	14.17	28.86	0.9644	0.9711	659	305
0	+ 15.0	1013	14.70	29.92	1.0000	1.0000	661	0
− 1.000	+ 17.0	1050	15.23	31.02	1.0366	1.0295	664	− 305

CONVERSIONS - QNH - QFE - PRESSURE ALTITUDE

Ident.: PER-OPD-GEN-00001964.0001001 / 09 DEC 09
Applicable to: ALL

QNH (hPa)	CORRECTION (ft)	QNH (in Hg)
949 – 951	+ 1900	28.01 – 28.10
952 – 955	+ 1800	28.11 – 28.20
956 – 958	+ 1700	28.21 – 28.30
959 – 961	+ 1600	28.31 – 28.40
962 – 964	+ 1500	28.41 – 28.45
965 – 968	+ 1400	28.46 – 28.56
969 – 971	+ 1300	28.57 – 28.66
972 – 974	+ 1200	28.68 – 28.77
975 – 978	+ 1100	28.78 – 28.86
979 – 981	+ 1000	28.87 – 28.95
982 – 984	+ 900	28.96 – 29.05
985 – 988	+ 800	29.06 – 29.15
989 – 991	+ 700	29.16 – 29.25
992 – 994	+ 600	29.26 – 29.35
995 – 997	+ 500	29.36 – 29.45
998 – 1001	+ 400	29.46 – 29.54
1002 – 1004	+ 300	29.55 – 29.64
1005 – 1007	+ 200	29.65 – 29.74
1008 – 1011	+ 100	29.75 – 29.84
1012 – 1014	0	29.85 – 29.94
1015 – 1018	– 100	29.95 – 30.04
1019 – 1021	– 200	30.05 – 30.14
1022 – 1025	– 300	30.15 – 30.24
1026 – 1028	– 400	30.25 – 30.34
1029 – 1031	– 500	30.35 – 30.44
1032 – 1035	– 600	30.45 – 30.54
1036 – 1038	– 700	30.55 – 30.65
1039 – 1042	– 800	30.66 – 30.75
1043 – 1045	– 900	30.76 – 30.85
1046 – 1050	– 1000	30.86 – 30.95

Examples :
1) Elevation: 2500 ft QNH = 1020 hPa
Find : correction: -200 ft
Pressure altitude = 2300 ft QFE = 933 hPa
2) Elevation: 1500 ft QFE = 980 hPa
Find : Pressure altitude: 920 ft
Correction = - 580 ft QNH = 1032 hPa

CONVERSIONS QFE HPA - IN. HG - FT

Ident.: PER-OPD-GEN-00001965.0001001 / 08 FEB 11

Applicable to: ALL

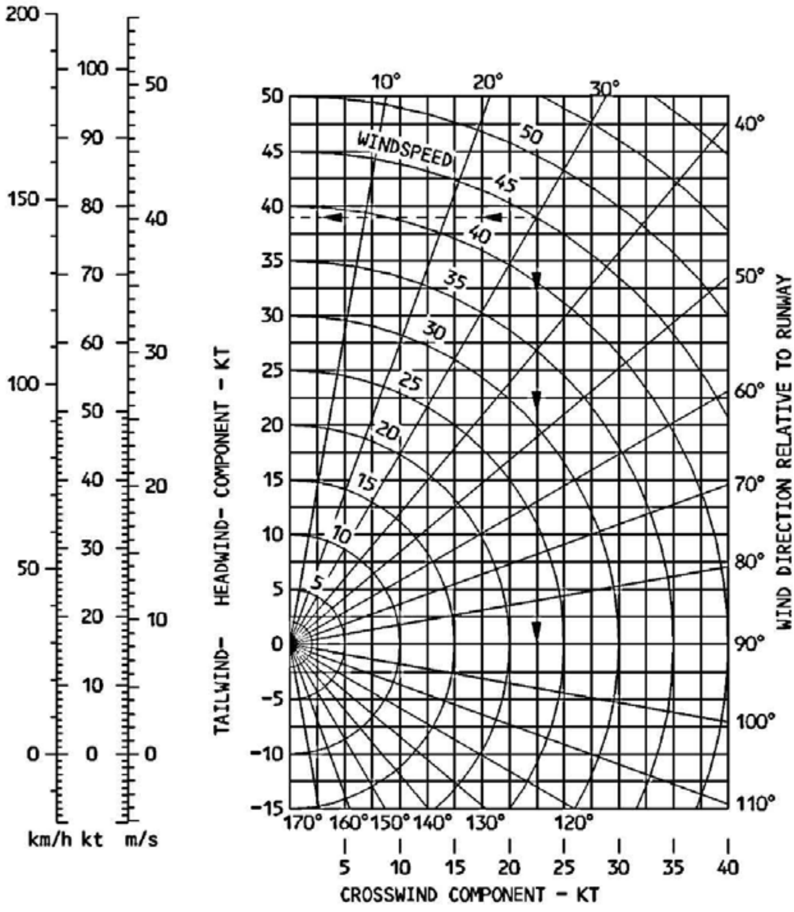
QFE hPa	in. Hg	PRESS. ALT. ft	QFE hPa	in. Hg	PRESS. ALT. ft	QFE hPa	in. Hg	PRESS. ALT. ft
1050	31.01	– 989	960	28.35	1486	870	25.69	4157
1048	30.95	– 936	958	28.29	1543	868	25.63	4219
1046	30.89	– 883	956	28.23	1601	866	25.57	4281
1044	30.83	– 830	954	28.17	1658	864	25.51	4343
1042	30.77	– 776	952	28.11	1715	862	25.45	4405
1040	30.71	– 723	950	28.05	1773	860	25.40	4468
1038	30.65	– 669	948	27.99	1831	858	25.34	4531
1036	30.59	– 615	946	27.94	1889	856	25.28	4593
1034	30.53	– 562	944	27.88	1947	854	25.22	4656
1032	30.47	– 508	942	27.82	2005	852	25.16	4718
1030	30.42	– 454	940	27.76	2062	850	25.10	4781
1028	30.36	– 400	938	27.70	2120	848	25.04	4844
1026	30.30	– 346	936	27.64	2178	846	24.98	4907
1024	30.24	– 292	934	27.58	2236	844	24.92	4970
1022	30.18	– 238	932	27.52	2294	842	24.86	5033
1020	30.12	– 184	930	27.46	2353	840	24.81	5097
1018	30.06	– 129	928	27.40	2412	838	24.75	5161
1016	30.00	– 74	926	27.34	2471	836	24.69	5225
1014	29.94	– 20	924	27.29	2530	834	24.63	5289
1012	29.88	34	922	27.23	2589	832	24.57	5353
1010	29.83	89	920	27.17	2647	830	24.51	5417
1008	29.77	144	918	27.11	2707	828	24.45	5481
1006	29.71	199	916	27.05	2767	826	24.39	5545
1004	29.65	254	914	26.99	2826	824	24.33	5610
1002	29.59	309	912	26.93	2885	822	24.27	5675
1000	29.53	364	910	26.87	2944	820	24.21	5740
998	29.47	419	908	26.81	3004	818	24.16	5805
996	29.41	475	906	26.75	3064	816	24.10	5870
994	29.35	530	904	26.70	3124	814	24.04	5935
992	29.29	586	902	26.64	3183	812	23.98	6000
990	29.23	641	900	26.58	3243	810	23.92	6065
988	29.18	697	898	26.52	3303	808	23.86	6131
986	29.12	753	896	26.46	3363	806	23.80	6197
984	29.06	809	894	26.40	3424	804	23.74	6263
982	29.00	865	892	26.34	3484	802	23.68	6329
980	28.94	921	890	26.28	3545	800	23.62	6394
978	28.88	977	888	26.22	3606	798	23.56	6461
976	28.82	1033	886	26.16	3667	796	23.51	6528
974	28.76	1089	884	26.10	3728	794	23.45	6595
972	28.70	1145	882	26.05	3789	792	23.39	6661
970	28.64	1202	880	25.99	3850	790	23.33	6727
968	28.59	1259	878	25.93	3911	788	23.27	6794
966	28.53	1316	876	25.87	3973	786	23.21	6861
964	28.47	1373	874	25.81	4034	784	23.15	6928
962	28.41	1430	872	25.75	4096	782	23.09	6995

WIND COMPONENTS (FOR TAKEOFF AND LANDING)

Ident.: PER-OPD-GEN-00001966.0001001 / 08 FEB 11

MULTIPLY	BY	TO GET
kt	1.852	km/h
kt	0.5144	m/s
m/s	3.6	km/h
m/s	1.9438	kt
km/h	0.5396	kt
km/h	0.2778	m/s

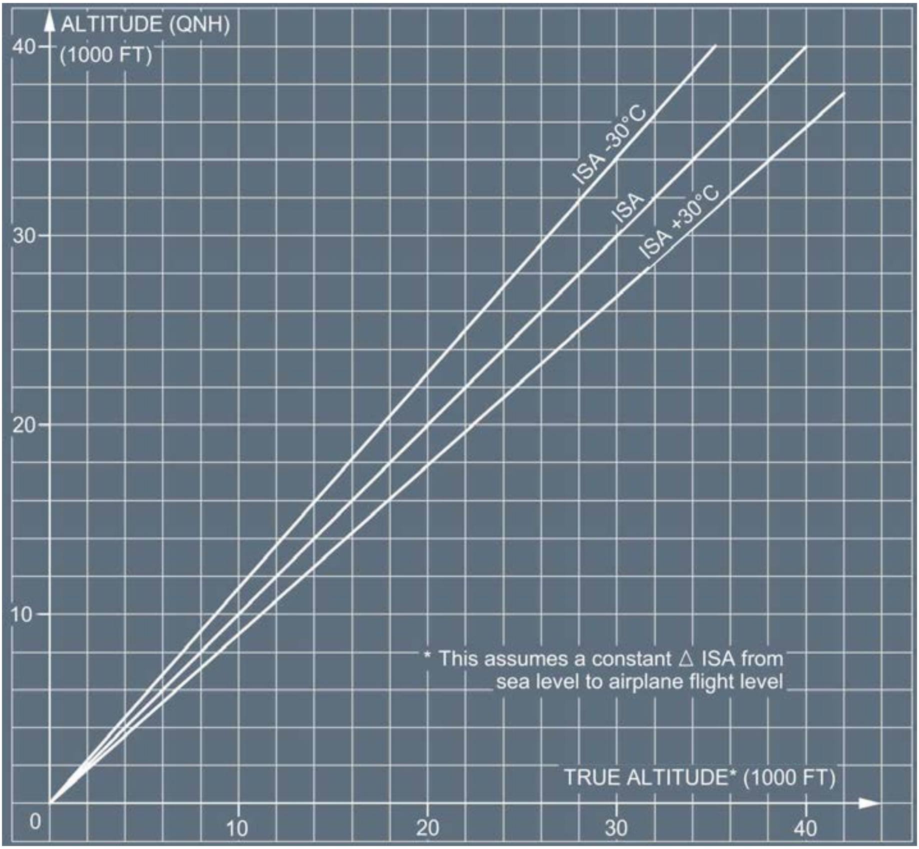
GIVEN	FIND
WIND DIRECTION RELATIVE TO RUNWAY HEADING=30 DEG WIND SPEED=45 KT	CROSS WIND COMPONENT=22.5 KT HEAD WIND COMPONENT=39.0 KT



ALTITUDE TEMPERATURE CORRECTION

Ident.: PER-OPD-GEN-00001967.0001001 / 12 FEB 11
Applicable to: ALL

FOR HIGH ALTITUDE USE



FOR LOW ALTITUDE USE

Values to be added by the pilot to minimum promulgated heights/altitude (ft)

Airport Temperature °C	Height above the elevation of the altimeter setting source (feet)								
	200	300	400	500	1 000	2 000	3 000	4 000	5 000
0	20	20	30	30	60	120	170	230	280

Continued on the following page

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Airport Temperature °C	Height above the elevation of the altimeter setting source (feet)								
	200	**300**	**400**	**500**	**1 000**	**2 000**	**3 000**	**4 000**	**5 000**
-10	20	30	40	50	100	200	290	390	490
-20	30	50	60	70	140	280	420	570	710
-30	40	60	80	100	190	380	570	760	950
-40	50	80	100	120	240	480	720	970	1 210
-50	60	90	120	150	300	590	890	1 190	1 500

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GENERAL

Ident.: PER-OPD-CON-AEO-00001657.0001001 / 23 FEB 11
Applicable to: ALL

The ground distance/air distance conversion tables show the air distance for a given ground distance due to the influence of the wind.

The Tables are given for :
- M .78
- Long range speed.

M.78

Ident.: PER-OPD-CON-AEO-00001658.0001001 / 28 JAN 11
Applicable to: ALL

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND			WIND COMPONENTS (KT)			HEAD WIND
	+ 150	+ 100	+ 50	0	− 50	− 100	− 150
10	7	8	9	**10**	11	13	15
20	15	16	18	**20**	23	26	30
30	22	25	27	**30**	34	39	45
40	30	33	36	**40**	45	51	60
50	37	41	45	**50**	56	64	75
100	75	82	90	**100**	113	129	150
200	150	164	180	**200**	225	257	300
300	225	245	270	**300**	338	386	450
400	300	327	360	**400**	450	514	600
500	375	409	450	**500**	563	643	750
1000	750	818	900	**1000**	1125	1286	1501
1500	1125	1227	1350	**1500**	1688	1929	2251
2000	1500	1636	1800	**2000**	2248	2572	3001
2500	1875	2045	2250	**2500**	2813	3215	3752
3000	2250	2454	2700	**3000**	3375	3858	4502
3500	2624	2863	3150	**3500**	3938	4501	5252
4000	2999	3272	3600	**4000**	4500	5144	6003
4500	3374	3681	4050	**4500**	5063	5787	6753
5000	3749	4090	4500	**5000**	5626	6430	7503

FLIP23 A320211 M565A1PIP 3410 03301.000011 0250300 .7800 .00000 0 0300350 0 0 77 64 43 61 18590 FCOM-N0-03-50-002-001

LONG RANGE SPEED UP TO FL270

Ident.: PER-OPD-CON-AEO-00001659.0003001 / 28 FEB 11
Applicable to: ALL

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	−50	−100	−150
10	7	8	9	**10**	12	14	17
20	14	16	18	**20**	23	27	33
30	21	24	26	**30**	35	41	50
40	29	32	35	**40**	46	55	67
50	36	39	44	**50**	58	68	83
100	71	79	88	**100**	115	136	167
200	143	158	176	**200**	231	273	334
300	214	237	265	**300**	346	409	501
400	286	316	353	**400**	462	546	668
500	357	395	441	**500**	577	682	835
1000	714	789	882	**1000**	1154	1365	1669
1500	1071	1184	1323	**1500**	1731	2047	2504
2000	1428	1578	1764	**2000**	2309	2730	3339
2500	1784	1973	2205	**2500**	2886	3412	4174
3000	2141	2367	2646	**3000**	3463	4095	5008
3500	2498	2762	3087	**3500**	4040	4777	5843
4000	2855	3156	3528	**4000**	4617	5459	6678
4500	3212	3551	3969	**4500**	5194	6142	7512
5000	3569	3945	4410	**5000**	5771	6824	8347

LONG RANGE SPEED ABOVE FL270

Ident.: PER-OPD-CON-AEO-00001660.0003001 / 23 FEB 11
Applicable to: ALL

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+150	+100	+ 50	0	–50	–100	–150
10	8	8	9	**10**	11	13	15
20	15	16	18	**20**	22	26	30
30	23	25	27	**30**	34	38	45
40	30	33	36	**40**	45	51	60
50	38	41	45	**50**	56	64	75
100	75	82	90	**100**	112	128	149
200	150	164	180	**200**	225	257	299
300	225	246	270	**300**	337	385	448
400	301	328	360	**400**	450	513	598
500	376	410	450	**500**	562	641	747
1000	751	819	901	**1000**	1124	1283	1494
1500	1127	1229	1351	**1500**	1686	1924	2241
2000	1503	1639	1801	**2000**	2248	2566	2989
2500	1879	2048	2252	**2500**	2810	3207	3736
3000	2254	2458	2702	**3000**	3372	3849	4483
3500	2630	2868	3152	**3500**	3934	4490	5230
4000	3006	3277	3603	**4000**	4496	5132	5977
4500	3381	3687	4053	**4500**	5058	5773	6724
5000	3757	4097	4503	**5000**	5620	6415	7471

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GENERAL

Ident.: PER-OPD-CON-OEI-00004074.0001001 / 09 DEC 09
Applicable to: ALL

The ground distance/air distance conversion tables are used to calculate the air distance for a given ground distance due to the influence of the wind.

Tables are given for :
- LONG RANGE SPEED
- FIXED SPEEDS

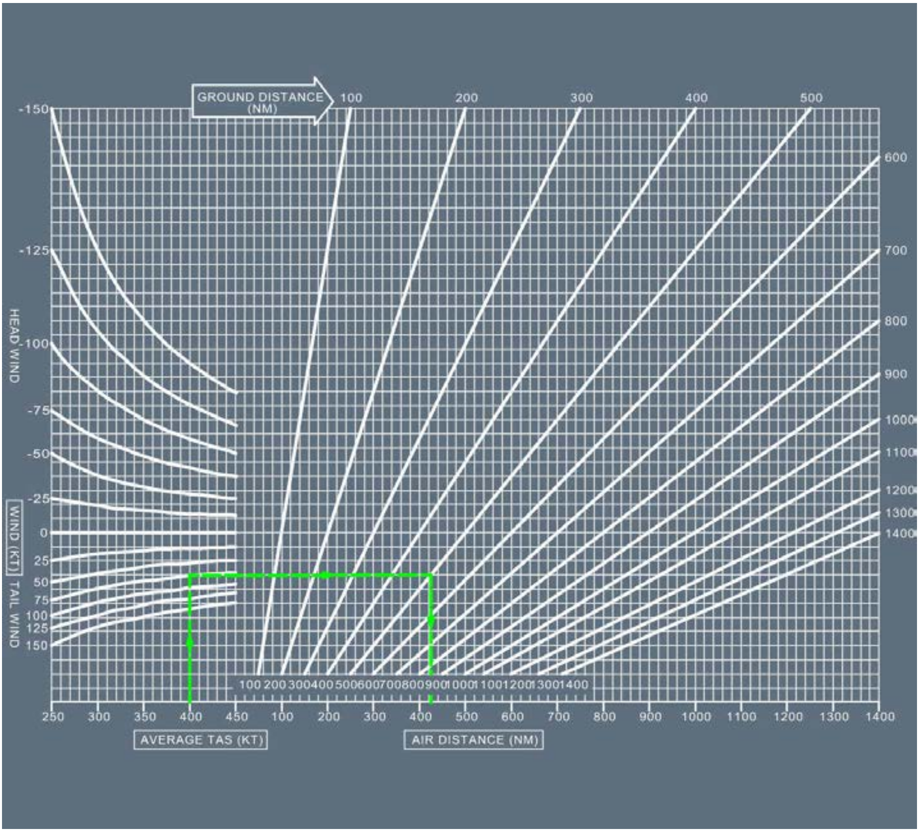
LONG RANGE SPEED

Ident.: PER-OPD-CON-OEI-00001960.0003001 / 09 DEC 09
Applicable to: ALL

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	−50	−100	−150
10	7	8	9	**10**	11	13	15
20	15	16	18	**20**	23	26	31
30	22	24	27	**30**	34	39	46
40	30	32	36	**40**	45	52	62
50	37	41	45	**50**	57	65	77
60	44	49	54	**60**	68	78	93
70	52	57	63	**70**	79	91	108
80	59	65	72	**80**	91	104	123
90	67	73	81	**90**	102	118	139
100	74	81	90	**100**	113	131	154
200	148	162	179	**200**	227	261	308
300	222	243	269	**300**	340	392	463
400	296	324	358	**400**	453	522	617
500	370	405	448	**500**	566	653	771
600	444	486	537	**600**	680	784	925
700	518	567	627	**700**	793	914	1080
800	592	648	716	**800**	906	1045	1234
900	666	729	806	**900**	1019	1176	1388
1000	740	810	895	**1000**	1133	1306	1542
1100	814	891	985	**1100**	1246	1437	1696
1200	888	972	1074	**1200**	1359	1567	1851
1300	962	1053	1164	**1300**	1473	1698	2005
1400	1036	1134	1253	**1400**	1586	1829	2159
1500	1110	1215	1343	**1500**	1699	1959	2313
1600	1184	1296	1432	**1600**	1812	2090	2468
1700	1258	1377	1522	**1700**	1926	2220	2622
1800	1332	1458	1611	**1800**	2039	2351	2776
1900	1406	1539	1701	**1900**	2152	2482	2930
2000	1480	1620	1790	**2000**	2266	2612	3085

FIXED SPEEDS

Ident.: PER-OPD-CON-OEI-00001961.0001001 / 09 DEC 09
Applicable to: ALL



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PERFORMANCE

THRUST RATINGS

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GENERAL

Ident.: PER-THR-GEN-00004079.0001001 / 28 FEB 11
Applicable to: ALL

The thrust rating charts have been established for:
- Maximum takeoff
- Maximum go around
- Flexible takeoff
- Maximum continuous
- Maximum climb
- Maximum cruise

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DEFINITION

Ident.: PER-THR-MTO-00001968.0001001 / 01 MAR 11
Applicable to: ALL

It is the maximum thrust certified for takeoff and is normally limited to five minutes.
This time is extended to ten minutes for engine out contingency, as authorized by the approved AFM.

MAXIMUM TAKEOFF

Ident.: PER-THR-MTO-00001969.0019001 / 28 JAN 11
Applicable to: ALL

CFM56-5B6 TAKE OFF N1 NO AIR BLEED MACH=.000	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 30	OAT ≥ ISA + 30
	AIR CONDITIONING ON	–.7	–.7
	ENGINE ANTI ICE ON	0.0	–1.4
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–2.1

OAT (°C)	PRESSURE ALTITUDE (FT) –2000.	–1000.	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.
–54.0	73.7	74.7	75.8	76.7	77.6	78.7	79.3	79.8	80.4	80.8
–50.0	74.4	75.4	76.4	77.4	78.3	79.3	79.9	80.5	81.1	81.5
–46.0	75.0	76.1	77.1	78.0	79.0	80.0	80.6	81.2	81.8	82.2
–42.0	75.7	76.7	77.8	78.7	79.6	80.7	81.3	81.9	82.4	82.9
–38.0	76.3	77.4	78.4	79.4	80.3	81.4	82.0	82.6	83.1	83.6
–34.0	76.9	78.0	79.0	80.0	80.9	82.0	82.6	83.2	83.8	84.2
–30.0	77.5	78.6	79.7	80.6	81.6	82.7	83.3	83.9	84.4	84.9
–26.0	78.1	79.2	80.3	81.3	82.2	83.3	83.9	84.5	85.1	85.6
–22.0	78.8	79.9	80.9	81.9	82.8	84.0	84.6	85.2	85.7	86.2
–18.0	79.4	80.5	81.6	82.5	83.5	84.6	85.2	85.9	86.4	86.9
–14.0	80.0	81.1	82.2	83.2	84.1	85.3	85.9	86.5	87.0	87.5
–10.0	80.6	81.7	82.8	83.8	84.7	85.9	86.5	87.1	87.7	88.2
–6.0	81.2	82.3	83.4	84.4	85.3	86.5	87.1	87.7	88.3	88.8
–2.0	81.7	82.9	84.0	85.0	85.9	87.1	87.7	88.4	88.9	89.4
2.0	82.3	83.5	84.6	85.6	86.6	87.7	88.3	89.0	89.5	90.0
6.0	82.9	84.1	85.2	86.2	87.2	88.3	89.0	89.6	90.1	90.6
10.0	83.5	84.6	85.8	86.8	87.8	88.9	89.6	90.2	90.8	91.3
14.0	84.1	85.2	86.4	87.4	88.4	89.5	90.2	90.8	91.4	91.9
18.0	84.6	85.8	86.9	88.0	88.9	90.1	90.8	91.4	92.0	92.5
22.0	85.2	86.4	87.5	88.5	89.5	90.7	91.4	92.0	92.6	93.1
26.0	85.7	86.9	88.1	89.1	90.1	91.3	91.9	92.6	93.2	93.7
30.0	86.3	87.5	88.6	89.7	90.7	91.9	92.5	93.2	93.7	94.3
34.0	86.8	88.0	89.2	90.2	91.2	92.4	93.1	93.8	*94.1*	*94.0*
38.0	87.4	88.6	89.7	90.8	91.8	93.0	*93.4*	*93.5*	*93.5*	*93.4*
42.0	88.0	89.2	90.3	91.4	*92.1*	*92.8*	*92.9*	*93.0*	*92.9*	
46.0	88.5	89.7	*90.6*	*91.1*	*91.6*					
50.0	*88.7*	*89.4*	*90.0*	*90.6*	*91.1*					
54.0	*88.2*	*88.8*	*89.5*							

OAT < ISA + 30
OAT ≥ ISA + 30

CFM56-5B6 TAKE OFF N1 NO AIR BLEED MACH=.000	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 30	OAT > ISA + 30
	AIR CONDITIONING ON	–0.7	–0.7
	NACELLE ANTI-ICE ON	0.0	–1.4
	NACELLE ANTI-ICE AND WING ANTI-ICE ON	0.0	–2.1

OAT (°C)	PRESSURE ALTITUDE (FT) 7000.	8000.	9000.	9200.	10000.	11000.	12000.	13000.	14000.	14500.
–54.0	80.8	81.3	81.9	82.0	82.4	82.9	83.5	84.1	84.7	84.9
–50.0	81.5	82.0	82.6	82.7	83.1	83.6	84.2	84.8	85.4	85.7
–46.0	82.2	82.7	83.3	83.4	83.8	84.4	85.0	85.6	86.1	86.4
–42.0	82.9	83.4	84.0	84.1	84.6	85.1	85.7	86.3	86.8	87.1
–38.0	83.6	84.1	84.7	84.8	85.2	85.7	86.3	86.9	87.5	87.8
–34.0	84.2	84.7	85.3	85.4	85.9	86.4	87.0	87.6	88.2	88.5
–30.0	84.9	85.4	86.0	86.1	86.6	87.1	87.7	88.3	88.9	89.2
–26.0	85.6	86.0	86.6	86.8	87.2	87.7	88.4	89.0	89.6	89.8
–22.0	86.2	86.7	87.3	87.4	87.9	88.4	89.0	89.7	90.2	90.5
–18.0	86.9	87.4	88.0	88.1	88.6	89.1	89.7	90.3	90.9	91.2
–14.0	87.5	88.0	88.6	88.8	89.2	89.8	90.4	91.0	91.6	91.9
–10.0	88.2	88.7	89.3	89.4	89.9	90.4	91.0	91.6	92.2	92.5
–6.0	88.8	89.3	89.9	90.0	90.5	91.0	91.7	92.3	92.9	93.2
–2.0	89.4	89.9	90.5	90.6	91.1	91.7	92.3	92.9	93.5	93.8
2.0	90.0	90.5	91.2	91.3	91.8	92.3	92.9	93.6	94.2	94.5
6.0	90.6	91.2	91.8	91.9	92.4	92.9	93.6	94.2	94.8	95.1
10.0	91.3	91.8	92.4	92.5	93.0	93.5	94.2	94.8	95.4	95.7
14.0	91.9	92.4	93.0	93.2	93.6	94.2	94.8	95.5	96.1	96.4
18.0	92.5	93.0	93.6	93.8	94.2	94.8	95.4	96.1	*96.4*	*96.4*
22.0	93.1	93.6	94.2	94.4	94.8	95.4	*95.8*	*95.8*	*95.7*	*95.6*
26.0	93.7	94.2	94.8	94.9	*95.2*	*95.1*	*95.1*	*95.0*	*94.8*	*94.8*
30.0	94.3	*94.5*	*94.5*	*94.5*	*94.5*	*94.4*	*94.3*			
34.0	*94.0*	*93.9*	*93.9*	*93.9*	*93.8*					
38.0	*93.4*	*93.3*								
42.0										
46.0										
50.0										
54.0										

OAT < ISA + 30
OAT ≥ ISA + 30

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DEFINITION

Ident.: PER-THR-MGA-00001971.0001001 / 23 FEB 11
Applicable to: ALL

It is the maximum permissible thrust during go-around.

MAXIMUM GO AROUND

Ident.: PER-THR-MGA-00001972.0025001 / 28 JAN 11
Applicable to: ALL

CFM56-5B6 GO AROUND N1 AIR CONDITIONING ON MACH=.225	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 30	OAT ≥ ISA + 30
	AIR CONDITIONING OFF	.6	.6
	ENGINE ANTI ICE ON	0.0	–1.3
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–1.9

TAT (°C)	PRESSURE ALTITUDE (FT) –2000.	–1000.	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.
–54.0	74.7	75.6	76.5	77.2	77.8	78.3	79.1	79.8	80.4	80.9
–50.0	75.3	76.3	77.2	77.8	78.5	79.0	79.8	80.5	81.1	81.6
–46.0	76.0	76.9	77.8	78.5	79.2	79.7	80.4	81.2	81.8	82.3
–42.0	76.6	77.6	78.5	79.2	79.9	80.4	81.1	81.8	82.5	83.0
–38.0	77.3	78.2	79.1	79.8	80.5	81.0	81.8	82.5	83.1	83.7
–34.0	77.9	78.8	79.8	80.5	81.1	81.7	82.4	83.2	83.8	84.3
–30.0	78.5	79.5	80.4	81.1	81.8	82.3	83.1	83.8	84.5	85.0
–26.0	79.1	80.1	81.1	81.7	82.4	83.0	83.7	84.5	85.1	85.7
–22.0	79.8	80.7	81.7	82.4	83.1	83.6	84.4	85.1	85.8	86.3
–18.0	80.4	81.4	82.3	83.0	83.7	84.3	85.0	85.8	86.4	87.0
–14.0	81.0	82.0	83.0	83.7	84.4	84.9	85.7	86.4	87.1	87.6
–10.0	81.6	82.6	83.6	84.3	85.0	85.5	86.3	87.0	87.7	88.3
–6.0	82.2	83.2	84.2	84.9	85.6	86.1	86.9	87.7	88.3	88.9
–2.0	82.8	83.8	84.8	85.5	86.2	86.8	87.5	88.3	88.9	89.5
2.0	83.4	84.4	85.4	86.1	86.8	87.4	88.1	88.9	89.6	90.1
6.0	83.9	85.0	86.0	86.7	87.4	88.0	88.8	89.5	90.2	90.7
10.0	84.5	85.6	86.6	87.3	88.0	88.6	89.4	90.1	90.8	91.4
14.0	85.1	86.2	87.2	87.9	88.6	89.2	90.0	90.7	91.4	92.0
18.0	85.7	86.7	87.7	88.5	89.2	89.8	90.6	91.3	92.0	92.6
22.0	86.2	87.3	88.3	89.0	89.8	90.4	91.1	91.9	92.6	93.2
26.0	86.8	87.9	88.9	89.6	90.3	90.9	91.7	92.5	93.2	93.8
30.0	87.4	88.4	89.4	90.2	90.9	91.5	92.3	93.1	93.8	94.4
34.0	87.9	89.0	90.0	90.8	91.5	92.1	92.9	93.7	94.4	95.0
38.0	88.5	89.5	90.6	91.3	92.1	92.7	93.5	94.3	*94.4*	*94.4*
42.0	89.0	90.1	91.1	91.9	92.6	93.2	*93.6*	*93.8*	*93.8*	*93.7*
46.0	89.6	90.7	91.7	92.5	*92.7*	*92.8*	*93.1*	*93.2*	*93.1*	
50.0	*90.1*	*91.2*	*91.8*	*92.1*	*92.3*	*92.4*	*92.6*			
54.0	*90.2*	*90.7*	*91.3*	*91.6*	*91.8*					
58.0	*89.6*	*90.2*	*90.8*							
62.0	*89.0*									

OAT < ISA + 30
OAT ≥ ISA + 30

PERFORMANCE

THRUST RATINGS

MAXIMUM GO AROUND

CFM56-5B6 GO AROUND N1 AIR CONDITIONING ON MACH=.225	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 30	OAT ≥ ISA + 30
	AIR CONDITIONING OFF	.6	.6
	ENGINE ANTI ICE ON	0.0	–1.3
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–1.9

TAT (°C)	PRESSURE ALTITUDE (FT) 7000.	8000.	9000.	9200.	10000.	11000.	12000.	13000.	14000.	14500.
–54.0	80.9	81.5	82.0	82.1	82.5	83.0	83.6	84.1	84.6	84.8
–50.0	81.6	82.2	82.7	82.8	83.2	83.7	84.3	84.8	85.3	85.5
–46.0	82.3	82.9	83.4	83.5	83.9	84.5	85.0	85.5	86.0	86.3
–42.0	83.0	83.6	84.1	84.2	84.7	85.2	85.7	86.2	86.7	87.0
–38.0	83.7	84.2	84.8	84.9	85.3	85.8	86.4	86.9	87.4	87.7
–34.0	84.3	84.9	85.5	85.6	86.0	86.5	87.1	87.6	88.1	88.4
–30.0	85.0	85.6	86.1	86.2	86.7	87.2	87.7	88.3	88.8	89.0
–26.0	85.7	86.2	86.8	86.9	87.3	87.8	88.4	88.9	89.5	89.7
–22.0	86.3	86.9	87.5	87.6	88.0	88.5	89.1	89.6	90.1	90.4
–18.0	87.0	87.6	88.1	88.2	88.7	89.2	89.8	90.3	90.8	91.1
–14.0	87.6	88.2	88.8	88.9	89.3	89.9	90.4	91.0	91.5	91.8
–10.0	88.3	88.9	89.4	89.5	90.0	90.5	91.1	91.6	92.1	92.4
–6.0	88.9	89.5	90.0	90.2	90.6	91.1	91.7	92.3	92.8	93.0
–2.0	89.5	90.1	90.7	90.8	91.2	91.8	92.3	92.9	93.4	93.7
2.0	90.1	90.7	91.3	91.4	91.9	92.4	93.0	93.5	94.1	94.3
6.0	90.7	91.4	91.9	92.0	92.5	93.0	93.6	94.2	94.7	95.0
10.0	91.4	92.0	92.6	92.7	93.1	93.7	94.2	94.8	95.3	95.6
14.0	92.0	92.6	93.2	93.3	93.7	94.3	94.9	95.4	96.0	96.2
18.0	92.6	93.2	93.8	93.9	94.4	94.9	95.5	96.1	96.6	96.9
22.0	93.2	93.8	94.4	94.5	94.9	95.5	96.1	96.7	*96.6*	*96.5*
26.0	93.8	94.4	95.0	95.1	95.5	96.1	*96.1*	*96.0*	*95.8*	*95.8*
30.0	94.4	95.0	95.6	*95.6*	*95.5*	*95.4*	*95.3*	*95.2*	*95.1*	
34.0	*95.0*	*95.0*	*94.9*	*94.9*	*94.7*	*94.6*	*94.5*			
38.0	*94.4*	*94.2*	*94.1*	*94.1*	*93.9*					
42.0	*93.7*	*93.5*								
46.0										
50.0										
54.0										
58.0										
62.0										

OAT < ISA + 30

OAT ≥ ISA + 30

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DEFINITION

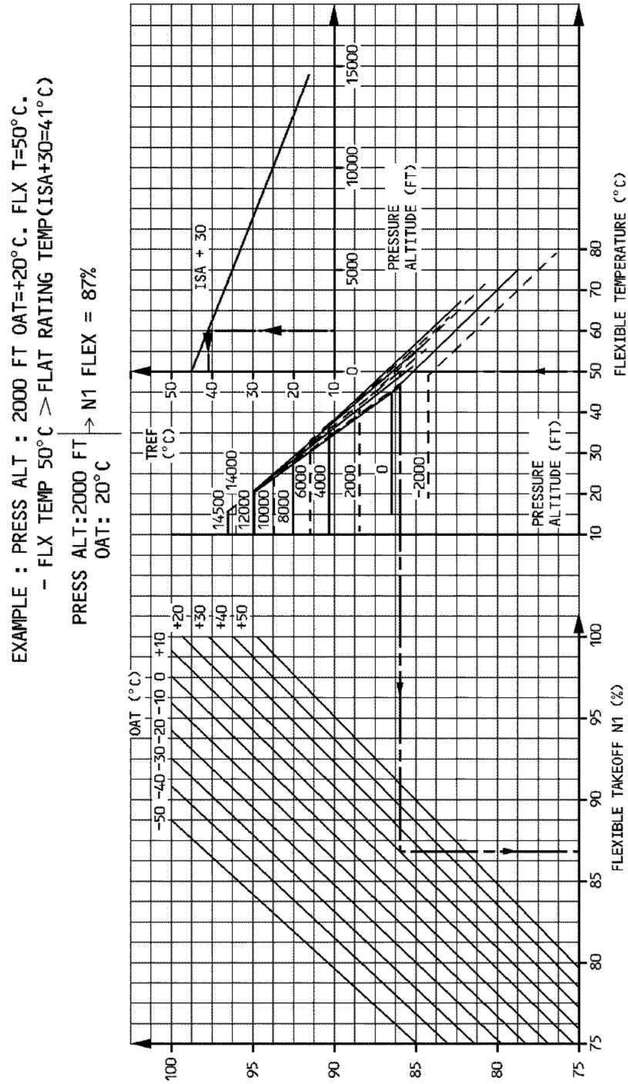
Ident.: PER-THR-FLX-00001973.0001001 / 23 FEB 11
Applicable to: ALL

It is a reduced takeoff thrust as compared to the maximum permissible. The related N1 is calculated as a function of the flexible temperature entered in the FMGS MCDU. The flexible temperature is a function of the aircraft weight and environmental conditions.
It guarantees that the regular performance requirements are met.

FLEXIBLE TAKEOFF

Ident.: PER-THR-FLX-00001974.0014001 / 23 FEB 11

Applicable to: ALL



CFM56-5B6	N1 CORRECTIONS FOR AIR BLEED	
FLEX TAKEOFF N1 MACH = .000	AIR CONDITIONING ON	- 0.700
	ENGINE ANTI ICE ON	0.000
	ENGINE AND WING ANTI ICE ON	0.000

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DEFINITION

Ident.: PER-THR-MCT-00001975.0001001 / 28 FEB 11
Applicable to: ALL

It is the maximum thrust certified for continuous use. This rating should be used, at the pilot's discretion, only when required to ensure safe flight (engine failure).

MAXIMUM CONTINUOUS

Ident.: PER-THR-MCT-00001976.0012001 / 28 JAN 11
Applicable to: ALL

CFM56-5B5/B6	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 10	OAT ≥ ISA + 10
MAXIMUM CONTINUOUS N1 AIR CONDITIONING ON* IAS=230 KT	AIR CONDITIONING OFF	.8	.8
	ENGINE ANTI ICE ON	0.0	−1.1
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	−2.5

TAT (°C)	PRESSURE ALTITUDE (FT) –1000.	3000.	7000.	11000.	15000.	19000.	23000.	27000.	31000.	35000.	39000.
−54.0	73.4	76.1	78.4	80.4	81.8	81.4	82.2	83.2	84.3	85.1	84.1
−50.0	74.1	76.8	79.1	81.1	82.6	82.1	83.0	84.0	85.0	85.8	84.9
−46.0	74.7	77.4	79.8	81.8	83.3	82.8	83.7	84.7	85.7	86.6	85.6
−42.0	75.4	78.1	80.5	82.5	84.0	83.5	84.4	85.4	86.4	87.3	86.3
−38.0	76.0	78.7	81.1	83.1	84.6	84.2	85.0	86.1	87.1	88.0	87.0
−34.0	76.6	79.4	81.8	83.8	85.3	84.8	85.7	86.7	87.8	88.6	87.7
−30.0	77.2	80.0	82.4	84.5	86.0	85.5	86.4	87.4	88.5	89.3	88.3
−26.0	77.8	80.6	83.1	85.1	86.6	86.1	87.0	88.1	89.2	90.0	89.0
−22.0	78.5	81.3	83.7	85.8	87.3	86.8	87.7	88.7	89.8	*90.5*	89.7
−18.0	79.1	81.9	84.4	86.4	88.0	87.5	88.4	89.4	90.5	*90.3*	*89.6*
−14.0	79.7	82.5	85.0	87.1	88.6	88.1	89.0	90.1	*90.4*	*90.0*	*89.3*
−10.0	80.3	83.1	85.6	87.7	89.3	88.8	89.7	*90.3*	*90.1*	*89.6*	*89.0*
−6.0	80.8	83.7	86.2	88.3	89.9	89.4	*90.3*	*90.0*	*89.7*	*89.0*	*88.2*
−2.0	81.4	84.3	86.9	88.9	90.5	90.0	*90.0*	*89.7*	*89.0*	*88.4*	*87.5*
2.0	82.0	84.9	87.5	89.6	91.1	*90.2*	*89.7*	*89.0*	*88.4*	*87.7*	*86.9*
6.0	82.6	85.5	88.1	90.2	91.8	*89.9*	*89.3*	*88.4*	*87.8*	*87.0*	*86.3*
10.0	83.2	86.1	88.7	90.8	*91.5*	*89.5*	*88.6*	*87.8*	*87.2*	*86.2*	*85.7*
14.0	83.8	86.7	89.3	*91.2*	*91.1*	*89.0*	*87.9*	*87.1*	*86.5*		
18.0	84.3	87.3	89.9	*90.8*	*90.7*	*88.4*	*87.2*	*86.5*			
22.0	84.9	87.8	*90.0*	*90.4*	*90.3*	*87.6*	*86.5*				
26.0	85.4	88.4	*89.7*	*89.9*	*89.5*	*86.8*					
30.0	86.0	*88.5*	*89.5*	*89.3*	*88.8*	*86.0*					
34.0	*86.5*	*88.5*	*89.0*	*88.6*	*88.0*						
38.0	*86.7*	*88.4*	*88.4*	*87.9*							
42.0	*86.9*	*88.1*	*87.8*	*87.2*							
46.0	*87.0*	*87.5*	*87.1*								
50.0	*86.7*	*86.8*	*86.4*								
54.0	*86.0*	*86.2*									

OAT < ISA + 10
OAT ≥ ISA + 10

(*) One engine inoperative - 1 pack operative on remaining engine.

DEFINITION

Ident.: PER-THR-MCL-00001977.0001001 / 23 FEB 11
Applicable to: ALL

It is the maximum thrust approved for normal climb.

MAXIMUM CLIMB

Ident.: PER-THR-MCL-00001978.0012001 / 28 JAN 11
Applicable to: ALL

CFM56-5B5/B6 MAXIMUM CLIMB N1 AIR CONDITIONING ON 250/300/.78	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 10	OAT ≥ ISA + 10
	AIR CONDITIONING OFF	.8	.8
	ENGINE ANTI ICE ON	0.0	–.8
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–1.4

TAT (°C)	PRESSURE ALTITUDE (FT) –1000.	3000.	7000.	11000.	15000.	19000.	23000.	27000.	31000.	35000.	39000.
–54.0	73.4	75.4	77.0	77.8	78.8	79.8	80.7	81.5	82.5	83.9	83.9
–50.0	74.1	76.1	77.6	78.4	79.5	80.5	81.4	82.2	83.3	84.6	84.6
–46.0	74.7	76.7	78.3	79.1	80.2	81.2	82.1	82.9	84.0	85.3	85.3
–42.0	75.4	77.4	79.0	79.8	80.9	81.9	82.8	83.6	84.7	86.0	86.0
–38.0	76.0	78.0	79.6	80.5	81.5	82.5	83.5	84.3	85.3	86.7	86.7
–34.0	76.6	78.7	80.3	81.1	82.2	83.2	84.1	84.9	86.0	87.4	87.4
–30.0	77.2	79.3	80.9	81.7	82.8	83.8	84.8	85.6	86.7	88.1	88.1
–26.0	77.8	79.9	81.5	82.4	83.5	84.5	85.4	86.2	87.4	88.7	88.7
–22.0	78.4	80.5	82.2	83.0	84.1	85.1	86.1	86.9	88.0	89.4	89.4
–18.0	79.1	81.2	82.8	83.7	84.8	85.8	86.7	87.6	88.7	90.1	*89.9*
–14.0	79.7	81.8	83.5	84.3	85.4	86.4	87.4	88.2	89.4	*90.3*	*89.6*
–10.0	80.3	82.4	84.1	84.9	86.0	87.1	88.0	88.9	90.0	*90.1*	*89.4*
–6.0	80.8	83.0	84.7	85.5	86.6	87.7	88.7	89.5	*90.3*	*90.0*	*88.8*
–2.0	81.4	83.6	85.3	86.1	87.2	88.3	89.3	90.1	*90.1*	*89.5*	*88.0*
2.0	82.0	84.2	85.9	86.7	87.9	88.9	89.9	*90.1*	*90.0*	*88.8*	*87.4*
6.0	82.6	84.8	86.5	87.3	88.5	89.5	*90.0*	*89.9*	*89.6*	*88.2*	*86.8*
10.0	83.2	85.4	87.1	87.9	89.1	*89.8*	*89.8*	*89.7*	*89.0*	*87.5*	*86.2*
14.0	83.7	85.9	87.7	88.6	89.7	*89.6*	*89.7*	*89.2*	*88.4*	*86.8*	*85.6*
18.0	84.3	86.5	88.2	89.1	*89.4*	*89.3*	*89.2*	*88.6*	*87.7*		
22.0	84.9	87.1	*88.7*	*89.2*	*89.0*	*89.0*	*88.6*	*87.9*	*87.0*		
26.0	85.4	87.6	*88.3*	*88.9*	*88.7*	*88.5*	*88.0*	*87.2*	*86.3*		
30.0	86.0	*87.8*	*87.9*	*88.5*	*88.2*	*87.8*	*87.2*	*86.6*			
34.0	86.5	*87.3*	*87.3*	*87.8*	*87.5*	*87.1*	*86.5*				
38.0	*86.4*	*86.8*	*86.6*	*87.1*	*86.8*	*86.4*					
42.0	*85.9*	*86.1*	*85.9*	*86.4*	*86.0*						
46.0	*85.3*	*85.4*	*85.2*	*85.7*	*85.3*						
50.0	*84.5*	*84.7*	*84.4*	*85.0*							
54.0	*83.7*	*83.9*									

OAT < ISA + 10
OAT ≥ ISA + 10

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DEFINITION

Ident.: PER-THR-MCR-00001979.0004001 / 02 FEB 11
Applicable to: ALL

It is the maximum thrust approved for normal cruise.
There is no thrust lever position corresponding to this thrust rating.
It is not displayed to the pilot, and the N1 limit which is displayed in cruise is the maximum climb N1.
The FMGS uses the maximum cruise N1 to compute the aircraft maximum speed.
In manual thrust setting, in cruise, the pilot should limit N1 to the maximum cruise N1 that is equal to the displayed maximum climb N1 minus 1.9 %.

MAXIMUM CRUISE

Ident.: PER-THR-MCR-00001980.0019001 / 28 FEB 11
Applicable to: ALL

CFM56-5B5/B6	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA+10	OAT ≥ ISA+10
MAXIMUM CRUISE N1 AIR CONDITIONING ON 250/300/.78	AIR CONDITIONING OFF	0.8	0.8
	ENGINE ANTI ICE ON	0.0	–0.8
	ENGINE ANTI ICE AND WING ANTI ICE ON	0.0	–1.4

TAT (°C)	PRESSURE ALTITUDE (FT) –1000.	3000.	7000.	11000.	15000.	19000.	23000.	27000.	31000.	35000.	39000.
–54.0	71.5	73.5	75.1	75.9	76.9	77.9	78.8	79.6	80.6	82.0	82.0
–50.0	72.2	74.2	75.7	76.5	77.6	78.6	79.5	80.3	81.4	82.7	82.7
–46.0	72.8	74.8	76.4	77.2	78.3	79.3	80.2	81.0	82.1	83.4	83.4
–42.0	73.5	75.5	77.1	77.9	79.0	80.0	80.9	81.7	82.8	84.1	84.1
–38.0	74.1	76.1	77.7	78.6	79.6	80.6	81.6	82.4	83.4	84.8	84.8
–34.0	74.7	76.8	78.4	79.2	80.3	81.3	82.2	83.0	84.1	85.5	85.5
–30.0	75.3	77.4	79.0	79.8	80.9	81.9	82.9	83.7	84.8	86.2	86.2
–26.0	75.9	78.0	79.6	80.5	81.6	82.6	83.5	84.3	85.5	86.8	86.8
–22.0	76.5	78.6	80.3	81.1	82.2	83.2	84.2	85.0	86.1	87.5	87.5
–18.0	77.2	79.3	80.9	81.8	82.9	83.9	84.8	85.7	86.8	88.2	*88.0*
–14.0	77.8	79.9	81.6	82.4	83.5	84.5	85.5	86.3	87.5	*88.4*	*87.7*
–10.0	78.4	80.5	82.2	83.0	84.1	85.2	86.1	87.0	88.1	*88.2*	*87.5*
–6.0	78.9	81.1	82.8	83.6	84.7	85.8	86.8	87.6	*88.4*	*88.1*	*86.9*
–2.0	79.5	81.7	83.4	84.2	85.3	86.4	87.4	88.2	*88.2*	*87.6*	*86.1*
2.0	80.1	82.3	84.0	84.8	86.0	87.0	88.0	*88.2*	*88.1*	*86.9*	*85.5*
6.0	80.7	82.9	84.6	85.4	86.6	87.6	*88.1*	*88.0*	*87.7*	*86.3*	*84.9*
10.0	81.3	83.5	85.2	86.0	87.2	*87.9*	*87.9*	*87.8*	*87.1*	*85.6*	*84.3*
14.0	81.8	84.0	85.8	86.7	87.8	*87.7*	*87.8*	*87.3*	*86.5*	*84.9*	*83.7*
18.0	82.4	84.6	86.3	87.2	*87.5*	*87.4*	*87.3*	*86.7*	*85.8*		
22.0	83.0	85.2	*86.8*	*87.3*	*87.1*	*87.1*	*86.7*	*86.0*	*85.1*		
26.0	83.5	85.7	*86.4*	*87.0*	*86.8*	*86.6*	*86.1*	*85.3*	*84.4*		
30.0	84.1	*85.9*	*86.0*	*86.6*	*86.3*	*85.9*	*85.3*	*84.7*			
34.0	84.6	*85.4*	*85.4*	*85.9*	*85.6*	*85.2*	*84.6*				
38.0	*84.5*	*84.9*	*84.7*	*85.2*	*84.9*	*84.5*					
42.0	*84.0*	*84.2*	*84.0*	*84.5*	*84.1*						
46.0	*83.4*	*83.5*	*83.3*	*83.8*	*83.4*						
50.0	*82.6*	*82.8*	*82.5*	*83.1*							
54.0	*81.8*	*82.0*									

OAT < ISA + 10
OAT ≥ ISA + 10

PERFORMANCE

TAKEOFF

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DEFINITION OF FLEXIBLE TAKEOFF

DEFINITION OF FLEXIBLE TAKEOFF

Ident.: PER-TOF-THR-FLX-10-00001718.0001001 / 28 JAN 11
Applicable to: ALL

In many cases the aircraft takes off with a weight lower than the maximum permissible takeoff weight. When this happens, it can meet the required performance (runway, second segment, obstacle,...) with a decreased thrust that is adapted to the weight : this is called FLEXIBLE TAKEOFF and the thrust is called FLEXIBLE TAKEOFF THRUST.
The use of flexible takeoff thrust saves engine life.

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USE OF FLEXIBLE TAKEOFF

USE OF FLEXIBLE TAKEOFF

Ident.: PER-TOF-THR-FLX-20-00001719.0001001 / 09 DEC 09
Applicable to: ALL

The pilot can use flexible takeoff when the actual takeoff weight is lower than the maximum permissible takeoff weight for the actual temperature. The maximum permissible takeoff weight decreases when temperature increases, so it is possible to assume a temperature at which the actual takeoff weight would be the limiting one. This temperature is called FLEXIBLE TEMPERATURE or assumed temperature and is entered in the FADEC via the MCDU PERF TO page in order to get the adapted thrust.

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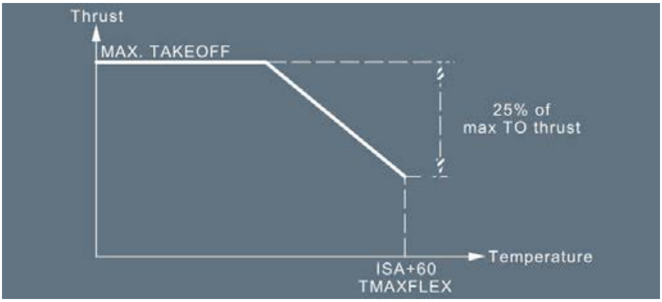
REQUIREMENTS

REQUIREMENTS

Ident.: PER-TOF-THR-FLX-30-00001792.0019001 / 04 JUL 17
Applicable to: ALL

- Thrust must not be reduced by more than 25 % of the full rated takeoff thrust.
- The flexible takeoff N1 cannot be lower than the Max climb N1 at the same flight conditions.
  The FADEC takes the above two constraints into account to determine flexible N1.
  The above two constraints also limit the maximum flexible temperature at ISA + 60 (75 °C at sea level).
- The flexible temperature cannot be lower than the flat rating temperature, TREF (ISA +30), or the actual temperature (OAT).



- Flexible takeoff is not permitted on contaminated runways.
- The operator should check the maximum thrust (TOGA) at regular intervals in order to detect any engine deterioration, or maintain an adequate engine performance monitoring program to follow up the engine parameters.

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RECOMMENDATION

GENERAL

Ident.: PER-TOF-THR-FLX-40-00001720.0002001 / 15 DEC 15
Applicable to: ALL

- In order to extend engine life and save maintenance costs, it is recommended to use flexible thrust reduction.
- However, to improve the takeoff performance, the thrust can be increased by selecting a lower flexible temperature.

Using the same takeoff chart, for a given weight it is possible to :
- Select a temperature lower than the maximum determined one and keep the speeds defined at maximum temperature or,
- Move towards the left side (tailwind) of the takeoff chart while remaining within the same configuration and looking for the same actual takeoff weight at lower temperature.
  This produces a lower flexible temperature and, in general, lower takeoff speeds (V1 /VR /V2).

Using one of the two above possibilities, check that the selected temperature is greater than the actual temperature (OAT) and greater than the flat rating temperature (TREF).

TAKEOFF PROCEDURE

Ident.: PER-TOF-THR-FLX-40-00001721.0001001 / 28 JAN 11
Applicable to: ALL

Depending on environmental takeoff conditions, the following procedure is recommended.

CONDITIONS	PROCEDURE	REASON
Dry or wet well paved runway	- Use the flap setting giving the highest flexible temperature. - When flexible temperature difference between two flap settings is low, use the highest flap setting.	Extend engine life and save maintenance costs.
High altitude takeoff	Use CONF2/CONF3	Improve comfort
Badly paved runway or Accelerate stop distance limited runway	Use CONF2/CONF3 or Move towards left side of the takeoff chart	Improve comfort Improve stopping distance
Windshear expected along takeoff path	Use maximum thrust	Maintain acceleration capability
Contaminated runway	Use maximum thrust (flex forbidden)	Improve stopping distance Decrease time on runway. Required by regulations.

TAKEOFF CHARTS

Ident.: PER-TOF-TOC-05-00001704.0001001 / 21 MAR 11
Applicable to: ALL

Takeoff charts are required to provide performance at takeoff. It is possible to present the charts in two different ways, one of which is selected by the airline. The different presentations are :
- temperature entry (temperature provided in the left column)
- weight entry (weight provided in the left column).

Both presentations are described here after. Sections PER-TOF-TOC-10, 12 and 14 are relative to temperature entry while PER-TOF-TOC-16, 18 and 20 are relative to weight entry.

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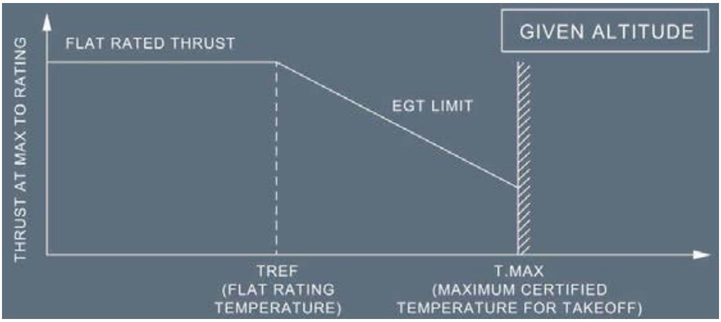
TAKEOFF PERFORMANCE

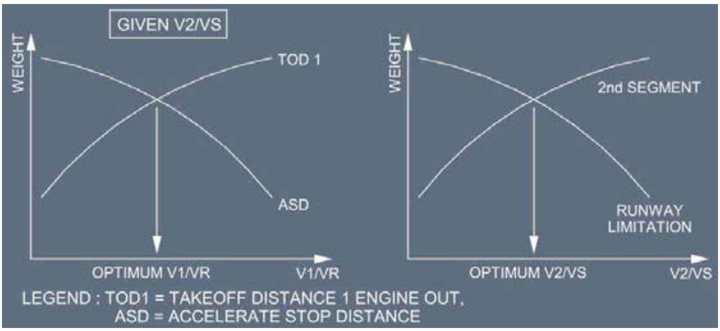
TAKEOFF PERFORMANCE

Ident.: PER-TOF-TOC-10-10-00001705.0001001 / 23 FEB 11
Applicable to: ALL

Takeoff optimization is calculated for a given runway and its obstacles and for given conditions of flap setting, temperature, wind and QNH. The calculation produces a maximum permissible takeoff weight (or a maximum takeoff temperature for an actual weight).
The takeoff thrust produced by the engine varies as follows :



The optimization process calculates the speeds which will produce the maximum takeoff weight. To do so, it takes into account the different takeoff limitations such as TOD , ASD , TOR, second segment..., as shown on the figure charts below.



On a typical runway, the performance of a twin engine aircraft, is generally limited by the one engine out operation at takeoff. The optimum V2 /VS and optimum V1 /VR are consequently unique.

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TAKEOFF CHART DESCRIPTION

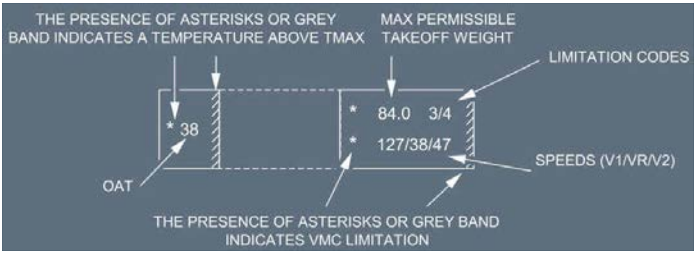
GENERAL

Ident.: PER-TOF-TOC-10-20-00001706.0003001 / 03 MAR 11
Applicable to: ALL

The takeoff chart (RTOW : Regulatory Takeoff Weight) is calculated for a specific aircraft version and for a particular runway specified at the top of the chart. The top of the chart also gives some information about the runway and lists the calculation assumptions.

The chart is given for 2 different configurations and 5 wind values per configuration. This allows the crew to select the configuration that gives either :
- the highest permissible takeoff weight, or, for a given weight,
- the highest flexible temperature.

If different configurations give equivalent performance, the crew should select the configuration associated with the lowest takeoff speeds.
For each temperature value (and for a given configuration and wind), the chart provides the following information :



The available limitation codes are :
- First segment : 1
- Second segment : 2
- Runway length : 3
- Obstacles : 4
- Tire speed : 5
- Brake energy : 6
- Maximum computation weight : 7
- Final takeoff : 8
- VMU : 9

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Ident.: PER-TOF-TOC-10-20-00014608.0002001 / 18 JUL 12
Applicable to: ALL

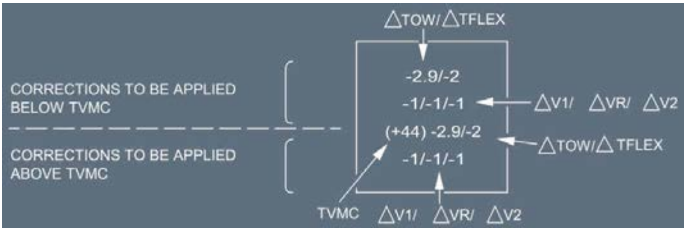
Each takeoff chart is computed for a given set of conditions (air conditioning, QNH, anti ice...) specified at the top of the chart. If the actual takeoff conditions are different, the crew must apply corrections. Two types of correction are available :

- Conservative corrections on *Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS* (to be used when not provided on the chart).
- Corrections (less restrictive) listed on the chart, to be applied as explained below.

DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART

Ident.: PER-TOF-TOC-10-20-00005368.0001001 / 08 JUL 15
Applicable to: ALL

The corrections are presented on 4 lines:



TVMC is a temperature value given per column. This is a fictitious value that indicates the temperature above which the speeds are close to a VMCG /VMCA limitation or are VMCG /VMCA limited.

Note: *The lower two lines may be shaded on certain chart formats.*

MINIMUM SPEEDS

Ident.: PER-TOF-TOC-10-20-00005372.0001001 / 08 JUL 15
Applicable to: ALL

Minimum V1/VR/V2 due to VMCG /VMCA are provided on the bottom right side of the takeoff chart. They are only applicable in case of speed corrections.
These speeds are conservative. They may be slightly higher than V1/VR/V2 displayed on the takeoff chart.

FLEX TEMPERATURE INDICATOR

Ident.: PER-TOF-TOC-10-20-00005373.0001001 / 18 FEB 11
Applicable to: ALL

On the temperature entry chart, the temperature column may display asterisks or have a gray band to indicate temperature values above TMAX and which are flex temperature.

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ADDITIONAL INFORMATION

ONE ENGINE OUT CLIMB PROCEDURE

Ident.: PER-TOF-TOC-10-30-00001708.0001001 / 23 FEB 11
Applicable to: ALL

The performance given in the chart is consistent with the flight path specified for the aircraft with one engine out and takes into account significant obstacles.
When the procedure to be followed is not the standard instrument departure, the chart describes a specific procedure (EOSID).
When the specified procedure requires a turn, except if otherwise stated on the RTOW chart, the turn should be performed with a maximum bank of 15 ° until the aircraft reaches 1 500 ft or until green dot.
The acceleration height (or altitude) ensures that the net flight path clears the highest obstacle by at least 35 ft when accelerating in level flight to green dot speed after an engine failure, in the most adverse conditions.

TAKEOFF ON A WET RUNWAY

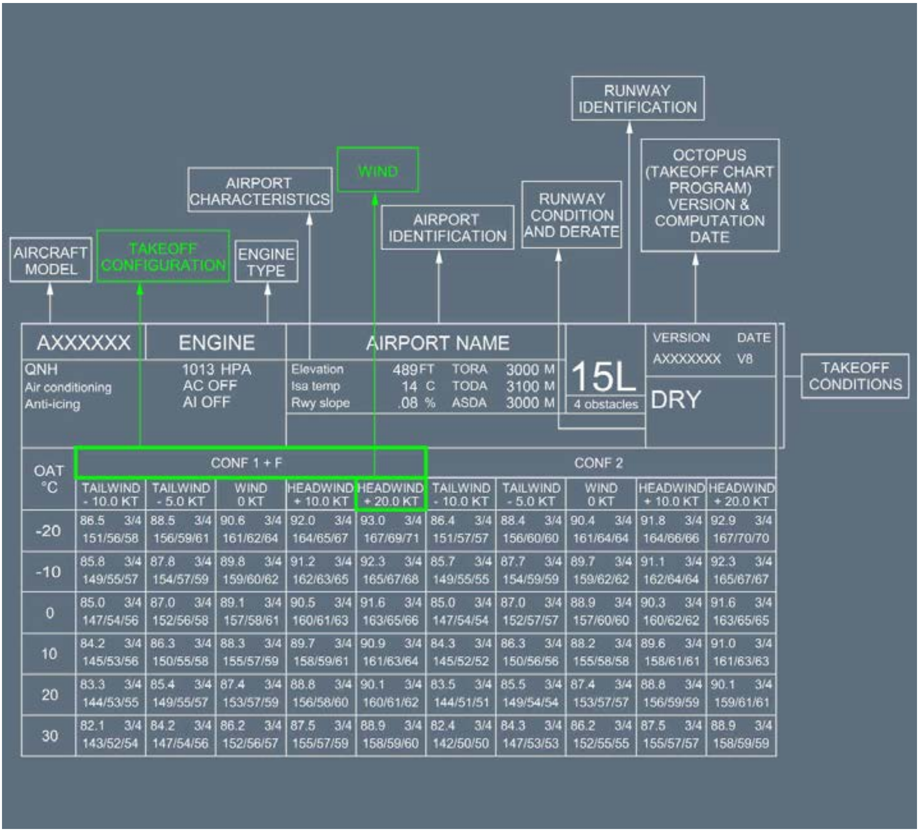
Ident.: PER-TOF-TOC-10-30-00001709.0002001 / 23 FEB 11
Applicable to: ALL

Takeoff charts computed for wet runway with a 15 ft screen height and/or use of reverse thrust may produce, in some conditions, a maximum takeoff weight (or flexible temperature) higher than that obtained for a dry runway. It is thus mandatory to compare both charts (dry and wet) and retain the lower of the two weights (or flexible temperature) and the associated speeds determined for a wet runway.

Note: *The crew need not compare the charts if the top of the wet runway chart specifies “DRY CHECK”. (The comparison has already been inserted in the WET runway calculation).*

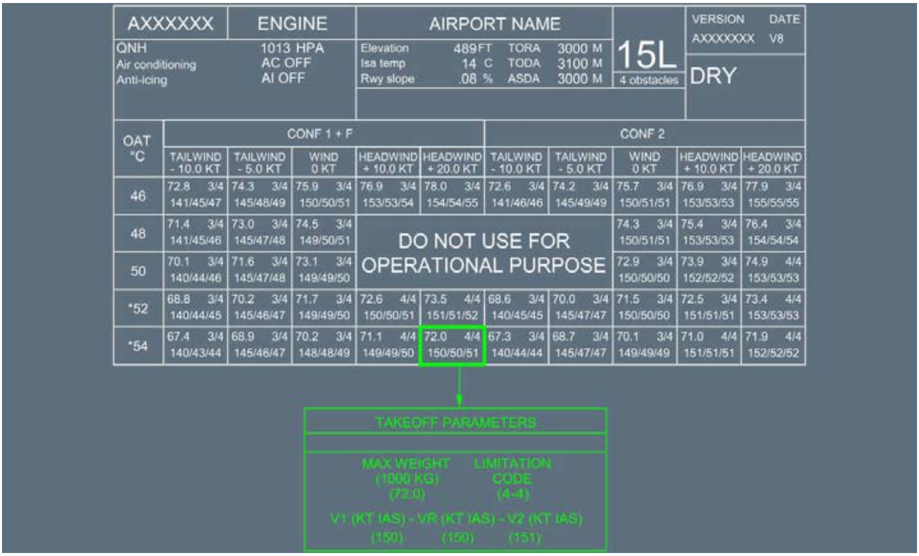
DESCRIPTION OF TAKEOFF CHART

Ident.: PER-TOF-TOC-10-30-00001710.0003001 / 23 FEB 11
Applicable to: ALL



OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND 0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND 0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
-20	86.5 3/4 151/56/58	88.5 3/4 156/59/61	90.6 3/4 161/62/64	92.0 3/4 164/65/67	93.0 3/4 167/69/71	86.4 3/4 151/57/57	88.4 3/4 156/60/60	90.4 3/4 161/64/64	91.8 3/4 164/66/66	92.9 3/4 167/70/70
-10	85.8 3/4 149/55/57	87.8 3/4 154/57/59	89.8 3/4 159/60/62	91.2 3/4 162/63/65	92.3 3/4 165/67/68	85.7 3/4 149/55/55	87.7 3/4 154/59/59	89.7 3/4 159/62/62	91.1 3/4 162/64/64	92.3 3/4 165/67/67
0	85.0 3/4 147/54/56	87.0 3/4 152/56/58	89.1 3/4 157/58/61	90.5 3/4 160/61/63	91.6 3/4 163/65/66	85.0 3/4 147/54/54	87.0 3/4 152/57/57	88.9 3/4 157/60/60	90.3 3/4 160/62/62	91.6 3/4 163/65/65
10	84.2 3/4 145/53/56	86.3 3/4 150/55/58	88.3 3/4 155/57/59	89.7 3/4 158/59/61	90.9 3/4 161/63/64	84.3 3/4 145/52/52	86.3 3/4 150/56/56	88.2 3/4 155/58/58	89.6 3/4 158/61/61	91.0 3/4 161/63/63
20	83.3 3/4 144/53/55	85.4 3/4 149/55/57	87.4 3/4 153/57/59	88.8 3/4 156/58/60	90.1 3/4 160/61/62	83.5 3/4 144/51/51	85.5 3/4 149/54/54	87.4 3/4 153/57/57	88.8 3/4 156/59/59	90.1 3/4 159/61/61
30	82.1 3/4 143/52/54	84.2 3/4 147/54/56	86.2 3/4 152/56/57	87.5 3/4 155/57/59	88.9 3/4 158/59/60	82.4 3/4 142/50/50	84.3 3/4 147/53/53	86.2 3/4 152/55/55	87.5 3/4 155/57/57	88.9 3/4 158/59/59

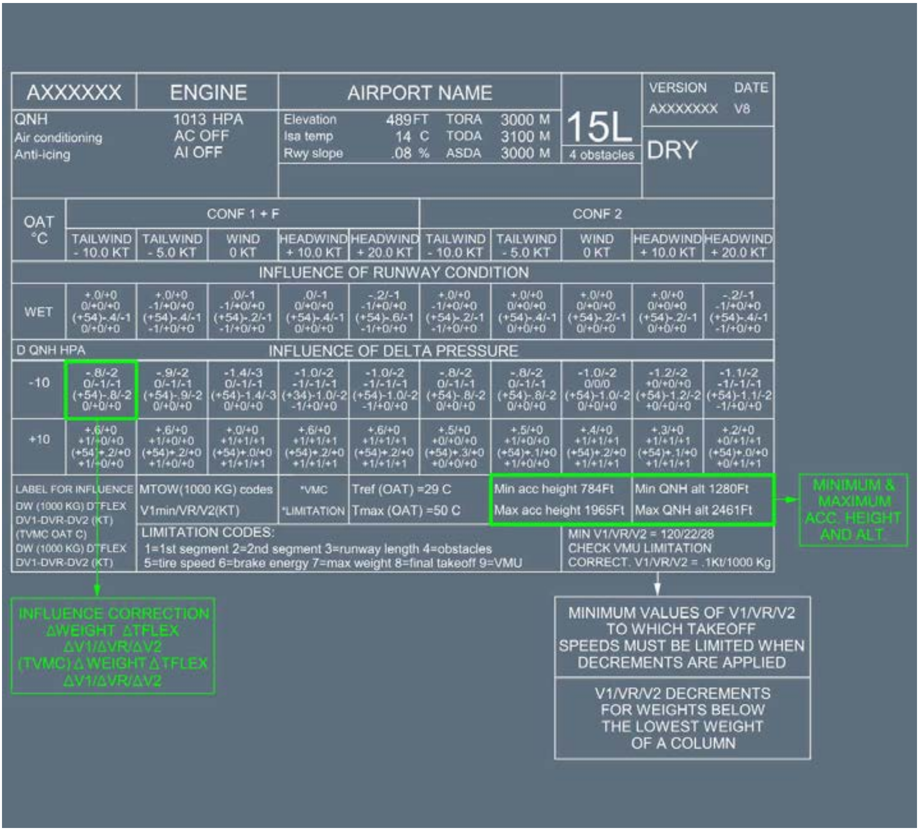
TAKEOFF CHARTS - GENERAL (TEMPERATURE ENTRY)



AXXXXXX	ENGINE	AIRPORT NAME	15L	VERSION AXXXXXXX	DATE V8
QNH / Air conditioning / Anti-icing	1013 HPA / AC OFF / AI OFF	Elevation 489 FT, TORA 3000 M; Isa temp 14 C, TODA 3100 M; Rwy slope .08 %, ASDA 3000 M	4 obstacles	DRY	

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND 0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND 0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
46	72.8 3/4 141/45/47	74.3 3/4 145/48/49	75.9 3/4 150/50/51	76.9 3/4 153/53/54	78.0 3/4 154/54/55	72.6 3/4 141/46/46	74.2 3/4 145/49/49	75.7 3/4 150/51/51	76.9 3/4 153/53/53	77.9 3/4 155/55/55
48	71.4 3/4 141/45/46	73.0 3/4 145/47/48	74.5 3/4 149/50/51	DO NOT USE FOR OPERATIONAL PURPOSE				74.3 3/4 150/51/51	75.4 3/4 153/53/53	76.4 3/4 154/54/54
50	70.1 3/4 140/44/46	71.6 3/4 145/47/48	73.1 3/4 149/49/50					72.9 3/4 150/50/50	73.9 3/4 152/52/52	74.9 4/4 153/53/53
*52	68.8 3/4 140/44/45	70.2 3/4 145/46/47	71.7 3/4 149/49/50	72.6 4/4 150/50/51	73.5 4/4 151/51/52	68.6 3/4 140/45/45	70.0 3/4 145/47/47	71.5 3/4 150/50/50	72.5 3/4 151/51/51	73.4 4/4 153/53/53
*54	67.4 3/4 140/43/44	68.9 3/4 145/46/47	70.2 3/4 148/48/49	71.1 4/4 149/49/50	72.0 4/4 150/50/51	67.3 3/4 140/44/44	68.7 3/4 145/47/47	70.1 3/4 149/49/49	71.0 4/4 151/51/51	71.9 4/4 152/52/52

TAKEOFF CHARTS - GENERAL (TEMPERATURE ENTRY)



EXAMPLE OF TAKEOFF CHART

Ident.: PER-TOF-TOC-10-30-00014705.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

A3XXXXX	ENGINES	AIRPORT NAME		Version A3XXXXXX	Date **V20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT Isa temp 14 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M	15L 4 obstacles	DRY

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
-20	80.2 4/6 156/56/58	80.2 4/6 162/62/64	83.6 3/4 167/67/69	84.8 3/4 170/70/72	85.8 3/4 173/73/75	80.4 4/6 154/54/59	81.9 3/4 159/59/64	83.4 3/4 164/64/69	84.4 3/4 167/67/72	85.2 2/4 169/69/74
-10	79.5 4/6 153/56/58	81.3 4/6 159/59/62	83.1 4/6 164/64/66	84.3 3/4 167/67/69	85.3 3/4 171/71/72	79.7 4/6 151/52/57	81.4 4/6 156/56/62	82.9 3/4 161/61/66	84.0 3/4 164/64/69	84.9 3/4 167/67/72
0	78.8 4/6 151/54/57	80.6 4/6 156/57/59	82.5 4/6 162/62/64	83.7 3/4 165/65/67	84.7 3/4 168/68/70	79.0 4/6 149/51/56	80.8 4/6 154/54/60	82.4 3/4 159/59/64	83.5 3/4 162/62/67	84.5 3/4 165/65/70
10	78.2 4/6 148/53/55	80.0 4/6 154/57/59	81.8 4/6 159/60/62	83.1 4/6 163/63/65	84.2 3/4 166/66/67	78.4 4/6 147/50/54	80.2 4/6 152/52/58	81.9 3/4 156/56/62	83.00 3/4 159/59/65	83.9 3/4 162/63/68
20	77.6 4/6 146/51/53	79.3 4/6 151/55/57	81.1 4/6 157/57/61	82.5 4/6 160/60/62	83.6 4/6 163/63/65	77.7 4/6 145/48/52	79.5 4/6 150/51/56	81.3 4/6 154/54/60	82.4 3/4 157/57/63	83.4 3/4 160/61/66
30	76.9 4/6 144/50/52	78.7 4/6 149/54/56	80.5 4/6 154/57/60	81.8 4/6 158/58/60	83.0 4/6 161/61/63	77.1 4/6 143/46/50	78.9 4/6 148/50/55	80.7 4/6 153/53/58	81.9 3/4 155/56/61	82.9 3/4 158/59/64
32	76.8 4/6 144/50/52	78.6 4/6 149/53/55	80.4 4/6 154/56/55	81.7 4/6 157/58/60	82.9 4/6 161/61/63	77.0 4/6 142/45/50	78.7 4/6 147/50/55	80.6 4/6 152/53/58	81.8 4/6 155/55/60	82.8 3/4 157/59/64
34	76.7 4/6 143/50/52	78.4 4/6 148/53/55	80.2 4/6 154/56/58	81.5 4/6 157/57/60	82.8 4/6 160/60/62	76.9 4/6 142/45/50	78.6 4/6 147/52/57	80.5 4/6 152/52/57	81.7 4/6 154/55/60	82.7 3/4 157/58/64
36	76.6 4/6 143/49/52	78.4 4/6 148/52/54	80.1 4/6 153/56/58	81.4 4/6 156/57/59	82.7 4/6 160/60/62	76.8 4/6 141/45/50	78.5 4/6 148/50/55	80.3 4/6 151/52/57	76.1 4/6 154/55/60	76.6 3/4 157/58/63
38	76.5 4/6 142/49/52	78.3 4/6 147/52/54	80.0 4/6 153/56/58	81.3 4/6 156/58/60	82.6 4/6 159/60/62	76.7 4/6 141/45/50	78.4 4/6 146/48/53	80.2 4/6 151/52/57	81.5 4/6 154/54/59	82.5 3/4 156/58/63
40	76.4 4/6 142/49/52	78.2 4/6 147/52/54	79.9 4/6 152/56/58	81.2 4/6 156/58/60	82.5 4/6 159/59/61	76.6 4/6 141/45/50/	78.3 4/6 146/48/53	80.1 4/6 150/51/56	81.4 4/6 153/54/59	82.4 3/4 156/57/63
42	76.3 4/6 142/49/51	78.0 4/6 147/52/54	DO NOT USE FOR OPERATIONAL PURPOSE						81.3 4/6 153/54/59	82.3 3/4 156/57/62
44	76.1 4/6 142/49/51	77.9 4/6 146/51/53							81.1 4/6 153/53/58	82.1 3/4 155/57/62
46	75.5 4/6 142/48/50	77.2 4/6 148/50/52	78.9 4/6 152/55/57	80.2 4/6 155/56/58	80.7 4/6 154/56/58	75.7 4/6 141/45/49	77.3 4/6 145/47/52	79.1 4/6 150/50/55	74.5 4/6 152/53/58	75.1 2/4 152/55/60
48	74.5 4/6 143/48/50	76.2 4/6 148/50/52	77.9 4/6 153/53/55	79.1 4/6 155/53/55	79.3 2/4 153/55/57	74.7 4/6 141/44/48	76.4 4/6 146/47/51	78.0 3/4 150/50/55	79.1 3/4 152/53/57	79.5 4/8 155/58/63
50	73.6 4/6 143/47/49	75.3 4/6 148/49/51	76.9 4/6 153/53/55	77.9 4/8 154/54/55	77.9 2/4 151/54/55	73.8 4/6 142/42/46	75.4 4/6 146/47/51	76.9 3/4 150/50/54	78.0 3/4 152/52/57	78.0 2/4 149/52/57
52	72.7 4/6 144/46/48	74.4 4/6 149/49/51	75.8 3/4 153/53/54	76.3 2/4 152/52/53	76.3 2/4 147/52/53	72.9 4/6 142/44/48	74.3 3/4 146/46/50	75.8 3/4 150/50/54	76.4 2/4 150/50/55	76.4 2/4 146/50/55
54	71.8 4/6 145/46/47	73.3 3/4 149/49/51	74.6 3/4 152/52/54	75.0 2/4 150/50/52	75.0 2/4 145/50/52	71.9 3/4 142/43/47	73.3 3/4 146/46/50	74.7 3/4 149/49/54	75.1 2/4 148/49/54	75.1 2/4 144/49/54
	INFLUENCE OF RUNWAY CONDITION									
WET	-2.0/ -5 -16/ 1/ -1 (+54) +2.0/ -5 -16/0/0	-1.5/ -4 -15/ -2/ -2 (+54) -1.5 -4 -15/ 0/ 0	-1.2/ -3 -13/ -4/ -4 (+54) -1.3 -3 -13/ 0/ 0	-1.1/ -2 -11/ -3/ -3 (+54) -1.1 / -2 -11/ 0/ 0	1.8/ -2 -10/ -2 /2 (+54) -0.8 -2 -10/ 0/ 0	-0.9/ -4 -14/ 0 / (+54) -0.9/ -4 -14/ 0/ 0	-1.5/ -4 -13/ 0/ (+54) -1.5/ -4 -13/ 0/ 0	-1.2/ -3 -12/ -2/ -2 (+54) -1.3/ -3 -11/ 0/ 0	-1.2/ -2 -10/ -1/ -1 (+54) -1.2 /-2 -10/ 0/ 0	-1.5/ -3 -4/ -2/ -2 (+54) -1.5 -3 -4/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE									
-10.0	-0.8/ -2 0/ 0/ (+54) -0.8/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.3/ -3 -1/ 0/ (+54) -1.3/ -3 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.2/ -3 0/ 0/ (+54) -1.2/ -3 0/ 0/	-0.8/ -2 -1/ -1/ -2 (+54) -0.8/ -2 -1/ 0/	-0.8 -2 -1/ 0/ (+54) -0.8/ -2 -1/ 0/	-0.8 -1 -1/ -1/ -1 (+54) -0.8/ -2 -1/ 0/
+10.0	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	0.0/ 0 0/ 0/ (+54) +0.0 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 0/ +1/ +1 (+54) +0.2 /0 0/ +1/ +1	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	MTOW(1000 KG) codes V1min/VR/V2 (kt)	*VMC *LIMITATION	Tref (OAT) = 44 C Tmax (OAT) = 54 C	Min acc height 484 FT Max acc height 1917 FT	Min QNH alt 953 FT Max QNH alt 2406 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU				Min V1/VR/V2 = 109/114/117 CHECK VMU LIMITATION Correct. V1/VR/V2 = 1.0 KT/1000 KG

DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS

DIRECT CHART READING

Ident.: PER-TOF-TOC-12-10-00001712.0002001 / 23 FEB 11
Applicable to: ALL

The takeoff chart is computed for a given runway under a set of conditions, which are:
- OAT
- Wind
- Configuration
- QNH, air conditioning, anti ice...

Two configurations are produced on the chart. This enables the crew to select that giving the highest permissible takeoff weight. In case of equivalent performance, retain the configuration giving the lower takeoff speeds.
For a given configuration, enter the chart with the OAT and wind value to determine the maximum permissible weight. For an OAT or wind value not presented on the chart, interpolate between two consecutive temperature rows and/or two consecutive wind columns. Conservative OAT or wind values can also be considered. No extrapolation is allowed.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Ident.: PER-TOF-TOC-12-10-00001713.0002001 / 28 JAN 11
Applicable to: ALL

Retain the maximum takeoff weight, associated configuration and speeds from above.
For conditions different from those of the chart, apply relevant corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS

Ident.: PER-TOF-TOC-12-10-00014706.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

Corrections are given for QNH ≠ 1 013 hPa, air conditioning ON, anti ice ON(*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).
1. For the given wind and temperature conditions, read the maximum takeoff weight.
2. Apply the published weight correction(s) to the maximum takeoff weight (for each correction) to determine the maximum permissible takeoff weight.
3. Read the speeds associated with the maximum permissible takeoff weight by entering the chart in the wind column.

EXAMPLE 1

DATA: OAT = 25 °C
Head Wind = 10 kt
Air conditioning ON
QNH = 1 013 hPa

Use the chart (*Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART*):

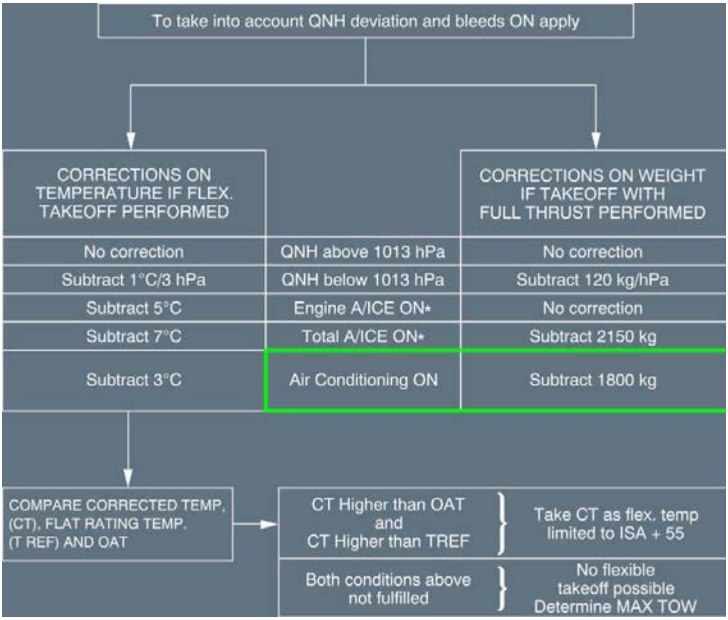
A3XXXXX	ENGINES	AIRPORT NAME		15L	Version A3XXXXXX	Date **V20
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT Isa temp 14 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M	4 obstacles	DRY	

OAT °C	CONF 1 + F TAILWIND - 10.0 KT	CONF 1 + F TAILWIND - 5.0 KT	CONF 1 + F WIND .0 KT	CONF 1 + F HEADWIND + 10.0 KT	CONF 1 + F HEADWIND + 20.0 KT	CONF 2 TAILWIND - 10.0 KT	CONF 2 TAILWIND - 5.0 KT	CONF 2 WIND .0 KT	CONF 2 HEADWIND + 10.0 KT	CONF 2 HEADWIND + 20.0 KT
-20	80.2 4/6 156/56/58	80.2 4/6 162/62/64	83.6 3/4 167/67/69	84.8 3/4 170/70/72	85.8 3/4 173/73/75	80.4 4/6 154/54/59	81.9 3/4 159/59/64	83.4 3/4 164/64/69	84.4 3/4 167/67/72	85.2 2/4 169/69/74
-10	79.5 4/6 153/56/58	81.3 4/6 159/59/62	83.1 4/6 164/64/66	84.3 3/4 167/67/69	85.3 3/4 171/71/72	79.7 4/6 151/52/57	81.4 4/6 156/56/62	82.9 3/4 161/61/66	84.0 3/4 164/64/69	84.9 3/4 167/67/72
0	78.8 4/6 151/54/57	80.6 4/6 156/57/59	82.5 4/6 162/62/64	83.7 3/4 165/65/67	84.7 3/4 168/68/70	79.0 4/6 149/51/56	80.8 4/6 154/54/60	82.4 3/4 159/59/64	83.5 3/4 162/62/67	84.5 3/4 165/65/70
10	78.2 4/6 148/53/55	80.0 4/6 154/57/59	81.8 4/6 159/60/62	83.1 4/6 163/63/65	84.2 3/4 166/66/67	78.4 4/6 147/50/54	80.2 4/6 152/52/58	81.9 3/4 156/56/62	83.00 3/4 159/59/65	83.9 3/4 162/63/68
20	77.6 4/6 146/51/53	79.3 4/6 151/55/57	81.1 4/6 157/57/61	82.5 4/6 160/60/62	83.6 4/6 163/63/65	77.7 4/6 145/48/52	79.5 4/6 150/51/56	81.3 4/6 154/54/60	82.4 3/4 157/57/63	83.4 3/4 160/61/66
30	76.9 4/6 144/50/52	78.7 4/6 149/54/56	80.5 4/6 154/57/60	81.8 4/6 158/58/60	83.0 4/6 161/61/63	77.1 4/6 143/46/50	78.9 4/6 148/50/55	80.7 4/6 153/53/58	81.9 3/4 155/56/61	82.9 3/4 158/59/64
32	76.8 4/6 144/50/52	78.6 4/6 149/53/55	80.4 4/6 154/56/55	81.7 4/6 157/58/60	82.9 4/6 161/61/63	77.0 4/6 142/45/50	78.7 4/6 147/50/55	80.6 4/6 152/53/58	81.8 4/6 155/55/60	82.8 3/4 157/59/64
34	76.7 4/6 143/50/52	78.4 4/6 148/53/55	DO NOT USE FOR OPERATIONAL PURPOSE						81.7 4/6 154/55/60	82.7 3/4 157/58/64
36	76.6 4/6 143/49/52	78.4 4/6 148/52/54							76.1 4/6 154/55/60	76.6 3/4 157/58/63
38	76.5 4/6 142/49/52	78.3 4/6 147/52/54	80.0 4/6 153/56/58	81.3 4/6 156/58/60	82.6 4/6 159/60/62	76.7 4/6 141/45/50	78.4 4/6 146/48/53	80.2 4/6 151/52/57	81.5 4/6 154/54/59	82.5 3/4 156/58/63

Enter the 10 kt head wind column and interpolate for 25 °C, CONF 1+F,

Maximum TO weight (1 000 kg) air conditioning OFF..82.1
Enter the 10 kt head wind column and interpolate for 25 °C, CONF 2,
Maximum TO weight (1 000 kg) air conditioning OFF..82.1
Retain CONF 2 as takeoff configuration as the speeds are lower.
Maximum TO weight (1 000 kg) air conditioning OFF..82.1

Use the QNH/BLEEDS correction page:(*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).
For example:



Air conditioning correction.. -1.8
Maximum permissible TO weight (1 000 kg) air conditioning ON.. 80.3
Determine takeoff speeds for 80.3 (1 000 kg) in the 10 kt head wind column CONF 2 (interpolate when necessary).

A3XXXXX	ENGINES	AIRPORT NAME		Version A3XXXXXX	Date **V20
QNH	1013.25 HPA	Elevation 489 FT	TORA 3000 M	15L	DRY
Air cond.	AC OFF	Isa temp 14 C	TODA 3000 M	4 obstacles	
Anti-icing	AI OFF	Rwy slope .08 %	ASDA 3000 M		
All reversers operating					
No reversers on dry runway					

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
44	76.1 4/6 142/49/51	77.9 4/6 146/51/53	75.1 2/3 153/54/55	75.7 2/3 156/57/58	76.3 2/3 158/59/60	73.0 2/3 142/44/47	74.1 2/3 146/47/51	75.1 2/3 150/51/55	81.1 4/6 153/53/58	82.1 3/4 155/57/62
46	75.5 4/6 142/48/50	77.2 4/6 148/50/52	78.9 4/6 152/55/57	80.2 4/6 155/56/58	80.7 4/6 154/56/58	75.7 4/6 141/45/49	77.3 4/6 145/47/52	79.1 4/6 150/50/55	80.3 3/4 152/53/58	80.7 2/4 152/55/60
48	74.5 4/6 143/48/50	76.2 4/6 148/50/52	77.9 4/6 153/53/55	79.1 4/6 155/53/55	79.3 2/4 153/55/57	74.7 4/6 141/44/48	76.4 4/6 146/47/51	78.0 3/4 150/50/55	79.1 3/4 152/53/57	79.5 4/6 155/58/63

V1 = 152 kt, VR = 153 kt, V2 = 158 kt.

CORRECTIONS FOR WET OR CONTAMINATED RUNWAYS

Ident.: PER-TOF-TOC-12-10-00001715.0001001 / 28 JAN 11
Applicable to: ALL

(*Refer to PER-TOF-CTA-10 GENERAL*)

CORRECTIONS PRODUCED ON THE RTOW CHART

Ident.: PER-TOF-TOC-12-10-00014707.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.
For example: *Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART*
A description of this correction is given on *Refer to PER-TOF-TOC-10-20 DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART*. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti ice. A maximum of three corrections can be produced on one chart.

To apply the corrections, proceed as follows:
1. Enter the chart with given OAT and wind to determine the maximum takeoff weight before correction.
2. Apply the first correction:
   If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and ΔV1 /ΔVR /ΔV2 corrections from line 2.
   Else, (for OAT greater than TVMC), apply ΔW correction from line 3 and ΔV1 /ΔVR /ΔV2 corrections from line 4.
3. To combine a second (and third, as applicable) correction:
   If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and ΔV1 /VR /ΔV2 corrections from line 2.
   Check that the resulting speeds are higher than the minimum speeds displayed on the RTOW chart and that V2 is higher than the VMU limited speed (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*).
   If OAT is higher than TVMC (line 3) or if the above speed check is not fulfilled, apply ΔW correction from line 3 and ΔV1 /ΔVR /ΔV2 corrections from line 4. No speed check is required.

<u>Note:</u>
- *QNH correction is given for ±10 hPa . It is allowed to extrapolate linearly for greater QNH deviation.*
- *When using a takeoff chart with failure cases, it is not allowed to combine two failure cases.*
- *Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART, apply the wet correction first.*
- *If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.*
- *No speed check is required for the first correction. However, if the first influence correction follows a conservative FCOM correction, a speed check is required.*

EXAMPLE 2

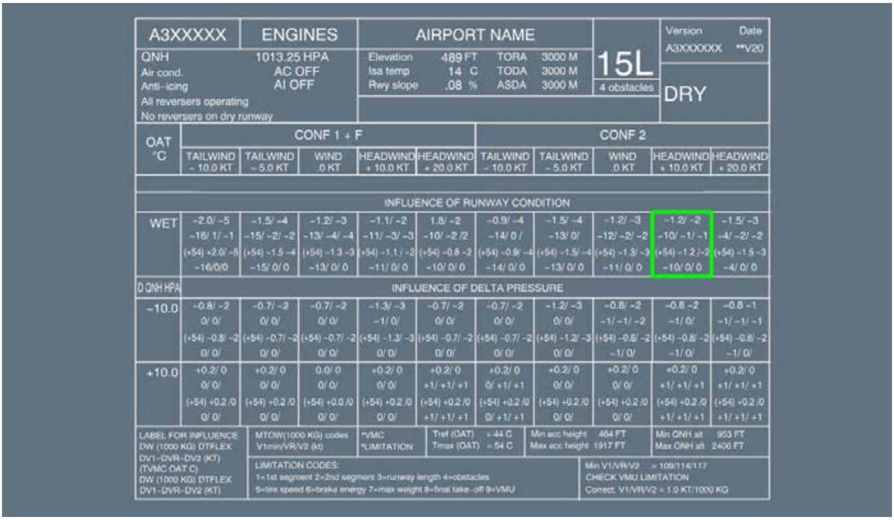
DATA : CONF 2
OAT = 25 °C
Head Wind = 10 kt
QNH = 1 028 hPa
WET runway

In this example, we will consider CONF 2 as takeoff configuration. But same computation has to be done in CONF 1 and you must retain the best configuration.
Use the chart (*Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART*)

A3XXXXX	ENGINES	AIRPORT NAME	15L	Version A3XXXXXX	Date **V20
QNH	1013.25 HPA	Elevation 489 FT, Isa temp 14 C, Rwy slope .08 %	4 obstacles	DRY	
Air cond.	AC OFF	TORA 3000 M, TODA 3000 M, ASDA 3000 M			
Anti-icing	AI OFF				
All reversers operating					
No reversers on dry runway					

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
-20	80.2 4/6 156/56/58	80.2 4/6 162/62/64	83.6 3/4 167/67/69	84.8 3/4 170/70/72	85.8 3/4 173/73/75	80.4 4/6 154/54/59	81.9 3/4 159/59/64	83.4 3/4 164/64/69	84.4 3/4 167/67/72	85.2 2/4 169/69/74
-10	79.5 4/6 153/56/58	81.3 4/6 159/59/62	83.1 4/6 164/64/66	84.3 3/4 167/67/69	85.3 3/4 171/71/72	79.7 4/6 151/52/57	81.4 4/6 156/56/62	82.9 3/4 161/61/66	84.0 3/4 164/64/69	84.9 3/4 167/67/72
0	78.8 4/6 151/54/57	80.6 4/6 156/57/59	82.5 4/6 162/62/64	83.7 3/4 165/65/67	84.7 3/4 168/68/70	79.0 4/6 149/51/56	80.8 4/6 154/54/60	82.4 3/4 159/59/64	83.5 3/4 162/62/67	84.5 3/4 165/65/70
10	78.2 4/6 148/53/55	80.0 4/6 154/57/59	81.8 4/6 159/60/62	83.1 4/6 163/63/65	84.2 3/4 166/66/67	78.4 4/6 147/50/54	80.2 4/6 152/52/58	81.9 3/4 156/56/62	83.00 3/4 159/59/65	83.9 3/4 162/63/68
20	77.6 4/6 146/51/53	79.3 4/6 151/55/57	81.1 4/6 157/57/61	82.5 4/6 160/60/62	83.6 4/6 163/63/65	77.7 4/6 145/48/52	79.5 4/6 150/51/56	81.3 4/6 154/54/60	82.4 3/4 157/57/63	83.4 3/4 160/61/66
30	76.9 4/6 144/50/52	78.7 4/6 149/54/56	80.5 4/6 154/57/60	81.8 4/6 158/58/60	83.0 4/6 161/61/63	77.1 4/6 143/46/50	78.9 4/6 148/50/55	80.7 4/6 153/53/58	81.9 3/4 155/56/61	82.9 3/4 158/59/64
32	76.8 4/6 144/50/52	78.6 4/6 149/53/55	80.4 4/6 154/56/55	81.7 4/6 157/58/60	82.9 4/6 161/61/63	77.0 4/6 142/45/50	78.7 4/6 147/50/55	80.6 4/6 152/53/58	81.8 4/6 155/55/60	82.8 3/4 157/59/64
34	76.7 4/6 143/50/52	78.4 4/6 148/53/55	DO NOT USE FOR OPERATIONAL PURPOSE						81.7 4/6 154/55/60	82.7 3/4 157/58/64
36	76.6 4/6 143/49/52	78.4 4/6 148/52/54							76.1 4/6 154/55/60	76.6 3/4 157/58/63
38	76.5 4/6 142/49/52	78.3 4/6 147/52/54	80.0 4/6 153/56/58	81.3 4/6 156/58/60	82.6 4/6 159/60/62	76.7 4/6 141/45/50	78.4 4/6 146/48/53	80.2 4/6 151/52/57	81.5 4/6 154/54/59	82.5 3/4 156/58/63

- Enter the 10 kt head wind column and interpolate for 25 °C, CONF 2, max TO weight (1 000 kg)..82.1
- Read associated speeds as V1 = 156 kt, VR = 157 kt, V2 = 162 kt
- Apply WET correction



A3XXXXX	ENGINES	AIRPORT NAME	15L	Version A3XXXXXX	Date **V20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT Isa temp 14 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M	4 obstacles	DRY

OAT °C	CONF 1 + F TAILWIND - 10.0 KT	CONF 1 + F TAILWIND - 5.0 KT	CONF 1 + F WIND .0 KT	CONF 1 + F HEADWIND + 10.0 KT	CONF 1 + F HEADWIND + 20.0 KT	CONF 2 TAILWIND - 10.0 KT	CONF 2 TAILWIND - 5.0 KT	CONF 2 WIND .0 KT	CONF 2 HEADWIND + 10.0 KT	CONF 2 HEADWIND + 20.0 KT
INFLUENCE OF RUNWAY CONDITION										
WET	-2.0/ -5 -16/ 1/ -1 (+54) +2.0/ -5 -16/0/0	-1.5/ -4 -15/ -2/ -2 (+54) -1.5 -4 -15/ 0/ 0	-1.2/ -3 -13/ -4/ -4 (+54) -1.3 -3 -13/ 0/ 0	-1.1/ -2 -11/ -3/ -3 (+54) -1.1 / -2 -11/ 0/ 0	1.8/ -2 -10/ -2 /2 (+54) -0.8 -2 -10/ 0/ 0	-0.9/ -4 -14/ 0 / (+54) -0.9/ -4 -14/ 0/ 0	-1.5/ -4 -13/ 0/ (+54) -1.5/ -4 -13/ 0/ 0	-1.2/ -3 -12/ -2/ -2 (+54) -1.3/ -3 -11/ 0/ 0	-1.2/ -2 -10/ -1/ -1 (+54) -1.2 / -2 -10/ 0/ 0	-1.5/ -3 -4/ -2/ -2 (+54) -1.5 -3 -4/ 0/ 0
D QNH HPA — INFLUENCE OF DELTA PRESSURE										
-10.0	-0.8/ -2 0/ 0/ (+54) -0.8/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.3/ -3 -1/ 0/ (+54) -1.3/ -3 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.2/ -3 0/ 0/ (+54) -1.2/ -3 0/ 0/	-0.8/ -2 -1/ -1/ -2 (+54) -0.8/ -2 -1/ 0/	-0.8 -2 -1/ 0/ (+54) -0.8/ -2 -1/ 0/	-0.8 -1 -1/ -1/ -1 (+54) -0.8/ -2 -1/ 0/
+10.0	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	0.0/ 0 0/ 0/ (+54) +0.0 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 0/ +1/ +1 (+54) +0.2 /0 0/ +1/ +1	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	MTOW(1000 KG) codes V1min/VR/V2 (kt)	*VMC *LIMITATION	Tref (OAT) = 44 C Tmax (OAT) = 54 C	Min acc height 464 FT Max acc height 1917 FT	Min QNH alt 953 FT Max QNH alt 2406 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU				Min V1/VR/V2 = 109/114/117 CHECK VMU LIMITATION Correct. V1/VR/V2 = 1.0 KT/1000 KG

For OAT < TVMC (54 °C), ΔW = ... -1.2
Intermediate weight (1 000 kg)..= 80.9
Associated speeds,
V1 = 156 kt - 10 = 146 kt
VR = 157 kt - 1 = 156 kt
V2 = 162 kt - 1 = 161 kt
(No speed check required for first correction)

- Apply QNH correction

A3XXXXX	ENGINES	AIRPORT NAME	15L	Version A3XXXXXX	Date **V20
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT TORA 3000 M Isa temp 14 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND − 10.0 KT	TAILWIND − 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND − 10.0 KT	TAILWIND − 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
	INFLUENCE OF RUNWAY CONDITION									
WET	-2.0/ -5 -16/ 1/ -1 (+54) +2.0/ -5 -16/0/0	-1.5/ -4 -15/ -2/ -2 (+54) -1.5 -4 -15/ 0/ 0	-1.2/ -3 -13/ -4/ -4 (+54) -1.3 -3 -13/ 0/ 0	-1.1/ -2 -11/ -3/ -3 (+54) -1.1 / -2 -11/ 0/ 0	1.8/ -2 -10/ -2 /2 (+54) -0.8 -2 -10/ 0/ 0	-0.9/ -4 -14/ 0 / (+54) -0.9/ -4 -14/ 0/ 0	-1.5/ -4 -13/ 0/ (+54) -1.5/ -4 -13/ 0/ 0	-1.2/ -3 -12/ -2/ -2 (+54) -1.3/ -3 -11/ 0/ 0	-1.2/ -2 -10/ -1/ -1 (+54) -1.2 /-2 -10/ 0/ 0	-1.5/ -3 -4/ -2/ -2 (+54) -1.5 -3 -4/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE									
-10.0	-0.8/ -2 0/ 0/ (+54) -0.8/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.3/ -3 -1/ 0/ (+54) -1.3/ -3 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.2/ -3 0/ 0/ (+54) -1.2/ -3 0/ 0/	-0.8/ -2 -1/ -1/ -2 (+54) -0.8/ -2 -1/ 0/	-0.8 -2 -1/ 0/ (+54) -0.8/ -2 -1/ 0/	-0.8 -1 -1/ -1/ -1 (+54) -0.8/ -2 -1/ 0/
+10.0	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	0.0/ 0 0/ 0/ (+54) +0.0 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 0/ +1/ +1 (+54) +0.2 /0 0/ +1/ +1	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	MTOW(1000 KG) codes V1min/VR/V2 (kt)	*VMC *LIMITATION	Tref (OAT) = 44 C Tmax (OAT) = 54 C	Min acc height 464 FT Max acc height 1917 FT	Min QNH alt 953 FT Max QNH alt 2406 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU			Min V1/VR/V2 = 109/114/117 CHECK VMU LIMITATION Correct. V1/VR/V2 = 1.0 KT/1000 KG	

For OAT < TVMC (54 °C), ΔW = 0.2 × 15/10 =..+ 0.3
Maximum permissible takeoff weight (1 000 kg)..= 81.2
Associated speeds,
V1 = 146 kt + 1 × 15/10 = 147 kt
VR = 156 kt + 1 × 15/10 = 158 kt
V2 = 161 kt + 1 × 15/10 = 163 kt

- Check that the speeds are higher than minimum speeds from the chart and from VMU table (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*).
  It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4.

	Takeoff Configuration : 2			
	TOW	**V1**	**VR**	**V2**
TOW (RTOW)	82.1	156	157	162
FCOM correction(s)				
Intermediate value	82.1	156	157	162
WET Correction	- 1.2	-10	-1	-1
Intermediate value	80.9	146	156	161
QNH Correction	+ 0.3	+1	+2	+2
Final value	81.2	147	158	163

COMBINING CORRECTIONS FROM FCOM AND CHART

Ident.: PER-TOF-TOC-12-10-00014713.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

Proceed as follows:

1. Enter the chart with selected configuration, OAT and wind to read the maximum takeoff weight.
2. Apply corrections from FCOM to determine an intermediate weight. Interpolate associated speeds for intermediate weight in the same column (same wind and configuration).
3. Apply corrections from RTOW chart as explained above.

EXAMPLE 3

DATA : CONF 2
OAT = 25 °C
Head wind = 10 kt
Air conditioning ON
QNH = 1 028 hPa
WET runway

In this example, we will consider CONF 2 as takeoff configuration. But same computation has to be done in CONF 1 and you must retain the best configuration.

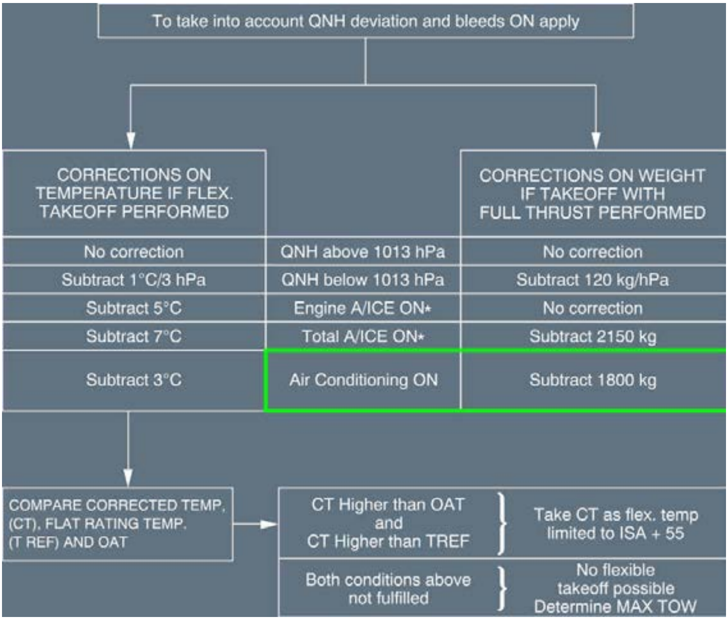
1. Use the chart (*Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART*).

A3XXXXX	ENGINES	AIRPORT NAME		Version A3XXXXXX	Date **V20
QNH	1013.25 HPA	Elevation 489 FT	TORA 3000 M	15L	
Air cond.	AC OFF	Isa temp 14 C	TODA 3000 M		DRY
Anti-icing	AI OFF	Rwy slope .08 %	ASDA 3000 M	4 obstacles	
All reversers operating					
No reversers on dry runway					

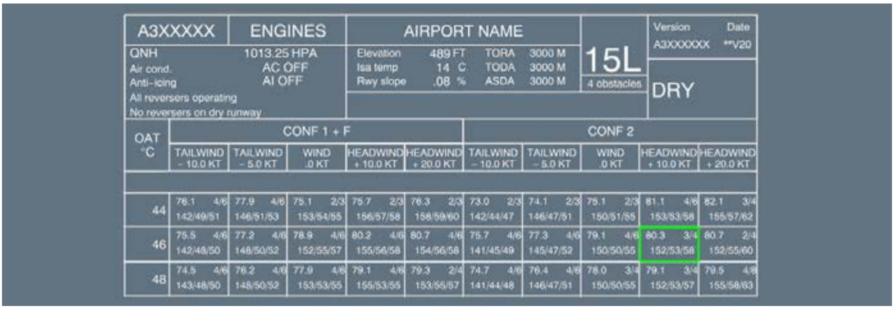
OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
-20	80.2 4/6 156/56/58	80.2 4/6 162/62/64	83.6 3/4 167/67/69	84.8 3/4 170/70/72	85.8 3/4 173/73/75	80.4 4/6 154/54/59	81.9 3/4 159/59/64	83.4 3/4 164/64/69	84.4 3/4 167/67/72	85.2 2/4 169/69/74
-10	79.5 4/6 153/56/58	81.3 4/6 159/59/62	83.1 4/6 164/64/66	84.3 3/4 167/67/69	85.3 3/4 171/71/72	79.7 4/6 151/52/57	81.4 4/6 156/56/62	82.9 3/4 161/61/66	84.0 3/4 164/64/69	84.9 3/4 167/67/72
0	78.8 4/6 151/54/57	80.6 4/6 156/57/59	82.5 4/6 162/62/64	83.7 3/4 165/65/67	84.7 3/4 168/68/70	79.0 4/6 149/51/56	80.8 4/6 154/54/60	82.4 3/4 159/59/64	83.5 3/4 162/62/67	84.5 3/4 165/65/70
10	78.2 4/6 148/53/55	80.0 4/6 154/57/59	81.8 4/6 159/60/62	83.1 4/6 163/63/65	84.2 3/4 166/66/67	78.4 4/6 147/50/54	80.2 4/6 152/52/58	81.9 3/4 156/56/62	83.00 3/4 159/59/65	83.9 3/4 162/63/68
20	77.6 4/6 146/51/53	79.3 4/6 151/55/57	81.1 4/6 157/57/61	82.5 4/6 160/60/62	83.6 4/6 163/63/65	77.7 4/6 145/48/52	79.5 4/6 150/51/56	81.3 4/6 154/54/60	82.4 3/4 157/57/63	83.4 3/4 160/61/66
30	76.9 4/6 144/50/52	78.7 4/6 149/54/56	80.5 4/6 154/57/60	81.8 4/6 158/58/60	83.0 4/6 161/61/63	77.1 4/6 143/46/50	78.9 4/6 148/50/55	80.7 4/6 153/53/58	81.9 3/4 155/56/61	82.9 3/4 158/59/64
32	76.8 4/6 144/50/52	78.6 4/6 149/53/55	80.4 4/6 154/56/55	81.7 4/6 157/58/60	82.9 4/6 161/61/63	77.0 4/6 142/45/50	78.7 4/6 147/50/55	80.6 4/6 152/53/58	81.8 4/6 155/55/60	82.8 3/4 157/59/64
34	76.7 4/6 143/50/52	78.4 4/6 148/53/55	DO NOT USE FOR OPERATIONAL PURPOSE						81.7 4/6 154/55/60	82.7 3/4 157/58/64
36	76.6 4/6 143/49/52	78.4 4/6 148/52/54							76.1 4/6 154/55/60	76.6 3/4 157/58/63
38	76.5 4/6 142/49/52	78.3 4/6 147/52/54	80.0 4/6 153/56/58	81.3 4/6 156/58/60	82.6 4/6 159/60/62	76.7 4/6 141/45/50	78.4 4/6 146/48/53	80.2 4/6 151/52/57	81.5 4/6 154/54/59	82.5 3/4 156/58/63

Enter the 10 kt head wind column and interpolate for 25 °C, CONF 2,
Max TO weight (1 000 kg) air conditioning OFF.. 82.1

2. First, apply the QNH/Bleeds correction (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).



Max TO weight (1 000 kg) air conditioning OFF.................... 82.1
Air conditioning correction.................... - 1.8
Intermediate weight.................... = 80.3
Determine the takeoff speeds for 80.3 (1 000 kg) in the 10 kt head wind column CONF 2 (interpolate when necessary)



A3XXXXX	ENGINES	AIRPORT NAME	15L	Version A3XXXXXX	Date **V20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT, TORA 3000 M Isa temp 14 C, TODA 3000 M Rwy slope .08 %, ASDA 3000 M	4 obstacles	DRY	

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
44	76.1 4/6 142/49/51	77.9 4/6 146/51/53	75.1 2/3 153/54/55	75.7 2/3 156/57/58	76.3 2/3 158/59/60	73.0 2/3 142/44/47	74.1 2/3 146/47/51	75.1 2/3 150/51/55	81.1 4/6 153/53/58	82.1 3/4 155/57/62
46	75.5 4/6 142/48/50	77.2 4/6 148/50/52	78.9 4/6 152/55/57	80.2 4/6 155/56/58	80.7 4/6 154/56/58	75.7 4/6 141/45/49	77.3 4/6 145/47/52	79.1 4/6 150/50/55	80.3 3/4 152/53/58	80.7 2/4 152/55/60
48	74.5 4/6 143/48/50	76.2 4/6 148/50/52	77.9 4/6 153/53/55	79.1 4/6 155/53/55	79.3 2/4 153/55/57	74.7 4/6 141/44/48	76.4 4/6 146/47/51	78.0 3/4 150/50/55	79.1 3/4 152/53/57	79.5 4/6 155/58/63

V1 = 152 kt , VR = 153 kt , V2 = 158 kt

3. Apply WET correction

PERFORMANCE

TAKEOFF

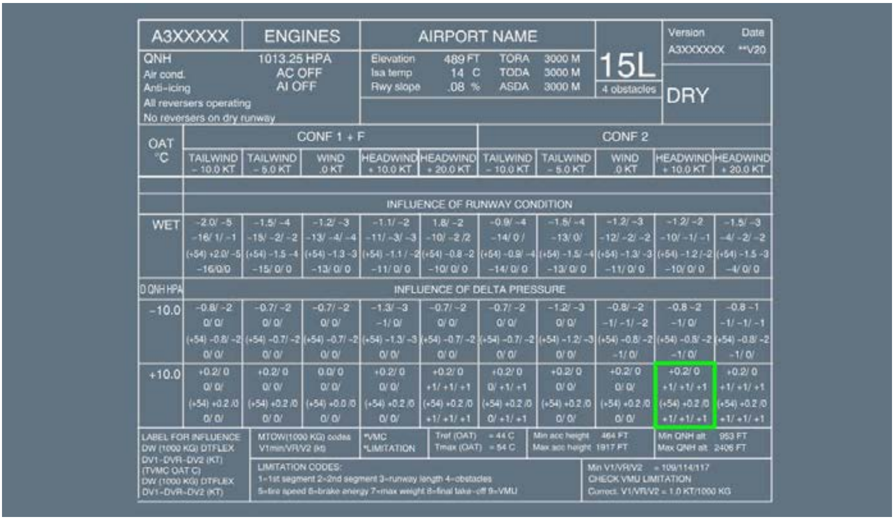
TAKEOFF CHARTS - MTOW CALCULATION (TEMPERATURE ENTRY)

A3XXXXX	ENGINES	AIRPORT NAME		15L	Version A3XXXXXX	Date **V20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT Isa temp 14 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M	4 obstacles	DRY	

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
	INFLUENCE OF RUNWAY CONDITION									
WET	-2.0/ -5 -16/ 1/ -1 (+54) +2.0/ -5 -16/0/0	-1.5/ -4 -15/ -2/ -2 (+54) -1.5 -4 -15/ 0/ 0	-1.2/ -3 -13/ -4/ -4 (+54) -1.3 -3 -13/ 0/ 0	-1.1/ -2 -11/ -3/ -3 (+54) -1.1 / -2 -11/ 0/ 0	1.8/ -2 -10/ -2 /2 (+54) -0.8 -2 -10/ 0/ 0	-0.9/ -4 -14/ 0 / (+54) -0.9/ -4 -14/ 0/ 0	-1.5/ -4 -13/ 0/ (+54) -1.5/ -4 -13/ 0/ 0	-1.2/ -3 -12/ -2/ -2 (+54) -1.3/ -3 -11/ 0/ 0	-1.2/ -2 -10/ -1/ -1 (+54) -1.2 /-2 -10/ 0/ 0	-1.5/ -3 -4/ -2/ -2 (+54) -1.5 -3 -4/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE									
-10.0	-0.8/ -2 0/ 0/ (+54) -0.8/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.3/ -3 -1/ 0/ (+54) -1.3/ -3 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.2/ -3 0/ 0/ (+54) -1.2/ -3 0/ 0/	-0.8/ -2 -1/ -1/ -2 (+54) -0.8/ -2 -1/ 0/	-0.8 -2 -1/ 0/ (+54) -0.8/ -2 -1/ 0/	-0.8 -1 -1/ -1/ -1 (+54) -0.8/ -2 -1/ 0/
+10.0	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	0.0/ 0 0/ 0/ (+54) +0.0 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 0/ +1/ +1 (+54) +0.2 /0 0/ +1/ +1	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	MTOW(1000 KG) codes V1min/VR/V2 (kt)	*VMC *LIMITATION	Tref (OAT) = 44 C Tmax (OAT) = 54 C	Min acc height 464 FT Max acc height 1917 FT	Min QNH alt 953 FT Max QNH alt 2406 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU				Min V1/VR/V2 = 109/114/117 CHECK VMU LIMITATION Correct. V1/VR/V2 = 1.0 KT/1000 KG

For OAT < TVMC (54 °C), ΔW =... -1.2
Intermediate weight... = 79.1
Associated speeds,
V1 = 152 kt - 10 = 142 kt
VR = 153 kt - 1 = 152 kt
V2 = 158 kt - 1 = 157 kt
(No speed check required for first correction).
Apply QNH correction



A3XXXXX	ENGINES	AIRPORT NAME	15L	Version A3XXXXXX Date **V20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT TORA 3000 M Isa temp 14 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
	INFLUENCE OF RUNWAY CONDITION									
WET	-2.0/ -5 -16/ 1/ -1 (+54) +2.0/ -5 -16/0/0	-1.5/ -4 -15/ -2/ -2 (+54) -1.5 -4 -15/ 0/ 0	-1.2/ -3 -13/ -4/ -4 (+54) -1.3 -3 -13/ 0/ 0	-1.1/ -2 -11/ -3/ -3 (+54) -1.1 / -2 -11/ 0/ 0	1.8/ -2 -10/ -2 /2 (+54) -0.8 -2 -10/ 0/ 0	-0.9/ -4 -14/ 0 / (+54) -0.9/ -4 -14/ 0/ 0	-1.5/ -4 -13/ 0/ (+54) -1.5/ -4 -13/ 0/ 0	-1.2/ -3 -12/ -2/ -2 (+54) -1.3/ -3 -11/ 0/ 0	-1.2/ -2 -10/ -1/ -1 (+54) -1.2 /-2 -10/ 0/ 0	-1.5/ -3 -4/ -2/ -2 (+54) -1.5 -3 -4/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE									
-10.0	-0.8/ -2 0/ 0/ (+54) -0.8/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.3/ -3 -1/ 0/ (+54) -1.3/ -3 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.2/ -3 0/ 0/ (+54) -1.2/ -3 0/ 0/	-0.8/ -2 -1/ -1/ -2 (+54) -0.8/ -2 -1/ 0/	-0.8 -2 -1/ 0/ (+54) -0.8/ -2 -1/ 0/	-0.8 -1 -1/ -1/ -1 (+54) -0.8/ -2 -1/ 0/
+10.0	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	0.0/ 0 0/ 0/ (+54) +0.0 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 0/ +1/ +1 (+54) +0.2 /0 0/ +1/ +1	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	MTOW(1000 KG) codes V1min/VR/V2 (kt)	*VMC *LIMITATION	Tref (OAT) = 44 C Tmax (OAT) = 54 C	Min acc height 464 FT Max acc height 1917 FT	Min QNH alt 953 FT Max QNH alt 2406 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU			Min V1/VR/V2 = 109/114/117 CHECK VMU LIMITATION Correct. V1/VR/V2 = 1.0 KT/1000 KG	

For OAT < TVMC (54 °C), ΔW = 0.2 × 15/10 =...+0.3
Max permissible takeoff weight... = 79.4
Associated speed,
V1 = 142 kt + 1 × 15/10 = 143 kt
VR = 152 kt + 1 × 15/10 = 154 kt
V2 = 157 kt + 1 × 15/10 = 159 kt

Check that the speeds are higher than minimum speeds from the chart and from VMU table (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*)(it is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4).
Since the speed check is fulfilled:
Max permissible takeoff weight = 79.4 (1 000 kg)
V1 = 143 kt, VR = 154 kt, V2 = 159 kt.

	Takeoff Configuration : 2			
	TOW	**V1**	**VR**	**V2**
TOW (RTOW)	82.1			
FCOM correction(s)	- 1.8			
Intermediate value	80.3	152	153	158
WET Correction	- 1.2	-10	-1	-1
Intermediate value	79.1	142	152	157
QNH Correction	+ 0.3	+1	+2	+2

Continued on the following page

Continued from the previous page

	Takeoff Configuration : 2			
	TOW	**V1**	**VR**	**V2**
Final value	79.4	143	154	159

EXTRAPOLATION

EXTRAPOLATION

Ident.: PER-TOF-TOC-12-30-00001716.0002001 / 01 MAR 11
Applicable to: ALL

For a takeoff weight lower than those displayed on the chart, associated speeds are calculated as follows :

1. For given configuration and wind, note the speeds associated with the takeoff weight in the row displaying the highest permissible temperature.
2. Apply speed corrections provided at the bottom of the RTOW chart to V1 , VR and V2 limited to the minimum speeds.

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MAXIMUM STRUCTURAL TAKEOFF WEIGHT

MAXIMUM STRUCTURAL TAKEOFF WEIGHT

Ident.: PER-TOF-TOC-12-40-00001717.0001001 / 18 MAR 11
Applicable to: ALL

The maximum structural takeoff weight is a weight limitation depending on the aircraft. This limitation is provided in the Flight Manual and in *Refer to LIM-AG-WGHT Weight Limitations*. Compare the maximum structural takeoff weight to the maximum permissible takeoff weight computed for given conditions and retain the lower of the two values.

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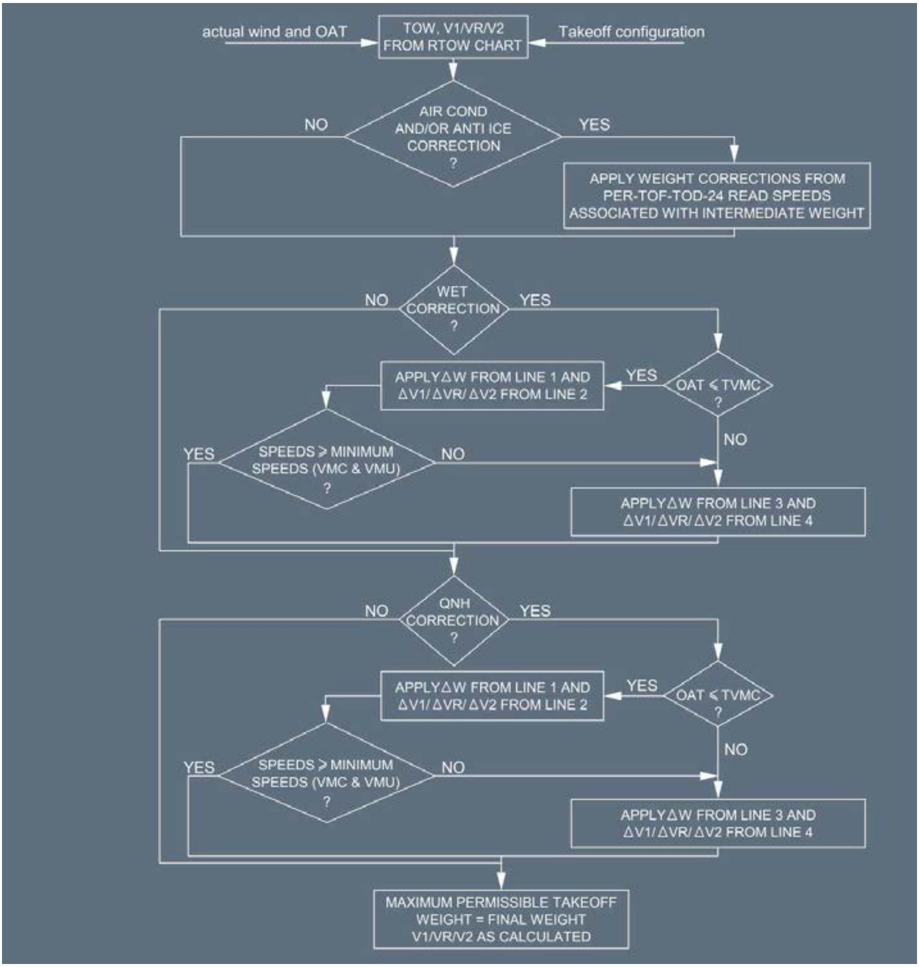
SUMMARY

SUMMARY

Ident.: PER-TOF-TOC-12-50-00006313.0001001 / 11 MAR 11
Applicable to: ALL

The following flow diagram gives the different steps to follow.



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DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS

GENERAL

Ident.: PER-TOF-TOC-14-10-00001722.0002001 / 17 MAR 11
Applicable to: ALL

Before determining the flexible temperature, calculate the maximum permissible takeoff weight (see previous section) and ensure that the actual takeoff weight is lower than the determined maximum takeoff weight.

- Enter the RTOW chart with the wind condition to interpolate for the actual takeoff weight. Read the flexible temperature in the temperature column corresponding to the actual weight.
- Repeat this process for the other configuration available. Select the configuration giving the highest flexible temperature.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Ident.: PER-TOF-TOC-14-10-00001723.0002001 / 14 MAR 11
Applicable to: ALL

When the takeoff conditions are different from those provided on the chart, apply the associated corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS

Ident.: PER-TOF-TOC-14-10-00014714.0001001 / 29 JUL 16
Applicable to: ALL

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

Corrections are given for QNH ≠ 1 013 hPa , air conditioning ON, anti ice ON (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).

1. For a given takeoff weight, wind condition and selected configuration, determine the flexible temperature. Retain the takeoff speeds associated with the actual weight.
2. Apply the published temperature correction. To combine two or more corrections, add the different corrections and apply to temperature value.
   (No speed corrections required).

EXAMPLE 2

DATA :

DATA :	Actual takeoff weight	=	75 600 kg
	Head wind	=	10 kt
	Air conditioning ON		
	QNH	=	1 013 hPa

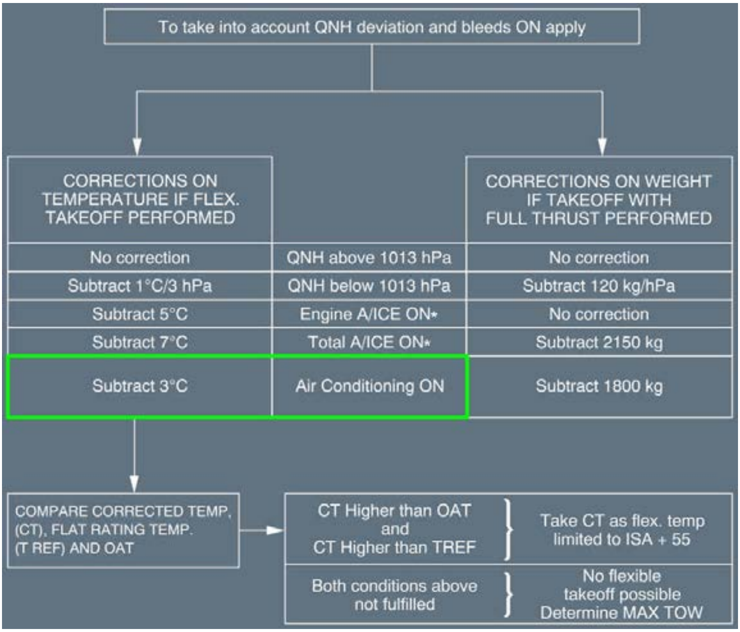
Use the chart: (*Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART*).

A3XXXXX	ENGINES	AIRPORT NAME	15L	Version A3XXXXXX / Date **V20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT / TORA 3000 M Isa temp 14 C / TODA 3000 M Rwy slope .08 % / ASDA 3000 M	4 obstacles	DRY

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
48	74.5 4/6 143/48/50	76.2 4/6 148/50/52	77.9 4/6 153/53/55	79.1 4/6 155/53/55	79.3 2/4 153/55/57	74.7 4/6 141/44/48	76.4 4/6 146/47/51	78.0 3/4 150/50/55	79.1 3/4 152/53/57	79.5 4/8 155/58/63
50	73.6 4/6 143/47/49	75.3 4/6 148/49/51	76.9 4/6 153/53/55	77.9 4/8 154/54/55	77.9 2/4 151/54/55	73.8 4/6 142/42/46	75.4 4/6 146/47/51	76.9 3/4 150/50/54	78.0 3/4 152/52/57	78.0 2/4 149/52/57
52	72.7 4/6 144/46/48	74.4 4/6 149/49/51	75.8 3/4 153/53/54	76.3 2/4 152/52/53	76.3 2/4 147/52/53	72.9 4/6 142/44/48	74.3 3/4 146/46/50	75.8 3/4 150/50/54	76.4 2/4 150/50/55	76.4 2/4 146/50/55
54	71.8 4/6 145/46/47	73.3 3/4 149/49/51	74.8 3/4 152/52/54	75.0 2/4 150/50/52	75.0 2/4 145/50/52	71.9 3/4 142/43/47	73.3 3/4 146/46/50	74.7 3/4 149/49/54	75.1 2/4 148/49/54	75.1 2/4 144/49/54

Determine the maximum permissible takeoff weight. The actual weight being lower than the maximum one, flexible takeoff is possible.
Enter the 10 kt head wind column and interpolate for 75 600 kg, CONF 1+F,
Flexible temperature.. 53 °C
Enter the 10 kt head wind column and interpolate for 75 600 kg, CONF 2,
Flexible temperature.. 53 °C

Retain CONF 2 as the speeds are lower.
Takeoff speeds are V1 = 149 kt, VR = 150 kt, V2 = 155 kt
Flexible temperature with air conditioning OFF.. 53 °C
Use the QNH/Bleeds corrections:(*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).
For example:



Air conditioning correction .... -3 °C
Flexible temperature...= 50 °C
Check that OAT/TREF < flex temperature ≤ TMAXFLEX
TMAXFLEX is specified in LIM-70.

CORRECTIONS FOR WET RUNWAY

Ident.: PER-TOF-TOC-14-10-00001725.0001001 / 28 JAN 11
Applicable to: ALL

CORRECTIONS FOR WET RUNWAY

(*Refer to PER-TOF-CTA-10 GENERAL*)

CORRECTIONS PRODUCED ON THE RTOW CHART

Ident.: PER-TOF-TOC-14-10-00014717.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.
For a description of this correction *Refer to PER-TOF-TOC-10-20 DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART*. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti-icing. A maximum of three corrections can be produced on one chart.

To apply the correction, proceed as follows:
1. Enter the chart with wind and selected configuration. Interpolate for actual takeoff weight. Read flexible temperature associated with this weight.
2. Apply the first correction:
   Apply ∆Tflex correction and apply speed corrections (∆V1 / ∆VR / ∆V2).
   Check that the resulting V2 is higher than the VMU Limited speed (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*). If the speed checks are not fulfilled, flexible takeoff is not possible. Set TOGA thrust and retain the speeds associated with maximum permissible takeoff weight or the speeds read in the chart of the actual weight if they are all lower.
   <u>No speed correction is required for QNH and bleeds influence</u> (Not applicable to maximum takeoff weight determination).
3. To combine a second and/or a third correction, proceed as per point 2, except that also the resulting speeds must be checked higher than the minimum speed displayed on the RTOW chart.
4. Check that the final flexible temperature is:
   - higher than OAT and TREF
   - limited to TMAXFLEX

     If the check is fulfilled, retain final flexible temperature as the one to be inserted in the MCDU.
     If the check is not fulfilled, (final flexible temperature lower than OAT or TREF), no flexible takeoff is possible.
     Use TOGA thrust and retain speeds that have been calculated for the maximum permissible takeoff weight. (*Refer to PER-TOF-TOC-14-20 FLEXIBLE TAKEOFF NOT POSSIBLE*)

<u>Note:</u>
- *QNH correction is given for ±10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.*
- *Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART, apply the wet influence first.*

<u>Note:</u>
- *If asterisk or dotted lines appear in the influence boxes, refer to more conservative corrections provided in the FCOM.*

EXAMPLE 5

DATA : CONF 2

DATA :	CONF 2		
	Actual takeoff weight	=	75 600 kg
	Head wind	=	10 kt
	WET runway		
	Air conditioning OFF		
	QNH	=	1 023 hPa

In this example, we will consider CONF 2 as takeoff configuration. But same computation has to be done in CONF 1 and you must retain the best configuration.
Use the chart:(*Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART*).

A3XXXXX	ENGINES	AIRPORT NAME		15L	Version A3XXXXXX	Date **V20
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT Isa temp 14 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M	4 obstacles	DRY	

OAT °C	CONF 1 + F TAILWIND - 10.0 KT	CONF 1 + F TAILWIND - 5.0 KT	CONF 1 + F WIND .0 KT	CONF 1 + F HEADWIND + 10.0 KT	CONF 1 + F HEADWIND + 20.0 KT	CONF 2 TAILWIND - 10.0 KT	CONF 2 TAILWIND - 5.0 KT	CONF 2 WIND .0 KT	CONF 2 HEADWIND + 10.0 KT	CONF 2 HEADWIND + 20.0 KT
48	74.5 4/6 143/48/50	76.2 4/6 148/50/52	77.9 4/6 153/53/55	79.1 4/6 155/53/55	79.3 2/4 153/55/57	74.7 4/6 141/44/48	76.4 4/6 146/47/51	78.0 3/4 150/50/55	79.1 3/4 152/53/57	79.5 4/8 155/58/63
50	73.6 4/6 143/47/49	75.3 4/6 148/49/51	76.9 4/6 153/53/55	77.9 4/8 154/54/55	77.9 2/4 151/54/55	73.8 4/6 142/42/46	75.4 4/6 146/47/51	76.9 3/4 150/50/54	78.0 3/4 152/52/57	78.0 2/4 149/52/57
52	72.7 4/6 144/46/48	74.4 4/6 149/49/51	75.8 3/4 153/53/54	76.3 2/4 152/52/53	76.3 2/4 147/52/53	72.9 4/6 142/44/48	74.3 3/4 146/46/50	75.8 3/4 150/50/54	76.4 2/4 150/50/55	76.4 2/4 146/50/55
54	71.8 4/6 145/46/47	73.3 3/4 149/49/51	74.8 3/4 152/52/54	75.0 2/4 150/50/52	75.0 2/4 145/50/52	71.9 3/4 142/43/47	73.3 3/4 146/46/50	74.7 3/4 149/49/54	75.1 2/4 148/49/54	75.1 2/4 144/49/54

Determine the maximum permissible takeoff weight (see example 2). The actual weight being lower than the maximum one, flexible takeoff is possible.
Enter the 10 kt head wind column and interpolate for 75 600 kg, CONF 2,
Flexible temperature.. 53 °C
Takeoff speeds are V1 = 149 kt, VR = 150 kt, V2 = 155 kt
Apply WET correction

A3XXXXX	ENGINES	AIRPORT NAME	15L	Version A3XXXXXX	Date **V20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT TORA 3000 M Isa temp 14 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
	INFLUENCE OF RUNWAY CONDITION									
WET	-2.0/ -5 -16/ 1/ -1 (+54) +2.0/ -5 -16/0/0	-1.5/ -4 -15/ -2/ -2 (+54) -1.5 -4 -15/ 0/ 0	-1.2/ -3 -13/ -4/ -4 (+54) -1.3 -3 -13/ 0/ 0	-1.1/ -2 -11/ -3/ -3 (+54) -1.1 / -2 -11/ 0/ 0	1.8/ -2 -10/ -2 /2 (+54) -0.8 -2 -10/ 0/ 0	-0.9/ -4 -14/ 0 / (+54) -0.9/ -4 -14/ 0/ 0	-1.5/ -4 -13/ 0/ (+54) -1.5/ -4 -13/ 0/ 0	-1.2/ -3 -12/ -2/ -2 (+54) -1.3/ -3 -11/ 0/ 0	-1.2/ -2 -10/ -1/ -1 (+54) -1.2 /-2 -10/ 0/ 0	-1.5/ -3 -4/ -2/ -2 (+54) -1.5 -3 -4/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE									
-10.0	-0.8/ -2 0/ 0/ (+54) -0.8/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.3/ -3 -1/ 0/ (+54) -1.3/ -3 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.2/ -3 0/ 0/ (+54) -1.2/ -3 0/ 0/	-0.8/ -2 -1/ -1/ -2 (+54) -0.8/ -2 -1/ 0/	-0.8 -2 -1/ 0/ (+54) -0.8/ -2 -1/ 0/	-0.8 -1 -1/ -1/ -1 (+54) -0.8/ -2 -1/ 0/
+10.0	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	0.0/ 0 0/ 0/ (+54) +0.0 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 0/ +1/ +1 (+54) +0.2 /0 0/ +1/ +1	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	MTOW(1000 KG) codes V1min/VR/V2 (kt)	*VMC *LIMITATION	Tref (OAT) = 44 C Tmax (OAT) = 54 C	Min acc height 464 FT Max acc height 1917 FT	Min QNH alt 953 FT Max QNH alt 2406 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU				Min V1/VR/V2 = 109/114/117 CHECK VMU LIMITATION Correct. V1/VR/V2 = 1.0 KT/1000 KG

ΔTflex =.. -2 °C
Intermediate flex temperature.. = 51 °C
Associated speeds,
V1 = 149 kt – 10 = 139 kt
VR = 150 kt – 1 = 149 kt
V2 = 155 kt – 1 = 154 kt
Check that V2 is higher than the VMU. (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*).
Apply QNH correction

A3XXXXX	ENGINES	AIRPORT NAME	15L	Version A3XXXXXX	Date **V20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT Isa temp 14 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M	4 obstacles	DRY

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
	INFLUENCE OF RUNWAY CONDITION									
WET	-2.0/ -5 -16/ 1/ -1 (+54) +2.0/ -5 -16/0/0	-1.5/ -4 -15/ -2/ -2 (+54) -1.5 -4 -15/ 0/ 0	-1.2/ -3 -13/ -4/ -4 (+54) -1.3 -3 -13/ 0/ 0	-1.1/ -2 -11/ -3/ -3 (+54) -1.1 / -2 -11/ 0/ 0	1.8/ -2 -10/ -2 /2 (+54) -0.8 -2 -10/ 0/ 0	-0.9/ -4 -14/ 0 / (+54) -0.9/ -4 -14/ 0/ 0	-1.5/ -4 -13/ 0/ (+54) -1.5/ -4 -13/ 0/ 0	-1.2/ -3 -12/ -2/ -2 (+54) -1.3/ -3 -11/ 0/ 0	-1.2/ -2 -10/ -1/ -1 (+54) -1.2 /-2 -10/ 0/ 0	-1.5/ -3 -4/ -2/ -2 (+54) -1.5 -3 -4/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE									
-10.0	-0.8/ -2 0/ 0/ (+54) -0.8/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.3/ -3 -1/ 0/ (+54) -1.3/ -3 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.2/ -3 0/ 0/ (+54) -1.2/ -3 0/ 0/	-0.8/ -2 -1/ -1/ -2 (+54) -0.8/ -2 -1/ 0/	-0.8 -2 -1/ 0/ (+54) -0.8/ -2 -1/ 0/	-0.8 -1 -1/ -1/ -1 (+54) -0.8/ -2 -1/ 0/
+10.0	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	0.0/ 0 0/ 0/ (+54) +0.0 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 0/ +1/ +1 (+54) +0.2 /0 0/ +1/ +1	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	MTOW(1000 KG) codes V1min/VR/V2 (kt)	*VMC *LIMITATION	Tref (OAT) = 44 C Tmax (OAT) = 54 C	Min acc height 464 FT Max acc height 1917 FT	Min QNH alt 953 FT Max QNH alt 2406 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU				Min V1/VR/V2 = 109/114/117 CHECK VMU LIMITATION Correct. V1/VR/V2 = 1.0 KT/1000 KG

ΔTflex =.. 0 °C
Maximum flexible temperature.. = 51 °C
No speed correction is required for QNH and bleed influence.
Takeoff speeds are V1 = 139 kt, VR = 149 kt, V2 = 154 kt
Check that OAT/TREF < flex temperature ≤ TMAXFLEX
TMAXFLEX is specified in LIM-70.

	Takeoff Configuration: 1 + F			
	Tflex	V1	VR	V2
Chart temperature	53	149	150	155
FCOM correction(s)				
Intermediate value	53	149	150	155
WET Correction	-2	-10	-1	-1
Intermediate value	51	139	149	154
QNH Correction	0	0	0	0
Final value	51	139	149	154

COMBINING CORRECTIONS FROM FCOM AND CHART

Ident.: PER-TOF-TOC-14-10-00014718.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

1. Apply corrections from FCOM (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).
2. Apply corrections from the RTOW chart.
   Apply speed corrections except for QNH and bleed influences.

EXAMPLE 6

DATA: CONF 2
Actual takeoff weight = 75 600 kg
Head wind = 10 kt
Air conditioning ON
QNH = 1 028 hPa
WET runway

In this example, we will consider CONF 2 as takeoff configuration. But same computation has to be done in CONF 1 and you must retain the best configuration.
Use the chart (*Refer to PER-TOF-TOC-10-20 DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART*). Determine the maximum permissible takeoff weight (*Refer to PER-TOF-TOC-12-10 COMBINING CORRECTIONS FROM FCOM AND CHART*: example 3). The actual weight being lower than the maximum one, flexible takeoff is possible.

A3XXXXX | ENGINES | AIRPORT NAME | 15L | Version A3XXXXXX | Date **V20

QNH 1013.25 HPA
Air cond. AC OFF
Anti-icing AI OFF
All reversers operating
No reversers on dry runway

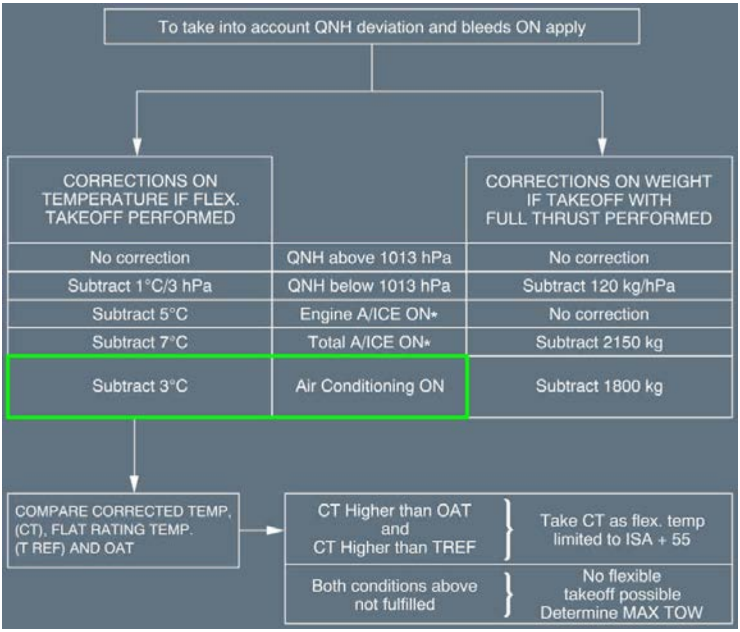
Elevation 489 FT | TORA 3000 M
Isa temp 14 C | TODA 3000 M
Rwy slope .08 % | ASDA 3000 M

4 obstacles

DRY

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
48	74.5 4/6 143/48/50	76.2 4/6 148/50/52	77.9 4/6 153/53/55	79.1 4/6 155/53/55	79.3 2/4 153/55/57	74.7 4/6 141/44/48	76.4 4/6 146/47/51	78.0 3/4 150/50/55	79.1 3/4 152/53/57	79.5 4/8 155/58/63
50	73.6 4/6 143/47/49	75.3 4/6 148/49/51	76.9 4/6 153/53/55	77.9 4/8 154/54/55	77.9 2/4 151/54/55	73.8 4/6 142/42/46	75.4 4/6 146/47/51	76.9 3/4 150/50/54	78.0 3/4 152/52/57	78.0 2/4 149/52/57
52	72.7 4/6 144/46/48	74.4 4/6 149/49/51	75.8 3/4 153/53/54	76.3 2/4 152/52/53	76.3 2/4 147/52/53	72.9 4/6 142/44/48	74.3 3/4 146/46/50	75.8 3/4 150/50/54	76.4 2/4 150/50/55	76.4 2/4 146/50/55
54	71.8 4/6 145/46/47	73.3 3/4 149/49/51	74.8 3/4 152/52/54	75.0 2/4 150/50/52	75.0 2/4 145/50/52	71.9 3/4 142/43/47	73.3 3/4 146/46/50	74.7 3/4 149/49/54	75.1 2/4 148/49/54	75.1 2/4 144/49/54

Enter the 10 kt head wind column and interpolate for 75 600 kg, CONF 2,
Flexible temperature.. 53 °C
Takeoff speeds are V1 = 149 kt, VR = 150 kt, V2 = 155 kt
First, apply the correction (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).
Flexible temperature with air conditioning OFF.. 53 °C



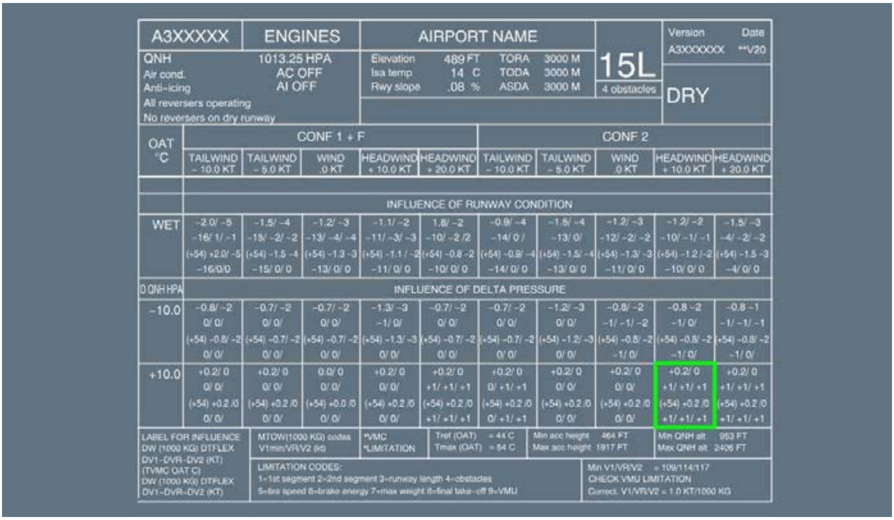
Air conditioning correction.. -3 °C
Intermediate flexible temperature..= 50 °C
No speed correction.
Apply WET correction

A3XXXXX	ENGINES	AIRPORT NAME	15L	Version A3XXXXXX	Date **V20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT TORA 3000 M Isa temp 14 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
	INFLUENCE OF RUNWAY CONDITION									
WET	-2.0/ -5 -16/ 1/ -1 (+54) +2.0/ -5 -16/0/0	-1.5/ -4 -15/ -2/ -2 (+54) -1.5 -4 -15/ 0/ 0	-1.2/ -3 -13/ -4/ -4 (+54) -1.3 -3 -13/ 0/ 0	-1.1/ -2 -11/ -3/ -3 (+54) -1.1 / -2 -11/ 0/ 0	1.8/ -2 -10/ -2 /2 (+54) -0.8 -2 -10/ 0/ 0	-0.9/ -4 -14/ 0 / (+54) -0.9/ -4 -14/ 0/ 0	-1.5/ -4 -13/ 0/ (+54) -1.5/ -4 -13/ 0/ 0	-1.2/ -3 -12/ -2/ -2 (+54) -1.3/ -3 -11/ 0/ 0	-1.2/ -2 -10/ -1/ -1 (+54) -1.2 /-2 -10/ 0/ 0	-1.5/ -3 -4/ -2/ -2 (+54) -1.5 -3 -4/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE									
-10.0	-0.8/ -2 0/ 0/ (+54) -0.8/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.3/ -3 -1/ 0/ (+54) -1.3/ -3 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.2/ -3 0/ 0/ (+54) -1.2/ -3 0/ 0/	-0.8/ -2 -1/ -1/ -2 (+54) -0.8/ -2 -1/ 0/	-0.8 -2 -1/ 0/ (+54) -0.8/ -2 -1/ 0/	-0.8 -1 -1/ -1/ -1 (+54) -0.8/ -2 -1/ 0/
+10.0	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	0.0/ 0 0/ 0/ (+54) +0.0 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 0/ +1/ +1 (+54) +0.2 /0 0/ +1/ +1	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	MTOW(1000 KG) codes V1min/VR/V2 (kt)	*VMC *LIMITATION	Tref (OAT) = 44 C Tmax (OAT) = 54 C	Min acc height 464 FT Max acc height 1917 FT	Min QNH alt 953 FT Max QNH alt 2406 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU				Min V1/VR/V2 = 109/114/117 CHECK VMU LIMITATION Correct. V1/VR/V2 = 1.0 KT/1000 KG

For flexible temperature < TVMC (54 °C), ΔTflex = ... -2 °C
Intermediate flex temperature... = 48 °C
Associated speeds,
V1 = 149 kt - 10 = 139 kt
VR = 150 kt - 1 = 149 kt
V2 = 155 kt - 1 = 154 kt
Check that V2 is higher than the VMU (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*).
Apply QNH correction



A3XXXXX | ENGINES | AIRPORT NAME | 15L | Version A3XXXXXX | Date **V20

QNH 1013.25 HPA
Air cond. AC OFF
Anti-icing AI OFF
All reversers operating
No reversers on dry runway

Elevation 489 FT | TORA 3000 M
Isa temp 14 C | TODA 3000 M
Rwy slope .08 % | ASDA 3000 M

4 obstacles

DRY

OAT °C	CONF 1 + F					CONF 2				
	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT	TAILWIND - 10.0 KT	TAILWIND - 5.0 KT	WIND .0 KT	HEADWIND + 10.0 KT	HEADWIND + 20.0 KT
	INFLUENCE OF RUNWAY CONDITION									
WET	-2.0/ -5 -16/ 1/ -1 (+54) +2.0/ -5 -16/0/0	-1.5/ -4 -15/ -2/ -2 (+54) -1.5 -4 -15/ 0/ 0	-1.2/ -3 -13/ -4/ -4 (+54) -1.3 -3 -13/ 0/ 0	-1.1/ -2 -11/ -3/ -3 (+54) -1.1 / -2 -11/ 0/ 0	1.8/ -2 -10/ -2 /2 (+54) -0.8 -2 -10/ 0/ 0	-0.9/ -4 -14/ 0 / (+54) -0.9/ -4 -14/ 0/ 0	-1.5/ -4 -13/ 0/ (+54) -1.5/ -4 -13/ 0/ 0	-1.2/ -3 -12/ -2/ -2 (+54) -1.3/ -3 -11/ 0/ 0	-1.2/ -2 -10/ -1/ -1 (+54) -1.2 /-2 -10/ 0/ 0	-1.5/ -3 -4/ -2/ -2 (+54) -1.5 -3 -4/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE									
-10.0	-0.8/ -2 0/ 0/ (+54) -0.8/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.3/ -3 -1/ 0/ (+54) -1.3/ -3 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-0.7/ -2 0/ 0/ (+54) -0.7/ -2 0/ 0/	-1.2/ -3 0/ 0/ (+54) -1.2/ -3 0/ 0/	-0.8/ -2 -1/ -1/ -2 (+54) -0.8/ -2 -1/ 0/	-0.8 -2 -1/ 0/ (+54) -0.8/ -2 -1/ 0/	-0.8 -1 -1/ -1/ -1 (+54) -0.8/ -2 -1/ 0/
+10.0	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	0.0/ 0 0/ 0/ (+54) +0.0 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 0/ +1/ +1 (+54) +0.2 /0 0/ +1/ +1	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 0/ 0/ (+54) +0.2 /0 0/ 0/	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1	+0.2/ 0 +1/ +1/ +1 (+54) +0.2 /0 +1/ +1/ +1

LABEL FOR INFLUENCE
DW (1000 KG) DTFLEX
DV1-DVR-DV2 (KT)
(TVMC OAT C)
DW (1000 KG) DTFLEX
DV1-DVR-DV2 (KT)

MTOW(1000 KG) codes
V1min/VR/V2 (kt)

*VMC
*LIMITATION

Tref (OAT) = 44 C
Tmax (OAT) = 54 C

Min acc height 464 FT
Max acc height 1917 FT

Min QNH alt 953 FT
Max QNH alt 2406 FT

LIMITATION CODES:
1=1st segment 2=2nd segment 3=runway length 4=obstacles
5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU

Min V1/VR/V2 = 109/114/117
CHECK VMU LIMITATION
Correct. V1/VR/V2 = 1.0 KT/1000 KG

For flexible temperature < TVMC (54 °C), ΔTflex =.. 0 °C
Flexible temperature..= 48 °C
No speed correction is required for QNH and bleed influence.
Takeoff speeds are,
V1 = 139 kt
VR = 149 kt
V2 = 154 kt
Check that OAT/TREF < flex temperature ≤ TMAXFLEX.
TMAXFLEX is specified in LIM-70.

	Takeoff Configuration : 2			
	Tflex	V1	VR	V2
Chart temperature	53	149	150	155
FCOM correction(s)	-3	0	0	0
Intermediate value	50	149	150	155
WET Correction	-2	-10	-1	-1
Intermediate value	48	139	149	154
QNH Correction	0	0	0	0
Final value	48	139	149	154

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FLEXIBLE TAKEOFF NOT POSSIBLE

FLEXIBLE TAKEOFF NOT POSSIBLE

Ident.: PER-TOF-TOC-14-20-00001726.0001001 / 30 SEP 13
Applicable to: ALL

In some cases when the actual takeoff weight is lower than the maximum permissible takeoff weight, but the flexible temperature is lower than TREF or OAT , flexible takeoff is not possible. It is mandatory to use TOGA thrust.

For speed determination:
- You can retain the speeds that have been calculated for the maximum permissible takeoff weight; OR
- You can retain the speeds associated with the actual takeoff weight provided they are all lower than the speeds calculated for the maximum permissible takeoff weight.

Intentionally left blank

FLEXIBLE TAKEOFF POSSIBLE BUT NOT USED

FLEXIBLE TAKEOFF POSSIBLE BUT NOT USED

Ident.: PER-TOF-TOC-14-25-00015228.0001001 / 30 SEP 13
Applicable to: ALL

If the flexible takeoff is possible, but the flight crew elects to perform the takeoff with TOGA thrust, for speed determination:

- You can retain the speeds that have been calculated for the maximum permissible takeoff weight; OR
- You can retain the speeds associated with the actual takeoff weight provided they are all lower than the speeds calculated for the maximum permissible takeoff weight.

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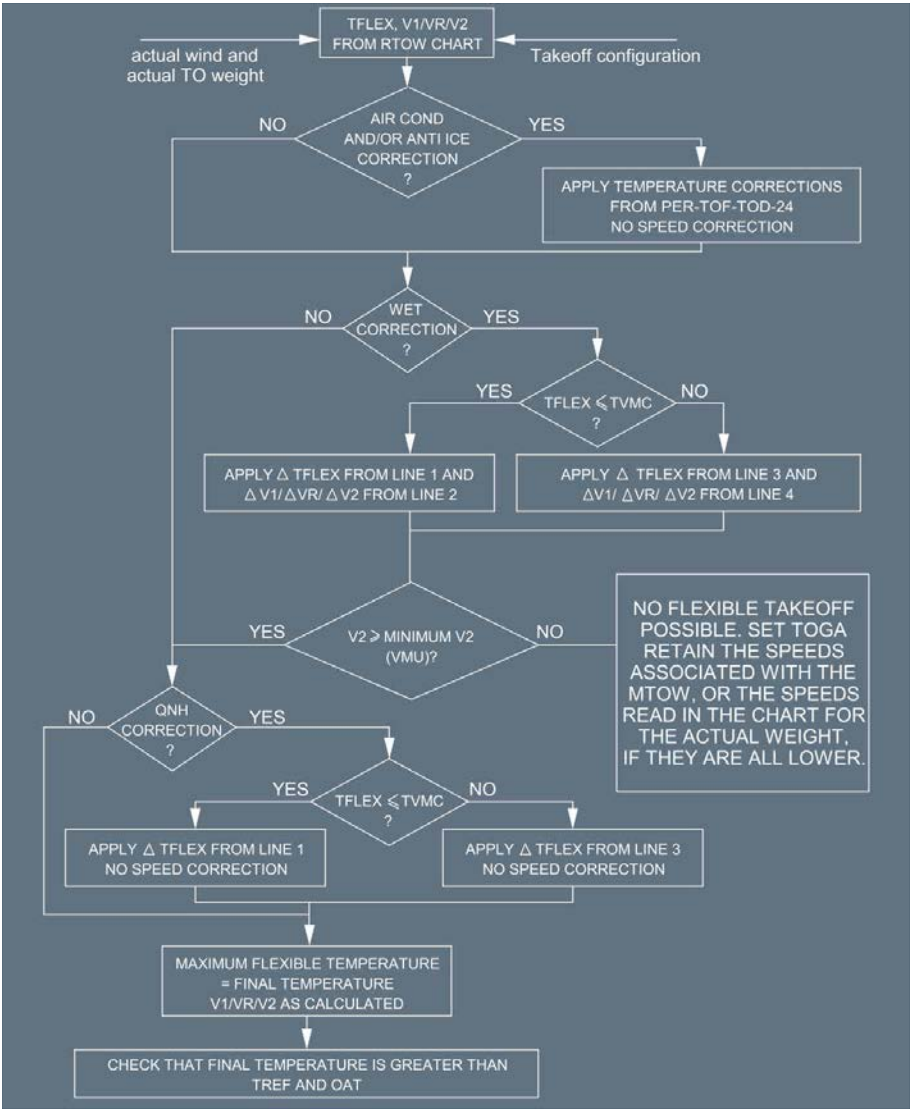
SUMMARY

SUMMARY

Ident.: PER-TOF-TOC-14-30-00006034.0001001 / 24 MAR 11
Applicable to: ALL

The flow diagram gives the different steps to follow.

TAKEOFF CHARTS - FLEXIBLE TAKEOFF (TEMPERATURE ENTRY)



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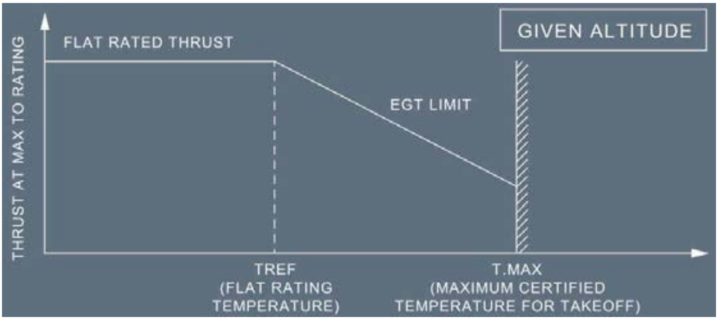
TAKEOFF PERFORMANCE

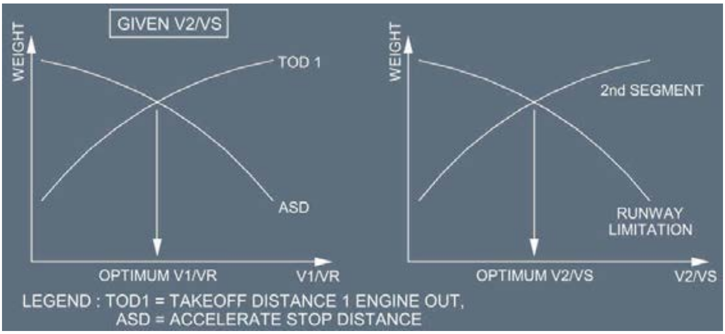
TAKEOFF PERFORMANCE

Ident.: PER-TOF-TOC-16-10-00001727.0001001 / 23 JUN 15
Applicable to: ALL

Takeoff optimization is calculated for a given runway and its obstacles and for given conditions of flap setting, temperature, wind and QNH. The calculation produces a maximum permissible takeoff weight (or a maximum takeoff temperature for an actual weight).
The takeoff thrust produced by the engine varies as follows :



The optimization process calculates the speeds which will produce the maximum takeoff weight. To do so, it takes into account the different takeoff limitations such as TOD , ASD , TOR, second segment..., as shown on the charts below.



On a typical runway, the performance of a twin engine aircraft, is generally limited by the one engine out operation at takeoff. The optimum V2 /VS and optimum V1 /VR are consequently unique.

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TAKEOFF CHART DESCRIPTION

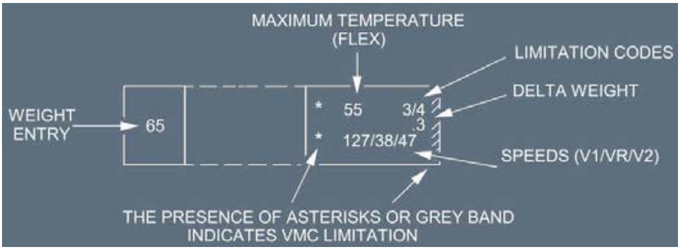
GENERAL

Ident.: PER-TOF-TOC-16-20-00001728.0003001 / 28 FEB 11
Applicable to: ALL

The takeoff chart (RTOW : Regulatory Takeoff Weight) is calculated for a specific aircraft version and for a particular runway specified at the top of the chart. The top of the chart also gives some information about the runway and lists the calculation assumptions.

The chart is given for 2 different configurations and 4 wind values per configuration. This allows the crew to select the configuration that gives either :
- the highest permissible takeoff weight, or, for a given weight,
- the highest flexible temperature.

If different configurations give equivalent performance, the crew should select the configuration associated with the lowest takeoff speeds.
The left column of the chart contains weight entry. For each weight entry (and for a given configuration and wind), the chart provides the following information :



Note: *The takeoff weight is the sum of the weight entry and the delta weight.*

The available limitation codes are :
- First segment : 1
- Second segment : 2
- Runway length : 3
- Obstacles : 4
- Tire speed : 5
- Brake energy : 6
- Maximum computation weight : 7
- Final takeoff : 8
- VMU : 9

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Ident.: PER-TOF-TOC-16-20-00001729.0002001 / 16 MAR 11
Applicable to: ALL

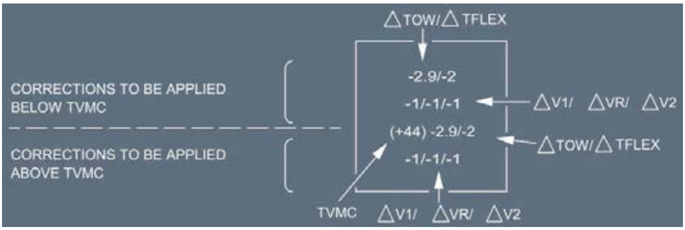
Each takeoff chart is computed for a given set of conditions (air conditioning, QNH, anti ice...) specified at the top of the chart. If the actual takeoff conditions are different, the crew must apply corrections.

Two types of corrections are available :
- Conservative corrections (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*) (to be used when not provided on the chart).
- Corrections (less restrictive) listed on the chart, to be applied as explained below.

DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART

Ident.: PER-TOF-TOC-16-20-00006633.0001001 / 08 JUL 15
Applicable to: ALL

The corrections are presented on 4 lines :



TVMC is a temperature value given per column. This is a fictitious value that indicates the temperature above which the speeds are close to a VMCG /VMCA limitation or are VMCG /VMCA limited.

Note: The lower two lines may be shaded on certain chart formats.

MINIMUM SPEED

Ident.: PER-TOF-TOC-16-20-00006634.0001001 / 08 JUL 15
Applicable to: ALL

Minimum V1 /VR /V2 due to VMCG /VMCA are provided on the bottom right side of the takeoff chart. They are only applicable in case of speed corrections.
These speeds are conservative. They may be slightly higher than V1 /VR /V2 displayed on the takeoff chart.

ADDITIONAL INFORMATION

ONE ENGINE OUT CLIMB PROCEDURE

Ident.: PER-TOF-TOC-16-30-00001730.0001001 / 10 DEC 09
Applicable to: ALL

The performance given in the chart is consistent with the flight path specified for the aircraft with one engine out and takes into account significant obstacles.
When the procedure to be followed is not the standard instrument departure, the chart describes a specific procedure (EOSID).
When the specified procedure requires a turn, except if otherwise stated on the RTOW chart, the turn should be performed with a maximum bank of 15 ° until the aircraft reaches 1 500 ft or until green dot.
The acceleration height (or altitude) ensures that the net flight path clears the highest obstacle by at least 35 ft when accelerating in level flight to green dot speed after an engine failure, in the most adverse conditions.

TAKEOFF ON A WET RUNWAY

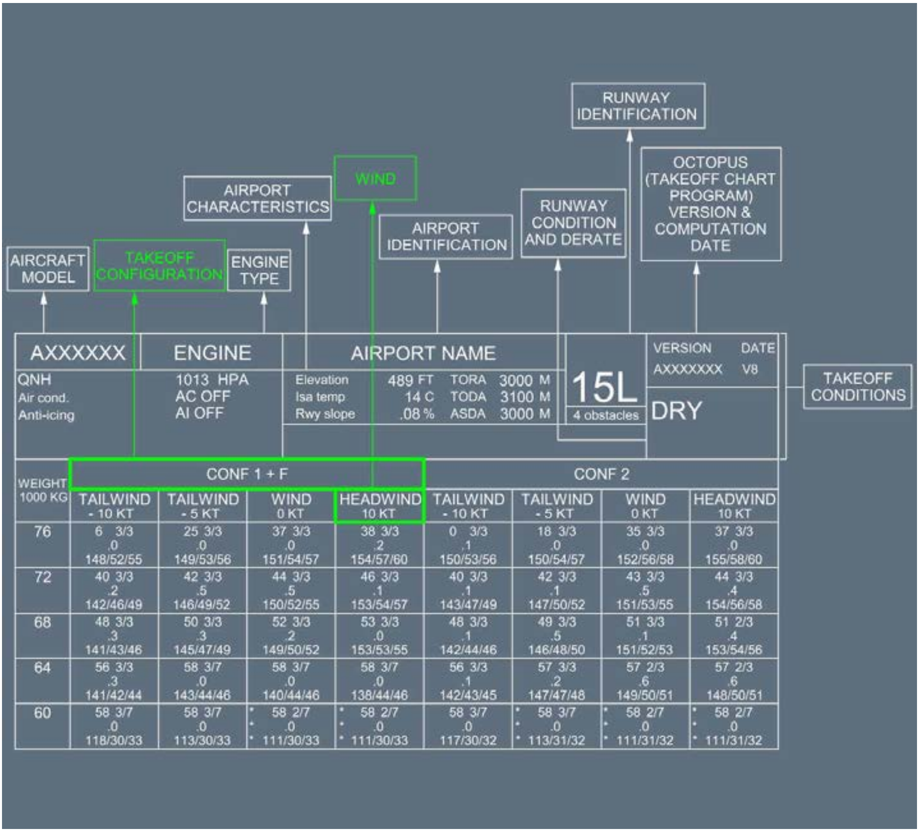
Ident.: PER-TOF-TOC-16-30-00001731.0002001 / 10 DEC 09
Applicable to: ALL

Takeoff charts computed for wet runway with a 15 ft screen height and/or use of reverse thrust may produce, in some conditions, a maximum takeoff weight (or flexible temperature) higher than that obtained for a dry runway. It is thus mandatory to compare both charts (dry and wet) and retain the lower of the two weights (or flexible temperature) and the associated speeds determined for a wet runway.

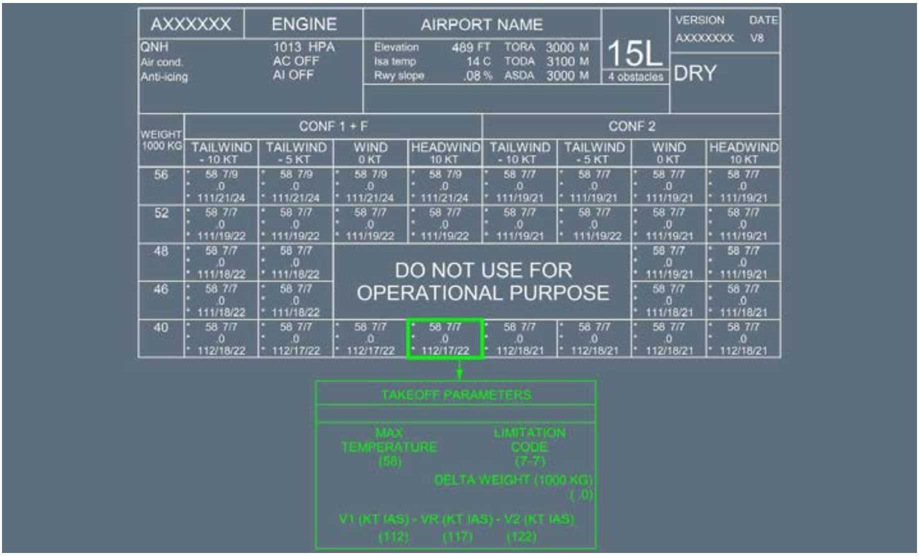
<u>Note:</u> *The crew need not compare the charts if the top of the wet runway chart specifies “DRY CHECK”. (The comparison has already been inserted in the WET runway calculation).*

RTOW CHARTS - COMPLEMENTARY INFORMATION

Ident.: PER-TOF-TOC-16-30-00001732.0002001 / 10 DEC 09
Applicable to: ALL



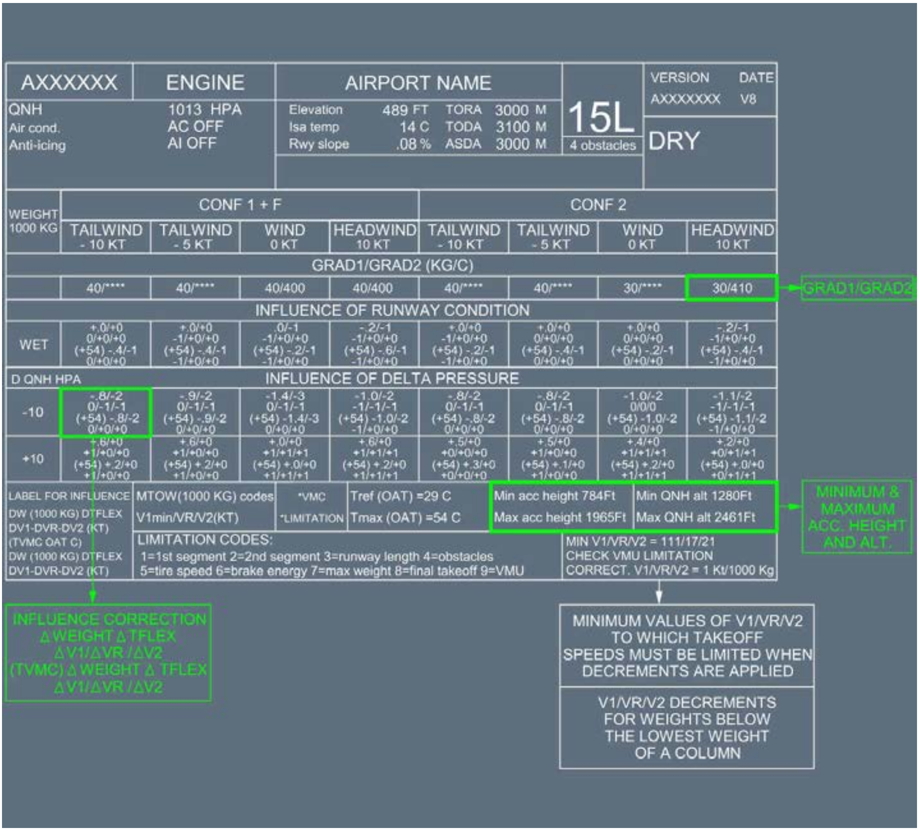
WEIGHT 1000 KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
76	6 3/3 .0 148/52/55	25 3/3 .0 149/53/56	37 3/3 .0 151/54/57	38 3/3 .2 154/57/60	0 3/3 .1 150/53/56	18 3/3 .0 150/54/57	35 3/3 .0 152/56/58	37 3/3 .0 155/58/60
72	40 3/3 .2 142/46/49	42 3/3 .5 146/49/52	44 3/3 .5 150/52/55	46 3/3 .1 153/54/57	40 3/3 .1 143/47/49	42 3/3 .1 147/50/52	43 3/3 .5 151/53/55	44 3/3 .4 154/56/58
68	48 3/3 .3 141/43/46	50 3/3 .3 145/47/49	52 3/3 .2 149/50/52	53 3/3 .0 153/53/55	48 3/3 .1 142/44/46	49 3/3 .5 146/48/50	51 3/3 .1 151/52/53	51 2/3 .4 153/54/56
64	56 3/3 .3 141/42/44	58 3/7 .0 143/44/46	58 3/7 .0 140/44/46	58 3/7 .0 138/44/46	56 3/3 .1 142/43/45	57 3/3 .2 147/47/48	57 2/3 .6 149/50/51	57 2/3 .6 148/50/51
60	58 3/7 .0 118/30/33	58 3/7 .0 113/30/33	* 58 2/7 * .0 * 111/30/33	* 58 2/7 * .0 * 111/30/33	58 3/7 .0 117/30/32	* 58 3/7 * .0 * 113/31/32	* 58 2/7 * .0 * 111/31/32	* 58 2/7 * .0 * 111/31/32



AXXXXXX	ENGINE	AIRPORT NAME	15L	VERSION AXXXXXXX	DATE V8
QNH Air cond. Anti-icing	1013 HPA AC OFF AI OFF	Elevation 489 FT, TORA 3000 M Isa temp 14 C, TODA 3100 M Rwy slope .08 %, ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000 KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
56	58 7/9 .0 111/21/24	58 7/9 .0 111/21/24	58 7/9 .0 111/21/24	58 7/9 .0 111/21/24	58 7/7 .0 111/19/21	58 7/7 .0 111/19/21	58 7/7 .0 111/19/21	58 7/7 .0 111/19/21
52	58 7/7 .0 111/19/22	58 7/7 .0 111/19/22	58 7/7 .0 111/19/22	58 7/7 .0 111/19/22	58 7/7 .0 111/19/21	58 7/7 .0 111/19/22	58 7/7 .0 111/19/21	58 7/7 .0 111/19/21
48	58 7/7 .0 111/18/22	58 7/7 .0 111/18/22	DO NOT USE FOR OPERATIONAL PURPOSE				58 7/7 .0 111/19/21	58 7/7 .0 111/19/21
46	58 7/7 .0 111/18/22	58 7/7 .0 111/18/22					58 7/7 .0 111/18/21	58 7/7 .0 111/18/21
40	58 7/7 .0 112/18/22	58 7/7 .0 112/17/22	58 7/7 .0 112/17/22	58 7/7 .0 112/17/22	58 7/7 .0 112/18/21	58 7/7 .0 112/18/21	58 7/7 .0 112/18/21	58 7/7 .0 112/18/21

TAKEOFF CHARTS - GENERAL (WEIGHT ENTRY)



RTOW EXAMPLE

Ident.: PER-TOF-TOC-16-30-00014719.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION DATE AXXXXXXX * *20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT Isa temp 15 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M 4 obstacles	DRY

WEIGHT 1000KG	CONF 1 + F TAILWIND - 10 KT	CONF 1 + F TAILWIND - 5 KT	CONF 1 + F WIND 0 KT	CONF 1 + F HEADWIND 10 KT	CONF 2 TAILWIND - 10 KT	CONF 2 TAILWIND - 5 KT	CONF 2 WIND 0 KT	CONF 2 HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 148/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	* 69 7/9 * 0.0 * 114/32/33	* 69 7/9 * 0.0 * 114/32/33	* 69 7/9 * 0.0 * 114/32/33	* 69 7/9 * 4.0 * 141/41/44	* 69 7/9 * 0.0 * 112/26/29	* 69 7/9 * 0.0 * 112/26/29	* 69 7/9 * 0.0 * 112/26/29
56	* 69 7/9 * 0.0 * 114/27/29	* 69 7/9 * 0.0 * 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				* 69 7/9 * 0.0 * 112/21/24	* 69 7/9 * 0.0 * 112/21/24
52	* 69 7/9 * 0.0 * 114/22/24	* 69 7/9 * 0.0 * 114/22/24					* 69 7/7 * 0.0 * 112/19/22	* 69 7/7 * 0.0 * 112/19/22
48	* 69 7/7 * 0.0 * 115/20/22	* 69 7/7 * 0.0 * 115/20/22	* 69 7/7 * 0.0 * 115/20/22	* 69 7/7 * 0.0 * 115/20/22	* 69 7/7 * 0.0 * 113/18/22	* 69 7/7 * 0.0 * 113/18/22	* 69 7/7 * 0.0 * 113/18/22	* 69 7/7 * 0.0 * 113/18/22
GRAD1/GRAD2 (KG/C)								
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470
INFLUENCE OF RUNWAY CONDITION								
WET	-1.4/ -3 -11/ -1/ -1 (+69) -1.4/ -3 -11/ 0/ 0	-1.1/ -3 -10 /-1/ -1 (+69) -1.1/ -3 -10/ 0/ 0	-0.7/ -2 -9/ -2/ -2 (+69) -0.7/ -2 -9/ 0/ 0	-0.7/ -2 -8/ -2/ -2 (+69) -0.7/ -2 -8/ 0/ 0	-1.3/ -3 -10/ -2/ -2 (+69) -1.3/ -3 -10/ 0/ 0	-1.3/ -3 -9/ -4/ -4 (+69) -1.3/ -3 -9/ 0/ 0	-0.4/ -1 -7/ -2 /-2 (+69) -0.4/ -1 -7/ 0/ 0	-0.2/ -1 -5/ 0/ 0 (+69) -0.2/ -1 -5/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE							
-10.0	-0.8/ -2 0/ 0/ -1 (+61) -0.8/ -2 0/ 0/ 0	-1.2/ -3 0/ 0/ -1 (+61) -1.2/ -3 0/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 0/ 0/ 0 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0
+10.0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	0.0/ 0 0/ 0/ 0 (+69) 0.0/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 +1/ +1/ +1 (+69) +0.2/ 0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	OAT C DW CODES V1min/VR/V2 (kt)	* VMC * LIMITATION	Tref (OAT) = 44 C Tmax(OAT) = 54 C	Min acc height 515 FT Max acc height 1934 FT	Min QNH alt 1004 FT MaxQNH alt 2423 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU			Min V1/VR/V2 = 115/20/22 CHECK VMU LIMITATION Correct. V1/VR/V2 = 0.1 KT/1000 KG	

DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS

GENERAL

Ident.: PER-TOF-TOC-18-10-00001734.0002001 / 10 DEC 09
Applicable to: ALL

The takeoff chart is computed for a given runway under a set of conditions, which are :
- OAT
- Wind
- Configuration
- QNH, air conditioning, anti ice...

Two configurations are produced on the chart. This enables the crew to select that giving the highest permissible takeoff weight.
In case of equivalent performance, retain the configuration giving the lower takeoff speeds.

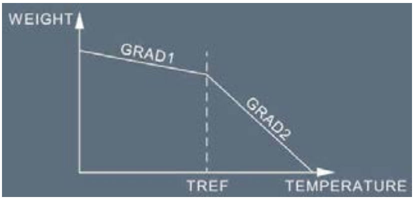
MTOW DETERMINATION

Ident.: PER-TOF-TOC-18-10-00013648.0002001 / 01 MAR 11
Applicable to: ALL

Enter the chart with the given configuration and actual wind column reading the temperature value. This temperature value stands for the OAT . Read the maximum takeoff weight corresponding to the actual OAT. Note that it is allowed to interpolate between two consecutive lines to obtain the maximum takeoff weight.
It is reminded that the takeoff weight is the sum of the weight entry and the delta weight. Similarly determine the takeoff speeds associated with the maximum takeoff weight.
In some cases, it may happen that the first temperature value (displayed for the highest weight entry) is higher than OAT. In this case, it is allowed to extrapolate the weight value to avoid unnecessary penalty. Use the Grad 1/Grad 2 gradients provided at the bottom of the corresponding column.

CORRECTION TO WEIGHT

Grad 1/Grad 2 are gradients provided for both sides of the flat rating temperature (TREF).
Grad 1 applies to temperatures below TREF and Grad 2 applies above TREF.
Read the lowest temperature of the column (corresponding to the highest weight entry).



- **If the lowest temperature and OAT are above TREF.**
  Obtain weight increment by multiplying Grad 2 by the difference in temperature between OAT and lowest temperature. Add this weight increment to the maximum takeoff weight calculated for the lowest temperature.
- **If the lowest temperature and OAT are below TREF.**
  Obtain weight increment by multiplying Grad 1 by the difference in temperature between OAT and lowest temperature. Add this weight increment to the maximum takeoff weight calculated for the lowest temperature.
- **If OAT is below TREF and lowest temperature is above TREF.**
  The weight increment is calculated in two steps. Step one is multiplying Grad 2 by temperature difference between lowest temperature and TREF. Step two is multiplying Grad 1 by temperature difference between TREF and OAT. Add results from step one and two to maximum takeoff weight calculated for lowest temperature.

<u>Note:</u> *Use the weight gradients only to extrapolate above the maximum weight shown in the RTOW chart. They are not valid for interpolation between two boxes, between filled boxes or between one filled and one blank box.*

Repeat the above process for the other available configuration and retain the configuration giving the highest takeoff weight.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Ident.: PER-TOF-TOC-18-10-00001736.0002001 / 11 FEB 11
Applicable to: ALL

Retain the maximum takeoff weight, associated configuration and speeds from above.
For conditions different from those of the chart, apply relevant corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS

Ident.: PER-TOF-TOC-18-10-00014720.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

Corrections are given for QNH ≠ 1 013 hPa, air conditioning ON, anti ice ON.

1. For the given wind and temperature conditions, determine the maximum takeoff weight.
2. Apply the published weight correction(s) to the maximum takeoff weight (for each correction) to determine the maximum permissible takeoff weight.
3. Read the speeds associated with the maximum permissible takeoff weight by entering the chart in the wind column with the retained weight value.

EXAMPLE A

DATA : OAT = 25 °C
Head Wind = 10 kt
Air conditioning ON
QNH = 1 013 hPa

Use the chart from (*Refer to PER-TOF-TOC-16-30 RTOW EXAMPLE*).

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT TORA 3000 M Isa temp 15 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

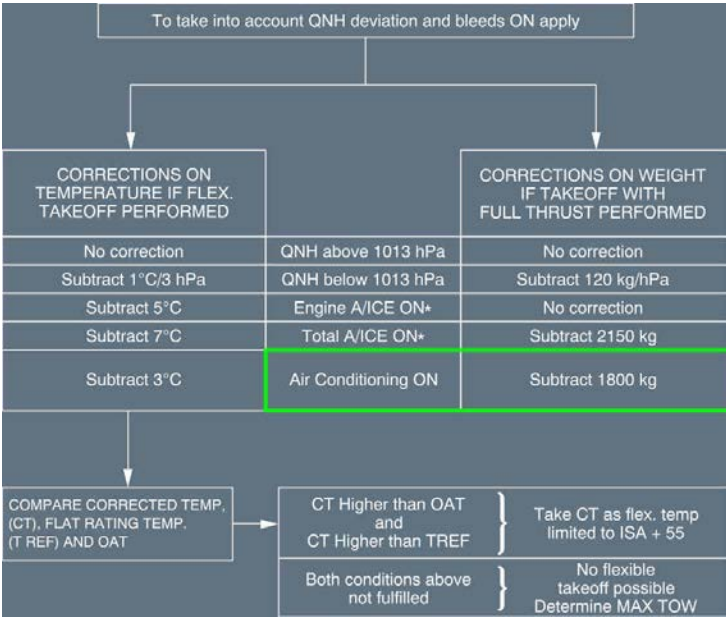
WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 148/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 4.0 141/41/44	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29
56	69 7/9 0.0 114/27/29	69 7/9 0.0 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				69 7/9 0.0 112/21/24	69 7/9 0.0 112/21/24
52	69 7/9 0.0 114/22/24	69 7/9 0.0 114/22/24					69 7/7 0.0 112/19/22	69 7/7 0.0 112/19/22
48	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22
GRAD1/GRAD2 (KG/C)								
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470

Enter the 10 kt head wind column CONF 1 + F, to read for 25 °C
The lowest temperature of the column is 45 °C, use Grad 1/Grad 2 to extrapolate the maximum takeoff weight.

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT TORA 3000 M Isa temp 15 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F TAILWIND - 10 KT	CONF 1 + F TAILWIND - 5 KT	CONF 1 + F WIND 0 KT	CONF 1 + F HEADWIND 10 KT	CONF 2 TAILWIND - 10 KT	CONF 2 TAILWIND - 5 KT	CONF 2 WIND 0 KT	CONF 2 HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 148/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	* 69 7/9 * 0.0 * 114/32/33	* 69 7/9 * 0.0 * 114/32/33	* 69 7/9 * 0.0 * 114/32/33	* 69 7/9 * 4.0 * 141/41/44	* 69 7/9 * 0.0 * 112/26/29	* 69 7/9 * 0.0 * 112/26/29	* 69 7/9 * 0.0 * 112/26/29
56	* 69 7/9 * 0.0 * 114/27/29	* 69 7/9 * 0.0 * 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				* 69 7/9 * 0.0 * 112/21/24	* 69 7/9 * 0.0 * 112/21/24
52	* 69 7/9 * 0.0 * 114/22/24	* 69 7/9 * 0.0 * 114/22/24					* 69 7/7 * 0.0 * 112/19/22	* 69 7/7 * 0.0 * 112/19/22
48	* 69 7/7 * 0.0 * 115/20/22	* 69 7/7 * 0.0 * 115/20/22	* 69 7/7 * 0.0 * 115/20/22	* 69 7/7 * 0.0 * 115/20/22	* 69 7/7 * 0.0 * 113/18/22	* 69 7/7 * 0.0 * 113/18/22	* 69 7/7 * 0.0 * 113/18/22	* 69 7/7 * 0.0 * 113/18/22
GRAD1/GRAD2 (KG/C)								
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470

TRef value is available on the bottom of this table.
Here, TRef is equal to 44 °C.
MAX TO weight (1 000 kg) air conditioning OFF = 80.6 + 0.46 × 1 + 0.06 × 19 = 82.2
Enter the 10 kt head wind column CONF 2, to read for 25 °C
The lowest temperature of the column is 46 °C, use Grad 1/Grad 2 to extrapolate the maximum takeoff weight.
MAX TO weight (1 000 kg) air conditioning OFF = 80.3 + 0.47 × 2 + 0.05 × 19 = 82.1
Retain CONF 1 + F as takeoff configuration.
Maximum TO weight (1 000 kg) air conditioning OFF.. 82.2
Use the QNH/BLEEDS correction page (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*):



Air conditioning correction.. -1.8
Maximum permissible TO weight (1 000 kg) air conditioning ON.. = 80.4
Determine takeoff speeds for 80.4 (1 000 kg) in the 10 kt head wind column CONF 1 + F (interpolate when necessary).

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT Isa temp 15 C Rwy slope .08 % TORA 3000 M TODA 3000 M ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 148/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 4.0 141/41/44	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29
56	69 7/9 0.0 114/27/29	69 7/9 0.0 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				69 7/9 0.0 112/21/24	69 7/9 0.0 112/21/24
52	69 7/9 0.0 114/22/24	69 7/9 0.0 114/22/24					69 7/7 0.0 112/19/22	69 7/7 0.0 112/19/22
48	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22
GRAD1/GRAD2 (KG/C)								
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470

V1 = 155 kt, VR = 156 kt, V2 = 158 kt

CORRECTIONS FOR WET OR CONTAMINATED RUNWAYS

Ident.: PER-TOF-TOC-18-10-00004071.0001001 / 10 DEC 09
Applicable to: ALL

(*Refer to PER-TOF-CTA-10 GENERAL*)

CORRECTIONS PRODUCED ON THE RTOW CHART

Ident.: PER-TOF-TOC-18-10-00014721.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”. (*Refer to PER-TOF-TOC-16-30 RTOW EXAMPLE*).
A description of this correction is given in PER-TOF-TOC-16-20 (*Refer to PER-TOF-TOC-16-20 DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART*). The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti ice. A maximum of three corrections can be produced on one chart.

To apply the corrections, proceed as follows:

1. Determine the maximum takeoff weight before correction for the given OAT and wind condition.
2. Apply the first correction:
   If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and ΔV1 /ΔVR /ΔV2 corrections from line 2.
   Else, (for OAT greater than TVMC), apply ΔW correction from line 3 and ΔV1 /ΔVR /ΔV2 corrections from line 4.
3. To combine a second (and third, as applicable) correction:
   If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and ΔV1 /ΔVR /ΔV2 corrections from line 2.
   Check that the resulting speeds are higher than the minimum speeds displayed on the RTOW chart and that V2 is higher than the VMU limited speed (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*).
   If OAT is higher than TVMC (line 3) or if the above speed check is not fulfilled, apply ΔW correction from line 3 and ΔV1 /ΔVR /ΔV2 corrections from line 4. No speed check is required.

<u>Note:</u>
- *QNH correction is given for ±10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.*
- *When using a takeoff chart with failure cases, it is not allowed to combine two failure cases.*
- *Corrections from the chart must be applied from top to bottom, i.e. in the RTOW (Refer to PER-TOF-TOC-16-30 RTOW EXAMPLE), apply the wet correction first.*
- *If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.*
- *No speed check is required for the first correction. However, if the first influence correction follows a conservative FCOM correction, a speed check is required.*

<u>EXAMPLE B</u>

DATA : CONF 1+F

OAT	=	45 °C
Head wind	=	10 kt
QNH	=	998 hPa
WET runway		

In this example, we will consider CONF 1+F as takeoff configuration. But same computation has to be done in CONF 2 and you must retain the best configuration.
Use the chart *Refer to PER-TOF-TOC-16-30 RTOW EXAMPLE*).

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT Isa temp 15 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M	4 obstacles	DRY

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 146/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 4.0 141/41/44	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29
56	69 7/9 0.0 114/27/29	69 7/9 0.0 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				69 7/9 0.0 112/21/24	69 7/9 0.0 112/21/24
52	69 7/9 0.0 114/22/24	69 7/9 0.0 114/22/24					69 7/7 0.0 112/19/22	69 7/7 0.0 112/19/22
48	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22
GRAD1/GRAD2 (KG/C)								
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470

- Enter the 10 kt head wind column CONF 1+F, to read for 45 °C max TO weight (1 000 kg)..80.6
- Read associated speeds as V1 = 155 kt, VR = 156 kt, V2 = 158 kt
- Apply WET correction

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX * / DATE *20
QNH 1013.25 HPA Air cond. AC OFF Anti–icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT / TORA 3000 M Isa temp 15 C / TODA 3000 M Rwy slope .08 % / ASDA 3000 M	4 obstacles	DRY

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND – 10 KT	TAILWIND – 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND – 10 KT	TAILWIND – 5 KT	WIND 0 KT	HEADWIND 10 KT
	INFLUENCE OF RUNWAY CONDITION							
WET	−1.4/ −3 −11/ −1/ −1 (+69) −1.4/ −3 −11/ 0/ 0	−1.1/ −3 −10 /−1/ −1 (+69) −1.1/ −3 −10/ 0/ 0	−0.7/ −2 −9/ −2/ −2 (+69) −0.7/ −2 −9/ 0/ 0	−0.7/ −2 −8/ −2/ −2 (+69) −0.7/ −2 −8/ 0/ 0	−1.3/ −3 −10/ −2/ −2 (+69) −1.3/ −3 −10/ 0/ 0	−1.3/ −3 −9/ −4/ −4 (+69) −1.3/ −3 −9/ 0/ 0	−0.4/ −1 −7/ −2 /−2 (+69) −0.4/ −1 −7/ 0/ 0	−0.2/ −1 −5/ 0/ 0 (+69) −0.2/ −1 −5/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE							
−10.0	−0.8/ −2 0/ 0/ −1 (+61) −0.8/ −2 0/ 0/ 0	−1.2/ −3 0/ 0/ −1 (+61) −1.2/ −3 0/ 0/ 0	−0.7/ −2 −1/ −1/ −1 (+61) −0.7/ −2 −1/ 0/ 0	−0.7/ −2 −1/ −1/ −1 (+61) −0.7/ −2 −1/ 0/ 0	−0.7/ −2 0/ 0/ 0 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0
+10.0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	0.0/ 0 0/ 0/ 0 (+69) 0.0/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 +1/ +1/ +1 (+69) +0.2/ 0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1–DVR–DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1–DVR–DV2 (KT)	OAT C DW CODES V1min/VR/V2 (kt)	* VMC * LIMITATION	Tref (OAT) = 44 C Tmax(OAT) = 54 C	Min acc height 515 FT Max acc height 1934 FT	Min QNH alt 1004 FT MaxQNH alt 2423 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take–off 9=VMU			Min V1/VR/V2 = 115/20/22 CHECK VMU LIMITATION Correct. V1/VR/V2 = 0.1 KT/1000 KG	

For OAT < TVMC (69 °C), ΔW =..– 0.7
Intermediate weight (1 000 kg)..= 79.9
Associated speeds,
V1 = 155 kt – 8 = 147 kt
VR = 156 kt – 2 = 154 kt
V2 = 158 kt – 2 = 156 kt
(No speed check required for first correction)

- Apply QNH correction

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT TORA 3000 M Isa temp 15 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
	INFLUENCE OF RUNWAY CONDITION							
WET	−1.4/ −3 −11/ −1/ −1 (+69) −1.4/ −3 −11/ 0/ 0	−1.1/ −3 −10 /−1/ −1 (+69) −1.1/ −3 −10/ 0/ 0	−0.7/ −2 −9/ −2/ −2 (+69) −0.7/ −2 −9/ 0/ 0	−0.7/ −2 −8/ −2/ −2 (+69) −0.7/ −2 −8/ 0/ 0	−1.3/ −3 −10/ −2/ −2 (+69) −1.3/ −3 −10/ 0/ 0	−1.3/ −3 −9/ −4/ −4 (+69) −1.3/ −3 −9/ 0/ 0	−0.4/ −1 −7/ −2 /−2 (+69) −0.4/ −1 −7/ 0/ 0	−0.2/ −1 −5/ 0/ 0 (+69) −0.2/ −1 −5/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE							
−10.0	−0.8/ −2 0/ 0/ −1 (+61) −0.8/ −2 0/ 0/ 0	−1.2/ −3 0/ 0/ −1 (+61) −1.2/ −3 0/ 0/ 0	−0.7/ −2 −1/ −1/ −1 (+61) −0.7/ −2 −1/ 0/ 0	−0.7/ −2 −1/ −1/ −1 (+61) −0.7/ −2 −1/ 0/ 0	−0.7/ −2 0/ 0/ 0 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0
+10.0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	0.0/ 0 0/ 0/ 0 (+69) 0.0/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 +1/ +1/ +1 (+69) +0.2/ 0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	OAT C DW CODES V1min/VR/V2 (kt)	* VMC * LIMITATION	Tref (OAT) = 44 C Tmax(OAT) = 54 C	Min acc height 515 FT Max acc height 1934 FT	Min QNH alt 1004 FT MaxQNH alt 2423 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU			Min V1/VR/V2 = 115/20/22 CHECK VMU LIMITATION Correct. V1/VR/V2 = 0.1 KT/1000 KG	

For OAT < TVMC (61 °C), ΔW = – 0.7 × 15/10 =..– 1
Maximum permissible takeoff weight (1 000 kg)..= 78.9
Associated speeds,
V1 = 147 kt – 1 × 15/10 = 145 kt
VR = 154 kt – 1 × 15/10 = 153 kt
V2 = 156 kt – 1 × 15/10 = 155 kt

- Check that the speeds are higher than minimum speeds from the chart and from VMU table (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*).
  It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4.

	Takeoff Configuration: 1 + F			
	TOW	**V1**	**VR**	**V2**
TOW (RTOW)	80.6	155	156	158
FCOM correction(s)				
Intermediate value	80.6	155	156	158
WET Correction	- 0.7	-8	-2	-2
Intermediate value	79.9	147	154	156
QNH Correction	- 1	-2	-1	-1
Final value	78.9	145	153	155

COMBINING CORRECTIONS FROM FCOM AND CHART

Ident.: PER-TOF-TOC-18-10-00014722.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

Proceed as follows:

1. Determine the maximum takeoff weight by entering the chart with selected configuration, OAT and wind.
2. Apply corrections from FCOM to determine an intermediate weight. Interpolate associated speeds for intermediate weight in the same column (same wind and configuration).
3. Apply corrections from RTOW chart as explained above.

EXAMPLE C

DATA : OAT = 25 °C
CONF 1+F
Head wind = 10 kt
Air conditioning ON
QNH = 998 hPa
WET runway

In this example, we will consider CONF 1+F as takeoff configuration. But same computation has to be done in CONF 2 and you must retain the best configuration.

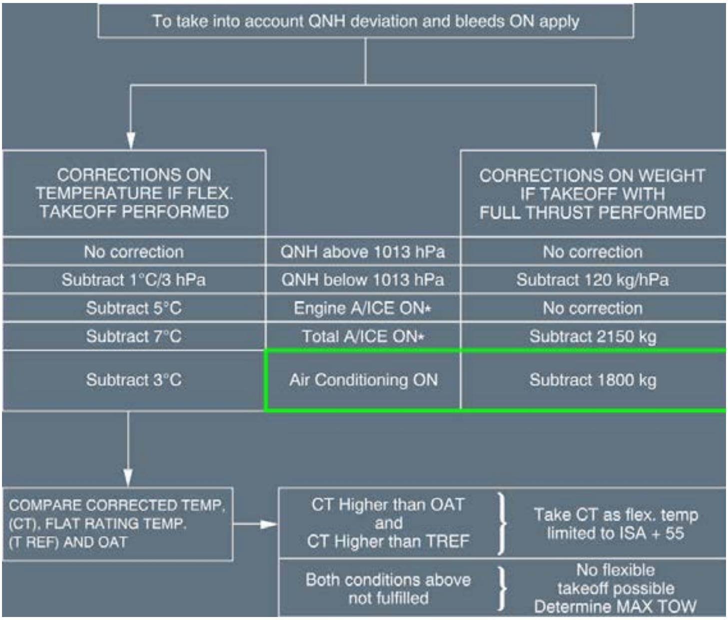
1. Use the chart (*Refer to PER-TOF-TOC-16-30 RTOW EXAMPLE*).

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT Isa temp 15 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M	4 obstacles	DRY

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 148/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 4.0 141/41/44	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29
56	69 7/9 0.0 114/27/29	69 7/9 0.0 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				69 7/9 0.0 112/21/24	69 7/9 0.0 112/21/24
52	69 7/9 0.0 114/22/24	69 7/9 0.0 114/22/24					69 7/7 0.0 112/19/22	69 7/7 0.0 112/19/22
48	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22
GRAD1/GRAD2 (KG/C)								
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470

Enter the 10 kt head wind column CONF 1 + F, to read for 25 °C
MAX TO weight (1 000 kg) air conditioning OFF = 80.6 + 0.46 × 1 + 0.06 × 19 = 82.2
In this example, Tref is equal to 44 °C, therefore the correction for 25 °C is 19 × GRAD1 correction (60kg) + 1 × GRAD2 correction(460kg).

2. First, apply the QNH/BLEEDS correction (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).



Max TO weight (1 000 kg) air conditioning OFF.. 82.2
Air conditioning correction.. -1.8
Intermediate weight.. = 80.4
Interpolate takeoff speeds for 80.4 (1 000 kg) in the 10 kt head wind column,
V1 = 155 kt, VR = 156 kt, V2 = 158 kt

A320XXX	ENGINES	AIRPORT NAME		15L	VERSION AXXXXXXX *	DATE *20
QNH	1013.25 HPA	Elevation 489 FT	TORA 3000 M	4 obstacles	DRY	
Air cond.	AC OFF	Isa temp 15 C	TODA 3000 M			
Anti-icing	AI OFF	Rwy slope .08 %	ASDA 3000 M			
All reversers operating						
No reversers on dry runway						

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 148/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	• 69 7/9 • 0.0 • 114/32/33	• 69 7/9 • 0.0 • 114/32/33	• 69 7/9 • 0.0 • 114/32/33	• 69 7/9 • 4.0 • 141/41/44	• 69 7/9 • 0.0 • 112/26/29	• 69 7/9 • 0.0 • 112/26/29	• 69 7/9 • 0.0 • 112/26/29
56	• 69 7/9 • 0.0 • 114/27/29	• 69 7/9 • 0.0 • 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				• 69 7/9 • 0.0 • 112/21/24	• 69 7/9 • 0.0 • 112/21/24
52	• 69 7/9 • 0.0 • 114/22/24	• 69 7/9 • 0.0 • 114/22/24					• 69 7/7 • 0.0 • 112/19/22	• 69 7/7 • 0.0 • 112/19/22
48	• 69 7/7 • 0.0 • 115/20/22	• 69 7/7 • 0.0 • 115/20/22	• 69 7/7 • 0.0 • 115/20/22	• 69 7/7 • 0.0 • 115/20/22	• 69 7/7 • 0.0 • 113/18/22	• 69 7/7 • 0.0 • 113/18/22	• 69 7/7 • 0.0 • 113/18/22	• 69 7/7 • 0.0 • 113/18/22
GRAD1/GRAD2 (KG/C)								
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470

3. Apply WET correction

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT TORA 3000 M Isa temp 15 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
	INFLUENCE OF RUNWAY CONDITION							
WET	−1.4/ −3 −11/ −1/ −1 (+69) −1.4/ −3 −11/ 0/ 0	−1.1/ −3 −10 /−1/ −1 (+69) −1.1/ −3 −10/ 0/ 0	−0.7/ −2 −9/ −2/ −2 (+69) −0.7/ −2 −9/ 0/ 0	−0.7/ −2 −8/ −2/ −2 (+69) −0.7/ −2 −8/ 0/ 0	−1.3/ −3 −10/ −2/ −2 (+69) −1.3/ −3 −10/ 0/ 0	−1.3/ −3 −9/ −4/ −4 (+69) −1.3/ −3 −9/ 0/ 0	−0.4/ −1 −7/ −2 /−2 (+69) −0.4/ −1 −7/ 0/ 0	−0.2/ −1 −5/ 0/ 0 (+69) −0.2/ −1 −5/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE							
−10.0	−0.8/ −2 0/ 0/ −1 (+61) −0.8/ −2 0/ 0/ 0	−1.2/ −3 0/ 0/ −1 (+61) −1.2/ −3 0/ 0/ 0	−0.7/ −2 −1/ −1/ −1 (+61) −0.7/ −2 −1/ 0/ 0	−0.7/ −2 −1/ −1/ −1 (+61) −0.7/ −2 −1/ 0/ 0	−0.7/ −2 0/ 0/ 0 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0
+10.0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	0.0/ 0 0/ 0/ 0 (+69) 0.0/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 +1/ +1/ +1 (+69) +0.2/ 0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1−DVR−DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1−DVR−DV2 (KT)	OAT C DW CODES V1min/VR/V2 (kt)	* VMC * LIMITATION	Tref (OAT) = 44 C Tmax(OAT) = 54 C	Min acc height 515 FT Max acc height 1934 FT	Min QNH alt 1004 FT MaxQNH alt 2423 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU			Min V1/VR/V2 = 115/20/22 CHECK VMU LIMITATION Correct. V1/VR/V2 = 0.1 KT/1000 KG	

For OAT < TVMC (69 °C), ΔW =.. -0.7
Intermediate weight.. = 79.7
Associated speeds,
V1 = 155 kt - 8 = 147 kt
VR = 156 kt - 2 = 154 kt
V2 = 158 kt - 2 = 156 kt
Apply QNH correction

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT TORA 3000 M Isa temp 15 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
	INFLUENCE OF RUNWAY CONDITION							
WET	-1.4/ -3 -11/ -1/ -1 (+69) -1.4/ -3 -11/ 0/ 0	-1.1/ -3 -10 /-1/ -1 (+69) -1.1/ -3 -10/ 0/ 0	-0.7/ -2 -9/ -2/ -2 (+69) -0.7/ -2 -9/ 0/ 0	-0.7/ -2 -8/ -2/ -2 (+69) -0.7/ -2 -8/ 0/ 0	-1.3/ -3 -10/ -2/ -2 (+69) -1.3/ -3 -10/ 0/ 0	-1.3/ -3 -9/ -4/ -4 (+69) -1.3/ -3 -9/ 0/ 0	-0.4/ -1 -7/ -2 /-2 (+69) -0.4/ -1 -7/ 0/ 0	-0.2/ -1 -5/ 0/ 0 (+69) -0.2/ -1 -5/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE							
-10.0	-0.8/ -2 0/ 0/ -1 (+61) -0.8/ -2 0/ 0/ 0	-1.2/ -3 0/ 0/ -1 (+61) -1.2/ -3 0/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 0/ 0/ 0 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0
+10.0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	0.0/ 0 0/ 0/ 0 (+69) 0.0/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 +1/ +1/ +1 (+69) +0.2/ 0 +1/ +1/ +1

LABEL FOR INFLUENCE
DW (1000 KG) DTFLEX
DV1-DVR-DV2 (KT)
(TVMC OAT C)
DW (1000 KG) DTFLEX
DV1-DVR-DV2 (KT)

OAT C DW CODES
V1min/VR/V2 (kt)

* VMC
* LIMITATION

Tref (OAT) = 44 C
Tmax(OAT) = 54 C

Min acc height 515 FT
Max acc height 1934 FT

Min QNH alt 1004 FT
MaxQNH alt 2423 FT

LIMITATION CODES:
1=1st segment 2=2nd segment 3=runway length 4=obstacles
5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU

Min V1/VR/V2 = 115/20/22
CHECK VMU LIMITATION
Correct. V1/VR/V2 = 0.1 KT/1000 KG

For OAT < TVMC (61 °C), ΔW = -0.7 × 15/10 =.. -1
Maximum permissible takeoff weight..= 78.7
Associated speed,
V1 = 147 kt - 1 × 15/10 = 145 kt
VR = 154 kt - 1 × 15/10 = 153 kt
V2 = 156 kt - 1 × 15/10 = 155 kt

Check that the speeds are higher than minimum speeds from the chart and from VMU table (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*).It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4.

Since the speed check is fulfilled:
MAX permissible takeoff weight = 78.7 (1 000 kg)
V1 = 145 kt, VR = 153 kt, V2 = 155 kt.

	Takeoff Configuration: 1 + F			
	TOW	**V1**	**VR**	**V2**
TOW (RTOW)	82.2			
FCOM correction(s)	-1.8			
Intermediate value	80.4	155	156	158

Continued on the following page

Continued from the previous page

	Takeoff Configuration: 1 + F			
	TOW	**V1**	**VR**	**V2**
WET Correction	-0.7	-9	-2	-2
Intermediate value	79.7	147	154	156
QNH Correction	-1	-2	-1	-1
Final value	78.7	145	153	155

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EXTRAPOLATION

EXTRAPOLATION

Ident.: PER-TOF-TOC-18-20-00001740.0002001 / 08 MAR 11
Applicable to: ALL

For OAT lower than the lowest temperature value of a wind column, it is possible to obtain a higher maximum permissible takeoff weight by using Grad 1/Grad 2 values. *Refer to PER-TOF-TOC-18-10 MTOW DETERMINATION*for more details.

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MAXIMUM STRUCTURAL TAKEOFF WEIGHT

MAXIMUM STRUCTURAL TAKEOFF WEIGHT

Ident.: PER-TOF-TOC-18-30-00001741.0001001 / 01 MAR 11
Applicable to: ALL

The maximum structural takeoff weight is a weight limitation depending on the aircraft. This limitation is provided in the Flight Manual and in the limitation chapter (*Refer to LIM-AG-WGHT Weight Limitations*).
Compare the maximum structural takeoff weight to the maximum permissible takeoff weight computed for given conditions and retain the lower of the two values.

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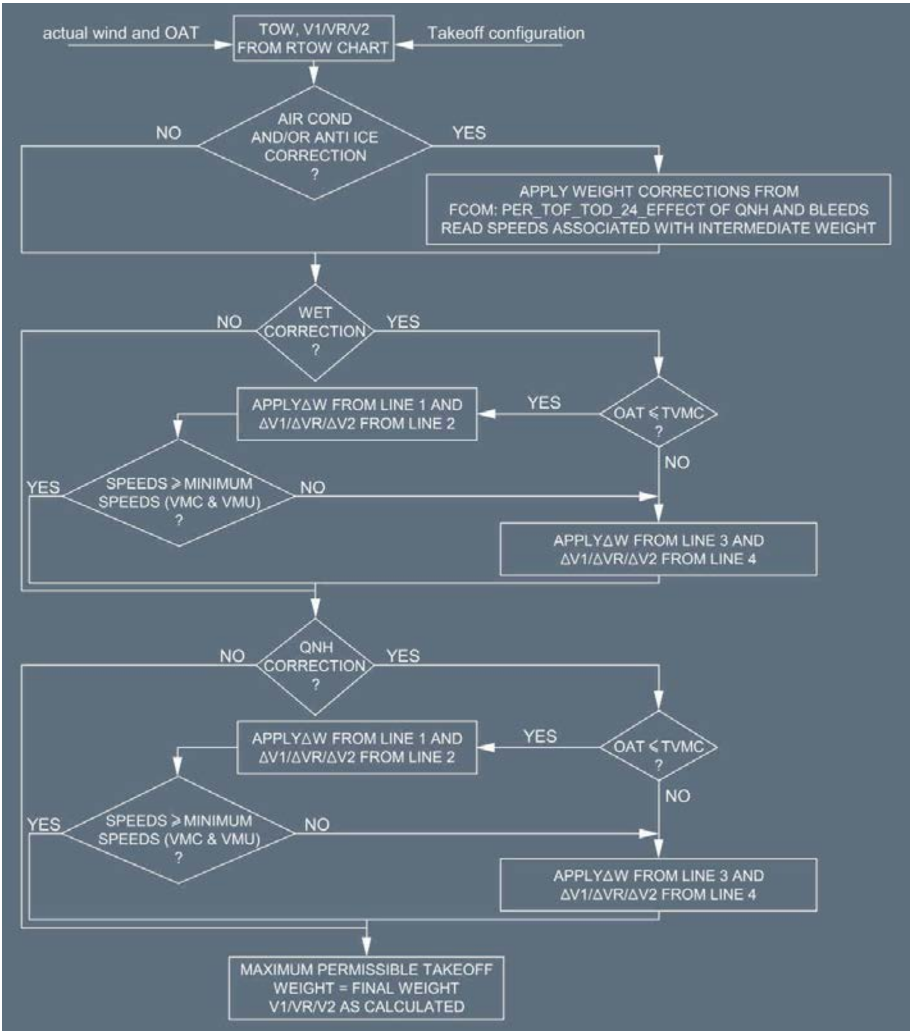
SUMMARY

SUMMARY

Ident.: PER-TOF-TOC-18-40-00006114.0001001 / 17 MAR 11
Applicable to: ALL

The following flow diagram gives the different steps to follow.



DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS

GENERAL

Ident.: PER-TOF-TOC-20-10-00013509.0002001 / 23 FEB 11
Applicable to: ALL

Before determining the flexible temperature, calculate the maximum permissible takeoff weight (see previous section) and ensure that the actual takeoff weight is lower than the determined maximum takeoff weight.

- For a given configuration and wind value, enter the RTOW chart with the actual takeoff weight to read the flexible temperature and associated speeds. It is reminded that the takeoff weight is the sum of the weight entry and the delta weight displayed in each box. It is allowed to interpolate between two consecutive rows and/or columns for weight and for wind values not displayed on the chart.
- Repeat this process for the other configuration available. Select that configuration giving the highest flexible temperature.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Ident.: PER-TOF-TOC-20-10-00013506.0002001 / 23 FEB 11
Applicable to: ALL

When the takeoff conditions are different from those provided on the chart, apply the associated corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS

Ident.: PER-TOF-TOC-20-10-00014723.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

Corrections are given for QNH ≠ 1 013 hPa, air conditioning ON, anti ice ON.

1. For a given takeoff weight and wind condition, read the flexible temperature. Retain the takeoff speeds associated with the actual weight.
2. Apply the published temperature correction. To combine two or more corrections, add the different corrections and apply to temperature value.
   (No speed corrections required).

EXAMPLE D

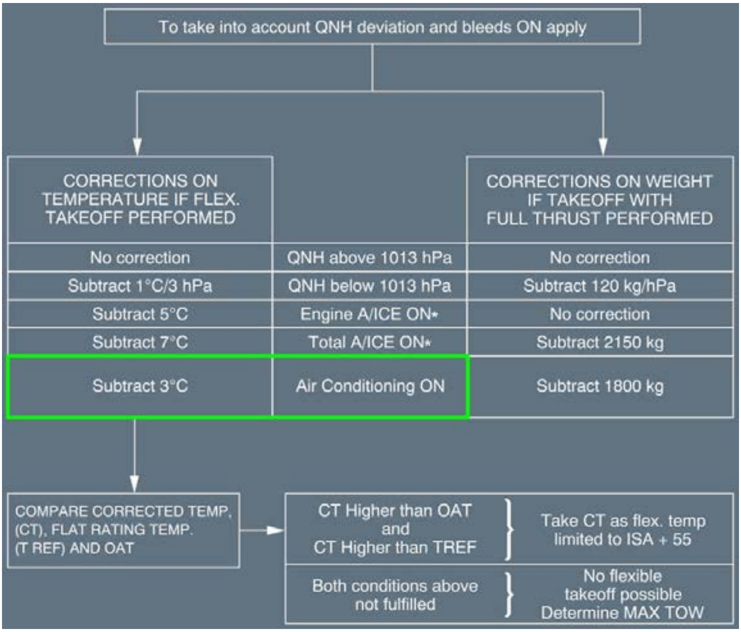
DATA :	Actual takeoff weight	=	68 000 kg
	Head wind	=	10 kt
	Air conditioning ON		
	QNH	=	1 013 hPa

Use the chart from *Refer to PER-TOF-TOC-16-30 RTOW EXAMPLE*. Determine the maximum permissible takeoff weight. The actual weight being lower than the maximum one, flexible takeoff is possible.

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT Isa temp 15 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M 4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 148/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 4.0 141/41/44	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29
56	69 7/9 0.0 114/27/29	69 7/9 0.0 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				69 7/9 0.0 112/21/24	69 7/9 0.0 112/21/24
52	69 7/9 0.0 114/22/24	69 7/9 0.0 114/22/24					69 7/7 0.0 112/19/22	69 7/7 0.0 112/19/22
48	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22
GRAD1/GRAD2 (KG/C)								
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470

Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 1 + F,
Flexible temperature.. 67 °C
Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 2,
Flexible temperature.. 66 °C
Retain CONF 1 + F for takeoff configuration.
Takeoff speeds are V1 = 153 kt, VR = 153 kt, V2 = 154 kt
Flexible temperature with air conditioning OFF.. 67 °C
Use the QNH/BLEEDS corrections (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*):



Air conditioning correction.. -3 °C
Flexible temperature..= 64 °C

CORRECTIONS FOR WET RUNWAY

Ident.: PER-TOF-TOC-20-10-00013280.0001001 / 18 FEB 11
Applicable to: ALL

Refer to PER-TOF-CTA-10 GENERAL

CORRECTIONS PRODUCED ON THE RTOW CHART

Ident.: PER-TOF-TOC-20-10-00014724.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.
A description of this correction is given on *Refer to PER-TOF-TOC-16-20 CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS*. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti-icing. A maximum of three corrections can be produced on one chart.

To apply the correction, proceed as follows:
1. Enter the chart with selected configuration, wind and actual takeoff weight to read the flexible temperature associated with this weight.
2. Apply the first correction:
   If the flexible temperature is less than or equal to TVMC (line 3), apply ΔTflex correction from line 1 and apply speed corrections (ΔV1 /ΔVR /ΔV2) from line 2.
   Else, (flexible temperature greater than TVMC), apply ΔTflex from line 3 and ΔV1 / ΔVR / ΔV2 corrections from line 4.
   Check V2 against VMU limitation (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*). If V2 is lower than V2 limited by VMU , flexible takeoff is not possible. Set TOGA thrust and retain the speeds associated with maximum permissible takeoff weight or the speeds read in the chart for the actual weight if they are all lower.
   No speed correction is required for QNH and bleeds influence (Not applicable to maximum takeoff weight determination).
3. To combine a second and/or a third correction, proceed as per point 2.
4. Check that the final flexible temperature is:
   - Higher than OAT and TREF
   - Limited to TMAX FLEX
     If the check is fulfilled, retain final flexible temperature as the one to be inserted in the MCDU
     If the check is not fulfilled, (final flexible temperature lower than OAT or TREF), no flexible takeoff is possible.
     Use TOGA thrust and retain speeds that have been calculated for the maximum permissible takeoff weight. (*Refer to PER-TOF-TOC-20-20 FLEXIBLE TAKEOFF NOT POSSIBLE*)

<u>Note:</u>
- *QNH correction is given for ± 10 hPa . It is allowed to extrapolate linearly for greater QNH deviation.*
- *Corrections from the chart must be applied from the top to bottom, i.e in the RTOW on Refer to PER-TOF-TOC-16-30 RTOW EXAMPLE, apply the wet influence first*

<u>Note:</u>
- *When the flexible temperature is higher than TVMC , it is allowed to limit the flexible temperature to TVMC and apply only corrections from lines 1 and 2.*

- *If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.*

EXAMPLE E

DATA : CONF 1+F
Actual takeoff weight = 68 000 kg
Head wind = 10 kt
QNH = 998 hPa
WET runway
Air conditioning OFF

In this example, we will consider CONF 1+F as takeoff configuration. But same computation has to be done in CONF 2 and you must retain the best configuration.
Use the chart from *Refer to PER-TOF-TOC-16-30 RTOW EXAMPLE*.
Determine the maximum permissible takeoff weight.
The actual weight being lower than the maximum one, flexible takeoff is possible.

A320XXX	ENGINES	AIRPORT NAME		15L	VERSION	DATE
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT Isa temp 15 C Rwy slope .08 %	TORA 3000 M TODA 3000 M ASDA 3000 M	4 obstacles	AXXXXXXX *	*20
					DRY	

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 148/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 4.0 141/41/44	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29
56	69 7/9 0.0 114/27/29	69 7/9 0.0 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				69 7/9 0.0 112/21/24	69 7/9 0.0 112/21/24
52	69 7/9 0.0 114/22/24	69 7/9 0.0 114/22/24					69 7/7 0.0 112/19/22	69 7/7 0.0 112/19/22
48	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22
GRAD1/GRAD2 (KG/C)	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470

Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 1+F,
Flexible temperature.. 67 °C

Takeoff speeds are V1 = 153 kt, VR = 153 kt, V2 = 154 kt
Apply WET correction

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT TORA 3000 M Isa temp 15 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F TAILWIND - 10 KT	CONF 1 + F TAILWIND - 5 KT	CONF 1 + F WIND 0 KT	CONF 1 + F HEADWIND 10 KT	CONF 2 TAILWIND - 10 KT	CONF 2 TAILWIND - 5 KT	CONF 2 WIND 0 KT	CONF 2 HEADWIND 10 KT
	INFLUENCE OF RUNWAY CONDITION							
WET	-1.4/ -3 -11/ -1/ -1 (+69) -1.4/ -3 -11/ 0/ 0	-1.1/ -3 -10 /-1/ -1 (+69) -1.1/ -3 -10/ 0/ 0	-0.7/ -2 -9/ -2/ -2 (+69) -0.7/ -2 -9/ 0/ 0	-0.7/ -2 -8/ -2/ -2 (+69) -0.7/ -2 -8/ 0/ 0	-1.3/ -3 -10/ -2/ -2 (+69) -1.3/ -3 -10/ 0/ 0	-1.3/ -3 -9/ -4/ -4 (+69) -1.3/ -3 -9/ 0/ 0	-0.4/ -1 -7/ -2 /-2 (+69) -0.4/ -1 -7/ 0/ 0	-0.2/ -1 -5/ 0/ 0 (+69) -0.2/ -1 -5/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE							
-10.0	-0.8/ -2 0/ 0/ -1 (+61) -0.8/ -2 0/ 0/ 0	-1.2/ -3 0/ 0/ -1 (+61) -1.2/ -3 0/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 0/ 0/ 0 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0
+10.0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	0.0/ 0 0/ 0/ 0 (+69) 0.0/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 +1/ +1/ +1 (+69) +0.2/ 0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	OAT C DW CODES V1min/VR/V2 (kt)	* VMC * LIMITATION	Tref (OAT) = 44 C Tmax(OAT) = 54 C	Min acc height 515 FT Max acc height 1934 FT	Min QNH alt 1004 FT MaxQNH alt 2423 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU			Min V1/VR/V2 = 115/20/22 CHECK VMU LIMITATION Correct. V1/VR/V2 = 0.1 KT/1000 KG	

For flexible temperature < TVMC (69 °C), ΔTflex =.. -2 °C
Intermediate flex temperature.. = 65 °C

Associated speeds,
V1 = 153 kt – 8 = 145 kt
VR = 153 kt –2 = 151 kt
V2 = 154 kt – 2 = 152 kt

Check V2 against VMU limitation (*Refer to PER-TOF-TOD-25-20 MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)*).It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4.
Apply QNH correction

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT · TORA 3000 M Isa temp 15 C · TODA 3000 M Rwy slope .08 % · ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
	INFLUENCE OF RUNWAY CONDITION							
WET	-1.4/ -3 -11/ -1/ -1 (+69) -1.4/ -3 -11/ 0/ 0	-1.1/ -3 -10 /-1/ -1 (+69) -1.1/ -3 -10/ 0/ 0	-0.7/ -2 -9/ -2/ -2 (+69) -0.7/ -2 -9/ 0/ 0	-0.7/ -2 -8/ -2/ -2 (+69) -0.7/ -2 -8/ 0/ 0	-1.3/ -3 -10/ -2/ -2 (+69) -1.3/ -3 -10/ 0/ 0	-1.3/ -3 -9/ -4/ -4 (+69) -1.3/ -3 -9/ 0/ 0	-0.4/ -1 -7/ -2 /-2 (+69) -0.4/ -1 -7/ 0/ 0	-0.2/ -1 -5/ 0/ 0 (+69) -0.2/ -1 -5/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE							
-10.0	-0.8/ -2 0/ 0/ -1 (+61) -0.8/ -2 0/ 0/ 0	-1.2/ -3 0/ 0/ -1 (+61) -1.2/ -3 0/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 0/ 0/ 0 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0
+10.0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	0.0/ 0 0/ 0/ 0 (+69) 0.0/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 +1/ +1/ +1 (+69) +0.2/ 0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	OAT C DW CODES V1min/VR/V2 (kt)	* VMC * LIMITATION	Tref (OAT) = 44 C Tmax(OAT) = 54 C	Min acc height 515 FT Max acc height 1934 FT	Min QNH alt 1004 FT MaxQNH alt 2423 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU			Min V1/VR/V2 = 115/20/22 CHECK VMU LIMITATION Correct. V1/VR/V2 = 0.1 KT/1000 KG	

For flex temperature ≥ TVMC (61 °C), ΔTflex = -2 x 15/10 =.. -3 °C
Flexible temperature..= 62 °C
No speed correction is required for QNH and bleed influence.
Takeoff speeds are V1 = 145 kt, VR = 151 kt, V2 = 152 kt
Check that OAT/TREF < flex temperature ≤ TMAXFLEX.
TMAXFLEX is specified in LIM-70.
For this example, if TMAXFLEX is equal to ISA + 45 °C (60 °C at airport elevation), Flex takeoff is not possible.

	Takeoff Configuration : 1 + F			
	Tflex	**V1**	**VR**	**V2**
Chart temperature	67	153	153	154
FCOM correction(s)				
Intermediate value	67	153	153	154
WET Correction	-2	-8	-2	-2
Intermediate value	65	145	151	152
QNH Correction	-3	0	0	0
Final value	62	145	151	152

COMBINING CORRECTIONS FROM FCOM AND CHART

Ident.: PER-TOF-TOC-20-10-00014725.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

1. Apply corrections from FCOM (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).
2. Apply corrections from the RTOW chart.
   Apply speed corrections except for QNH and bleed influences.

EXAMPLE F

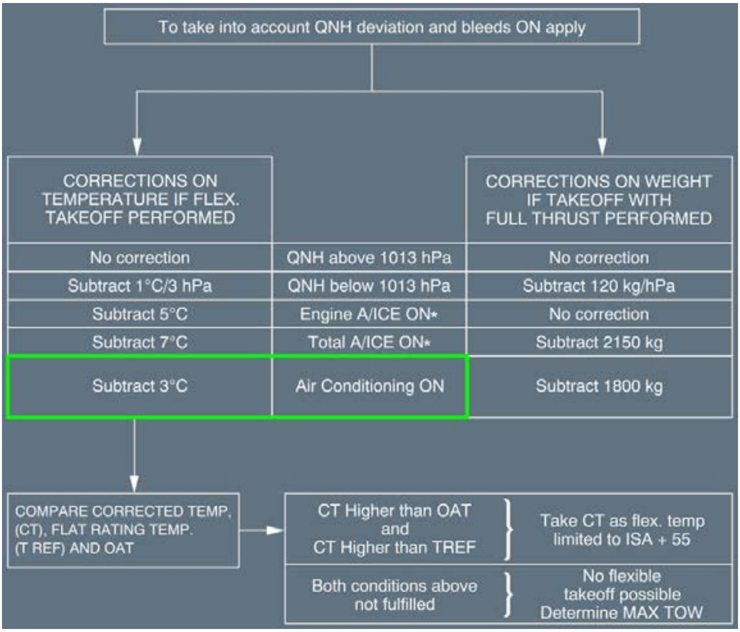
DATA : Actual takeoff weight = 68 000 kg
CONF 1+F
Head wind = 10 kt
Air conditioning ON
QNH = 998 hPa
WET runway

In this example, we will consider CONF 1+F as takeoff configuration. But same computation has to be done in CONF 2 and you must retain the best configuration.
Use the chart (*Refer to PER-TOF-TOC-16-30 RTOW EXAMPLE*).
Determine the maximum permissible takeoff weight (see example C). The actual weight being lower than the maximum one, flexible takeoff is possible.

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION DATE AXXXXXXX * *20
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT TORA 3000 M Isa temp 15 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
80	-18 4/6 0.0 155/56/58	9 4/6 0.0 154/57/59	37 4/6 0.0 153/55/57	45 4/6 0.6 155/56/58	-15 4/6 0.0 153/53/58	12 4/6 0.0 151/52/57	40 4/6 0.1 150/51/56	46 3/4 0.3 152/53/58
76	44 4/6 0.1 141/49/51	48 4/6 0.2 148/50/52	51 3/4 0.4 153/53/55	52 2/4 0.3 152/52/53	44 4/6 0.3 140/45/49	48 4/6 0.4 146/47/51	51 3/4 0.4 150/50/54	52 2/4 0.4 150/50/55
72	53 4/6 0.3 145/46/48	56 3/4 0.2 148/48/50	59 3/4 0.0 152/52/53	60 3/4 0.4 154/54/55	53 3/4 0.4 142/43/47	56 3/4 0.2 146/46/50	58 3/4 0.5 149/49/53	60 3/4 0.3 151/51/55
68	61 3/4 0.3 144/44/45	63 3/4 0.5 148/48/49	65 3/4 0.6 151/51/52	67 3/4 0.3 153/53/54	61 3/4 0.3 142/42/45	63 3/4 0.5 145/45/48	65 3/4 0.4 148/48/52	66 4/4 0.6 149/49/53
64	68 3/4 0.5 143/43/44	69 3/4 1.1 147/47/48	69 3/4 2.2 151/51/52	69 3/4 3.0 153/53/54	68 3/4 0.6 141/41/44	69 3/4 1.0 144/44/47	69 4/4 2.0 147/47/50	69 4/4 2.7 147/47/50
60	69 3/4 4.0 143/43/44	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 0.0 114/32/33	69 7/9 4.0 141/41/44	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29	69 7/9 0.0 112/26/29
56	69 7/9 0.0 114/27/29	69 7/9 0.0 114/27/29	DO NOT USE FOR OPERATIONAL PURPOSE				69 7/9 0.0 112/21/24	69 7/9 0.0 112/21/24
52	69 7/9 0.0 114/22/24	69 7/9 0.0 114/22/24					69 7/7 0.0 112/19/22	69 7/7 0.0 112/19/22
48	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 115/20/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22	69 7/7 0.0 113/18/22
	GRAD1/GRAD2 (KG/C)							
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470

- Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 1+F,
  Flexible temperature.. 67 °C
- Takeoff speeds are V1 = 153 kt, VR = 153 kt, V2 = 154 kt
- First, apply the correction from FCOM (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*).



Flexible temperature with air conditioning OFF... 67 °C
Air conditioning correction... -3 °C
Intermediate flexible temperature..= 64 °C
No speed correction.

- Apply WET correction

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH Air cond. Anti-icing All reversers operating No reversers on dry runway	1013.25 HPA AC OFF AI OFF	Elevation 489 FT TORA 3000 M Isa temp 15 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
	INFLUENCE OF RUNWAY CONDITION							
WET	−1.4/ −3 −11/ −1/ −1 (+69) −1.4/ −3 −11/ 0/ 0	−1.1/ −3 −10 /−1/ −1 (+69) −1.1/ −3 −10/ 0/ 0	−0.7/ −2 −9/ −2/ −2 (+69) −0.7/ −2 −9/ 0/ 0	−0.7/ −2 −8/ −2/ −2 (+69) −0.7/ −2 −8/ 0/ 0	−1.3/ −3 −10/ −2/ −2 (+69) −1.3/ −3 −10/ 0/ 0	−1.3/ −3 −9/ −4/ −4 (+69) −1.3/ −3 −9/ 0/ 0	−0.4/ −1 −7/ −2 /−2 (+69) −0.4/ −1 −7/ 0/ 0	−0.2/ −1 −5/ 0/ 0 (+69) −0.2/ −1 −5/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE							
−10.0	−0.8/ −2 0/ 0/ −1 (+61) −0.8/ −2 0/ 0/ 0	−1.2/ −3 0/ 0/ −1 (+61) −1.2/ −3 0/ 0/ 0	−0.7/ −2 −1/ −1/ −1 (+61) −0.7/ −2 −1/ 0/ 0	−0.7/ −2 −1/ −1/ −1 (+61) −0.7/ −2 −1/ 0/ 0	−0.7/ −2 0/ 0/ 0 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0	−0.7/ −2 0/ 0/ −1 (+61) −0.7/ −2 0/ 0/ 0
+10.0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	0.0/ 0 0/ 0/ 0 (+69) 0.0/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 +1/ +1/ +1 (+69) +0.2/ 0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	OAT C DW CODES V1min/VR/V2 (kt)	* VMC * LIMITATION	Tref (OAT) = 44 C Tmax(OAT) = 54 C	Min acc height 515 FT Max acc height 1934 FT	Min QNH alt 1004 FT MaxQNH alt 2423 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU			Min V1/VR/V2 = 115/20/22 CHECK VMU LIMITATION Correct. V1/VR/V2 = 0.1 KT/1000 KG	

For flexible temperature < TVMC (69 °C), ΔTflex =.. -2 °C
Intermediate flex temperature.. = 62 °C
Associated speeds,
V1 = 153 kt - 8 = 145 kt
VR = 153 kt - 2 = 151 kt
V2 = 154 kt - 2 = 152 kt
Check V2 against VMU limitation on FCOM *Refer to PER-TOF-TOD-25-10 SPEEDS LIMITED BY VMCG/VMCA*.
It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4.

- Apply QNH correction

A320XXX	ENGINES	AIRPORT NAME	15L	VERSION AXXXXXXX *	DATE *20
QNH 1013.25 HPA Air cond. AC OFF Anti-icing AI OFF All reversers operating No reversers on dry runway		Elevation 489 FT TORA 3000 M Isa temp 15 C TODA 3000 M Rwy slope .08 % ASDA 3000 M	4 obstacles	DRY	

WEIGHT 1000KG	CONF 1 + F				CONF 2			
	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT
	INFLUENCE OF RUNWAY CONDITION							
WET	-1.4/ -3 -11/ -1/ -1 (+69) -1.4/ -3 -11/ 0/ 0	-1.1/ -3 -10 /-1/ -1 (+69) -1.1/ -3 -10/ 0/ 0	-0.7/ -2 -9/ -2/ -2 (+69) -0.7/ -2 -9/ 0/ 0	-0.7/ -2 -8/ -2/ -2 (+69) -0.7/ -2 -8/ 0/ 0	-1.3/ -3 -10/ -2/ -2 (+69) -1.3/ -3 -10/ 0/ 0	-1.3/ -3 -9/ -4/ -4 (+69) -1.3/ -3 -9/ 0/ 0	-0.4/ -1 -7/ -2 /-2 (+69) -0.4/ -1 -7/ 0/ 0	-0.2/ -1 -5/ 0/ 0 (+69) -0.2/ -1 -5/ 0/ 0
D QNH HPA	INFLUENCE OF DELTA PRESSURE							
-10.0	-0.8/ -2 0/ 0/ -1 (+61) -0.8/ -2 0/ 0/ 0	-1.2/ -3 0/ 0/ -1 (+61) -1.2/ -3 0/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 -1/ -1/ -1 (+61) -0.7/ -2 -1/ 0/ 0	-0.7/ -2 0/ 0/ 0 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0	-0.7/ -2 0/ 0/ -1 (+61) -0.7/ -2 0/ 0/ 0
+10.0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	0.0/ 0 0/ 0/ 0 (+69) 0.0/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 0/ 0/ 0 (+69) +0.2/ 0 0/ 0/ 0	+0.2/ 0 +1/ +1/ +1 (+69) +0.2/ 0 +1/ +1/ +1

LABEL FOR INFLUENCE DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT) (TVMC OAT C) DW (1000 KG) DTFLEX DV1-DVR-DV2 (KT)	OAT C DW CODES V1min/VR/V2 (kt)	* VMC * LIMITATION	Tref (OAT) = 44 C Tmax(OAT) = 54 C	Min acc height 515 FT Max acc height 1934 FT	Min QNH alt 1004 FT MaxQNH alt 2423 FT
	LIMITATION CODES: 1=1st segment 2=2nd segment 3=runway length 4=obstacles 5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU			Min V1/VR/V2 = 115/20/22 CHECK VMU LIMITATION Correct. V1/VR/V2 = 0.1 KT/1000 KG	

For flexible temperature ≥ TVMC (61 °C), ΔTflex = -2 x 15/10 = ... -3 °C
Flexible temperature...= 59 °C
No speed correction is required for QNH and bleed influence.
Takeoff speeds are V1 = 145 kt, VR = 151 kt, V2 = 152 kt
Check that OAT/TREF < flex temperature ≤ TMAXFLEX
TMAXFLEX is specified in LIM-70.

	Takeoff Configuration : 1 + F			
	Tflex	**V1**	**VR**	**V2**
Chart temperature	67	153	153	154
FCOM correction(s)	-3	0	0	0
Intermediate value	64	153	153	154
WET Correction	-2	-8	-2	-2
Intermediate value	62	145	151	152
QNH Correction	-3	0	0	0
Final value	59	145	151	152

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FLEXIBLE TAKEOFF NOT POSSIBLE

FLEXIBLE TAKEOFF NOT POSSIBLE

Ident.: PER-TOF-TOC-20-20-00013281.0001001 / 18 FEB 11
Applicable to: ALL

In some cases when the actual takeoff weight is lower than the maximum permissible one but no flexible takeoff possible (that is flexible temperature lower than TREF or OAT):
- It is mandatory to use TOGA thrust
- You can retain the speeds that have been calculated for the maximum permissible takeoff weight; OR
- You can retain the speeds associated with the actual takeoff weight provided they are all lower than the speeds calculated for the maximum permissible takeoff weight.

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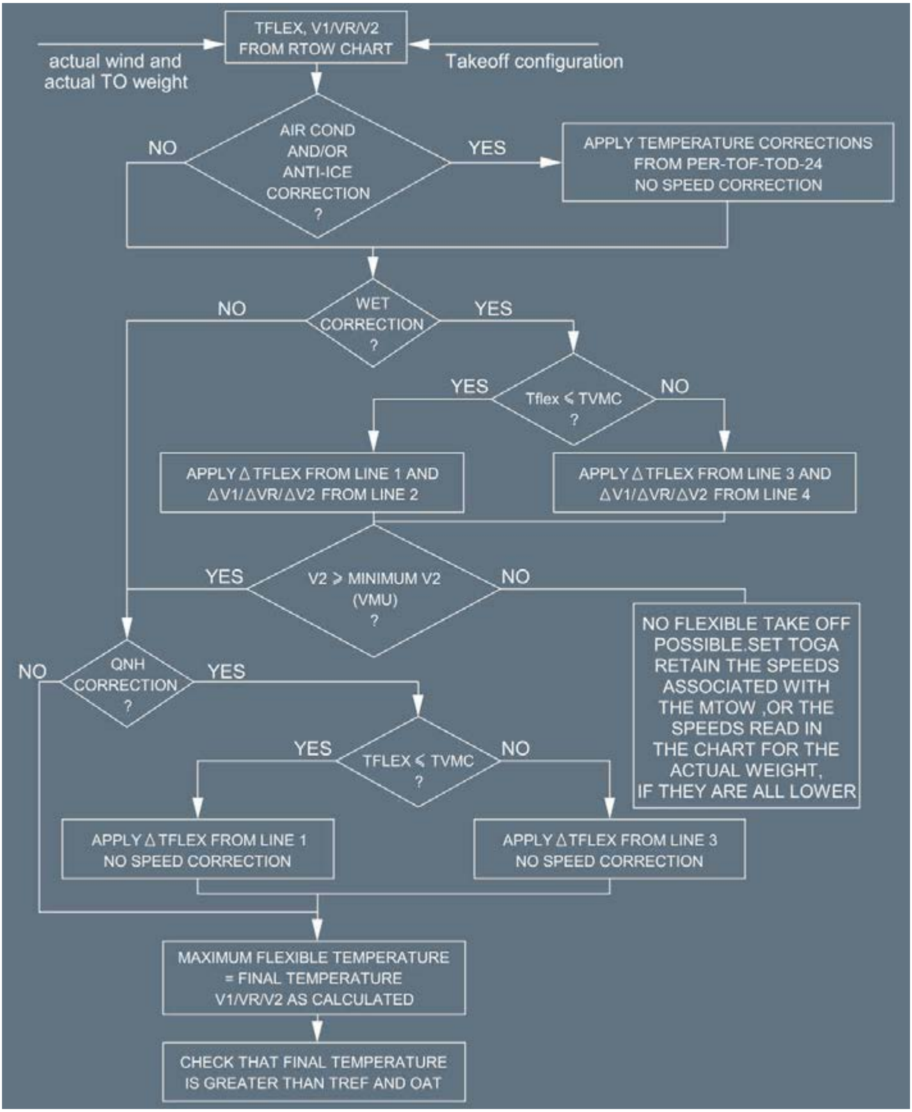
SUMMARY

SUMMARY

Ident.: PER-TOF-TOC-20-30-00013282.0001001 / 24 MAR 11
Applicable to: ALL

The flow diagram gives the different steps to follow


TFLEX, V1/VR/V2
FROM RTOW CHART
actual wind and
actual TO weight
Takeoff configuration
AIR COND
AND/OR
ANTI-ICE
CORRECTION
?
NO
YES
APPLY TEMPERATURE CORRECTIONS
FROM PER-TOF-TOD-24
NO SPEED CORRECTION
WET
CORRECTION
?
NO
YES
Tflex ≤ TVMC
?
YES
NO
APPLY Δ TFLEX FROM LINE 1 AND
ΔV1/ΔVR/ΔV2 FROM LINE 2
APPLY Δ TFLEX FROM LINE 3 AND
ΔV1/ΔVR/ΔV2 FROM LINE 4
V2 ≥ MINIMUM V2
(VMU)
?
YES
NO
NO FLEXIBLE TAKE OFF
POSSIBLE.SET TOGA
RETAIN THE SPEEDS
ASSOCIATED WITH
THE MTOW ,OR THE
SPEEDS READ IN
THE CHART FOR THE
ACTUAL WEIGHT,
IF THEY ARE ALL LOWER
QNH
CORRECTION
?
NO
YES
TFLEX ≤ TVMC
?
YES
NO
APPLY Δ TFLEX FROM LINE 1
NO SPEED CORRECTION
APPLY Δ TFLEX FROM LINE 3
NO SPEED CORRECTION
MAXIMUM FLEXIBLE TEMPERATURE
= FINAL TEMPERATURE
V1/VR/V2 AS CALCULATED
CHECK THAT FINAL TEMPERATURE
IS GREATER THAN TREF AND OAT

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EFFECT OF QNH AND BLEEDS (UP TO 9200 FT)

Ident.: PER-TOF-TOD-24-00012927.0054001 / 31 MAR 11
Applicable to: ALL

To take into account QNH deviation and/or bleeds ON apply

CORRECTIONS ON TEMPERATURE IF FLEX TAKEOFF PERFORMED		CORRECTIONS ON WEIGHT IF TAKEOFF WITH FULL THRUST IS PERFORMED
Add 1°C/40hPa until pressure altitude equals zero. No correction for pressure altitude below 0 ft.	QNH above 1013 hPa	Add 20kg/hPa until pressure altitude equals zero. No correction for pressure altitude below 0 ft.
Subtract 1°C/6hPa	QNH below 1013 hPa	Subtract 90 kg/hPa
Subtract 5°C	Engine A/ICE ON *	Subtract 250 kg
Subtract 11°C	Total A/ICE ON *	Subtract 750 kg
Subtract 5°C	Air Conditioning ON	Subtract 2200 kg

Compare corrected temp (CT), flat rating temp (T REF) and OAT →

CT higher than OAT and CT higher than TREF	Take CT as flex temp limited to ISA + 60
Either conditions above not fulfilled	No flexible takeoff possible determine MAX TOW

Note: - ** Corrections valid only for OAT < 10 °C*
- *For high altitude operation, REFER TO PER-TOF-TOD-24 EFFECT OF QNH FOR HIGH ALTITUDE OPERATIONS (if applicable).*

EXAMPLE

Ident.: PER-TOF-TOD-24-00014726.0001001 / 29 JUL 16
Applicable to: ALL

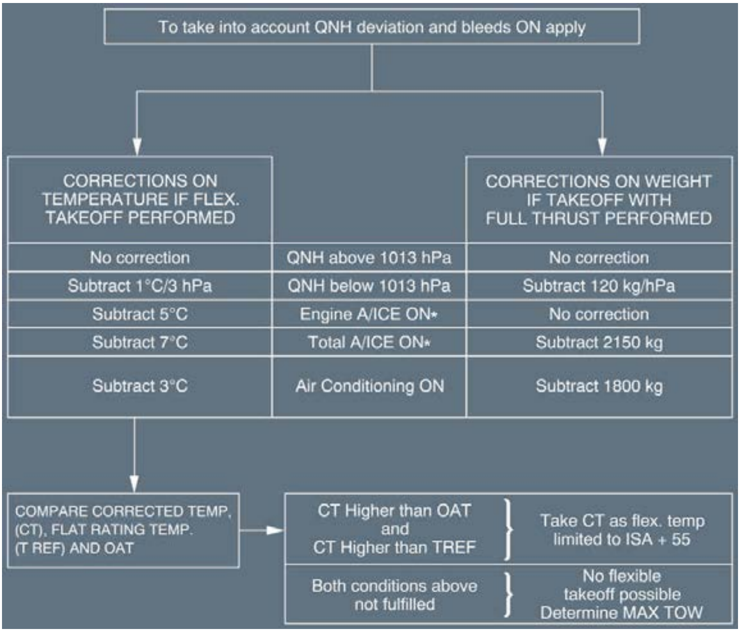
TAKEOFF CHART DATA

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.
Airport geometric elevation = 450 ft
QNH = 1 013 hPa
Anti ice OFF
Air conditioning OFF

EXAMPLE 1 - FULL THRUST TAKEOFF

Actual data : OAT = 5 °C
QNH = 998 hPa
Engine anti ice ON
Air conditioning OFF

Weight read in the takeoff chart: 73 000 kg.
Use the QNH/BLEEDS corrections (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS*) or (*Refer to PER-TOF-TOD-24 EFFECT OF QNH AND BLEEDS FOR HIGH ALTITUDE OPERATIONS*) for high altitude operations.



Read in the above table the corrections for high QNH and engine anti ice ON.
QNH correction: 120 kg x (1013 - 998) = 1 800 kg
Engine anti ice correction: No correction.
The maximum permissible takeoff weight is 73 000 - 1800 - 0 = 71 200 kg

EXAMPLE 2 - FLEXIBLE THRUST TAKEOFF

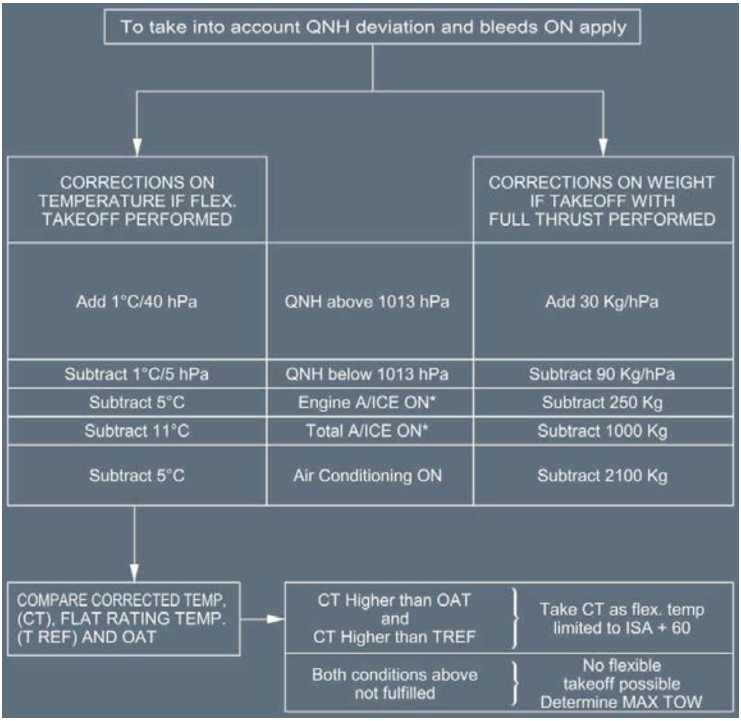
Actual data : OAT = 5 °C
QNH = 1 004 hPa
Anti ice OFF
Air conditioning ON
TOW = 65 000 kg

Flexible temperature read on the takeoff chart: TFLEX = 55 °C.
Read TREF on the takeoff chart or on the quick reference table.
Read in the above table the correction for QNH and air conditioning ON:
QNH correction = 1 °C / 3 hPa x (1 004 - 1 013) = -3 °C
Air conditioning ON correction: -3 °C
New flexible temperature = 55 - 3 - 3 = 49 °C
Check that the flexible temperature is above TREF and actual OAT.

Check that the flexible temperature is less than the maximum flexible temperature.

EFFECT OF QNH AND BLEEDS FOR HIGH ALTITUDE OPERATIONS (ABOVE 9200 FT)

Ident.: PER-TOF-TOD-24-00012926.0032001 / 24 MAR 11
Applicable to: ALL



Note: * Corrections valid only for OAT < 10 °C

EXAMPLES FOR HIGH ALTITUDE OPERATIONS

Ident.: PER-TOF-TOD-24-00012925.0015001 / 09 MAR 11
Applicable to: ALL

TAKEOFF CHART DATA

Airport geometric elevation = 11 500 ft
QNH = 1 013 hPa
Anti ice OFF
Air conditioning OFF

EXAMPLE 1 - FULL THRUST TAKEOFF

Actual data : OAT = 0 °C
QNH = 1 040 hPa
Engine anti ice ON
Air conditioning OFF

Weight read on the takeoff chart: 65 000 kg
Determine the actual airport pressure altitude (1 hPa is equivalent to 28 ft according to the ISA model).
Pressure altitude = 11 500 - (1 040 - 1 013) × 28 = 10 744 ft
Read in the above table the corrections for high QNH and engine anti ice ON.
QNH correction = 30 kg × (11 500 - 10 744)/28 = +810 kg
Engine anti ice correction = -250 kg
The maximum permissible takeoff weight is 65 000 + 810 - 250 = 65 560 kg

EXAMPLE 2 - FLEXIBLE THRUST TAKEOFF

Actual data : OAT = 0 °C
QNH = 1 040 hPa
Anti ice OFF
Air conditioning OFF
TOW = 60 000 kg

Flexible temperature read on the takeoff chart: TFLEX = 40 °C
Read TREF on the takeoff chart or on the quick reference table.
Determine the actual airport pressure altitude (1 hPa is equivalent to 28 ft according to the ISA model).
Pressure altitude = 11 500 - (1 040 - 1 013) × 28 = 10 744 ft
Read in the above table the correction for QNH and air conditioning ON:
QNH correction = 1 °C/40 hPa × (11 500 - 10 744)/28 hPa = 0 °C
Air conditioning ON correction = -5 °C
New flexible temperature = 40 - 5 + 0 = 35 °C
Check that the flexible temperature is above TREF and actual OAT.

Check that the flexible temperature is less than the maximum flexible temperature and retain the lower of the two.

SPEEDS LIMITED BY VMCG/VMCA

SPEEDS LIMITED BY VMCG/VMCA

Ident.: PER-TOF-TOD-25-10-00001754.0021001 / 08 JUL 15
Applicable to: ALL

All takeoff speeds have a minimum value limited by control. These minimum speeds are usually provided on each RTOW chart. If these speeds are not available, use the following conservative values. These speeds may be slightly higher than the minimum control speeds displayed on the RTOW chart.

MINIMUM V1 (KT IAS)										
CONF	PRESSURE ALTITUDE (FT)									
	-1 000	0	1 000	2000	3 000	4 000	6 000	8 000	9 200	12 000
1 + F	113	112	112	111	110	109	107	105	104	101
2	113	112	112	111	110	109	107	105	104	101
3	113	112	112	111	110	109	107	105	104	101

MINIMUM VR (KT IAS)										
CONF	PRESSURE ALTITUDE (FT)									
	-1 000	0	1 000	2 000	3 000	4 000	6 000	8 000	9 200	12 000
1 + F	116	116	115	114	113	112	110	108	106	102
2	116	116	115	114	113	112	110	108	106	102
3	116	116	115	114	113	112	110	108	106	102

MINIMUM V2 (KT IAS)										
CONF	PRESSURE ALTITUDE (FT)									
	-1 000	0	1 000	2 000	3 000	4 000	6 000	8 000	9 200	12 000
1 + F	123	123	122	121	120	118	116	114	112	108
2	123	123	122	120	119	118	116	114	112	108
3	123	123	122	121	120	118	116	114	112	108

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V2 LIMITED BY VMU/VMCA

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)

Ident.: PER-TOF-TOD-25-20-00001756.0029001 / 25 MAR 11
Applicable to: ALL

The following tables, one per configuration, provide the V2 limited by minimum unstick speed and minimum control speed in the air.

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)

CONFIGURATION 1+F

PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 kg)									
	35	40	45	50	55	60	65	70	75	80
-1000	123	123	123	123	123	128	133	137	142	147
0	123	123	123	123	123	128	133	138	142	147
1000	121	121	121	121	122	128	133	138	143	148
2000	120	120	120	120	122	128	133	138	143	148
3000	119	119	119	119	123	128	133	138	143	148
4000	118	118	118	118	123	128	133	138	143	148
5000	117	117	117	117	123	128	133	138	143	148
6000	116	116	116	117	123	128	133	138	143	148
7000	115	115	115	117	123	128	133	139	143	149
8000	113	113	113	117	123	128	134	139	144	149
9000	112	112	112	117	123	128	134	139	144	149
10000	111	111	111	117	123	129	134	139	144	149
11000	109	109	111	117	123	129	134	139	144	149
12000	108	108	111	117	123	129	134	139	144	150
13000	106	106	111	118	124	129	134	140	145	150
14000	104	104	111	118	124	129	134	140	145	150

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MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 2										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 kg)									
	35	40	45	50	55	60	65	70	75	80
-1000	123	123	123	123	123	123	126	131	136	140
0	122	122	122	122	122	122	126	131	136	141
1000	121	121	121	121	121	122	126	131	136	141
2000	120	120	120	120	120	122	127	131	136	141
3000	119	119	119	119	119	122	127	131	136	141
4000	118	118	118	118	118	122	127	132	136	141
5000	117	117	117	117	117	122	127	132	136	141
6000	115	115	115	115	117	122	127	132	137	141
7000	114	114	114	114	117	122	127	132	137	142
8000	113	113	113	113	117	122	127	132	137	142
9000	112	112	112	112	117	122	127	132	137	142
10000	110	110	110	112	117	123	127	132	137	142
11000	109	109	109	112	118	123	128	132	137	142
12000	108	108	108	112	118	123	128	133	137	142
13000	106	106	106	112	118	123	128	133	138	143
14000	104	104	106	112	118	123	128	133	138	143

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MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 3										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 kg)									
	35	40	45	50	55	60	65	70	75	80
-1000	123	123	123	123	123	123	123	128	132	137
0	122	122	122	122	122	122	123	128	133	137
1000	121	121	121	121	121	121	124	128	133	137
2000	120	120	120	120	120	120	124	128	133	137
3000	119	119	119	119	119	119	124	128	133	137
4000	118	118	118	118	118	119	124	128	133	138
5000	117	117	117	117	117	119	124	129	133	138
6000	116	116	116	116	116	119	124	129	133	138
7000	115	115	115	115	115	120	124	129	133	138
8000	113	113	113	113	115	120	124	129	133	138
9000	112	112	112	112	115	120	124	129	134	138
10000	111	111	111	111	115	120	124	129	134	138
11000	109	109	109	110	115	120	125	129	134	139
12000	108	108	108	110	115	120	125	129	134	139
13000	106	106	106	110	115	120	125	130	134	139
14000	105	105	105	110	115	120	125	130	134	139

OCTO 10.0.0 AD112A01 FCOM-N0[0096]02[0096]02[0096]30[0096]010-035

GENERAL

Ident.: PER-TOF-CTA-10-00001781.0001001 / 21 JUL 14
Applicable to: ALL

This section presents the recommendations of Airbus for operations from wet runways or from runways which are covered with contaminants such as standing water, slush or snow.

CAUTION	Takeoff is not recommended: - From an icy runway - From a runway for which the depth of contaminant is greater than the performance levels or the equivalences published in the documentation or performance software.

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DEFINITIONS

Ident.: PER-TOF-CTA-20-00001782.0001001 / 22 MAY 13
Applicable to: ALL

DAMP	:	A runway is damp when the surface is not dry, but when the water on it does not give it a shiny appearance.
WET	:	A runway is considered as wet when the surface has a shiny appearance due to a thin layer of water. When this layer does not exceed 3 mm depth, there is no substantial risk of hydroplaning.
STANDING WATER	:	is caused by heavy rainfall and /or insufficient runway drainage with a depth of more than 3 mm.
SLUSH	:	is water saturated with snow which spatters when stepping firmly on it. It is encountered at temperatures around 5 °C and its density is approximately 0.85 kg/l (7.1 lb/US Gal).
WET SNOW	:	is a condition where, if compacted by hand, snow will stick together and tend to form a snowball. Its density is approximately 0.4 kg/l (3.35 lb/US Gal).
DRY SNOW	:	is a condition where snow can be blown if loose, or if compacted by hand, will fall apart again upon release. Its density is approximately 0.2 kg/l (1.7 lb/US Gal).
COMPACTED SNOW	:	is a condition where snow has been compressed.
ICY	:	is a condition where the friction coefficient is 0.05 or below.

EQUIVALENCES

Ident.: PER-TOF-CTA-20-00014919.0001001 / 21 JUL 14
Applicable to: ALL

For the below-listed reported contaminants, the following equivalent runway conditions can be retained for the takeoff performance determination.

Reported contaminant		Equivalent Runway Condition
Type of contaminant	**Depth of contaminant**	
Slush	≤ 3 mm (1/8 in)	Wet
Water	≤ 3 mm (1/8 in)	
Wet snow	≤ 3 mm (1/8 in)	
	≤ 12.7 mm (1/2 in)	6.3 mm (1/4 in) Slush
	≤ 25.4 mm (1 in)	12.7 mm (1/2 in) Slush
Dry snow	≤ 3 mm (1/8 in)	Wet
	≤ 50.8 mm (2 in)	6.3 mm (1/4 in) Slush
	≤ 100 mm (4 in)	12.7 mm (1/2 in) Slush

OPERATIONAL CONDITIONS

Ident.: PER-TOF-CTA-30-00001783.0001001 / 14 DEC 09
Applicable to: ALL

Performance penalties for takeoff as published in this section are computed with the following assumptions :

- The contaminant is in a layer of uniform depth and density over the entire length of the runway.
- Antiskid and spoilers are operative.
- The friction coefficient is based on studies and checked by actual tests.
- The screen height at the end of takeoff segment is 15 ft, not 35 ft.

In addition, for contaminated runways only :

- There is drag due to rolling resistance of the wheels.
- There is drag due to spray on the airframe and gears.
- Reverse thrust is used for the deceleration phase.
- Maximum thrust is used for takeoff.

Note: The net flight path clears obstacles by 15 ft instead of 35 ft.

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TAKEOFF PERFORMANCE

TAKEOFF PERFORMANCE

Ident.: PER-TOF-CTA-40-10-00013660.0002001 / 23 JUN 15
Applicable to: ALL

CAUTION	The method is based on the use of the RTOW charts established at optimum V2 /VS and optimum V1 /VR . In addition, when applying corrections for a wet runway, the RTOW charts should also have been established with V1 min (minimum V1 of the V1 range). The method should not be used with takeoff charts computed for other conditions. All tables have been established for TOGA (and Flexible Takeoff for wet runways). Do not use them for Derated thrust.

Correct the determined maximum takeoff weight on dry runway to take into account QNH and bleed effects, then apply the corrections given on the following pages.

Note:
1. *The results obtained with this method may be different from the influence given at the bottom of the RTOW chart.*
2. *On contaminated runway, in some cases, no MTOW can be determined with this method (box dashed below a given weight). A specific RTOW chart must then be computed.*

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TAKEOFF FROM A WET RUNWAY

HOW TO PROCEED

Ident.: PER-TOF-CTA-40-20-00012966.0004001 / 24 MAR 11
Applicable to: ALL

1. Determine the maximum takeoff weight or flexible temperature and associated speeds on dry runway.
2. Two sets of tables are given depending on the use of thrust reversers and the presence of clearway. Select the table to use as applicable to your case.
   The runway length in the table corresponds to the available takeoff run (TORA).
3. Apply the corrections shown in the table to the maximum takeoff weight or flexible temperature and associated speeds determined on dry runway.
4. Check that takeoff speeds are greater than the minimum values shown on the RTOW chart.

   If one or more speeds are lower than these minimum values, apply the following procedure :
   - Actual TOW = maximum TOW
     - If V1 is lower than the minimum V1 (V1 limited by VMCG), take this last value as V1 and further decrease weight by 3 000 kg (6 600 lb) per knot difference between them. Check that VR and V2 are higher than or equal to the minimum values.
     - If VR or/and V2 falls below the minimum values, takeoff is not possible.
   - Actual TOW lower than maximum TOW
     - If V1 corresponding to actual TOW is lower than the minimum V1 (V1 limited by VMCG) :
       - If maximum TOW has a V1 equal to or above minimum V1 , retain minimum V1 as V1 and decrease the flexible temperature by 4 °C per knot difference between them.
       - In the rare case when the V1 corresponding to maximum TOW falls below the minimum V1 , decrease maximum TOW by 3 000 kg (6 600 lb) per knot difference between them. Limit the actual TOW to the value found after this decrement. Take V1 equal to minimum V1 and decrease the flexible temperature by 4 °C per knot difference between this last value and the V1 corresponding to the actual TOW . Check that VR and V2 are higher than or equal to the minimum values.
     - If VR or V2 corresponding to actual TOW falls below the minimum values, and if VR and V2 corresponding to maximum TOW are above the minimum values, retain the minimum speed value for VR and V2.
5. Check that V2 is above the minimum V2 value due to VMU (*Refer to PER-TOF-TOD-25-10 SPEEDS LIMITED BY VMCG/VMCA*).
6. Check that the corrected flexible temperature is higher than OAT and Tref.

Note: - *Do not extrapolate below the shortest runway length provided in the table.*

- *If no minimum speed value is available, use the conservative values provided on Refer to PER-TOF-TOD-25-10 SPEEDS LIMITED BY VMCG/VMCA.*

NO THRUST REVERSERS OPERATIVE (NO CLEARWAY)

Ident.: PER-TOF-CTA-40-20-00012743.0028001 / 04 MAR 11
Applicable to: ALL

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2 500 8 000	3 000 10 000	3 500 11 500 and above	2 000 6 500	2 500 8 000	3 000 10 000 and above	1 750 5 750	2 000 6 500	2 500 8 000 and above
FLEX TO Temperature decrement (°C)	3	3	2	5	3	2	0	7	4
MAX TO Weight decrement (1 000 kg) (1 000 lb)	1.3 2.9	1.3 2.9	0.8 1.8	1.9 4.2	1.1 2.5	1.0 2.3	1.1 2.5	2.0 4.5	2.0 4.5
V1 decrement (kt)	16	15	13	16	15	15	14	0	15
VR and V2 decrement (kt)	3	4	3	2	3	4	0	0	4

ALL THRUST REVERSERS OPERATIVE (NO CLEARWAY)

Ident.: PER-TOF-CTA-40-20-00012744.0023001 / 04 MAR 11
Applicable to: ALL

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1500 5000	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	1	1	1	1	1	1	0	2	1
MAX TO Weight decrement (1000 kg) (1000 lb)	0.4 0.9	0.3 0.7	0.2 0.5	0.2 0.5	0.3 0.7	0.3 0.7	0.4 0.9	0.4 0.9	0.6 1.4
V1 decrement (kt)	10	9	8	10	10	9	9	10	9
VR and V2 decrement (kt)	1	1	1	0	1	2	0	1	1

NO THRUST REVERSERS OPERATIVE (WITH CLEARWAY)

Ident.: PER-TOF-CTA-40-20-00012745.0024001 / 01 APR 11
Applicable to: ALL

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2 500 8 000	3 000 10 000	3 500 11 500 and above	2 000 6 500	2 500 8 000	3 000 10 000 and above	1 500 5 000	2 000 6 500	2 500 8 000 and above
FLEX TO Temperature decrement (°C)	5	4	2	7	5	4	0	6	5
MAX TO Weight decrement (1 000 kg) (1 000 lb)	2.4 5.3	2.1 4.7	1.2 2.7	3.2 7.1	2.5 5.6	1.9 4.2	3.1 6.9	2.6 5.8	2.3 5.1
V1 decrement (kt)	14	14	12	15	14	15	12	15	14
VR and V2 decrement (kt)	6	7	5	6	7	8	2	7	7

ALL THRUST REVERSERS OPERATIVE (WITH CLEARWAY)

Ident.: PER-TOF-CTA-40-20-00012941.0024001 / 28 JAN 11
Applicable to: ALL

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2 500 8 000	3 000 10 000	3 500 11 500 and above	2 000 6 500	2 500 8 000	3 000 10 000 and above	1 500 5 000	2 000 6 500	2 500 8 000 and above
FLEX TO Temperature decrement (°C)	3	2	1	4	3	2	0	4	3
MAX TO Weight decrement (1 000 kg) (1 000 lb)	1.5 3.4	1.0 2.3	0.6 1.4	1.6 3.6	1.5 3.4	1.0 2.3	2.2 4.9	1.7 3.8	1.6 3.6
V1 decrement (kt)	9	8	7	9	8	9	8	9	9
VR and V2 decrement (kt)	4	4	3	4	4	5	2	4	5

TAKEOFF FROM A CONTAMINATED RUNWAY

TAKEOFF FROM A 6.3 MM (1/4 INCH) WATER COVERED RUNWAY

Ident.: PER-TOF-CTA-40-30-00001786.0049001 / 23 JUN 15
Applicable to: ALL

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2 500 8 000	3 000 10 000	3 500 11 500	4 000 13 000 and above	2 000 6 500	2 500 8 000	3 000 10 000 and above	1 750 5 700	2 000 6 500	2 500 8 000 and above
∆ Weight (1 000 kg) With clearway Without clearway	12.7 11.3	11.6 9.4	8.4 7.0	6.9 4.7	14.6 13.0	12.6 11.4	11.2 9.6	13.8 11.7	13.1 11.6	11.4 10.3

- Enter the following tables with the corrected weight to determine MTOW . Then determine takeoff speeds associated with actual TOW.

CONF 1 + F

CORRECTED WEIGHT (1 000 kg)	<51.8	51.8	52	54	54 to 78
MTOW (1 000 kg)	-	45.3	46	54	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<45.3	45.3	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	124	127	130	132	134	137	139	141	143	145	148	150	152	154	157	158	160
VR (kt IAS)	118	118	119	122	125	127	129	132	134	136	138	140	143	145	147	149	152	153	155
V1 (kt IAS)	112	112	112	112	112	112	112	115	117	119	121	123	126	128	130	132	135	136	138

CONF 2

CORRECTED WEIGHT (1 000 kg)	<52.8	52.8	54	55	55 to 78
MTOW (1 000 kg)	-	46	51	55	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<46	46	48	50	52	54	55	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	126	129	131	133	134	135	138	140	142	144	147	149	151	153	156	157	159
VR (kt IAS)	119	119	122	125	127	129	130	131	134	136	138	140	143	145	147	149	152	153	155
V1 (kt IAS)	112	112	112	112	112	112	112	113	116	118	120	122	125	127	129	131	134	135	137

CONF 3

CORRECTED WEIGHT (1 000 kg)	<54.8	54.8	56	57	57 to 78
MTOW (1 000 kg)	-	48	53	57	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<48	48	50	52	54	56	57	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	126	128	130	132	133	134	136	138	141	143	145	147	150	152	153	155
VR (kt IAS)	119	119	122	124	126	128	129	130	132	134	137	139	141	143	146	148	149	151
V1 (kt IAS)	112	112	112	112	112	112	112	113	115	117	120	122	124	126	129	131	132	134

TAKEOFF FROM A 12.7 MM (1/2 INCH) WATER COVERED RUNWAY

Ident.: PER-TOF-CTA-40-30-00001794.0084001 / 23 JUN 15
Applicable to: ALL

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2 500 8 000	3 000 10 000	3 500 11 500	4 000 13 000 and above	2 000 6 500	2 500 8 000	3 000 10 000 and above	1 750 5 700	2 000 6 500	2 500 8 000 and above
∆ Weight (1 000 kg) With clearway Without clearway	18.6 17.2	18.2 16.0	15.2 13.8	12.5 10.3	18.9 17.3	18.4 17.2	16.9 15.3	18.1 16.0	17.3 15.8	16.7 15.6

- Enter the following tables with the corrected weight to determine MTOW . Then determine takeoff speeds associated with actual TOW.

CONF 1 + F

CORRECTED WEIGHT (1 000 kg)	<48.6	48.6	49.3	49.3 to 78
MTOW (1 000 kg)	-	45.3	49.3	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<45.3	45.3	46	48	49.3	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	124	127	129	130	132	134	137	139	141	143	145	148	150	152	154	157	158	160
VR (kt IAS)	119	119	120	123	125	126	128	130	133	135	137	139	141	144	146	148	150	153	154	156
V1 (kt IAS)	112	112	112	112	112	113	115	117	120	122	124	126	128	131	133	135	137	140	141	143

CONF 2

CORRECTED WEIGHT (1 000 kg)	<48.7	48.7	49.3	49.3 to 78
MTOW (1 000 kg)	-	46	49.3	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<46	46	48	49.3	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	126	128	129	131	133	135	138	140	142	144	147	149	151	153	156	157	159
VR (kt IAS)	119	119	122	124	125	127	129	131	134	136	138	140	143	145	147	149	152	153	155
V1 (kt IAS)	112	112	112	112	113	115	117	119	122	124	126	128	131	133	135	137	140	141	143

CONF 3

CORRECTED WEIGHT (1 000 kg)	<50.3	50.3	51	51 to 78
MTOW (1 000 kg)	-	48	51	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<48	48	50	51	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	126	127	128	130	132	134	136	138	141	143	145	147	150	152	153	155
VR (kt IAS)	119	119	122	123	124	126	128	130	132	134	137	139	141	143	146	148	149	151
V1 (kt IAS)	112	112	112	112	113	115	117	119	121	123	126	128	130	132	135	137	138	140

TAKEOFF FROM A 6.3 MM (1/4 INCH) SLUSH COVERED RUNWAY

Ident.: PER-TOF-CTA-40-30-00001787.0047001 / 25 MAR 11
Applicable to: ALL

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2 500 8 000	3 000 9 500	3 500 11 500	4 000 13 000 and above	2 250 7 000	2 750 9 000	3 250 10 500 and above	2 000 6 500	2 500 8 000	2 750 9 000 and above
∆ Weight (1 000 kg) With clearway Without clearway	9.7 8.4	8.7 7.9	6.7 6.3	5.5 5.5	7.6 6.2	5.9 5.1	5.5 5.1	8.1 6.3	6.3 5.3	5.1 4.4

- Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

CONF 1 + F

CORRECTED WEIGHT (1 000 kg)	<41.6	41.6	42	42 to 78
MTOW (1 000 kg)	-	40	42	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<40	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	115	115	118	121	123	126	129	131	134	136	138	141	143	145	148	150	152	155	157	159	161
VR (kt IAS)	115	115	118	121	123	126	129	131	134	136	138	141	143	145	148	150	152	155	157	159	161
V1 (kt IAS)	107	107	107	110	112	115	118	120	123	125	127	130	132	134	137	139	141	144	146	148	150

CONF 2

CORRECTED WEIGHT (1 000 kg)	<46.6	46.6	47.3	47.3 to 78
MTOW (1 000 kg)	-	43.3	47.3	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<43.3	43.3	44	46	47.3	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	113	113	114	116	118	119	121	123	126	128	130	132	135	137	139	141	143	145	147	149	151
VR (kt IAS)	111	111	112	114	116	117	119	121	124	126	128	130	133	135	137	139	141	143	145	147	149
V1 (kt IAS)	105	105	105	105	105	106	108	110	113	115	117	119	122	124	126	128	130	132	134	136	138

CONF 3

CORRECTED WEIGHT (1 000 kg)	<47.9	47.9	48	49	49 to 78
MTOW (1 000 kg)	-	44.7	45	49	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<44.7	44.7	46	48	49	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	113	113	115	117	118	119	122	124	127	129	131	133	136	138	140	142	144	146	148	149
VR (kt IAS)	110	110	112	14	115	116	119	121	124	126	128	130	133	135	137	139	141	143	145	146
V1 (kt IAS)	105	105	105	105	105	106	109	111	114	116	118	120	123	125	127	129	131	133	135	136

TAKEOFF FROM A 12.7 MM (1/2 INCH) SLUSH COVERED RUNWAY

Ident.: PER-TOF-CTA-40-30-00001788.0049001 / 25 MAR 11
Applicable to: ALL

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2 500 8 000	3 000 10 000	3 500 11 500	4 000 13 000 and above	2 000 6 500	2 500 8 000	3 000 10 000 and above	1 750 5 750	2 000 6 500	2 500 8 000 and above
Weight decrement (1 000 kg) With clearway Without clearway	16.7 15.0	16.7 14.5	13.6 12.2	12.0 9.8	18.2 16.6	17.6 16.4	16.6 15.0	18.1 16.0	16.7 15.2	16.3 15.2

- Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

CONF 1 + F

CORRECTED WEIGHT (1 000 kg)	<45.9	45.9	46	46 to 78
MTOW (1 000 kg)	-	45.3	46	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	≤45.3	45.3	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	124	127	130	132	134	137	139	141	143	145	148	150	152	154	157	158	160
VR (kt IAS)	119	119	120	123	126	128	130	133	135	137	139	141	144	146	148	150	153	154	156
V1 (kt IAS)	112	112	112	115	118	120	122	125	127	129	131	133	136	138	140	142	145	146	148

CONF 2

CORRECTED WEIGHT (1 000 kg)	<47.1	47.1	47.3	47.3 to 78
MTOW (1 000 kg)	-	46	47.3	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	≤46	46	47.3	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	125	126	129	131	133	135	138	140	142	144	147	149	151	153	156	157	159
VR (kt IAS)	120	120	122	123	126	128	130	132	135	137	139	141	144	146	148	150	153	154	156
V1 (kt IAS)	112	112	112	113	116	118	120	122	125	127	129	131	134	136	138	140	143	144	146

CONF 3

CORRECTED WEIGHT (1 000 kg)	<49.1	49.1	49.3	49.3 to 78
MTOW (1 000 kg)	-	44.7	49.3	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	≤48	48	49.3	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	125	126	128	130	132	134	136	138	141	143	145	147	150	152	153	155
VR (kt IAS)	120	120	122	123	125	127	129	131	133	135	138	140	142	144	147	149	150	152
V1 (kt IAS)	112	112	112	113	115	117	119	121	123	125	128	130	132	134	137	139	140	142

TAKEOFF FROM A COMPACTED SNOW COVERED RUNWAY

Ident.: PER-TOF-CTA-40-30-00001789.0049001 / 25 MAR 11
Applicable to: ALL

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2 500 8 000	3 000 10 000	3 500 11 500	4 000 13 000 and above	2 000 6 500	2 500 8 000	3 000 10 000 and above	1 750 5 700	2 000 6 500	2 500 8 000 and above
∆ Weight (1 000 kg) With clearway Without clearway	7.6 6.2	6.9 4.7	6.9 4.7	6.9 4.7	11.3 9.7	7.1 5.9	5.0 3.4	11.2 9.1	8.5 7.0	6.0 4.9

- Enter the following tables with the corrected weight to determine MTOW . Then determine takeoff speeds associated with actual TOW.

CONF 1 + F

CORRECTED WEIGHT (1 000 kg)	<49.7	49.7	50	51	51 to 78
MTOW (1 000 kg)	-	45.3	47	51	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<45.3	45.3	46	48	50	51	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	124	127	130	131	132	134	137	139	141	143	145	148	150	152	154	157	158	160
VR (kt IAS)	118	118	119	122	125	126	127	129	132	134	136	138	140	143	145	147	149	152	153	155
V1 (kt IAS)	112	112	112	112	112	112	113	115	118	120	122	124	126	129	131	133	135	138	139	141

CONF 2

CORRECTED WEIGHT (1 000 kg)	<51.3	51.3	52	53	53 to 78
MTOW (1 000 kg)	-	46	49	53	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<46	46	48	50	52	53	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	126	129	131	132	133	135	138	140	142	144	147	149	151	153	156	157	159
VR (kt IAS)	119	119	122	125	127	128	129	131	134	136	138	140	143	145	147	149	152	153	155
V1 (kt IAS)	112	112	112	112	112	112	113	115	118	120	122	124	127	129	131	133	136	137	139

CONF 3

CORRECTED WEIGHT (1 000 kg)	<54	54	56	56 to 78
MTOW (1 000 kg)	-	48	56	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1 000 kg)	<48	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	123	123	126	128	130	132	134	136	138	141	143	145	147	150	152	153	155
VR (kt IAS)	119	119	122	124	126	128	130	132	134	137	139	141	143	146	148	149	151
V1 (kt IAS)	112	112	112	112	112	112	114	116	118	121	123	125	127	130	132	133	135

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EXAMPLE

TAKEOFF PERFORMANCE ON DRY RUNWAY

Ident.: PER-TOF-CTA-40-40-00014730.0001001 / 29 JUL 16
Applicable to: ALL

DATA

The following data and graph are for example only, and are not for operational use. Even if the data in the following example is in "kg" and "m", the same method can be applied for "lb" and "ft".
Runway length : 3 000 m, OAT = 36 °C, no wind, CONF 1+F
Determine maximum takeoff weight on dry runway from RTOW chart (*Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART*).

OAT °C	CONF 1 + F				
	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT
34.0	76.7 4/6 143/50/52	78.4 4/6 148/53/55	80.2 4/6 154/56/58	81.5 4/6 157/57/60	82.8 4/6 160/60/62
36.0	76.6 4/6 143/49/52	78.4 4/6 148/52/54	80.1 4/6 153/56/58	81.4 4/6 156/57/59	82.7 4/6 160/60/62

Maximum TOW = 80 100 kg, V1 = 153 kt, VR = 156 kt, V2 = 158 kt.

TAKEOFF PERFORMANCE ON WET RUNWAY

Ident.: PER-TOF-CTA-40-40-00014731.0001001 / 29 JUL 16
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.
With no thrust reversers operating and assuming that no clearway was used to compute the dry RTOW chart, use the table *Refer to PER-TOF-CTA-40-20 NO THRUST REVERSERS OPERATIVE (NO CLEARWAY)*.

TAKEOFF CONFIGURATION	1+F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 AND ABOVE	2000 6500	2500 8000	3000 10000 AND ABOVE	1750 5750	2000 6500	2500 8000 AND ABOVE
FLEX TO TEMPERATURE DECREMENT (°C)	8	3	2	10	7	6	9	5	5
MAX TO WEIGHT DECREMENT (1000 kg) (1000 lb)	2.4 5.3	0.9 2.0	0.8 1.8	2.8 6.2	2.2 4.9	2.2 4.9	2.5 5.6	1.5 3.4	1.5 3.4
V1 DECREMENT (kt)	16	16	14	16	15	15	15	15	15
VR AND V2 DECREMENT (kt)	3	3	2	3	4	7	1	3	4

- Maximum takeoff weight correction :
  MTOW = 80 100 - 900 = 79 200 kg, V1 = 153 - 16 = 137 kt, VR = 156 - 3 = 153 kt, V2 = 158 - 3 = 155 kt.
- Flex temperature correction :
  Assuming an actual takeoff weight of 75 000 kg and an initial flex temperature of 53 °C
  TOW = 75 000 kg ⇒ Flex temperature = 53 - 3 = 50 °C
  V1 = 152 - 16 = 136 kt, VR = 153 - 3 = 150 kt, V2 = 154 - 3 = 151 kt.

Check the resulting speeds against the minimum speeds as per procedure *Refer to PER-TOF-CTA-40-20 HOW TO PROCEED*.

TAKEOFF PERFORMANCE ON RUNWAY COVERED WITH 1/2 INCH SLUSH

Ident.: PER-TOF-CTA-40-40-00014732.0001001 / 29 JUL 16
Applicable to: ALL

DATA

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.
Runway length 3 000 m (no clearway), OAT = 5 °C, 5 kt tailwind, CONF 1 + F
Determine maximum takeoff weight on dry runway (*Refer to PER-TOF-TOC-10-30 EXAMPLE OF TAKEOFF CHART*)

OAT °C	CONF 1 + F				
	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT
0.0	78.8 4/6 151/54/57	80.6 4/6 156/57/59	82.5 4/6 162/62/64	83.7 3/4 165/65/67	84.7 3/4 168/68/70
10.0	78.2 4/6 148/53/55	80.0 4/6 154/57/59	81.8 4/6 159/60/62	83.1 4/6 163/63/65	84.2 3/4 166/66/67

Maximum takeoff weight on dry runway = 80 300 kg
Determine a corrected weight (*Refer to PER-TOF-CTA-40-30 TAKEOFF FROM A 12.7 MM (1/2 INCH) SLUSH COVERED RUNWAY*). As no clearway, use the correction diplayed on the second line (without clearway).

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5700	2000 6500	2500 8000 and above
ΔWEIGHT (1000 kg) With clearway Without clearway	16.8 14.7	15.9 14.7	14.5 13.5	13.0 12.1	17.4 15.1	16.3 15.1	15.9 15.1	19.0 16.6	17.3 16.2	17.3 16.2

Corrected weight = 80 300 – 14 700 = 65 600 kg
Determine maximum takeoff weight and associated speeds :

CONF 1 + F			
CORRECTED WEIGHT (1000 kg)	<47	47	47 to 78
MTOW (1000 kg)	-	47	EQUAL TO CORRECTED WEIGHT

ACTUAL WEIGHT (1000 kg)	≤47	47	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
V2 (kt IAS)	124	124	126	129	131	134	136	139	141	143	146	148	150	153	155	157	159	161
VR (kt IAS)	123	123	125	128	130	133	135	138	140	142	145	147	149	152	154	156	158	160
V1 (kt IAS)	118	118	120	123	125	128	130	133	135	137	140	142	144	147	149	151	153	155

MTOW = 65 600 kg

V1 = 141 kt, VR = 147 kt, V2 = 148 kt

PERFORMANCE

FLIGHT PLANNING

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MINIMUM RECOMMENDED FUEL REQUIREMENTS

Ident.: PER-FPL-GEN-MFR-00001837.0003001 / 08 FEB 11
Applicable to: ALL

The total fuel quantity required to fly a given sector is the sum of the following quantities:

TAXI FUEL

Quantity required for startup and taxi. Fuel calculation is based on a consumption of 10 kg/min or 22 lb/min
Average quantity (12 min) → 120 kg or 265 lb

TRIP FUEL

Fuel required from departure to destination includes the following quantities:
- Takeoff and climb at selected speed.
- Cruise at selected speed.
- Descent from cruising level to 1 500 ft above destination airport.
- Approach and landing. Fuel calculation is based on a consumption of 17 kg/min or 40 lb/min
  Average quantity (6 min IFR) →110 kg or 240 lb

RESERVE FUEL

This quantity includes :

"EN ROUTE" RESERVE FUEL (CONTINGENCY FUEL)

- According to national regulations and company policy (generally based on a percentage of trip fuel).

ALTERNATE FUEL

Fuel required to fly from destination to alternate airport.
It includes go-around 80 kg or 180 lb, climb to cruising level, cruise at long range speed, descent and approach procedure.
60 kg or 140 lb for 4 min VFR

HOLDING FUEL

Calculation of holding fuel should take into account the altitude of the alternate and the landing weight at the alternate. To use holding charts *Refer to PER-HLD-GEN GENERAL*.
A conservative quantity corresponding to a 30 min holding at 1 500 ft above alternate airport elevation at "green dot" speed in the clean configuration is 1 150 kg or 2 600 lb

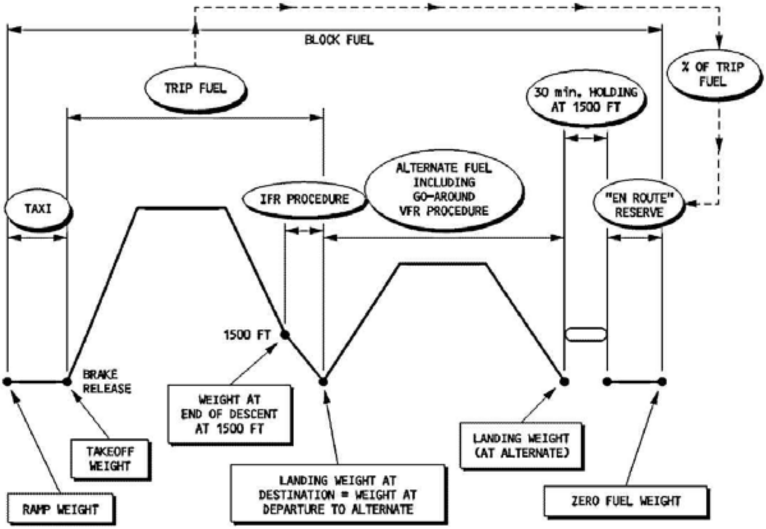
APU FUEL

During ground operations, APU fuel consumption is about 130 kg/h or 290 lb/h (Packs ON, 90 KVA load on APU GEN).

FLIGHT PLAN

Ident.: PER-FPL-GEN-FPL-00001835.0001001 / 22 MAR 11
Applicable to: ALL

When no precalculated flight plan is available, flight planning can be determined by using the tables given in this chapter.
Fuel policy will be the same as for precalculated flight plan.
The graph on the following page defines the different terms used in this chapter.



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INTRODUCTION

INTRODUCTION

Ident.: PER-FPL-FLP-QFP-10-00001827.0011001 / 25 FEB 11
Applicable to: ALL

The following flight planning tables allow the planner to determine trip fuel consumption and trip time required to cover a given air distance.

These tables are established for:
- Takeoff
- Climb profile 250 kt/300 kt/M 0.78
- Cruise Mach number M 0.78/LR
- Descent profile M 0.78/300 kt/250 kt
- Approach and landing 110 kg - 6 min IFR
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

They are based upon a reference landing weight of 50 000 kg.

<u>Note:</u>
1. In the tables, the asterisk (*) means that a step climb of 4 000 ft must be flown to reach the corresponding FL.
2. To obtain a flight plan at optimum cruise level, the highest flight level desired within the flight has to be selected in the table.
3. For each degree Celcius above ISA temperature apply fuel correction 0.015 (kg/°C/NM) × ΔISA (°C) × Air Distance (NM).

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CORRECTION FOR DEVIATION FROM REFERENCE LANDING WEIGHT

CORRECTION FOR DEVIATION FROM REFERENCE LANDING WEIGHT

Ident.: PER-FPL-FLP-QFP-20-00001828.0001001 / 03 MAR 11
Applicable to: ALL

The fuel consumption must be corrected when the actual landing weight is different from the reference landing weight.
If it is lower (or greater) than the reference landing weight, subtract (or add) the value given in the correction part of the table per 1 000 kg below (or above) the reference landing weight.

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EXAMPLE

EXAMPLE

Ident.: PER-FPL-FLP-QFP-30-00014738.0001001 / 04 JUL 17
Applicable to: ALL

INTRODUCTION

This section provides an example explaining step by step how to perform a quick planning.
This example is based on an A320-232 aircraft, which most likely does not reflect your actual aircraft. Nevertheless, the principle is valid for any aircraft, provided the appropriate performance tables are used.
For actual calculations, access the appropriate tables corresponding to your current aircraft and desired flight profile by following the "refer to" indications specified at each step, and do not use the tables provided in the example.

EXAMPLE

The example is based on the following parameters:

- Aircraft used for the example	A320-232
- Zero Fuel Weight	60 000 kg
- Temperature	ISA conditions
- Air conditioning	Normal
- Anti-ice	Off
- Cruise	M 0.78 at FL 370
- Departure - destination ground distance	1 800 NM
- Average wind on the leg to destination	-40 kt (headwind)
- Reserve fuel	5 %
- Destination - alternate ground distance	200 NM at FL 200
- Average wind on the leg to alternate	0 kt

To calculate the flight plan, it is necessary to start from the minimum landing fuel at the alternate airport.

1. Determine the 30 minutes holding fuel required at alternate airport (at 1 500 ft AGL).
   (*Refer to PER-FPL-GEN-MFR MINIMUM RECOMMENDED FUEL REQUIREMENTS* for actual 30 min fuel value).
   For the example, the conservative value of 1 200 kg is chosen.
   The resulting landing weight at alternate is 60 000 + 1 200 = 61 200 kg.
2. Determine time, trip fuel, and fuel correction for the leg from destination to alternate airport:

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT
GO-AROUND : 100 KG - CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE
DESCENT : M.78/300KT/250KT - VMC PROCEDURE : 80 KG (4MIN)

REF. LDG. WT AT ALTERNATE = 55000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 100	120	140	160	180	200	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL120	FL140 FL160	FL180 FL200
20									
40	529 0.12						2		
60	680 0.16	658 0.16					3		
80	832 0.20	805 0.20	803 0.20	803 0.20	805 0.19		5	4	4
100	984 0.24	952 0.24	945 0.24	941 0.23	939 0.23	938 0.22	6	6	5
120	1136 0.28	1099 0.28	1088 0.28	1080 0.27	1072 0.26	065 0.26	7	7	6
140	1289 0.32	1246 0.32	1230 0.32	1218 0.30	1206 0.29	192 0.29	9	8	6
160	1441 0.36	1393 0.36	1373 0.35	1357 0.34	1340 0.33	319 0.32	10	10	7
180	1594 0.40	1541 0.40	1517 0.39	1496 0.38	1474 0.36	446 0.35	11	11	8
200	1747 0.45	1689 0.44	1660 0.43	1635 0.41	1608 0.39	1573 0.38	13	12	9
220	1900 0.49	1837 0.48	1804 0.47	1774 0.45	1742 0.42	1701 0.42	14	14	9
240	2054 0.53	1985 0.52	1947 0.51	1914 0.48	1877 0.46	1828 0.45	15	15	10
260	2208 0.57	2134 0.56	2091 0.55	2054 0.52	2011 0.49	1955 0.48	17	16	11
280	2361 1.01						18	18	12
300	2515 1.05						20	19	12
320	2670 1.09	2580 1.08	2525 1.06	2474 1.02	2416 0.58	2338 0.58	21	20	13
340	2824 1.13	2730 1.12	2670 1.10	2615 1.06	2551 1.02	2466 1.01	22	22	14
360	2979 1.17	2879 1.16	2815 1.14	2755 1.09	2686 1.05	2593 1.04	24	23	14
380	3134 1.21	3029 1.20	2960 1.17	2896 1.13	2821 1.08	2721 1.07	25	24	15
400	3289 1.25	3179 1.23	3105 1.21	3037 1.16	2957 1.11	2849 1.10	26	26	16
420	3444 1.29	3329 1.27	3251 1.25	3178 1.20	3092 1.14	2977 1.13	28	27	17
440	3599 1.33	3479 1.31	3396 1.29	3319 1.23	3227 1.18	3105 1.17	29	28	17
460	3755 1.37	3629 1.35	3542 1.32	3461 1.27	3362 1.21	3233 1.20	31	30	18
480	3911 1.41	3780 1.39	3688 1.36	3602 1.30	3498 1.24	3361 1.23	32	31	19
500	4067 1.45	3931 1.43	3834 1.40	3744 1.33	3633 1.27	3489 1.26	33	32	19

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.3 %	ΔFUEL = + 2 %	ΔFUEL = + 5 %

DO NOT USE FOR OPERATIONAL PURPOSE

a. Convert the ground distance to air distance.
(*Refer to PER-OPD-CON-AEO GENERAL* for conversion).
On this leg, the average wind is zero. Therefore, the air distance equals the ground distance.
b. Enter the table with the air distance and desired flight level to obtain time, trip fuel, and fuel correction.

(*Refer to PER-FPL-FLP-ALN-20 GENERAL* for actual table).
For 200 NM air distance at FL 200, the table provides 0 h 38 min, 1 573 kg and
9 kg/1 000 kg.

c. Calculate the fuel burn correction regarding the estimated landing weight at the alternate airport.
Table reference weight : 55 000 kg
Estimated landing weight : 61 200 kg
Fuel correction 9 kg per 1 000 kg difference
The extra fuel burn is (61.2 - 55.0) x 9 = 56 kg.
d. Calculate the total trip fuel from destination to alternate.
Trip fuel : 1 573 + 56 = 1 629 kg
The estimated landing weight at destination is 61 200 + 1 629 = 62 829 kg.

3. Determine time, trip fuel, and fuel correction for the leg from departure to destination airport at M 0.78:

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. LANDING WEIGHT = 55000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
1450	8794 / 3.22	8379 / 3.23	8063 / 3.25	7792 / 3.26	[illegible]569 / 3.27	7563 / 3.27	46	67	103
1475	8940 / 3.25	8518 / 3.26	8196 / 3.28	7919 / 3.29	[illegible]693 / 3.30	7689 / 3.30	47	68	105
1500	9085 / 3.28	8657 / 3.30	8328 / 3.31	8046 / 3.33	[illegible]816 / 3.34	7814 / 3.34	48	69	107
1525	9231 / 3.32	8795 / 3.33	8461 / 3.35	8174 / 3.36	[illegible]939 / 3.37	7940 / 3.37	49	71	109
1550	9377 / 3.35	8934 / 3.36	8594 / 3.38	8301 / 3.39	[illegible]063 / 3.40	8067 / 3.40	50	72	111
1575	9523 / 3.38	9073 / 3.40	8727 / 3.41	8429 / 3.43	[illegible]187 / 3.44	8193 / 3.44	50	73	113
1600	9669 / 3.41	9213 / 3.43	8861 / 3.45	8557 / 3.46	[illegible]311 / 3.47	8320 / 3.47	51	74	115
1625	9815 / 3.45	9352 / 3.46	8994 / 3.48	8685 / 3.50	[illegible]435 / 3.50	8447 / 3.50	52	75	117
1650	9962 / 3.48	9492 / 3.49	9128 / 3.51	8813 / 3.53	[illegible]559 / 3.54	8575 / 3.54	53	76	119
1675	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]683 / 3.57	8703 / 3.57	54	78	121
1700	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]808 / 4.01	8831 / 4.01	55	79	123
1725	[illegible] / 3.58	[illegible] / 3.59	[illegible] / 4.01	[illegible] / 4.03	[illegible]933 / 4.04	8959 / 4.04	56	80	125
1750	10548 / 4.01	10051 / 4.03	9664 / 4.04	9326 / 4.06	[illegible]058 / 4.07	9087 / 4.07	57	81	127
1775	10695 / 4.04	10191 / 4.06	9798 / 4.08	9455 / 4.10	[illegible]183 / 4.11	9216 / 4.11	58	82	129
1800	10842 / 4.07	10332 / 4.09	9933 / 4.11	9584 / 4.13	[illegible]309 / 4.14	9345 / 4.14	59	84	132
1825	10988 / 4.11	10472 / 4.12	10068 / 4.14	9713 / 4.16	[illegible]436 / 4.17	9475 / 4.17	60	85	134
1850	11135 / 4.14	10613 / 4.16	10203 / 4.18	9842 / 4.20	[illegible]563 / 4.21	9605 / 4.21	61	86	136
1875	11282 / 4.17	10754 / 4.19	10338 / 4.21	9972 / 4.23	[illegible]691 / 4.24	9747 / 4.24*	62	87	138
1900	11430 / 4.20	10895 / 4.22	10473 / 4.24	10101 / 4.26	[illegible]819 / 4.27	9877 / 4.27*	63	89	140
1925	11577 / 4.24	11036 / 4.26	10608 / 4.28	10231 / 4.30	[illegible]948 / 4.31	10006 / 4.31*	64	90	142
1950	11724 / 4.27	11177 / 4.29	10744 / 4.31	10361 / 4.33	1[illegible]076 / 4.34	10136 / 4.34*	65	91	[illegible]44
1975	11872 / 4.30	11318 / 4.32	10879 / 4.34	10491 / 4.36	10205 / 4.37	10266 / 4.38*	66	93	146
2000	12019 / 4.33	11460 / 4.35	11015 / 4.38	10621 / 4.40	10334 / 4.41	10396 / 4.41*	67	94	149
2025	12167 / 4.37	11601 / 4.39	11151 / 4.41	10751 / 4.43	10464 / 4.44	10526 / 4.44*	68	95	151
2050	12314 / 4.40	11743 / 4.42	11287 / 4.44	10881 / 4.46	10593 / 4.48	10657 / 4.48*	70	97	153
2075	12462 / 4.43	11885 / 4.45	11424 / 4.48	11012 / 4.50	10723 / 4.51	10787 / 4.51*	71	98	155

LOW AIR CONDITIONING	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
ΔFUEL = – 0.4 %	ΔFUEL = + 3 %	ΔFUEL = + 5.5 %

DO NOT USE FOR
OPERATIONAL PURPOSE

a. Convert the ground distance to air distance.
(*Refer to PER-OPD-CON-AEO GENERAL* for conversion).
For 1 800 NM ground distance and 40 kt headwind at M 0.78, the interpolation from the table provides 1 979 NM air distance.

b. Enter the table with the air distance and desired flight level to obtain time, trip fuel, and fuel correction.
(*Refer to PER-FPL-FLP-QFP-40 FLIGHT PLANNING M.78* for actual M 0.78 table).
For 1 979 NM air distance at FL 370, the interpolation from the M 0.78 table provides 4 h 38 min, 10 226 kg and 146 kg/10 000 kg.

c. Calculate the fuel burn correction regarding the estimated landing weight at the destination airport.
Table reference weight : 55 000 kg
Estimated landing weight : 62 829 kg
Fuel correction 146 kg per 1 000 kg difference
The extra fuel burn is (62.829 - 55) x 146 = 1 143 kg.

d. Calculate the total trip fuel from departure to destination.
Trip fuel : 10 226 + 1 143 = 11 369 kg

4. Determine the contingency (reserve) fuel.
(Refer to company policy for fuel reserve value).
The five percent of the departure - destination trip fuel is:
11 369 x 0.05 = 568 kg.
5. Determine the taxi fuel at departure.
(*Refer to PER-FPL-GEN-MFR MINIMUM RECOMMENDED FUEL REQUIREMENTS* for actual taxi fuel).
For the example, the conservative value of 140 kg (12 min taxi time) is chosen.
6. Calculate the final block fuel.

- 30 min holding at alternate (1 500 ft AGL)	1 200 kg
- Trip fuel to alternate	1 629 kg
- Trip fuel to destination	11 369 kg
- Contingency (reserve) fuel	568 kg
- Taxi fuel	140 kg
Total block fuel	14 906 kg
Block weight	74 906 kg

FLIGHT PLANNING AT A GIVEN MACH NUMBER

FLIGHT PLANNING M.78

Ident.: PER-FPL-FLP-QFP-40-00001830.0026001 / 25 FEB 11
Applicable to: ALL

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. LANDING WEIGHT = 50000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
200	1544 0.38	1527 0.38	1515 0.38	1509 0.38	1508 0.38		12	14	15
225	1685 0.41	1659 0.41	1639 0.41	1626 0.41	1620 0.41	1619 0.41	12	15	17
250	1826 0.44	1791 0.44	1764 0.45	1744 0.45	1731 0.45	1727 0.45	13	15	18
275	1967 0.48	1923 0.48	1888 0.48	1861 0.48	1843 0.48	1835 0.48	13	16	19
300	2108 0.51	2055 0.51	2012 0.51	1979 0.51	1955 0.51	1942 0.51	14	17	20
325	2250 0.54	2188 0.54	2137 0.55	2097 0.55	2067 0.55	2050 0.55	14	18	21
350	2391 0.57	2320 0.58	2262 0.58	2215 0.58	2180 0.58	2158 0.58	15	19	23
375	2532 1.01	2453 1.01	2386 1.01	2333 1.01	2292 1.02	2267 1.02	15	19	24
400	2674 1.04	2585 1.04	2511 1.04	2451 1.05	2404 1.05	2375 1.05	16	20	25
425	2815 1.07	2718 1.07	2636 1.08	2569 1.08	2517 1.08	2484 1.08	17	21	26
450	2957 1.10	2851 1.11	2761 1.11	2687 1.11	2630 1.12	2593 1.12	17	22	27
475	3099 1.14	2984 1.14	2886 1.14	2806 1.15	2743 1.15	2701 1.15	18	22	28
500	3240 1.17	3117 1.17	3012 1.18	2924 1.18	2856 1.18	2810 1.18	18	23	30
525	3382 1.20	3250 1.21	3137 1.21	3042 1.21	2969 1.22	2919 1.22	19	24	31
550	3524 1.23	3383 1.24	3262 1.24	3161 1.25	3082 1.25	3029 1.25	19	25	32
575	3666 1.27	3516 1.27	3388 1.28	3280 1.28	3195 1.28	3138 1.28	20	26	33
600	3808 1.30	3649 1.30	3513 1.31	3399 1.31	3308 1.32	3247 1.32	21	26	34
625	3950 1.33	3783 1.34	3639 1.34	3517 1.35	3422 1.35	3357 1.35	21	27	36
650	4092 1.36	3916 1.37	3765 1.38	3636 1.38	3535 1.38	3467 1.38	22	28	37
675	4234 1.40	4049 1.40	3890 1.41	3756 1.41	3649 1.42	3577 1.42	22	29	38
700	4377 1.43	4183 1.44	4016 1.44	3875 1.45	3763 1.45	3687 1.45	23	30	40
725	4519 1.46	4317 1.47	4142 1.48	3994 1.48	3877 1.49	3797 1.49	24	30	41
750	4661 1.49	4450 1.50	4268 1.51	4113 1.52	3990 1.52	3907 1.52	24	31	42
775	4804 1.53	4584 1.53	4395 1.54	4233 1.55	4105 1.55	4018 1.55	25	32	43
800	4947 1.56	4718 1.57	4521 1.57	4352 1.58	4219 1.59	4128 1.59	25	33	45
825	5089 1.59	4852 2.00	4647 2.01	4472 2.02	4333 2.02	4239 2.02	26	34	46

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 2 %	ΔFUEL = + 4.5 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-003-190

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. LANDING WEIGHT = 50000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
825	5089 1.59	4852 2.00	4647 2.01	4472 2.02	4333 2.02	4239 2.02	26	34	46
850	5232 2.03	4986 2.03	4774 2.04	4592 2.05	4447 2.05	4350 2.05	27	35	47
875	5375 2.06	5120 2.07	4900 2.07	4711 2.08	4562 2.09	4461 2.09	27	35	49
900	5518 2.09	5255 2.10	5027 2.11	4831 2.12	4677 2.12	4572 2.12	28	36	50
925	5661 2.12	5389 2.13	5154 2.14	4951 2.15	4791 2.15	4683 2.15	28	37	51
950	5805 2.16	5524 2.16	5281 2.17	5072 2.18	4906 2.19	4795 2.19	29	38	53
975	5948 2.19	5658 2.20	5408 2.21	5192 2.22	5021 2.22	4906 2.22	30	39	54
1000	6091 2.22	5793 2.23	5535 2.24	5313 2.25	5137 2.25	5018 2.25	30	40	56
1025	6234 2.25	5928 2.26	5662 2.27	5433 2.28	5252 2.29	5130 2.29	31	41	57
1050	6378 2.29	6062 2.30	5790 2.31	5554 2.32	5368 2.32	5242 2.32	32	41	58
1075	6521 2.32	6197 2.33	5917 2.34	5675 2.35	5483 2.36	5355 2.36	32	42	60
1100	6665 2.35	6332 2.36	6045 2.37	5796 2.38	5599 2.39	5467 2.39	33	43	61
1125	6809 2.38	6467 2.39	6172 2.41	5917 2.42	5715 2.42	5580 2.42	34	44	63
1150	6952 2.42	6603 2.43	6300 2.44	6038 2.45	5831 2.46	5693 2.46	34	45	64
1175	7096 2.45	6738 2.46	6428 2.47	6160 2.48	5948 2.49	5806 2.49	35	46	65
1200	7240 2.48	6873 2.49	6556 2.50	6281 2.52	6064 2.52	5920 2.52	36	47	67
1225	7384 2.51	7009 2.53	6684 2.54	6403 2.55	6180 2.56	6033 2.56	36	48	68
1250	7528 2.55	7144 2.56	6812 2.57	6524 2.58	6297 2.59	6147 2.59	37	48	70
1275	7672 2.58	7280 2.59	6941 3.00	6646 3.02	6414 3.02	6261 3.02	38	49	71
1300	7817 3.01	7415 3.02	7069 3.04	6768 3.05	6531 3.06	6375 3.06	38	50	73
1325	7961 3.04	7551 3.06	7197 3.07	6890 3.08	6648 3.09	6489 3.09	39	51	74
1350	8105 3.08	7687 3.09	7326 3.10	7012 3.12	6765 3.13	6603 3.13	40	52	76
1375	8250 3.11	7823 3.12	7455 3.14	7134 3.15	6882 3.16	6718 3.16	40	53	78
1400	8394 3.14	7959 3.16	7583 3.17	7256 3.18	6999 3.19	6832 3.19	41	54	79
1425	8539 3.17	8095 3.19	7712 3.20	7379 3.22	7117 3.23	6947 3.23	42	55	81
1450	8684 3.21	8231 3.22	7841 3.24	7501 3.25	7234 3.26	7062 3.26	42	56	82

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 2 %	ΔFUEL = + 4.5 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-004-190

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. LANDING WEIGHT = 50000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
1450	8684 3.21	8231 3.22	7841 3.24	7501 3.25	7234 3.26	7062 3.26	42	56	82
1475	8828 3.24	8368 3.25	7970 3.27	7624 3.28	7352 3.29	7177 3.29	43	57	84
1500	8973 3.27	8504 3.29	8099 3.30	7747 3.32	7470 3.33	7293 3.33	44	58	86
1525	9118 3.30	8640 3.32	8229 3.34	7869 3.35	7588 3.36	7408 3.36	45	59	87
1550	9263 3.34	8777 3.35	8358 3.37	7992 3.38	7706 3.39	7524 3.39	45	60	89
1575	9408 3.37	8914 3.39	8488 3.40	8115 3.42	7824 3.43	7640 3.43	46	61	90
1600	9554 3.40	9050 3.42	8617 3.44	8239 3.45	7943 3.46	7756 3.46	47	62	92
1625	9699 3.44	9187 3.45	8747 3.47	8362 3.49	8061 3.49	7872 3.49	48	63	94
1650	9844 3.47	9324 3.48	8877 3.50	8485 3.52	8180 3.53	7988 3.53	48	64	95
1675	9990 3.50	9461 3.52	9007 3.53	8609 3.55	8299 3.56	8105 3.56	49	65	97
1700	10135 3.53	9598 3.55	9137 3.57	8733 3.59	8418 4.00	8222 4.00	50	66	99
1725	10281 3.57	9736 3.58	9267 4.00	8857 4.02	8537 4.03	8339 4.03	50	67	100
1750	10426 4.00	9873 4.02	9397 4.03	8981 4.05	8656 4.06	8456 4.06	51	68	102
1775	10572 4.03	10010 4.05	9528 4.07	9105 4.09	8776 4.10	8573 4.10	52	69	104
1800	10718 4.06	10148 4.08	9658 4.10	9229 4.12	8895 4.13	8691 4.13	53	70	106
1825	10864 4.10	10285 4.11	9789 4.13	9353 4.15	9015 4.16	8809 4.16	53	71	108
1850	11010 4.13	10423 4.15	9919 4.17	9477 4.19	9135 4.20	8927 4.20	54	72	109
1875	11156 4.16	10561 4.18	10050 4.20	9602 4.22	9255 4.23	9045 4.23	55	73	111
1900	11303 4.19	10698 4.21	10181 4.23	9727 4.25	9375 4.26	9163 4.26	56	74	113
1925	11449 4.23	10836 4.25	10312 4.27	9851 4.29	9495 4.30	9282 4.30	56	75	115
1950	11596 4.26	10974 4.28	10443 4.30	9976 4.32	9615 4.33	9401 4.33	57	76	117
1975	11742 4.29	11113 4.31	10574 4.33	10101 4.35	9736 4.36	9519 4.36	58	77	119
2000	11889 4.32	11251 4.34	10705 4.37	10226 4.39	9856 4.40	9638 4.40	59	78	120
2025	12036 4.36	11390 4.38	10837 4.40	10351 4.42	9977 4.43	9758 4.43	59	79	122
2050	12183 4.39	11529 4.41	10968 4.43	10477 4.45	10098 4.47	9877 4.47	60	80	124
2075	12330 4.42	11667 4.44	11100 4.46	10602 4.49	10219 4.50	9997 4.50	61	82	126

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 2 %	ΔFUEL = + 4.5 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-005-190

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. LANDING WEIGHT = 50000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
2075	12330 4.42	11667 4.44	11100 4.46	10602 4.49	10219 4.50	9997 4.50	61	82	126
2100	12477 4.45	11806 4.48	11231 4.50	10728 4.52	10340 4.53	10117 4.53	62	83	128
2125	12624 4.49	11946 4.51	11363 4.53	10853 4.55	10462 4.57	10237 4.57	62	84	130
2150	12771 4.52	12085 4.54	11495 4.56	10979 4.59	10583 5.00	10357 5.00	63	85	132
2175	12918 4.55	12224 4.57	11627 5.00	11105 5.02	10705 5.03	10477 5.03	64	86	133
2200	13066 4.58	12363 5.01	11759 5.03	11231 5.05	10826 5.07	10598 5.07	65	87	135
2225	13213 5.02	12503 5.04	11891 5.06	11358 5.09	10948 5.10	10718 5.10	66	88	137
2250	13361 5.05	12642 5.07	12024 5.10	11484 5.12	11070 5.13	10839 5.13	66	89	139
2275	13509 5.08	12782 5.11	12156 5.13	11611 5.15	11192 5.17	10960 5.17	67	90	141
2300	13656 5.12	12922 5.14	12289 5.16	11738 5.19	11315 5.20	11082 5.20	68	91	143
2325	13804 5.15	13062 5.17	12421 5.20	11865 5.22	11438 5.24	11203 5.24	69	93	145
2350	13952 5.18	13202 5.20	12554 5.23	11992 5.25	11562 5.27	11325 5.27	70	94	147
2375	14100 5.21	13342 5.24	12687 5.26	12119 5.29	11686 5.30	11448 5.30	71	95	149
2400	14248 5.25	13482 5.27	12820 5.30	12246 5.32	11810 5.34	11572 5.34	71	96	151
2425	14397 5.28	13622 5.30	12953 5.33	12374 5.36	11934 5.37	11696 5.37	72	97	153
2450	14545 5.31	13763 5.34	13086 5.36	12501 5.39	12058 5.40	11820 5.40	73	98	155
2475	14694 5.34	13903 5.37	13219 5.40	12629 5.42	12182 5.44	11944 5.44	74	100	156
2500	14842 5.38	14044 5.40	13352 5.43	12757 5.46	12307 5.47	12069 5.47	75	101	158
2525	14991 5.41	14185 5.43	13486 5.46	12885 5.49	12432 5.50	12194 5.50	76	102	160
2550	15140 5.44	14326 5.47	13619 5.49	13013 5.52	12556 5.54	12319 5.54	76	103	162
2575	15288 5.47	14467 5.50	13753 5.53	13141 5.56	12681 5.57	12445 5.57	77	105	164
2600	15437 5.51	14608 5.53	13887 5.56	13269 5.59	12807 6.00	12570 6.00	78	106	166
2625	15586 5.54	14749 5.57	14021 5.59	13398 6.02	12932 6.04	12696 6.04	79	107	169
2650	15735 5.57	14890 6.00	14155 6.03	13526 6.06	13058 6.07	12823 6.07	80	108	171
2675	15885 6.00	15032 6.03	14289 6.06	13655 6.09	13183 6.11	12949 6.11	81	110	173
2700	16034 6.04	15173 6.06	14423 6.09	13784 6.12	13309 6.14	13076 6.14	82	111	175

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = − 0.5 %	ΔFUEL = + 2 %	ΔFUEL = + 4.5 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-006-190

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. LANDING WEIGHT = 50000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	FUEL CONSUMED (KG) TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
2700	16034 6.04	15173 6.06	14423 6.09	13784 6.12	13309 6.14	13076 6.14	82	111	175
2725	16183 6.07	15315 6.10	14558 6.13	13913 6.16	13435 6.17	13203 6.17	83	112	177
2750	16333 6.10	15457 6.13	14692 6.16	14042 6.19	13562 6.21	13330 6.21	83	113	179
2775	16482 6.13	15599 6.16	14827 6.19	14171 6.22	13688 6.24	13457 6.24	84	115	181
2800	16632 6.17	15741 6.20	14962 6.23	14301 6.26	13815 6.27	13585 6.27	85	116	184
2825	16782 6.20	15883 6.23	15097 6.26	14431 6.29	13942 6.31	13713 6.31	86	117	186
2850	16931 6.23	16025 6.26	15232 6.29	14561 6.32	14069 6.34	13839 6.34*	87	119	188
2875	17081 6.26	16167 6.29	15367 6.33	14691 6.36	14196 6.37	13969 6.38*	88	120	190
2900	17232 6.30	16310 6.33	15502 6.36	14821 6.39	14323 6.41	14099 6.41*	89	121	192
2925	17382 6.33	16452 6.36	15637 6.39	14951 6.42	14451 6.44	14229 6.44*	90	123	195
2950	17533 6.36	16595 6.39	15773 6.43	15081 6.46	14579 6.48	14359 6.48*	91	124	197
2975	17684 6.40	16737 6.43	15908 6.46	15212 6.49	14707 6.51	14490 6.51*	92	126	199
3000	17835 6.43	16880 6.46	16044 6.49	15342 6.52	14835 6.54	14620 6.54*	92	127	201
3025	17986 6.46	17023 6.49	16180 6.52	15473 6.56	14964 6.58	14751 6.58*	93	128	204
3050	18137 6.49	17166 6.52	16316 6.56	15604 6.59	15093 7.01	14882 7.01*	94	130	206
3075	18288 6.53	17310 6.56	16452 6.59	15735 7.02	15221 7.04	15014 7.04*	95	131	208
3100	18440 6.56	17453 6.59	16588 7.02	15866 7.06	15350 7.08	15145 7.08*	96	132	211

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 2 %	ΔFUEL = + 4.5 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-007-190

FLIGHT PLANNING AT LONG RANGE SPEED

FLIGHT PLANNING LRC

Ident.: PER-FPL-FLP-QFP-50-00001831.0073001 / 17 MAR 11
Applicable to: ALL

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. LANDING WEIGHT = 50000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
200	1503 0.39	1501 0.39	1502 0.39	1504 0.38	1507 0.38		15	16	16
225	1629 0.43	1621 0.43	1618 0.42	1616 0.42	1617 0.42	1619 0.41	16	17	17
250	1754 0.47	1742 0.47	1734 0.46	1729 0.45	1726 0.45	1727 0.45	17	18	19
275	1880 0.51	1862 0.50	1851 0.50	1842 0.49	1836 0.48	1834 0.48	18	20	20
300	2006 0.54	1983 0.54	1968 0.53	1955 0.53	1946 0.52	1942 0.52	19	21	22
325	2132 0.58	2104 0.58	2085 0.57	2069 0.56	2057 0.55	2049 0.55	20	22	23
350	2258 1.02	2225 1.02	2202 1.01	2182 1.00	2167 0.59	2157 0.58	22	24	25
375	2384 1.06	2346 1.05	2319 1.04	2296 1.03	2278 1.02	2265 1.02	23	25	26
400	2511 1.10	2468 1.09	2436 1.08	2410 1.07	2389 1.06	2374 1.05	24	26	28
425	2638 1.13	2589 1.13	2554 1.12	2524 1.10	2500 1.09	2482 1.08	25	28	29
450	2764 1.17	2711 1.17	2672 1.15	2638 1.14	2611 1.13	2591 1.12	26	29	31
475	2891 1.21	2832 1.20	2790 1.19	2753 1.18	2722 1.16	2699 1.15	27	30	32
500	3018 1.25	2954 1.24	2908 1.23	2867 1.21	2833 1.20	2808 1.18	29	32	34
525	3145 1.29	3076 1.28	3026 1.26	2982 1.25	2945 1.23	2917 1.22	30	33	35
550	3273 1.32	3199 1.32	3144 1.30	3097 1.28	3057 1.27	3026 1.25	31	34	37
575	3400 1.36	3321 1.35	3263 1.34	3212 1.32	3168 1.30	3136 1.29	32	36	38
600	3528 1.40	3443 1.39	3381 1.37	3327 1.35	3280 1.33	3245 1.32	33	37	40
625	3655 1.44	3566 1.43	3500 1.41	3442 1.39	3393 1.37	3355 1.35	35	39	41
650	3783 1.47	3689 1.47	3619 1.45	3558 1.42	3505 1.40	3465 1.39	36	40	43
675	3911 1.51	3812 1.50	3738 1.48	3673 1.46	3617 1.44	3575 1.42	37	41	45
700	4039 1.55	3935 1.54	3857 1.52	3789 1.49	3730 1.47	3685 1.45	38	43	46
725	4167 1.59	4058 1.58	3977 1.56	3905 1.53	3843 1.51	3795 1.49	40	44	48
750	4296 2.02	4182 2.02	4096 1.59	4021 1.57	3956 1.54	3906 1.52	41	45	49
775	4424 2.06	4305 2.05	4216 2.03	4137 2.00	4069 1.57	4016 1.55	42	47	51
800	4553 2.10	4429 2.09	4336 2.06	4254 2.04	4182 2.01	4127 1.59	43	48	52
825	4682 2.14	4553 2.13	4456 2.10	4370 2.07	4295 2.04	4238 2.02	45	50	54

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 4 %	ΔFUEL = + 7 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-008-190

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. LANDING WEIGHT = 50000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
825	4682 2.14	4553 2.13	4456 2.10	4370 2.07	4295 2.04	4238 2.02	45	50	54
850	4811 2.17	4677 2.17	4576 2.14	4487 2.11	4409 2.08	4349 2.05	46	51	56
875	4940 2.21	4801 2.20	4697 2.17	4604 2.14	4523 2.11	4460 2.09	47	52	57
900	5069 2.25	4925 2.24	4817 2.21	4721 2.18	4637 2.14	4572 2.12	48	54	59
925	5198 2.29	5050 2.28	4938 2.24	4838 2.21	4751 2.18	4684 2.15	50	55	60
950	5328 2.32	5175 2.31	5059 2.28	4956 2.25	4865 2.21	4795 2.19	51	57	62
975	5457 2.36	5300 2.35	5180 2.32	5073 2.28	4979 2.25	4907 2.22	52	58	64
1000	5587 2.40	5425 2.39	5301 2.35	5191 2.32	5094 2.28	5019 2.25	53	60	65
1025	5717 2.44	5550 2.42	5422 2.39	5309 2.35	5209 2.31	5132 2.29	55	61	67
1050	5847 2.47	5676 2.46	5544 2.42	5427 2.39	5323 2.35	5245 2.32	56	62	68
1075	5977 2.51	5801 2.50	5666 2.46	5545 2.42	5439 2.38	5358 2.35	57	64	70
1100	6107 2.55	5927 2.54	5787 2.50	5663 2.46	5554 2.42	5471 2.39	58	65	72
1125	6237 2.59	6053 2.57	5909 2.53	5782 2.49	5669 2.45	5584 2.42	60	67	73
1150	6368 3.03	6179 3.01	6031 2.57	5900 2.52	5785 2.48	5698 2.45	61	68	75
1175	6498 3.06	6306 3.05	6154 3.00	6019 2.56	5901 2.52	5811 2.49	62	70	77
1200	6629 3.10	6432 3.08	6276 3.04	6138 2.59	6016 2.55	5925 2.52	64	71	78
1225	6760 3.14	6559 3.12	6399 3.07	6257 3.03	6133 2.59	6039 2.55	65	73	80
1250	6891 3.18	6686 3.16	6522 3.11	6376 3.06	6249 3.02	6153 2.59	66	74	82
1275	7022 3.21	6812 3.19	6644 3.14	6496 3.10	6365 3.05	6268 3.02	68	75	83
1300	7153 3.25	6940 3.23	6768 3.18	6615 3.13	6482 3.09	6382 3.05	69	77	85
1325	7284 3.29	7067 3.26	6891 3.22	6735 3.17	6598 3.12	6497 3.09	70	78	87
1350	7416 3.33	7194 3.30	7014 3.25	6855 3.20	6715 3.15	6612 3.12	71	80	89
1375	7548 3.36	7322 3.34	7138 3.29	6975 3.24	6832 3.19	6727 3.15	73	81	90
1400	7679 3.40	7450 3.37	7261 3.32	7095 3.27	6950 3.22	6843 3.19	74	83	92
1425	7811 3.44	7578 3.41	7385 3.36	7215 3.31	7067 3.26	6958 3.22	75	84	94
1450	7943 3.48	7706 3.45	7509 3.39	7336 3.34	7185 3.29	7074 3.25	77	86	96

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 4 %	ΔFUEL = + 7 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-009-190

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. LANDING WEIGHT = 50000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 33.0 %	FUEL CONSUMED (KG) TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
1450	7943 3.48	7706 3.45	7509 3.39	7336 3.34	7185 3.29	7074 3.25	77	86	96
1475	8075 3.51	7835 3.48	7634 3.43	7456 3.37	7302 3.32	7190 3.29	78	87	97
1500	8208 3.55	7963 3.52	7758 3.46	7577 3.41	7420 3.36	7306 3.32	79	89	99
1525	8340 3.59	8092 3.56	7883 3.50	7698 3.44	7538 3.39	7422 3.35	81	90	101
1550	8473 4.03	8221 3.59	8007 3.53	7820 3.48	7657 3.42	7539 3.39	82	92	103
1575	8606 4.06	8350 4.03	8132 3.57	7941 3.51	7775 3.46	7656 3.42	83	93	104
1600	8739 4.10	8479 4.06	8257 4.00	8062 3.55	7894 3.49	7773 3.45	85	94	106
1625	8872 4.14	8609 4.10	8383 4.04	8184 3.58	8013 3.52	7890 3.49	86	96	108
1650	9005 4.18	8738 4.14	8508 4.07	8306 4.01	8131 3.56	8007 3.52	88	97	110
1675	9139 4.21	8868 4.17	8634 4.11	8428 4.05	8251 3.59	8124 3.55	89	99	112
1700	9272 4.25	8998 4.21	8760 4.14	8551 4.08	8370 4.02	8242 3.59	90	100	114
1725	9406 4.29	9129 4.24	8886 4.18	8673 4.12	8490 4.06	8361 4.02	92	102	115
1750	9539 4.33	9259 4.28	9012 4.21	8796 4.15	8610 4.09	8479 4.05	93	103	117
1775	9673 4.36	9389 4.32	9138 4.25	8919 4.18	8730 4.12	8597 4.09	95	105	119
1800	9808 4.40	9520 4.35	9265 4.28	9042 4.22	8850 4.16	8716 4.12	96	106	121
1825	9942 4.44	9651 4.39	9392 4.32	9165 4.25	8970 4.19	8835 4.15	97	108	123
1850	10076 4.48	9782 4.42	9519 4.35	9288 4.29	9091 4.22	8954 4.19	99	109	125
1875	10211 4.51	9914 4.46	9646 4.39	9412 4.32	9211 4.26	9074 4.22	100	111	127
1900	10345 4.55	10045 4.50	9773 4.42	9536 4.35	9332 4.29	9193 4.25	102	112	129
1925	10480 4.59	10177 4.53	9900 4.46	9659 4.39	9453 4.32	9313 4.29	103	114	131
1950	10615 5.03	10309 4.57	10028 4.49	9784 4.42	9575 4.36	9433 4.32	105	116	132
1975	10750 5.06	10441 5.00	10156 4.53	9908 4.46	9696 4.39	9553 4.35	106	117	134
2000	10885 5.10	10573 5.04	10284 4.56	10032 4.49	9818 4.42	9673 4.39	108	119	136
2025	11021 5.14	10706 5.07	10412 4.59	10157 4.52	9940 4.46	9794 4.42	109	120	138
2050	11158 5.17	10838 5.11	10540 5.03	10282 4.56	10062 4.49	9915 4.45	111	122	140
2075	11295 5.21	10971 5.14	10669 5.06	10407 4.59	10184 4.52	10036 4.49	112	123	142

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 4 %	ΔFUEL = + 7 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7801 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-010-190

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. LANDING WEIGHT = 50000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 290	310	330	350	370	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL290 FL310	FL330 FL350	FL370 FL390
2075	11295 5.21	10971 5.14	10669 5.06	10407 4.59	10184 4.52	10036 4.49	112	123	142
2100	11432 5.25	11104 5.18	10797 5.10	10532 5.02	10306 4.55	10157 4.52	113	125	144
2125	11569 5.28	11236 5.22	10926 5.13	10657 5.06	10429 4.59	10279 4.55	115	126	146
2150	11706 5.32	11369 5.25	11055 5.17	10783 5.09	10552 5.02	10400 4.58	116	128	148
2175	11844 5.36	11502 5.29	11185 5.20	10908 5.12	10675 5.05	10522 5.02	118	130	150
2200	11981 5.39	11636 5.32	11314 5.24	11034 5.16	10798 5.09	10644 5.05	119	131	152
2225	12119 5.43	11769 5.36	11444 5.27	11160 5.19	10921 5.12	10767 5.08	121	133	154
2250	12257 5.47	11903 5.39	11574 5.30	11287 5.22	11045 5.15	10889 5.12	123	134	156
2275	12396 5.50	12037 5.43	11704 5.34	11413 5.26	11169 5.18	11012 5.15	124	136	158
2300	12534 5.54	12170 5.46	11834 5.37	11539 5.29	11293 5.22	11135 5.18	126	137	160
2325	12673 5.57	12305 5.50	11964 5.41	11666 5.33	11417 5.25	11259 5.22	127	139	162
2350	12811 6.01	12439 5.53	12095 5.44	11793 5.36	11541 5.28	11383 5.25	129	141	164
2375	12950 6.05	12573 5.57	12226 5.47	11920 5.39	11665 5.32	11507 5.28	130	142	166
2400	13090 6.08	12708 6.00	12357 5.51	12047 5.43	11790 5.35	11631 5.32	132	144	168
2425	13229 6.12	12843 6.04	12488 5.54	12174 5.46	11914 5.38	11756 5.35	133	145	170
2450	13369 6.16	12978 6.07	12619 5.58	12302 5.49	12039 5.42	11881 5.38	135	147	172
2475	13508 6.19	13113 6.11	12751 6.01	12430 5.53	12164 5.45	12006 5.42	136	149	175
2500	13648 6.23	13249 6.14	12882 6.04	12558 5.56	12289 5.48	12131 5.45	138	150	177
2525	13788 6.26	13384 6.18	13014 6.08	12686 5.59	12415 5.52	12257 5.48	139	152	179
2550	13929 6.30	13520 6.21	13147 6.11	12814 6.03	12540 5.55	12382 5.52	141	154	181
2575	14069 6.33	13656 6.25	13279 6.15	12943 6.06	12666 5.58	12508 5.55	142	155	183
2600	14210 6.37	13792 6.28	13411 6.18	13071 6.09	12792 6.02	12635 5.58	144	157	185
2625	14351 6.41	13929 6.32	13544 6.21	13200 6.13	12918 6.05	12761 6.02	145	158	187
2650	14492 6.44	14065 6.35	13677 6.25	13329 6.16	13045 6.08	12888 6.05	147	160	189
2675	14634 6.48	14202 6.39	13810 6.28	13459 6.19	13171 6.12	13015 6.08	148	162	191
2700	14775 6.51	14339 6.42	13944 6.32	13588 6.22	13298 6.15	13142 6.12	150	163	194

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 4 %	ΔFUEL = + 7 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-011-190

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 110 KG (6MIN)									
REF. LANDING WEIGHT = 50000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG) TIME (H.MIN)			
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2700	14775 6.51	14339 6.42	13944 6.32	13588 6.22	13298 6.15	13142 6.12	150	163	194
2725	14917 6.55	14477 6.46	14077 6.35	13718 6.26	13425 6.18	13270 6.15	151	165	196
2750	15059 6.59	14614 6.49	14211 6.38	13848 6.29	13552 6.22	13398 6.18	153	166	198
2775	15201 7.02	14752 6.52	14345 6.42	13978 6.32	13680 6.25	13526 6.22	155	168	200
2800	15344 7.06	14889 6.56	14479 6.45	14108 6.36	13807 6.28	13654 6.25	156	170	202
2825	15486 7.09	15028 6.59	14614 6.48	14238 6.39	13935 6.31	13784 6.29*	158	171	204
2850	15629 7.13	15166 7.03	14749 6.52	14369 6.42	14063 6.35	13914 6.32*	159	173	207
2875	15772 7.16	15304 7.06	14884 6.55	14500 6.46	14191 6.38	14044 6.35*	161	175	209
2900	15915 7.20	15443 7.10	15019 6.58	14632 6.49	14320 6.41	14174 6.39*	163	176	211
2925	16059 7.23	15582 7.13	15154 7.02	14763 6.52	14449 6.45	14305 6.42*	164	178	213
2950	16202 7.27	15721 7.17	15290 7.05	14895 6.55	14578 6.48	14435 6.45*	166	180	216
2975	16346 7.31	15860 7.20	15425 7.08	15026 6.59	14707 6.51	14566 6.49*	168	181	218
3000	16490 7.34	15999 7.23	15561 7.12	15158 7.02	14837 6.55	14697 6.52*	169	183	220
3025	16635 7.38	16139 7.27	15698 7.15	15291 7.05	14967 6.58	14828 6.55*	171	184	222
3050	16779 7.41	16279 7.30	15834 7.18	15423 7.08	15096 7.01	14960 6.59*	172	186	225
3075	16924 7.45	16419 7.34	15971 7.22	15556 7.12	15227 7.04	15091 7.02*	174	188	227
3100	17069 7.48	16559 7.37	16107 7.25	15689 7.15	15357 7.08	15223 7.05*	176	190	229
LOW AIR CONDITIONING ΔFUEL = – 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 4 %			TOTAL ANTI ICE ON ΔFUEL = + 7 %			

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-N0-02-05-40-012-190

ALL ENGINES OPERATIVE

GENERAL

Ident.: PER-FPL-FLP-ALN-20-00001832.0013001 / 25 FEB 14
Applicable to: ALL

The alternate planning tables enable the flight crew to determine the fuel consumption and time required to cover a given air distance from go-around at destination airport to landing at alternate airport.

These tables are established for:
- Go-around: 80 kg or 180 lb
- Climb profile: 250 kt/300 kt/M .78
- Long range speed
- Descent profile: M .78/300 kt/250 kt
- Approach and landing at alternate airport: 60 kg or 140 lb (4 min)
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

Following tables have been calculated using databases for CFM 56–5–B /P SAC. If the engines fitted on the aircraft are not /P or /3, the fuel consumption has to be increased by 3 %.

<u>Note:</u> *1. In the tables, the asterisk (*) means that a step climb of 4 000 ft must be flown to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
3. For each degree Celsius above ISA temperature apply a fuel correction of
0.015 (kg/°C/NM) × ΔISA (°C) × Air distance (NM)
or 0.033 (lb/°C/NM) × ΔISA (°C) × Air distance (NM)

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

Ident.: PER-FPL-FLP-ALN-20-00001834.0001001 / 28 FEB 11
Applicable to: ALL

The alternate planning tables are based on a reference landing weight at alternate.
The fuel consumption must be corrected when the landing weight is different from the reference landing weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1 000 kg or 1 000 lb below (or above) the reference weight.

ALTERNATE PLANNING ISA

Ident.: PER-FPL-FLP-ALN-20-00001833.0021001 / 02 MAR 11
Applicable to: ALL

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT
GO-AROUND : 100 KG - CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE
DESCENT : M.78/300KT/250KT - VMC PROCEDURE : 60 KG (4MIN)

REF. LDG. WT AT ALTERNATE = 50000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 100	120	140	160	180	200	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL120	FL140 FL160	FL180 FL200
20									
40	471 0.12						2		
60	618 0.17	602 0.16	603 0.16	608 0.16			4	3	
80	765 0.21	745 0.20	740 0.20	738 0.19	740 0.19	745 0.19	5	4	5
100	913 0.25	887 0.24	877 0.23	868 0.23	864 0.23	864 0.22	6	5	6
120	1061 0.30	1030 0.28	1014 0.27	999 0.27	989 0.26	983 0.26	7	6	6
140	1209 0.34	1172 0.32	1151 0.31	1130 0.30	1114 0.30	1102 0.29	9	7	7
160	1358 0.38	1315 0.36	1288 0.34	1260 0.34	1238 0.33	1221 0.33	10	8	8
180	1506 0.43	1458 0.40	1425 0.38	1391 0.37	1363 0.36	1340 0.36	11	9	9
200	1655 0.47	1602 0.44	1562 0.42	1522 0.41	1489 0.40	1459 0.40	13	10	10
220	1804 0.51	1745 0.48	1700 0.46	1653 0.44	1614 0.43	1579 0.43	14	11	11
240	1953 0.55	1889 0.52	1837 0.49	1785 0.48	1739 0.47	1698 0.47	15	12	12
260	2103 1.00	2033 0.56	1975 0.53	1916 0.52	1865 0.50	1818 0.50	16	13	13
280	2252 1.04	2177 1.00	2113 0.57	2048 0.55	1990 0.54	1938 0.53	18	14	14
300	2402 1.08	2321 1.04	2251 1.00	2179 0.59	2116 0.57	2057 0.57	19	15	15
320	2552 1.13	2466 1.07	2389 1.04	2311 1.02	2242 1.01	2177 1.00	20	16	15
340	2702 1.17	2611 1.11	2528 1.08	2443 1.06	2368 1.04	2297 1.04	21	17	16
360	2853 1.21	2755 1.15	2666 1.11	2575 1.09	2494 1.08	2417 1.07	23	18	17
380	3004 1.25	2901 1.19	2805 1.15	2708 1.13	2620 1.11	2537 1.11	24	19	18
400	3155 1.30	3046 1.22	2943 1.18	2840 1.16	2746 1.15	2657 1.14	25	20	19
420	3306 1.34	3191 1.26	3082 1.22	2972 1.20	2873 1.18	2778 1.18	26	21	20
440	3457 1.38	3337 1.30	3221 1.26	3105 1.23	2999 1.22	2898 1.21	28	22	21
460	3608 1.42	3483 1.33	3360 1.29	3238 1.27	3126 1.25	3019 1.25	29	23	22
480	3760 1.47	3629 1.37	3500 1.33	3370 1.30	3253 1.28	3139 1.28	30	24	23
500	3912 1.51	3775 1.41	3639 1.37	3503 1.34	3379 1.32	3260 1.32	31	25	23

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 4 %	ΔFUEL = + 7 %

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7801 .00200 110 0300300 50 0 100100 30 30 18590 FCOM-N0-02-05-50-002-190

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT
GO-AROUND : 100 KG - CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE
DESCENT : M.78/300KT/250KT - VMC PROCEDURE : 60 KG (4MIN)

REF. LDG. WT AT ALTERNATE = 50000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 230	250	270	290	310	330	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL230 FL250	FL270 FL290	FL310 FL330
100	871 0.22						6		
120	983 0.25	988 0.25	997 0.24				7	8	
140	1095 0.29	1096 0.28	1100 0.28	1109 0.27			8	9	
160	1207 0.32	1203 0.31	1204 0.31	1209 0.30	1215 0.30	1221 0.30	9	10	10
180	1319 0.35	1311 0.35	1308 0.34	1309 0.33	1310 0.33	1314 0.33	10	11	11
200	1431 0.39	1419 0.38	1412 0.37	1409 0.36	1406 0.36	1406 0.36	11	12	12
220	1543 0.42	1527 0.41	1516 0.40	1509 0.39	1502 0.39	1499 0.39	12	13	13
240	1655 0.46	1635 0.45	1620 0.43	1609 0.42	1598 0.42	1592 0.42	13	14	14
260	1768 0.49	1743 0.48	1724 0.47	1709 0.45	1694 0.45	1685 0.44	14	15	15
280	1880 0.52	1852 0.51	1829 0.50	1810 0.49	1791 0.48	1778 0.47	15	15	16
300	1993 0.56	1960 0.54	1933 0.53	1910 0.52	1887 0.51	1871 0.50	16	16	17
320	2106 0.59	2069 0.58	2038 0.56	2011 0.55	1983 0.54	1964 0.53	17	17	18
340	2219 1.02	2178 1.01	2143 0.59	2111 0.58	2080 0.57	2058 0.56	18	18	19
360	2332 1.06	2286 1.04	2247 1.02	2212 1.01	2176 1.00	2151 0.59	19	19	20
380	2445 1.09	2395 1.07	2352 1.05	2313 1.04	2273 1.03	2245 1.02	20	20	21
400	2558 1.13	2504 1.11	2457 1.08	2414 1.07	2370 1.06	2338 1.05	21	21	22
420	2671 1.16	2614 1.14	2563 1.11	2515 1.10	2467 1.09	2432 1.08	22	22	23
440	2785 1.19	2723 1.17	2668 1.15	2616 1.13	2564 1.12	2526 1.11	23	23	24
460	2899 1.23	2832 1.20	2773 1.18	2717 1.16	2661 1.15	2620 1.14	24	24	26
480	3012 1.26	2942 1.24	2879 1.21	2818 1.19	2758 1.18	2714 1.17	25	25	27
500	3126 1.29	3051 1.27	2984 1.24	2920 1.22	2855 1.21	2808 1.20	27	26	28

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 4 %	Δ FUEL = + 7 %

FLIP23D A319-112 CFM56-5B6/P SA3520 03301.000010 8025300 .7801 .00200 60 0300300 50 0 100100 30 30 18590 FCOM-N0-02-05-50-003-190

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PERFORMANCE

CLIMB

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PER-CLB-GEN GENERAL

PER-CLB-CLT CLIMB TABLES

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GENERAL

Ident.: PER-CLB-GEN-00001982.0001001 / 15 FEB 11
Applicable to: ALL

Climb tables are established at MAX CLIMB THRUST with air conditioning in normal mode and anti ice OFF.

The climb speed profile is :
- 250 kt from 1 500 ft up to FL 100
- acceleration from 250 kt to 300 kt
- climb at 300 kt then M .78 up to selected altitude.

All charts are established with a center of gravity corresponding to 33 %.

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CLIMB - ISA +10

Ident.: PER-CLB-CLT-00001987.0067001 / 29 JUN 16
Applicable to: ALL

CLIMB - 250KT/300KT/M.78 - ALL ENGINES

MAX. CLIMB THRUST NORMAL AIR CONDITIONING ANTI ICE OFF	ISA+10 CG=33.0%	**FROM BRAKE RELEASE** **TIME (MIN)** **FUEL (KG)** **DISTANCE (NM)** **TAS (KT)**

FL	**WEIGHT AT BRAKE RELEASE (1000KG)**													
	52		**54**		**56**		**58**		**60**		**62**		**64**	
390	18	1364	19	1438	21	1518	22	1604	23	1699	25	1806	27	1927
	121	395	128	396	136	397	145	398	156	400	167	401	182	403
370	16	1276	17	1342	18	1411	19	1483	20	1560	21	1641	23	1729
	106	388	112	388	118	389	125	390	132	391	140	392	148	393
350	15	1203	16	1263	17	1325	17	1390	18	1458	19	1529	20	1604
	95	381	100	381	105	382	111	383	117	384	123	384	130	385
330	14	1136	14	1192	15	1249	16	1309	17	1371	17	1435	18	1502
	86	374	90	374	95	375	99	375	104	376	110	377	115	377
310	13	1071	13	1122	14	1175	15	1230	15	1287	16	1346	17	1407
	77	365	81	366	85	367	89	367	93	368	98	368	103	369
290	12	1001	12	1049	13	1098	13	1148	14	1200	14	1254	15	1310
	68	355	72	356	75	357	79	357	82	357	86	358	90	358
270	10	917	11	959	11	1004	12	1049	12	1096	13	1144	13	1193
	58	342	61	343	64	343	67	344	70	344	73	344	77	345
250	9	840	10	878	10	918	10	959	11	1001	11	1044	12	1089
	50	329	52	330	55	330	57	331	60	331	63	331	65	331
240	9	803	9	840	9	878	10	917	10	957	11	998	11	1040
	46	323	49	323	51	324	53	324	55	324	58	325	60	325
220	8	734	8	768	8	802	9	837	9	873	10	910	10	949
	40	310	42	311	43	311	45	311	47	312	49	312	52	312
200	7	669	7	700	7	731	8	763	8	795	8	829	9	863
	34	298	35	298	37	298	39	299	40	299	42	299	44	299
180	6	608	6	635	7	663	7	692	7	721	7	751	8	782
	29	284	30	285	31	285	33	286	34	286	36	286	37	286
160	5	549	6	573	6	599	6	624	6	651	7	678	7	706
	24	271	25	271	27	272	28	272	29	272	30	272	31	273
140	5	492	5	514	5	537	5	560	6	584	6	608	6	633

CORRECTIONS	**LOW AIR CONDITIONING**	**HIGH AIR CONDITIONING**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
FUEL	- 0.4 %	+ 2.2 %	+ 8.5 %	+ 16.5 %

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CLIMB - 250KT/300KT/M.78 - ALL ENGINES														
MAX. CLIMB THRUST NORMAL AIR CONDITIONING ANTI ICE OFF				ISA+10 CG=33.0%			FROM BRAKE RELEASE TIME (MIN) FUEL (KG) DISTANCE (NM) TAS (KT)							
FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	52		54		56		58		60		62		64	
	20	257	21	257	22	258	23	258	24	258	25	258	26	259
120	4	438	4	458	5	478	5	498	5	520	5	541	5	563
	17	242	18	242	18	242	19	243	20	243	21	243	22	243
100	3	350	3	366	4	382	4	398	4	415	4	433	4	451
	12	214	12	214	13	215	13	215	14	216	14	216	15	216
50	2	228	2	238	2	248	2	259	2	270	3	281	3	293
	6	177	6	177	7	178	7	178	7	178	8	179	8	179
15	1	142	1	148	1	155	2	161	2	168	2	175	2	183
	3	128	3	128	3	129	3	129	3	130	4	130	4	130

CORRECTIONS	LOW AIR CONDITIONING	HIGH AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
FUEL	- 0.4 %	+ 2.2 %	+ 8.5 %	+ 16.5 %

CLIMB - 250KT/300KT/M.78 - ALL ENGINES														
MAX. CLIMB THRUST NORMAL AIR CONDITIONING ANTI ICE OFF				ISA+10 CG=33.0%			FROM BRAKE RELEASE TIME (MIN) FUEL (KG) DISTANCE (NM) TAS (KT)							
FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	66		68		70		72		74		76		78	
390														
370	24	1825	26	1931	27	2049								
	158	395	169	396	182	398								
350	21	1683	22	1768	24	1859	25	1958	26	2068	28	2191	30	2331
	137	386	144	387	153	389	162	390	173	392	185	394	200	397
330	19	1572	20	1646	21	1724	22	1807	23	1896	25	1993	26	2097
	121	378	127	379	134	380	141	381	149	383	157	384	167	386
310	17	1471	18	1537	19	1606	20	1680	21	1757	22	1839	23	1927
	107	369	113	370	118	371	124	372	130	373	137	374	144	376
290	16	1367	16	1427	17	1489	18	1555	19	1624	20	1696	21	1772
	94	359	99	360	103	360	108	361	113	362	119	363	125	364

CORRECTIONS	LOW AIR CONDITIONING	HIGH AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
FUEL	- 0.4 %	+ 2.5 %	+ 9.5 %	+ 18.5 %

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CLIMB - 250KT/300KT/M.78 - ALL ENGINES

MAX. CLIMB THRUST NORMAL AIR CONDITIONING ANTI ICE OFF	ISA+10 CG=33.0%	**FROM BRAKE RELEASE** **TIME (MIN)** / **FUEL (KG)** **DISTANCE (NM)** / **TAS (KT)**

FL	**WEIGHT AT BRAKE RELEASE (1000KG)** 66		68		70		72		74		76		78	
270	14	1244	15	1297	15	1352	16	1410	16	1469	17	1532	18	1597
	80	345	84	346	87	347	91	347	95	348	100	349	104	350
250	12	1135	13	1182	13	1231	14	1282	14	1334	15	1389	16	1447
	68	332	71	333	74	333	77	334	81	335	84	335	88	336
240	12	1084	12	1128	13	1175	13	1222	14	1272	14	1324	15	1378
	63	325	66	326	68	327	71	327	74	328	77	329	81	330
220	10	988	11	1028	11	1069	12	1112	12	1157	12	1203	13	1251
	54	313	56	313	58	314	61	314	63	315	66	316	68	317
200	9	898	10	934	10	972	10	1010	11	1050	11	1091	11	1134
	46	300	48	300	50	301	52	302	54	302	56	303	58	304
180	8	814	8	846	9	880	9	914	9	950	10	987	10	1025
	39	287	40	287	42	288	44	288	45	289	47	290	49	291
160	7	734	7	763	8	793	8	824	8	856	9	889	9	923
	33	273	34	274	35	274	37	275	38	276	40	277	41	277
140	6	659	7	685	7	712	7	739	7	767	8	797	8	827
	27	259	28	260	29	260	31	261	32	262	33	263	34	264
120	6	586	6	609	6	633	6	658	6	683	7	709	7	736
	23	244	23	245	24	245	25	246	26	247	27	248	28	249
100	4	469	5	487	5	507	5	526	5	546	5	567	5	589
	16	217	16	218	17	218	18	219	18	220	19	221	20	222
50	3	304	3	316	3	328	3	341	3	354	3	367	3	380
	8	180	9	181	9	182	9	183	10	184	10	185	10	187
15	2	190	2	198	2	205	2	213	2	221	2	229	2	237
	4	131	4	132	4	133	4	134	4	136	5	137	5	139

CORRECTIONS	**LOW AIR CONDITIONING**	**HIGH AIR CONDITIONING**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
FUEL	- 0.4 %	+ 2.5 %	+ 9.5 %	+ 18.5 %

CLIMB - ISA +20

Ident.: PER-CLB-CLT-00001989.0023001 / 15 FEB 11
Applicable to: ALL

CLIMB - 250KT/300KT/M.78

MAX. CLIMB THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+20 CG=33.0%	FROM BRAKE RELEASE TIME (MIN) FUEL (KG) DISTANCE (NM) TAS (KT)

FL	WEIGHT AT BRAKE RELEASE (1000KG) 52	54	56	58	60	62	64
390	24 1637 167 410	26 1739 179 411	28 1852 193 413				
370	21 1513 144 402	23 1598 153 403	24 1689 162 404	26 1786 173 405	27 1891 184 406	29 2007 197 408	31 2136 212 410
350	19 1419 128 395	21 1495 136 396	22 1575 143 397	23 1660 152 398	24 1750 161 399	26 1846 171 400	27 1950 181 401
330	18 1332 115 388	19 1402 121 388	20 1475 128 389	21 1552 135 390	22 1632 143 391	23 1717 151 392	24 1807 159 393
310	16 1247 102 379	17 1311 108 380	18 1377 114 381	19 1446 120 381	20 1519 126 382	21 1595 133 383	22 1675 140 384
290	15 1154 90 368	15 1212 94 369	16 1272 99 369	17 1335 104 370	18 1399 110 371	19 1467 115 371	20 1538 121 372
270	13 1045 75 354	13 1096 79 354	14 1149 83 355	15 1204 87 355	15 1261 92 356	16 1319 96 356	17 1380 101 357
250	11 949 64 340	12 994 67 340	12 1041 70 341	13 1090 74 341	14 1140 77 342	14 1192 81 342	15 1246 85 343
240	11 904 59 333	11 947 62 334	12 992 65 334	12 1038 68 334	13 1085 71 335	13 1134 74 335	14 1185 78 336
220	9 821 50 320	10 859 52 320	10 899 55 321	11 940 57 321	11 982 60 321	12 1026 63 322	12 1071 65 322
200	8 742 42 306	9 777 44 306	9 813 46 307	9 849 48 307	10 887 50 307	10 926 53 308	11 966 55 308
180	7 669 35 292	8 700 37 292	8 732 39 293	8 765 40 293	9 798 42 293	9 833 44 293	9 869 46 294
160	6 601 29 277	7 629 31 278	7 657 32 278	7 686 34 278	8 716 35 279	8 747 37 279	8 779 38 279
140	6 536 24 262	6 561 26 263	6 586 27 263	6 612 28 263	7 639 29 264	7 666 30 264	7 694 32 264
120	5 474 20 246	5 496 21 246	5 518 22 247	6 541 23 247	6 565 24 247	6 589 25 248	6 614 26 248
100	4 376 14 216	4 393 14 217	4 411 15 217	4 429 16 218	4 448 16 218	5 467 17 218	5 487 18 219
50	2 243 7 176	3 254 7 177	3 266 8 177	3 277 8 178	3 289 8 178	3 302 9 178	3 314 9 179
15	2 150 3 123	2 157 3 124	2 164 3 124	2 172 4 124	2 179 4 125	2 187 4 125	2 195 4 126

LOW AIR CONDITIONING	HIGH AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = − 0.4 %	ΔFUEL = + 0.4 %	ΔFUEL = + 1.5 %	ΔFUEL = + 2.5 %

11.0-08F0A319-112 CFM56-5B6/P SA21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 20 FCOM-N0-03-05-10-008-180

CLIMB - 250KT/300KT/M.78							
MAX. CLIMB THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA+20 CG=33.0%		FROM BRAKE RELEASE TIME (MIN) FUEL (KG) DISTANCE (NM) TAS (KT)		
	WEIGHT AT BRAKE RELEASE (1000KG)						
FL	66	68	70	72	74	76	78
390							
370							
350	29 2062 193 402	31 2186 207 404	33 2326 222 406	35 2487 241 408			
330	26 1903 169 394	27 2006 179 395	29 2117 190 397	31 2241 203 398	33 2378 217 400	35 2534 234 402	
310	23 1760 148 385	24 1849 156 386	26 1945 165 387	27 2048 174 388	29 2161 185 390	30 2283 197 391	32 2418 211 393
290	20 1612 127 373	21 1690 134 374	23 1773 141 375	24 1861 149 376	25 1956 157 377	26 2057 166 378	28 2166 176 379
270	18 1444 106 358	19 1511 111 358	19 1581 116 359	20 1655 122 360	21 1733 128 361	22 1817 135 362	23 1905 142 363
250	15 1302 88 343	16 1360 93 344	17 1421 97 344	18 1485 101 345	18 1552 106 346	19 1623 111 347	20 1697 117 347
240	14 1237 81 336	15 1292 85 337	16 1349 89 337	16 1409 93 338	17 1471 97 339	18 1537 102 339	19 1606 107 340
220	13 1117 68 322	13 1166 71 323	14 1216 75 323	14 1269 78 324	15 1323 81 325	16 1381 85 325	16 1441 89 326
200	11 1007 57 308	12 1050 60 309	12 1094 62 309	13 1141 65 310	13 1189 68 310	14 1239 71 311	14 1291 74 312
180	10 905 48 294	10 943 50 295	11 983 52 295	11 1024 54 296	11 1066 57 296	12 1110 59 297	12 1156 62 297
160	9 811 40 280	9 845 42 280	9 880 43 281	10 916 45 281	10 954 47 282	10 993 49 282	11 1033 51 283
140	7 723 33 265	8 753 34 265	8 784 36 265	8 816 37 266	9 850 39 266	9 884 41 267	9 920 42 268
120	7 640 27 248	7 667 28 249	7 694 29 249	7 722 31 250	8 752 32 250	8 782 33 251	8 814 35 252
100	5 508 19 219	5 529 19 220	5 551 20 220	6 573 21 221	6 596 22 222	6 621 23 222	6 646 24 223
50	3 327 10 180	3 341 10 180	3 355 10 181	4 369 11 182	4 384 11 182	4 399 12 183	4 414 12 184
15	2 203 4 127	2 211 4 127	2 220 5 128	2 229 5 129	2 238 5 130	2 247 5 131	2 257 5 132
LOW AIR CONDITIONING ΔFUEL = – 0.4 %		HIGH AIR CONDITIONING ΔFUEL = + 0.4 %		ENGINE ANTI ICE ON ΔFUEL = + 1.5 %		TOTAL ANTI ICE ON ΔFUEL = + 2.5 %	

11.0-08F0A319-112 CFM56-5B6/P SA21100000C5KG330 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .780 20 FCOM-N0-03-05-10-009-180

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PERFORMANCE

CRUISE

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DEFINITIONS

Ident.: PER-CRZ-ALT-10-00001995.0001001 / 22 MAR 17
Applicable to: ALL

- Optimum altitude : the altitude at which the airplane covers the maximum distance per kilogram (pound) of fuel (best specific range). It depends on the actual weight and the deviation from ISA.
- Maximum altitude is defined as the lower of:
  - maximum altitude at maximum cruise thrust in level flight and
  - maximum altitude at maximum climb thrust with 300 ft/min vertical speed.

Refer to QRH/PER-M Optimum & Maximum Altitudes (Paper Only) or use the performance application of FlySmart with Airbus.
The QRH charts are established for a center of gravity at 33 % MAC.
Maximum and optimum altitudes are given for different temperatures at long range speed and M 0.78.

<u>Note:</u> *1. The n = 1.3 g (n = 1.4 g) curve indicates the buffet margin.*
2. Definition of the maximum altitude in the FMGC is different (Refer to DSC-22_20-50-10 MCDU).

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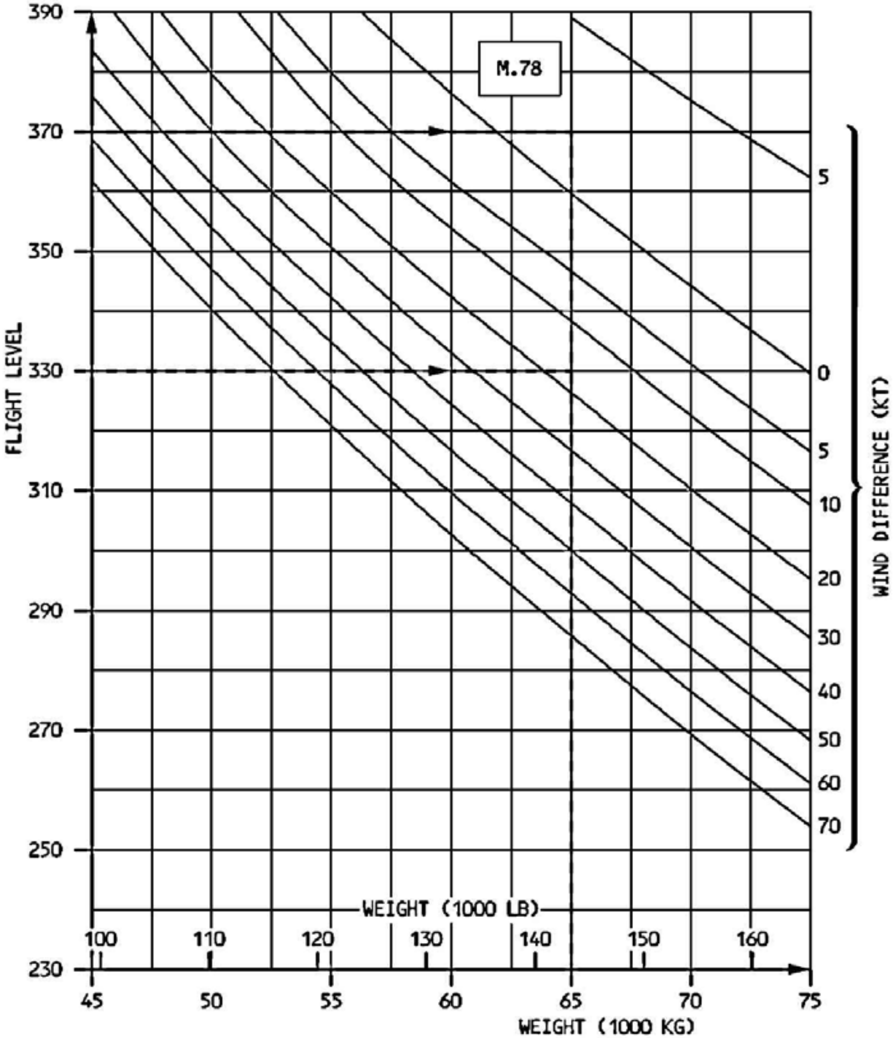
WIND ALTITUDE TRADE FOR CONSTANT SPECIFIC RANGE

Ident.: PER-CRZ-ALT-20-00001998.0014001 / 07 MAR 11
Applicable to: ALL



GIVEN : Weight : 65 000 kg (143 300 lb)

		Wind at FL 370 : 10 kt head
FIND	:	Minimum wind difference to descend to FL 330 : (17 - 2) = 15 kt
RESULTS	:	Descent to FL 330 may be considered provided the tail wind at this altitude is more than (15 - 10) = 5 kt.

GENERAL

Ident.: PER-CRZ-CRT-10-00004112.0002001 / 01 DEC 14
Applicable to: ALL

Cruise tables are established:
- for ISA and ISA + 20
- with normal air conditioning and anti ice OFF
- from FL 290 to FL 390 at M 0.78
- from FL 100 to FL 390 at long range speed
- with a 33 % center of gravity.

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CRUISE - M.78 - ISA

Ident.: PER-CRZ-CRT-20-00002005.0023001 / 09 DEC 09
Applicable to: ALL

CRUISE - M.78												
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF							ISA CG=33.0%		**N1 (%) KG/H/ENG NM/1000KG**			**MACH IAS (KT) TAS (KT)**
WEIGHT (1000KG)	**FL290**		**FL310**		**FL330**		**FL350**		**FL370**		**FL390**	
50	80.3	.780	80.2	.780	80.0	.780	80.0	.780	80.5	.780	81.7	.780
	1280	302	1188	289	1106	277	1035	264	978	252	939	241
	180.3	462	192.6	458	205.1	454	217.2	450	228.7	447	238.3	447
52	80.5	.780	80.3	.780	80.3	.780	80.3	.780	80.9	.780	82.2	.780
	1290	302	1199	289	1119	277	1048	264	995	252	961	241
	179.0	462	190.9	458	202.8	454	214.4	450	224.9	447	232.8	447
54	80.7	.780	80.5	.780	80.5	.780	80.6	.780	81.3	.780	82.7	.780
	1299	302	1209	289	1132	277	1064	264	1013	252	986	241
	177.7	462	189.2	458	200.3	454	211.3	450	220.7	447	226.9	447
56	80.9	.780	80.7	.780	80.8	.780	80.9	.780	81.8	.780	83.2	.780
	1309	302	1221	289	1146	277	1080	264	1034	252	1015	241
	176.3	462	187.3	458	198.0	454	208.1	450	216.3	447	220.4	447
58	81.0	.780	81.0	.780	81.0	.780	81.3	.780	82.2	.780	83.8	.780
	1320	302	1235	289	1160	277	1098	264	1058	252	1048	241
	174.9	462	185.4	458	195.6	454	204.8	450	211.5	447	213.3	447
60	81.2	.780	81.2	.780	81.3	.780	81.7	.780	82.7	.780	84.5	.780
	1331	302	1249	289	1176	277	1117	264	1083	252	1083	241
	173.4	462	183.3	458	192.9	454	201.3	450	206.5	447	206.5	447
62	81.4	.780	81.4	.780	81.6	.780	82.1	.780	83.2	.780	85.1	.780
	1344	302	1262	289	1193	277	1139	264	1113	252	1120	241
	171.8	462	181.3	458	190.1	454	197.4	450	201.1	447	199.7	447
64	81.6	.780	81.7	.780	82.0	.780	82.6	.780	83.8	.780	85.9	.780
	1357	302	1277	289	1211	277	1163	264	1146	252	1157	241
	170.1	462	179.2	458	187.3	454	193.4	450	195.1	447	193.3	447
66	81.8	.780	81.9	.780	82.3	.780	83.0	.780	84.3	.780		
	1371	302	1293	289	1230	277	1188	264	1181	252		
	168.3	462	176.9	458	184.4	454	189.2	450	189.4	447		
68	82.0	.780	82.2	.780	82.7	.780	83.4	.780	84.9	.780		
	1385	302	1310	289	1252	277	1216	264	1217	252		
	166.7	462	174.7	458	181.2	454	184.8	450	183.7	447		
70	82.2	.780	82.5	.780	83.2	.780	83.9	.780	85.6	.780		
	1400	302	1328	289	1276	277	1250	264	1254	252		
	164.9	462	172.3	458	177.7	454	179.9	450	178.3	447		
72	82.5	.780	82.9	.780	83.5	.780	84.5	.780	86.3	.780		
	1416	302	1348	289	1302	277	1285	264	1292	252		
	163.0	462	169.8	458	174.3	454	175.0	450	173.1	447		
74	82.8	.780	83.2	.780	83.9	.780	85.0	.780				
	1433	302	1369	289	1329	277	1320	264				
	161.1	462	167.2	458	170.7	454	170.2	450				
76	83.0	.780	83.6	.780	84.4	.780	85.6	.780				
	1451	302	1392	289	1360	277	1358	264				
	159.1	462	164.4	458	166.7	454	165.6	450				
LOW AIR CONDITIONING ΔFUEL = − 0.5 %					**ENGINE ANTI ICE ON** ΔFUEL = + 2 %				**TOTAL ANTI ICE ON** ΔFUEL = + 4.5 %			

CRUISE - M.78 - ISA+20

Ident.: PER-CRZ-CRT-20-00002015.0024001 / 09 DEC 09
Applicable to: ALL

CRUISE - M.78

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF							ISA+20 CG=33.0%		**N1 (%) KG/H/ENG NM/1000KG**		**MACH IAS (KT) TAS (KT)**	
WEIGHT (1000KG)	**FL290**		**FL310**		**FL330**		**FL350**		**FL370**		**FL390**	
50	83.8	.780	83.7	.780	83.6	.780	83.7	.780	84.2	.780	85.4	.780
	1349	302	1253	289	1167	277	1092	264	1032	252	991	241
	178.4	481	190.5	477	202.9	474	215.0	470	226.5	468	235.8	468
52	84.0	.780	83.9	.780	83.8	.780	83.9	.780	84.6	.780	85.9	.780
	1359	302	1264	289	1180	277	1107	264	1050	252	1015	241
	177.1	481	188.8	477	200.7	474	212.2	470	222.7	468	230.4	468
54	84.2	.780	84.1	.780	84.1	.780	84.3	.780	85.0	.780	86.4	.780
	1369	302	1276	289	1194	277	1123	264	1070	252	1041	241
	175.7	481	187.1	477	198.3	474	209.1	470	218.6	468	224.5	468
56	84.4	.780	84.3	.780	84.4	.780	84.6	.780	85.5	.780	87.0	.780
	1380	302	1288	289	1209	277	1140	264	1092	252	1073	241
	174.3	481	185.3	477	195.9	474	205.9	470	214.1	468	217.9	468
58	84.5	.780	84.5	.780	84.6	.780	85.0	.780	85.9	.780		
	1391	302	1302	289	1224	277	1159	264	1116	252		
	172.9	481	183.3	477	193.5	474	202.7	470	209.4	468		
60	84.7	.780	84.8	.780	84.9	.780	85.4	.780	86.4	.780		
	1404	302	1317	289	1241	277	1179	264	1144	252		
	171.4	481	181.3	477	190.9	474	199.2	470	204.4	468		
62	84.9	.780	85.0	.780	85.3	.780	85.8	.780	86.9	.780		
	1417	302	1331	289	1259	277	1202	264	1176	252		
	169.9	481	179.3	477	188.1	474	195.4	470	198.9	468		
64	85.1	.780	85.2	.780	85.6	.780	86.3	.780	87.5	.780		
	1431	302	1347	289	1277	277	1227	264	1211	252		
	168.1	481	177.2	477	185.4	474	191.4	470	193.0	468		
66	85.3	.780	85.5	.780	86.0	.780	86.7	.780				
	1446	302	1364	289	1298	277	1254	264				
	166.4	481	175.0	477	182.4	474	187.2	470				
68	85.6	.780	85.8	.780	86.4	.780	87.2	.780				
	1460	302	1382	289	1321	277	1285	264				
	164.8	481	172.7	477	179.2	474	182.7	470				
70	85.8	.780	86.1	.780	86.8	.780	87.7	.780				
	1476	302	1401	289	1346	277	1321	264				
	163.0	481	170.4	477	175.9	474	177.8	470				
72	86.0	.780	86.5	.780	87.2	.780						
	1494	302	1422	289	1373	277						
	161.1	481	167.9	477	172.4	474						
74	86.3	.780	86.8	.780	87.6	.780						
	1512	302	1444	289	1402	277						
	159.2	481	165.3	477	168.9	474						
76	86.6	.780	87.2	.780								
	1530	302	1469	289								
	157.3	481	162.5	477								
LOW AIR CONDITIONING ΔFUEL = – 0.5 %					**ENGINE ANTI ICE ON** ΔFUEL = + 2 %				**TOTAL ANTI ICE ON** ΔFUEL = + 4.5 %			

LONG RANGE CRUISE - ISA

Ident.: PER-CRZ-CRT-30-00002018.0024001 / 10 DEC 09
Applicable to: ALL

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG=33.0%

N1 (%) / MACH
KG/H/ENG / IAS (KT)
NM/1000KG / TAS (KT)

WEIGHT (1000KG)	FL100		FL150		FL200		FL230		FL250		FL270	
50	57.8	.431	64.5	.521	68.0	.564	69.2	.580	70.6	.602	72.5	.634
	1008	238	1081	263	1020	258	972	250	963	249	968	252
	136.4	275	150.9	326	169.6	346	181.0	352	188.2	362	195.4	378
52	58.8	.439	65.8	.534	68.3	.565	70.0	.589	71.6	.616	73.8	.650
	1047	243	1125	269	1036	259	1006	254	1004	255	1012	259
	133.9	280	148.8	335	167.5	347	177.8	358	184.6	371	191.7	388
54	61.3	.473	67.1	.548	68.8	.569	70.9	.599	72.7	.630	74.8	.663
	1147	262	1170	277	1059	261	1041	259	1046	262	1052	265
	131.5	302	146.8	343	165.0	350	174.7	364	181.3	379	188.2	396
56	63.5	.501	68.2	.559	69.5	.576	71.8	.612	73.8	.645	75.5	.672
	1237	277	1209	282	1091	264	1081	264	1089	268	1082	268
	129.2	320	144.9	350	162.4	354	171.7	371	178.1	388	185.2	401
58	65.2	.521	68.6	.562	70.3	.584	72.7	.624	74.9	.658	76.0	.675
	1306	289	1228	284	1123	268	1122	270	1131	274	1104	270
	127.3	333	143.3	352	159.8	359	168.8	379	175.0	396	182.4	403
60	66.2	.531	68.9	.563	71.0	.593	73.7	.637	75.6	.667	76.4	.676
	1346	294	1245	285	1158	272	1164	276	1164	278	1123	270
	126.0	339	141.8	353	157.3	364	166.0	386	172.4	401	179.7	404
62	67.1	.540	69.3	.565	71.8	.602	74.8	.650	76.3	.673	77.0	.682
	1383	300	1262	286	1193	276	1207	282	1193	281	1151	273
	124.6	345	140.3	354	154.8	370	163.3	394	169.9	405	176.7	407
64	67.9	.548	69.6	.566	72.7	.614	75.6	.661	76.7	.676	77.6	.689
	1417	304	1278	286	1236	282	1247	287	1214	282	1185	276
	123.4	350	138.8	355	152.4	377	160.8	401	167.5	407	173.6	411
66	68.6	.553	69.9	.568	73.5	.625	76.3	.669	77.1	.677	78.3	.698
	1445	307	1297	287	1278	287	1280	290	1234	282	1221	279
	122.2	353	137.2	356	150.2	384	158.6	406	165.3	408	170.5	417
68	69.2	.558	70.5	.574	74.3	.635	76.9	.675	77.6	.683	79.0	.707
	1470	310	1327	290	1319	292	1308	293	1264	285	1259	283
	121.1	356	135.4	360	148.0	390	156.5	409	162.7	411	167.6	422
70	69.7	.562	71.1	.580	75.3	.647	77.3	.677	78.2	.690	79.7	.717
	1495	312	1360	293	1363	298	1330	294	1297	288	1298	288
	120.0	359	133.6	364	145.8	397	154.5	411	160.1	415	164.7	428
72	70.0	.563	71.7	.587	76.1	.657	77.6	.678	78.8	.698	80.4	.725
	1512	313	1394	297	1405	303	1349	295	1334	291	1335	291
	119.0	360	131.9	368	143.8	404	152.6	412	157.4	420	162.0	433
74	70.3	.565	72.3	.594	76.8	.665	78.1	.683	79.5	.706	81.0	.731
	1529	314	1428	300	1439	307	1378	297	1372	295	1371	294
	117.9	361	130.2	372	142.0	409	150.4	415	154.9	425	159.3	437
76	70.5	.567	73.0	.601	77.4	.672	78.7	.689	80.2	.715	81.5	.739
	1548	315	1464	304	1471	310	1412	300	1412	299	1407	297
	116.9	362	128.5	376	140.3	413	148.2	418	152.5	430	156.7	441

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 2 %	ΔFUEL = + 4.5 %

11.0-08F0A319-112 CFM56-5B6/P SA12200000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .990 .000 .000 0 FCOM-N0-03-05-15-013-180

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF							ISA CG=33.0%		N1 (%) KG/H/ENG NM/1000KG			MACH IAS (KT) TAS (KT)
WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390	
50	74.5	.666	75.3	.675	76.6	.696	78.2	.725	79.6	.751	81.5	.775
	970	255	934	247	922	244	922	244	923	242	930	239
	203.2	394	212.2	396	219.5	405	226.6	418	233.3	431	238.9	444
52	75.2	.672	76.0	.683	77.5	.708	78.9	.735	80.3	.761	82.2	.781
	996	257	964	250	959	249	958	248	960	246	963	241
	199.7	398	207.9	401	214.7	412	221.3	424	227.5	437	232.6	448
54	75.6	.675	76.8	.692	78.4	.721	79.6	.747	81.1	.772	82.8	.784
	1016	258	997	254	998	254	996	252	998	250	995	242
	196.5	399	203.6	406	210.0	419	216.2	430	221.8	443	226.0	450
56	76.2	.679	77.6	.701	79.1	.730	80.2	.755	81.8	.779	83.4	.784
	1041	260	1032	258	1033	257	1030	255	1032	252	1024	242
	193.1	402	199.4	411	205.5	424	211.4	435	216.4	447	219.4	450
58	76.9	.687	78.4	.713	79.7	.739	80.9	.766	82.3	.782	84.0	.785
	1074	263	1070	262	1069	261	1069	259	1062	253	1060	243
	189.4	407	195.3	418	201.1	430	206.5	442	211.1	448	212.2	450
60	77.6	.696	79.2	.724	80.3	.749	81.5	.775	82.9	.785	84.7	.785
	1109	267	1109	266	1105	265	1106	262	1095	254	1097	243
	185.7	412	191.5	425	197.0	435	201.8	446	205.5	450	205.2	450
62	78.4	.705	79.9	.732	80.9	.757	82.2	.780	83.4	.784	85.4	.786
	1145	271	1145	270	1141	268	1140	265	1124	254	1136	243
	182.3	418	187.7	430	192.9	440	197.4	450	200.0	450	198.3	451
64	79.2	.716	80.5	.741	81.6	.767	82.7	.783	84.0	.785	86.1	.785
	1184	275	1182	274	1182	272	1169	265	1161	254	1172	243
	178.9	424	184.0	435	188.8	446	192.9	451	194.0	450	192.1	450
66	79.9	.725	81.0	.749	82.2	.775	83.2	.785	84.6	.786	86.2	.757
	1222	279	1218	277	1219	275	1201	266	1197	255	1159	233
	175.6	429	180.5	440	184.9	451	188.4	452	188.2	451	187.2	434
68	80.5	.733	81.5	.757	82.7	.780	83.6	.785	85.2	.786		
	1258	282	1254	280	1253	277	1231	266	1236	255		
	172.4	434	177.1	444	181.1	454	183.8	452	182.4	451		
70	81.0	.741	82.1	.767	83.2	.782	84.1	.785	85.9	.787		
	1294	286	1296	284	1282	278	1265	266	1277	255		
	169.4	438	173.6	450	177.4	455	178.8	453	176.8	451		
72	81.5	.748	82.7	.775	83.7	.784	84.7	.786	86.3	.781		
	1331	289	1335	287	1313	278	1301	267	1296	253		
	166.4	443	170.3	455	173.6	456	174.0	453	172.9	448		
74	82.0	.755	83.2	.780	84.1	.786	85.2	.786	86.5	.742		
	1366	292	1369	289	1347	279	1340	267	1278	239		
	163.6	447	167.2	458	169.7	457	169.1	453	166.5	426		
76	82.6	.764	83.7	.782	84.6	.785	85.9	.787				
	1408	295	1399	290	1377	279	1380	267				
	160.6	452	164.0	459	165.8	457	164.3	453				
LOW AIR CONDITIONING ΔFUEL = – 0.5 %					**ENGINE ANTI ICE ON** ΔFUEL = + 2 %				**TOTAL ANTI ICE ON** ΔFUEL = + 4.5 %			

LONG RANGE CRUISE - ISA+20

Ident.: PER-CRZ-CRT-30-00002033.0024001 / 10 DEC 09
Applicable to: ALL

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+20
CG=33.0%

N1 (%) / MACH
KG/H/ENG / IAS (KT)
NM/1000KG / TAS (KT)

WEIGHT (1000KG)	FL100		FL150		FL200		FL230		FL250		FL270	
50	60.1	.431	68.3	.535	70.6	.561	71.9	.576	73.4	.597	75.3	.628
	1059	238	1160	270	1054	256	1005	248	995	247	1000	250
	134.7	285	150.0	348	169.8	358	181.1	364	188.1	374	195.2	391
52	61.5	.445	69.2	.543	71.0	.562	72.8	.585	74.4	.610	76.7	.645
	1112	246	1191	274	1071	257	1040	252	1036	253	1048	257
	132.3	294	148.2	353	167.5	359	177.7	370	184.5	382	191.3	401
54	66.1	.506	70.0	.550	71.5	.566	73.6	.594	75.5	.624	77.8	.659
	1288	280	1219	277	1095	259	1075	256	1079	259	1092	263
	129.9	335	146.6	357	165.0	361	174.6	375	181.1	391	187.7	410
56	67.4	.519	70.8	.556	72.3	.573	74.5	.605	76.6	.637	78.6	.667
	1339	288	1246	280	1128	263	1113	261	1124	265	1124	266
	128.2	344	144.9	361	162.2	366	171.5	382	177.7	399	184.6	415
58	68.0	.524	71.2	.558	73.0	.580	75.4	.616	77.8	.652	79.1	.670
	1364	290	1267	282	1161	266	1154	266	1170	271	1147	268
	127.1	347	143.3	363	159.6	371	168.6	389	174.6	409	181.7	417
60	68.8	.531	71.5	.560	73.8	.588	76.5	.630	78.7	.663	79.6	.672
	1396	294	1285	283	1197	270	1201	273	1209	276	1169	269
	125.8	351	141.7	364	157.0	376	165.7	398	171.7	415	178.9	418
62	69.6	.538	71.9	.562	74.6	.597	77.6	.644	79.3	.669	80.2	.678
	1427	298	1304	284	1234	274	1249	279	1239	279	1200	271
	124.6	356	140.2	366	154.5	381	162.8	407	169.1	419	175.8	422
64	70.3	.544	72.2	.563	75.4	.607	78.6	.656	79.8	.672	80.9	.686
	1458	302	1321	285	1275	279	1294	285	1263	280	1236	274
	123.4	360	138.6	366	152.1	388	160.2	414	166.7	421	172.6	427
66	71.0	.549	72.6	.565	76.3	.619	79.4	.665	80.2	.674	81.6	.694
	1488	305	1341	286	1319	284	1330	289	1285	281	1273	278
	122.2	364	137.0	368	149.7	395	157.9	420	164.3	422	169.5	431
68	71.7	.554	73.1	.571	77.1	.630	80.0	.670	80.8	.680	82.3	.702
	1515	308	1373	288	1364	290	1359	291	1319	284	1312	281
	121.0	367	135.1	371	147.5	402	155.7	423	161.6	426	166.4	437
70	72.2	.559	73.8	.577	78.1	.641	80.4	.673	81.4	.687	83.0	.712
	1542	310	1407	292	1409	295	1383	292	1355	287	1354	286
	119.9	370	133.3	375	145.3	410	153.6	425	158.9	431	163.5	443
72	72.5	.560	74.4	.583	79.0	.652	80.8	.675	82.1	.694	83.8	.721
	1560	311	1441	295	1455	300	1405	293	1393	290	1396	290
	118.8	371	131.5	379	143.2	417	151.6	426	156.3	435	160.7	449
74	72.8	.562	75.0	.589	79.8	.661	81.3	.680	82.7	.702	84.3	.729
	1580	312	1476	298	1494	305	1437	295	1431	293	1436	293
	117.7	372	129.8	383	141.2	422	149.4	429	153.7	440	157.9	453
76	73.1	.563	75.6	.596	80.4	.668	81.8	.686	83.4	.711	84.9	.737
	1598	313	1513	302	1529	308	1473	298	1473	297	1476	296
	116.6	373	128.1	387	139.5	426	147.1	433	151.2	446	155.2	458

LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = − 0.5 %	ΔFUEL = + 2 %	ΔFUEL = + 4.5 %

11.0-08F0A319-112 CFM56-5B6/P SA12200000C5KG330 0 018590 0 0 1 1.0 .0 .00 0 01 .990 .000 .000 20 FCOM-N0-03-05-15-019-180

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF							ISA+20 CG=33.0%		N1 (%) KG/H/ENG NM/1000KG		MACH IAS (KT) TAS (KT)	
WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390	
50	77.7	.662	78.5	.671	79.9	.692	81.6	.721	83.2	.749	85.2	.772
	1008	253	972	246	961	243	964	243	970	241	977	238
	202.6	409	211.5	411	218.7	420	225.4	434	231.5	449	236.8	463
52	78.3	.668	79.3	.680	80.8	.702	82.3	.732	83.9	.759	85.9	.779
	1036	256	1005	249	998	247	1003	247	1009	245	1013	241
	199.0	412	207.0	416	213.7	426	219.9	441	225.7	455	230.5	467
54	78.8	.671	80.1	.689	81.8	.715	83.1	.744	84.7	.770	86.5	.783
	1058	257	1040	253	1040	252	1043	251	1049	249	1049	242
	195.7	414	202.6	422	208.8	434	214.6	448	219.9	461	223.8	470
56	79.4	.676	80.9	.698	82.5	.726	83.8	.753	85.4	.777	87.1	.783
	1086	259	1078	256	1080	256	1081	254	1085	251	1081	242
	192.1	417	198.2	427	204.1	441	209.8	453	214.5	466	217.1	469
58	80.2	.684	81.8	.709	83.2	.737	84.5	.763	86.0	.781	87.3	.768
	1121	262	1117	261	1121	260	1122	258	1119	253	1087	237
	188.4	422	194.2	434	199.5	448	204.8	459	209.2	468	211.7	460
60	80.9	.693	82.6	.720	83.9	.747	85.2	.772	86.6	.784	87.4	.723
	1158	266	1160	265	1161	264	1162	261	1155	254	1071	222
	184.7	428	190.1	441	195.3	454	200.1	465	203.6	470	202.3	433
62	81.7	.702	83.3	.730	84.5	.756	85.8	.778	87.1	.784		
	1195	269	1199	269	1200	267	1197	264	1186	254		
	181.1	433	186.2	447	191.2	459	195.6	468	198.0	470		
64	82.5	.712	83.9	.740	85.1	.765	86.3	.781	87.7	.784		
	1236	273	1241	273	1242	271	1230	265	1224	254		
	177.7	439	182.4	453	187.1	465	191.2	470	192.1	470		
66	83.3	.722	84.5	.748	85.8	.773	86.8	.784	87.8	.764		
	1277	278	1279	276	1281	274	1266	266	1217	247		
	174.3	445	178.9	458	183.2	469	186.5	472	188.2	458		
68	83.9	.730	85.1	.756	86.3	.778	87.3	.784				
	1316	281	1318	279	1317	276	1297	266				
	171.0	450	175.5	463	179.4	473	181.9	472				
70	84.4	.738	85.6	.764	86.8	.781	87.8	.784				
	1357	285	1360	283	1350	277	1335	266				
	167.9	456	172.0	468	175.7	474	176.9	472				
72	85.0	.747	86.2	.772	87.3	.784	88.0	.772				
	1397	288	1400	286	1384	278	1341	261				
	164.8	461	168.7	472	171.8	476	173.4	465				
74	85.5	.753	86.8	.777	87.8	.785	88.1	.741				
	1435	291	1437	288	1418	279	1326	250				
	162.0	465	165.5	476	168.0	477	168.4	447				
76	86.0	.762	87.3	.781	88.0	.780						
	1478	294	1471	289	1437	277						
	159.0	470	162.4	478	164.8	473						
LOW AIR CONDITIONING ΔFUEL = − 0.5 %					ENGINE ANTI ICE ON ΔFUEL = + 2 %				TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

GENERAL

Ident.: PER-CRZ-ICQ-10-00002036.0003001 / 22 MAR 17
Applicable to: ALL

In cruise, a quick check table (*Refer to QRH/PER-M In Cruise Quick Check at a Given Mach Number (Paper Only)* or use the performance application of FlySmart with Airbus) allows the flight crew to determine the fuel consumption and the time required to cover a given air distance from any moment in cruise to land.

The QRH table is established for:
- Cruise Mach number: M 0.78
- Descent profile: M 0.78/300 kt/250 kt
- Approach and landing: 110 kg or 240 lb -6 min IMC
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

Note: *1. In the table, the asterisk "*" means that a step climb of 4 000 ft has been made to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
3. For each degree celsius above ISA apply a fuel correction of
0.005 (kg/°C/NM) × ΔISA (°C) × Air Distance (NM)
or 0.011 (lb/°C/NM) × ΔISA (°C) × Air Distance (NM)

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

Ident.: PER-CRZ-ICQ-10-00002039.0001001 / 22 MAR 16
Applicable to: ALL

The in cruise quick check table is based on a reference initial weight.
The fuel consumption must be corrected when the actual weight is different from the reference initial weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1 000 kg or 1 000 lb below (or above) the reference weight.

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EXAMPLE FOR THE QRH USE

Ident.: PER-CRZ-ICQ-20-00014741.0001001 / 22 MAR 17
Applicable to: ALL

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

In-cruise quick check with cruise at M.78

FL 370

Actual cruise weight : 55 000 kg

Remaining ground distance : 800 NM

ISA +10

Average wind during flight : -40 kt (head wind)

- Evaluation of air distance to be covered
  - Use the “Ground Distance/Air Distance” conversion table (*Refer to PER-OPD-CON-AEO M.78*)

AIR DISTANCE (NM) - M.78							
GROUND	TAILWIND			WIND COMPONENTS (KT)			HEADWIND
DIST. (NM)	**+150**	**+100**	**+50**	**0**	**-50**	**-100**	**-150**
10	7	8	9	10	11	13	15
20	15	16	18	20	23	26	30
30	22	25	27	30	34	39	45
40	30	33	36	40	45	51	60
50	37	41	45	50	56	64	75
100	75	82	90	100	113	129	150
200	150	164	180	200	225	257	300
300	225	245	270	300	338	386	450
400	300	327	360	400	450	514	600
500	375	409	450	500	563	643	750
1000	750	818	900	1000	1125	1286	1501
1500	1125	1227	1350	1500	1688	1929	2251
2000	1500	1636	1800	2000	2250	2572	3001
2500	1875	2045	2250	2500	2813	3215	3752
3000	2250	2454	2700	3000	3375	3858	4502
3500	2624	2863	3150	3500	3938	4501	5252
4000	2999	3272	3600	4000	4500	5144	6003
4500	3374	3681	4050	4500	5063	5787	6753
5000	3749	4090	4500	5000	5626	6430	7503

The corresponding air distance is : 880 NM

- Determination of the fuel consumption and time for the reference initial weight in cruise.
  - Enter table (*Refer to QRH/PER-M In Cruise Quick Check at a Given Mach Number (Paper Only)*) with an air distance of 880 NM and FL 370 for ISA.

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.78 - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 120 KG (6MIN)

REF. INITIAL WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG = 33.0 %			**FUEL CONSUMED (KG)** **TIME (H.MIN)**			
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	**310**	**330**	**350**	**370**	**390**	**FL290 FL310**	**FL330 FL350**	**FL370 FL390**
725	4001 1.43	3772 1.44	3583 1.45	3427 1.46	3313 1.46	3278 1.46	16	24	42
750	4145 1.47	3909 1.47	3712 1.48	3551 1.49	3433 1.49	3397 1.49	17	25	43
775	4290 1.50	4045 1.51	3842 1.52	3675 1.52	3552 1.53	3516 1.53	18	26	45
800	4434 1.53	4181 1.54	3971 1.55	3799 1.56	3672 1.56	3634 1.56	18	27	46
825	4578 1.56	4317 1.57	4100 1.58	3922 1.59	3791 2.00	3752 2.00	19	28	48
850	4722 2.00	4452 2.01	4229 2.01	4046 2.02	3910 2.03	3870 2.03	20	29	49
875	4866 2.03	4588 2.04	4358 2.05	4169 2.06	4029 2.06	3988 2.06	20	30	51
900	5010 2.06	4724 2.07	4486 2.08	4292 2.09	4148 2.10	4105 2.10	21	31	52
925	5153 2.09	4859 2.10	4615 2.11	4415 2.12	4266 2.13	4222 2.13	22	32	54
950	5297 2.13	4995 2.14	4743 2.15	4538 2.16	4385 2.16	4340 2.16	22	33	55
975	5440 2.16	5130 2.17	4871 2.18	4661 2.19	4503 2.20	4456 2.20	23	34	57
1000	5584 2.19	5265 2.20	DO NOT USE FOR OPERATIONAL PURPOSE						58
1025	5727 2.22	5400 2.23							60
1050	5870 2.26	5535 2.27	5256 2.28	5028 2.29	4857 2.30	4806 2.30	25	36	61
1075	6013 2.29	5670 2.30	5383 2.31	5150 2.32	4974 2.33	4922 2.33	26	37	63
1100	6156 2.32	5805 2.33	5511 2.34	5272 2.36	5092 2.36	5038 2.36	26	38	64
1125	6299 2.35	5940 2.37	5639 2.38	5394 2.39	5209 2.40	5153 2.40	27	39	65
1150	6442 2.39	6074 2.40	5766 2.41	5516 2.42	5326 2.43	5269 2.43	28	40	67
1175	6584 2.42	6209 2.43	5893 2.44	5637 2.46	5443 2.46	5384 2.46	28	41	68
1200	6727 2.45	6343 2.46	6020 2.48	5759 2.49	5560 2.50	5499 2.50	29	42	70
1225	6869 2.48	6477 2.50	6148 2.51	5880 2.52	5676 2.53	5614 2.53	30	43	71
1250	7012 2.52	6611 2.53	6274 2.54	6001 2.56	5793 2.56	5729 2.56	30	44	72
1275	7154 2.55	6745 2.56	6401 2.58	6122 2.59	5909 3.00	5843 3.00	31	45	74
1300	7296 2.58	6879 2.59	6528 3.01	6243 3.02	6025 3.03	5957 3.03	31	46	75
1325	7439 3.01	7013 3.03	6655 3.04	6364 3.06	6141 3.07	6071 3.07	32	46	76
1350	7581 3.05	7147 3.06	6781 3.08	6485 3.09	6257 3.10	6185 3.10	33	47	78
LOW AIR CONDITIONING ΔFUEL = – 0.5 %			**ENGINE ANTI ICE ON** ΔFUEL = + 3 %			**TOTAL ANTI ICE ON** ΔFUEL = + 6 %			

Fuel consumption : 4 053 kg
Time needed : 2 h 07 min

- Correction due to real in cruise weight of 55 000 kg
  - Δ fuel consumption : -51 kg per 1 000 kg below reference
  - Δ fuel : -51 × (60 - 55) = -255 kg
- Temperature correction :
  - Δ fuel consumption : +0.005 kg per 1 °above ISA and per 1 NM Air distance
  - Δ fuel : +0.005 × 10 × 880 = 44 kg

RESULT

Fuel : 4 053 - 255 + 44 = 3 842 kg

Time : 2 h 07 min

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PERFORMANCE

<u>HOLDING</u>

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PER-HLD-GEN GENERAL

PER-HLD-HLD HOLDING TABLES

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GENERAL

Ident.: PER-HLD-GEN-00002129.0001001 / 01 DEC 14
Applicable to: ALL

Holding table contains information about the total fuel flow that allows the flight crew to plan holding and reserve fuel requirements.
It is established for flight in a race track holding pattern in clean configuration at green dot speed.
This chart is established with air conditioning in normal mode and the center of gravity at 33 %.

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CONF 0 - GREEN DOT SPEED

Ident.: PER-HLD-HLD-00002146.0025001 / 16 FEB 11
Applicable to: ALL

RACE TRACK HOLDING PATTERN - GREEN DOT SPEED								
MAX. CRUISE THRUST LIMITS CLEAN CONFIGURATION NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG=33.0%		N1 (%) FF (KG/H/ENG)	
WEIGHT (1000KG)	FL 15	FL 50	FL100	FL140	FL180	FL200	FL220	FL250
44	44.7 854	46.8 836	50.2 806	52.9 781	56.3 760	57.8 753	59.5 750	62.2 749
46	45.6 888	47.8 871	51.1 837	54.0 811	57.4 792	58.9 787	60.6 785	63.5 783
48	46.5 923	48.8 906	52.0 868	55.1 842	58.4 826	59.9 821	61.7 819	64.7 816
50	47.3 959	49.8 938	52.9 898	56.1 874	59.3 859	60.9 856	62.8 853	65.7 848
52	48.2 994	50.5 968	53.9 929	57.3 906	60.3 894	61.9 890	63.9 887	66.6 880
54	49.1 1030	51.3 1000	54.8 960	58.2 939	61.2 929	63.0 923	65.0 921	67.5 912
56	50.0 1063	52.1 1031	55.8 992	59.0 972	62.2 961	64.0 957	66.0 952	68.5 944
58	50.8 1094	52.9 1061	56.7 1024	59.9 1006	63.1 995	65.0 992	66.8 984	69.4 976
60	51.5 1125	53.7 1091	57.7 1057	60.7 1041	64.1 1029	66.0 1023	67.7 1016	70.2 1008
62	52.2 1155	54.5 1122	58.7 1090	61.5 1075	65.0 1063	66.9 1055	68.5 1048	71.0 1041
64	52.9 1186	55.3 1154	59.4 1123	62.4 1108	66.0 1095	67.6 1087	69.3 1081	71.8 1075
66	53.6 1217	56.1 1186	60.1 1157	63.2 1141	66.9 1125	68.4 1119	70.1 1113	72.7 1109
68	54.3 1247	56.9 1218	60.8 1191	64.0 1173	67.6 1158	69.2 1151	70.9 1146	73.5 1144
70	55.0 1279	57.7 1251	61.6 1225	64.9 1208	68.4 1190	69.9 1184	71.6 1179	74.3 1180
72	55.7 1311	58.6 1285	62.3 1259	65.7 1241	69.1 1223	70.7 1216	72.3 1212	75.1 1217
74	56.5 1344	59.4 1319	63.1 1292	66.6 1272	69.8 1255	71.4 1249	73.1 1247	75.9 1256
76	57.2 1377	60.2 1352	63.8 1325	67.4 1303	70.5 1288	72.1 1283	73.8 1282	76.6 1295
LOW AIR CONDITIONING ΔFF = – 0.3 %	ENGINE ANTI ICE ON ΔFF = + 5 %		TOTAL ANTI ICE ON ΔFF = + 9 %		PER 1° ABOVE ISA ΔFF = + 0.3 %		STRAIGHT LINE ΔFF = – 5 %	

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PERFORMANCE

DESCENT

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PER-DES-GEN GENERAL

PER-DES-STD STANDARD

PER-DES-EMG EMERGENCY

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GENERAL

Ident.: PER-DES-GEN-00002131.0001001 / 09 DEC 09
Applicable to: ALL

Descent tables are established for normal descent speed M .78 / 300 kt /250 kt and emergency descent at MMO/VMO with airbrakes extended, down to 1 500 ft with :

- Normal air conditioning
- CG = 33 %
- Anti ice OFF

For normal descent, cabin vertical speed is limited to 350 ft/min

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DESCENT- M.78/300KT/250KT

Ident.: PER-DES-STD-00002133.0039001 / 07 MAR 11
Applicable to: ALL

DESCENT - M.78/300KT/250KT									
IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG=33.0%		MAXIMUM CABIN RATE OF DESCENT 350 FT/MIN				
WEIGHT (1000KG)	45				65				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
390	14.7	156	91	68.2	17.6	167	107	IDLE	241
370	13.2	127	79	IDLE	16.9	162	102	IDLE	252
350	12.6	124	75	IDLE	16.2	158	97	IDLE	264
330	12.1	120	71	IDLE	15.6	155	92	IDLE	277
310	11.7	118	68	IDLE	15.0	151	87	IDLE	289
290	11.2	115	64	IDLE	14.4	147	83	IDLE	300
270	10.6	111	60	IDLE	13.6	142	77	IDLE	300
250	10.0	107	56	IDLE	12.8	137	71	IDLE	300
240	9.8	106	54	IDLE	12.4	135	69	IDLE	300
220	9.1	101	49	IDLE	11.6	129	63	IDLE	300
200	8.5	94	45	IDLE	10.7	120	57	IDLE	300
180	7.8	87	40	IDLE	9.8	110	51	IDLE	300
160	7.1	78	36	IDLE	8.9	98	45	IDLE	300
140	6.3	67	31	IDLE	7.9	84	39	IDLE	300
120	5.6	56	27	IDLE	6.9	70	33	IDLE	300
100	4.9	47	23	IDLE	6.0	58	28	IDLE	300
50	1.7	14	7	IDLE	2.1	18	9	IDLE	250
15	.0	0	0	IDLE	.0	0	0	IDLE	250

CORRECTIONS	LOW AIR CONDITIONING	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA
TIME	-	+ 6 %	+ 10 %	+ 0.3 %
FUEL	-	+ 30 %	+ 50 %	+ 0.5 %
DISTANCE	-	+ 5 %	+ 7 %	+ 0.5 %

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EMER DESCENT

Ident.: PER-DES-EMG-00002134.0203001 / 21 MAR 17
Applicable to: ALL

EMERGENCY DESCENT - M.82/350KT										
IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG=33.0%		AIRBRAKES EXTENDED					
WEIGHT (1000KG)	45				65					
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
390	5.8	58	42	IDLE	7.9	79	57	IDLE	255
370	5.5	56	39	IDLE	7.5	77	54	IDLE	267
350	5.1	54	37	IDLE	7.1	75	51	IDLE	279
330	4.8	52	34	IDLE	6.7	73	48	IDLE	292
310	4.6	50	32	IDLE	6.4	71	45	IDLE	306
290	4.3	49	30	IDLE	6.1	69	43	IDLE	319
270	4.1	48	28	IDLE	5.8	67	40	IDLE	333
250	3.9	46	27	IDLE	5.5	65	38	IDLE	347
240	3.8	46	26	IDLE	5.3	64	37	IDLE	350
220	3.5	43	24	IDLE	4.9	61	33	IDLE	350
200	3.2	40	21	IDLE	4.5	56	30	IDLE	350
180	2.9	36	19	IDLE	4.1	51	27	IDLE	350
160	2.6	32	17	IDLE	3.6	45	23	IDLE	350
140	2.2	27	14	IDLE	3.1	38	20	IDLE	350
120	1.9	22	12	IDLE	2.7	31	17	IDLE	350
100	1.6	17	10	IDLE	2.2	24	14	IDLE	350
50	.8	8	5	IDLE	1.1	11	7	IDLE	350
0	.0	0	0	IDLE	.0	0	0	IDLE	350

11.0-08F0A319-112 CFM56-5B6/P SA23310000C5KG330 0 018590 0 0-1 .0 .0 .00 0 02 .820350.000 .000 0 FCOM-N0-03-05-30-003-180

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PERFORMANCE

GO AROUND

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PER-GOA-GEN GENERAL

PER-GOA-ACG APPROACH CLIMB LIMITING WEIGHT

PER-GOA-ACG-NOR NORMAL

PER-GOA-ACG-CAT CAT II

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GENERAL

Ident.: PER-GOA-GEN-00002140.0002001 / 28 JAN 11
Applicable to: ALL

In the go around configuration corresponding to the all engine procedure, the minimum steady gradient one engine inoperative required by the regulations is 2.1 % at a speed not exceeding 1.4 Vs. This requirement is also called approach climb performance by regulations.
The following graph allow to determine the go around limiting weight which satisfies the required gradient with the certified go around configurations 3 and 2.
The required gradient of 2.1 % is considered at the airport reference altitude. The power setting is “GO AROUND” thrust with the air conditioning ON. The speed is 1.23 Vs of the specified configuration. For the occasional cases where approach climb performance is found restrictive, a correction is given for an increased speed, up to 1.4 Vs.

Note: *Landing climb performance (2 engines running) is never limiting.*

PROCEDURE

Ident.: PER-GOA-GEN-00002141.0003001 / 21 MAR 17
Applicable to: ALL

According to airport pressure altitude and temperature determine if the slats/flaps setting must be restricted as a function of the landing weight, in order to meet the go around gradient requirement of 2.1 %.
Establish the final approach configuration with one more step of flaps. If the approach is interrupted, retract the flaps by one step during the go-around.
In case of category 2 and 3 approaches, JAR -OPS requires a regulatory approach climb gradient of 2.5 % to be maintained.
Use the tables for CAT II & III approaches to determine the maximum approach climb limiting weight according to airport pressure altitude and temperature.

Note: 1. *If circumstances dictate, landing may be made at a weight corresponding to the maximum structural takeoff weight. (Refer to PRO-ABN-MISC [QRH] OVERWEIGHT LANDING).*
2. *When icing conditions are predicted during the flight and TAT is 10 °C or below and there is an evidence of significant ice accretion, to take into account ice formation on the non heated structure:*
   - *Decrease the approach climb limiting weight by 7.3 %*
   - *In CONF FULL, the approach speed must not be lower than VREF +5 kt, or in CONF 3, the approach speed must not be lower than VLS +10 kt.*

   For Landing Performance assessment, refer to QRH PER-A.
3. *In the following tables corrections for anti ice are only valid for OAT lower than 10 °C.*
4. *Use the CAT II tables in case of CAT III approach calculation.*

CONF 2

Ident.: PER-GOA-ACG-NOR-00002142.0015001 / 28 FEB 11
Applicable to: ALL

APPROACH CLIMB LIMITING WEIGHT (1000 KG) - CONF 2												
ONE ENGINE OUT ONE ENGINE AT GO AROUND THRUST							Normal Air Conditioning Anti Ice OFF			Gradient : 2.1 % V = 1.23 Vs		
OAT (°C)	PRESSURE ALTITUDE (FT)											
	-2000	**0**	**200**	**400**	**600**	**800**	**1000**	**1500**	**2000**	**5000**	**8000**	**12000**
≤10	75.3	74.9	74.7	74.5	74.3	74.1	73.9	73.4	72.9	69.6	66.1	60.3
20	74.9	74.6	74.4	74.2	74.0	73.9	73.7	73.2	72.6	69.4	65.9	60.2
22	74.9	74.5	74.4	74.2	74.0	73.8	73.6	73.1	72.6	69.4	65.9	59.7
24	74.8	74.5	74.3	74.1	73.9	73.7	73.6	73.1	72.5	69.4	65.8	58.6
26	74.8	74.4	74.3	74.1	73.9	73.7	73.5	73.0	72.5	69.3	65.8	57.4
28	74.7	74.4	74.2	74.0	73.8	73.7	73.5	73.0	72.5	69.3	65.8	56.2
30	74.7	74.3	74.2	74.0	73.8	73.6	73.4	72.9	72.4	69.3	65.1	54.9
32	74.6	74.3	74.1	73.9	73.8	73.6	73.4	72.9	72.4	69.3	63.7	
34	74.6	74.3	74.1	73.9	73.7	73.5	73.4	72.9	72.4	69.2	62.3	
36	74.5	74.2	74.1	73.9	73.7	73.5	73.3	72.9	72.4	68.6	61.0	
38	74.5	74.2	74.0	73.9	73.7	73.5	73.3	72.9	72.4	67.4	59.7	
40	74.4	74.2	74.0	73.9	73.7	73.5	73.3	72.8	72.3	66.2		
42	74.4	74.2	74.0	73.8	73.6	73.4	73.2	72.7	71.7	65.0		
44	74.4	74.1	73.9	73.7	73.4	73.0	72.6	71.5	70.4	63.7		
46	74.3	73.4	72.9	72.5	72.1	71.7	71.3	70.2	69.2			
48	74.3	72.0	71.6	71.2	70.8	70.4	70.0	68.9	67.9			
50	73.5	70.7	70.3	69.9	69.5	69.1	68.7	67.7	66.7			
52	72.2	69.4	69.0	68.6	68.2	67.8	67.4	66.4				
54	70.9	68.3	67.9	67.5								
55	70.3	67.7										
AIR CONDITIONING OFF ADD				**ENGINE ANTI ICE ON SUBTRACT**			**TOTAL ANTI ICE ON SUBTRACT**			**SPEED INCREASE PER 0.01 Vs ADD**		
1850 kg				250 kg			800 kg			300 kg		

CONF 3

Ident.: PER-GOA-ACG-NOR-00002143.0015001 / 28 FEB 11
Applicable to: ALL

APPROACH CLIMB LIMITING WEIGHT (1000 KG) - CONF 3

ONE ENGINE OUT ONE ENGINE AT GO AROUND THRUST	Normal Air Conditioning Anti Ice OFF	Gradient : 2.1 % V = 1.23 Vs

OAT (°C)	PRESSURE ALTITUDE (FT)											
	-2000	0	200	400	600	800	1000	1500	2000	5000	8000	12000
≤10	72.8	72.4	72.2	72.0	71.8	71.6	71.4	70.9	70.4	67.3	63.8	58.2
20	72.4	72.1	71.9	71.7	71.6	71.4	71.2	70.7	70.2	67.1	63.6	58.1
22	72.4	72.1	71.9	71.7	71.5	71.3	71.1	70.6	70.1	67.0	63.6	57.7
24	72.3	72.0	71.8	71.6	71.5	71.3	71.1	70.6	70.1	67.0	63.5	56.6
26	72.3	72.0	71.8	71.6	71.4	71.2	71.0	70.5	70.0	67.0	63.5	55.4
28	72.2	71.9	71.7	71.5	71.4	71.2	71.0	70.5	70.0	67.0	63.5	54.2
30	72.2	71.9	71.7	71.5	71.3	71.1	70.9	70.5	70.0	66.9	62.9	53.0
32	72.1	71.8	71.7	71.5	71.3	71.1	70.9	70.4	69.9	66.9	61.6	
34	72.1	71.8	71.6	71.4	71.3	71.1	70.9	70.4	69.9	66.9	60.2	
36	72.0	71.8	71.6	71.4	71.2	71.0	70.9	70.4	69.9	66.3	58.9	
38	72.0	71.7	71.6	71.4	71.2	71.0	70.9	70.4	69.9	65.1	57.7	
40	72.0	71.7	71.5	71.4	71.2	71.0	70.8	70.4	69.8	64.0		
42	71.9	71.7	71.5	71.4	71.2	71.0	70.8	70.3	69.2	62.8		
44	71.9	71.6	71.4	71.3	71.0	70.5	70.1	69.1	68.0	61.6		
46	71.9	70.9	70.5	70.1	69.7	69.3	68.9	67.8	66.8			
48	71.8	69.6	69.2	68.8	68.4	68.0	67.6	66.6	65.6			
50	71.1	68.4	68.0	67.6	67.2	66.8	66.4	65.4	64.4			
52	69.8	67.1	66.7	66.3	65.9	65.5	65.2	64.2				
54	68.6	66.0	65.6	65.2								
55	67.9	65.5										

AIR CONDITIONING OFF ADD	ENGINE ANTI ICE ON SUBTRACT	TOTAL ANTI ICE ON SUBTRACT	SPEED INCREASE PER 0.01 Vs ADD
1600 kg	250 kg	800 kg	300 kg

CAT II - CONF 2

Ident.: PER-GOA-ACG-CAT-00002144.0019001 / 02 MAR 11
Applicable to: ALL

APPROACH CLIMB LIMITING WEIGHT (1000 KG) - CONF 2

ONE ENGINE OUT
ONE ENGINE AT GO AROUND THRUST

Normal Air Conditioning
Anti Ice OFF

Gradient : 2.5 %
CAT II

OAT (°C)	PRESSURE ALTITUDE (FT)											
	-1000	0	200	400	600	800	1000	1500	2000	5000	9200	12000
≤10	74.3	74.1	73.9	73.7	73.6	73.4	73.2	72.7	72.2	68.9	63.7	59.6
20	74.0	73.8	73.6	73.5	73.3	73.1	72.9	72.4	71.9	68.7	63.5	59.5
22	74.0	73.8	73.6	73.4	73.2	73.1	72.9	72.4	71.9	68.7	63.5	59.0
24	73.9	73.7	73.5	73.4	73.2	73.0	72.8	72.3	71.8	68.7	63.5	57.9
26	73.9	73.7	73.5	73.3	73.1	73.0	72.8	72.3	71.8	68.6	63.5	56.8
28	73.8	73.6	73.4	73.3	73.1	72.9	72.7	72.2	71.8	68.6	62.7	55.6
30	73.8	73.6	73.4	73.2	73.0	72.9	72.7	72.2	71.7	68.6	61.4	54.4
32	73.7	73.5	73.4	73.2	73.0	72.8	72.7	72.2	71.7	68.6	60.0	
34	73.7	73.5	73.3	73.2	73.0	72.8	72.6	72.2	71.7	68.5	58.7	
36	73.7	73.5	73.3	73.1	73.0	72.8	72.6	72.1	71.7	67.9	57.4	
38	73.6	73.5	73.3	73.1	72.9	72.8	72.6	72.1	71.7	66.8		
40	73.6	73.4	73.3	73.1	72.9	72.8	72.6	72.1	71.6	65.6		
42	73.6	73.4	73.3	73.1	72.9	72.7	72.5	72.0	71.0	64.4		
44	73.6	73.3	73.2	73.0	72.7	72.3	71.8	70.8	69.8	63.2		
46	73.5	72.6	72.2	71.8	71.4	71.0	70.6	69.6	68.5			
48	72.7	71.3	70.9	70.5	70.1	69.7	69.3	68.3	67.3			
50	71.4	70.1	69.7	69.3	68.9	68.5	68.1	67.1	66.1			
52	70.2	68.8	68.4	68.0	67.6	67.2	66.8	65.9				
54	69.0	67.7	67.3	66.9								
55	68.4	67.1										

AIR CONDITIONING OFF ADD	ENGINE ANTI ICE ON SUBTRACT	TOTAL ANTI ICE ON SUBTRACT
1600 kg	200 kg	750 kg

CAT II - CONF 3

Ident.: PER-GOA-ACG-CAT-00002145.0019001 / 02 MAR 11
Applicable to: ALL

APPROACH CLIMB LIMITING WEIGHT (1000 KG) - CONF 3

ONE ENGINE OUT ONE ENGINE OUT AT GO AROUND THRUST	Normal Air Conditioning Anti Ice OFF	Gradient : 2.5 % CAT II

OAT (°C)	PRESSURE ALTITUDE (FT)											
	-1000	0	200	400	600	800	1000	1500	2000	5000	9200	12000
≤10	69.9	69.7	69.6	69.4	69.2	69.0	68.8	68.3	67.8	64.9	60.0	56.4
20	69.7	69.5	69.3	69.1	68.9	68.8	68.6	68.1	67.6	64.7	59.9	56.2
22	69.6	69.4	69.3	69.1	68.9	68.7	68.5	68.1	67.6	64.6	59.9	55.8
24	69.6	69.4	69.2	69.0	68.8	68.7	68.5	68.0	67.5	64.6	59.8	54.8
26	69.5	69.3	69.2	69.0	68.8	68.6	68.4	68.0	67.5	64.6	59.8	53.7
28	69.5	69.3	69.1	68.9	68.8	68.6	68.4	67.9	67.4	64.5	59.0	52.6
30	69.4	69.2	69.1	68.9	68.7	68.5	68.4	67.9	67.4	64.5	57.9	51.4
32	69.4	69.2	69.0	68.9	68.7	68.5	68.3	67.9	67.4	64.5	56.6	
34	69.3	69.2	69.0	68.8	68.7	68.5	68.3	67.8	67.4	64.5	55.4	
36	69.3	69.1	69.0	68.8	68.6	68.5	68.3	67.8	67.3	63.9	54.2	
38	69.3	69.1	69.0	68.8	68.6	68.4	68.3	67.8	67.3	62.8		
40	69.3	69.1	68.9	68.8	68.6	68.4	68.3	67.8	67.3	61.8		
42	69.2	69.1	68.9	68.8	68.6	68.4	68.2	67.7	66.7	60.7		
44	69.2	69.0	68.8	68.7	68.4	68.0	67.6	66.6	65.6	59.6		
46	69.1	68.4	68.0	67.6	67.2	66.8	66.4	65.4	64.4			
48	68.4	67.1	66.8	66.4	66.0	65.6	65.2	64.3	63.3			
50	67.2	65.9	65.6	65.2	64.8	64.4	64.1	63.1	62.2			
52	66.1	64.8	64.4	64.0	63.6	63.3	62.9	62.0				
54	64.9	63.7	63.3	63.0								
55	64.4	63.2										

AIR CONDITIONING OFF ADD	ENGINE ANTI ICE ON SUBTRACT	TOTAL ANTI ICE ON SUBTRACT
1500 kg	200 kg	700 kg

PERFORMANCE

LANDING

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GENERAL

Ident.: PER-LDG-GEN-00013287.0001001 / 19 APR 17
Applicable to: ALL

REQUIRED LANDING DISTANCE (RLD) AT DISPATCH

The RLD is the regulatory reference to be used for dispatch landing performance computation.

The RLD is the factored certified landing distance based on:
- Maximum manual braking initiated immediately after main gear touchdown
- Prompt selection of max reverse thrust, maintained to 70kt, and idle thrust to full stop (when credit is used)
- Antiskid and all spoilers operative
- The regulatory dispatch factor.

MANUAL LANDING

CONTAMINATED RUNWAY

If the surface is contaminated, EU-OPS operators must use the longer of the RLD for wet runway and the RLD for the applicable contaminant for dispatch.

AUTOMATIC LANDING

The RLD for automatic landing is defined as the RLD in manual landing corrected with the increment given in AFM. These increments assume maximum manual braking from main gear touchdown.

IN-FLIGHT LANDING DISTANCE

The flight crew should use the Landing Distances published in the QRH as the reference for In-Flight landing performance computation. The In-Flight Landing Distances reflect the performance achievable in a typical operational landing without margin, assuming realistic airborne phase from threshold to touchdown and deceleration on ground to full stop.

The In-Flight Landing Distances consider:
- Airborne phase of 7 seconds from threshold to touchdown
- Maximum manual braking initiated immediately after main gear touchdown
- Normal system delays in braking activation in case of autobrake
- Prompt selection of max reverse thrust, maintained to 70kt, and idle thrust to full stop (when credit is used)
- Antiskid and all spoilers operative.

FACTORED IN-FLIGHT LANDING DISTANCE

The flight crew should apply an appropriate margin to the In-Flight Landing Distances published in the QRH to account for operational variability (e.g. in wind and runway condition reporting) and flying technique (e.g. speed and height above threshold, flare).

This factor should account for:
- The Applicable Regulations
- The Airline Policy
- The discretion of the Pilot.

The Factored In-Flight Landing Distance may in some cases, and in particular on contaminated runway, exceed the RLD considered at dispatch.
The requirements for dispatch remain unchanged and are based on the RLD. However, when arrival conditions are expected to be marginal it is recommended to make a preliminary calculation of In-Flight Landing Distance or Factored In-Flight Landing Distance at dispatch in order to nominate suitable destination alternates.

DISPATCH

Ident.: PER-LDG-GEN-00013288.0001001 / 18 MAR 11
Applicable to: ALL

The pilot must check before departure that the available runway length at destination is at least equal to the required landing distance for the forecasted landing weight.
In case of aircraft system failure affecting landing distance known before the dispatch, the available runway length must be at least equal to the required landing distance with failure, i.e. the required landing distance without failure multiplied by the coefficient given in the Flight Manual or the MMEL.

USE OF THE AUTOBRAKE SYSTEM

Ident.: PER-LDG-GEN-00012045.0001001 / 22 MAY 12
Applicable to: ALL

The autobrake system is designed to help the pilot in case of :
- aborted takeoff or
- landing on short runways or
- operation with low visibility weather conditions

Furthermore, it ensures a straight roll-out and optimizes the landing distance on contaminated runways provided the contamination is evenly distributed.

At landing, select the braking mode according to :
- runway length
- configuration
- runway condition

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GENERAL

Ident.: PER-LDG-CTA-10-00013002.0001001 / 21 JUL 14
Applicable to: ALL

This section presents the recommendations of Airbus for operations from wet runways or from runways which are covered with contaminants such as standing water, slush or snow.

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DEFINITIONS

Ident.: PER-LDG-CTA-20-00013004.0001001 / 31 AUG 17
Applicable to: ALL

DAMP	:	A runway is considered as damp, when the surface of the runway is not dry, but the water on the surface does not cause a shiny appearance.
WET	:	A runway is considered as wet, when the surface of the runway has a shiny appearance due to a thin film of water. When this film does not exceed 3 mm, there is no significant danger of hydroplaning.
FROST	:	The deposit of ice crystals on the runway is referred to as frost. The direct sublimation of humidity contained in the air on a runway, when the surface temperature is below freezing, causes frost.
COMPACTED SNOW	:	The maintenance personnel use a snow groomer to compress snow on a runway in order to obtain a hard surface.
SLIPPERY WHEN WET	:	Notice to Airmen (NOTAM) report a runway as "slippery when wet", when the runway partially or entirely fails to satisfy the minimum (regulatory) friction requirement of the responsible authority.
DRY SNOW	:	Dry snow is snow that, if compacted by hand, does not stay compressed when released. The wind can blow dry snow. The density of dry snow is approximately 0.2 kg/l (1.7 lb/US Gal).
WET SNOW	:	Wet snow is snow that, if compacted by hand, stays compressed when released, and with which snowballs can be created. The density of wet snow is approximately 0.4 kg/l (3.35 lb/US Gal).
STANDING WATER	:	Standing water occurs due to heavy rain and/or insufficient runway drainage with a depth of more than 3 mm.
SLUSH	:	Slush is snow soaked with water, which spatters when stepped on firmly. Slush occurs at temperatures around 5 °C and has a density of approximately 0.85 kg/l (7.1 lb/US Gal).
ICE (Cold and Dry)	:	Situation in which ice occurs on the runway in cold and dry conditions.
WET ICE	:	When the ice on a runway melts, or there are loose/fluid contaminants on top of the ice, the ice is referred to as "wet ice". When there is wet ice on a runway, braking and directional control are difficult or not possible, because the runway surface is very slippery.

EQUIVALENCES

Ident.: PER-LDG-CTA-20-00014917.0001001 / 21 JUL 14
Applicable to: ALL

For the below-listed reported contaminants, the following equivalent runway conditions can be retained for the landing performance determination.

Reported contaminant		Equivalent Runway Condition
Type of contaminant	**Depth of contaminant**	
Slush	≤ 3 mm (1/8 in)	Wet
Water	≤ 3 mm (1/8 in)	
Wet snow	≤ 3 mm (1/8 in)	
	≤ 30 mm (6/5 in)	Slush
Dry snow	≤ 3 mm (1/8 in)	Wet
	≤ 100 mm (4 in)	Slush

RUNWAY CONDITION ASSESSMENT MATRIX FOR LANDING

Ident.: PER-LDG-DIS-MAT-00014450.0001001 / 17 MAR 17
Applicable to: ALL

Runway Surface Conditions		Observations on Deceleration and Directional Control	Related Landing Performance		Maximum Crosswind for Landing (Gust included)
Runway State or / and Runway Contaminant	**ESF(1) or PIREP(2)**		**Code**	**Level**	
Dry	-	-	**6**	**DRY**	38 kt
Damp **Wet** Up to 3 mm (1/8") of water **Slush** Up to 3 mm (1/8") **Dry snow** Up to 3 mm (1/8") **Wet snow** Up to 3 mm (1/8") **Frost**	**Good**	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	**5**	**GOOD**	38 kt
Compacted snow OAT at or below -15 °C	**Good to Medium**	Braking deceleration and controllability is between Good and Medium.	**4**	**GOOD TO MEDIUM**	29 kt
Dry snow More than 3 mm (1/8"), up to 100 mm (4") **Wet snow** More than 3 mm (1/8"), up to 30 mm (6/5") **Compacted snow** OAT above -15 °C **Dry snow over compacted snow** **Wet snow over compacted snow** **Slippery when wet**	**Medium**	Braking deceleration is noticeably reduced for the wheel braking effort applied. Directional control may be reduced.	**3**	**MEDIUM**	25 kt
Water More than 3 mm (1/8"), up to 12.7 mm (1/2") **Slush** More than 3 mm (1/8"), up to 12.7 mm (1/2")	**Medium to Poor**	Braking deceleration and controllability is between Medium and Poor. Potential for hydroplaning exists.	**2**	**MEDIUM TO POOR**	20 kt
Ice (cold & dry)	**Poor**	Braking deceleration is significantly reduced for the wheel braking effort applied. Directional	**1**	**POOR**	15 kt

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Runway Surface Conditions		Observations on Deceleration and Directional Control	Related Landing Performance		Maximum Crosswind for Landing (Gust included)
Runway State or / and Runway Contaminant	**ESF(1) or PIREP(2)**		**Code**	**Level**	
		control may be significantly reduced.			
Wet ice **Water on top of Compacted Snow** **Dry Snow or Wet Snow over ice**	**Nil**	Braking deceleration is minimal to non-existant for the wheel braking effort applied. Directional control may be uncertain.	**-**	**-**	-

(1) *ESF: Estimated Surface Friction*

(2) *PIREP: Pilot Report of Braking Action*

Note: Refer for FCOM LIM-AFS chapter for Automatic Approach, Landing and Rollout limitations.

RLD CONF FULL

Ident.: PER-LDG-DIS-RLD-00013995.0013001 / 22 MAY 12
Applicable to: ALL

The RLD in the first table considers: Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, and VAPP=VLS.

Required Landing Distances (m)					
Runway State / **Weight (1000 kg)**	**Dry**	**Wet**	**Compacted snow**	**Slush**	**Standing Water**
42	1 160	1 330	1 370	1 390	1 430
46	1 150	1 320	1 380	1 410	1 440
50	1 190	1 370	1 440	1 490	1 520
54	1 240	1 420	1 510	1 580	1 630
58	1 280	1 470	1 570	1 660	1 730
62	1 330	1 530	1 640	1 740	1 830
66	1 390	1 590	1 710	1 830	1 940

Corrections on Landing Distances (m)						
Runway State		**Dry**	**Wet**	**Compacted snow**	**Slush**	**Standing Water**
Altitude	Per 1 000 ft ABOVE SL	+ 50	+ 60	+ 80	+ 130	+ 130
Speed	Per 5 kt	+ 70	+ 90	+ 90	+ 140	+ 170
Wind	Per 5 kt TW	+ 150	+ 170	+ 160	+ 260	+ 330
Reverse	Per Thrust Reverser Operative	-	-	- 80	- 90	- 100

RLD CONF 3

Ident.: PER-LDG-DIS-RLD-00013996.0013001 / 22 MAY 12
Applicable to: ALL

The RLD in the first table considers: Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, and VAPP=VLS.

Required Landing Distances (m)					
Runway State / **Weight (1000 kg)**	**Dry**	**Wet**	**Compacted snow**	**Slush**	**Standing Water**
42	1 160	1 330	1 420	1 460	1 500
46	1 210	1 400	1 510	1 570	1 610
50	1 280	1 470	1 600	1 680	1 750
54	1 330	1 530	1 680	1 790	1 890
58	1 390	1 590	1 750	1 890	2 010
62	1 450	1 660	1 820	2 000	2 140
66	1 550	1 790	1 910	2 140	2 270

Corrections on Landing Distances (m)						
Runway State		**Dry**	**Wet**	**Compacted snow**	**Slush**	**Standing Water**
Altitude	Per 1 000 ft ABOVE SL	+ 60	+ 70	+ 90	+ 150	+ 150
Speed	Per 5 kt	+ 110	+ 110	+ 90	+ 150	+ 200
Wind	Per 5 kt TW	+ 150	+ 170	+ 170	+ 300	+ 390
Reverse	Per Thrust Reverser Operative	-	-	- 100	- 110	- 120

EXAMPLE

Ident.: PER-LDG-DIS-RLD-00014743.0001001 / 29 JUL 16
Applicable to: ALL

EXAMPLE 1

The following data and graphs are for example only, and are not for operational use. Even if the data in the following example is in “kg” and “m”, the same method can be applied for “lb” and “ft”.

Required Landing Distance (RLD) determination with multiple corrections

Data: Landing CONF = CONF FULL
LW = 58 T
DRY runway
Airport altitude = 2 000 ft
Approach speed = VLS
5 kt TW
ISA conditions
No slope

Read the reference distance for 58 T from RLD table:

Required Landing Distances (m)					
Runway State / **Weight (1000 kg)**	**Dry**	**Wet**	**Compacted snow**	**Slush**	**Standing Water**
46	1 150	1 320	1 310	1 300	1 350
50	Do not use for operational purpose				
54	1 260	1 450	1 480	1 480	1 530
58	1 320	1 510	1 560	1 570	1 630
62	1 380	1 580	1 640	1 670	1 750
66	1 480	1 710	1 730	1 760	1 880

RLD (DRY, 0 ft, VLS, no wind) = 1 320 m

Read the different corrections:

Corrections on Landing Distances (m)						
Runway State		**Dry**	**Wet**	**Compacted snow**	**Slush**	**Standing Water**
Altitude	Per 1 000 ft ABOVE SL	+ 60	+ 70	+ 90	+ 130	+ 140
Speed	Per 5 kt	+ 100	+ 100	+ 80	+ 110	+ 160
Wind	Per 5 kt TW	+ 140	+ 170	+ 150	+ 220	+ 300
Reverse	Per Thrust Reverser Operative	-	-	- 90	- 90	- 110
CG	Extended Forward CG	+ 30	+ 30	+ 40	+ 40	+ 50

Altitude correction: 60 x 2 = +120 m
Wind correction: 140 x 1 = +140 m

RLD (DRY, 2 000 ft, VLS, 5 kt TW) = 1 320 + 120 + 140 = 1 580 m

EXAMPLE 2

Required Landing Distance (RLD) calculation with WET CHECK (Mandatory for EASA operators)

Data: Landing CONF = CONF FULL
LW = 58 T
Runway covered with STANDING WATER
Airport altitude = 2 000 ft
Approach speed = VLS
Credit for all thrust reversers
ISA conditions
No slope

Required Landing Distances (m)					
Runway State / Weight (1000 kg)	Dry	Wet	Compacted snow	Slush	Standing Water
46	1 150	1 320	1 310	1 300	1 350
50	1 210	1 390	1 400	1 390	1 440
54	1 260	1 450	1 480	1 480	1 530
58	1 320	1 510	1 560	1 570	1 630
62	1 380	1 580	1 640	1 670	1 750
66	1 480	1 710	1 730	1 760	1 880

Corrections on Landing Distances (m)						
Runway State		Dry	Wet	Compacted snow	Slush	Standing Water
Altitude	Per 1 000 ft ABOVE SL	+ 60	+ 70	+ 90	+ 130	+ 140
Speed	Per 5 kt	+ 100	+ 100	+ 80	+ 110	+ 160
Wind	Per 5 kt TW	+ 140	+ 170	+ 150	+ 220	+ 300
Reverse	Per Thrust Reverser Operative	-	-	- 90	- 90	- 110
CG	Extended Forward CG	+ 30	+ 30	+ 40	+ 40	+ 50

RLD (WATER, 2 000 ft, VLS, no wind, all reversers) = 1 630 + 140 x 2 - 110 x 2 = 1 690 m

Compare this distance to the landing distance in the same conditions on WET runway:
RLD (WET, 2 000 ft, VLS, no wind) = 1 510 + 70 x 2 = 1 650 m

RLD (WET) < RLD (WATER), therefore RLD = 1 690 m

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AUTOMATIC LANDING ON DRY RUNWAY

Ident.: PER-LDG-DIS-RLA-00013359.0023001 / 18 MAR 11
Applicable to: ALL

Determine the corrected required landing distance for manual landing from the data above.

The required landing distance for automatic landing is equal to the corrected required landing distance for manual landing except in the following case:
- In case of landing in CONF 3 with landing weight equal to or less than 55 000 kg and with no wind or headwind, it is equal to the corrected required landing distance for manual required landing increased by 95 m.
- In case of landing in CONF FULL with landing weight equal to or less than 70 000 kg it is equal to the corrected required landing distance for manual required landing increased by 90 m.

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PERFORMANCE

ONE ENGINE INOPERATIVE

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PER-OEI-GEN GENERAL

PER-OEI-ALT ALTITUDE

PER-OEI-ALT-10 CEILINGS

PER-OEI-CRT CRUISE TABLES

PER-OEI-CRT-10 STANDARD AND OBSTACLE STRATEGIES

PER-OEI-CRT-20 FIXED SPEED STRATEGIES

PER-OEI-ICQ IN CRUISE QUICK CHECK

PER-OEI-ICQ-10 STANDARD STRATEGIES

PER-OEI-ICQ-20 FIXED SPEED STRATEGIES

PER-OEI-HLD HOLDING

PER-OEI-DES DESCENT

PER-OEI-DES-10 STANDARD STRATEGY

PER-OEI-DES-15 OBSTACLE STRATEGY

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PER-OEI-DES-20 FIXED SPEED STRATEGIES

PER-OEI-DES-30 DESCENT TO LANDING

INTRODUCTION

Ident.: PER-OEI-GEN-00002064.0001001 / 10 DEC 09
Applicable to: ALL

This chapter provides the single engine performance data to be used for the conduct and monitoring of the flight following an engine failure.
The diversion strategy (descent and cruise speed schedules) shall be selected, and specified in the operator's routes specifications, as a function of the prevailing operational factors (e.g. obstacles clearance requirements and/or ETOPS operation).

FLIGHT PREPARATION

Ident.: PER-OEI-GEN-00002065.0001001 / 01 DEC 14
Applicable to: ALL

In readiness for a possible engine failure occurring during the flight, any flight shall be planned so as to comply with any of the following requirements, as applicable :
- obstacle clearance,
- oxygen,
- maximum diversion distance (ETOPS operation).

The following FCOM sections provide flight preparation and fuel planning information :
- *Refer to PER-FPL-GEN-MFR MINIMUM RECOMMENDED FUEL REQUIREMENTS*, for Standard Fuel Planning,
- *Refer to PRO-SPO-40-10 General*, for Extended Range Operation (ETOPS) and associated fuel requirements.

STRATEGY

Ident.: PER-OEI-GEN-00002067.0001001 / 23 NOV 11
Applicable to: ALL

Depending on the prevailing operational constraints, the most appropriate diversion strategy shall be selected, out of the following options:

	STANDARD STRATEGY	OBSTACLE STRATEGY	FIXED SPEED STRATEGIES	
			320 kt	VMO
DESCENT TO CEILING	• M .78/300 kt • MCT	• Green Dot Speed • MCT	• M .78/320 kt • MCT	• M .80/350 kt • MCT
CRUISE	LR ceiling LR speed	- Obstacle not cleared: Maintain Green Dot Speed at MCT - Obstacle cleared : Revert to standard strategy	FL per *Refer to PRO-SPO-40-60 ETOPS Fuel Requirement from Critical Point to Landing - One Engine Out - Cruise at 320kt* MCT/320 kt	FL per *Refer to PRO-SPO-40-60 ETOPS Fuel Requirement from Critical Point to Landing - One Engine Out - Cruise at 350kt* MCT/350 kt
DESCENT TO LANDING	IDLE/M .78/300 kt/250 kt			
Approx increase in fuel consumption compared with both engines operative	+33 %			

For ETOPS operations, any of the above diversion strategies can be used provided that the selected strategy and speed schedule is used in:
- establishing the area of operation (maximum diversion distance), *Refer to PRO-SPO-40-60 General*,
- calculating the diversion fuel requirements for the single engine ETOPS critical scenario, *Refer to PRO-SPO-40-30 ETOPS Fuel Scenarios*,
- demonstrating the applicable obstacle clearance requirements (net flight path and net ceiling).

During the diversion, the flight crew is expected to use the planned speed schedule.
However, based on the evaluation of the actual situation, the pilot in command has the authority to deviate from this planned one engine inoperative speed.

CEILINGS

Ident.: PER-OEI-ALT-10-00016065.0001001 / 22 MAR 17
Applicable to: ALL

Refer to QRH/PER-L Ceilings (Paper Only) or use the performance application of FlySmart with Airbus.

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LONG RANGE CRUISE - 1 ENGINE OUT - ISA

Ident.: PER-OEI-CRT-10-00002108.0022001 / 01 MAR 11
Applicable to: ALL

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA
CG=33.0%

N1 (%)	MACH
KG/H	IAS (KT)
NM/1000KG	TAS (KT)

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
48	74.1	.438	76.0	.458	78.1	.480	79.5	.495	81.1	.513	82.1	.523
	1798	242	1805	244	1816	246	1792	244	1779	244	1740	239
	155.4	279	160.7	290	166.4	302	172.5	309	178.5	318	184.8	322
50	75.2	.447	77.4	.470	79.1	.489	80.5	.504	82.0	.519	82.8	.528
	1872	247	1889	250	1884	251	1862	249	1839	247	1792	241
	152.4	285	157.6	298	163.1	307	169.0	315	174.9	322	181.0	324
52	76.5	.458	78.7	.481	80.0	.495	81.5	.512	82.6	.523	83.7	.536
	1957	253	1970	256	1944	254	1928	253	1890	249	1862	245
	149.5	293	154.6	305	160.2	311	165.7	320	171.5	324	176.8	329
54	77.8	.469	79.6	.488	80.9	.503	82.5	.519	83.2	.527	84.6	.544
	2041	260	2039	260	2012	258	1992	257	1940	250	1935	249
	146.8	300	151.8	310	157.2	316	162.6	324	168.2	326	172.8	334
56	79.0	.480	80.4	.495	81.9	.511	83.0	.523	84.0	.534	85.4	.552
	2124	265	2100	264	2081	262	2044	258	2008	254	2004	252
	144.2	306	149.3	313	154.4	321	159.6	326	164.7	331	169.1	339
58	79.9	.487	81.2	.501	82.8	.518	83.6	.526	84.9	.541	86.1	.556
	2193	269	2164	267	2147	266	2095	260	2080	258	2063	254
	141.8	311	146.7	318	151.6	326	156.8	328	161.2	335	165.5	341
60	80.7	.493	82.1	.508	83.4	.522	84.3	.531	85.7	.549	86.7	.560
	2256	273	2233	271	2203	268	2156	263	2153	261	2123	256
	139.5	315	144.2	322	149.0	328	153.8	332	157.9	340	162.0	344
62	81.4	.498	83.0	.515	84.0	.525	85.1	.538	86.4	.554	87.3	.564
	2317	276	2301	275	2255	270	2228	266	2217	264	2188	258
	137.4	318	141.8	326	146.5	330	150.8	336	154.8	343	158.4	347
64	82.3	.505	83.7	.521	84.5	.528	85.8	.546	86.9	.558	88.1	.571
	2386	280	2364	278	2306	272	2302	270	2276	266	2265	261
	135.2	323	139.6	330	144.1	332	147.9	340	151.8	345	154.8	351
66	83.1	.512	84.2	.524	85.2	.534	86.6	.552	87.5	.562	88.7	.573
	2457	284	2418	280	2375	275	2373	273	2340	268	2325	263
	133.0	327	137.3	332	141.5	336	145.2	344	148.7	348	151.5	352
68	83.8	.518	84.7	.527	85.9	.541	87.1	.556	88.1	.567	88.7	.562
	2524	287	2469	281	2447	278	2434	275	2407	270	2316	257
	131.0	331	135.2	334	139.0	340	142.5	347	145.7	351	149.2	346
70	84.5	.522	85.2	.530	86.6	.547	87.7	.559	88.7	.570	88.7	.547
	2585	289	2525	283	2520	281	2493	277	2469	272	2305	250
	129.0	333	133.1	336	136.5	344	140.0	349	142.9	353	145.7	336
72	84.9	.525	85.9	.536	87.3	.553	88.2	.563	88.7	.561	88.7	.512
	2638	291	2596	286	2592	285	2558	279	2460	267	2283	233
	127.1	335	130.9	340	134.2	348	137.4	351	141.1	347	137.8	314
74	85.4	.528	86.6	.542	87.8	.556	88.8	.567	88.7	.548		
	2687	292	2669	290	2652	286	2625	281	2450	261		
	125.4	337	128.7	344	131.9	350	134.8	354	138.5	339		

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = + 2.5 %	ΔFUEL = + 5 %

11.0-08F0A319-112 CFM56-5B6/P SA12200010C6KG330 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 0 FCOM-N0-03-06-30-004-240

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF	ISA CG=33.0%	N1 (%) KG/H NM/1000KG	MACH IAS (KT) TAS (KT)

WEIGHT (1000KG)	FL210		FL220		FL230		FL240		FL250		FL260	
48	82.5	.528	83.2	.536	84.0	.546	84.5	.553	85.0	.558	85.6	.564
	1718	236	1713	235	1713	235	1704	233	1690	230	1685	228
	188.0	323	190.7	327	193.3	331	196.0	334	198.6	336	200.8	338
50	83.5	.536	84.2	.546	84.8	.553	85.3	.557	85.8	.563	86.5	.571
	1788	240	1787	239	1778	238	1762	235	1755	233	1756	231
	183.5	328	186.0	332	188.6	335	191.1	337	193.3	339	195.0	342
52	84.4	.545	85.0	.552	85.5	.557	86.0	.563	86.7	.571	87.2	.572
	1861	244	1853	243	1837	240	1827	237	1830	236	1810	231
	179.2	334	181.7	337	184.1	338	186.2	340	187.9	344	189.6	343
54	85.3	.552	85.7	.557	86.2	.562	86.9	.570	87.4	.573	88.4	.585
	1929	247	1912	245	1900	242	1902	241	1886	237	1916	237
	175.2	338	177.5	339	179.6	341	181.2	345	182.8	345	183.1	351
56	85.9	.557	86.4	.562	87.0	.569	87.6	.573	88.4	.582	88.6	.573
	1989	250	1975	247	1974	245	1963	242	1977	240	1922	232
	171.3	341	173.3	342	175.0	345	176.5	346	177.1	350	178.7	343
58	86.5	.561	87.2	.568	87.8	.573	88.4	.579	88.5	.568	88.5	.546
	2048	251	2046	250	2039	247	2040	244	1973	234	1904	220
	167.5	343	169.1	346	170.6	348	171.5	350	173.2	342	171.9	327
60	87.3	.566	87.9	.573	88.4	.575	88.5	.567	88.5	.540		
	2118	254	2118	252	2101	248	2042	239	1955	222		
	163.6	346	165.0	349	166.2	349	167.7	343	166.2	325		
62	88.1	.573	88.5	.575	88.6	.566	88.5	.542				
	2195	257	2175	253	2112	244	2025	228				
	159.8	351	161.1	350	162.6	344	161.8	328				
64	88.6	.575	88.6	.565	88.6	.544						
	2252	258	2182	248	2097	234						
	156.1	352	157.9	344	157.5	330						
66	88.7	.564	88.6	.546								
	2249	253	2168	240								
	153.4	345	153.5	333								
68	88.7	.547										
	2237	245										
	149.5	334										
70	88.7	.547										
	2207	222										
	137.7	304										
72												
74												

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = + 2.5 %	ΔFUEL = + 5 %

11.0-08F0A319-112 CFM56-5B6/P SA12200010C6KG330 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 0 FCOM-N0-03-06-30-005-240

LONG RANGE CRUISE - 1 ENGINE OUT - ISA +20

Ident.: PER-OEI-CRT-10-00002111.0065001 / 10 DEC 09
Applicable to: ALL

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA+20
CG=33.0%

N1 (%) / MACH
KG/H / IAS (KT)
NM/1000KG / TAS (KT)

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
48	76.7	.434	78.5	.452	80.9	.475	82.4	.491	84.1	.509	85.2	.520
	1857	240	1858	241	1875	244	1858	242	1849	242	1814	237
	154.8	287	159.9	297	165.5	310	171.3	318	177.1	328	183.2	332
50	77.9	.443	80.0	.465	81.9	.484	83.5	.501	85.1	.516	86.0	.526
	1935	245	1950	248	1948	248	1934	247	1914	245	1873	240
	151.6	293	156.7	306	162.1	316	167.7	324	173.4	332	179.2	336
52	79.1	.453	81.4	.476	82.9	.492	84.6	.509	85.7	.520	86.9	.533
	2016	250	2035	254	2019	252	2006	251	1969	247	1945	244
	148.7	300	153.7	313	159.0	321	164.3	330	169.9	334	175.1	341
54	80.4	.464	82.3	.484	84.0	.500	85.5	.516	86.4	.524	87.9	.541
	2106	257	2108	258	2094	257	2075	255	2023	249	2021	247
	145.9	307	150.8	318	155.9	326	161.1	334	166.5	337	171.1	346
56	81.7	.475	83.3	.491	84.9	.508	86.2	.520	87.2	.532	88.7	.549
	2193	263	2179	262	2165	261	2131	257	2099	253	2095	251
	143.3	314	148.1	323	153.0	331	158.1	337	162.9	342	167.2	350
58	82.6	.482	84.2	.498	85.9	.515	86.7	.524	88.1	.539	89.4	.554
	2267	267	2250	266	2236	264	2186	259	2175	256	2161	253
	140.7	319	145.5	327	150.2	336	155.2	339	159.4	347	163.6	354
60	83.6	.490	85.1	.505	86.5	.519	87.5	.530	89.0	.547	89.6	.550
	2344	271	2323	269	2295	267	2256	262	2253	260	2181	251
	138.3	324	142.9	332	147.5	339	152.1	343	156.1	352	160.9	351
62	84.4	.496	86.0	.512	87.0	.522	88.3	.536	89.4	.547	89.6	.538
	2409	274	2395	273	2350	268	2329	265	2292	260	2173	246
	136.1	328	140.5	336	145.0	341	149.1	347	153.5	352	158.2	344
64	85.3	.503	86.8	.518	87.6	.526	89.1	.543	89.4	.538	89.6	.522
	2486	278	2463	276	2406	270	2407	269	2287	256	2161	238
	133.8	333	138.1	340	142.6	343	146.2	352	151.3	346	154.1	333
66	86.1	.509	87.3	.521	88.3	.532	89.8	.550	89.4	.526	89.5	.487
	2558	282	2520	278	2482	274	2482	272	2280	250	2144	222
	131.7	337	135.9	342	139.9	347	143.4	356	148.5	339	144.9	311
68	86.9	.515	87.8	.524	89.1	.539	90.4	.554	89.4	.509		
	2628	285	2575	280	2559	277	2548	274	2271	242		
	129.6	341	133.7	344	137.3	351	140.8	359	144.2	327		
70	87.5	.519	88.4	.529	89.8	.545	91.0	.557	89.4	.476		
	2692	288	2641	282	2637	280	2613	276	2263	225		
	127.6	344	131.5	347	134.9	356	138.2	361	135.2	306		
72	88.0	.522	89.1	.534	90.5	.551	91.0	.549				
	2748	289	2714	285	2713	283	2606	272				
	125.7	345	129.3	351	132.5	359	136.6	356				
74	88.5	.525	89.8	.540	90.7	.547	90.9	.539				
	2803	291	2792	289	2730	282	2598	267				
	123.9	347	127.1	355	130.8	357	134.5	349				

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = + 2.5 %	ΔFUEL = + 5 %

11.0-08F0A319-112 CFM56-5B6/P SA12200010C6KG330 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 20 FCOM-N0-03-06-30-010-240

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF							ISA+20 CG=33.0%		N1 (%) KG/H NM/1000KG		MACH IAS (KT) TAS (KT)	
WEIGHT (1000KG)	FL210		FL220		FL230		FL240		FL250		FL260	
48	85.8	.526	86.5	.534	87.3	.544	87.9	.551	88.4	.556	89.0	.562
	1798	235	1794	234	1794	234	1785	232	1773	229	1766	227
	186.2	335	188.8	339	191.4	343	194.0	346	196.5	348	198.6	351
50	86.7	.534	87.5	.544	88.2	.551	88.7	.556	89.3	.562	89.5	.560
	1870	239	1871	239	1863	237	1850	234	1842	232	1801	226
	181.7	340	184.1	345	186.6	348	189.0	350	191.1	352	194.1	350
52	87.7	.543	88.4	.550	88.9	.556	89.5	.561	89.4	.553	89.5	.543
	1947	243	1941	242	1927	239	1918	237	1848	228	1789	219
	177.4	345	179.7	349	182.0	351	184.1	353	187.5	346	189.4	339
54	88.6	.550	89.1	.555	89.6	.559	89.5	.550	89.4	.534	89.5	.501
	2018	246	2004	244	1986	240	1912	232	1835	220	1765	201
	173.3	350	175.5	352	177.7	353	180.9	346	182.3	335	177.1	313
56	89.2	.554	89.6	.556	89.5	.547	89.5	.531	89.4	.481		
	2080	248	2051	244	1977	235	1899	223	1809	197		
	169.4	352	171.8	352	174.7	345	176.0	334	166.7	301		
58	89.6	.553	89.6	.544	89.5	.529	89.4	.484				
	2116	248	2042	239	1964	227	1875	203				
	166.2	352	168.9	345	170.0	334	162.5	305				
60	89.6	.541	89.5	.527	89.5	.485						
	2108	242	2030	231	1942	208						
	163.4	344	164.4	334	157.8	306						
62	89.6	.524	89.5	.486								
	2096	234	2009	212								
	159.1	334	153.3	308								
64	89.5	.487										
	2077	217										
	149.1	310										
66												
68												
70												
72												
74												
ENGINE ANTI ICE ON ΔFUEL = + 2.5 %							TOTAL ANTI ICE ON ΔFUEL = + 5 %					

11.0-08F0A319-112 CFM56-5B6/P SA12200010C6KG330 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 20 FCOM-N0-03-06-30-011-240

CRUISE - MCT/VMO - 1 ENGINE OUT - ISA

Ident.: PER-OEI-CRT-20-00002112.0025001 / 22 FEB 11
Applicable to: ALL

CRUISE - MCT/341KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF							ISA CG=33.0%		N1 (%) KG/H NM/1000KG			MACH IAS (KT) TAS (KT)
WEIGHT (1000KG)	FL100		FL150		FL160		FL180		FL200		FL220	
48	89.6	.614	90.0	.631	90.0	.635	88.7	.620	88.6	.622	88.6	.622
	3242	341	2891	320	2823	316	2500	296	2353	286	2215	275
	120.9	392	136.8	396	140.3	396	153.5	384	162.3	382	171.3	379
50	89.6	.613	90.0	.630	90.0	.633	88.7	.617	88.6	.618	88.6	.619
	3243	341	2891	319	2823	315	2500	295	2352	284	2213	273
	120.6	391	136.5	395	139.9	395	152.9	382	161.5	380	170.3	377
52	89.6	.612	90.0	.628	90.0	.631	88.7	.614	88.6	.615	88.6	.614
	3245	340	2892	318	2823	314	2499	294	2351	283	2212	271
	120.4	391	136.1	393	139.5	394	152.2	380	160.7	378	169.2	374
54	89.6	.611	90.0	.626	90.1	.629	88.7	.611	88.7	.611	88.6	.609
	3246	340	2892	317	2823	313	2499	292	2350	281	2211	269
	120.1	390	135.6	392	139.0	392	151.5	379	159.8	376	167.9	371
56	89.6	.609	90.0	.624	90.1	.627	88.7	.608	88.7	.607	88.7	.603
	3248	339	2892	316	2823	312	2498	291	2349	279	2209	266
	119.8	389	135.2	391	138.6	391	150.8	377	158.8	373	166.4	368
58	89.6	.608	90.0	.622	90.1	.624	88.7	.605	88.7	.603	88.7	.596
	3250	338	2893	315	2823	310	2497	289	2347	277	2205	263
	119.4	388	134.7	390	138.0	390	150.0	374	157.7	370	164.7	363
60	89.6	.607	90.0	.620	90.1	.622	88.7	.601	88.7	.597	88.7	.588
	3252	337	2893	314	2822	309	2497	287	2344	274	2198	259
	119.1	387	134.2	388	137.4	388	149.0	372	156.4	367	162.9	358
62	89.6	.605	90.0	.617	90.1	.619	88.7	.596	88.7	.590	88.7	.578
	3254	336	2893	313	2822	308	2493	285	2338	270	2191	254
	118.7	386	133.6	387	136.8	386	148.1	369	155.0	362	160.7	352
64	89.6	.604	90.0	.614	90.1	.616	88.7	.591	88.7	.582	88.6	.565
	3256	335	2894	311	2822	306	2488	282	2331	267	2182	248
	118.3	385	133.0	385	136.2	384	147.1	366	153.4	358	157.9	344
66	89.6	.602	90.1	.612	90.1	.613	88.7	.585	88.7	.573	88.6	.546
	3258	335	2894	310	2822	304	2482	279	2325	263	2168	240
	117.9	384	132.4	383	135.5	382	145.8	362	151.5	352	153.5	333
68	89.7	.600	90.1	.608	90.2	.609	88.7	.578	88.7	.562		
	3260	333	2894	308	2822	302	2475	275	2316	257		
	117.5	383	131.7	381	134.7	380	144.5	358	149.2	346		
70	89.7	.598	90.1	.605	90.2	.605	88.7	.570	88.7	.547		
	3259	332	2894	306	2822	300	2469	272	2305	250		
	117.1	382	130.9	379	133.7	377	142.9	353	145.7	336		
72	89.7	.596	90.1	.601	90.2	.600	88.7	.561	88.7	.512		
	3257	331	2895	304	2822	298	2460	267	2283	233		
	116.7	380	130.1	377	132.7	374	141.1	347	137.8	314		
74	89.7	.593	90.1	.596	90.2	.594	88.7	.548				
	3255	330	2891	302	2816	295	2450	261				
	116.3	379	129.2	374	131.6	371	138.5	339				
ENGINE ANTI ICE ON ΔFUEL = + 1.5 %							**TOTAL ANTI ICE ON** ΔFUEL = + 3.5 %					

11.0-08F0A319-112 CFM56-5B6/P SA12300010C6KG330 0 018590 0 0 3 1.3 .0 .00 0 1100.000 .000 .000 0 FCOM-N0-03-06-50-005-240

CRUISE - MCT/VMO - 1 ENGINE OUT - ISA +20

Ident.: PER-OEI-CRT-20-00002115.0045001 / 02 FEB 11
Applicable to: ALL

CRUISE - MCT/323KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST
PACK FLOW HI
ANTI-ICING OFF

ISA+20
CG=33.0%

N1 (%) / MACH
KG/H / IAS (KT)
NM/1000KG / TAS (KT)

WEIGHT (1000KG)	FL100		FL150		FL160		FL180		FL200		FL220	
48	90.1	.581	90.9	.598	91.0	.601	89.4	.582	89.7	.587	89.6	.585
	3032	323	2710	303	2650	299	2312	277	2210	269	2073	258
	126.9	385	143.5	389	147.0	390	161.8	374	169.5	375	178.9	371
50	90.1	.580	90.9	.596	91.0	.599	89.4	.578	89.7	.583	89.6	.580
	3031	322	2708	302	2651	298	2310	276	2207	267	2069	255
	126.6	384	143.1	388	146.5	388	161.0	372	168.6	372	177.5	367
52	90.1	.579	90.9	.594	91.0	.597	89.4	.575	89.7	.578	89.6	.573
	3030	321	2706	300	2648	296	2308	274	2203	265	2064	252
	126.3	383	142.7	386	146.0	387	160.2	370	167.5	369	175.9	363
54	90.1	.577	90.9	.591	91.0	.594	89.4	.571	89.7	.572	89.6	.565
	3029	320	2704	299	2646	295	2305	272	2199	262	2058	248
	126.0	382	142.2	384	145.5	385	159.2	367	166.3	366	174.0	358
56	90.1	.575	90.9	.589	91.0	.591	89.4	.566	89.7	.566	89.6	.556
	3028	319	2702	298	2643	293	2303	270	2193	259	2051	244
	125.7	381	141.6	383	144.9	383	158.1	364	164.7	361	171.8	352
58	90.1	.573	90.9	.586	91.0	.588	89.4	.561	89.6	.558	89.6	.544
	3027	318	2699	296	2640	292	2300	267	2188	255	2042	239
	125.3	379	141.1	381	144.3	381	156.8	361	163.0	357	168.9	345
60	90.1	.571	90.9	.582	91.0	.584	89.4	.554	89.6	.550	89.5	.527
	3025	317	2697	295	2636	290	2296	264	2181	251	2030	231
	125.0	378	140.4	379	143.5	378	155.3	356	160.9	351	164.4	334
62	90.1	.569	90.9	.579	91.0	.580	89.4	.547	89.6	.538	89.5	.486
	3024	316	2694	293	2633	288	2292	260	2173	246	2009	212
	124.6	377	139.7	376	142.7	376	153.5	352	158.2	344	153.3	308
64	90.1	.567	90.9	.575	91.0	.575	89.4	.538	89.6	.522		
	3022	315	2690	291	2628	285	2287	256	2161	238		
	124.1	375	138.9	374	141.8	373	151.3	346	154.1	333		
66	90.1	.564	90.8	.570	91.0	.570	89.4	.526	89.5	.487		
	3020	313	2687	288	2624	283	2280	250	2144	222		
	123.6	373	138.0	371	140.8	369	148.5	339	144.9	311		
68	90.1	.562	90.8	.565	91.0	.564	89.4	.509				
	3018	312	2682	285	2618	279	2271	242				
	123.1	372	137.0	367	139.6	365	144.2	327				
70	90.1	.559	90.8	.559	91.0	.557	89.4	.476				
	3016	310	2677	282	2613	276	2263	225				
	122.5	370	135.8	364	138.2	361	135.2	306				
72	90.1	.555	90.8	.552	91.0	.549						
	3014	308	2672	279	2606	272						
	121.9	367	134.4	359	136.6	356						
74	90.1	.552	90.8	.545	90.9	.539						
	3012	306	2666	275	2598	267						
	121.2	365	132.8	354	134.5	349						

ENGINE ANTI ICE ON
ΔFUEL = + 1.5 %

TOTAL ANTI ICE ON
ΔFUEL = + 3.5 %

11.0-08F0A319-112 CFM56-5B6/P SA12300010C6KG330 0 018590 0 0 3 1.3 .0 .00 0 1100.000 .000 .000 20 FCOM-N0-03-06-50-008-240

CRUISE - MCT/320KT - 1 ENGINE OUT - ISA

Ident.: PER-OEI-CRT-20-00002116.0025001 / 22 FEB 11
Applicable to: ALL

CRUISE - MCT/320KT - 1 ENGINE OUT												
MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF							ISA CG=33.0%		N1 (%) KG/H NM/1000KG		MACH IAS (KT) TAS (KT)	
WEIGHT (1000KG)	FL100		FL150		FL160		FL180		FL200		FL220	
48	86.4	.576	89.9	.631	90.0	.635	88.7	.620	88.6	.622	88.6	.622
	2828	320	2887	320	2823	316	2500	296	2353	286	2215	275
	130.1	368	136.9	395	140.3	396	153.5	384	162.3	382	171.3	379
50	86.5	.576	90.0	.630	90.0	.633	88.7	.617	88.6	.618	88.6	.619
	2841	320	2891	319	2823	315	2500	295	2352	284	2213	273
	129.5	368	136.5	395	139.9	395	152.9	382	161.5	380	170.3	377
52	86.6	.576	90.0	.628	90.0	.631	88.7	.614	88.6	.615	88.6	.614
	2857	320	2892	318	2823	314	2499	294	2351	283	2212	271
	128.8	368	136.1	393	139.5	394	152.2	380	160.7	378	169.2	374
54	86.7	.576	90.0	.626	90.1	.629	88.7	.611	88.7	.611	88.6	.609
	2873	320	2892	317	2823	313	2499	292	2350	281	2211	269
	128.1	368	135.6	392	139.0	392	151.5	379	159.8	376	167.9	371
56	86.9	.576	90.0	.624	90.1	.627	88.7	.608	88.7	.607	88.7	.603
	2890	320	2892	316	2823	312	2498	291	2349	279	2209	266
	127.3	368	135.2	391	138.6	391	150.8	377	158.8	373	166.4	368
58	87.0	.576	90.0	.622	90.1	.624	88.7	.605	88.7	.603	88.7	.596
	2908	320	2893	315	2823	310	2497	289	2347	277	2205	263
	126.5	368	134.7	390	138.0	390	150.0	374	157.7	370	164.7	363
60	87.2	.576	90.0	.620	90.1	.622	88.7	.601	88.7	.597	88.7	.588
	2926	320	2893	314	2822	309	2497	287	2344	274	2198	259
	125.7	368	134.2	388	137.4	388	149.0	372	156.4	367	162.9	358
62	87.4	.576	90.0	.617	90.1	.619	88.7	.596	88.7	.590	88.7	.578
	2946	320	2893	313	2822	308	2493	285	2338	270	2191	254
	124.9	368	133.6	387	136.8	386	148.1	369	155.0	362	160.7	352
64	87.5	.576	90.0	.614	90.1	.616	88.7	.591	88.7	.582	88.6	.565
	2967	320	2894	311	2822	306	2488	282	2331	267	2182	248
	124.0	368	133.0	385	136.2	384	147.1	366	153.4	358	157.9	344
66	87.7	.576	90.1	.612	90.1	.613	88.7	.585	88.7	.573	88.6	.546
	2988	320	2894	310	2822	304	2482	279	2325	263	2168	240
	123.1	368	132.4	383	135.5	382	145.8	362	151.5	352	153.5	333
68	87.9	.576	90.1	.608	90.2	.609	88.7	.578	88.7	.562		
	3010	320	2894	308	2822	302	2475	275	2316	257		
	122.2	368	131.7	381	134.7	380	144.5	358	149.2	346		
70	88.1	.576	90.1	.605	90.2	.605	88.7	.570	88.7	.547		
	3033	320	2894	306	2822	300	2469	272	2305	250		
	121.3	368	130.9	379	133.7	377	142.9	353	145.7	336		
72	88.3	.576	90.1	.601	90.2	.600	88.7	.561	88.7	.512		
	3057	320	2895	304	2822	298	2460	267	2283	233		
	120.3	368	130.1	377	132.7	374	141.1	347	137.8	314		
74	88.5	.576	90.1	.596	90.2	.594	88.7	.548				
	3083	320	2891	302	2816	295	2450	261				
	119.3	368	129.2	374	131.6	371	138.5	339				
ENGINE ANTI ICE ON ΔFUEL = + 2 %							TOTAL ANTI ICE ON ΔFUEL = + 4 %					

11.0-08F0A319-112 CFM56-5B6/P SA12300010C6KG330 0 018590 0 0 3 1.0 .0 .00 0 1100.000 .000 .000 0 FCOM-N0-03-06-50-009-240

CRUISE - MCT/320KT - 1 ENGINE OUT - ISA +20

Ident.: PER-OEI-CRT-20-00002119.0025001 / 22 FEB 11
Applicable to: ALL

CRUISE - MCT/320KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF							ISA+20 CG=33.0%		N1 (%) KG/H NM/1000KG			MACH IAS (KT) TAS (KT)
WEIGHT (1000KG)	FL100		FL150		FL160		FL180		FL200		FL220	
48	89.6	.576	90.9	.598	91.0	.601	89.4	.582	89.7	.587	89.6	.585
	2975	320	2710	303	2650	299	2312	277	2210	269	2073	258
	128.2	381	143.5	389	147.0	390	161.8	374	169.5	375	178.9	371
50	89.8	.576	90.9	.596	91.0	.599	89.4	.578	89.7	.583	89.6	.580
	2989	320	2708	302	2651	298	2310	276	2207	267	2069	255
	127.6	381	143.1	388	146.5	388	161.0	372	168.6	372	177.5	367
52	89.9	.576	90.9	.594	91.0	.597	89.4	.575	89.7	.578	89.6	.573
	3006	320	2706	300	2648	296	2308	274	2203	265	2064	252
	126.9	381	142.7	386	146.0	387	160.2	370	167.5	369	175.9	363
54	90.1	.576	90.9	.591	91.0	.594	89.4	.571	89.7	.572	89.6	.565
	3023	320	2704	299	2646	295	2305	272	2199	262	2058	248
	126.2	381	142.2	384	145.5	385	159.2	367	166.3	366	174.0	358
56	90.1	.575	90.9	.589	91.0	.591	89.4	.566	89.7	.566	89.6	.556
	3028	319	2702	298	2643	293	2303	270	2193	259	2051	244
	125.7	381	141.6	383	144.9	383	158.1	364	164.7	361	171.8	352
58	90.1	.573	90.9	.586	91.0	.588	89.4	.561	89.6	.558	89.6	.544
	3027	318	2699	296	2640	292	2300	267	2188	255	2042	239
	125.3	379	141.1	381	144.3	381	156.8	361	163.0	357	168.9	345
60	90.1	.571	90.9	.582	91.0	.584	89.4	.554	89.6	.550	89.5	.527
	3025	317	2697	295	2636	290	2296	264	2181	251	2030	231
	125.0	378	140.4	379	143.5	378	155.3	356	160.9	351	164.4	334
62	90.1	.569	90.9	.579	91.0	.580	89.4	.547	89.6	.538	89.5	.486
	3024	316	2694	293	2633	288	2292	260	2173	246	2009	212
	124.6	377	139.7	376	142.7	376	153.5	352	158.2	344	153.3	308
64	90.1	.567	90.9	.575	91.0	.575	89.4	.538	89.6	.522		
	3022	315	2690	291	2628	285	2287	256	2161	238		
	124.1	375	138.9	374	141.8	373	151.3	346	154.1	333		
66	90.1	.564	90.8	.570	91.0	.570	89.4	.526	89.5	.487		
	3020	313	2687	288	2624	283	2280	250	2144	222		
	123.6	373	138.0	371	140.8	369	148.5	339	144.9	311		
68	90.1	.562	90.8	.565	91.0	.564	89.4	.509				
	3018	312	2682	285	2618	279	2271	242				
	123.1	372	137.0	367	139.6	365	144.2	327				
70	90.1	.559	90.8	.559	91.0	.557	89.4	.476				
	3016	310	2677	282	2613	276	2263	225				
	122.5	370	135.8	364	138.2	361	135.2	306				
72	90.1	.555	90.8	.552	91.0	.549						
	3014	308	2672	279	2606	272						
	121.9	367	134.4	359	136.6	356						
74	90.1	.552	90.8	.545	90.9	.539						
	3012	306	2666	275	2598	267						
	121.2	365	132.8	354	134.5	349						
ENGINE ANTI ICE ON ΔFUEL = + 2 %							**TOTAL ANTI ICE ON** ΔFUEL = + 4 %					

11.0-08F0A319-112 CFM56-5B6/P SA12300010C6KG330 0 018590 0 0 3 1.0 .0 .00 0 1100.000 .000 .000 20 FCOM-N0-03-06-50-012-240

IN CRUISE QUICK CHECK AT LONG RANGE SPEED

Ident.: PER-OEI-ICQ-10-00002122.0004001 / 22 MAR 17
Applicable to: ALL

In cruise quick check tables (*Refer to QRH/PER-L In Cruise Quick Check Long Range (Paper Only)* or use the performance application of FlySmart with Airbus) allow the flight crew to determine the fuel consumption and the time required to cover a given air distance from any moment in cruise to landing, with one engine inoperative.

The QRH tables are established for:
- Cruise Mach number : long range
- Descent profile : M .78/300 kt/250 kt
- Approach and landing : 110 kg or 240 lb - 6 min IMC
- ISA
- CG = 33 %
- Pack flow HI
- Anti ice OFF

Note: *1. In the tables, the asterisk (*) means that a step climb of 4 000 ft must be flown to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
3. For each degree Celsius above ISA temperature apply a fuel correction of 0.015 (kg/°C/NM) × Δ ISA (°C) × air distance (NM) or 0.033 (lb/°C/NM) × ΔISA (°C) × air distance (NM).

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

Ident.: PER-OEI-ICQ-10-00002123.0001001 / 21 MAR 17
Applicable to: ALL

The in cruise quick check tables are based on a reference initial weight.
A correction on the fuel consumption has to be made, when the actual initial weight is different from the reference initial weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1 000 kg or 1 000 lb below (or above) the reference initial weight (*Refer to PER-OEI-DES-20 DESCENT - M.80/350KT*).

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GENERAL

Ident.: PER-OEI-ICQ-20-00002125.0004001 / 14 NOV 11
Applicable to: ALL

The following in cruise quick check tables allow the flight crew to determine the fuel consumption and the time required to cover a given air distance from any moment in cruise to landing with one engine inoperative.

These tables are established for:
- Cruise speed: MCT /VMO , MCT/320 kt.
- Descent profile: M .78/300 kt/250 kt
- Approach and landing: 110 kg or 240 lb – 6 min IMC
- ISA
- CG = 33 %
- Pack flow HI
- Anti ice OFF

Note: *1. In the tables, the asterisk "*" means that a step climb of 4 000 ft has been made to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
3. For each degree Celsius above ISA apply a fuel correction of
0.015 (kg/°C/NM) × ΔISA (°C) × Air Distance (NM)
or 0.033 (lb/°C/NM) × ΔISA (°C) × Air Distance (NM)

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

Ident.: PER-OEI-ICQ-20-00002126.0001001 / 21 MAR 17
Applicable to: ALL

The in cruise quick check tables are based on a reference initial weight. The fuel consumption must be corrected when the actual weight is different from the reference initial weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1 000 kg or 1 000 lb below (or above) the reference weight (*Refer to PER-OEI-DES-20 DESCENT - M.80/350KT*).

IN CRUISE QUICK CHECK VMO

Ident.: PER-OEI-ICQ-20-00002127.0024001 / 10 DEC 09
Applicable to: ALL

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - ONE ENGINE FAILURE
CRUISE : MCT/VMO - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. INITIAL WEIGHT = 55000 KG PACK FLOW HI ANTI-ICING OFF	ISA CG = 33.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 100	150	160	180	200	220	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL150	FL160 FL180	FL200 FL220
200	1626 0.37	1337 0.38	1293 0.38	1172 0.39	1093 0.39	1024 0.40	0	0	0
250	2043 0.45	1706 0.46	1653 0.46	1503 0.47	1407 0.47	1323 0.48	0	0	1
300	2459 0.53	2076 0.54	2014 0.54	1834 0.55	1721 0.55	1621 0.56	0	1	2
350	2876 1.00	2445 1.01	2374 1.01	2164 1.03	2034 1.03	1919 1.04	1	1	3
400	3292 1.08	2814 1.09	2734 1.09	2495 1.11	2347 1.11	2217 1.12	1	2	4
450	3708 1.16	3183 1.16	3094 1.16	2825 1.19	2660 1.19	2515 1.20	2	2	5
500	4124 1.23	3551 1.24	3453 1.24	3154 1.27	2973 1.27	2812 1.28	2	3	6
550	4540 1.31	3920 1.32	3813 1.32	3484 1.34	3285 1.35	3109 1.36	3	4	7
600	4956 1.39	4288 1.39	4172 1.39	3813 1.42	3597 1.43	3405 1.44	3	4	8
650	5371 1.46	4656 1.47	4531 1.47	4142 1.50	3909 1.51	3702 1.52	4	5	9
700	5786 1.54	5024 1.55	4889 1.54	4471 1.58	4220 1.59	3997 2.00	4	5	10
750	6202 2.02	5391 2.02	5248 2.02	4799 2.06	4531 2.07	4293 2.08	5	6	10
800	6617 2.09	5759 2.10	5606 2.10	5128 2.14	4842 2.15	4588 2.16	5	7	11
850	7031 2.17	6126 2.17	5965 2.17	5456 2.22	5153 2.23	4883 2.24	6	7	12
900	7446 2.25	6493 2.25	6323 2.25	5784 2.29	5463 2.30	5178 2.32	6	8	13
950	7861 2.32	6860 2.32	6681 2.32	6112 2.37	5774 2.38	5472 2.40	6	8	14
1000	8275 2.40	7227 2.40	7038 2.40	6439 2.45	6084 2.46	5766 2.48	7	9	15
1050	8689 2.48	7593 2.48	7396 2.48	6766 2.53	6394 2.54	6060 2.56	7	9	15
1100	9103 2.55	7960 2.55	7753 2.55	7094 3.01	6704 3.02	6354 3.04	8	10	16
1150	9517 3.03	8326 3.03	8110 3.03	7420 3.09	7013 3.10	6648 3.11	8	10	17
1200	9930 3.11	8692 3.10	8467 3.10	7747 3.16	7322 3.18	6941 3.19	8	11	18
1250	10344 3.18	9057 3.18	8824 3.18	8074 3.24	7631 3.25	7234 3.27	9	11	18
1300	10757 3.26	9423 3.25	9181 3.25	8400 3.32	7940 3.33	7526 3.35	9	12	19
1350	11170 3.33	9788 3.33	9537 3.33	8726 3.40	8248 3.41	7818 3.43	9	12	20
1400	11583 3.41	10154 3.40	9893 3.40	9051 3.48	8557 3.49	8110 3.51	10	13	20

ENGINE ANTI ICE ON △ FUEL = + 2 %	**TOTAL ANTI ICE ON** △ FUEL = + 5 %

FLIP23D A319-112 CFM56-5B6/P SA3611 03301.001011 0250300 .7800 .00100 110 0300350 55 0 *** 20 20 20 18590 FCOM-N0-03-06-50-014-240

IN CRUISE QUICK CHECK 320KT

Ident.: PER-OEI-ICQ-20-00002128.0024001 / 10 DEC 09
Applicable to: ALL

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - ONE ENGINE FAILURE
CRUISE : MCT/320KT - DESCENT : M.78/300KT/250KT
IMC PROCEDURE : 110 KG (6MIN)

REF. INITIAL WEIGHT = 55000 KG
PACK FLOW HI
ANTI-ICING OFF

ISA
CG = 33.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 100	150	160	180	200	220	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL150	FL160 FL180	FL200 FL220
200	1534 0.39	1337 0.38	1293 0.38	1172 0.39	1093 0.39	1024 0.40	0	0	0
250	1924 0.47	1706 0.46	1653 0.46	1503 0.47	1407 0.47	1323 0.48	1	0	1
300	2315 0.55	2076 0.54	2014 0.54	1834 0.55	1721 0.55	1621 0.56	2	1	2
350	2704 1.03	2445 1.01	2374 1.01	2164 1.03	2034 1.03	1919 1.04	3	1	3
400	3094 1.12	2814 1.09	2734 1.09	2495 1.11	2347 1.11	2217 1.12	3	2	4
450	3483 1.20	3183 1.16	3094 1.16	2825 1.19	2660 1.19	2515 1.20	4	2	5
500	3871 1.28	3551 1.24	3453 1.24	3154 1.27	2973 1.27	2812 1.28	5	3	6
550	4259 1.36	3920 1.32	3813 1.32	3484 1.34	3285 1.35	3109 1.36	6	4	7
600	4647 1.44	4288 1.39	4172 1.39	3813 1.42	3597 1.43	3405 1.44	7	4	8
650	5034 1.52	4656 1.47	4531 1.47	4142 1.50	3909 1.51	3702 1.52	8	5	9
700	5421 2.01	5024 1.55	4889 1.54	4471 1.58	4220 1.59	3997 2.00	9	5	10
750	5807 2.09	5392 2.02	5248 2.02	4799 2.06	4531 2.07	4293 2.08	9	6	10
800	6194 2.17	5761 2.10	5606 2.10	5128 2.14	4842 2.15	4588 2.16	10	7	11
850	6579 2.25	6129 2.17	5965 2.17	5456 2.22	5153 2.23	4883 2.24	11	7	12
900	6965 2.33	6497 2.25	6323 2.25	5784 2.29	5463 2.30	5178 2.32	12	8	13
950	7349 2.41	6865 2.33	6681 2.32	6112 2.37	5774 2.38	5472 2.40	13	8	14
1000	7734 2.49	7233 2.40	7038 2.40	6439 2.45	6084 2.46	5766 2.48	14	9	15
1050	8118 2.58	7601 2.48	7396 2.48	6766 2.53	6394 2.54	6060 2.56	14	9	15
1100	8502 3.06	7968 2.55	7753 2.55	7094 3.01	6704 3.02	6354 3.04	15	10	16
1150	8885 3.14	8336 3.03	8110 3.03	7420 3.09	7013 3.10	6648 3.11	16	10	17
1200	9268 3.22	8703 3.11	8467 3.10	7747 3.16	7322 3.18	6941 3.19	17	11	18
1250	9651 3.30	9071 3.18	8824 3.18	8074 3.24	7631 3.25	7234 3.27	18	11	18
1300	10033 3.38	9438 3.26	9181 3.25	8400 3.32	7940 3.33	7526 3.35	18	12	19
1350	10416 3.46	9805 3.33	9537 3.33	8726 3.40	8248 3.41	7818 3.43	19	12	20
1400	10798 3.55	10172 3.41	9893 3.40	9051 3.48	8557 3.49	8110 3.51	20	13	20

ENGINE ANTI ICE ON △ FUEL = + 2 %

TOTAL ANTI ICE ON △ FUEL = + 5 %

FLIP23D A319-112 CFM56-5B6/P SA3611 03301.001011 0250300 .7800 .00100 110 0300350 55 0 *** 20 20 20 18590 FCOM-N0-03-06-50-015-240

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HOLDING

Ident.: PER-OEI-HLD-00002130.0026001 / 28 FEB 11
Applicable to: ALL

RACE TRACK HOLDING PATTERN - GREEN DOT SPEED - 1 ENGINE OUT								
MAX. CONTINUOUS THRUST LIMITS CLEAN CONFIGURATION PACK FLOW HI ANTI-ICING OFF					ISA CG=33.0%		N1 (%) FF (KG/H)	
WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL160	FL180	FL200
46	60.2 1511	62.6 1498	66.8 1490	68.6 1488	70.2 1484	72.0 1481	73.9 1481	75.9 1483
48	61.2 1574	63.7 1563	68.2 1556	69.7 1552	71.4 1548	73.2 1547	75.2 1548	77.1 1553
50	62.2 1638	64.8 1628	69.2 1620	70.8 1616	72.6 1613	74.5 1614	76.5 1616	78.3 1622
52	63.2 1703	65.9 1694	70.3 1684	71.9 1680	73.7 1679	75.7 1680	77.6 1686	79.5 1692
54	64.2 1768	67.1 1760	71.3 1748	73.0 1745	74.9 1746	76.9 1748	78.7 1756	80.6 1762
56	65.2 1833	68.2 1826	72.3 1813	74.1 1812	76.0 1814	77.9 1819	79.8 1825	81.6 1836
58	66.1 1898	69.3 1888	73.4 1879	75.2 1879	77.1 1882	78.9 1888	80.9 1895	82.5 1912
60	67.1 1966	70.2 1952	74.4 1945	76.2 1947	78.1 1952	80.0 1958	81.8 1968	83.4 1989
62	68.2 2030	71.1 2017	75.4 2013	77.3 2016	79.1 2022	81.0 2029	82.7 2044	84.4 2071
64	69.2 2093	72.0 2083	76.3 2082	78.3 2086	80.0 2093	81.9 2101	83.5 2121	85.2 2156
66	70.2 2157	72.9 2149	77.3 2151	79.2 2156	81.0 2164	82.8 2176	84.4 2198	86.0 2243
68	71.0 2222	73.8 2216	78.3 2221	80.1 2227	81.9 2235	83.6 2253	85.3 2282	86.9 2330
70	71.8 2289	74.7 2284	79.2 2290	81.0 2298	82.8 2309	84.4 2328	86.0 2368	87.7 2422
72	72.6 2356	75.5 2352	80.0 2362	81.8 2371	83.6 2385	85.2 2406	86.8 2456	88.6 2526
74	73.4 2423	76.4 2422	80.9 2434	82.7 2444	84.3 2461	86.0 2492	87.5 2545	
ENGINE ANTI ICE ON $\Delta FF = +3\%$			TOTAL ANTI ICE ON $\Delta FF = +6.5\%$			PER 1° ABOVE ISA $\Delta FF = +0.3\%$		

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DESCENT - M.78/300KT

Ident.: PER-OEI-DES-10-00002135.0022001 / 05 APR 11
Applicable to: ALL

DESCENT - M.78/300KT - 1 ENGINE OUT									
MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF			ISA CG=33.0%		MINIMUM RATE OF DESCENT 500FT/MIN				
WEIGHT (1000KG)	50				70				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	IAS (KT)
390	42.5	1422	287	MCT					241
370	40.7	1384	274	MCT	39.8	1379	267	MCT	252
350	38.9	1341	260	MCT	38.4	1345	257	MCT	264
330	37.3	1297	248	MCT	36.9	1307	245	MCT	277
310	35.7	1252	236	MCT	35.4	1264	234	MCT	289
290	34.1	1204	224	MCT	33.7	1214	221	MCT	300
270	31.9	1134	208	MCT	31.5	1141	204	MCT	300
250	29.3	1045	188	MCT	28.8	1053	185	MCT	300
230	26.0	927	165	MCT	25.8	944	163	MCT	300
220	24.0	855	151	V/S	24.0	878	151	MCT	300
210	22.0	781	137	V/S	22.0	804	137	V/S	300
200	20.0	709	124	V/S	20.0	728	124	V/S	300
190	18.0	637	111	V/S	18.0	654	111	V/S	300
180	16.0	565	98	V/S	16.0	579	98	V/S	300
170	14.0	494	85	V/S	14.0	506	85	V/S	300
160	12.0	422	72	V/S	12.0	433	72	V/S	300
150	10.0	351	60	V/S	10.0	360	60	V/S	300
140	8.0	281	47	V/S	8.0	287	47	V/S	300
100	.0	0	0	V/S	.0	0	0	V/S	300

CORRECTIONS	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA
TIME	− 0.5 %	− 2 %	−
FUEL	+ 2 %	+ 5 %	+ 0.3 %
DISTANCE	− 0.8 %	− 2.5 %	+ 0.2 %

11.0-08F0A319-112 CFM56-5B6/P SA23200010C6KG330 0 018590 0 0 3 .0 .0 500.00 0 02 .780300.000 .000 0 FCOM-N0-03-06-30-003-240

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GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED - ISA

Ident.: PER-OEI-DES-15-00002080.0024001 / 02 FEB 11
Applicable to: ALL

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA CG=33.0%	DISTANCE (NM) TIME (MIN) INITIAL SPEED(KT) FUEL(1000KG) LEVEL OFF (FT)

INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 230	250	270	290	310	330	350	370	390
48						159 30 194 .8 32100	231 43 196 1.1 32300	269 49 198 1.2 32400	296 54 200 1.3 32400
50					80 15 196 .4 30800	208 39 198 1.0 31200	257 48 200 1.2 31300	288 53 202 1.4 31300	314 57 204 1.4 31400
52					171 32 200 .9 30000	242 45 202 1.2 30200	280 52 204 1.4 30300	308 56 206 1.5 30300	330 60 208 1.6 30300
54				84 16 202 .5 28700	211 40 204 1.1 29100	260 48 206 1.3 29200	292 54 208 1.5 29300	317 58 210 1.6 29300	338 61 212 1.6 29300
56				173 33 206 1.0 27900	242 45 208 1.3 28100	280 52 210 1.5 28200	310 57 212 1.6 28300	333 61 214 1.7 28300	353 64 216 1.7 28400
58			103 20 208 .6 26700	216 41 210 1.2 27000	267 50 212 1.5 27200	300 56 214 1.6 27200	326 60 216 1.7 27300	348 63 218 1.8 27300	366 66 220 1.9 27400
60			180 34 212 1.1 25900	250 47 214 1.4 26100	289 54 216 1.6 26200	318 59 218 1.8 26300	341 63 220 1.9 26300	360 66 222 1.9 26300	379 68 224 2.0 26400
62		105 20 214 .7 24700	222 42 216 1.3 25000	274 52 218 1.6 25100	309 58 220 1.8 25200	335 62 222 1.9 25300	356 65 224 2.0 25300	376 68 226 2.1 25400	392 71 228 2.1 25400
64		170 33 218 1.1 24000	242 46 220 1.5 24100	285 54 222 1.7 24200	315 59 224 1.9 24300	340 63 226 2.0 24400	360 66 228 2.0 24400	379 69 230 2.1 24400	395 71 232 2.2 24400
66	75 14 220 .5 22800	208 40 222 1.3 23200	261 49 224 1.6 23300	297 56 226 1.8 23400	324 60 228 2.0 23500	347 64 230 2.0 23500	366 67 232 2.1 23500	384 69 234 2.2 23600	400 72 236 2.2 23600
68	155 30 224 1.0 22200	234 45 226 1.5 22400	278 52 228 1.8 22500	309 58 230 1.9 22600	333 62 232 2.0 22600	355 65 234 2.1 22700	373 68 236 2.2 22700	390 70 238 2.3 22700	405 72 240 2.3 22800
70	196 38 228 1.3 21500	255 48 230 1.7 21600	292 55 232 1.9 21700	320 59 234 2.0 21800	343 63 236 2.2 21800	363 66 238 2.2 21900	381 69 240 2.3 21900	396 71 242 2.3 21900	
72	227 43 232 1.6 20700	274 52 234 1.9 20800	306 57 236 2.0 20900	331 61 238 2.2 21000	352 65 240 2.2 21000	372 68 242 2.3 21000	389 70 244 2.4 21100	404 72 246 2.4 21100	
74	251 48 236 1.8 19900	291 55 238 2.0 20000	320 60 240 2.2 20100	344 63 242 2.3 20200	364 67 244 2.4 20200	382 69 246 2.4 20200	396 71 248 2.5 20300	412 74 250 2.5 20300	

CORRECTIONS	DISTANCE	TIME	FUEL	LEVEL OFF
ENGINE ANTI ICE ON	+ 2 %	+ 2 %	+ 7 %	– 100 ft
TOTAL ANTI ICE ON	+ 7 %	+ 6 %	+ 10 %	– 600 ft

11.0-08F0A319-112 CFM56-5B6/P SA23500010C6KG330 0 018590 0 0 3 .0 .0 .00 0 02 1.000 1.000 .000 0 FCOM-N0-03-06-40-003-240

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED - ISA +20

Ident.: PER-OEI-DES-15-00002088.0024001 / 22 MAR 17
Applicable to: ALL

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST
PACK FLOW HI
ANTI-ICING OFF

ISA+20
CG=33.0%

DISTANCE (NM) TIME (MIN)
INITIAL SPEED(KT) FUEL(1000KG)
LEVEL OFF (FT)

INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 230	250	270	290	310	330	350	370	390
48					183 35 192 .9 29900	257 48 194 1.2 30100	299 55 196 1.4 30200	328 60 198 1.5 30300	350 63 200 1.5 30300
50				119 23 194 .6 28600	229 43 196 1.1 28900	281 52 198 1.4 29100	316 58 200 1.5 29100	342 62 202 1.6 29200	363 66 204 1.6 29200
52				194 37 198 1.0 27700	261 49 200 1.3 27900	303 56 202 1.5 28000	333 61 204 1.6 28100	357 65 206 1.7 28100	377 68 208 1.8 28100
54			140 27 200 .8 26400	236 45 202 1.3 26700	288 54 204 1.5 26900	323 60 206 1.6 26900	348 64 208 1.7 27000	371 68 210 1.8 27000	389 70 212 1.9 27100
56		18 4 202 .1 24900	204 39 204 1.1 25500	268 51 206 1.5 25700	309 58 208 1.7 25800	340 63 210 1.8 25900	364 67 212 1.9 25900	385 70 214 1.9 26000	403 73 216 2.0 26000
58		145 28 206 .9 24300	239 46 208 1.4 24600	290 55 210 1.6 24700	325 61 212 1.8 24800	353 65 214 1.9 24800	377 69 216 2.0 24900	397 72 218 2.0 24900	417 75 220 2.1 24900
60	2 0 208 .0 22900	197 38 210 1.2 23500	260 50 212 1.5 23700	301 57 214 1.7 23800	331 62 216 1.9 23800	357 66 218 2.0 23900	379 69 220 2.0 23900	396 72 222 2.1 24000	415 75 224 2.1 24000
62	139 27 212 .9 22400	232 44 214 1.4 22700	281 53 216 1.7 22800	315 59 218 1.8 22900	343 64 220 2.0 22900	365 67 222 2.1 23000	386 71 224 2.1 23000	404 73 226 2.2 23000	421 75 228 2.2 23100
64	194 38 216 1.3 21600	258 49 218 1.6 21800	298 56 220 1.8 21900	329 62 222 2.0 22000	354 66 224 2.1 22000	375 69 226 2.2 22100	395 72 228 2.2 22100	411 74 230 2.3 22100	
66	230 44 220 1.5 20800	280 53 222 1.8 20900	315 59 224 2.0 21000	342 64 226 2.1 21100	365 68 228 2.2 21100	386 71 230 2.3 21200	404 73 232 2.3 21200	420 76 234 2.4 21200	
68	257 49 224 1.7 19900	299 57 226 2.0 20000	329 62 228 2.1 20100	354 66 230 2.2 20200	377 70 232 2.3 20200	396 73 234 2.4 20300	414 75 236 2.4 20300	430 77 238 2.5 20300	
70	286 55 228 2.0 19000	322 61 230 2.1 19100	350 66 232 2.3 19200	373 69 234 2.4 19200	393 72 236 2.5 19300	412 75 238 2.5 19300	428 77 240 2.6 19300	443 80 242 2.6 19400	
72	310 59 232 2.1 18000	341 64 234 2.3 18100	367 69 236 2.4 18200	388 72 238 2.5 18300	408 75 240 2.6 18300	426 78 242 2.7 18300	442 80 244 2.7 18400		
74	273 51 236 1.9 17400	305 57 238 2.1 17500	331 61 240 2.2 17500	353 65 242 2.3 17500	374 68 244 2.4 17600	392 71 246 2.5 17600	408 73 248 2.5 17600		

CORRECTIONS	DISTANCE	TIME	FUEL	LEVEL OFF
ENGINE ANTI ICE ON	+ 2 %	+ 2 %	+ 7 %	– 100 ft
TOTAL ANTI ICE ON	+ 7 %	+ 6 %	+ 10 %	– 600 ft

11.0-08F0A319-112 CFM56-5B6/P SA23500010C6KG330 0 018590 0 0 3 .0 .0 .00 0 02 1.000 1.000 .000 20 FCOM-N0-03-06-40-006-240

- For LONG RANGE CRUISE table *Refer to PER-OEI-CRT-10 LONG RANGE CRUISE - 1 ENGINE OUT - ISA*
- For IN CRUISE QUICK CHECK *Refer to QRH/PER-L In Cruise Quick Check Long Range (Paper Only)* or use the performance application of FlySmart with Airbus.

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DESCENT - M.80/350KT

Ident.: PER-OEI-DES-20-00002136.0025001 / 22 FEB 11
Applicable to: ALL

DESCENT - M.80/350KT - 1 ENGINE OUT									
MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF			ISA CG=33.0%		MINIMUM RATE OF DESCENT 500FT/MIN				
WEIGHT (1000KG)	50				70				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	IAS (KT)
390	25.7	1033	190	MCT					248
370	24.2	1001	179	MCT	26.1	1076	193	MCT	260
350	22.7	965	168	MCT	24.8	1047	184	MCT	272
330	21.3	929	157	MCT	23.5	1013	174	MCT	284
310	20.1	892	147	MCT	22.2	976	164	MCT	297
290	18.9	856	138	MCT	20.9	938	154	MCT	311
270	17.9	822	130	MCT	19.7	898	144	MCT	324
250	17.0	790	123	MCT	18.6	859	135	MCT	338
230	16.1	758	116	MCT	17.6	820	127	MCT	350
220	15.6	737	111	MCT	16.8	792	121	MCT	350
210	14.9	712	106	MCT	16.0	762	115	MCT	350
200	14.2	685	101	MCT	15.2	728	108	MCT	350
190	13.5	655	95	MCT	14.3	692	101	MCT	350
180	12.7	622	89	MCT	13.3	651	94	MCT	350
170	11.8	581	82	MCT	12.2	604	86	MCT	350
160	10.6	528	74	MCT	10.9	544	76	MCT	350
150	9.3	463	64	MCT	9.4	472	65	MCT	350
140	7.7	389	53	MCT	7.8	392	54	MCT	350
100	.0	0	0	V/S	.0	0	0	V/S	350

CORRECTIONS	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA
TIME	− 1.5 %	− 5 %	−
FUEL	+ 0.5 %	− 1 %	+ 0.3 %
DISTANCE	− 1.5 %	− 5 %	+ 0.3 %

11.0-08F0A319-112 CFM56-5B6/P SA23200010C6KG330 0 018590 0 0 3 .0 .0 500.00 0 02 .800350.000 .000 0 FCOM-N0-03-06-50-003-240

DESCENT - M.78/320KT

Ident.: PER-OEI-DES-20-00002137.0025001 / 02 FEB 11
Applicable to: ALL

DESCENT - M.78/320KT - 1 ENGINE OUT									
MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF			ISA CG=33.0%	MINIMUM RATE OF DESCENT 500FT/MIN					
WEIGHT (1000KG)	50				70				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	IAS (KT)
390	36.5	1332	256	MCT					241
370	34.7	1293	242	MCT	34.8	1305	243	MCT	252
350	32.9	1250	229	MCT	33.4	1271	233	MCT	264
330	31.2	1206	216	MCT	31.9	1233	221	MCT	277
310	29.6	1161	204	MCT	30.3	1190	210	MCT	289
290	28.2	1117	193	MCT	28.8	1144	198	MCT	302
270	26.9	1074	183	MCT	27.4	1097	187	MCT	315
250	25.4	1022	171	MCT	25.6	1037	173	MCT	320
230	23.4	951	157	MCT	23.4	958	157	MCT	320
220	22.3	909	148	MCT	22.2	912	148	MCT	320
210	21.0	860	139	MCT	20.9	861	138	MCT	320
200	19.6	803	129	MCT	19.4	804	128	MCT	320
190	17.9	736	117	MCT	17.8	738	116	MCT	320
180	16.0	657	104	V/S	16.0	663	104	MCT	320
170	14.0	574	90	V/S	14.0	580	90	V/S	320
160	12.0	491	77	V/S	12.0	495	77	V/S	320
150	10.0	408	64	V/S	10.0	412	64	V/S	320
140	8.0	326	50	V/S	8.0	329	50	V/S	320
100	.0	0	0	V/S	.0	0	0	V/S	320
CORRECTIONS		ENGINE ANTI ICE ON		TOTAL ANTI ICE ON	PER 1° ABOVE ISA				
TIME		− 1 %		− 3 %	−				
FUEL		+ 2 %		+ 4 %	+ 0.3 %				
DISTANCE		− 1 %		− 3 %	+ 0.3 %				

11.0-08F0A319-112 CFM56-5B6/P SA23200010C6KG330 0 018590 0 0 3 .0 .0 500.00 0 02 .780320.000 .000 0 FCOM-N0-03-06-50-004-240

DESCENT TO LANDING

Ident.: PER-OEI-DES-30-00002138.0024001 / 09 DEC 09
Applicable to: ALL

DESCENT - M.78/300KT/250KT - 1 ENGINE OUT									
IDLE THRUST PACK FLOW HI ANTI-ICING OFF			ISA CG=33.0%						
WEIGHT (1000KG)	50				70				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
390	14.2	72	86	IDLE					241
370	13.6	69	81	IDLE	16.7	86	100	IDLE	252
350	13.0	68	77	IDLE	16.0	83	95	IDLE	264
330	12.5	66	73	IDLE	15.4	81	91	IDLE	277
310	12.0	64	69	IDLE	14.8	79	86	IDLE	289
290	11.5	63	66	IDLE	14.2	77	82	IDLE	300
270	10.9	60	61	IDLE	13.4	75	76	IDLE	300
250	10.3	58	57	IDLE	12.6	72	70	IDLE	300
240	10.0	57	54	IDLE	12.2	70	67	IDLE	300
220	9.3	54	50	IDLE	11.4	67	62	IDLE	300
200	8.7	51	45	IDLE	10.6	62	56	IDLE	300
180	8.0	47	41	IDLE	9.7	57	50	IDLE	300
160	7.3	42	37	IDLE	8.8	51	44	IDLE	300
140	6.5	36	32	IDLE	7.9	44	39	IDLE	300
120	5.8	30	28	IDLE	6.9	36	33	IDLE	300
100	5.1	25	23	IDLE	6.0	30	28	IDLE	300
50	1.8	7	8	IDLE	2.1	9	9	IDLE	250
15	.0	0	0	IDLE	.0	0	0	IDLE	250

CORRECTIONS	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	PER 1° ABOVE ISA
TIME	+ 3 %	+ 4 %	+ 0.3 %
FUEL	+ 25 %	+ 39 %	+ 0.4 %
DISTANCE	+ 3 %	+ 3 %	+ 0.5 %

11.0-08F0A319-112 CFM56-5B6/P SA23100010C6KG330 0 018590 0 0-1 .0 .0 .00 0 03 .780300.000250.000 0 FCOM-G0-06-60-001-240

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