The Best Advanced PAPER AIRCRAFT

Book 1

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The Best Advanced Paper Aircraft

Book 1

Long Distance Gliders, Performance Paper Airplanes, and Gliders with Landing Gear

Carmel D. Morris

Print editions first published by Harper Collins, Sydney and London, and Putnam New York (Perigee).

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Preface

This book is written by a best-selling author of over 35 books including *Paper Boats!* and *Paper Bugs!* (Harper Collins), *Paper Spacecraft* (Scholastic), and *Paper Airplanes in Cardboard*, (Scholastic, Big One).

There are some unique designs by Carmel that many over the years have tried to copy in their books; this book was first published when Carmel was a teenager; the models she designed while still at school which proved useful for many students in school assemblies and college.

Recalcitrant by nature, Carmel found fame amongst her college peers and these books became international best sellers almost overnight. Many origami paper aircraft book authors were inspired by her books and in the *Best Paper Aircraft* tradition wrote their own books – but this book started it all for more complicated paper aircraft. This book has also been known to have inspired many young people into engineering and scientific fields. It is often used for education in schools, colleges and exhibits; the Dallas Love Field *Frontiers of Flight Museum* paper plane training is a fine example.

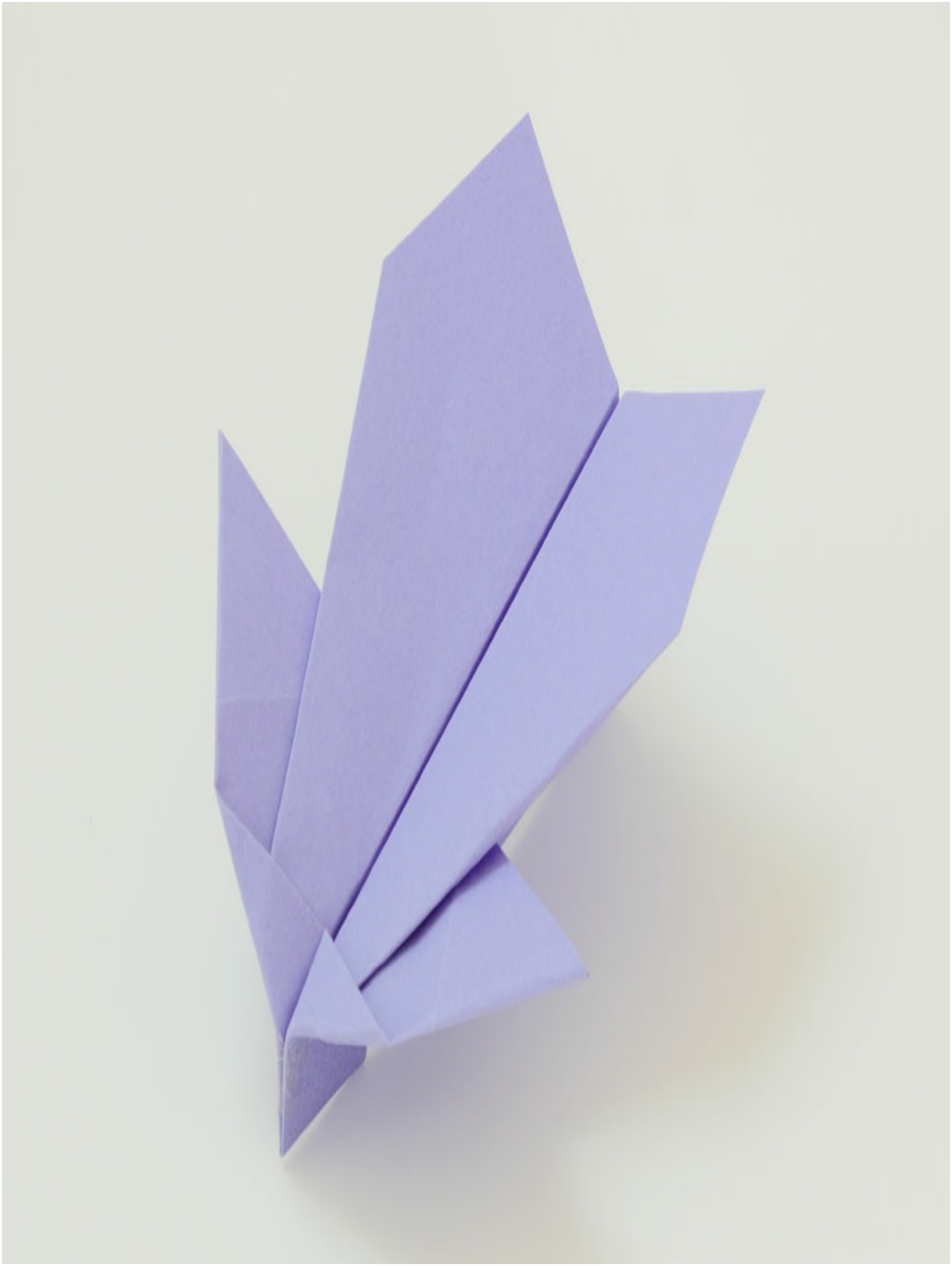
Now I am happy to release this book

for a new generation of keen paper aircraft folders. There's a model to suit every occasion, from the historical to modern, performance and wind-catchers, to long distance gliding, and every aerobatic style in-between.

Happy folding and flying!

Col. Dwight Edwards (Retired)

Introduction



Super Stunt Plane

Welcome to the fun world of paper airplanes. Not just your average dart, *The Best Advanced Paper Aircraft* will show you how to fold and fly some amazing models. Most of the models in this book are folded; you do not have to cut anywhere but for rear tail lift in some models, and shaping a wing section in the WWI Fokker.

About the paper sizes

All models in this book are made from standard US Letter which also works well for A4, despite a slightly different aspect ratio.

Ensure paper weight is in the range of 80 to 100 gsm (grams per square meter). This ensures good rigidity in folds, i.e. better creases. Do not use paper that is thicker as more complicated folds can come undone. Photocopy paper is ideal.

Folding

This digital edition features self-explanatory diagrams designed to help you on the go, rather like an app. Base fold steps are repeated for each model that uses them, so you do not need to return to an earlier section on your Kindle, iPhone or Android device. In this new edition, more complicated design stages include handy ‘how-to’

photos. Start out with the easy models first. Please be patient when folding the harder models, and ask a parent to help if you get stuck. Many of the models in this book can also be found on the YouTube channel **Paper Plane Lab**.

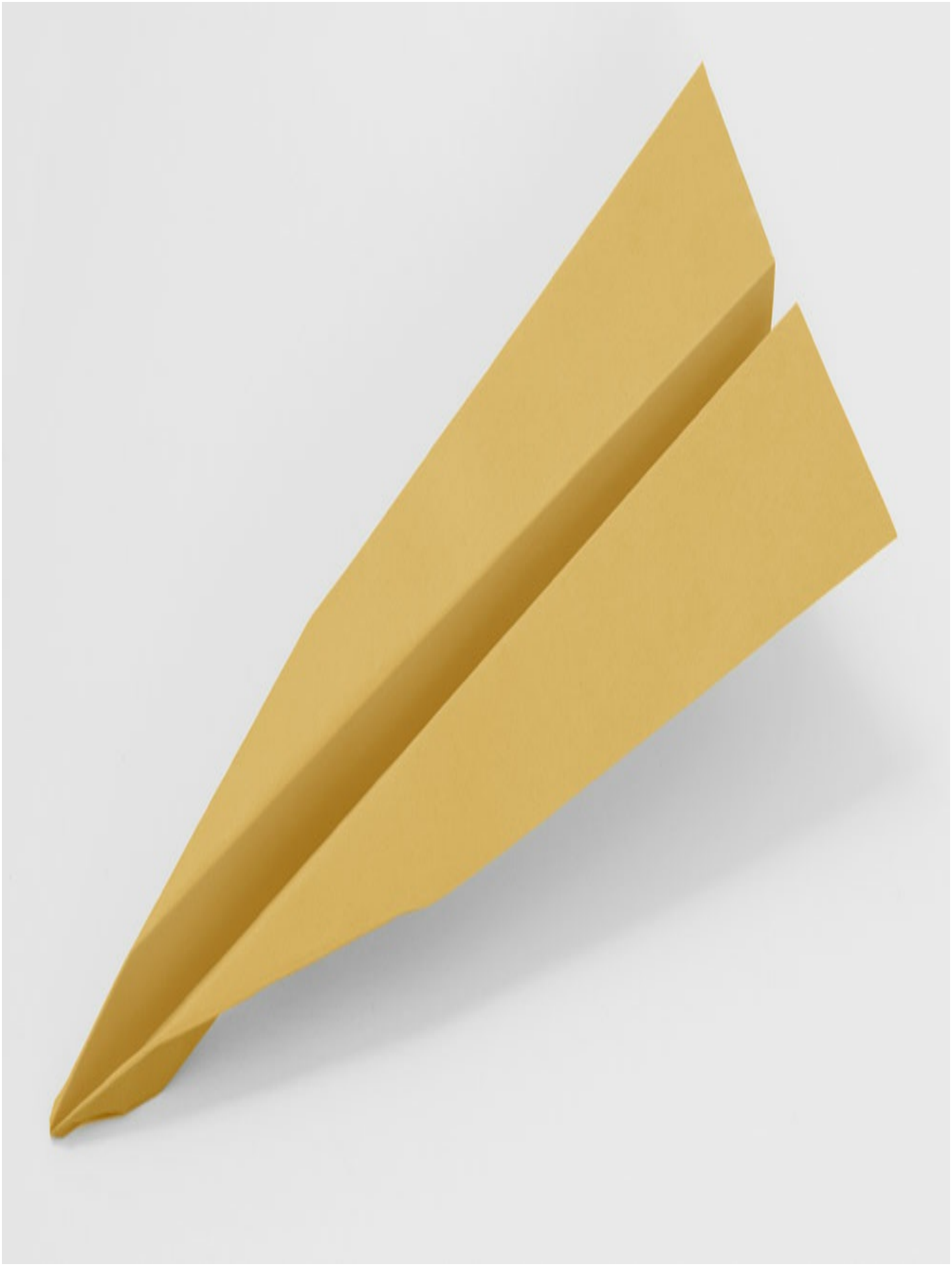
Throwing

Always remember safety; do not throw your darts in the direction of people. Pointed objects could hit an eye.

If any glider dives, add some tail lift on the trailing edges by curling up the paper. For advice on good folding practice and throwing, *Paper Plane Throwing Tips* (Kindle edition) is now

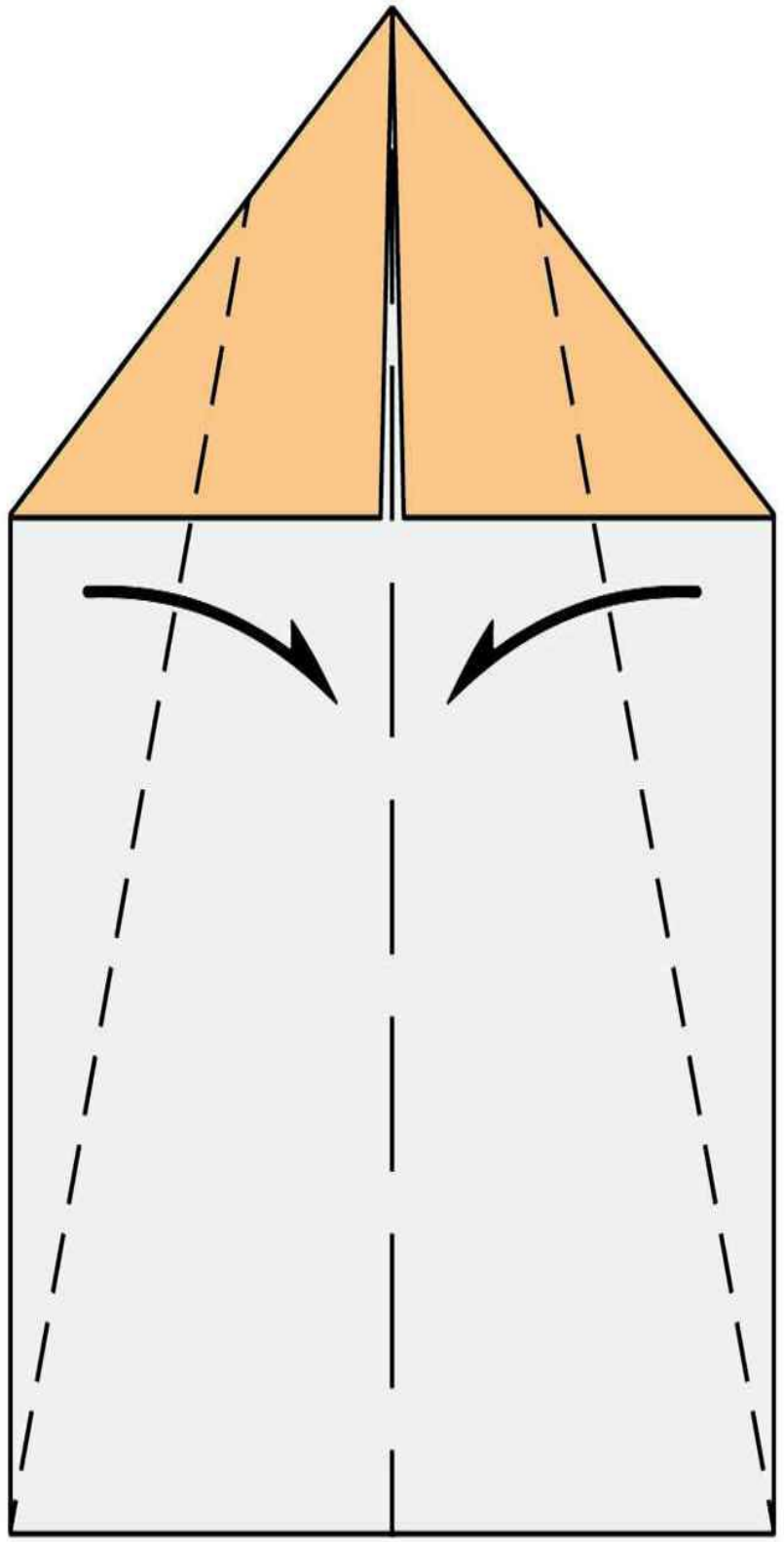
available.

Long Distance Glider 1



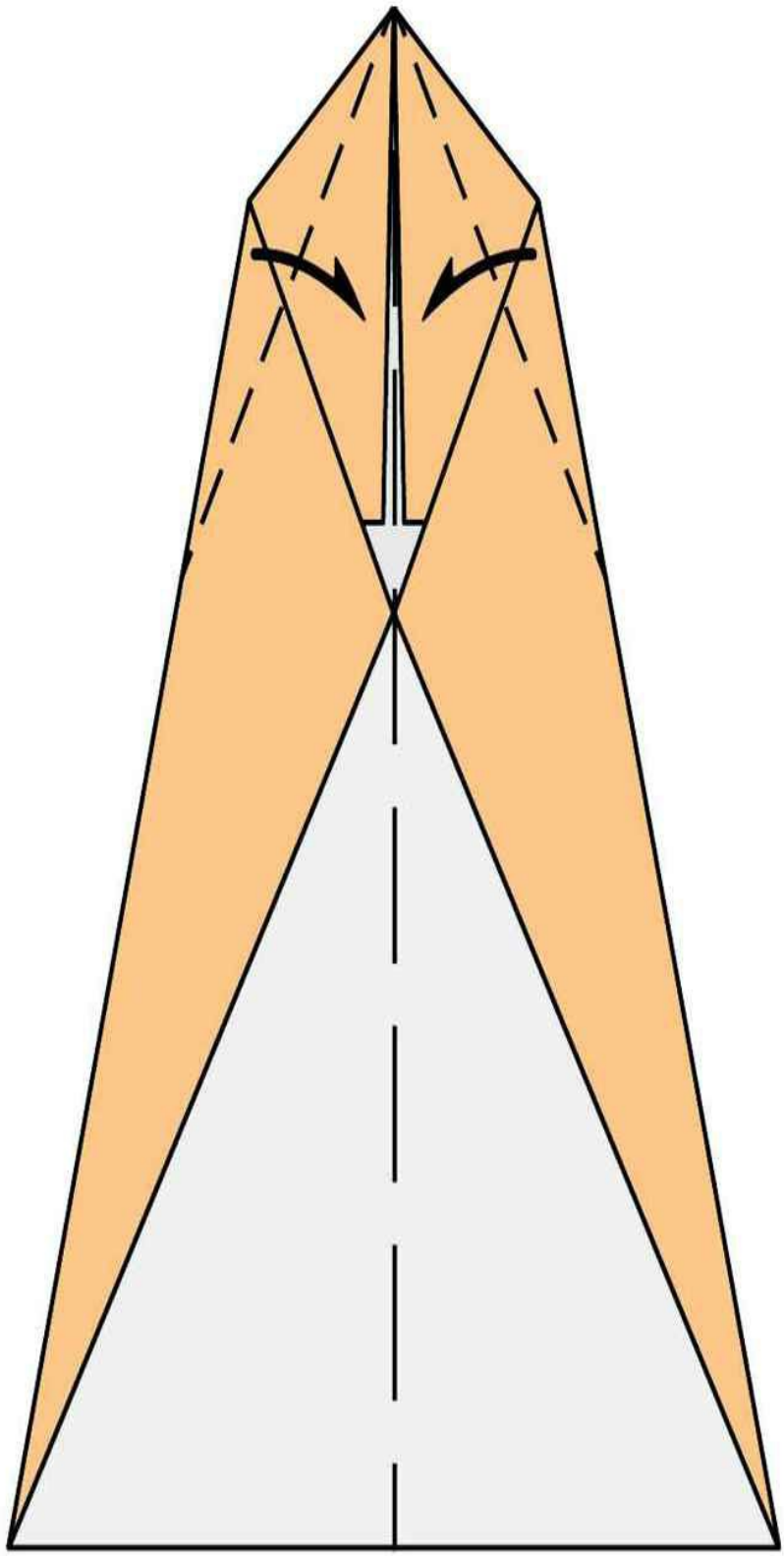
If you are sitting way at the back of a lecture theatre or cinema and do not find it entertaining, this dart will get your message across!

1 Long Distance MK1

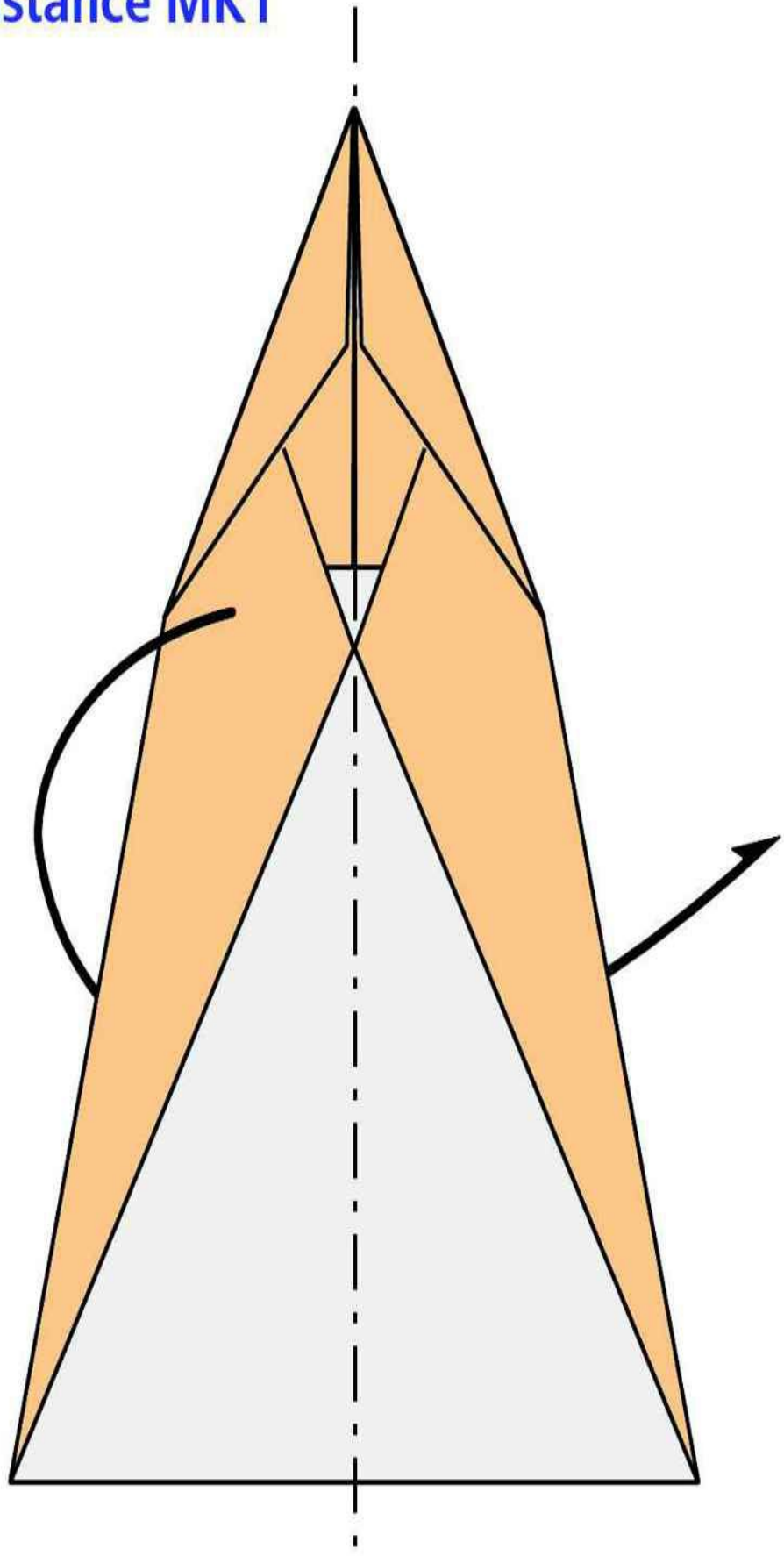


In Step 1, begin with a sheet of paper crease-folded in half and the top corners folded in. Fold the side corners in to meet the center crease.

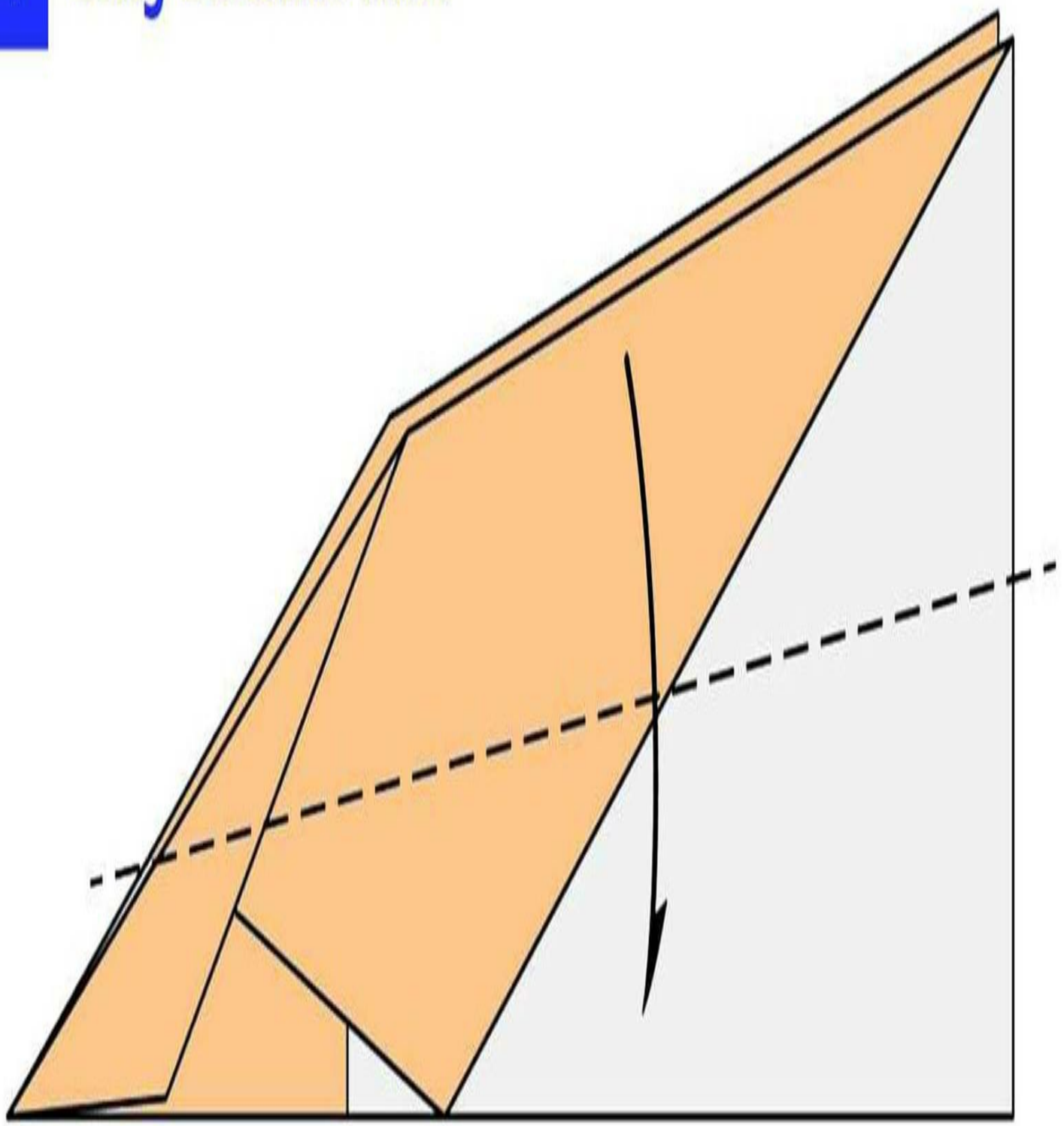
2 Long Distance MK1



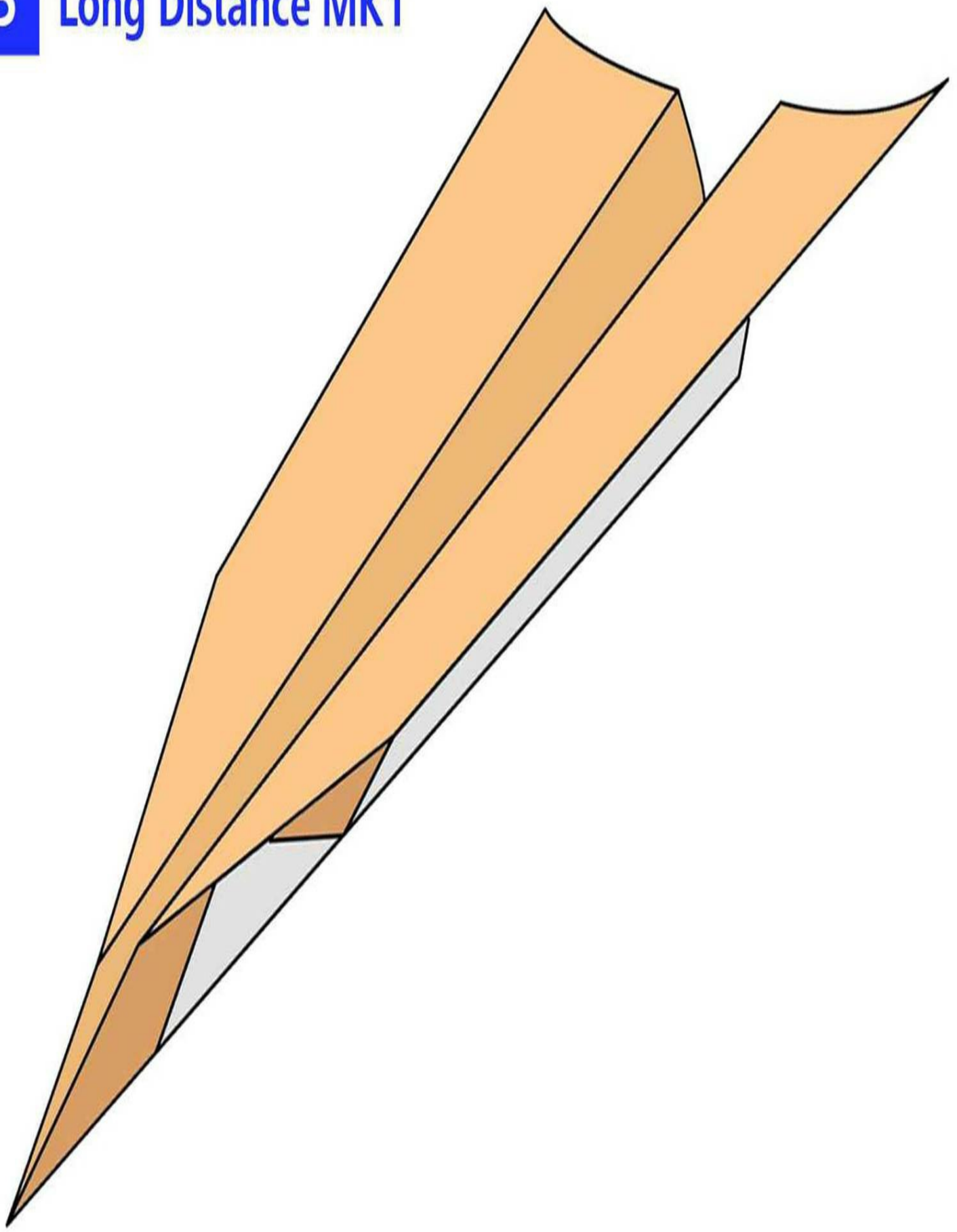
3 Long Distance MK1



4 Long Distance MK1



5 Long Distance MK1



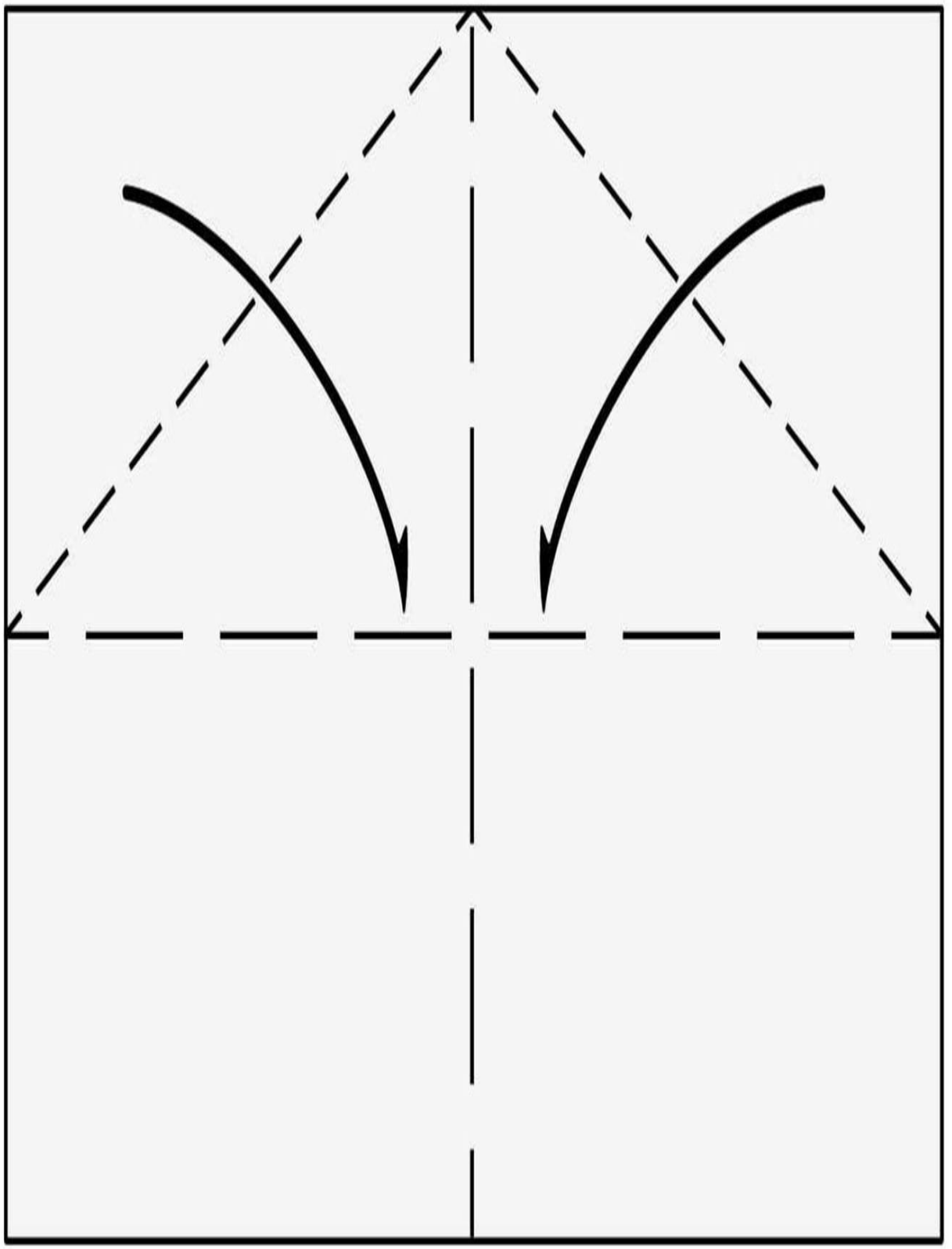
Your dart is now complete. Curl the tail section slightly upwards for lift if you need it. If the model stalls, reverse fold back the nose by an inch or so.

Throw with gentle force at approximately 30 to 40 degrees in an upward direction. Because of its length, this dart will prove accurate in meeting its target.

Super Wing

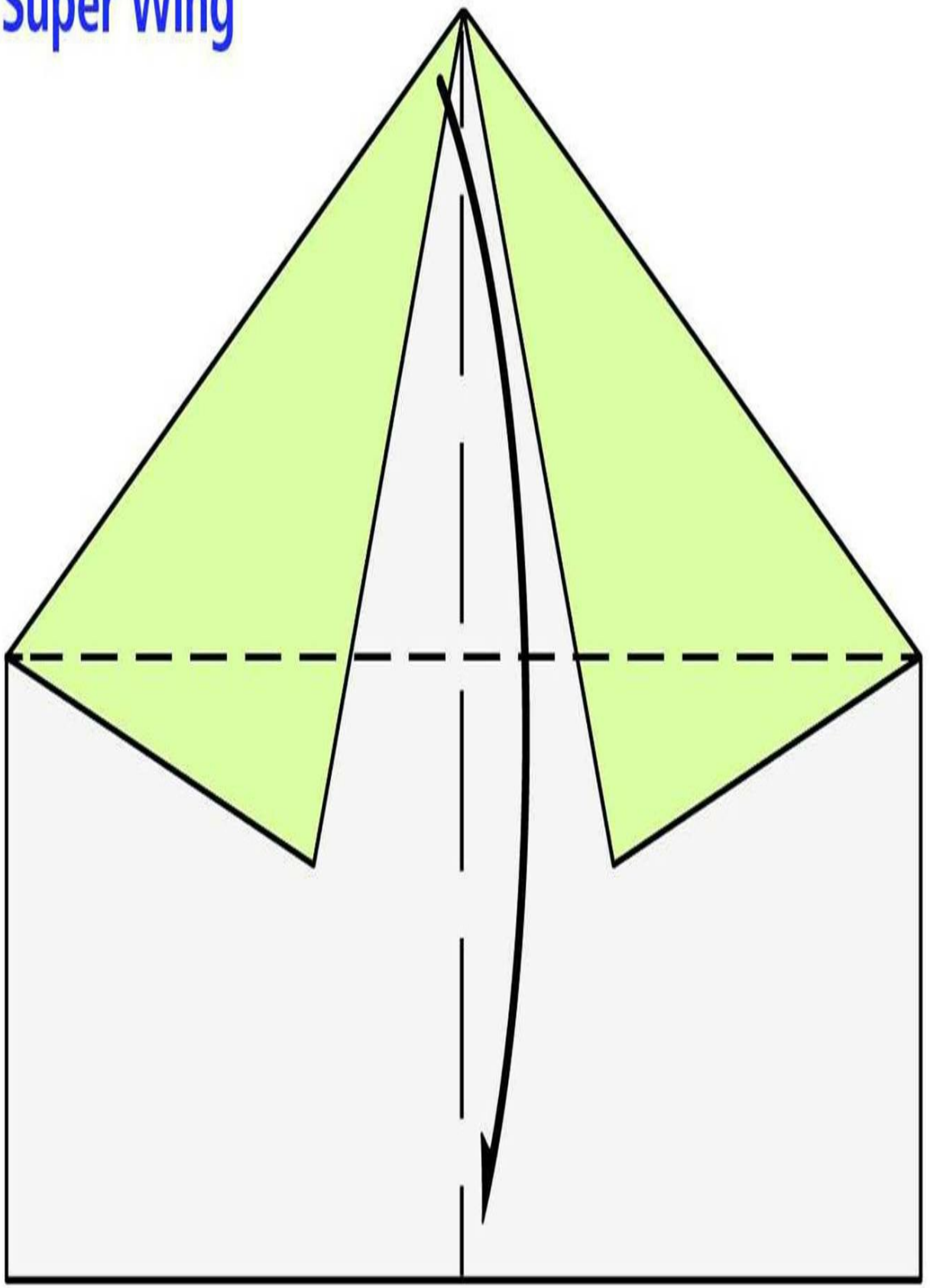
This is an incredible paper wing. It is surprisingly stable as a glider and can perform some aerial manoeuvres too.

1 Super Wing

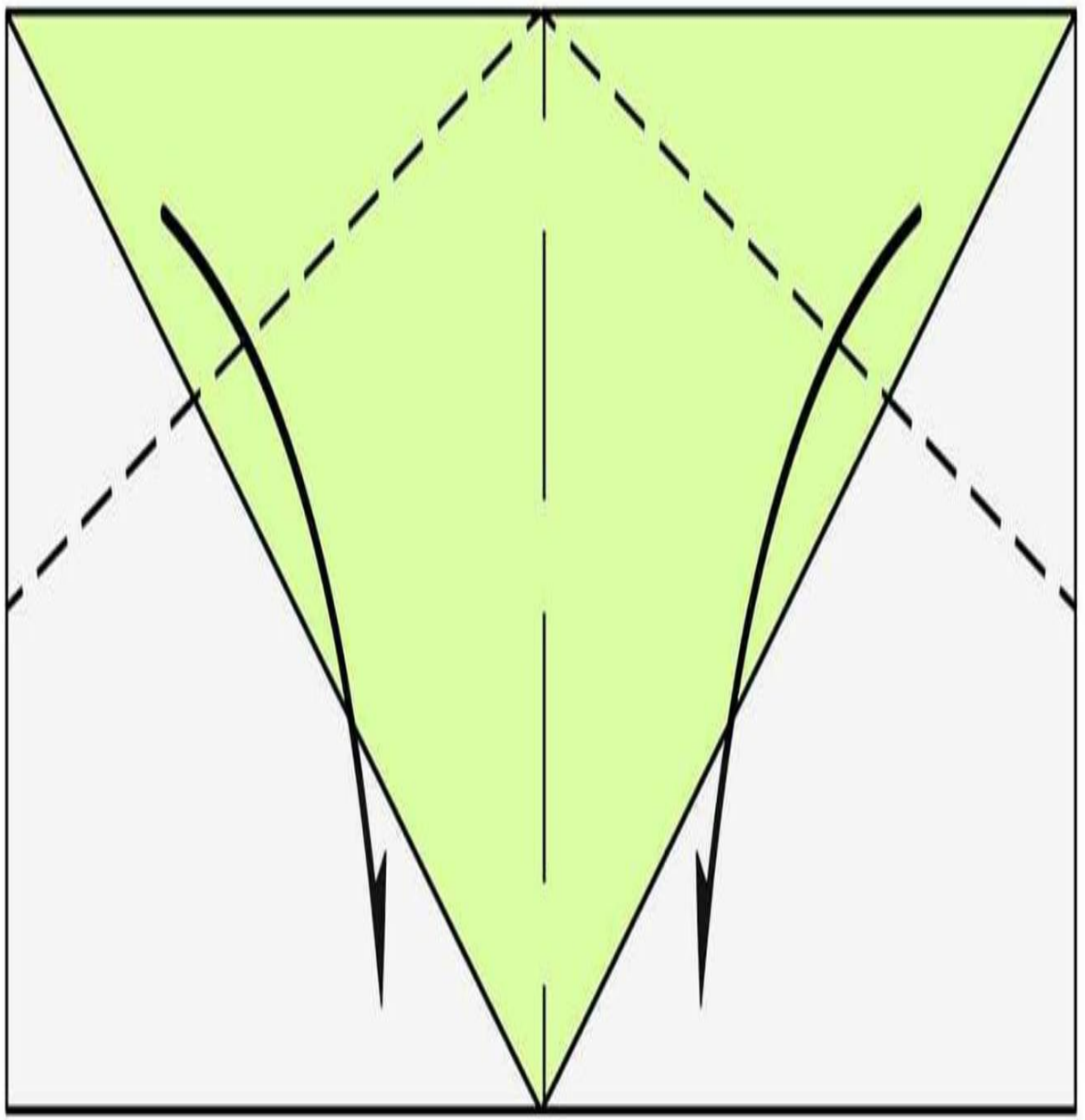


Begin with a sheet of paper facing you horizontally and crease-folded in half in both directions along the dashes (valley fold). In Step 1, fold in the corners from each crease-folded x,y axis.

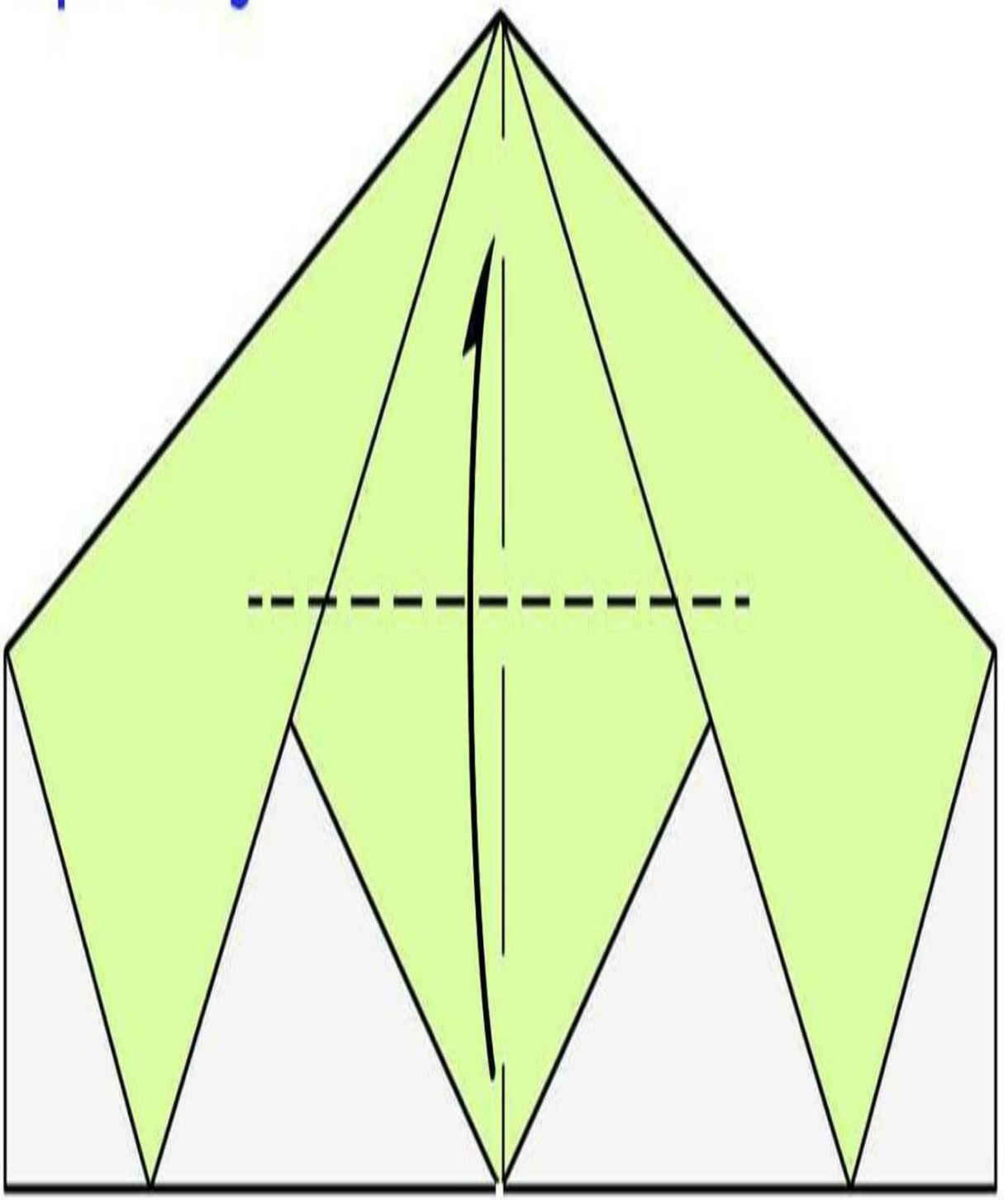
2 Super Wing



3 Super Wing

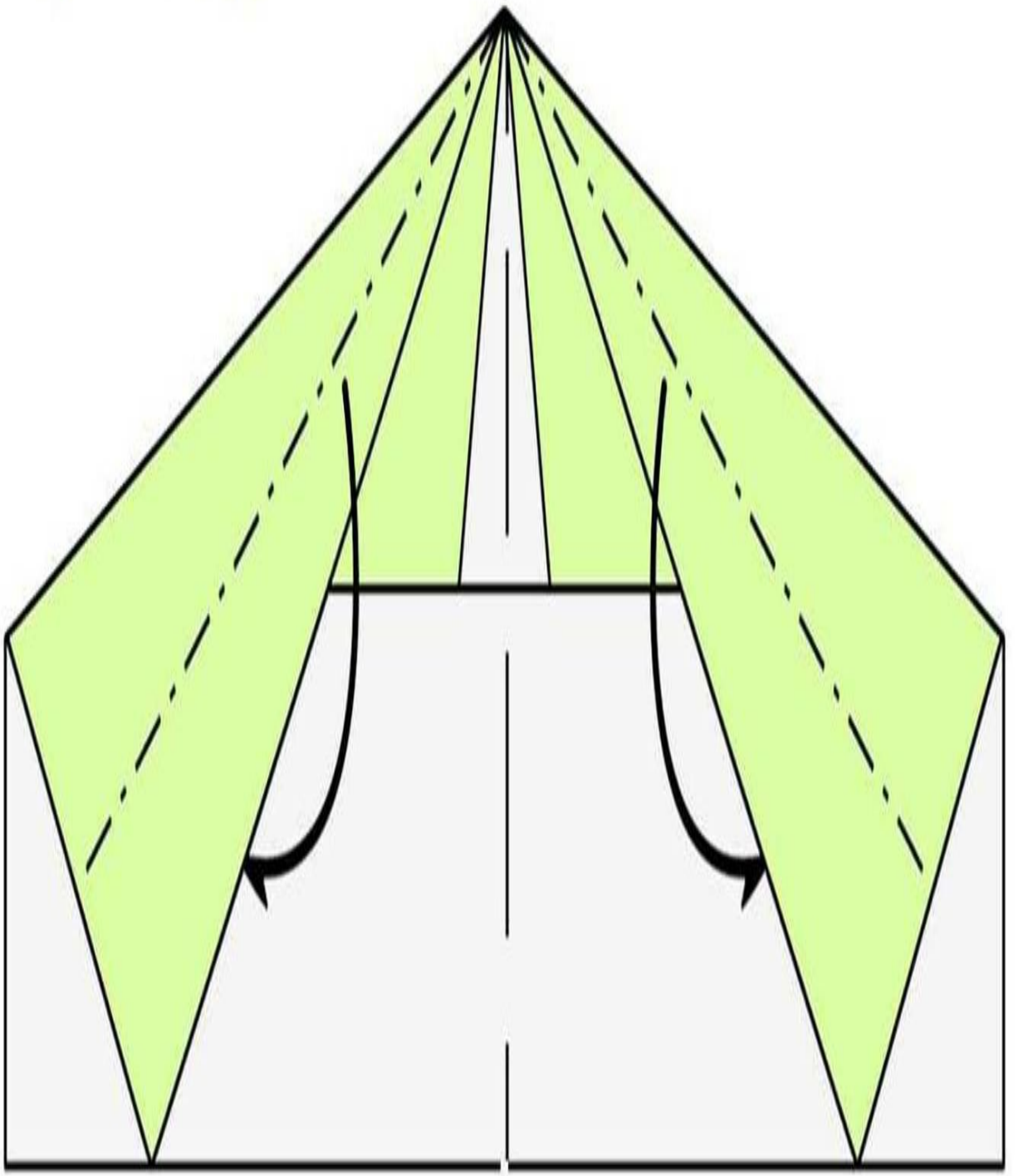


4 Super Wing



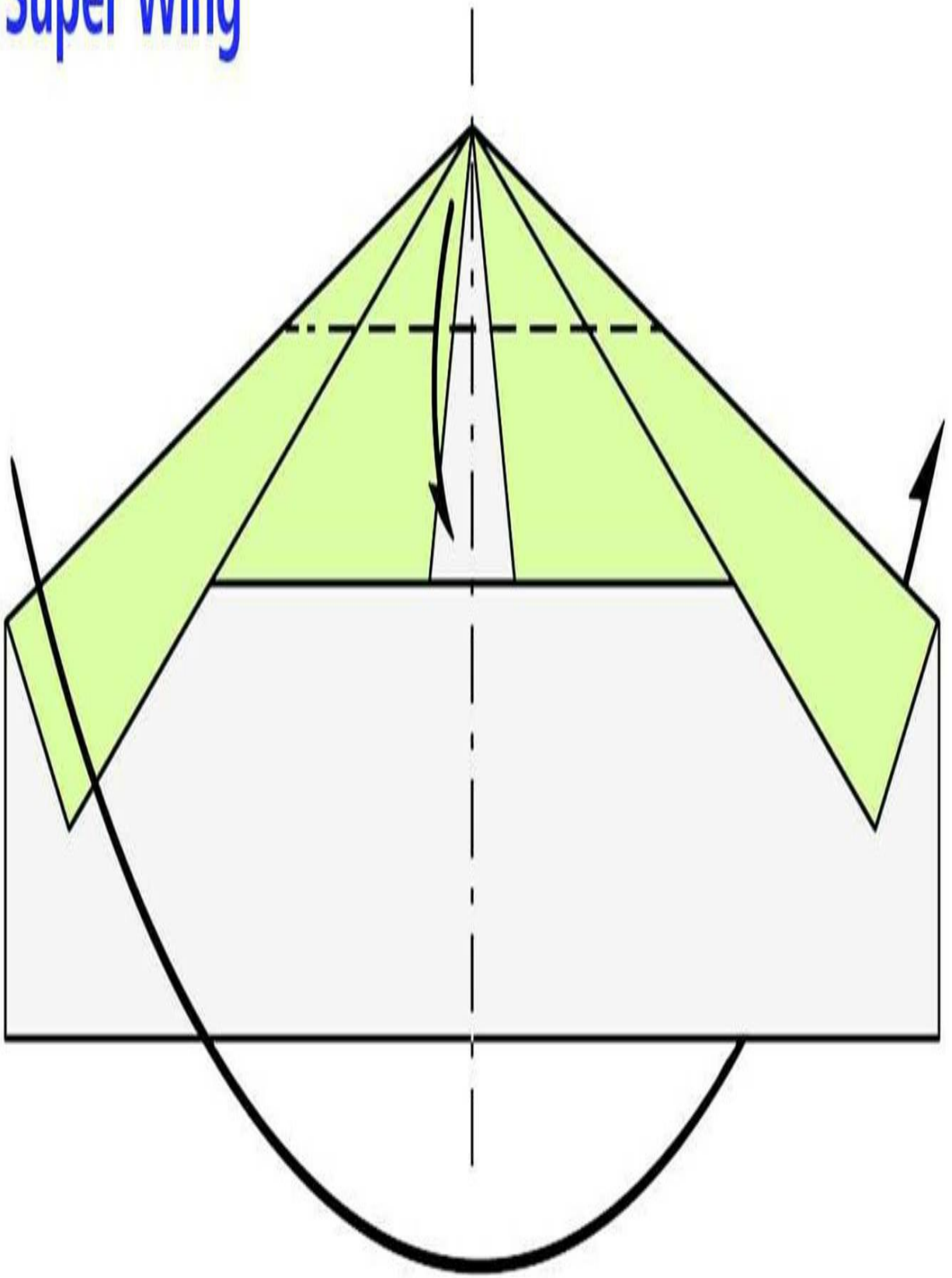
In Step 4, fold point up to nose, tucking under the outer flaps.

5 Super Wing



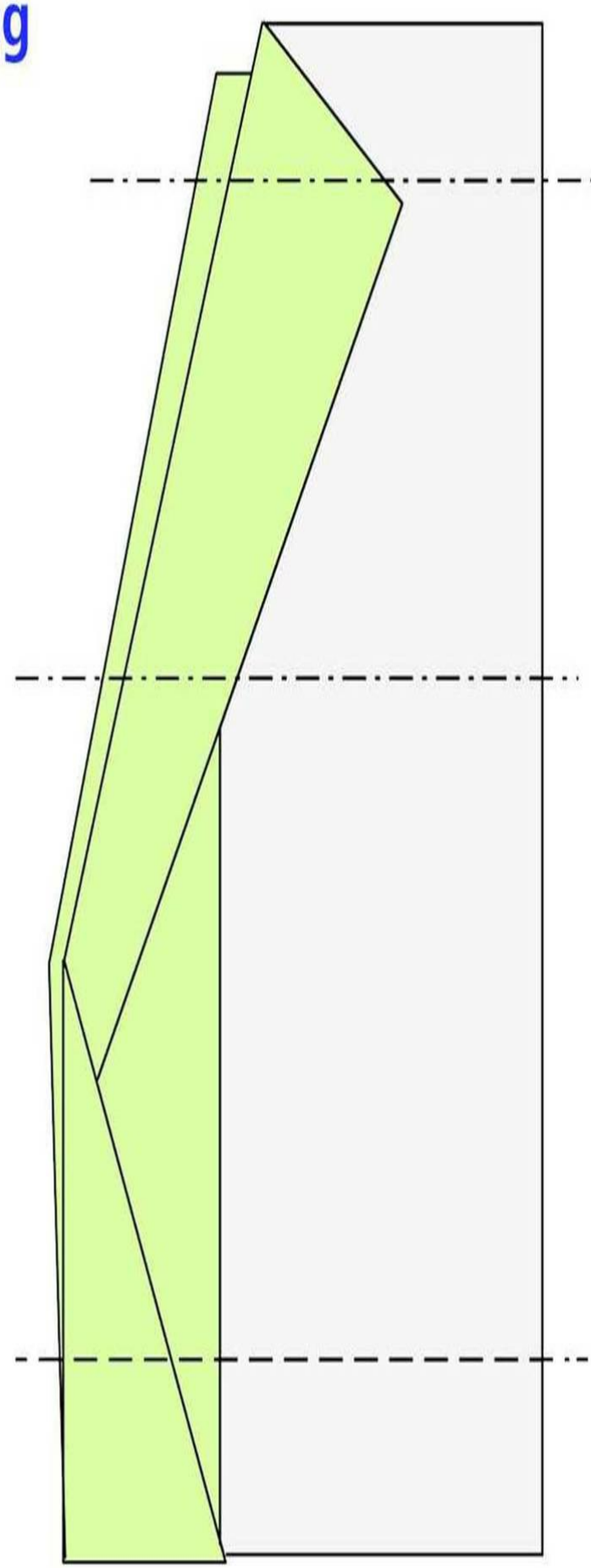
In Step 5, fold back the flaps along the dots and dashes (mountain fold) to strengthen the leading edge.

6 Super Wing



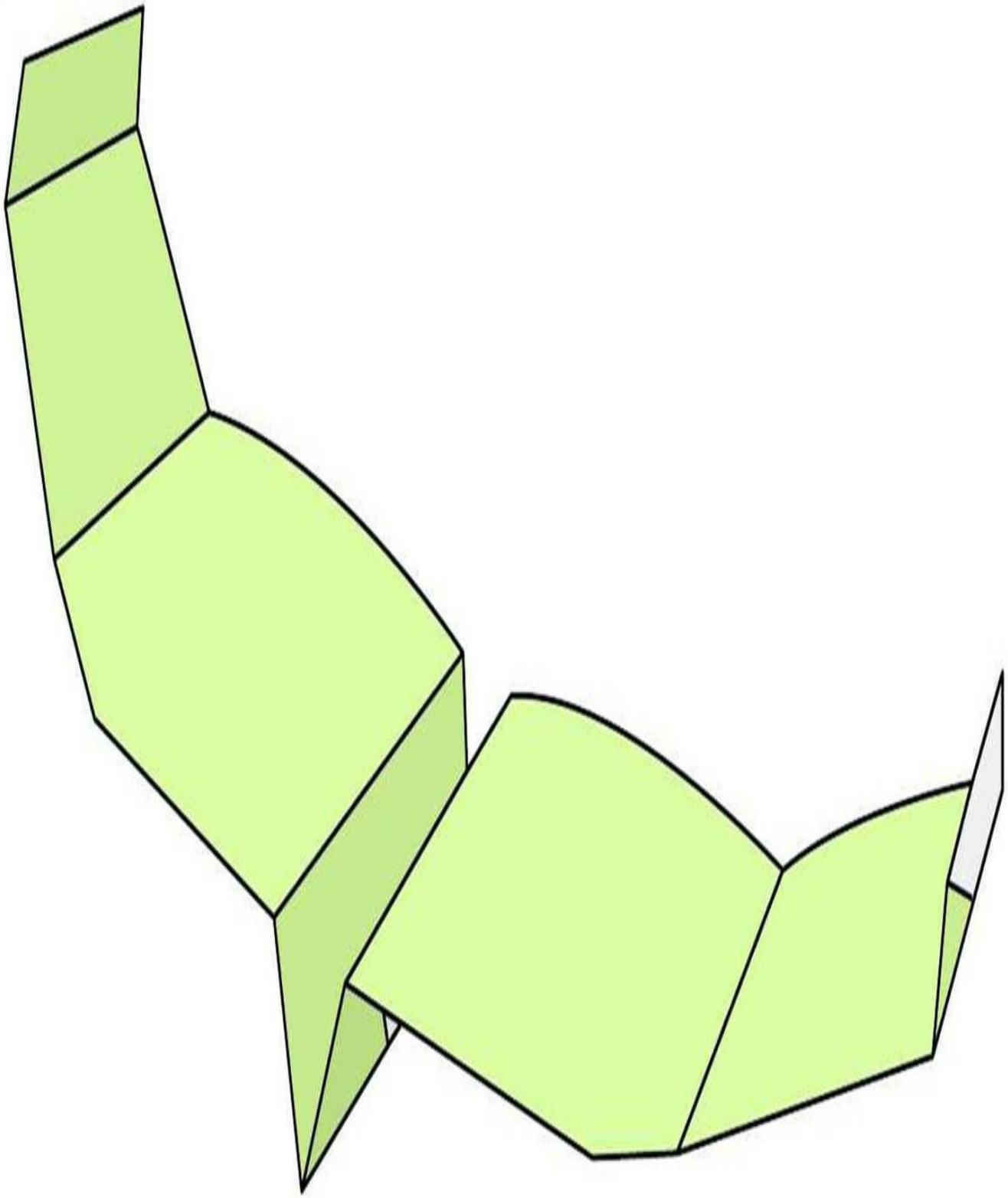
In Step 6, fold nose down, and then fold behind in half. Rotate model to face you as shown in Step 7.

7 Super Wing



In Step 7, where the valley fold is indicated, fold the wings down; where the mountain folds are indicated, fold wing fins in towards fuselage.

8 Super Wing



The completed Super Wing. Throw horizontally with slight force. If your model is perfectly symmetrical, it should be able to perform loops when thrown with greater force in an upward 45 degree angle.

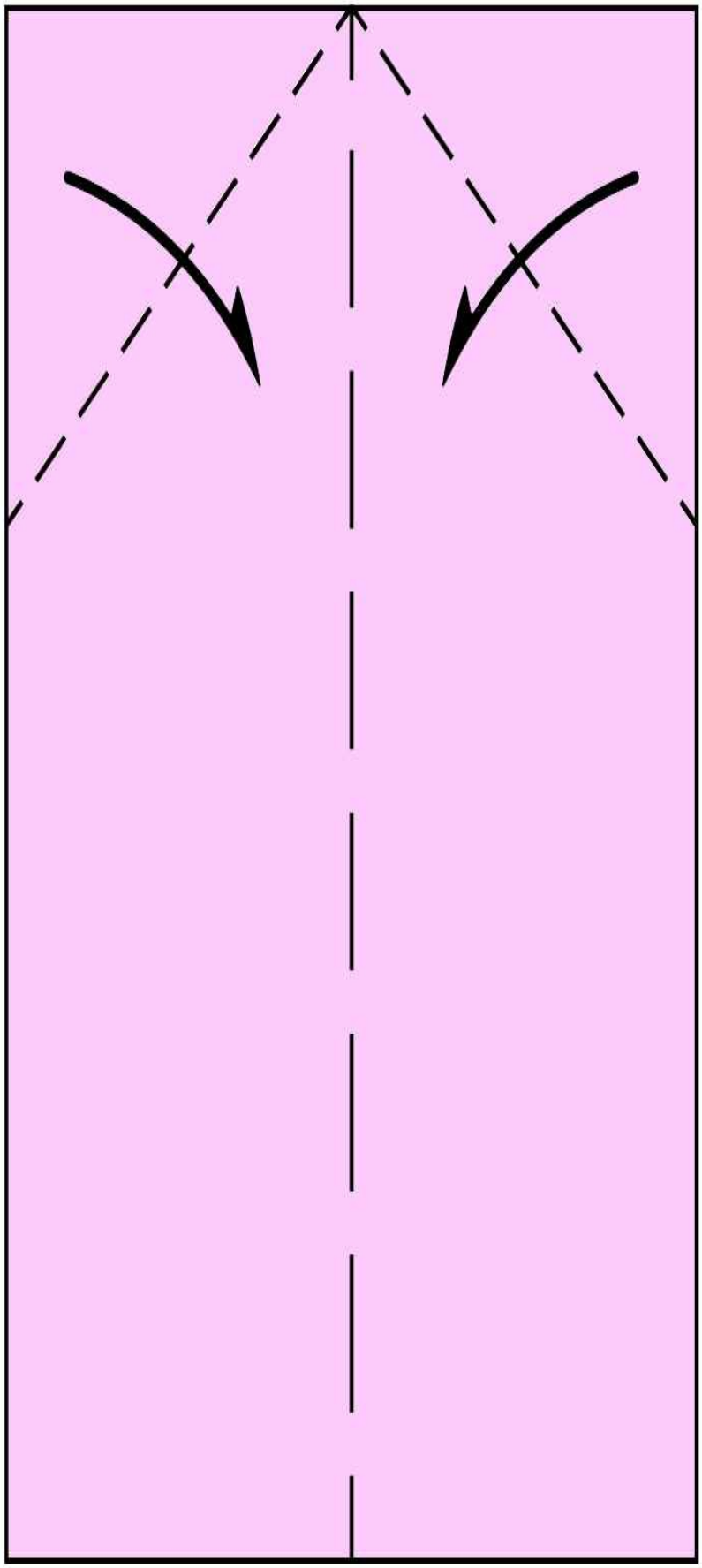
To make the Super Wing return to you in a relative horizontal circle, throw it upwards and away from you at approximately 30 degrees with its underside facing you.

Long Distance Glider MKII

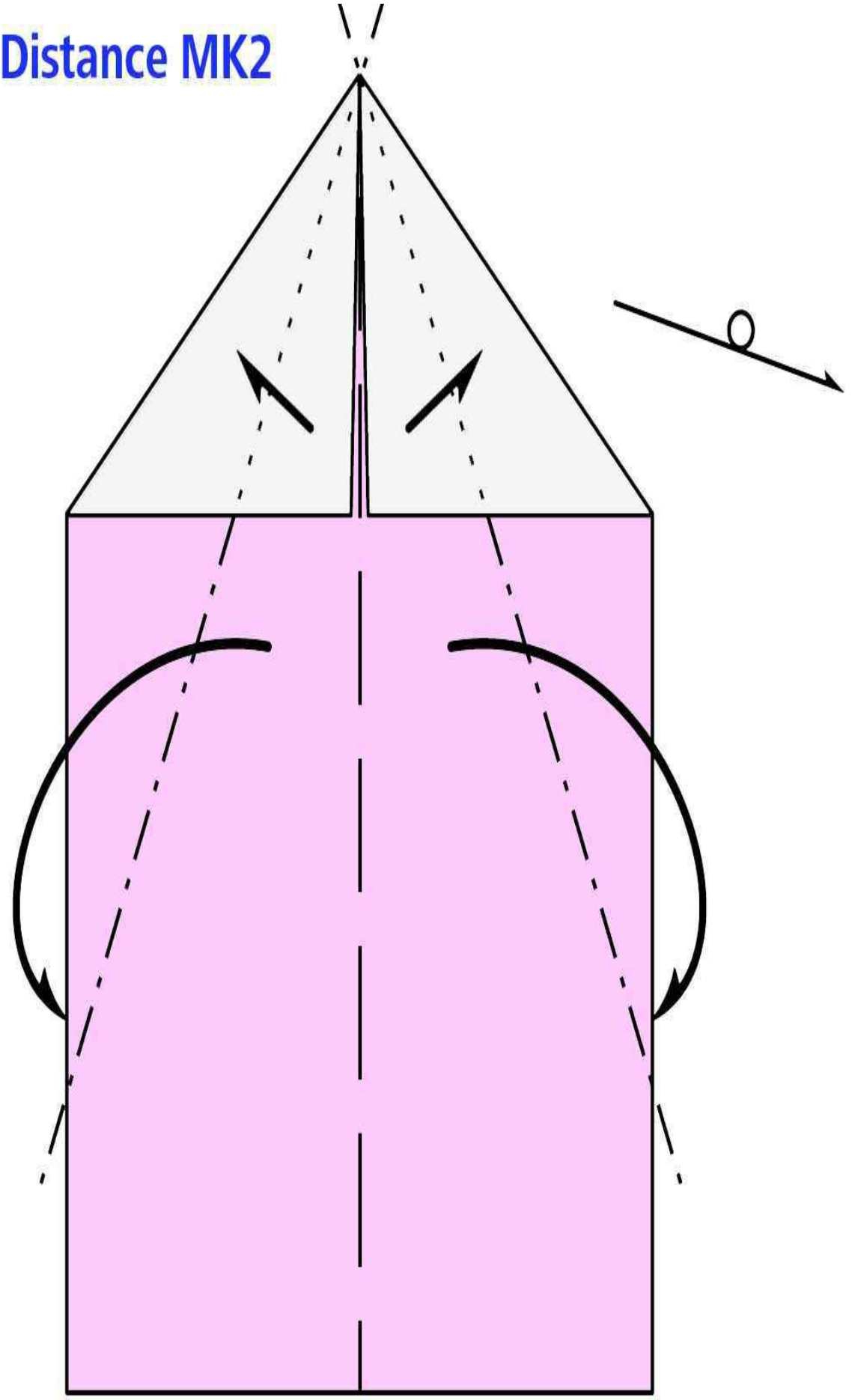
Here is a dart that can be thrown with greater force due to its solidly-constructed split-nose section.

While staying at the Hotel del Coronado in San Diego, we snuck into the red-roofed turret to have a look. On the lookout above we were able to throw these and they stayed aloft, sailing across the ocean air, coming to land (we presumed) at the naval base next door, as it had flown off in that direction. We hope they made a good touchdown on a carrier!

1

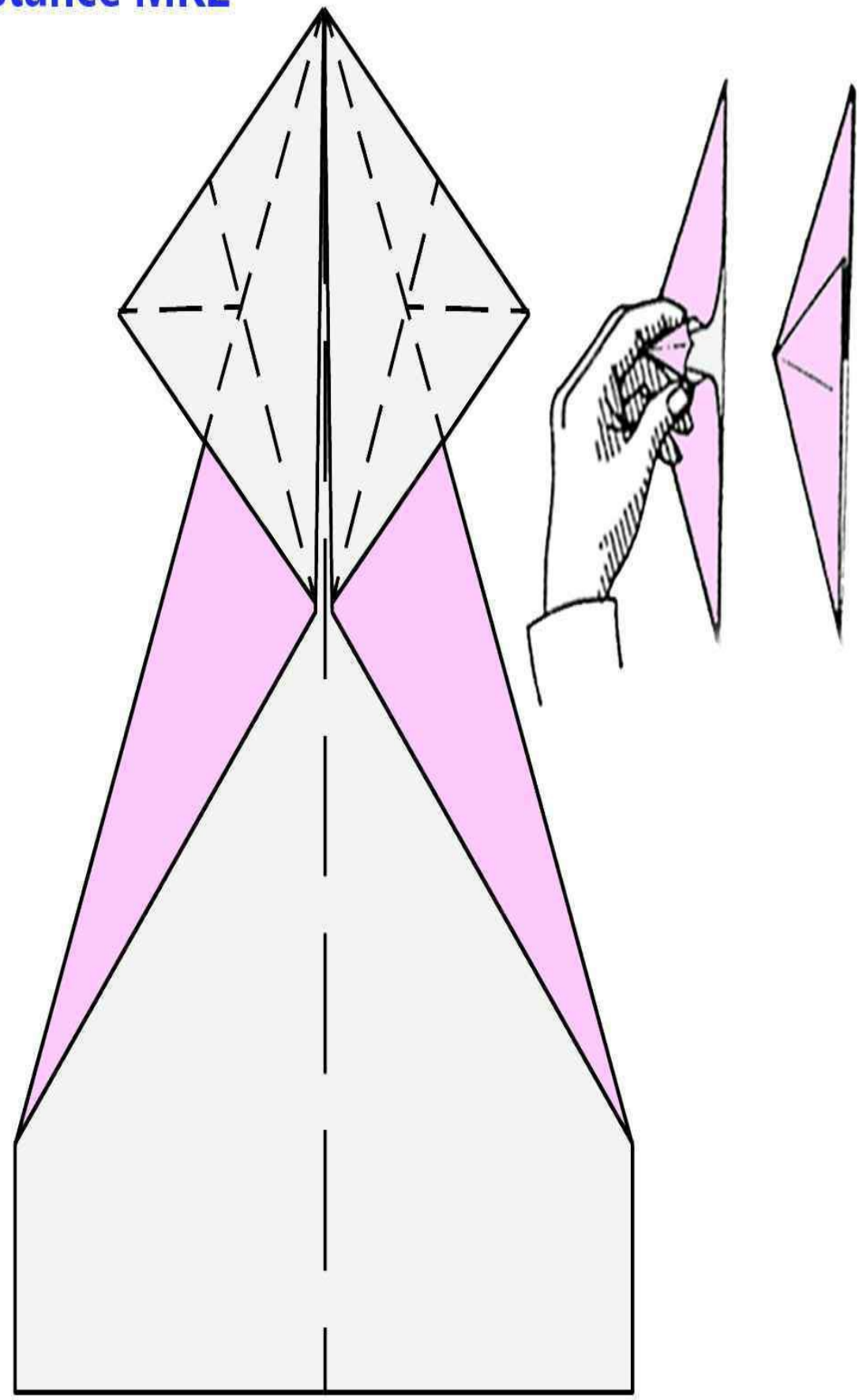


2 Long Distance MK2



In Step 2, as you fold the sides behind (including the hidden section (dotted line), the top corners flip out and around behind. Next, turn the paper over (arrow symbol with circle).

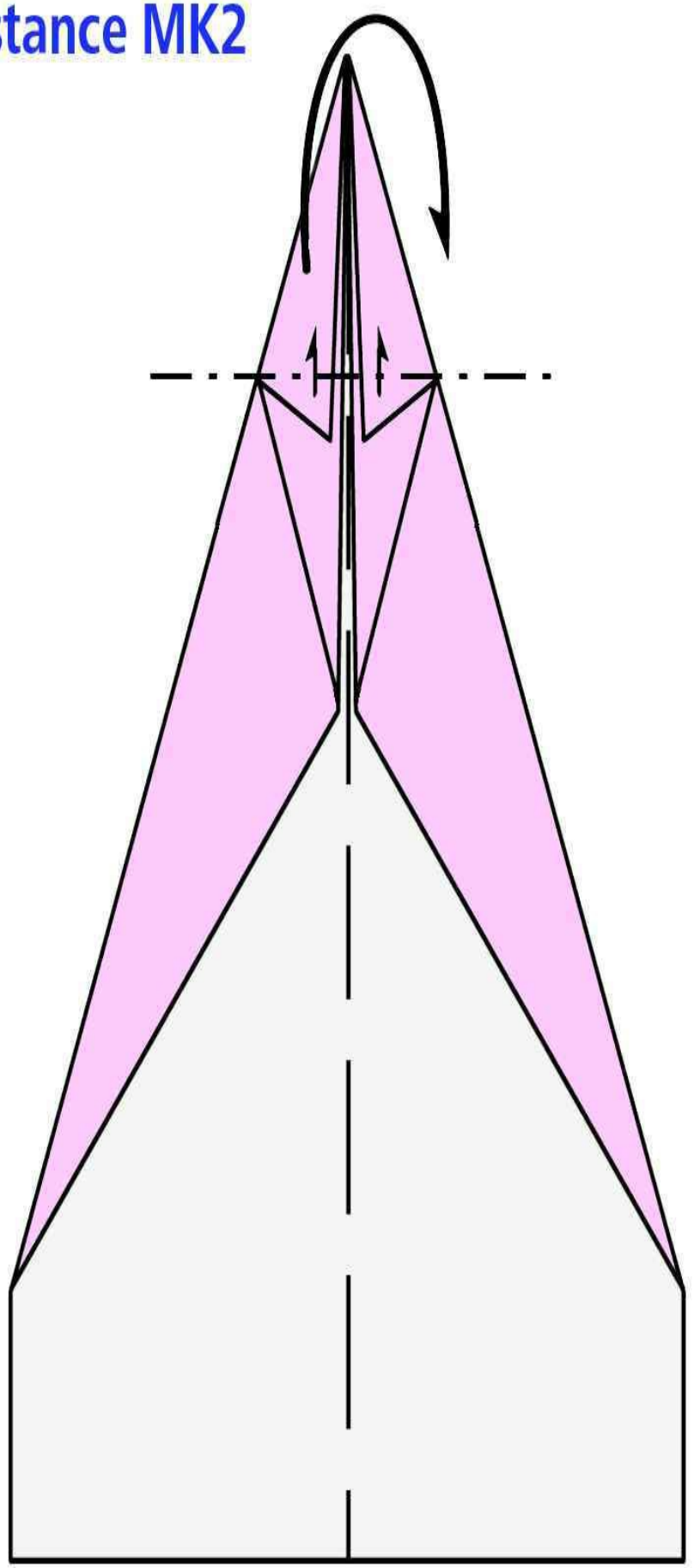
3 Long Distance MK2



In Step 3, we will make ‘rabbit ears’ on the top sections. Make crease-folds and then pinch the edges together to make an ‘ear’ section on each side.

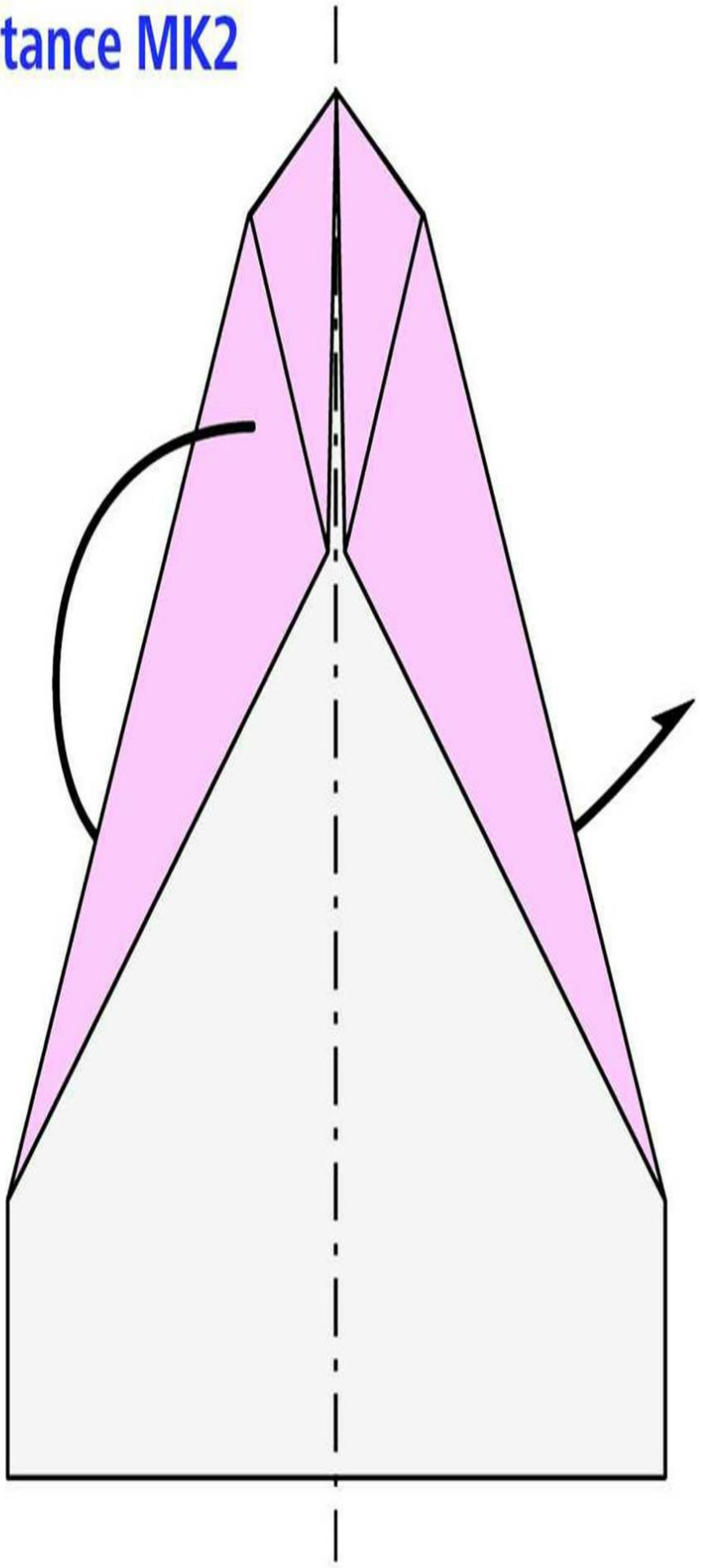
The following photos may help…

4 Long Distance MK2

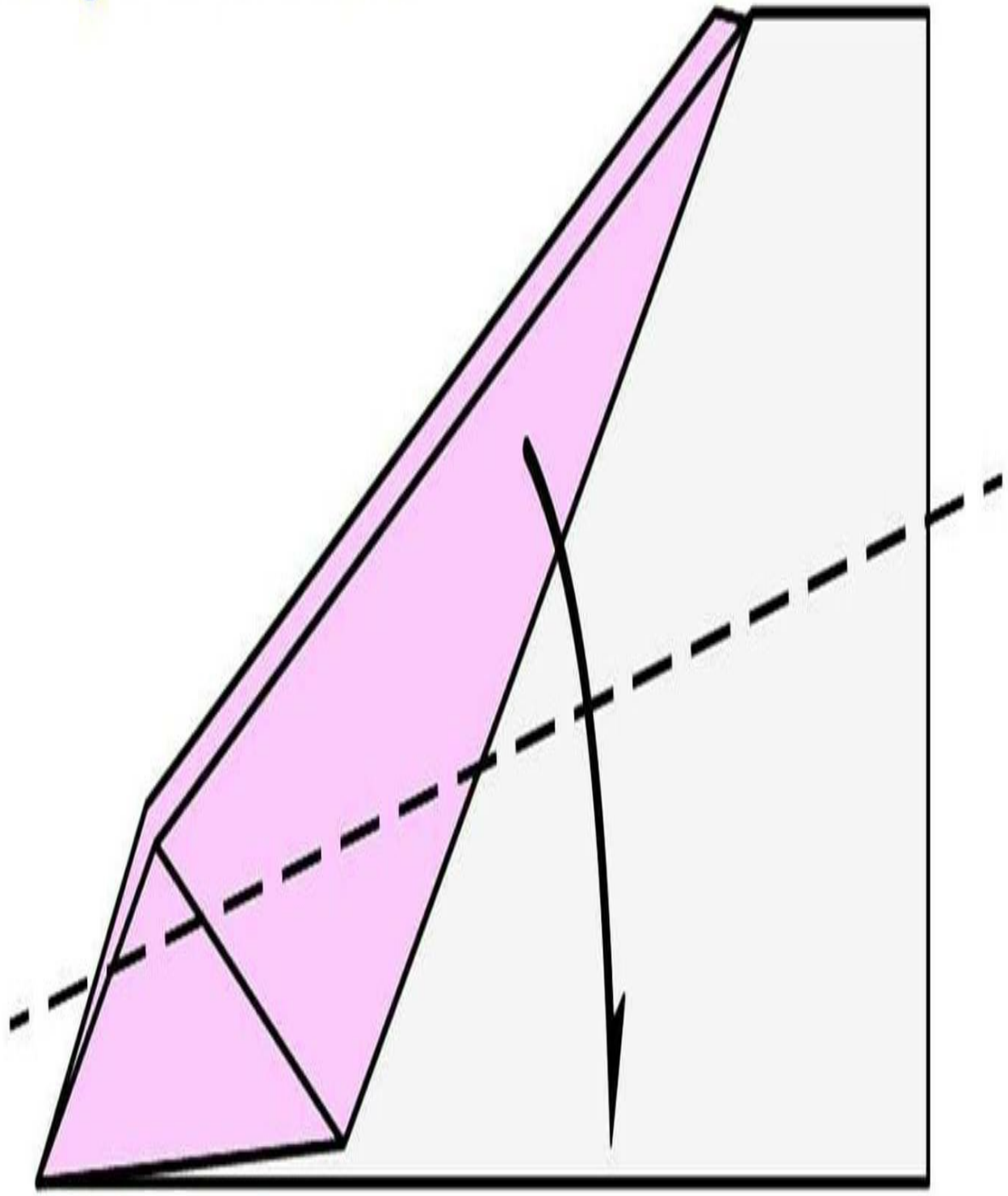


In Step 4, fold the nose behind and flip forward the two bunny ‘ears’.

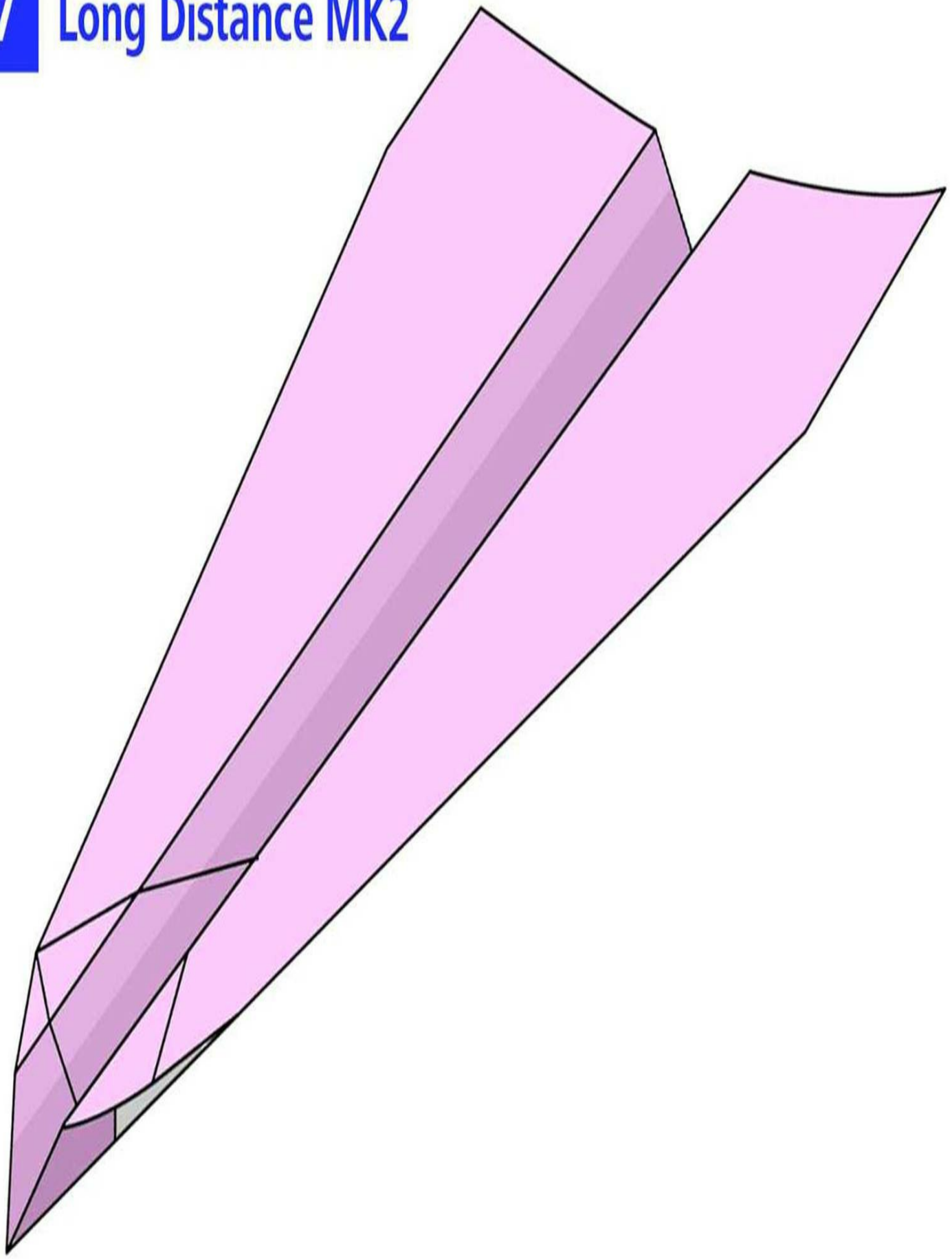
5 Long Distance MK2



6 Long Distance MK2

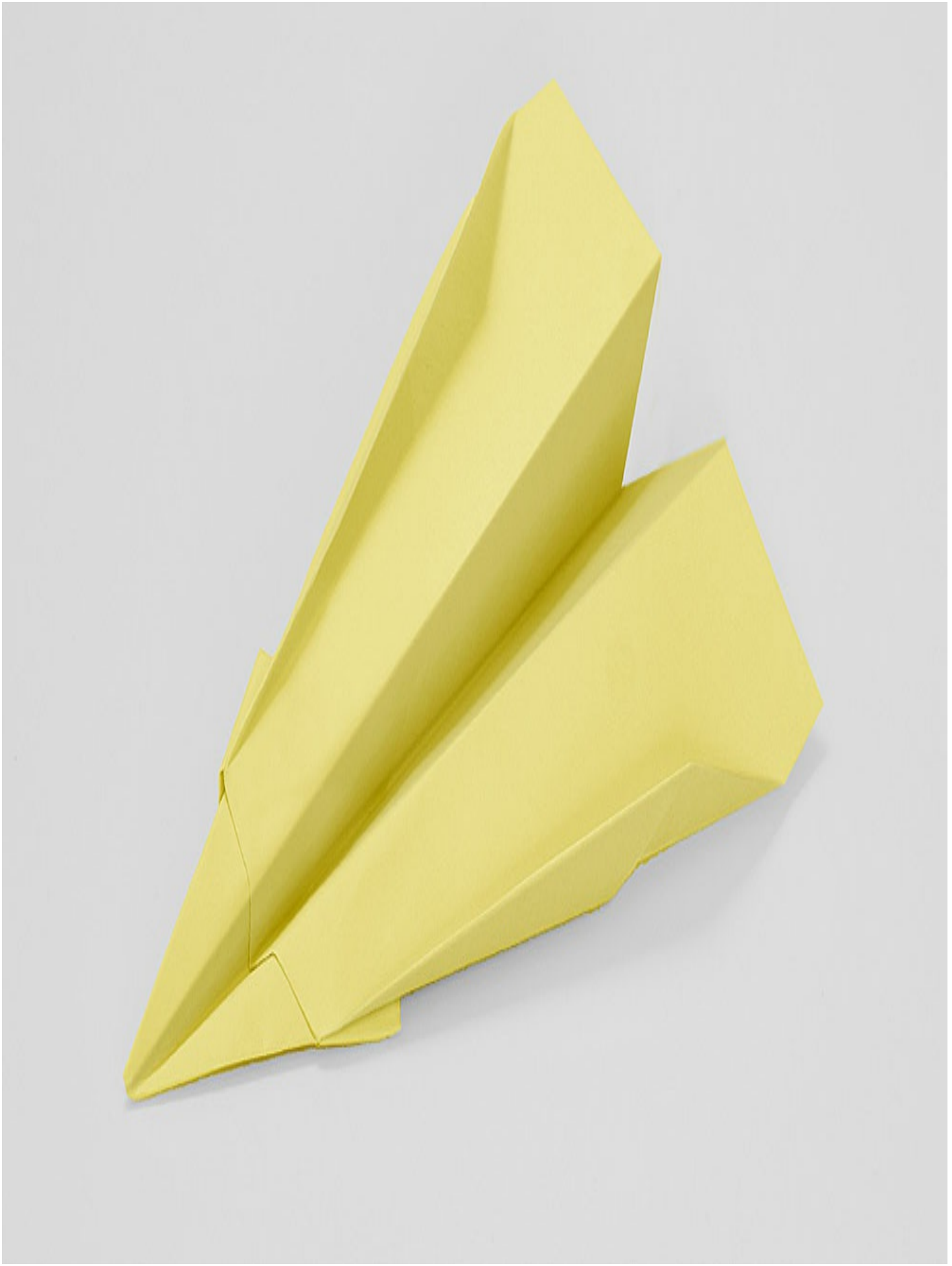


7 Long Distance MK2



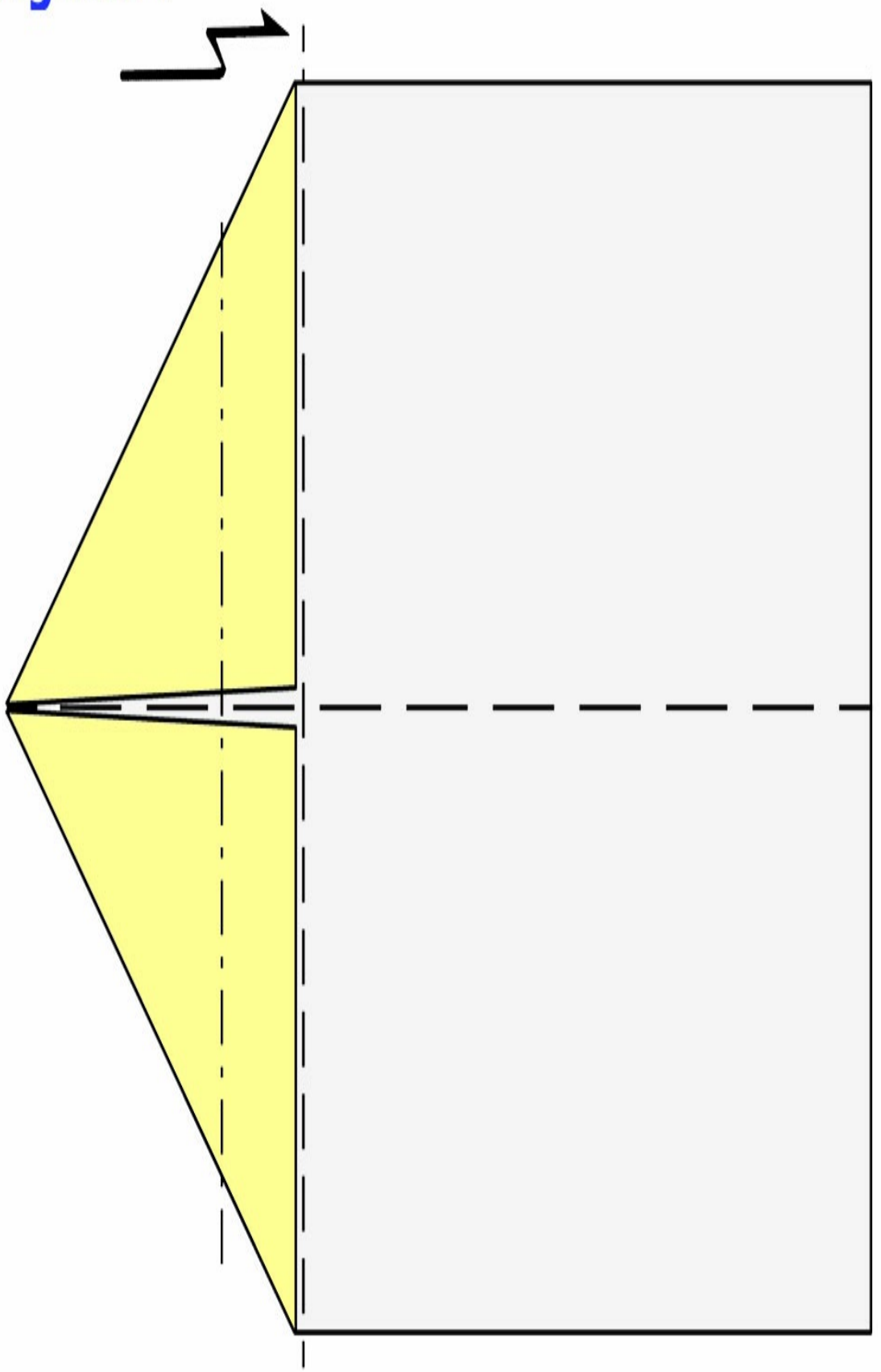
The completed glider; curl up the tail section slightly if you need added lift. Throw upwards with moderate force, preferably against or slightly side-on to the wind.

Megadart (Super Dart)



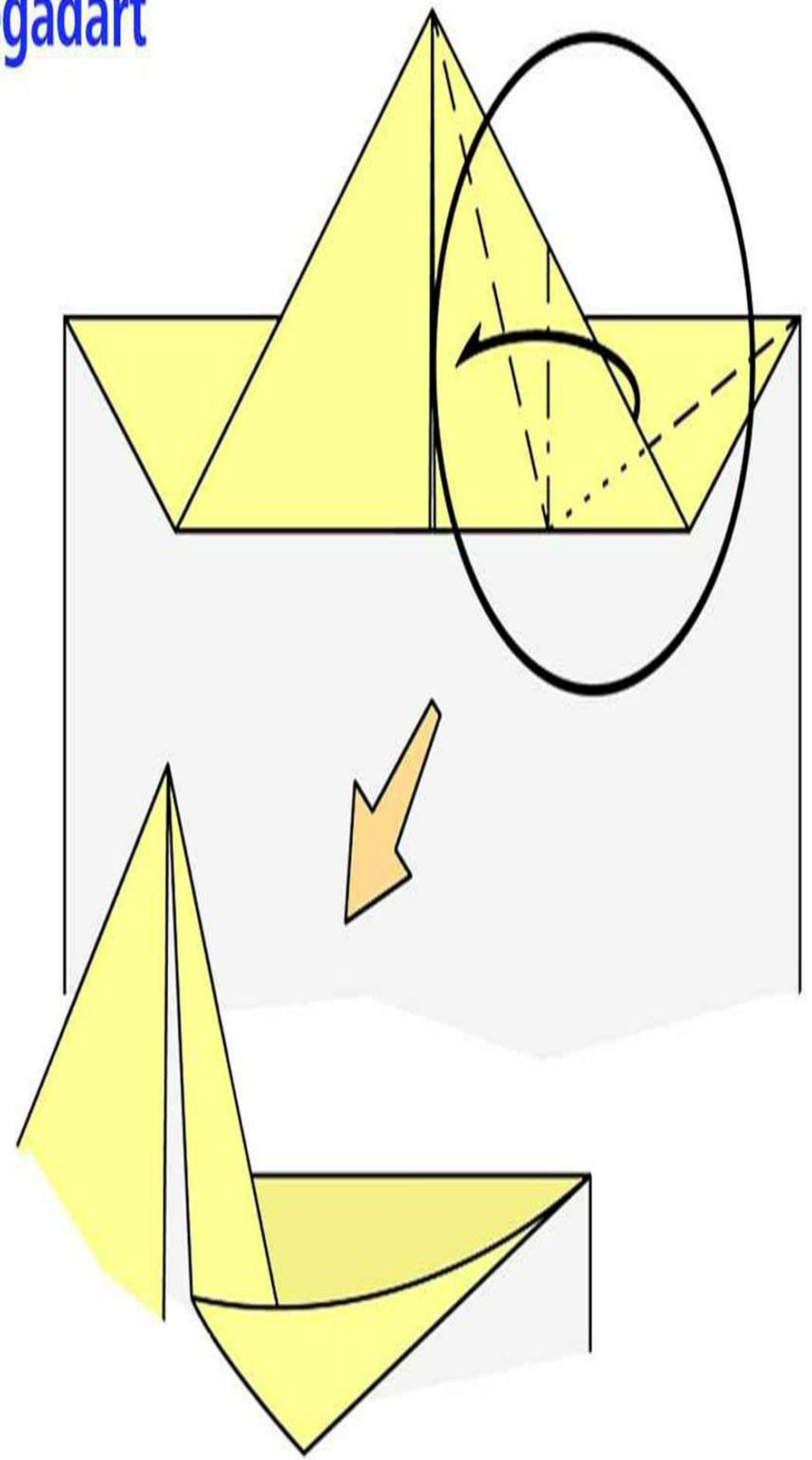
This model is popular and has been used in several books and apps, including our own *Paper Aircraft Advanced* iOS and Android app.

1 Megadart



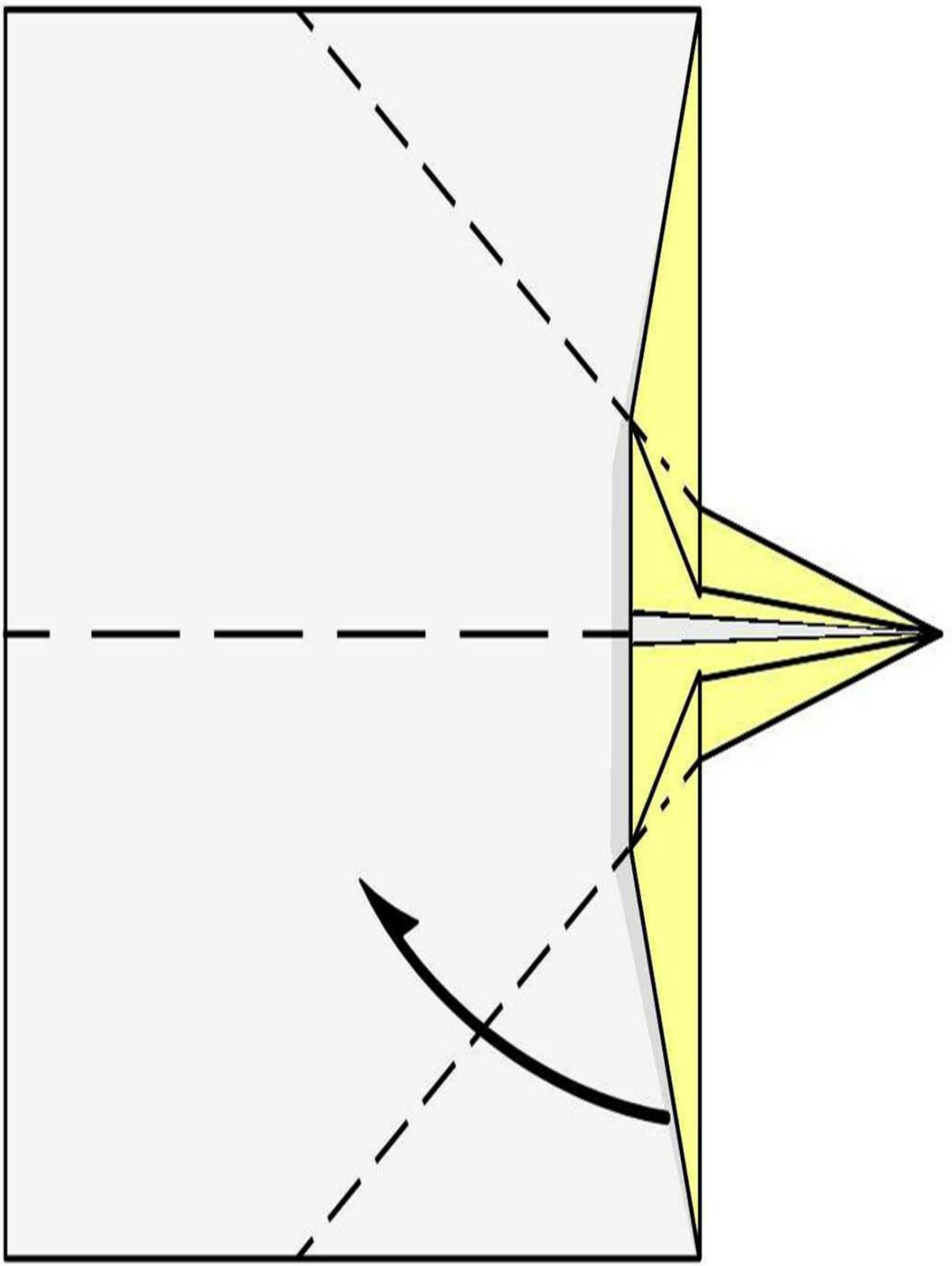
In Step 1 we will make a ‘stair-step’ fold. Where indicated, valley-fold to the right, and then back to the left.

2 Megadart



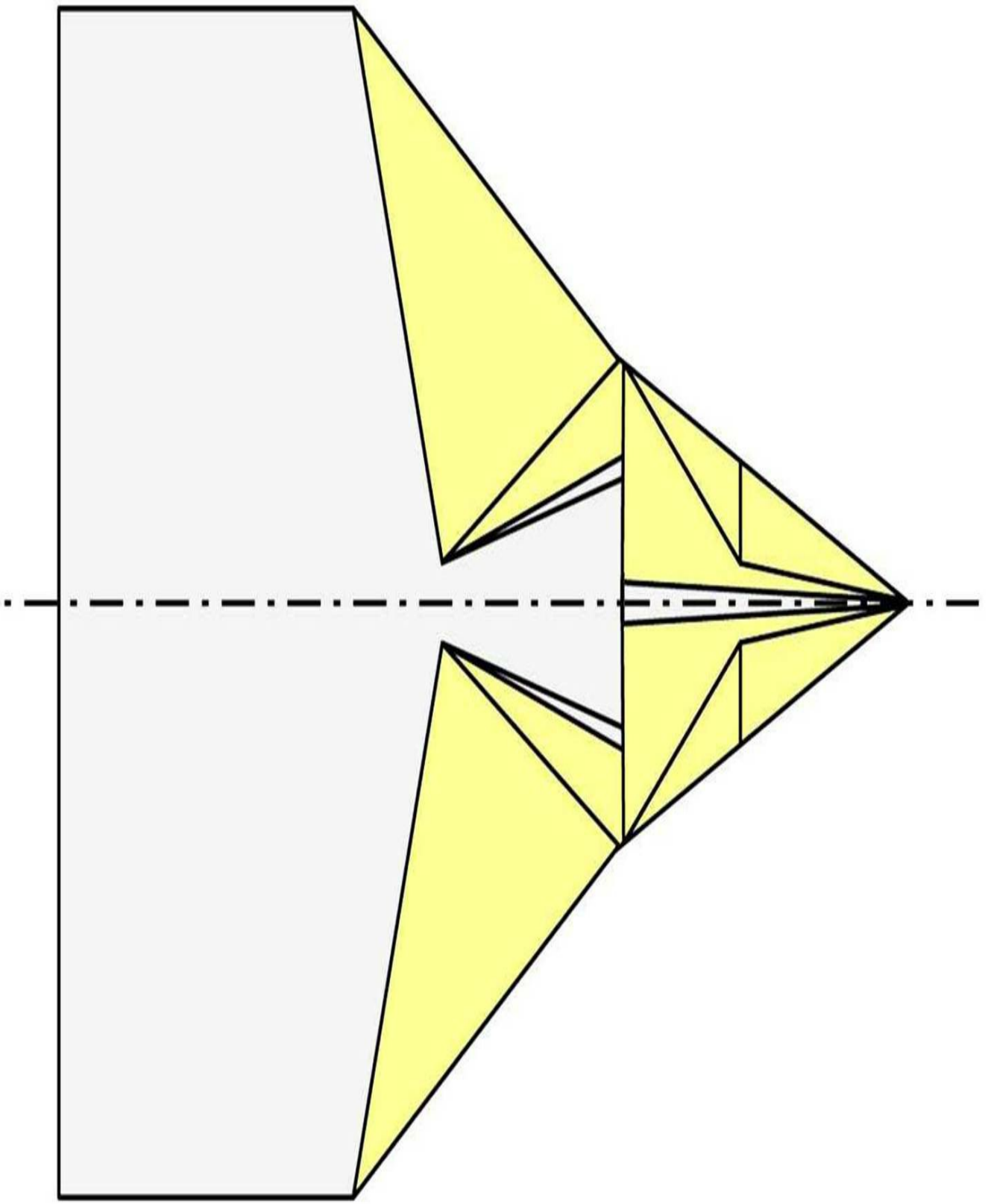
In Step 2, make creases and place finger under right-hand section, and then pull to the left. Repeat for the left side, and flip the model around to that shown in Step 3.

3 Megadart

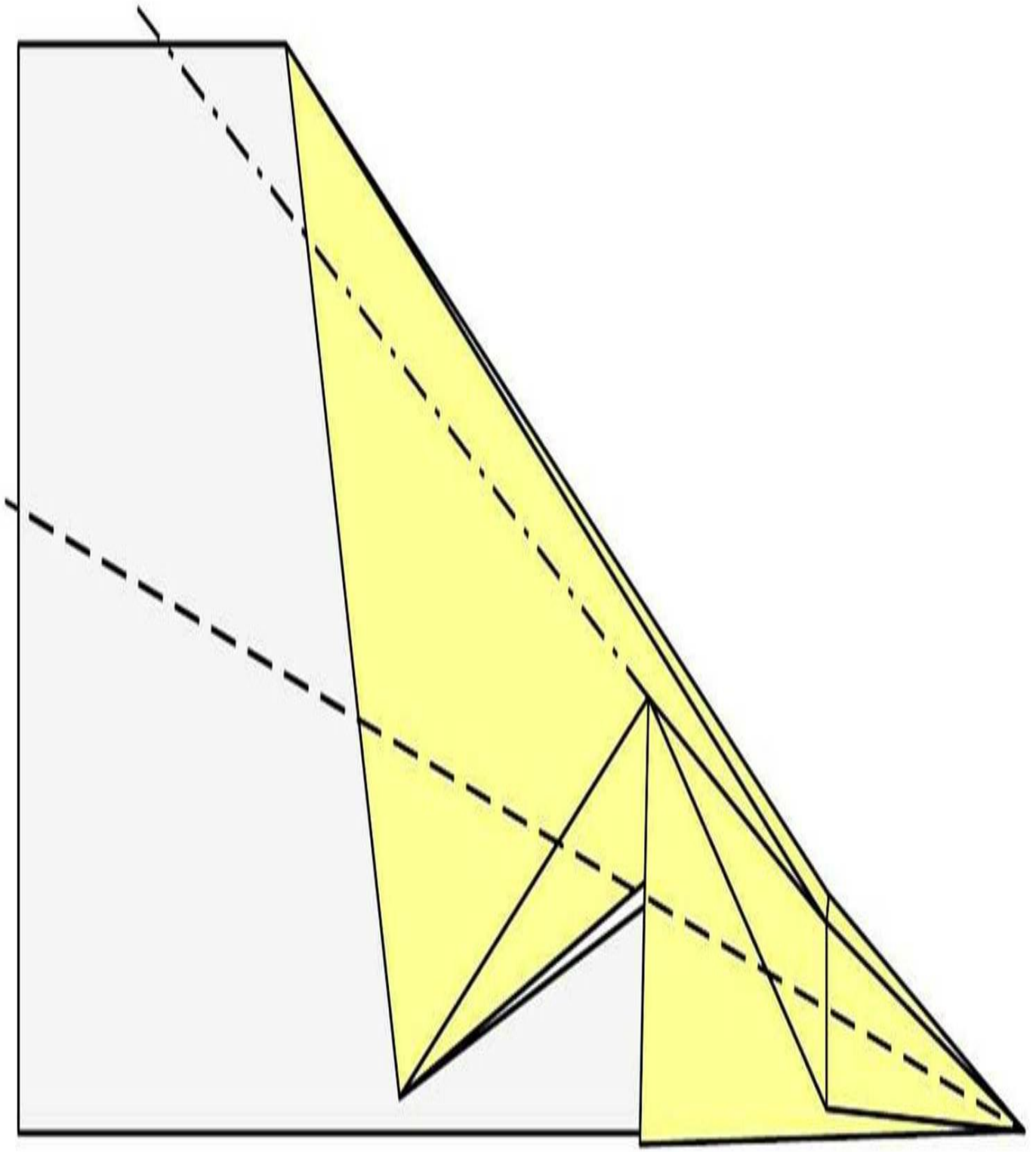


In Step 3, make creases and ‘inverse’ fold this section, where the lower right-hand edge folds inside and towards the left/center. Repeat for the opposite side.

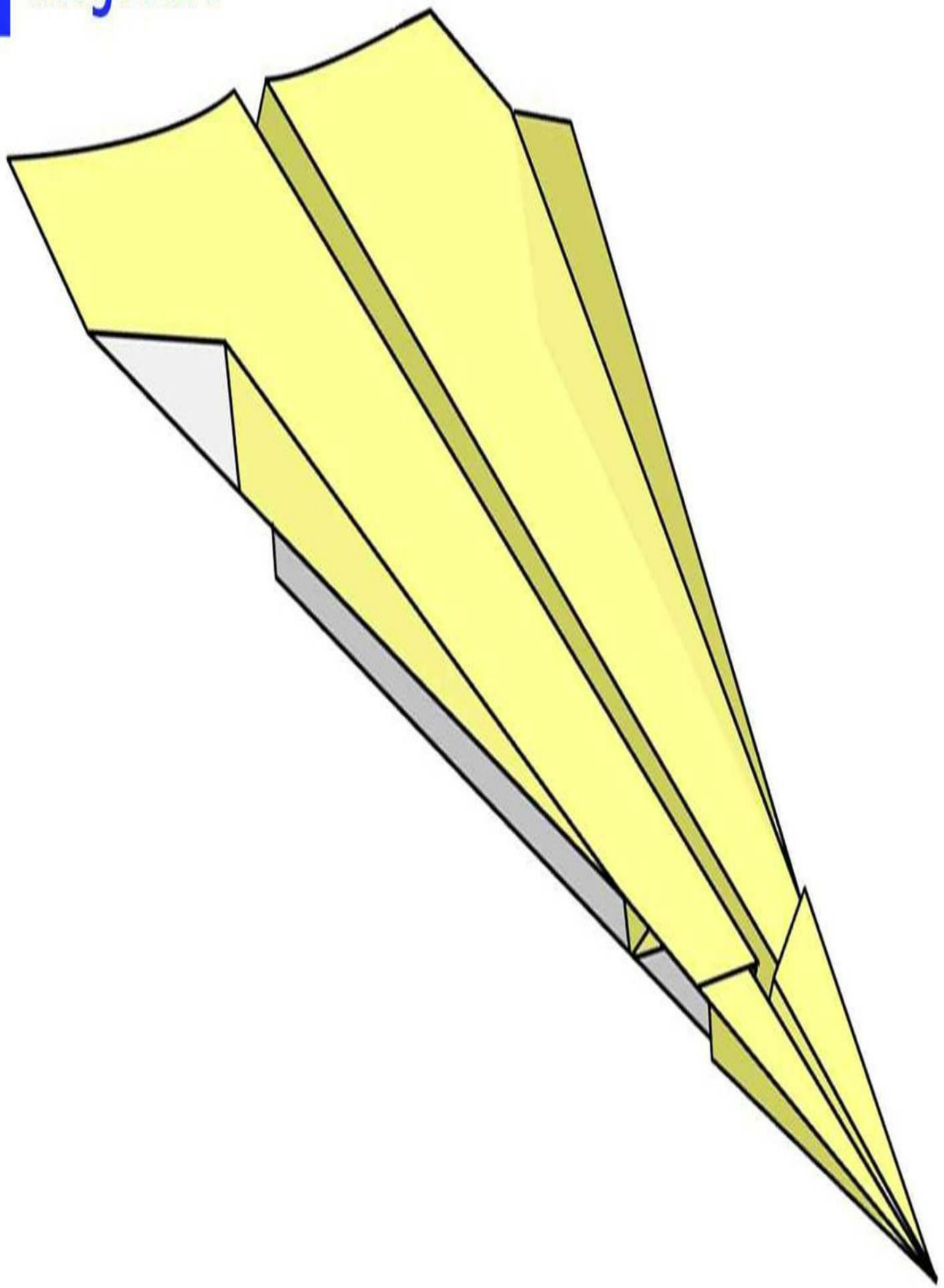
4 Megadart



5 Megadart



6 Megadart



The completed craft is now ready to fly. Curl up the tail section slightly if you require more lift. Throw hard and high. With the nose section tilted slightly, you should be able to get a decent-sized loop.

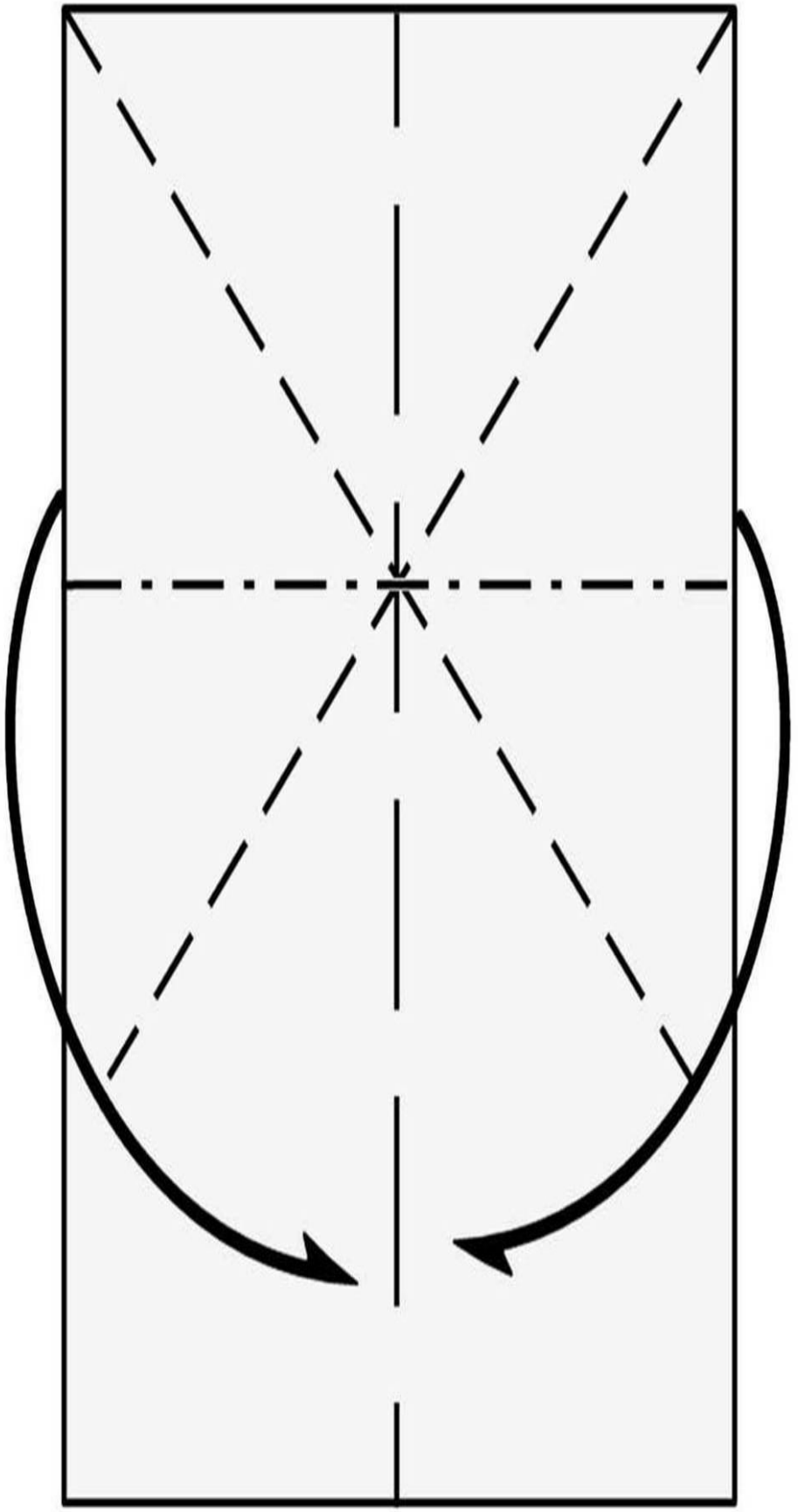
Super Looper

Many authors have tried to copy this model but this is the original and best design for outstanding looping performance.

This craft begins with a standard basic fold. In step 1 you will see diagonals (valley folds). The horizontal dot-dash (mountain fold) line means you crease behind. This allows you to bring the sides together and collapse the paper to make the basic fold.

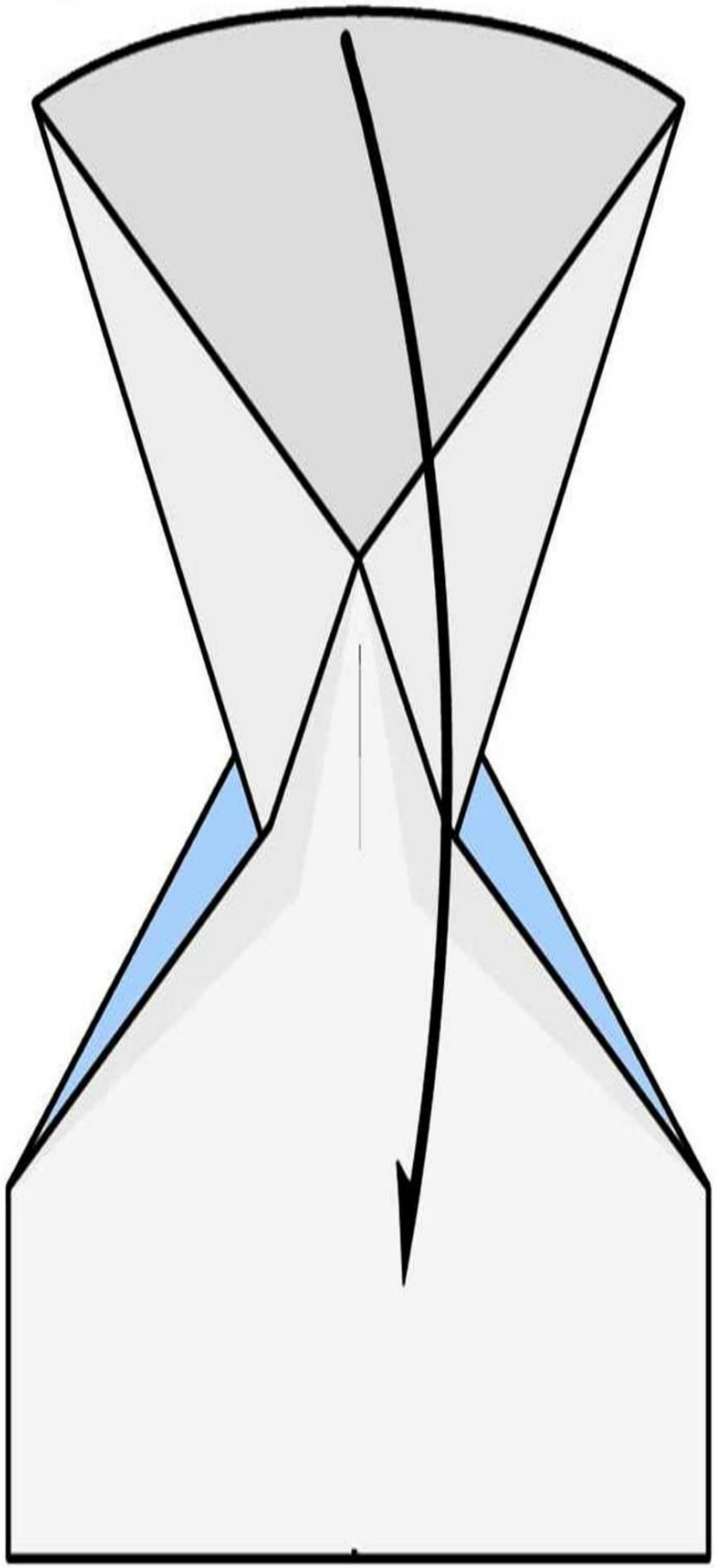
Let's try it now…

1 Super Looper

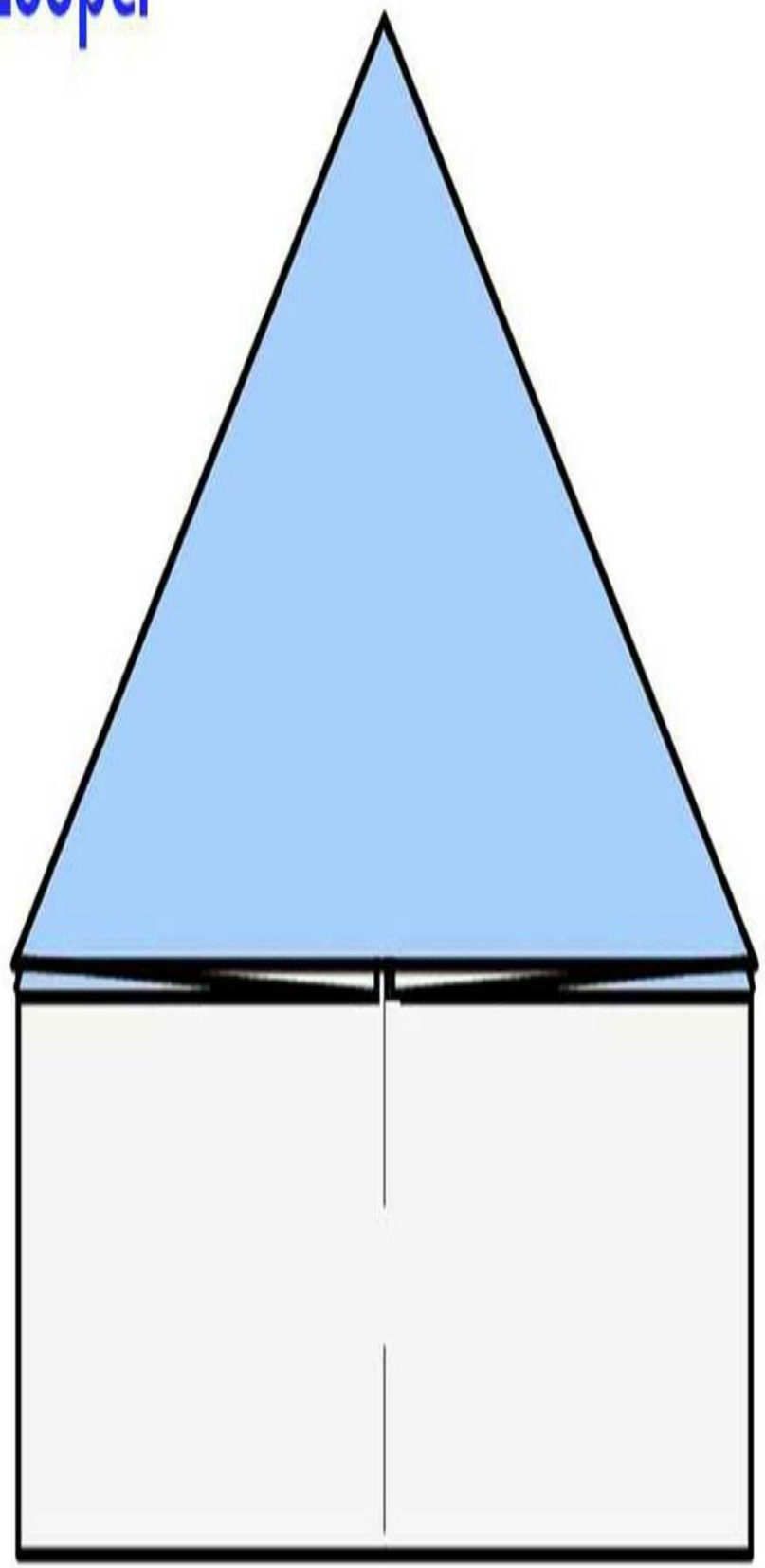


In Step 1, make all creases (the horizontal is folded behind) and then unfold. Now bring in the sides and collapse down the top as shown in Steps 2 and 3.

2 Super Looper

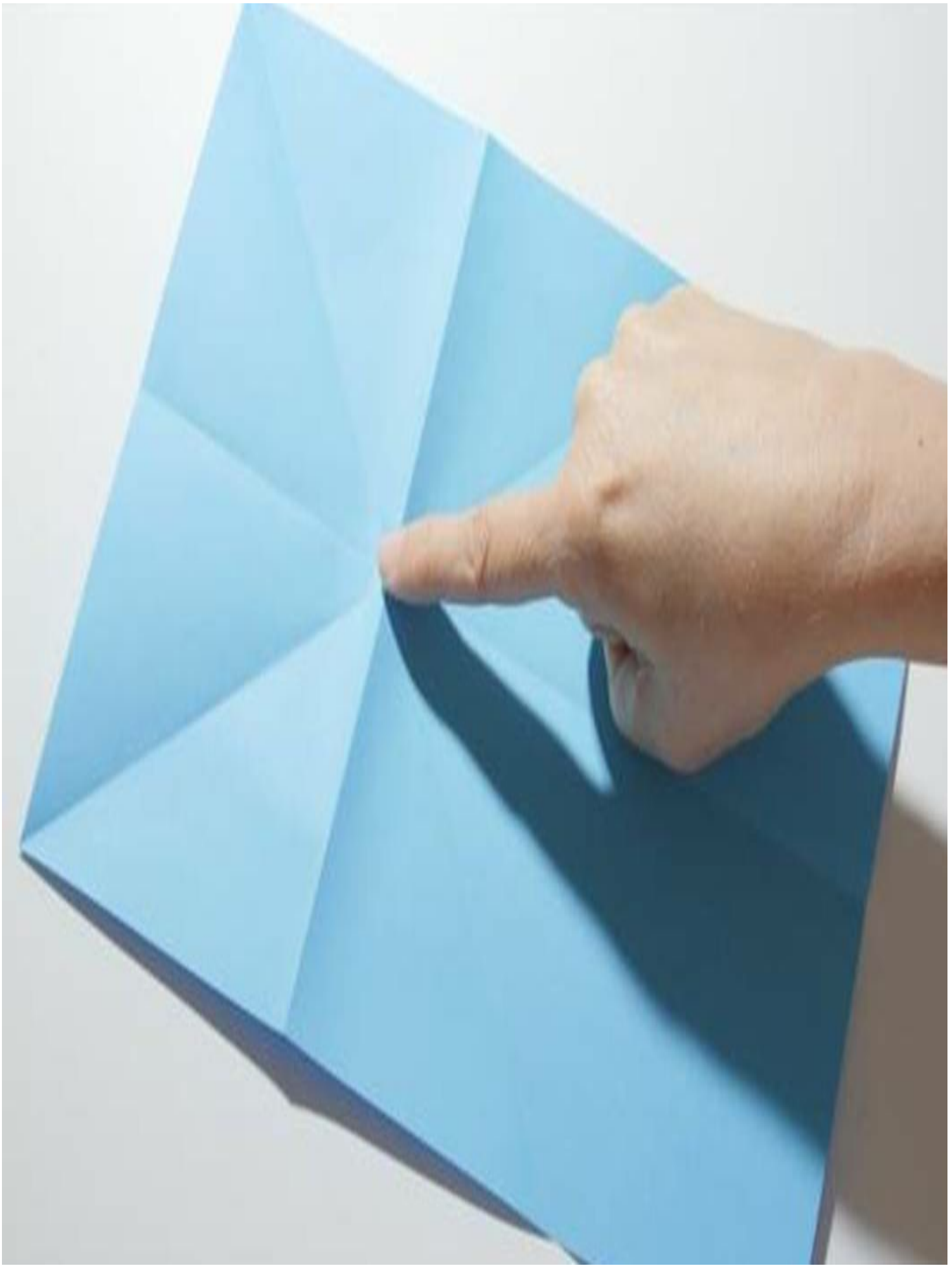


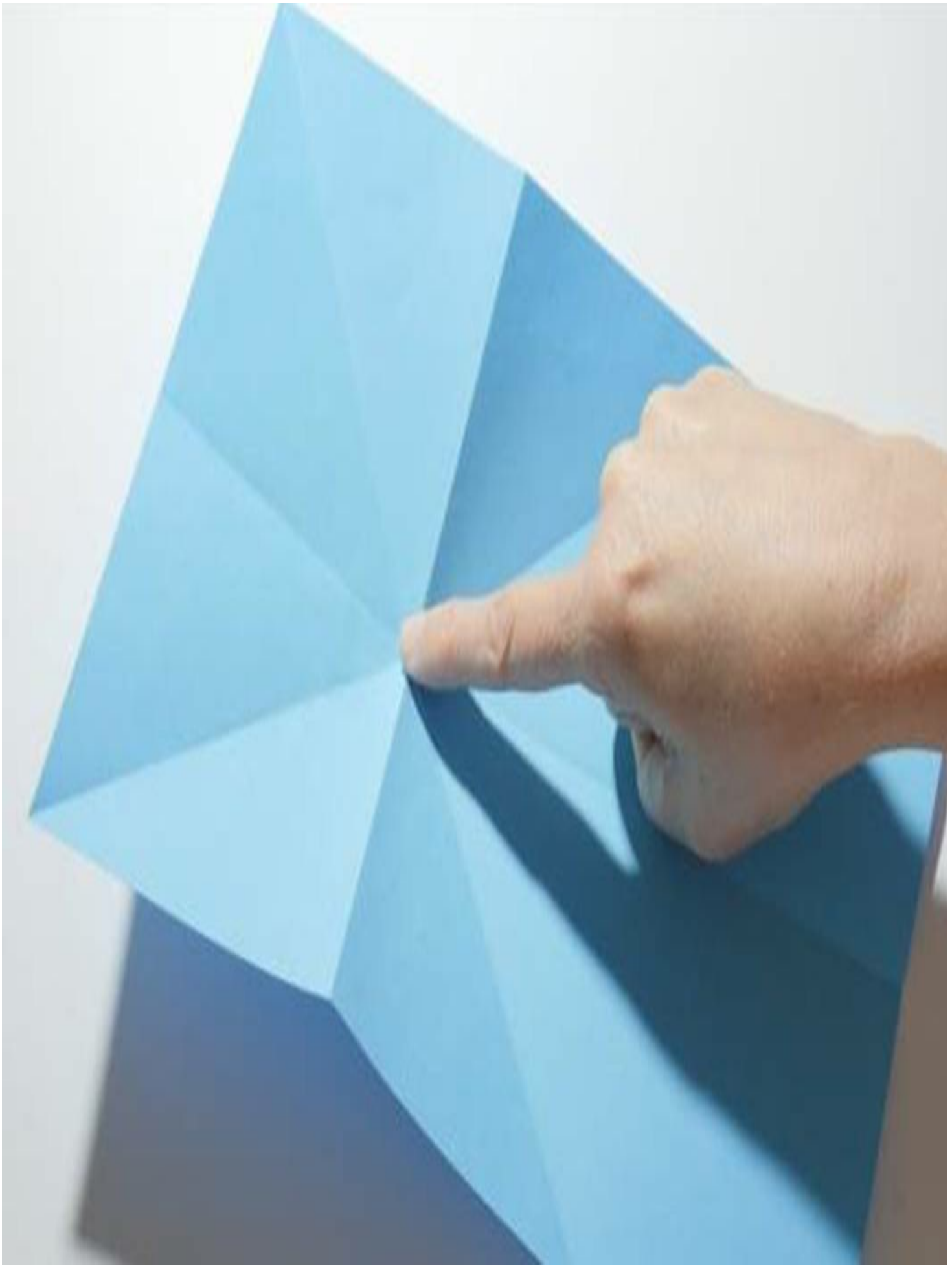
3 Super Looper



Step 3 shows the finished basic fold. If you have difficulty with this fold, the following photos may assist…

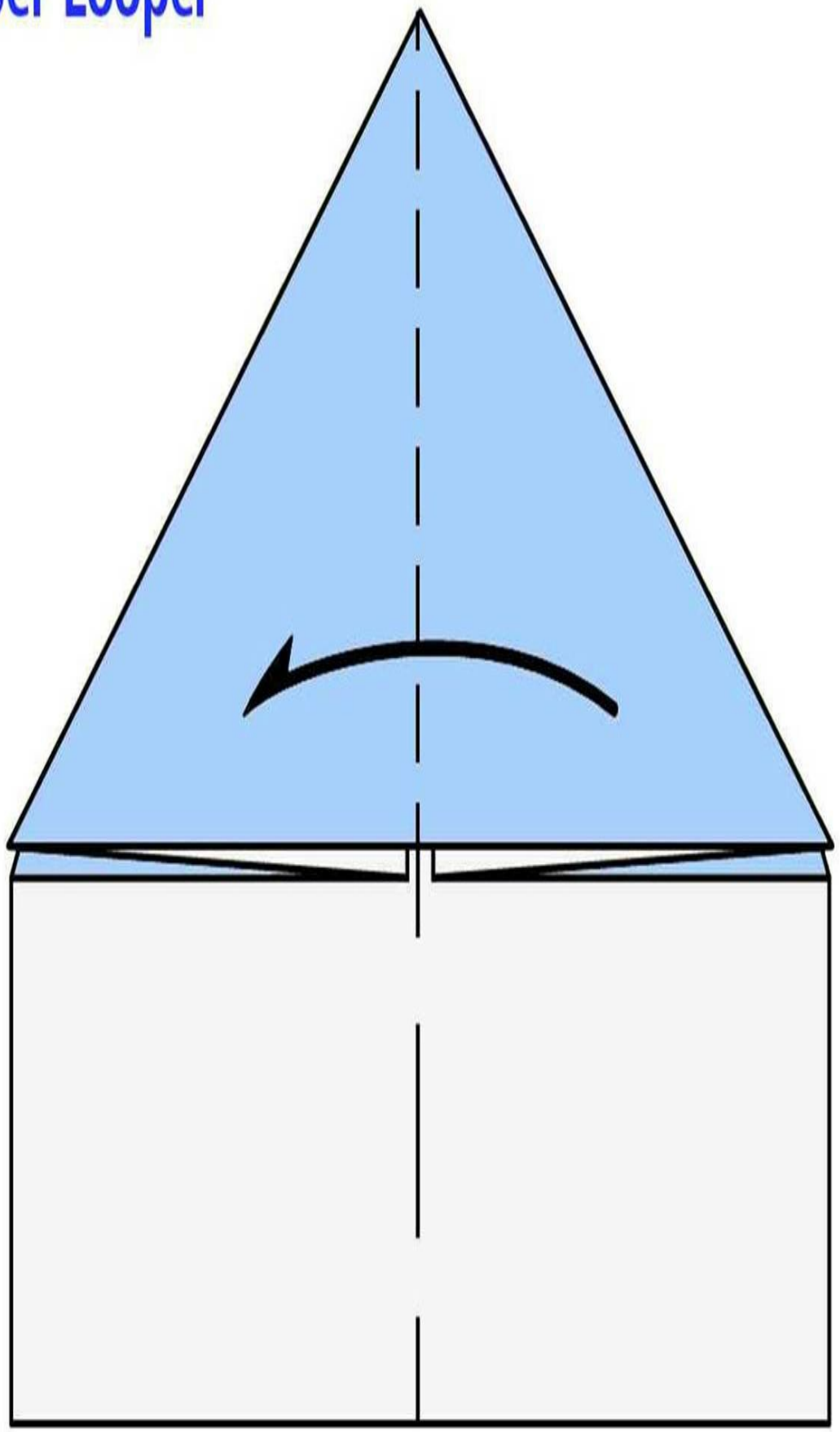
After making all the creases, push the center to pop the sides up.



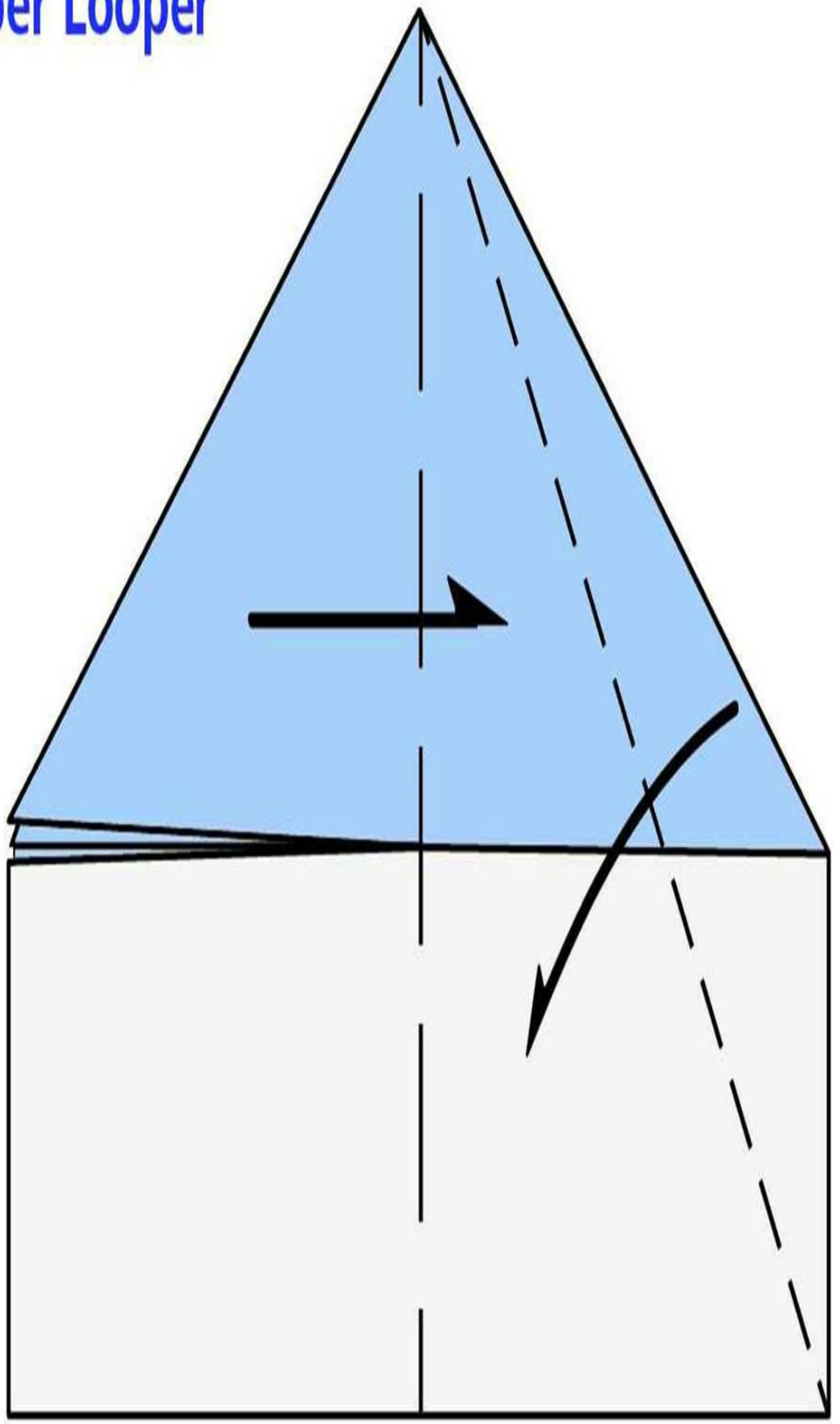


You can then collapse the sides together to make the new fold.

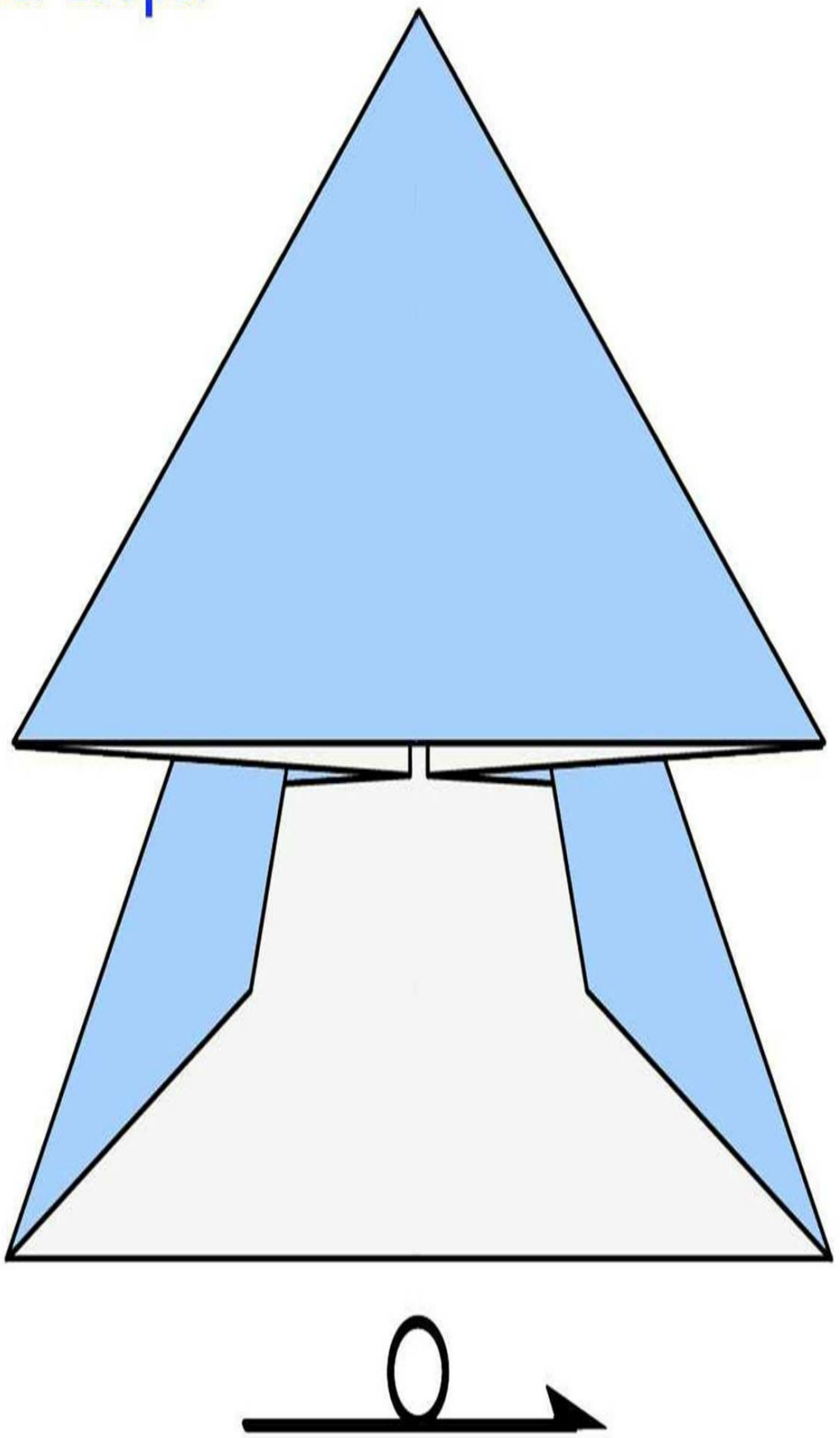
4 Super Looper



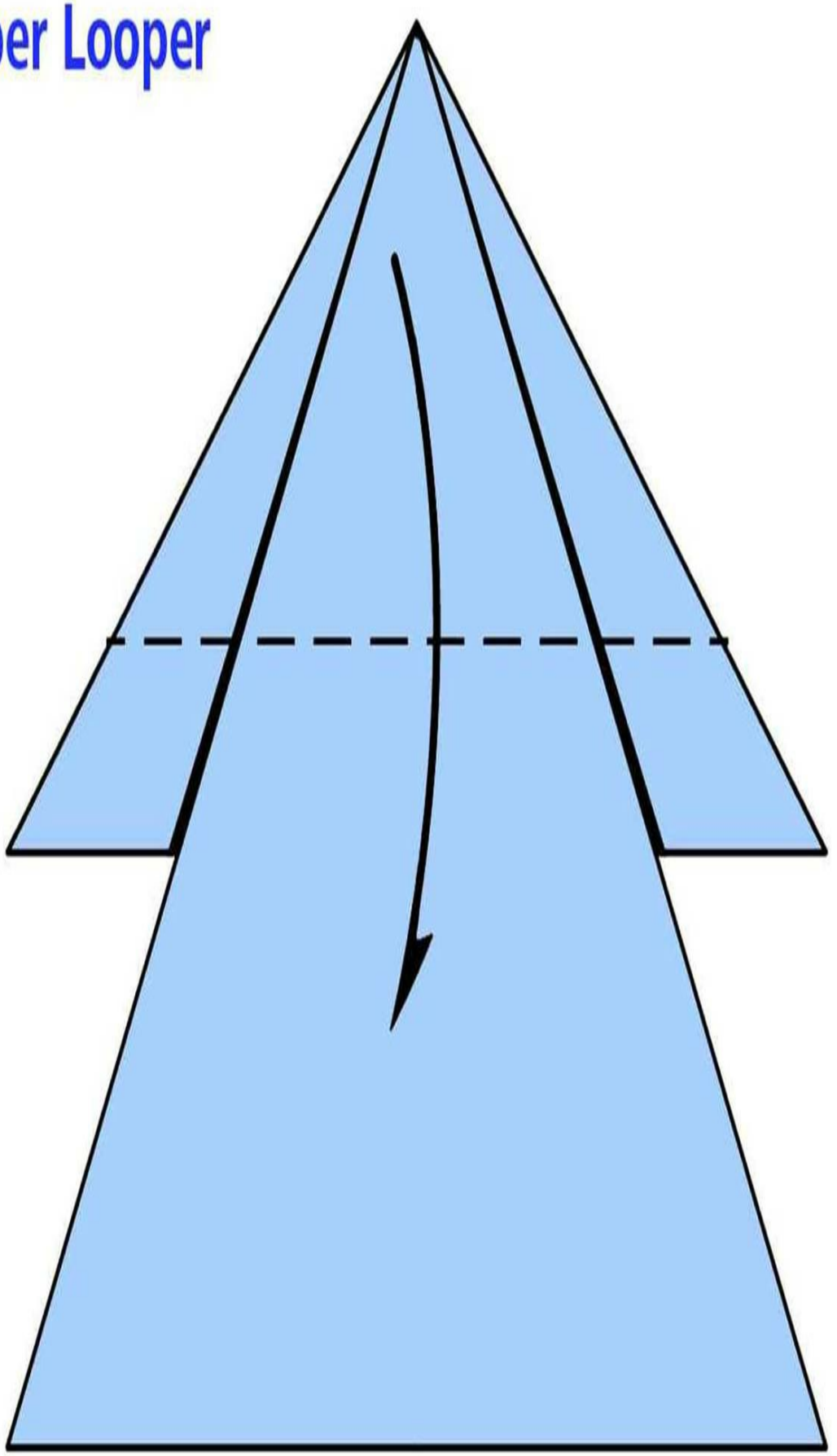
5 Super Looper



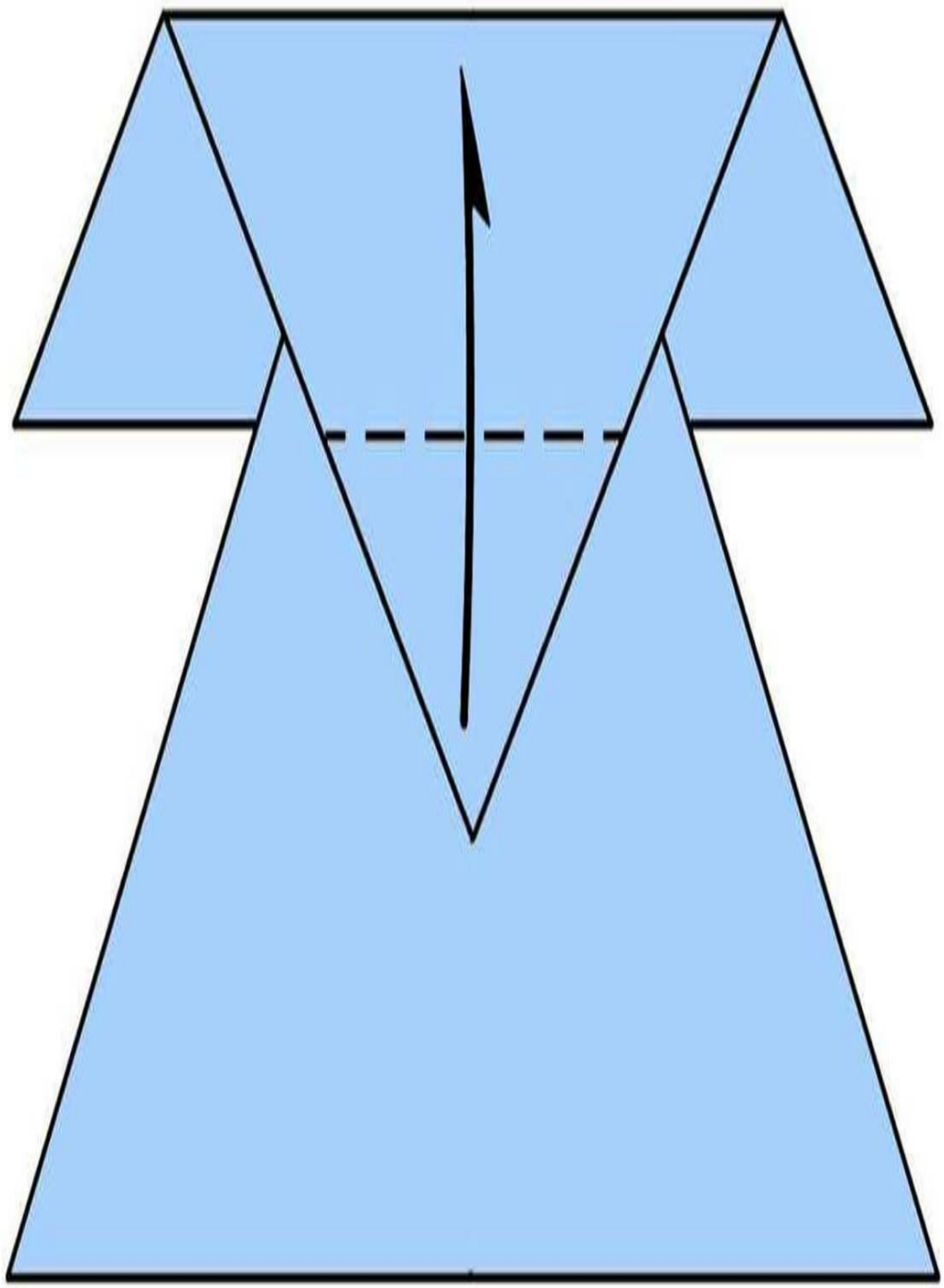
6 Super Looper



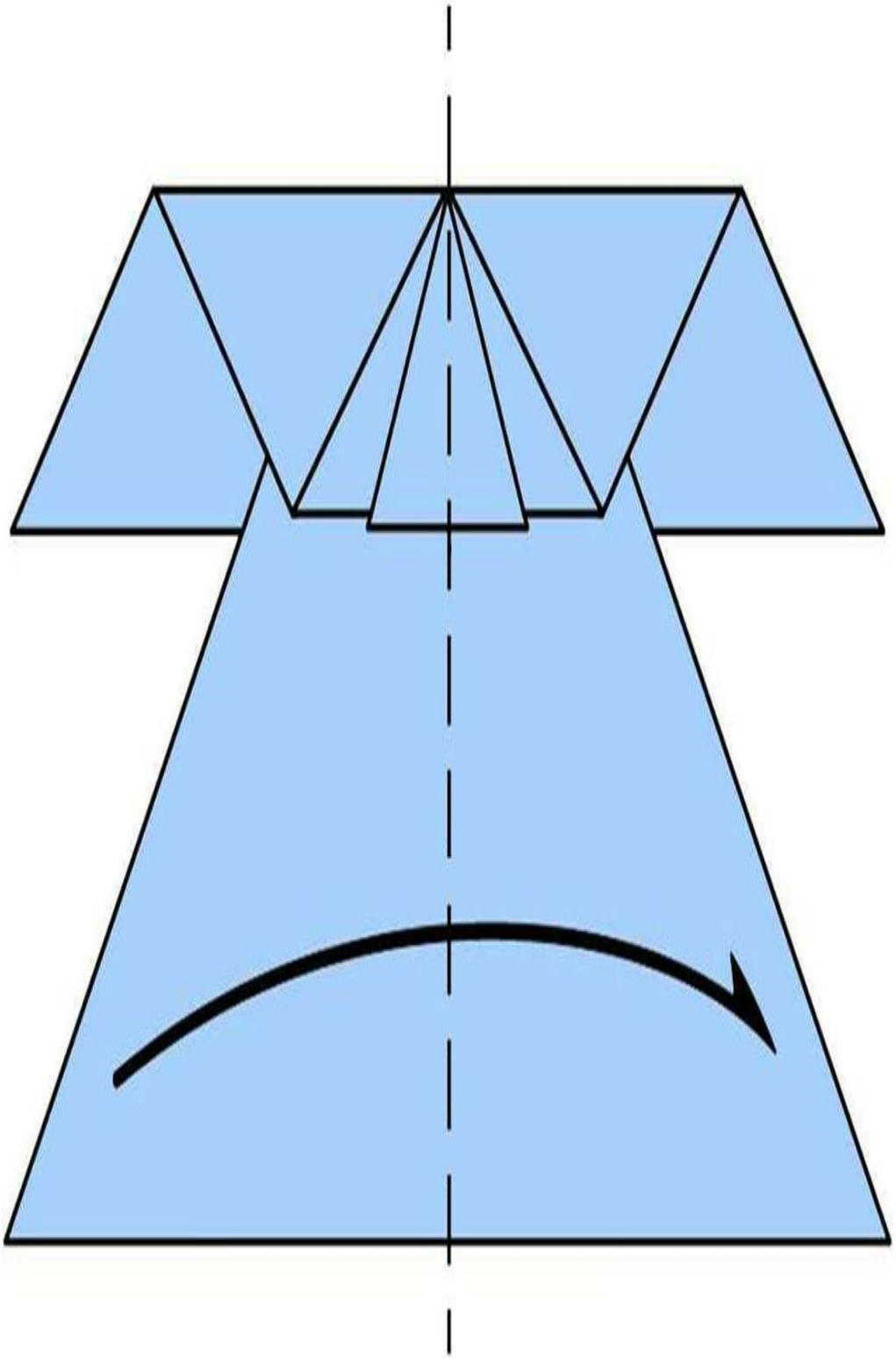
7 Super Looper



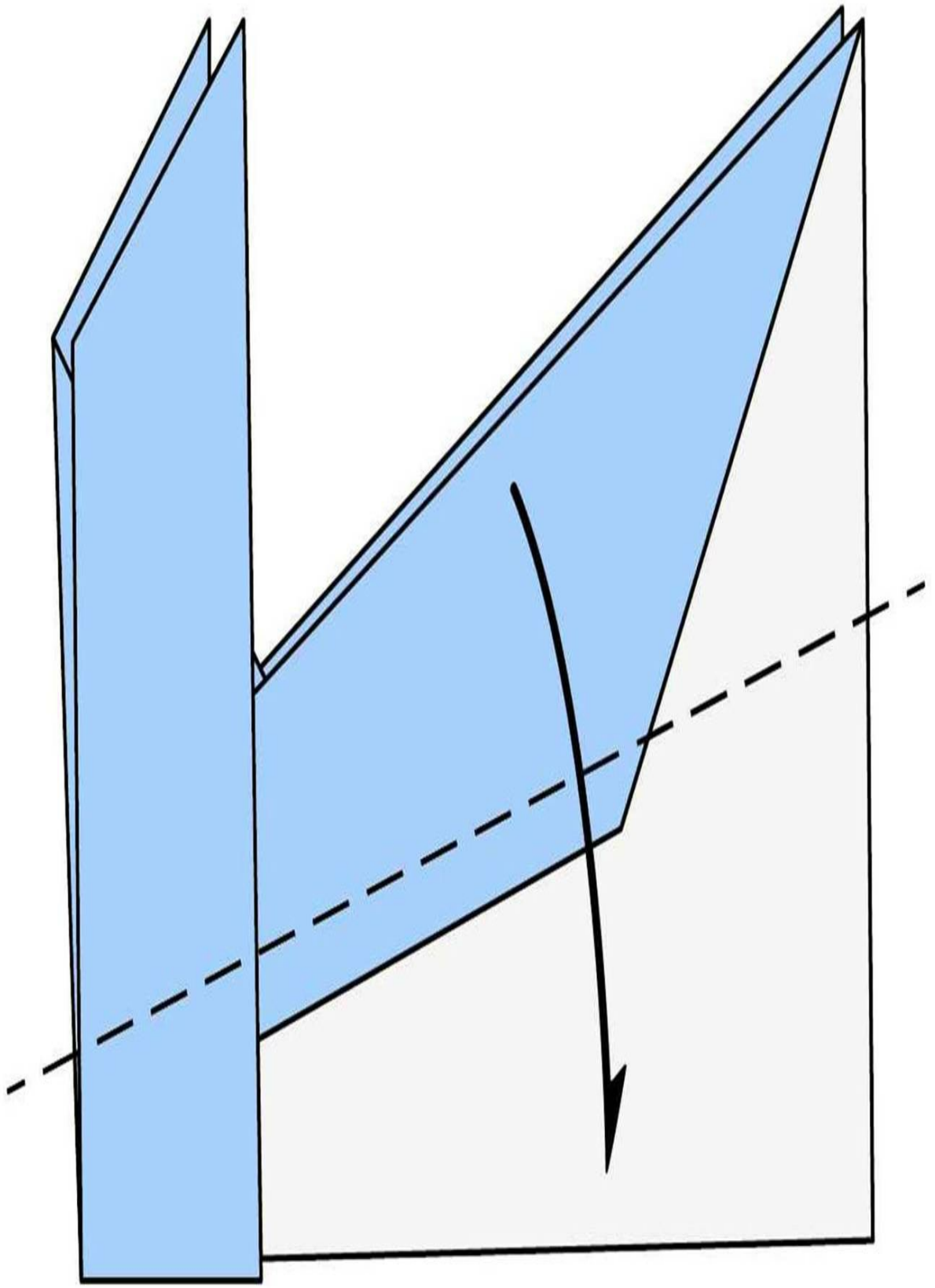
8 Super Looper



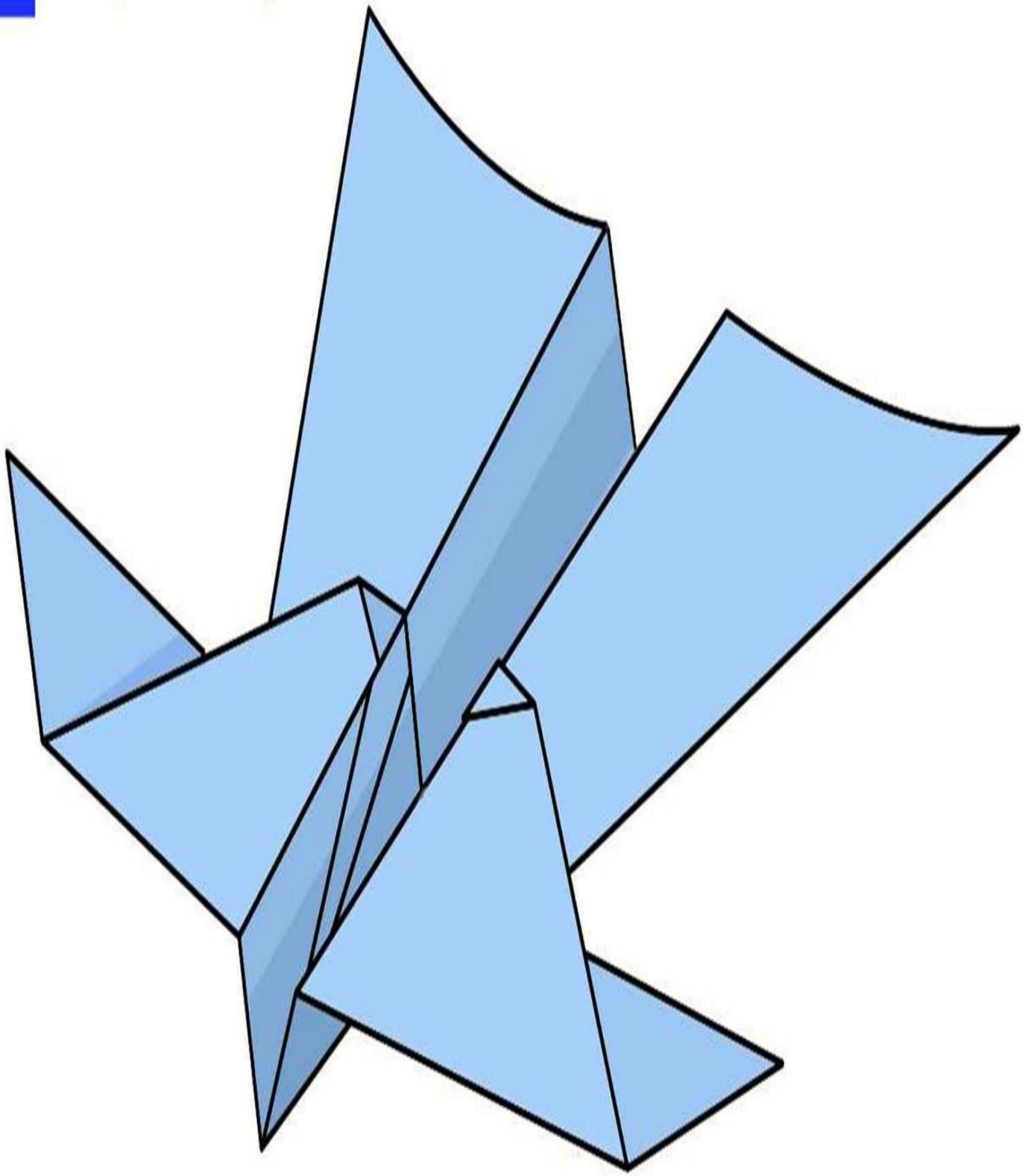
9 Super Looper



10 Super Looper



11 Super Looper



The completed Super Looper; throw upwards with force and it will do a massive loop. If thrown at the oncoming wind, it will be picked up and carried away. Adjust the amount of tail curl (more trailing edge upward curl for indoors, meaning a smaller diameter loop).

There is a video on how to fold and throw this plane on Dwight's YouTube channel, **Paper Plane Lab**.

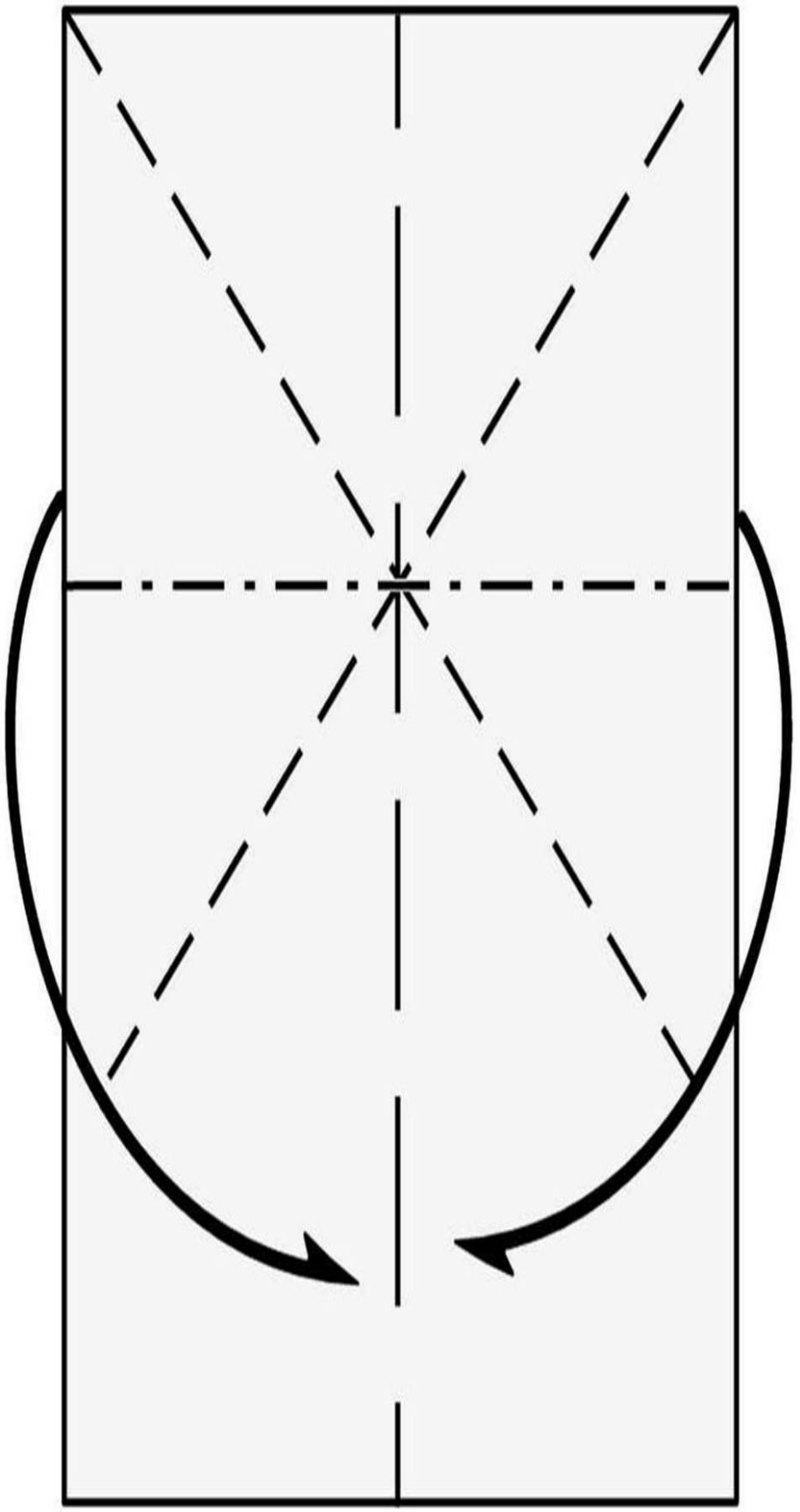
WWI Fokker Eindecker

This early monoplane (1915) is not only a novelty, but flyable! If the lesson is Aviation History, show your appreciation by landing one of these on the teacher's desk.

It is recommended to cut an inch off the length of the paper for a longer aspect ratio. While the model flies well using A4 or Letter paper, a longer fuselage will provide better stability.

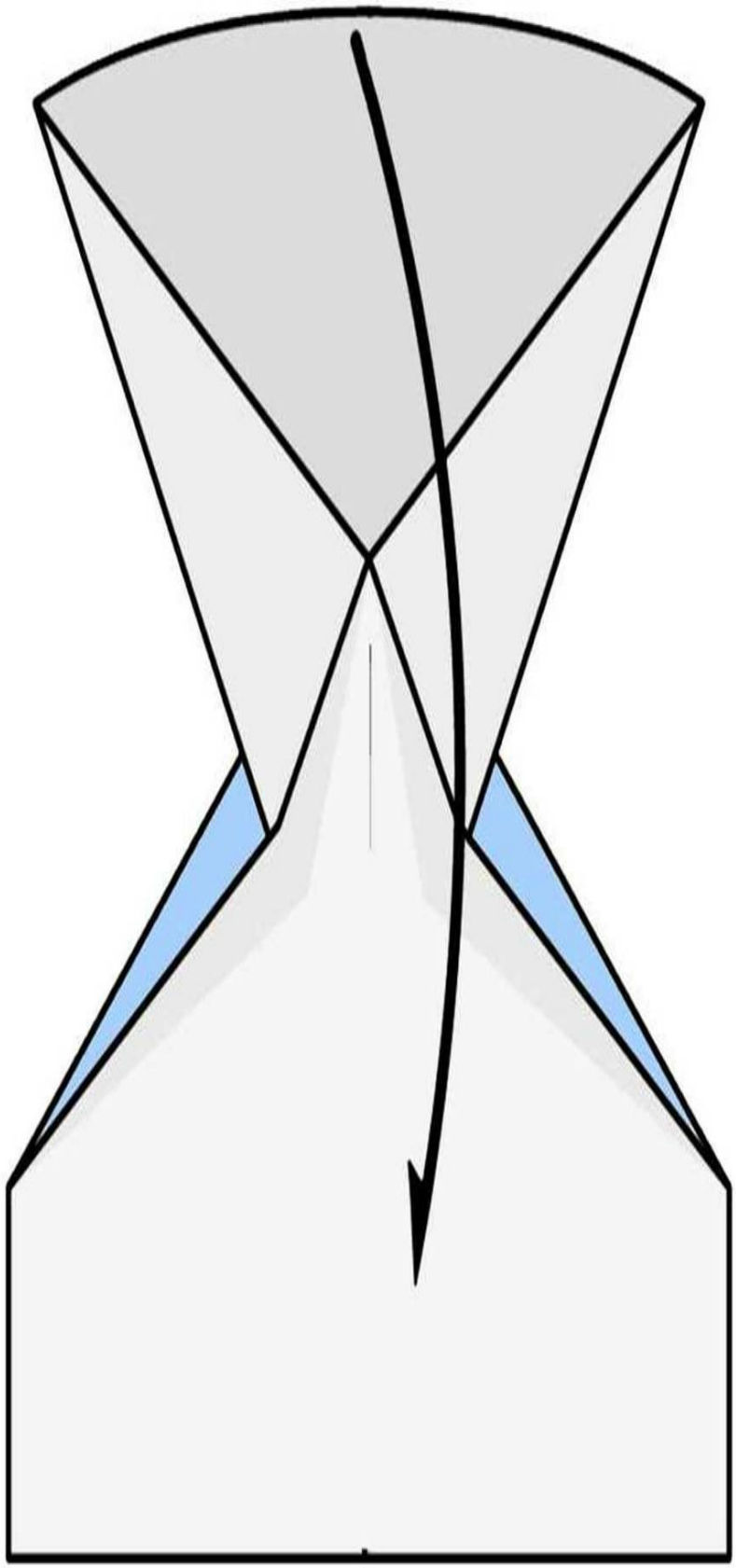
This model uses the same base fold as the Super Looper.

1 WWI Fokker Eindecker

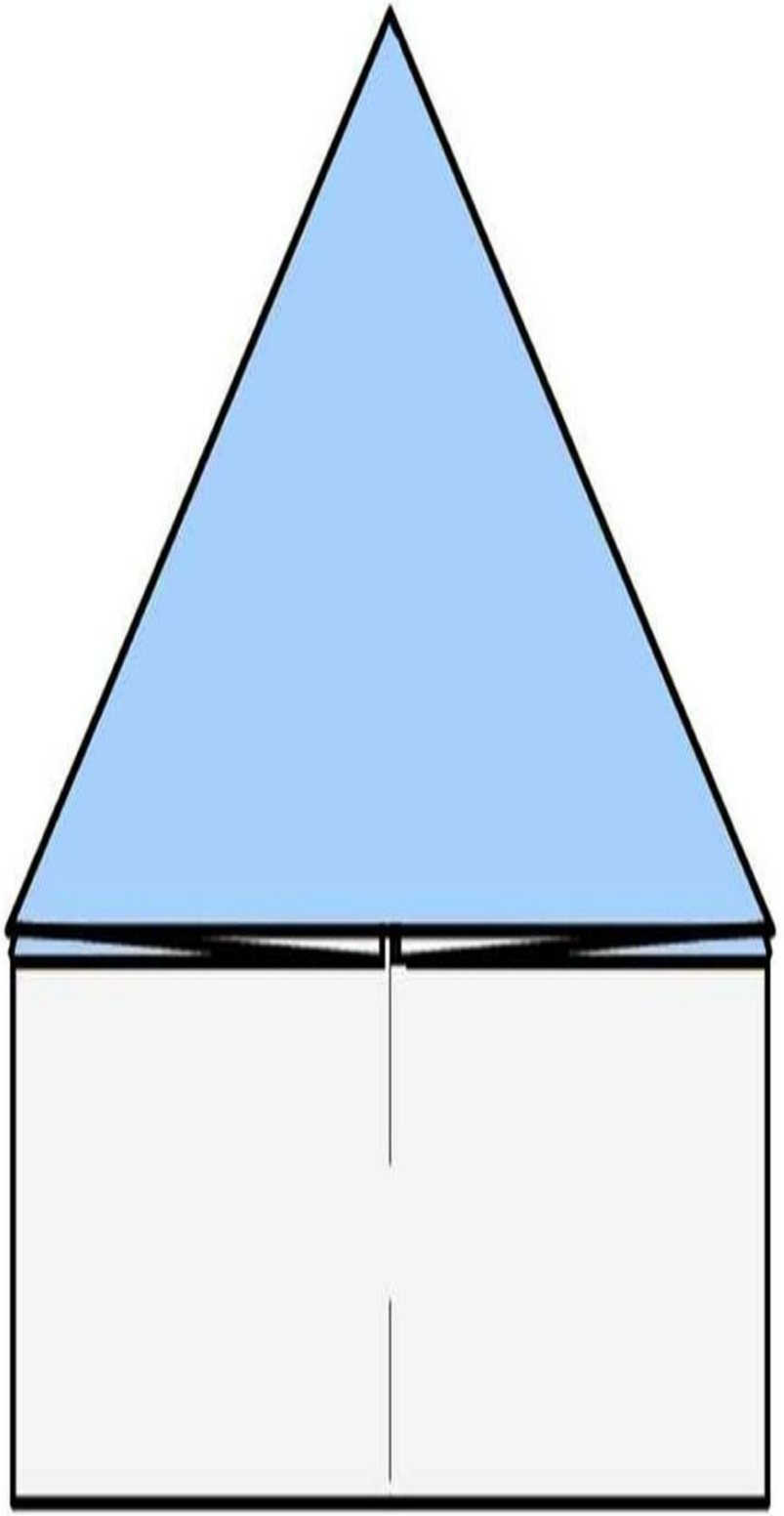


In Step 1, 2 and 3, crease and make a basic fold.

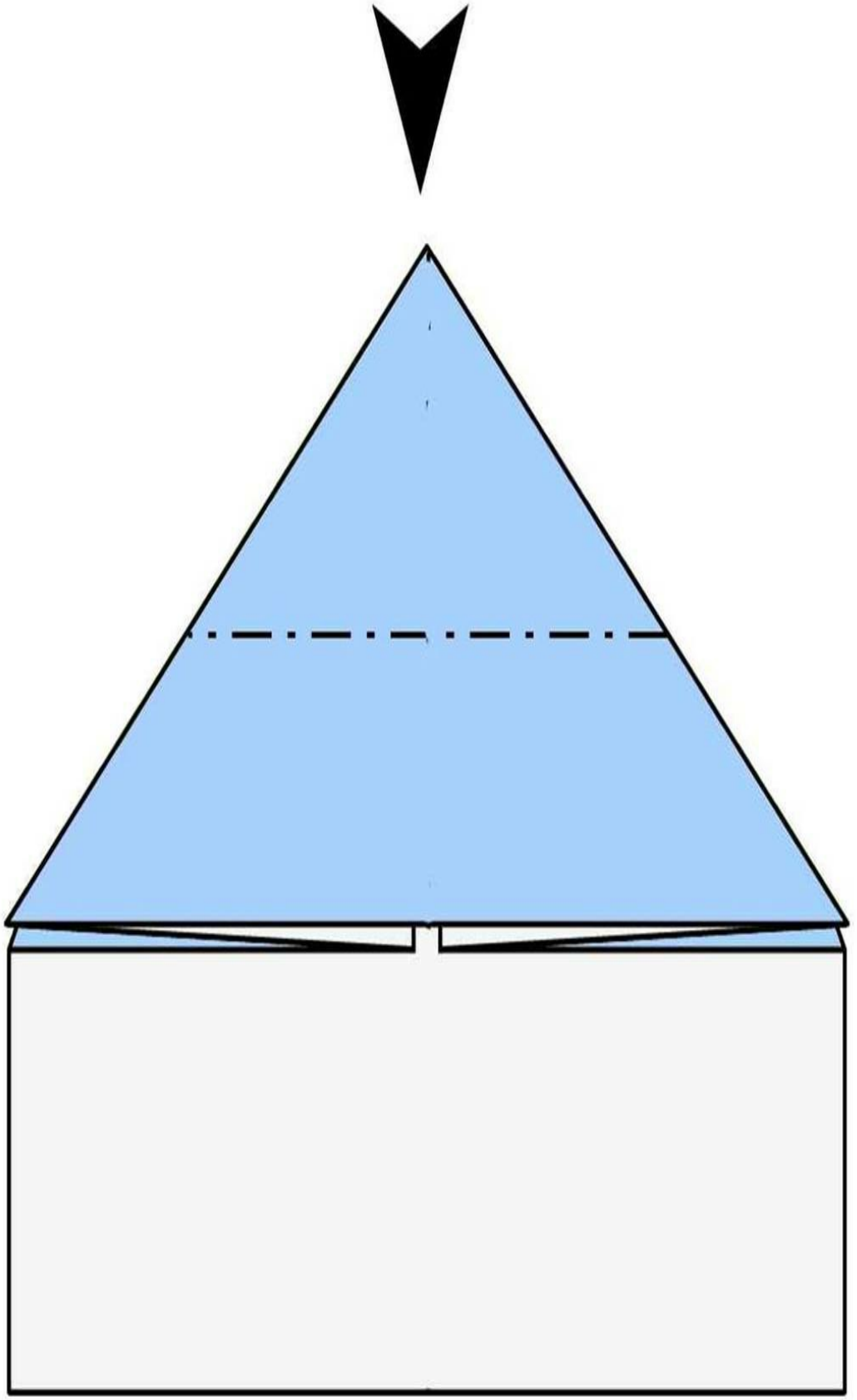
2 WWI Fokker Eindecker



3 WWI Fokker Eindecker

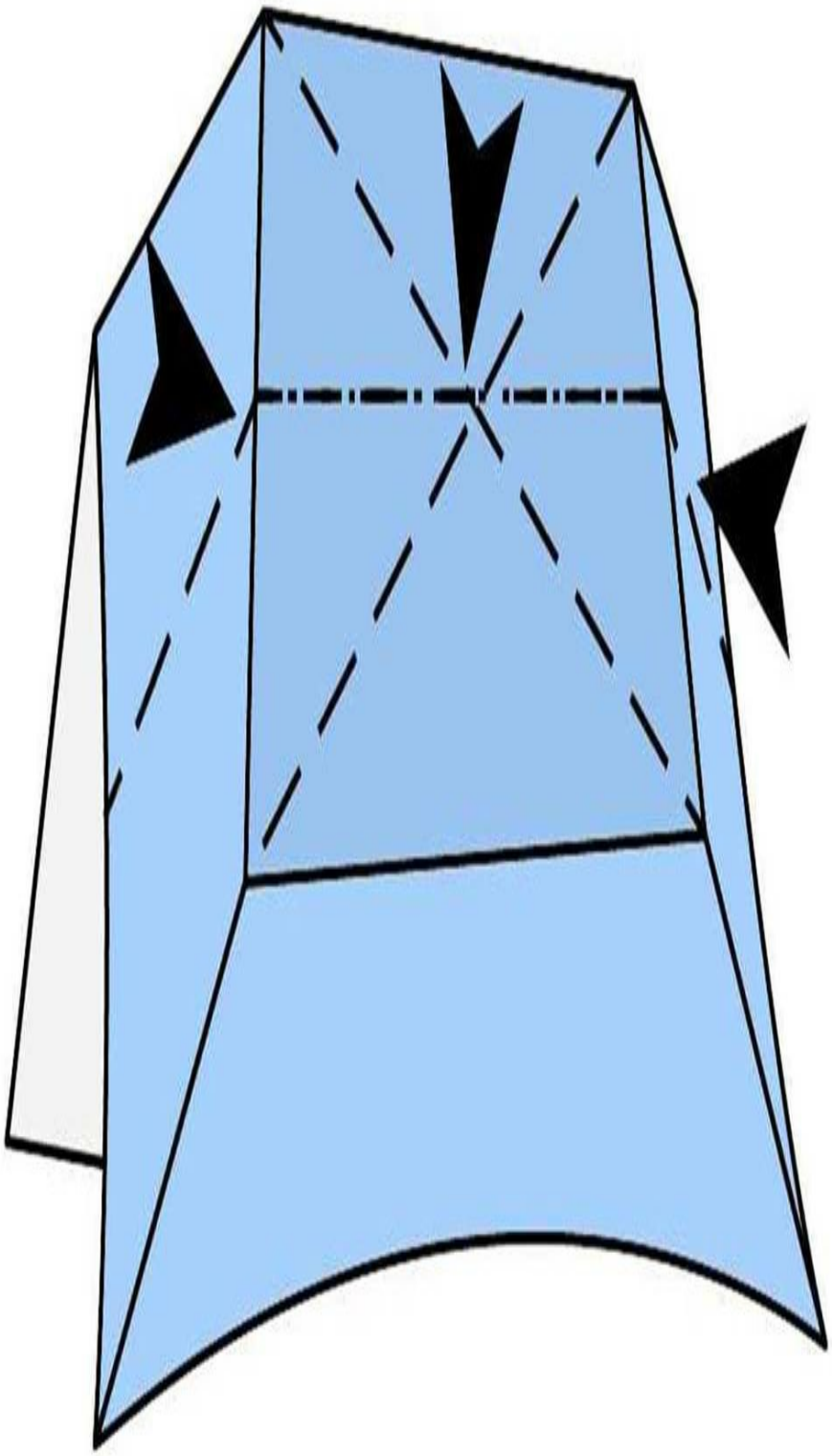


4 WWI Fokker Eindecker

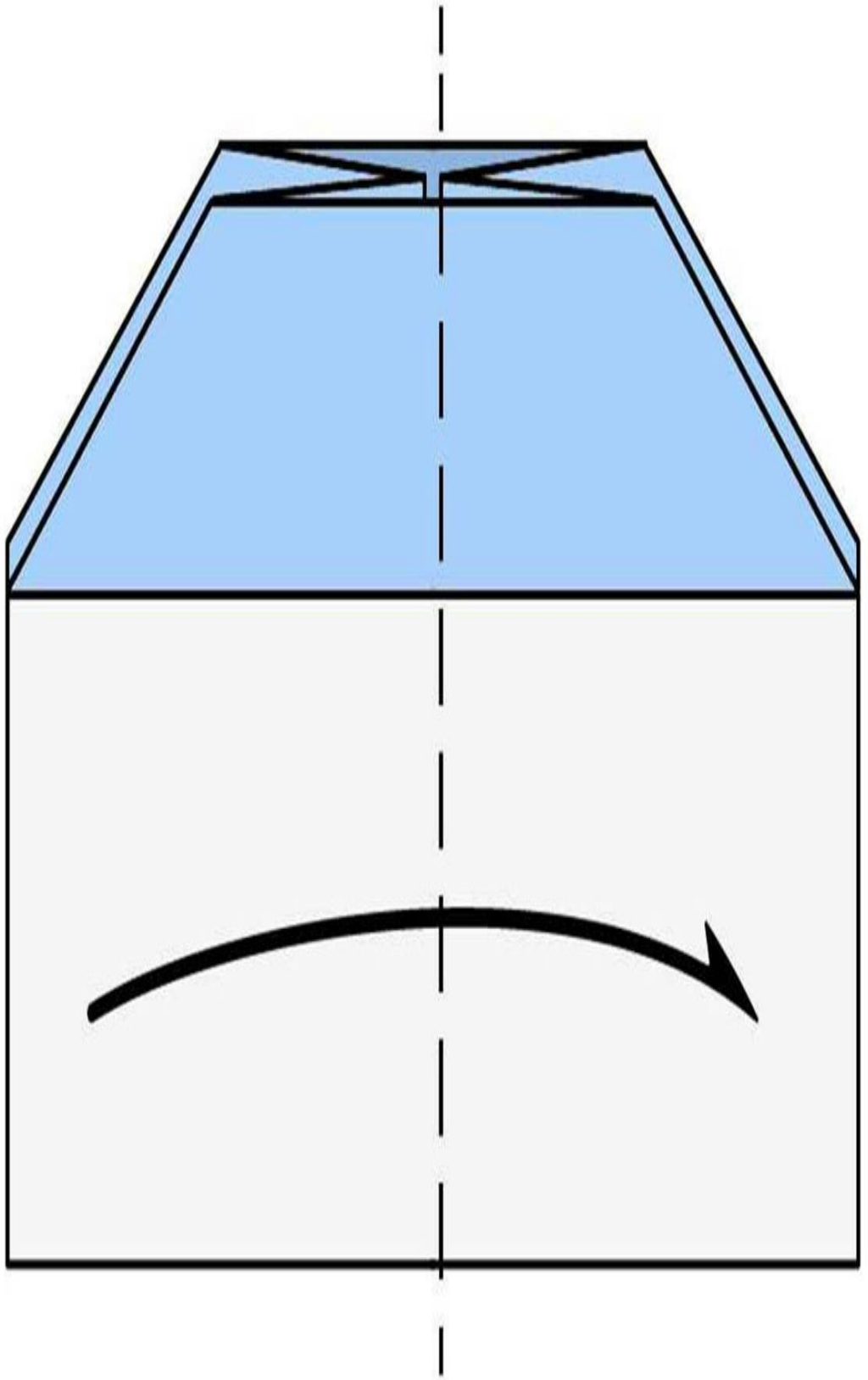


In Step 4, crease well on all sides and push the point inwards. This means opening out the fold and then collapsing it again as shown in Steps 5 and 6.

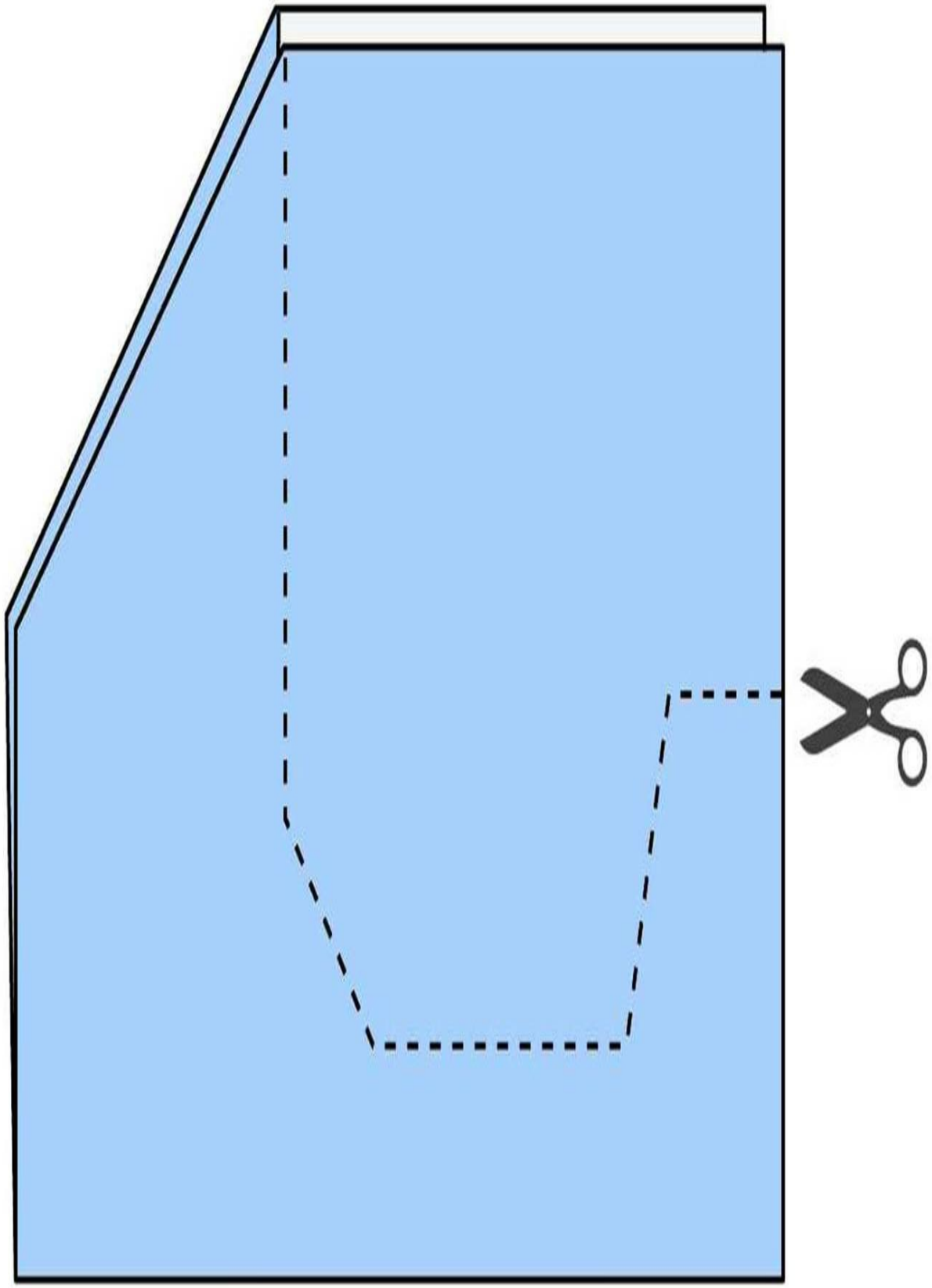
5 WWI Fokker Eindecker



6 WWI Fokker Eindecker

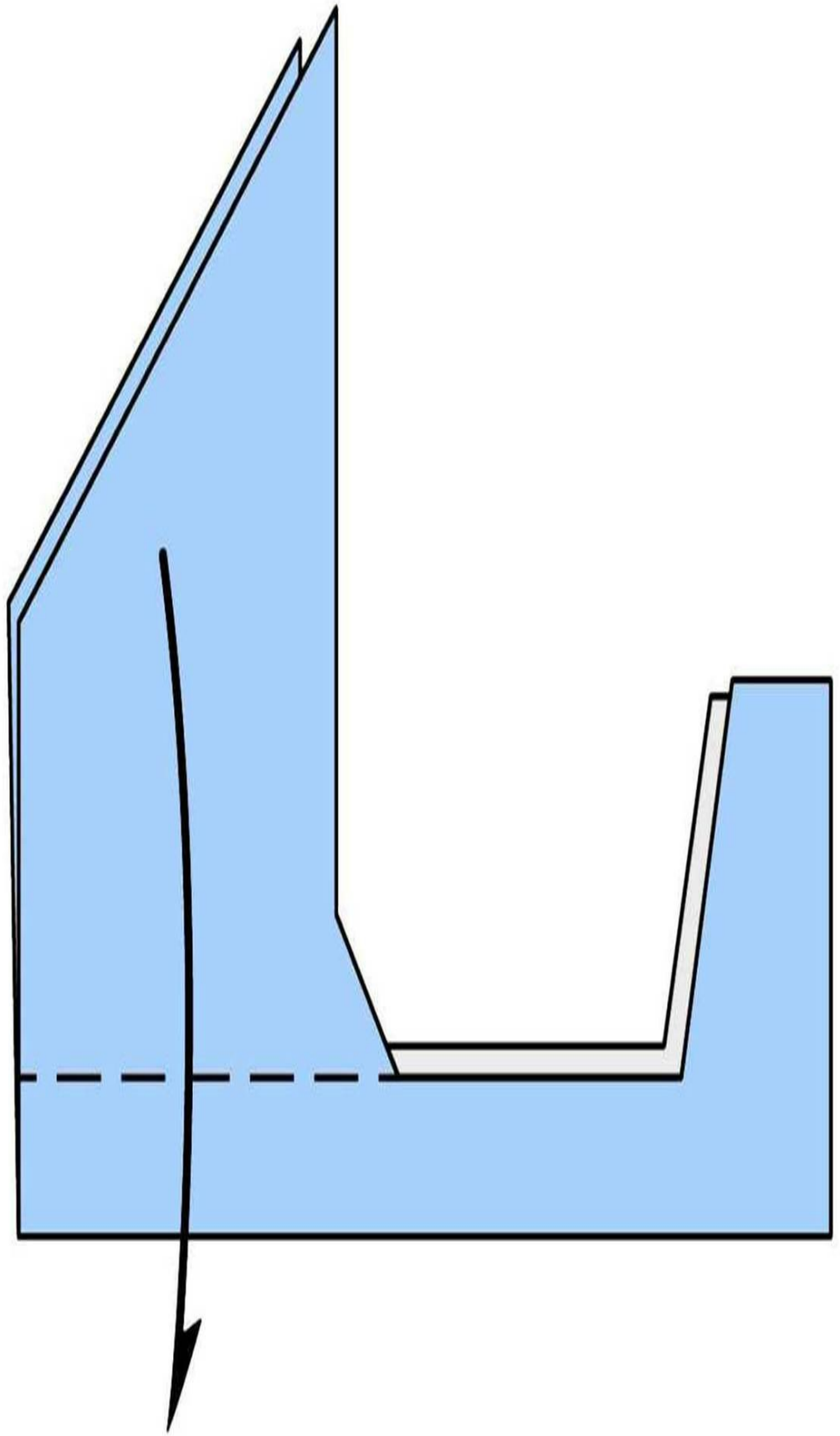


7 WWI Fokker Eindecker



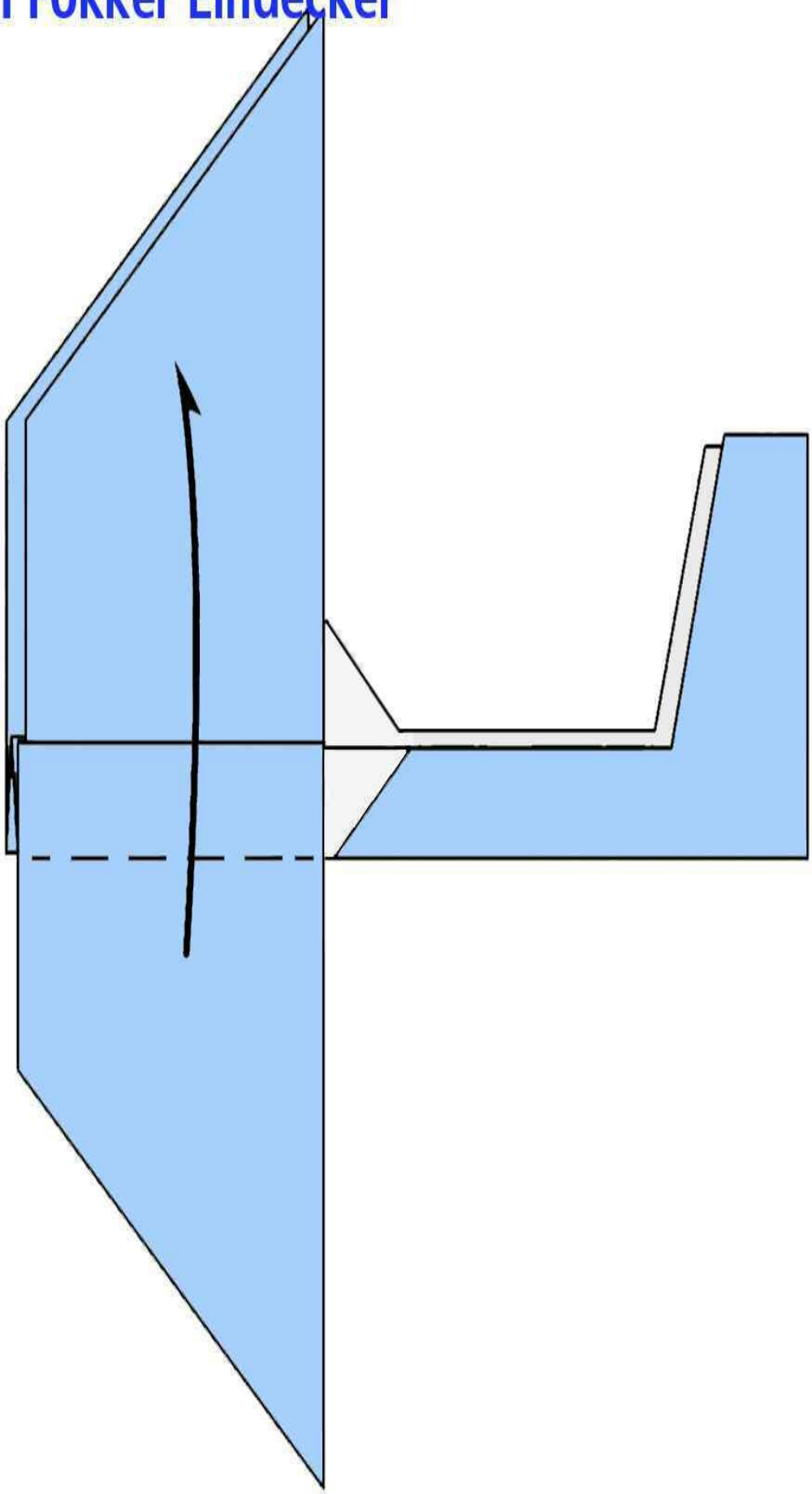
In Step 7, this area needs to be cut off.

8 WWI Fokker Eindecker

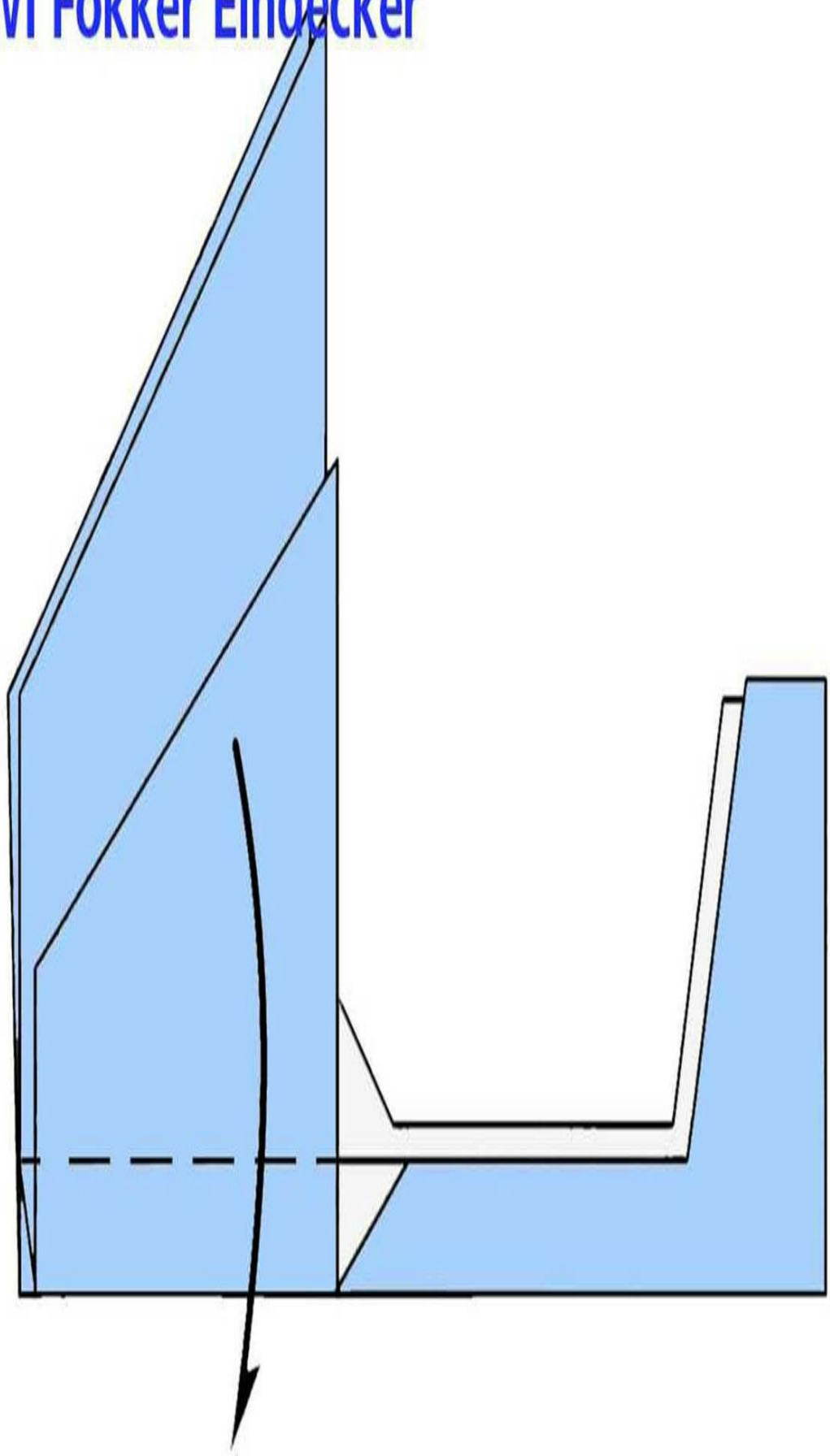


In the following steps we will make the undercarriage.

9 WWI Fokker Eindecker

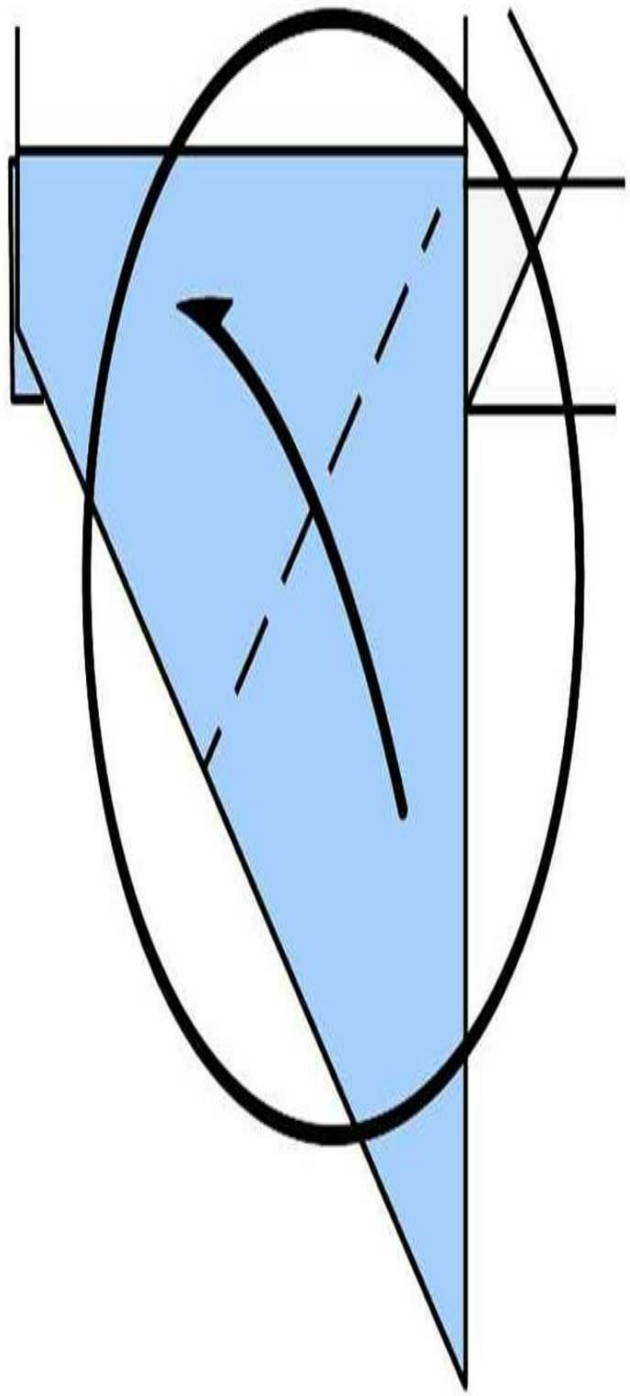


10 WWI Fokker Eindecker

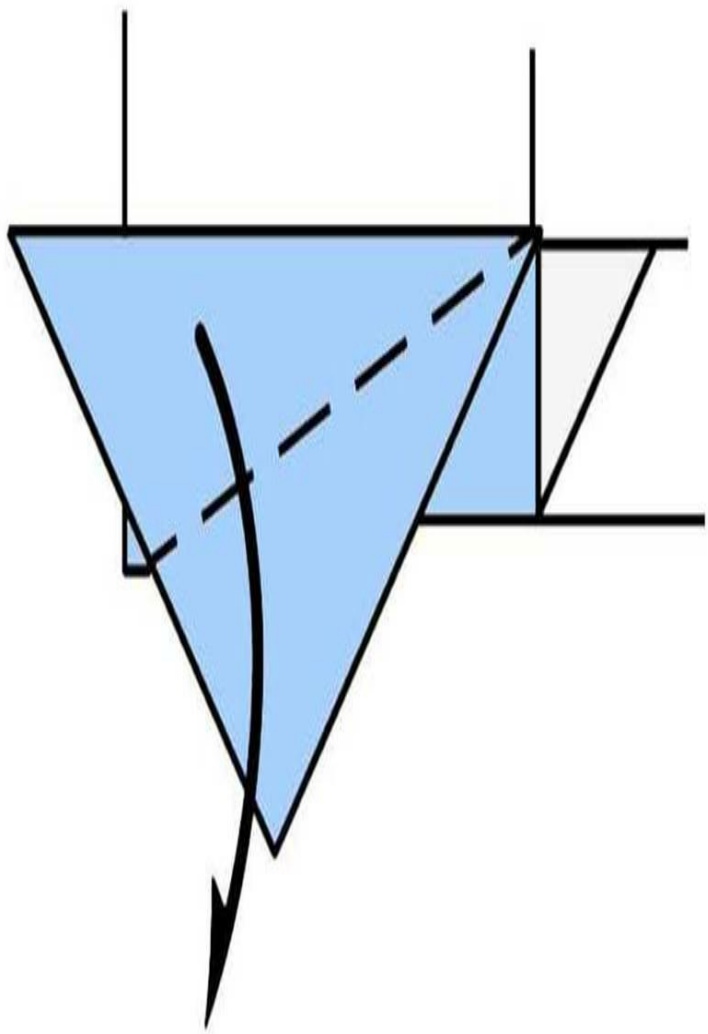


Steps 11 – 14 show a cutaway section detailing the landing gear assembly for one side. When done, repeat for the other side.

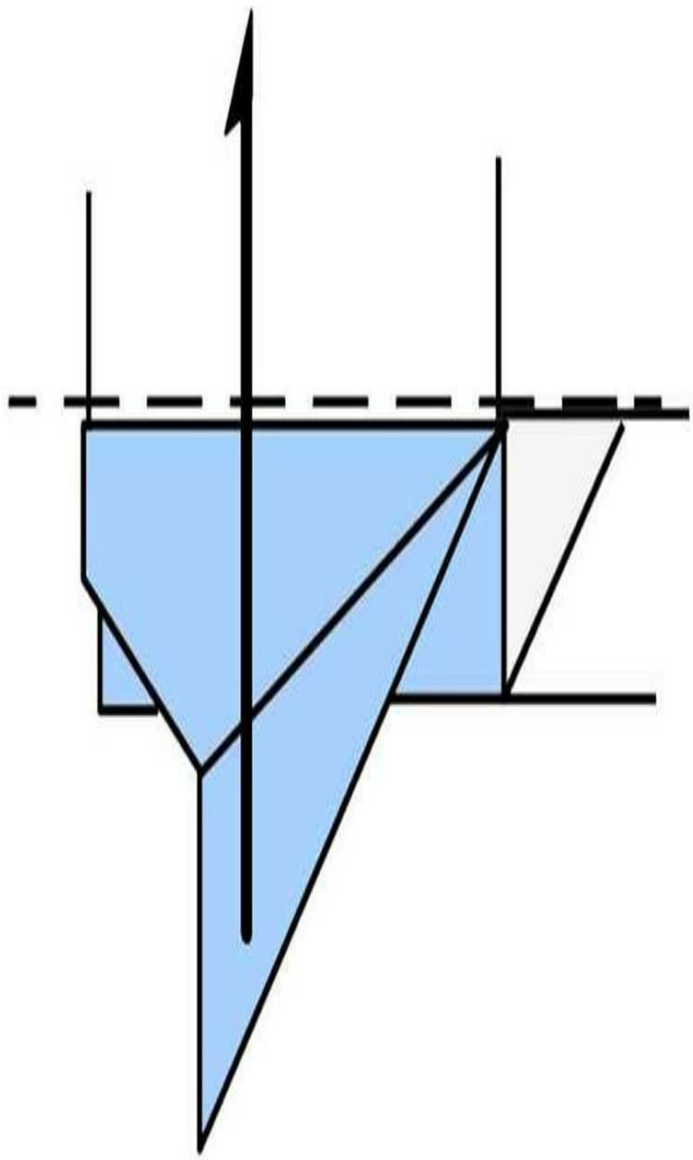
11 WWI Fokker Eindecker



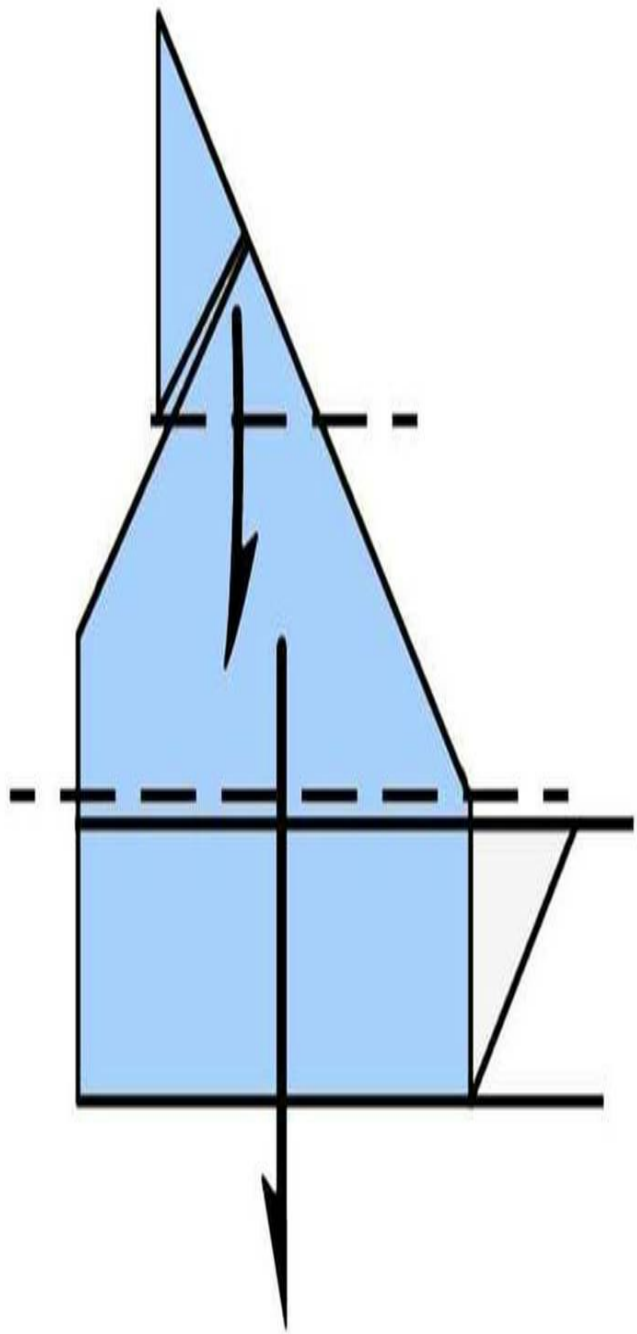
12 WWI Fokker Eindecker



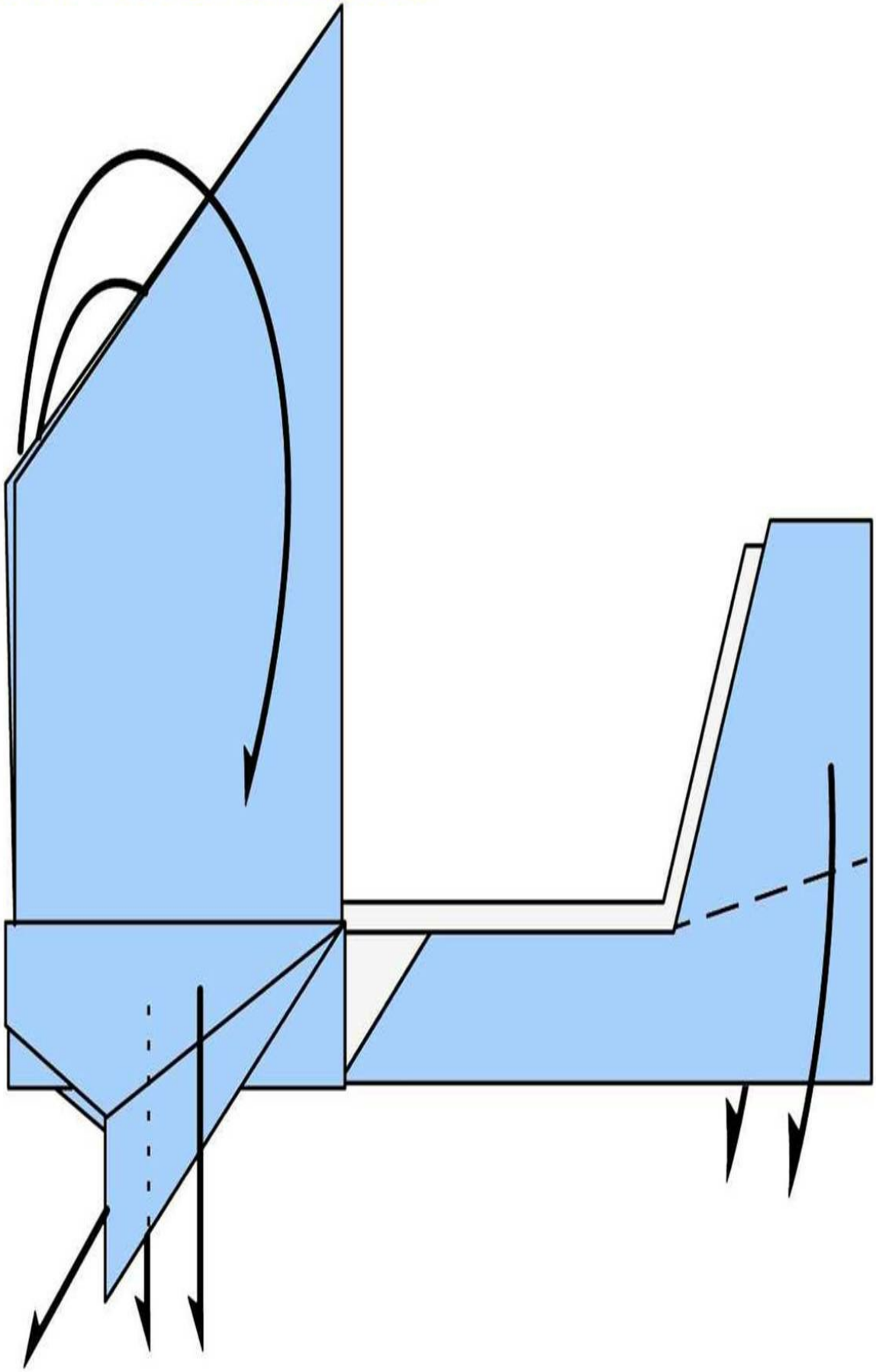
13 WWI Fokker Eindecker



14 WWI Fokker Eindecker

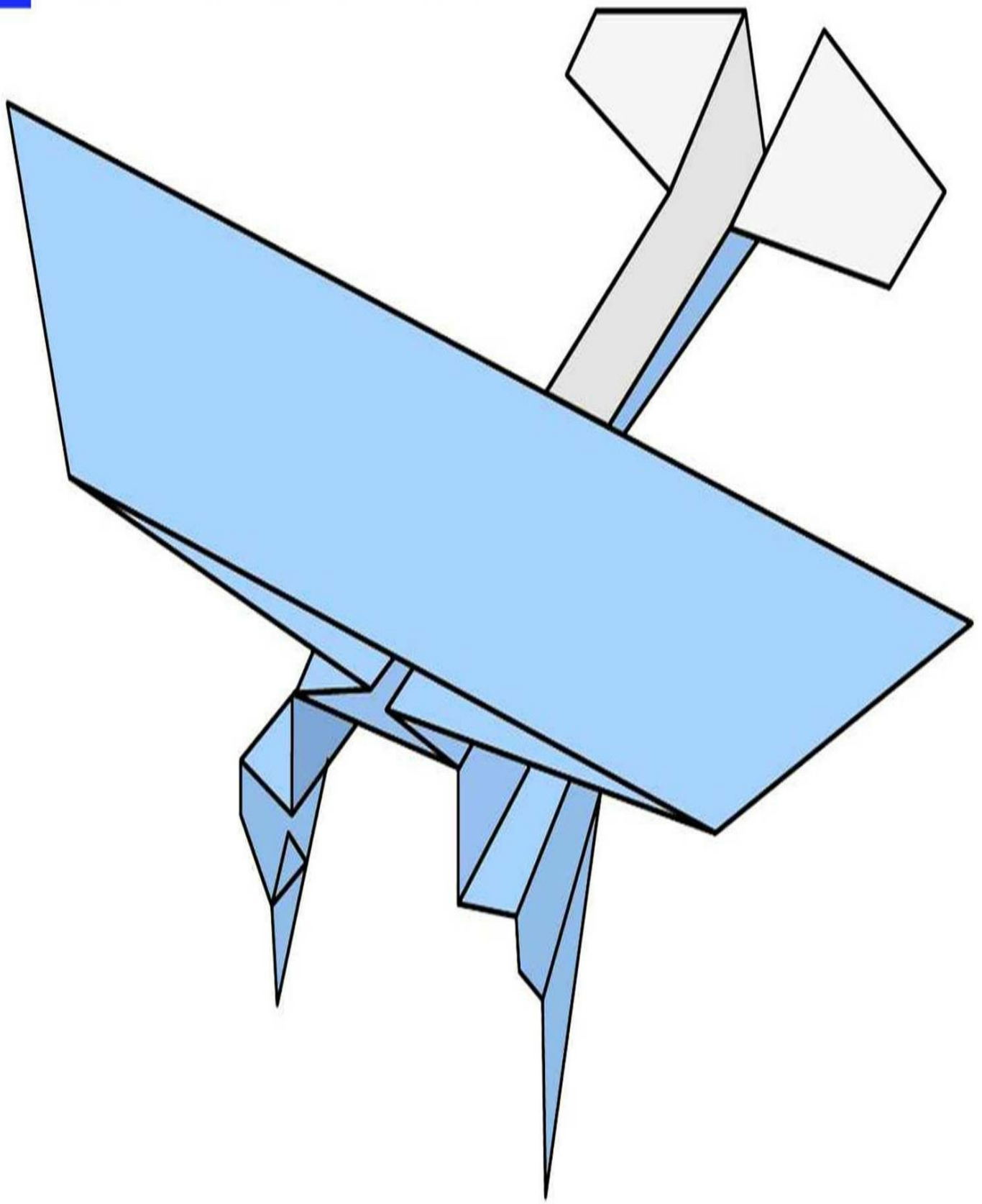


15 WWI Fokker Eindecker



In Step 15, bring the wings down, grasping each end at the tips and pulling gently to straighten the wingspan. The undercarriage is lowered to a position which supports the plane. Fold tail wings down and you are now ready to fly.

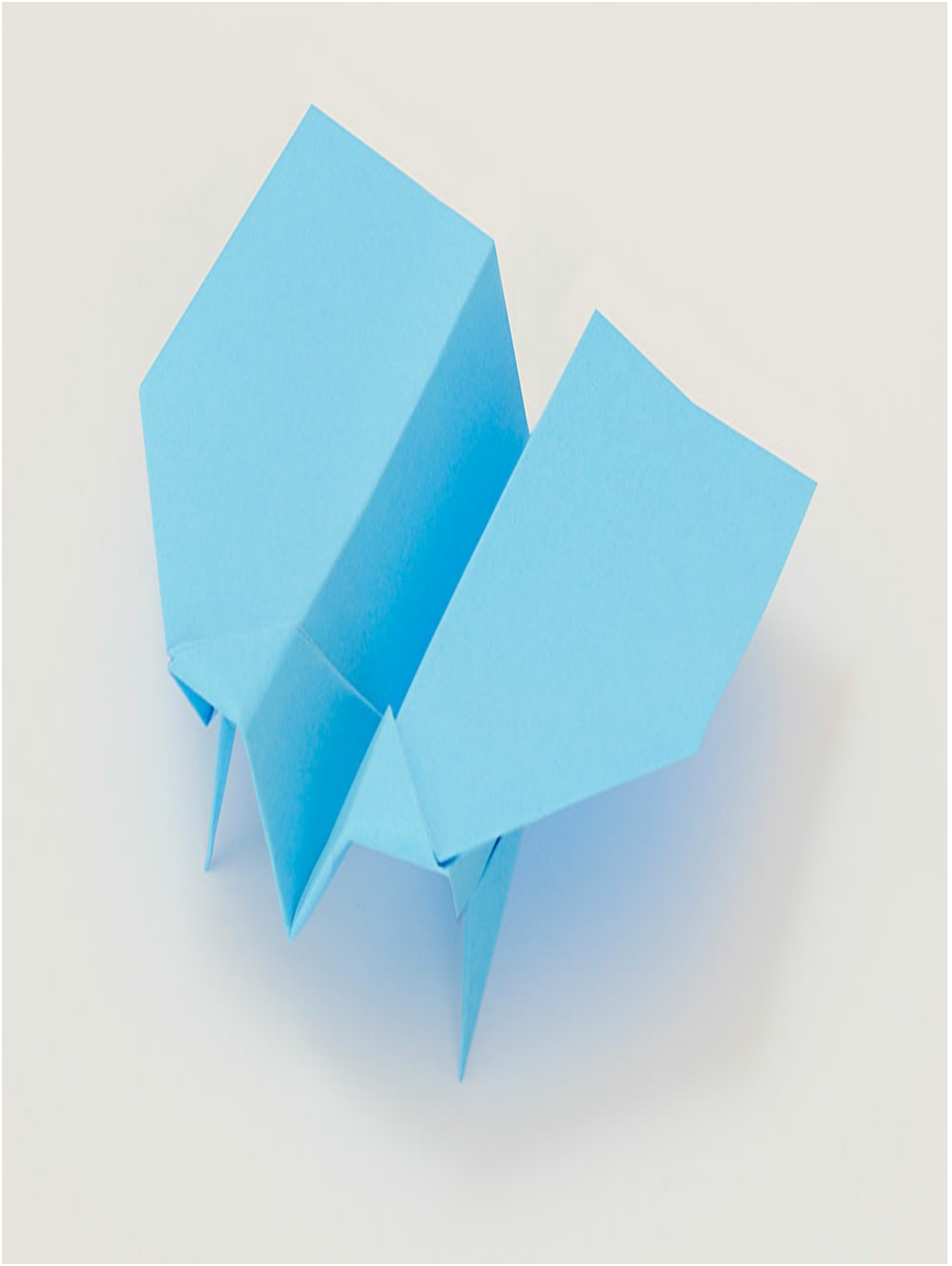
16 WWI Fokker Eindecker



This finished WWI craft is more of a gentle flier than the original which turned the British aircraft into ‘Fokker fodder’ during World War 1.

Place your index finger inside the fuselage at the tail section while grasping the underside of the fuselage with thumb and forefinger. With a slight downward movement, gently let go of your craft. It will glide to a soft landing.

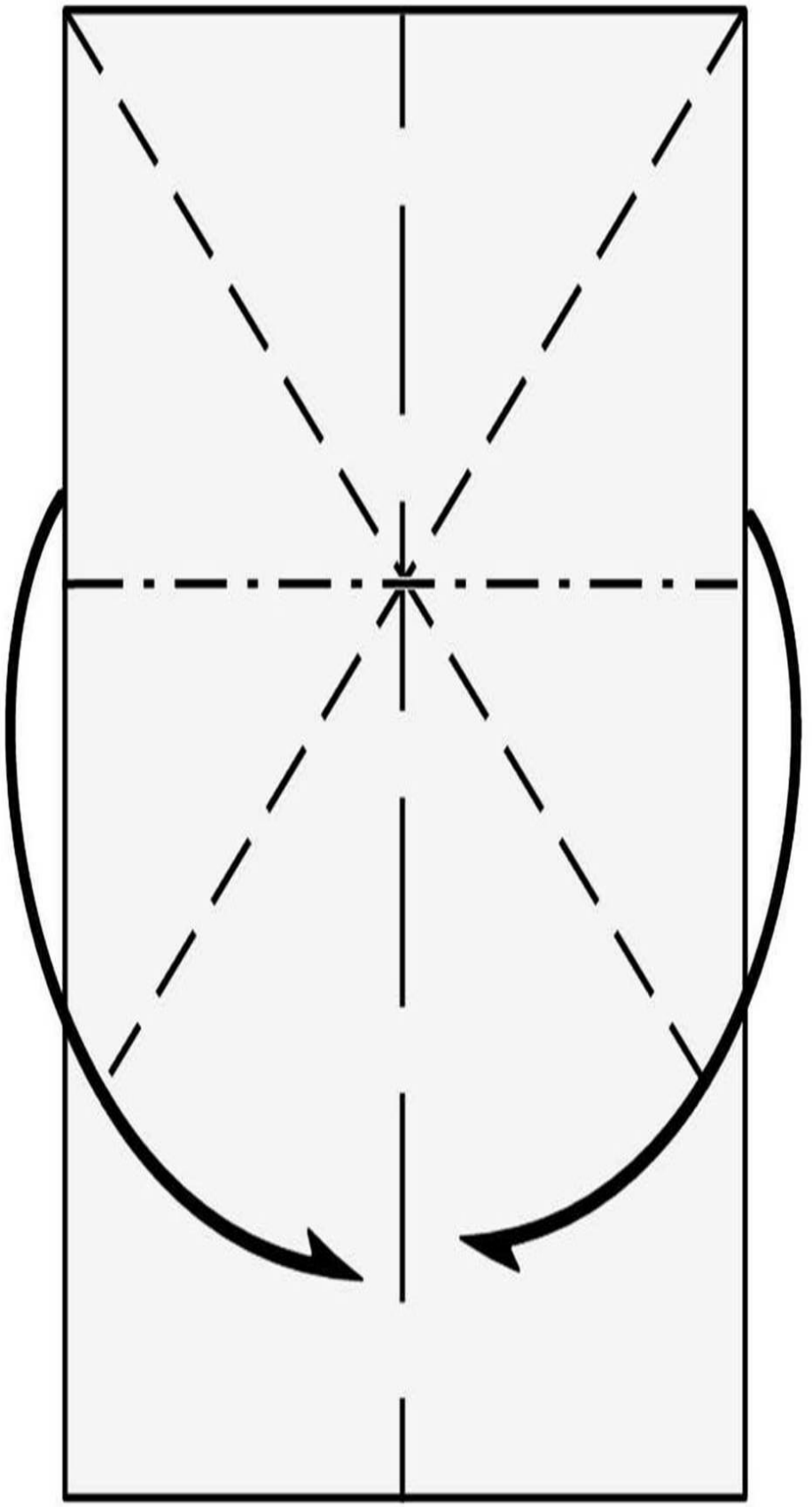
Glider with Landing Gear



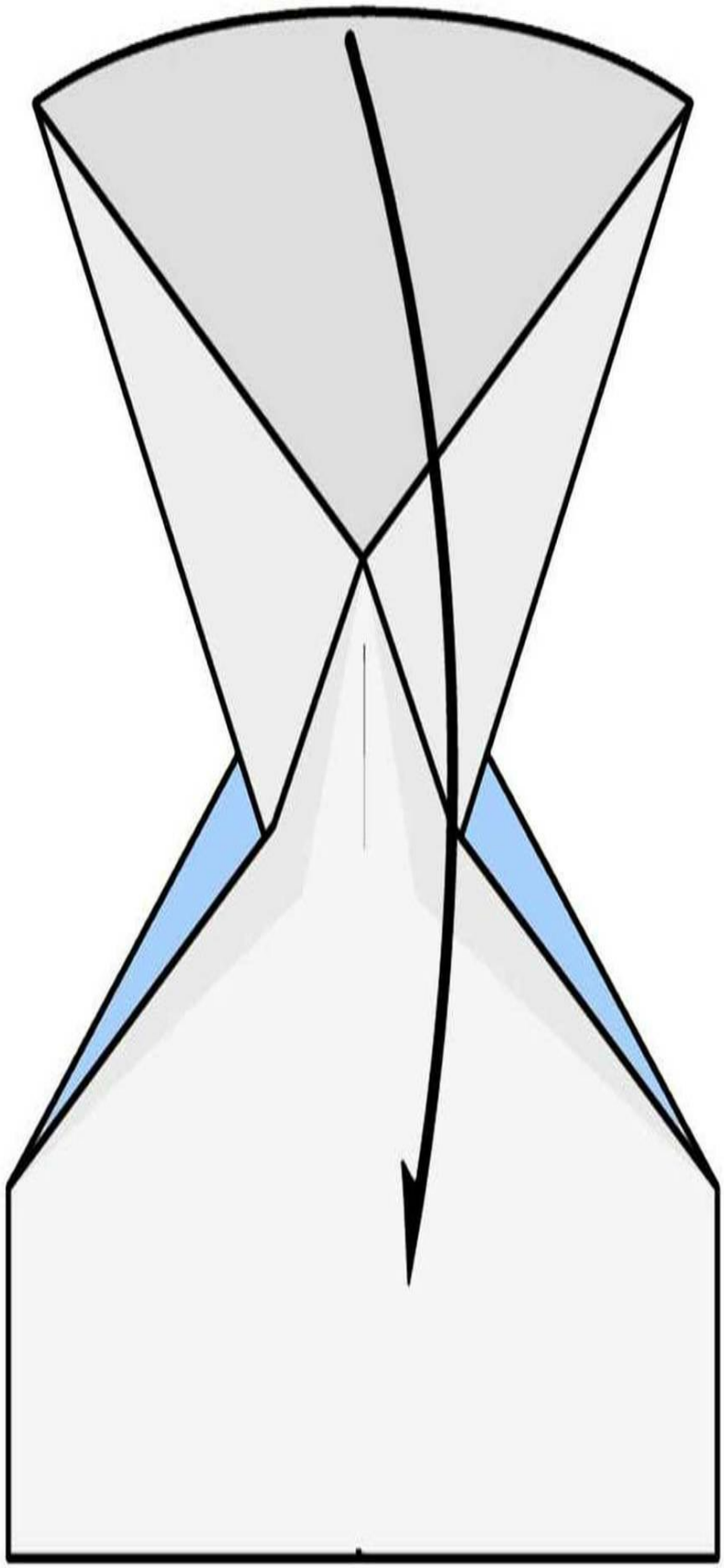
Lands well on a desk! The undercarriage also provides stability. The undercarriage is more refined than the WWI aircraft and can be used in that plane also.

The craft uses the same basic fold as the Super Looper, and the base fold steps are repeated for your convenience.

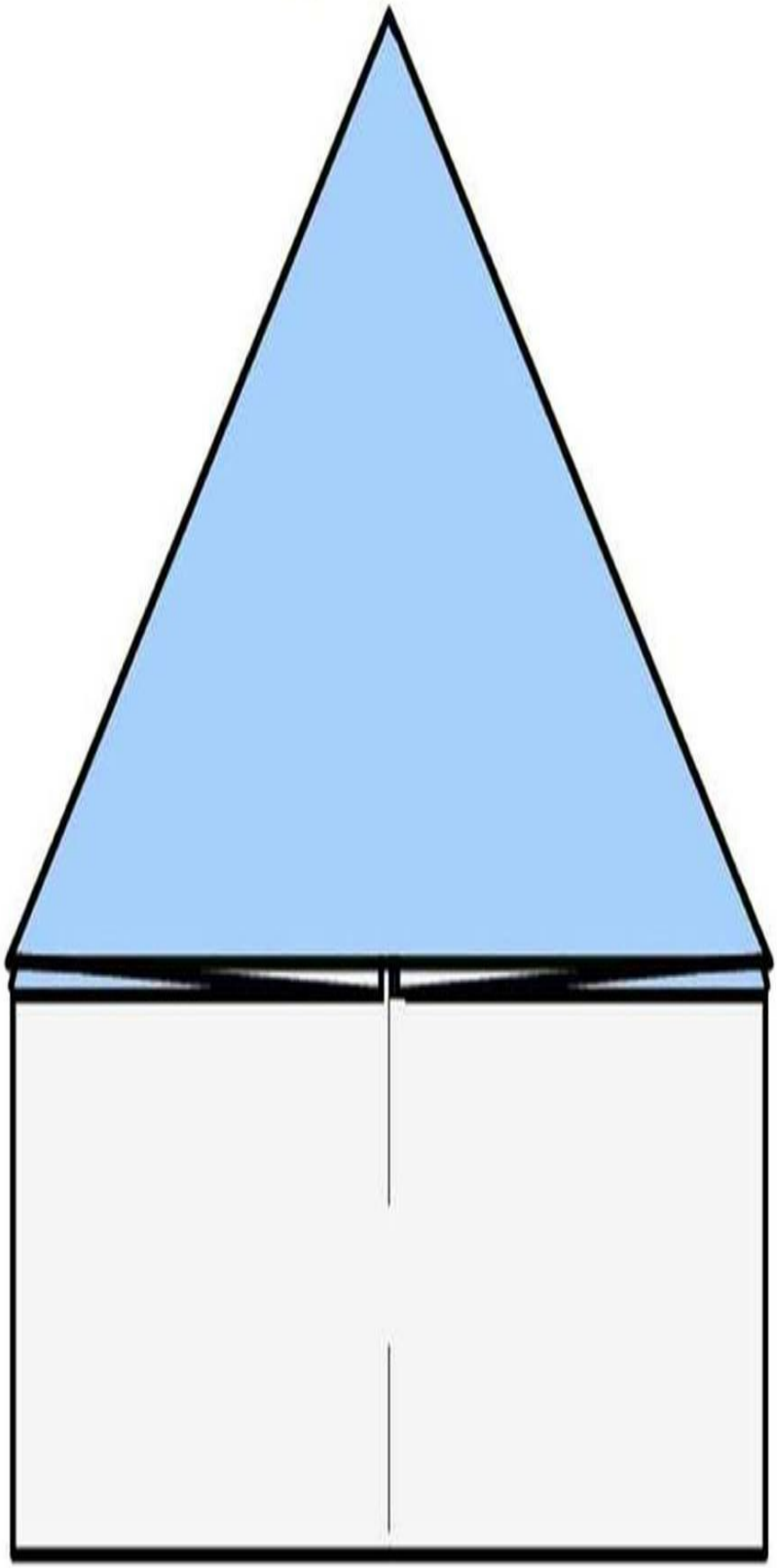
1 Glider with Landing Gear



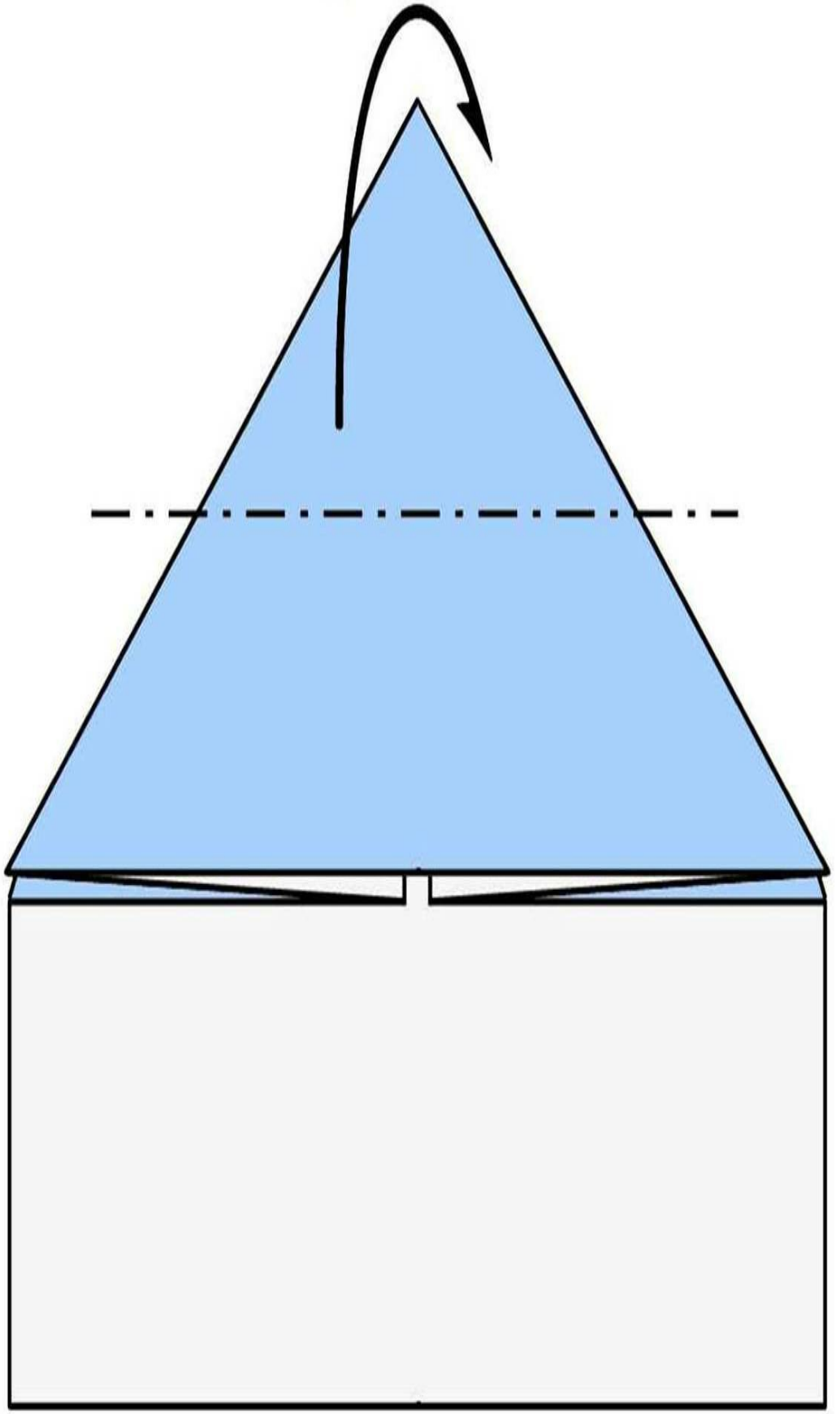
2 Glider with Landing Gear



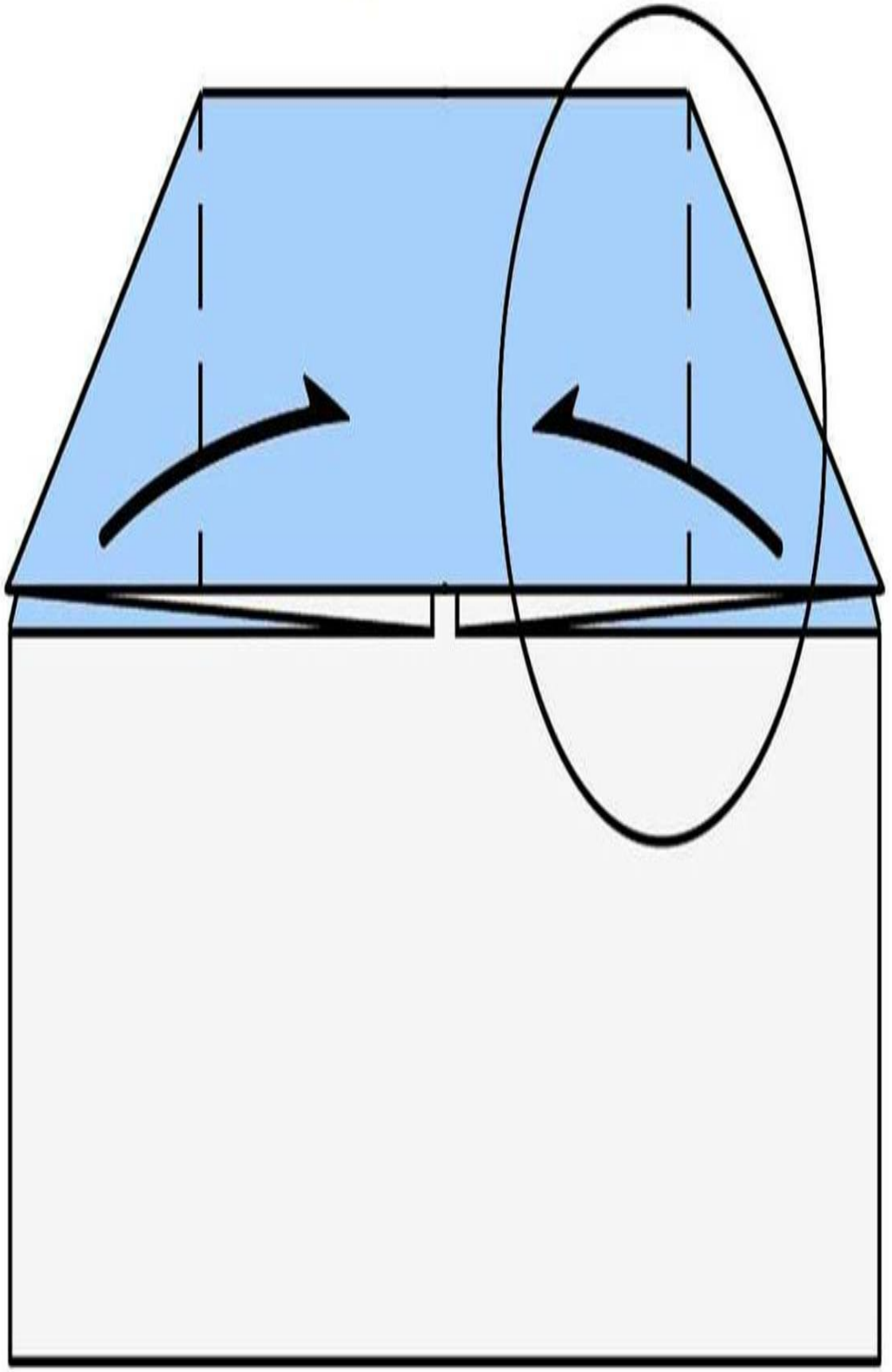
3 Glider with Landing Gear



4 Glider with Landing Gear

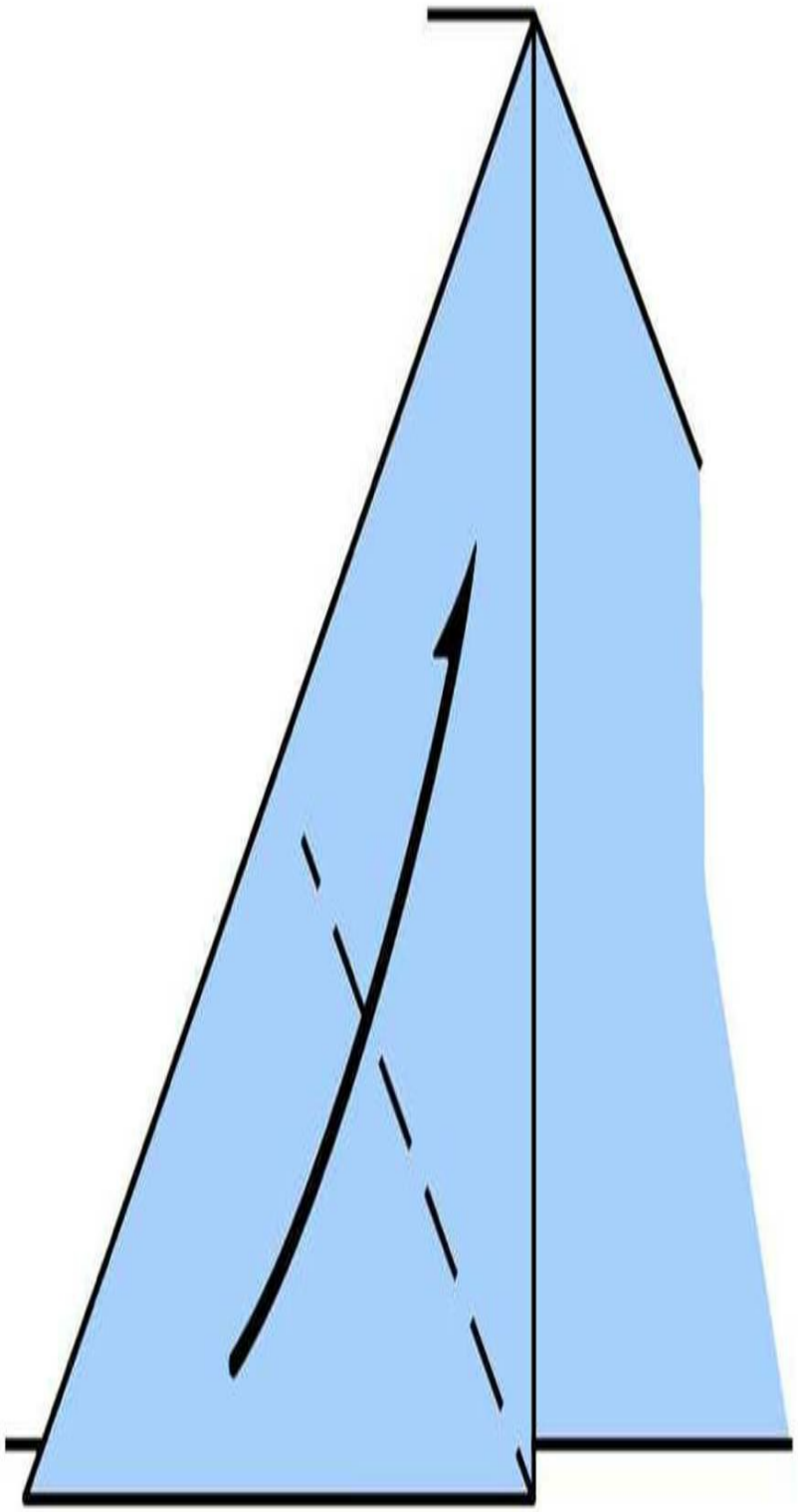


5 Glider with Landing Gear

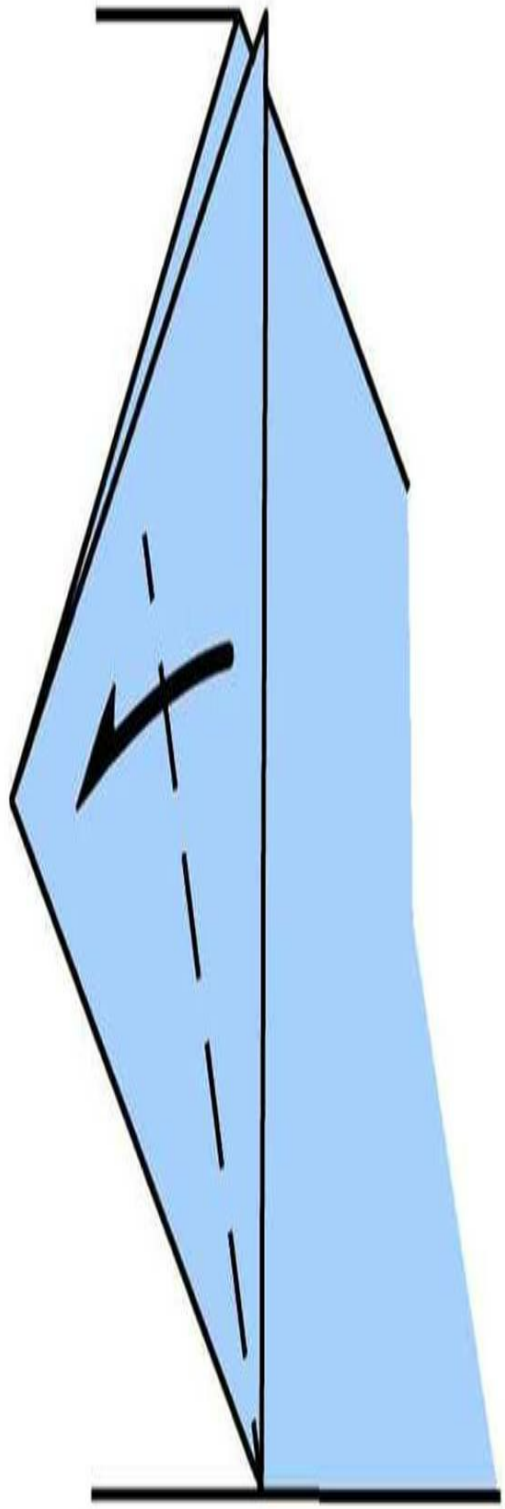


In Steps 5 – 12 we will make the undercarriage.

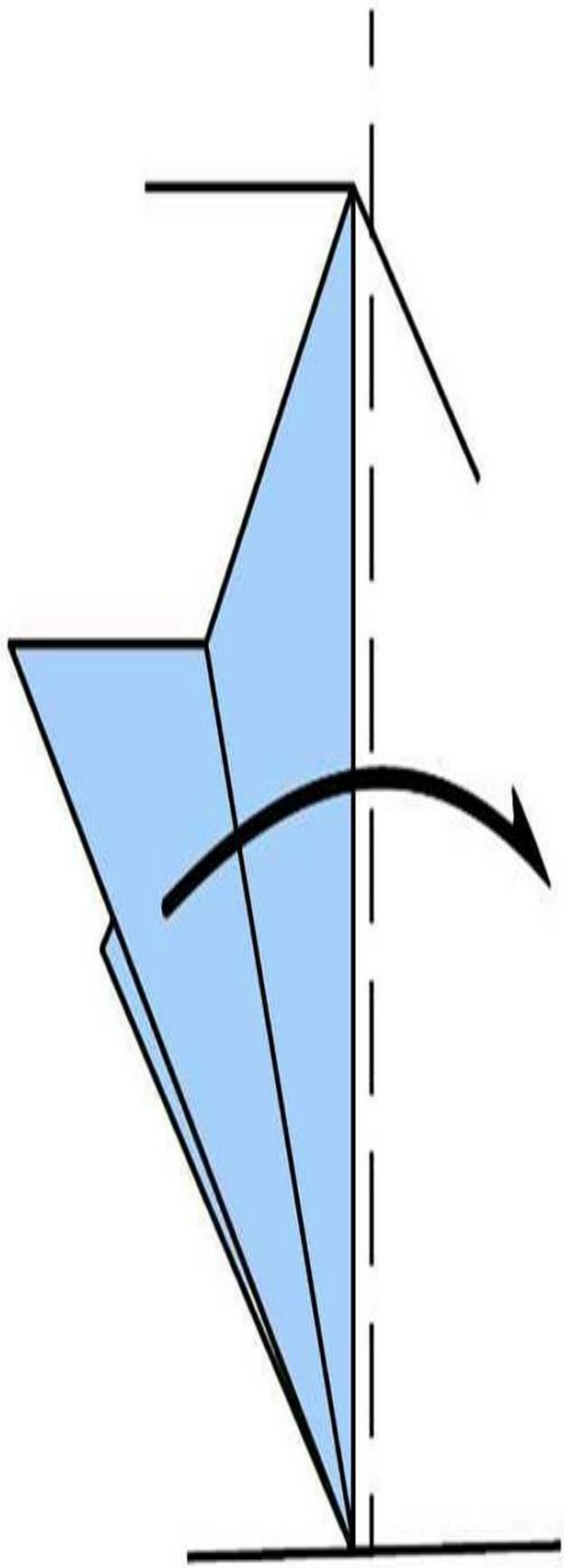
6 Glider with Landing Gear



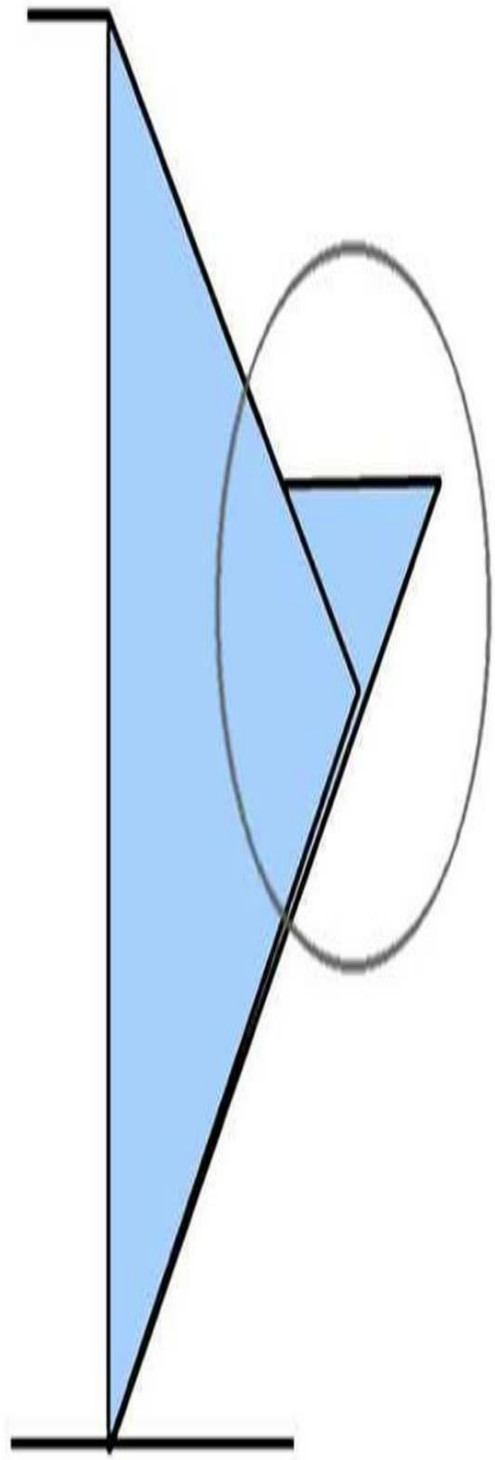
7 Glider with Landing Gear



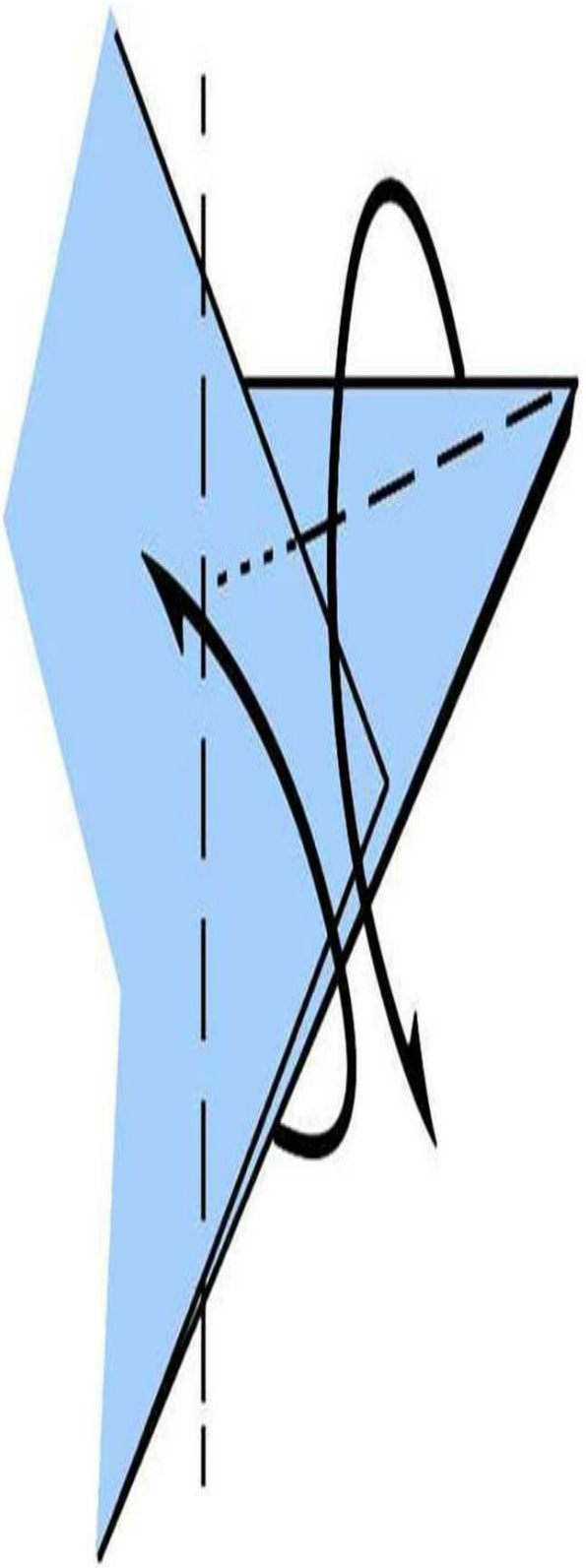
8 Glider with Landing Gear



9 Glider with Landing Gear

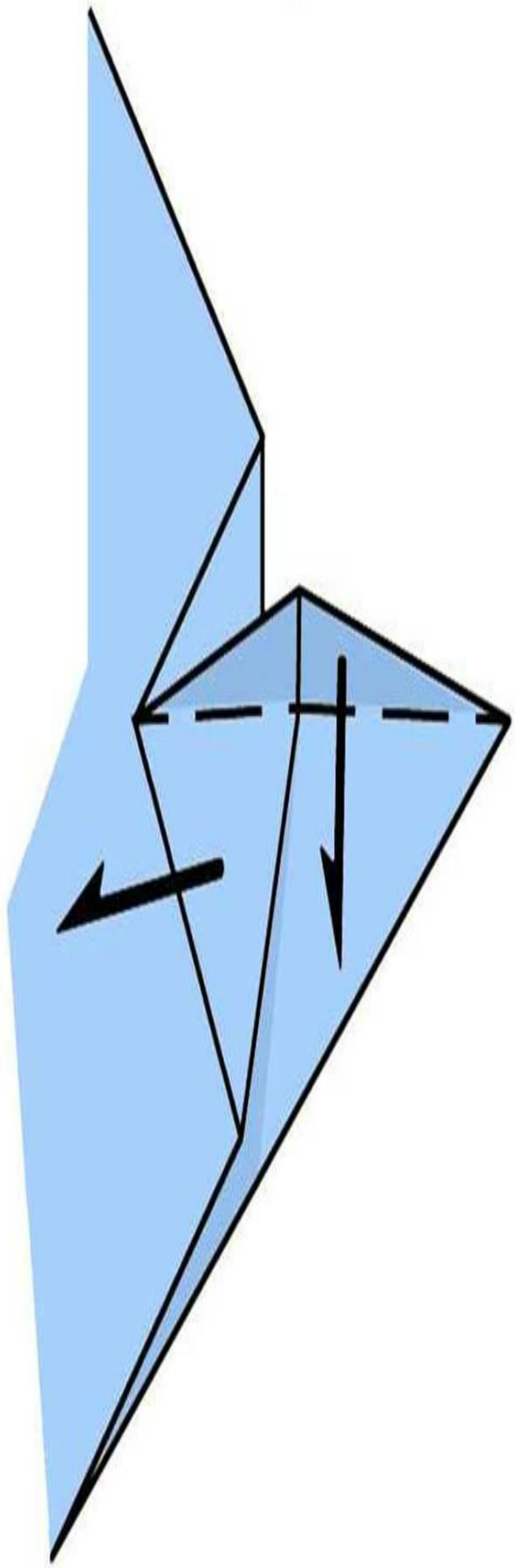


10 Glider with Landing Gear

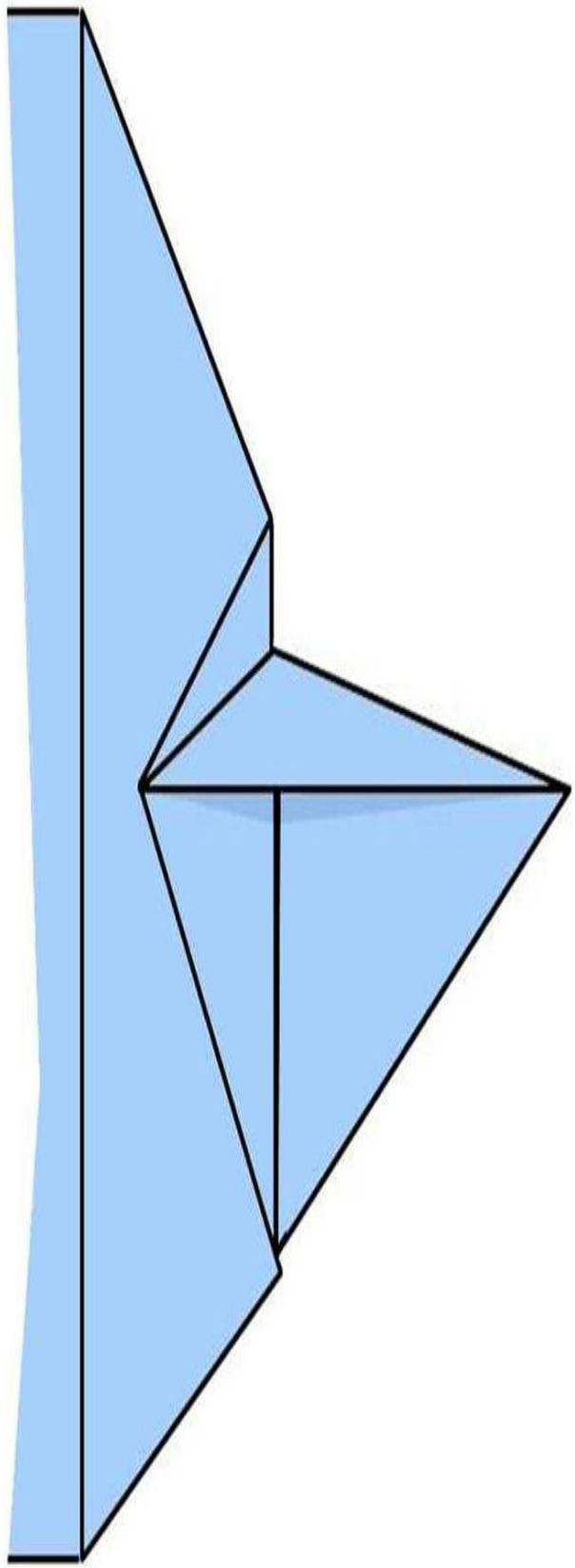


Step 10 shows a close-up cutaway of the landing feet detail. As you fold the triangle section to the left, fold the upper horizontal edge down. Step 11 shows this process under way. Flatten the fold when done, and repeat for the other side.

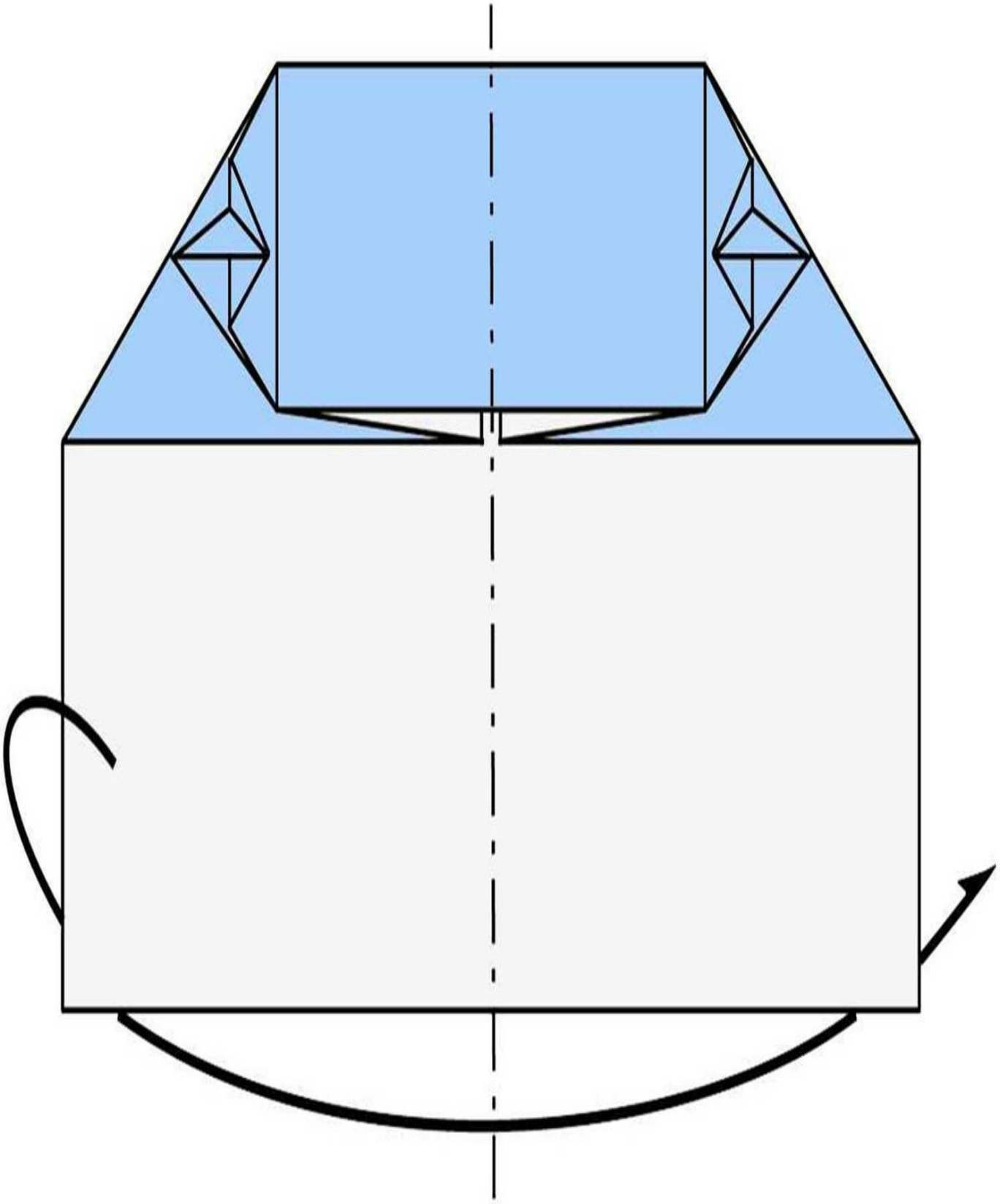
11 Glider with Landing Gear



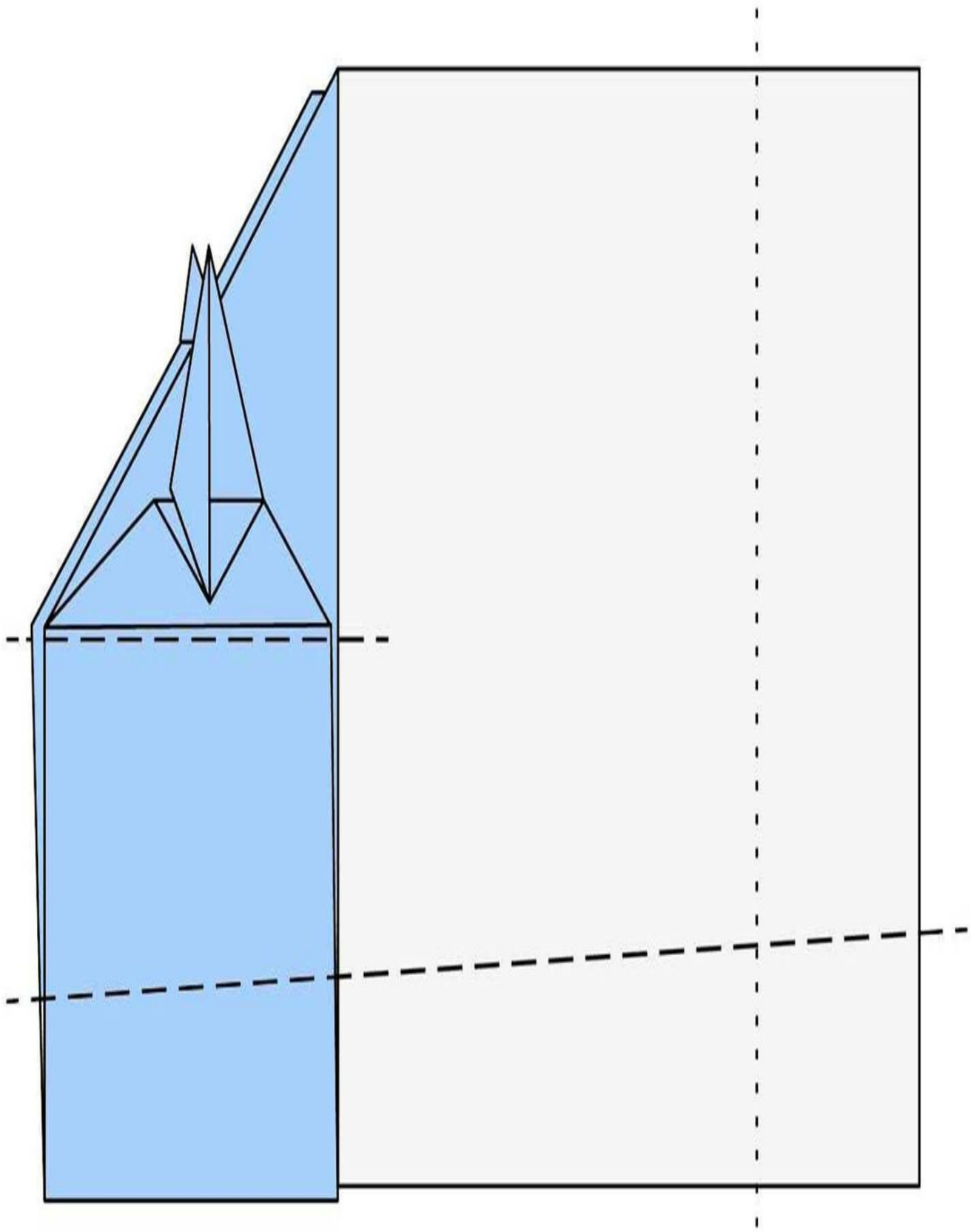
12 Glider with Landing Gear



13 Glider with Landing Gear

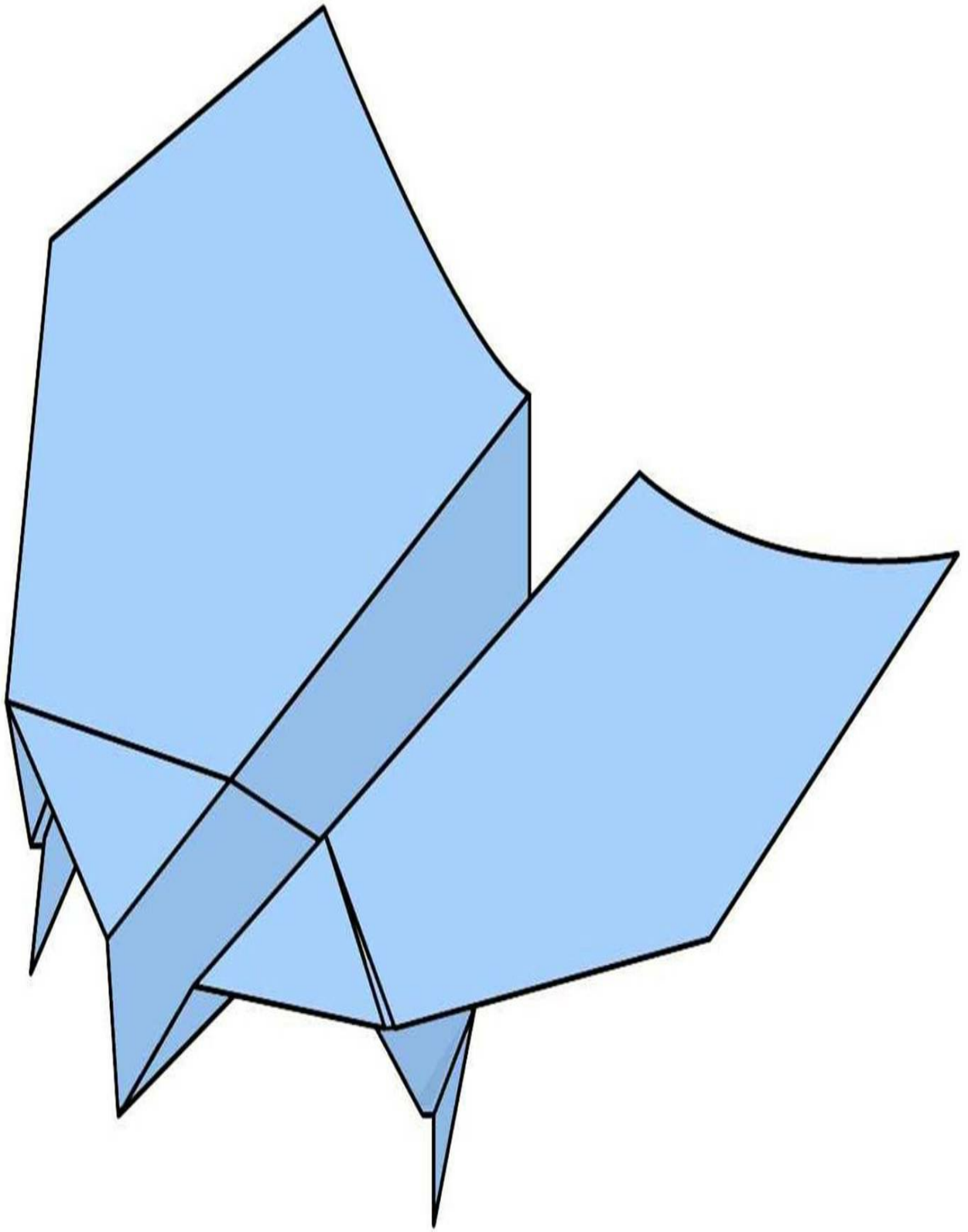


14 Glider with Landing Gear



In Step 14, fold wings and undercarriage down. If your glider stalls, cut off the trailing edge from half and inch to an inch.

15 Glider with Landing Gear



The finished glider; gently throw horizontally away from you towards a smooth surface and watch it land gracefully. This glider can also be thrown with more force and can fly far.

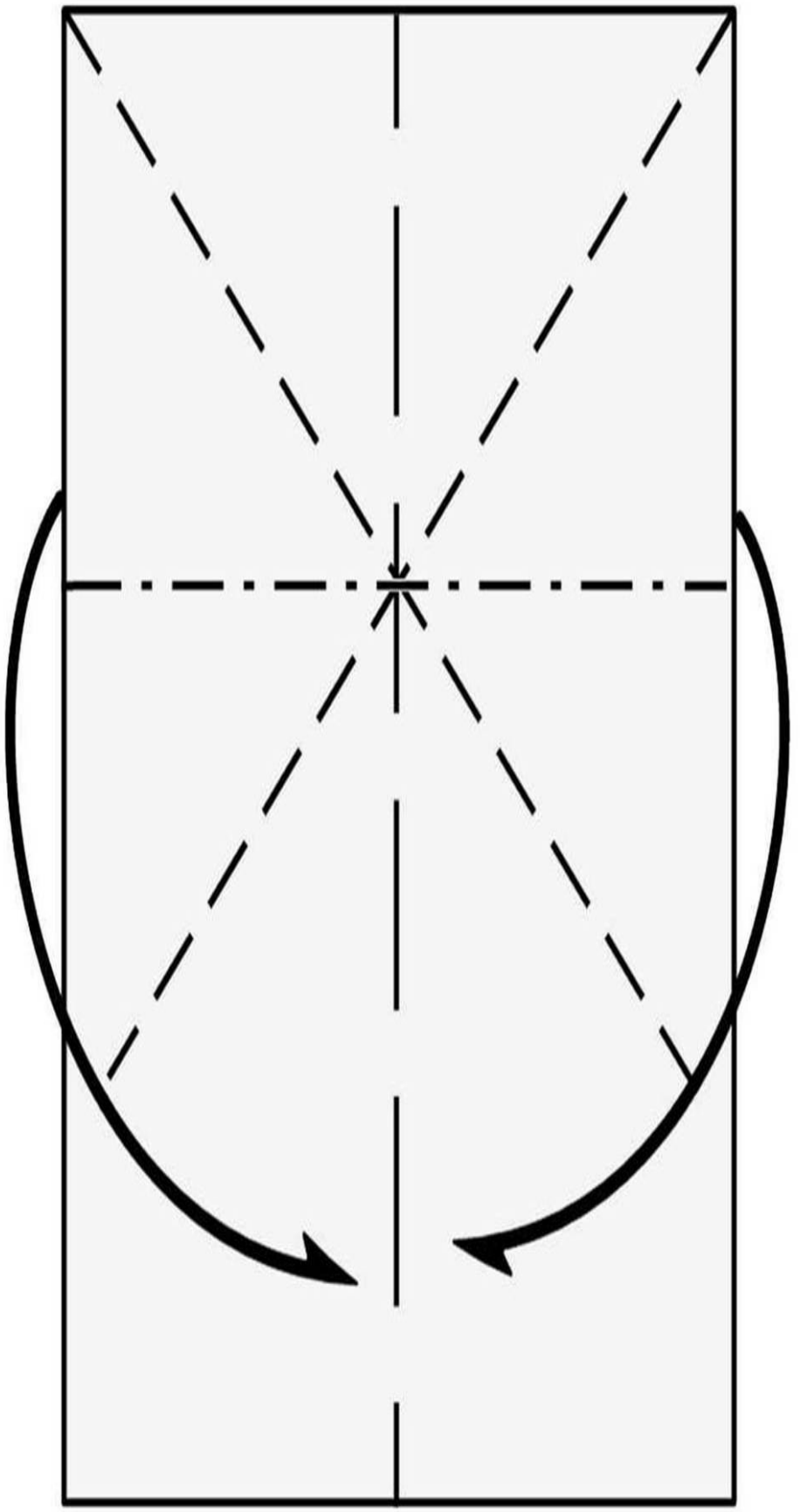
Dive Bomber 1

This craft makes for a neat dive bomber when throw hard and downwards towards a target.

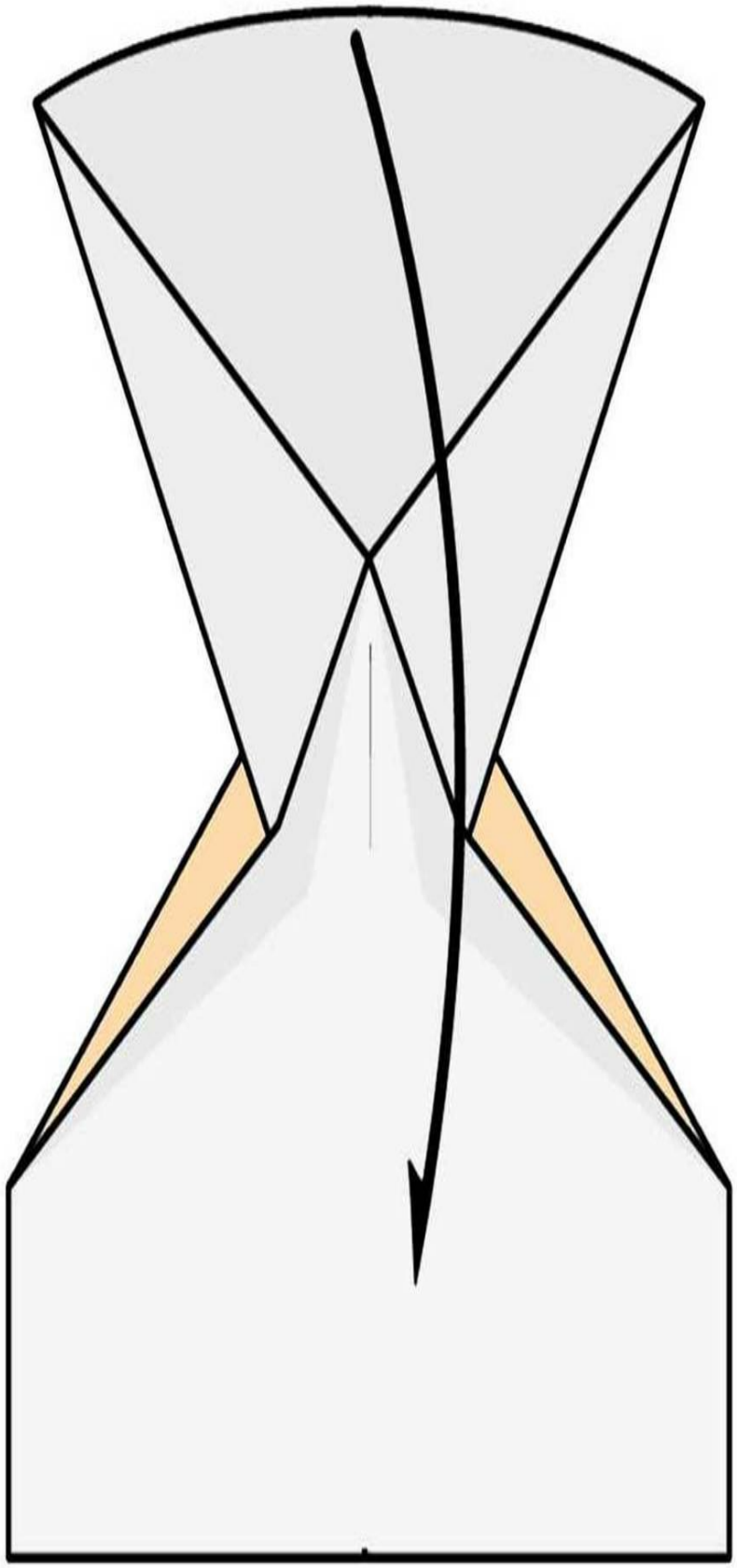
Also known as a sea plane (though there is a better one in the *Paper Boats* book), this craft can actually float somewhat in water if the undercarriage is bowed out and the craft is folded using plastic sheeting/wrapping paper.

This model uses the same basic fold as the Super Looper, and base fold steps are repeated here for your convenience.

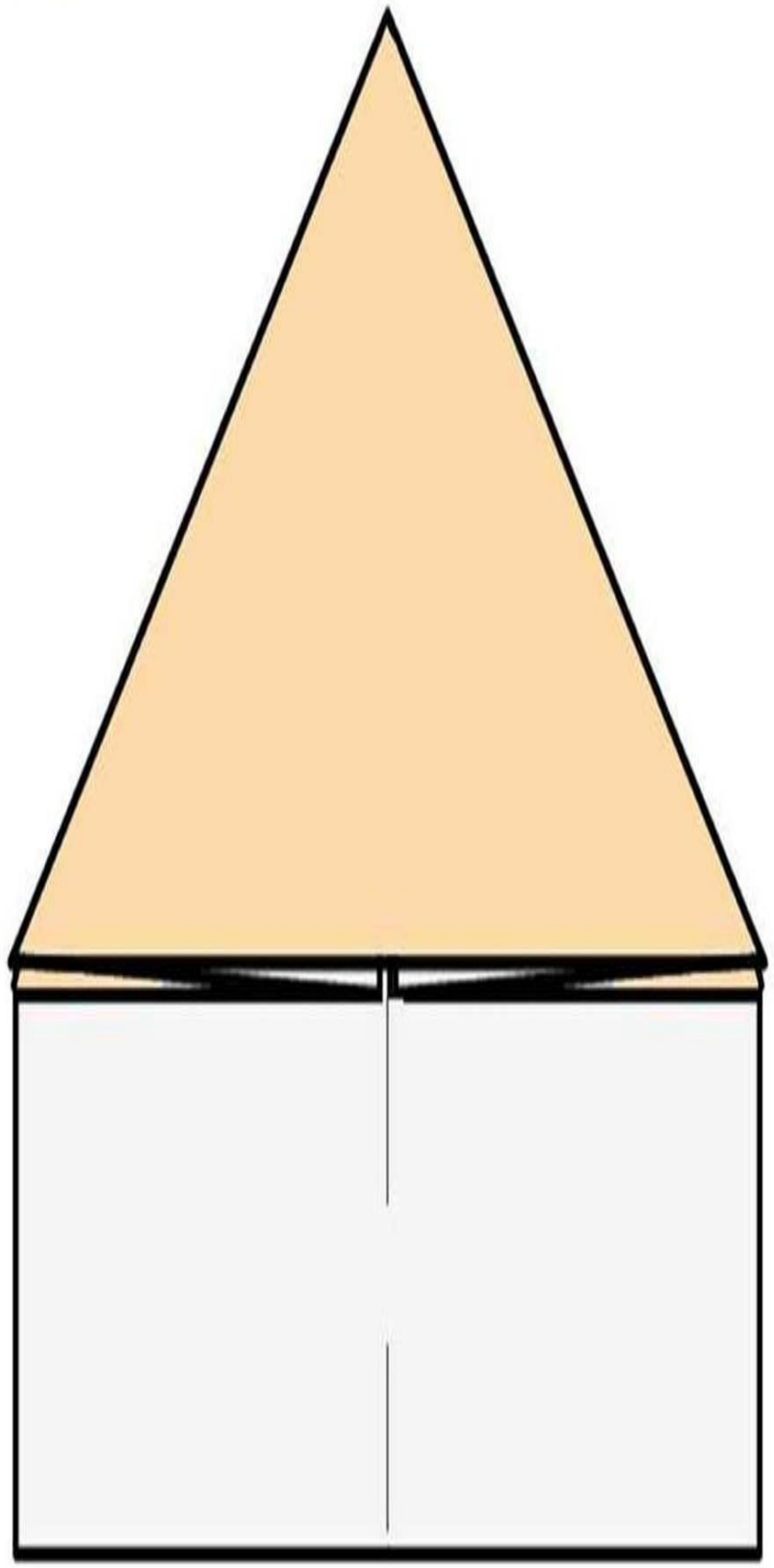
1 Dive Bomber 1



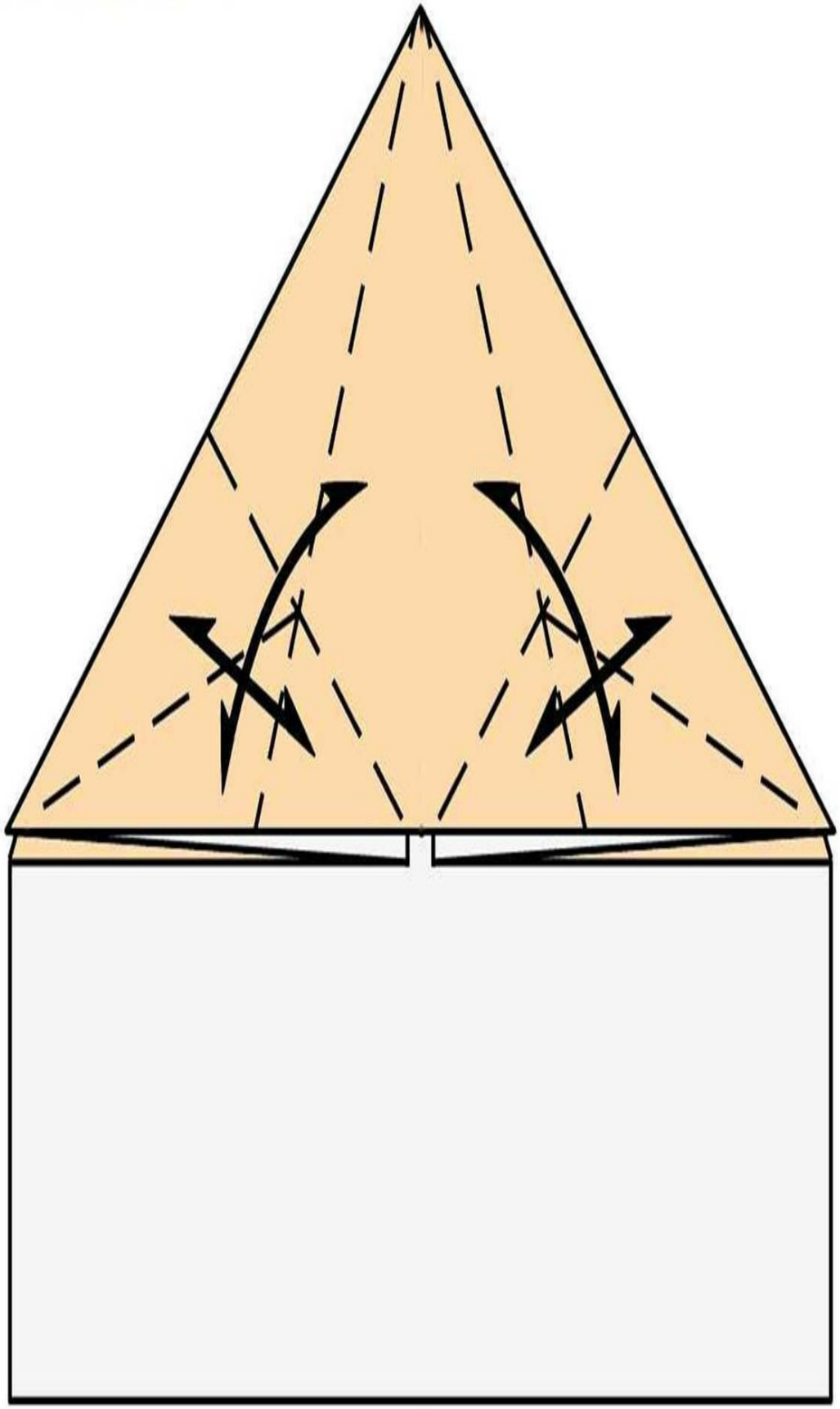
2 Dive Bomber 1



3 Dive Bomber 1

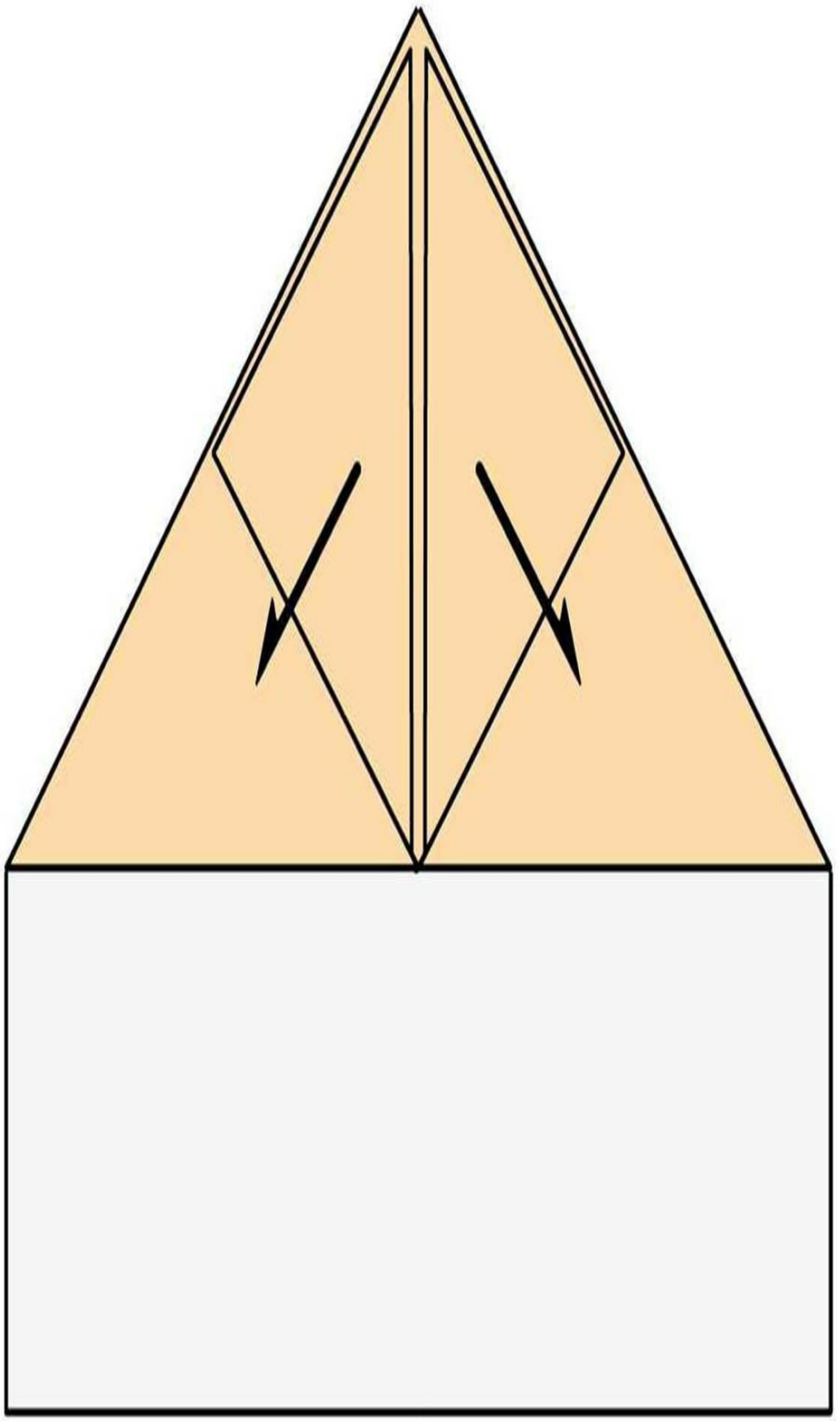


4 Dive Bomber 1

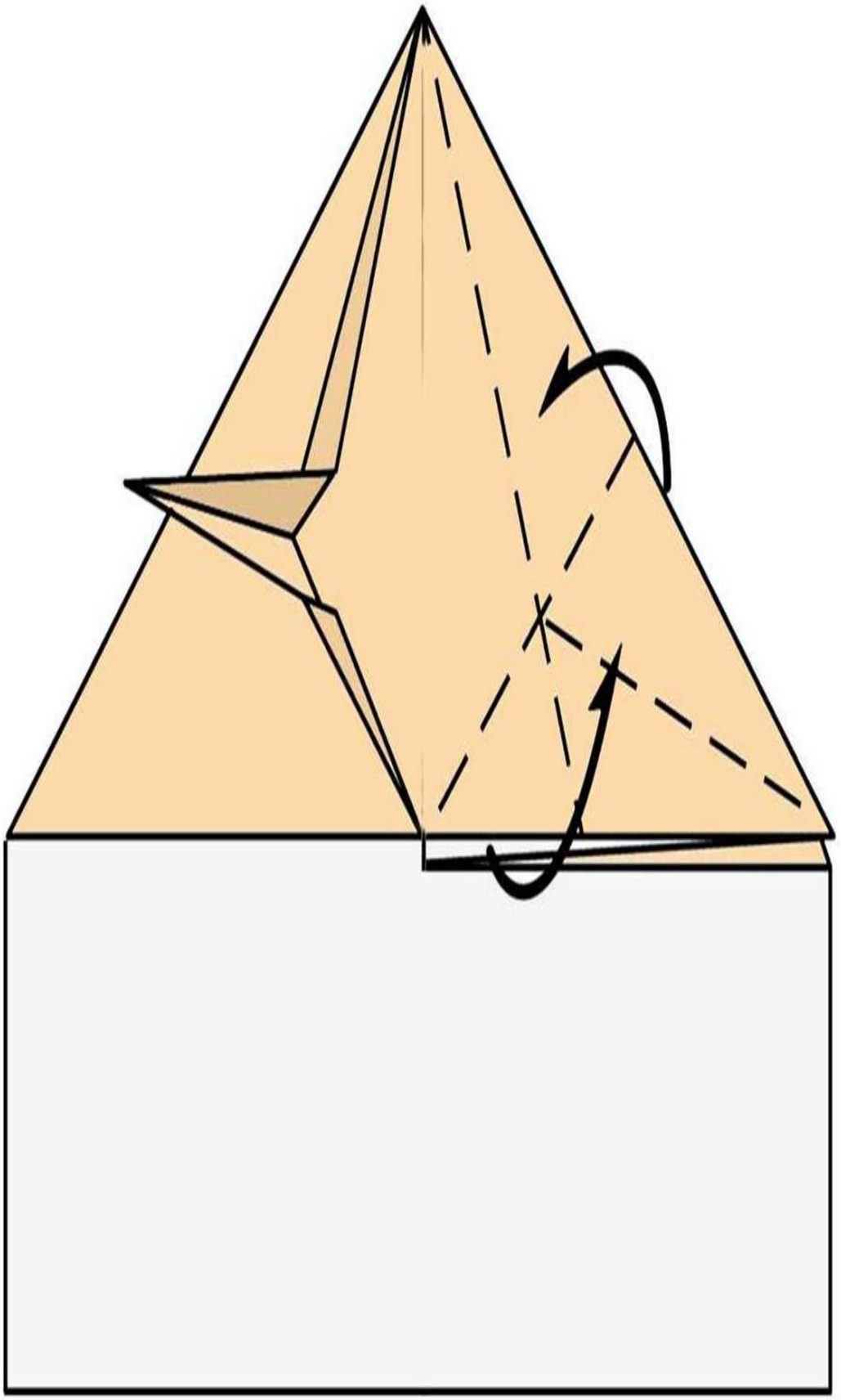


In Step 4, make all the creases and pinch the sides together to make big bunny ears, by following Steps 5 – 7.

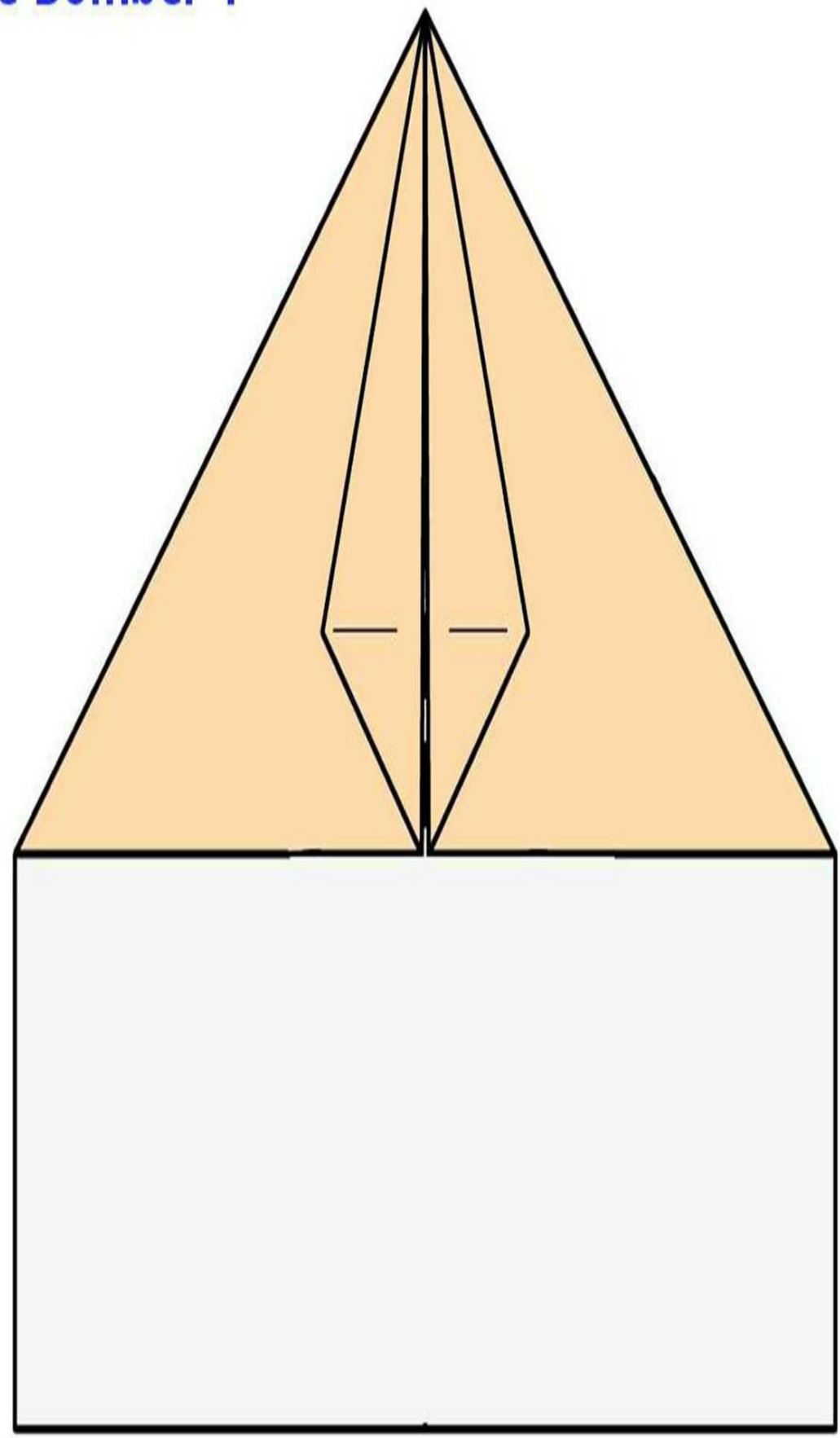
5 Dive Bomber 1



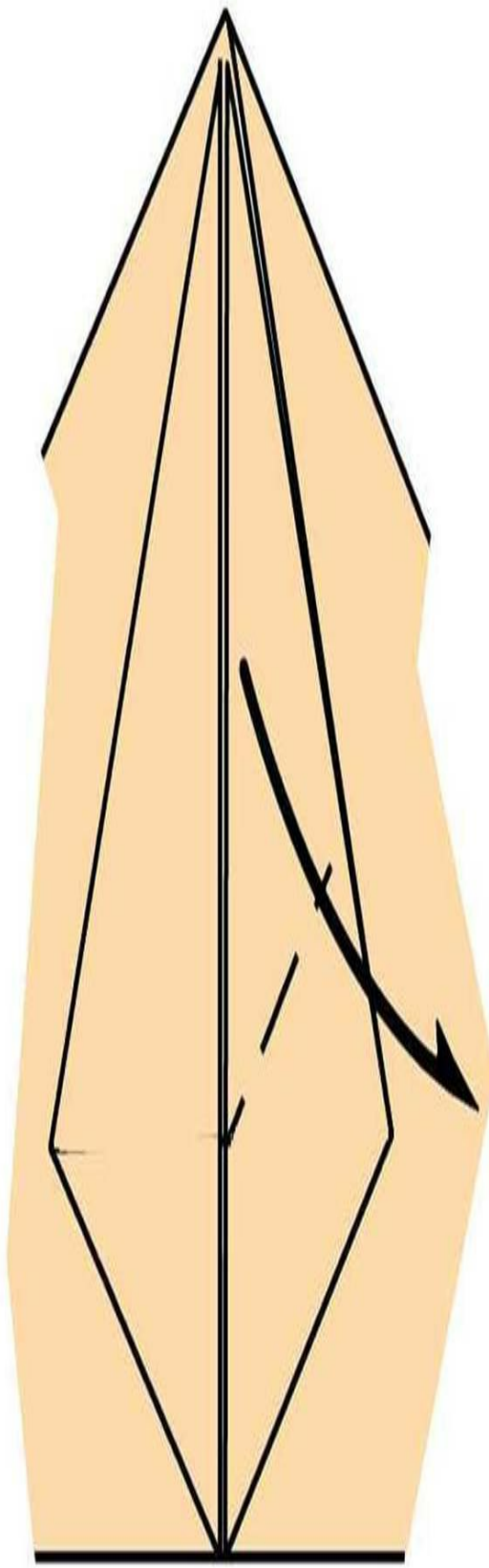
6 Dive Bomber 1



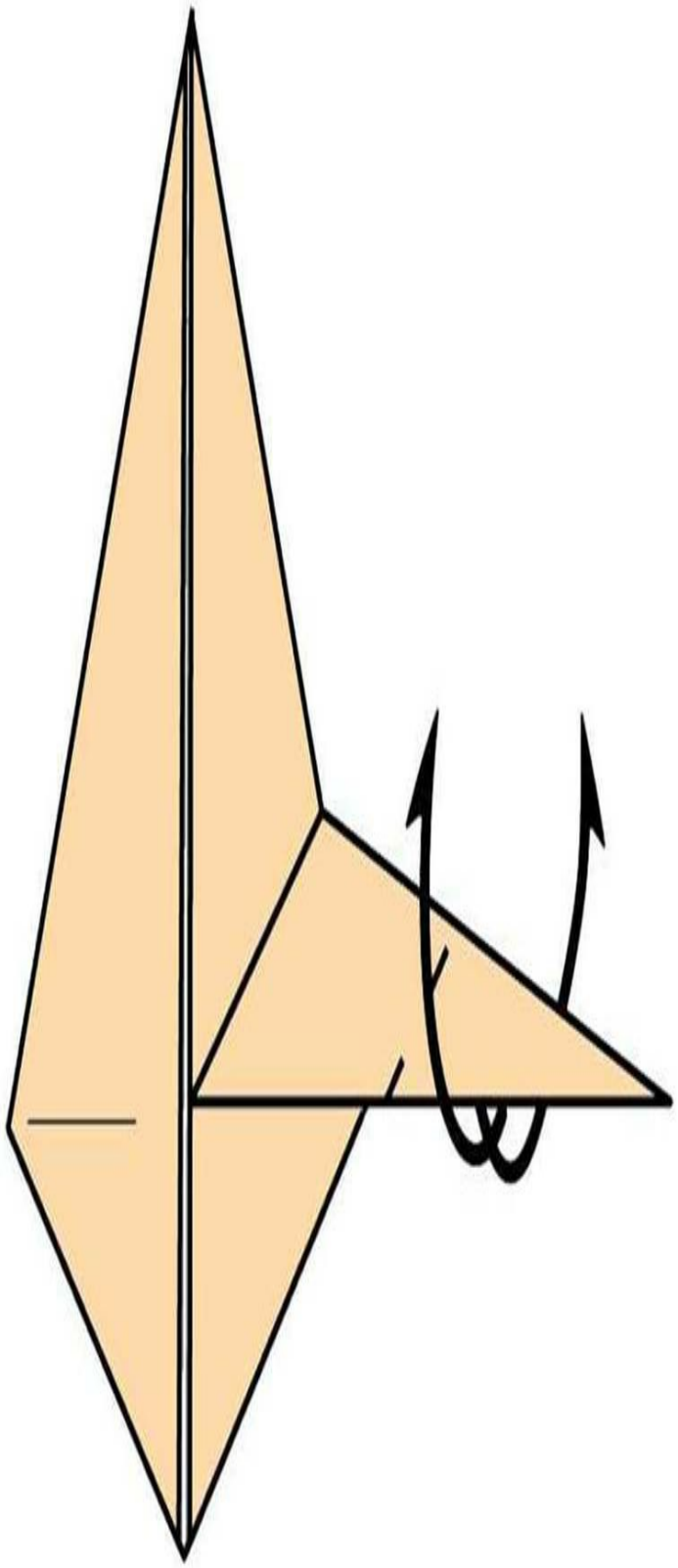
7 Dive Bomber 1



8 Dive Bomber 1

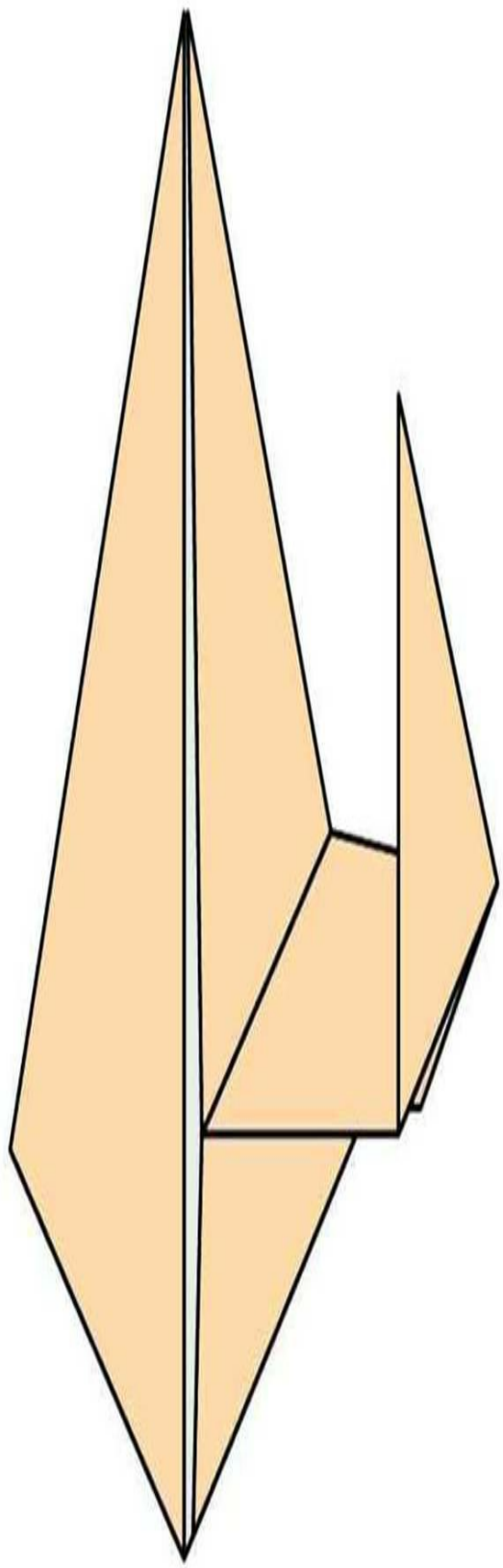


9 Dive Bomber 1



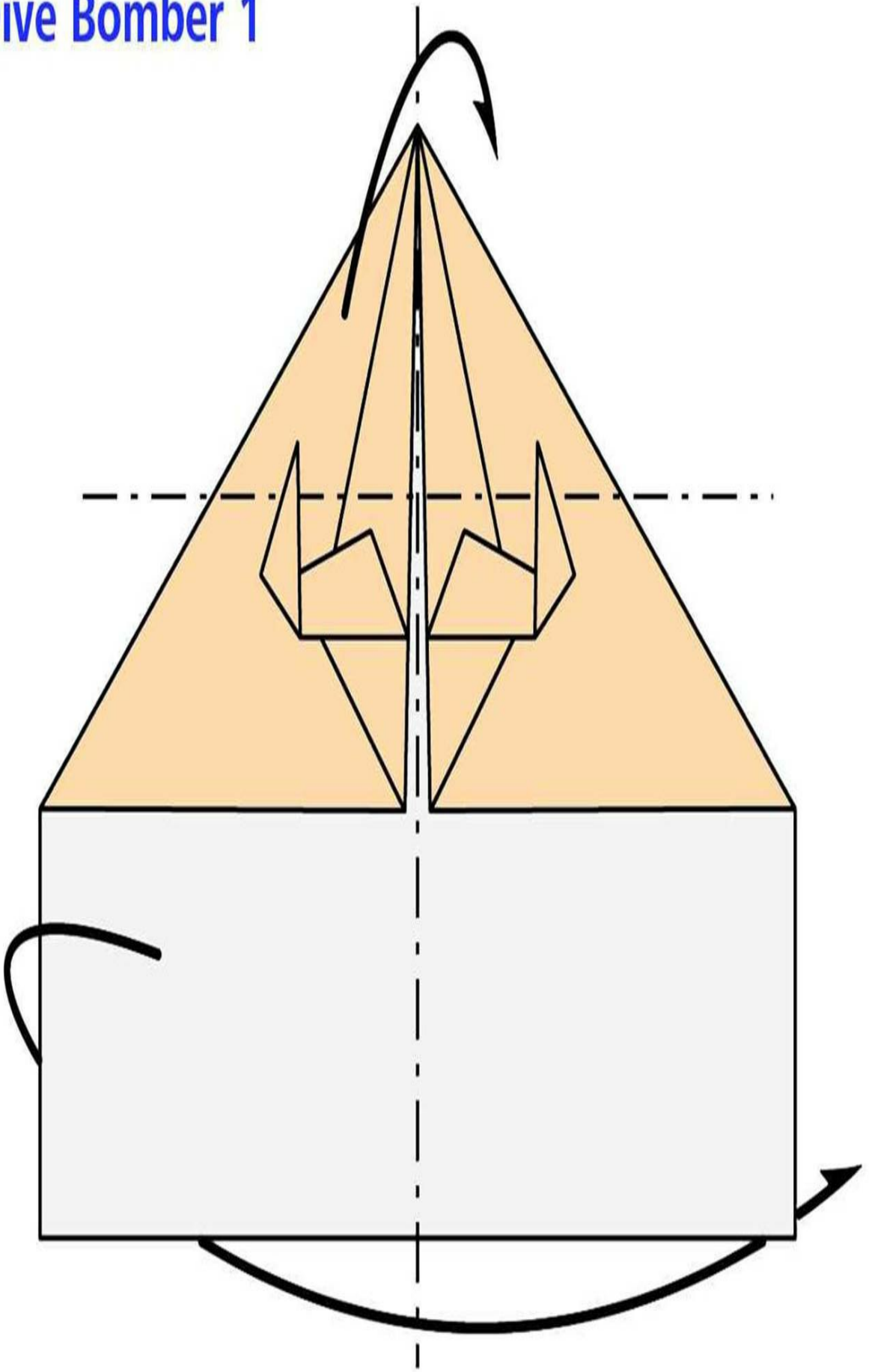
In Step 9, crease along line, put your finger inside the flap and ‘reverse’ fold (opening it and turning it inside out).

10 Dive Bomber 1



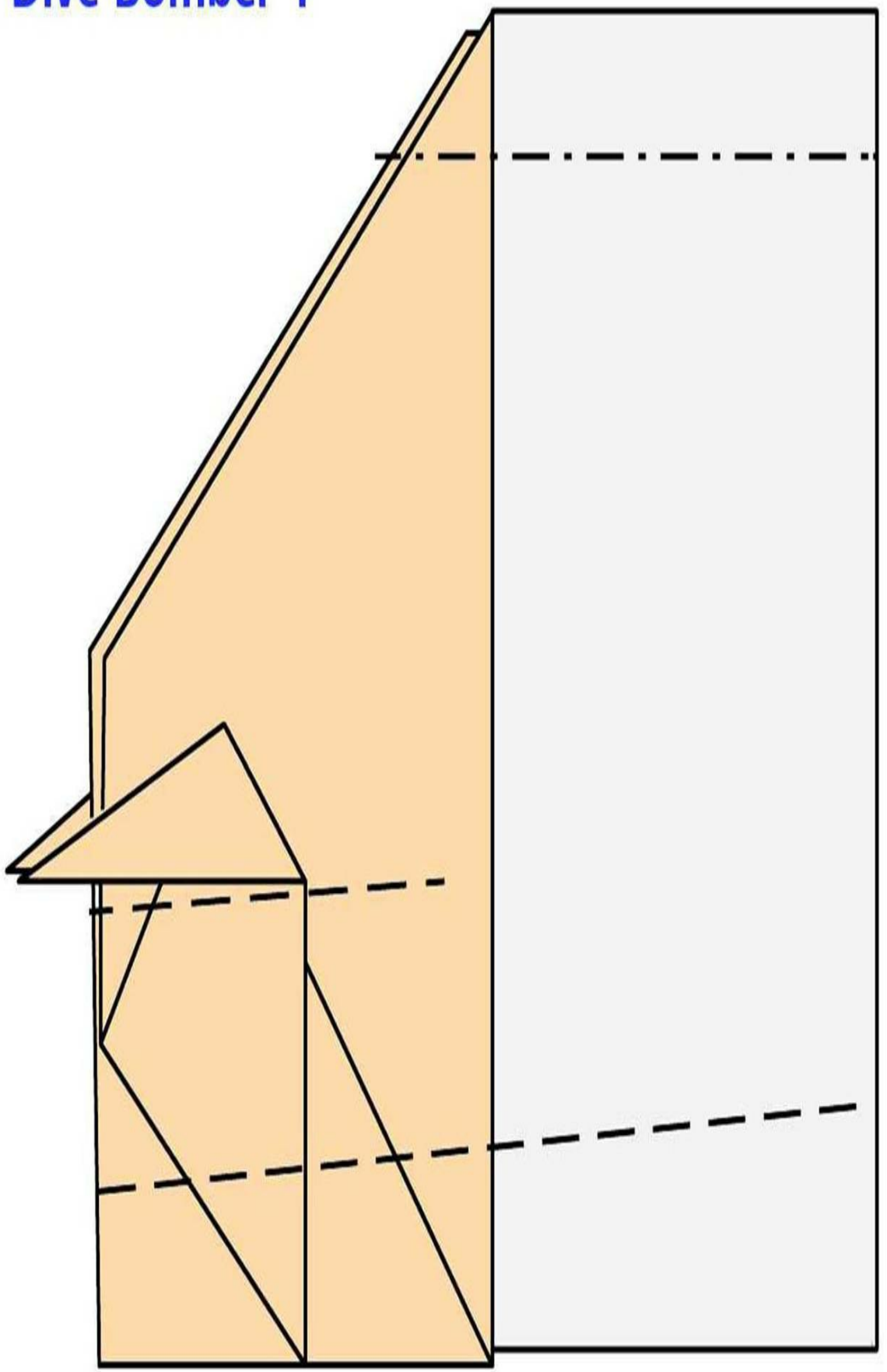
In Step 10, repeat this fold for the left side.

11 Dive Bomber 1



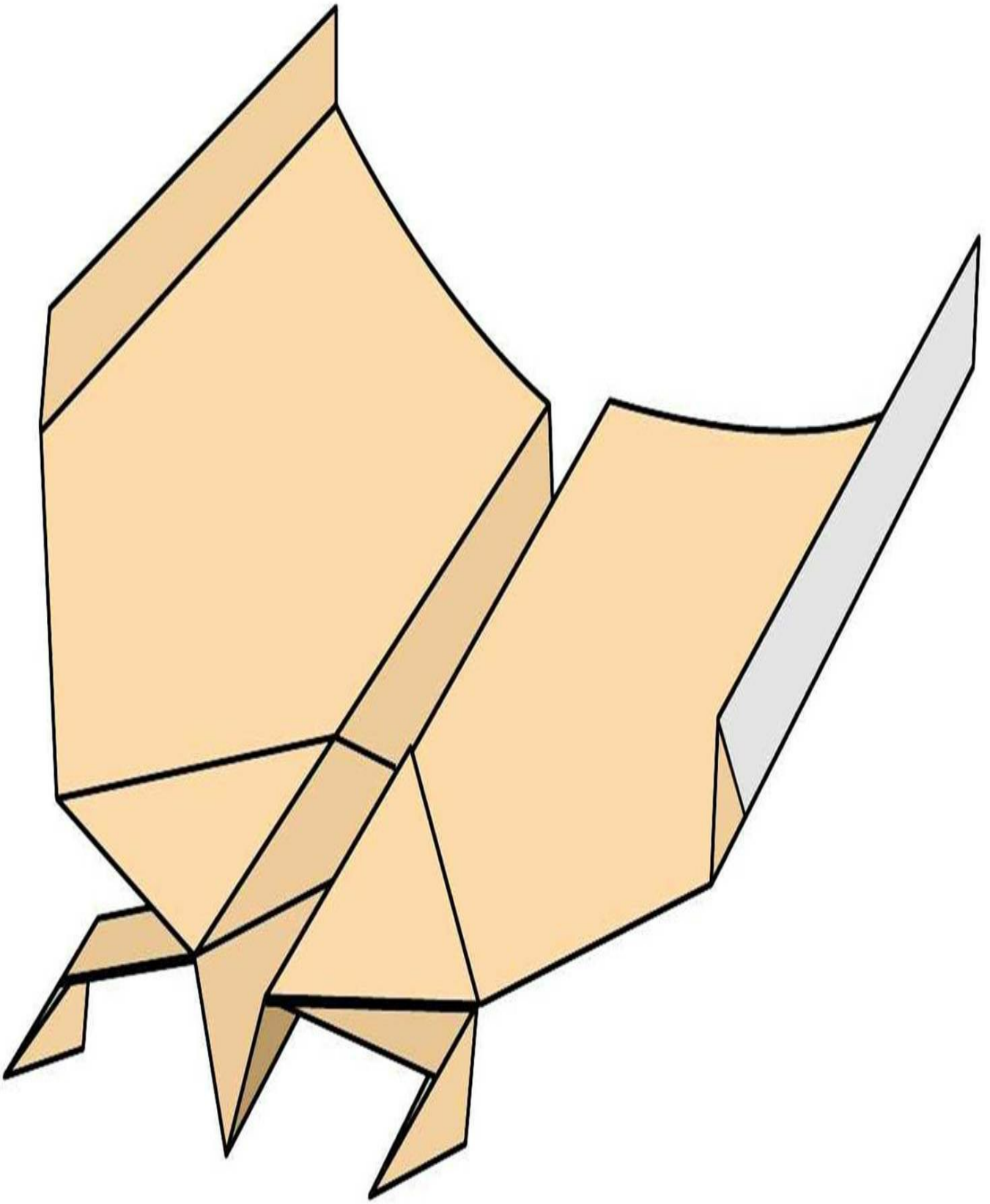
In Step 11, Fold nose section behind and then fold in half behind.

12 Dive Bomber 1



In Step 12, fold down the ‘guns’ with the wings, otherwise fold them downwards and open out the legs to make skis if you want to make a ‘water landing’ craft.

13 Dive Bomber 1



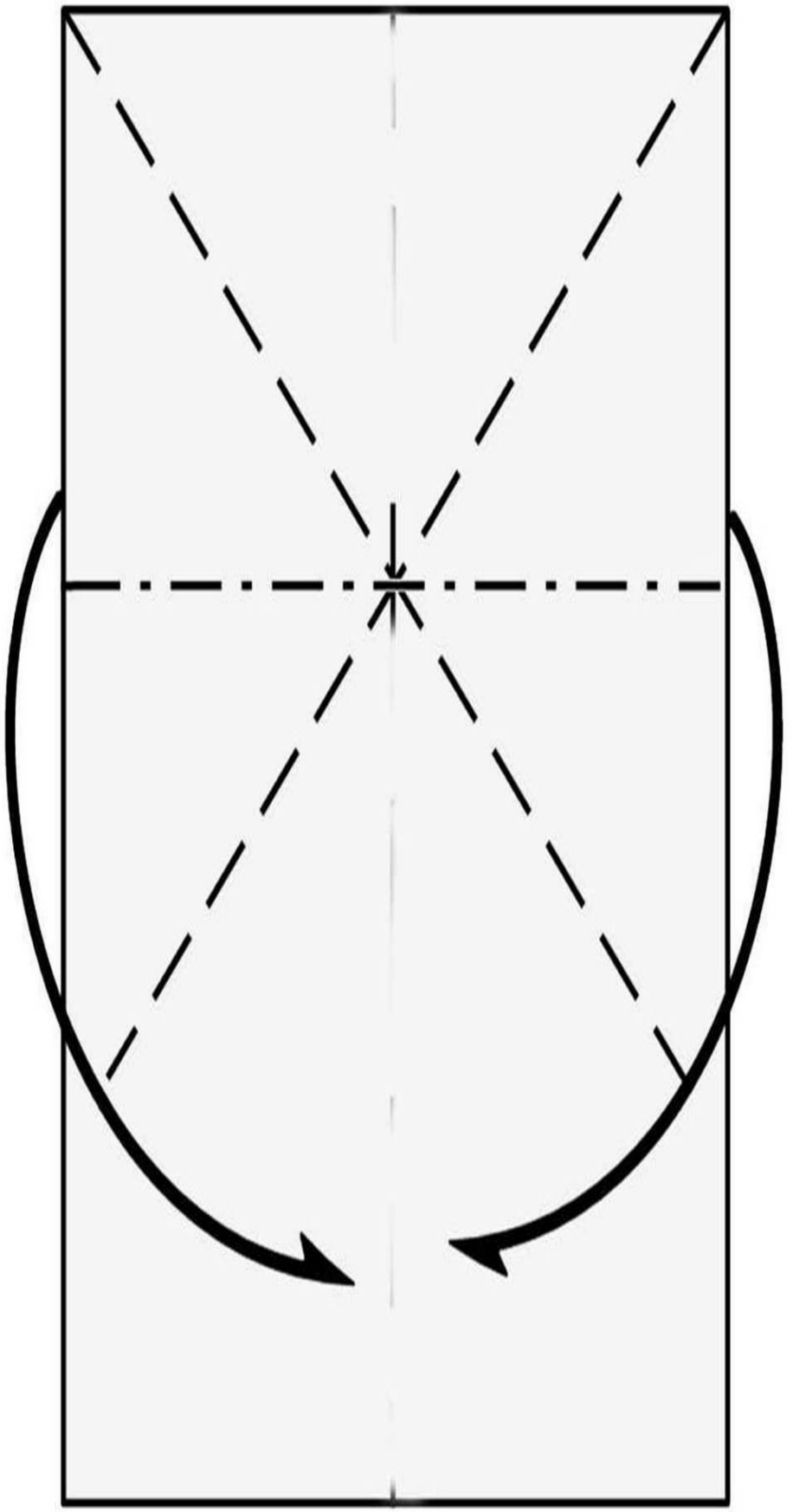
The completed diver bomber/sea plane; if the craft stalls trim the trailing edge wing section by half an inch or so.

Shuttle Copter

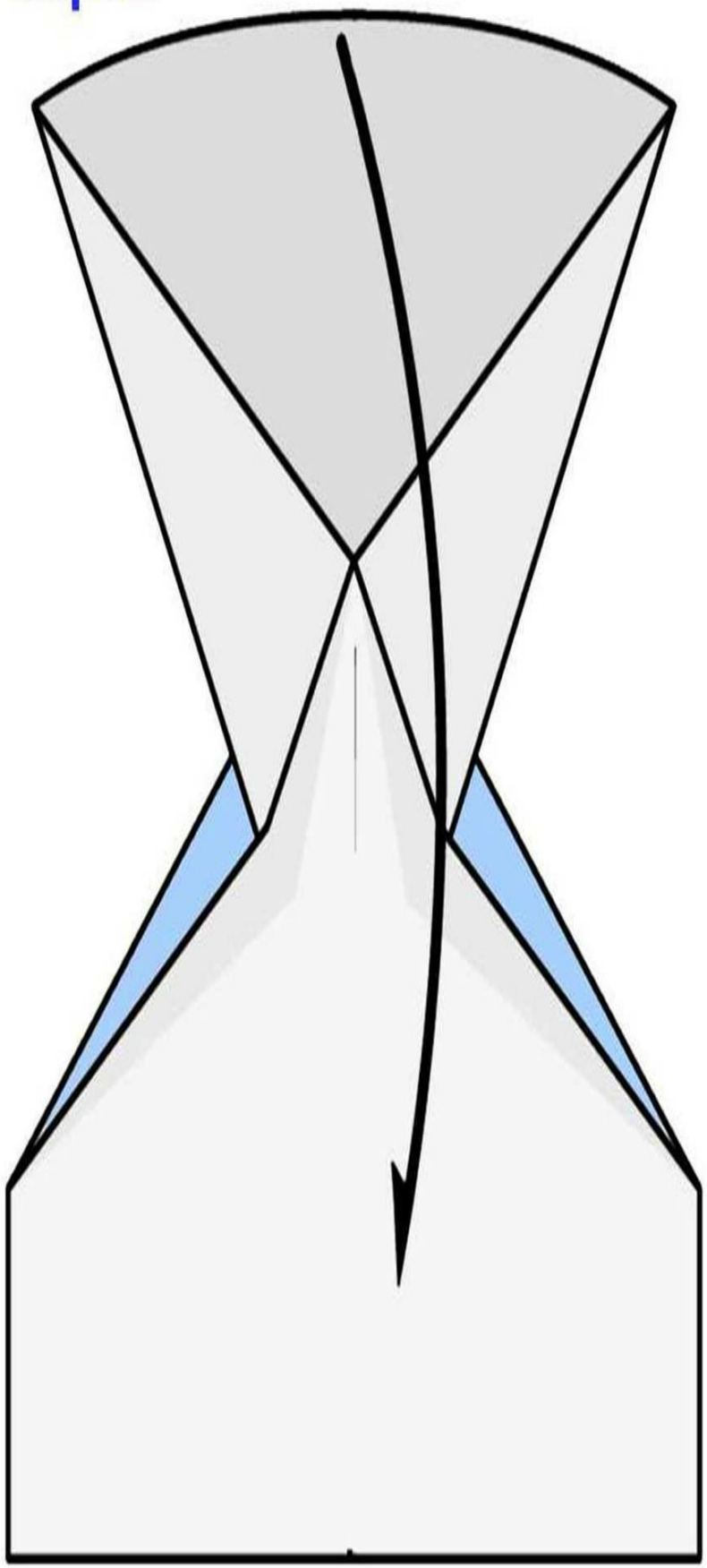
This thing can be thrown high into the air with great thrust, yet it spins gently down, somewhat reminiscent of a pine cone seed.

This model uses the same basic fold as the Super Looper, and base fold steps are repeated here for your convenience.

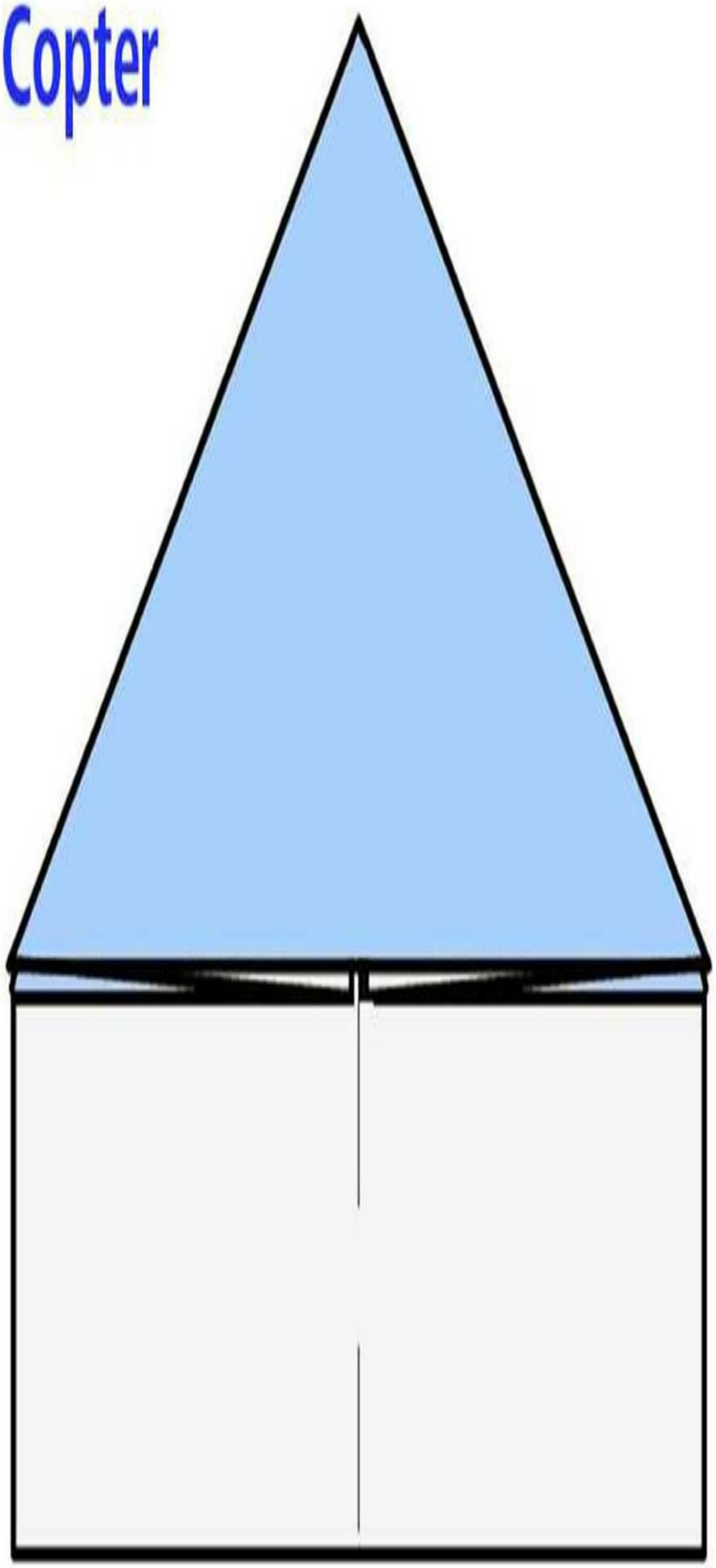
1 Shuttle Copter



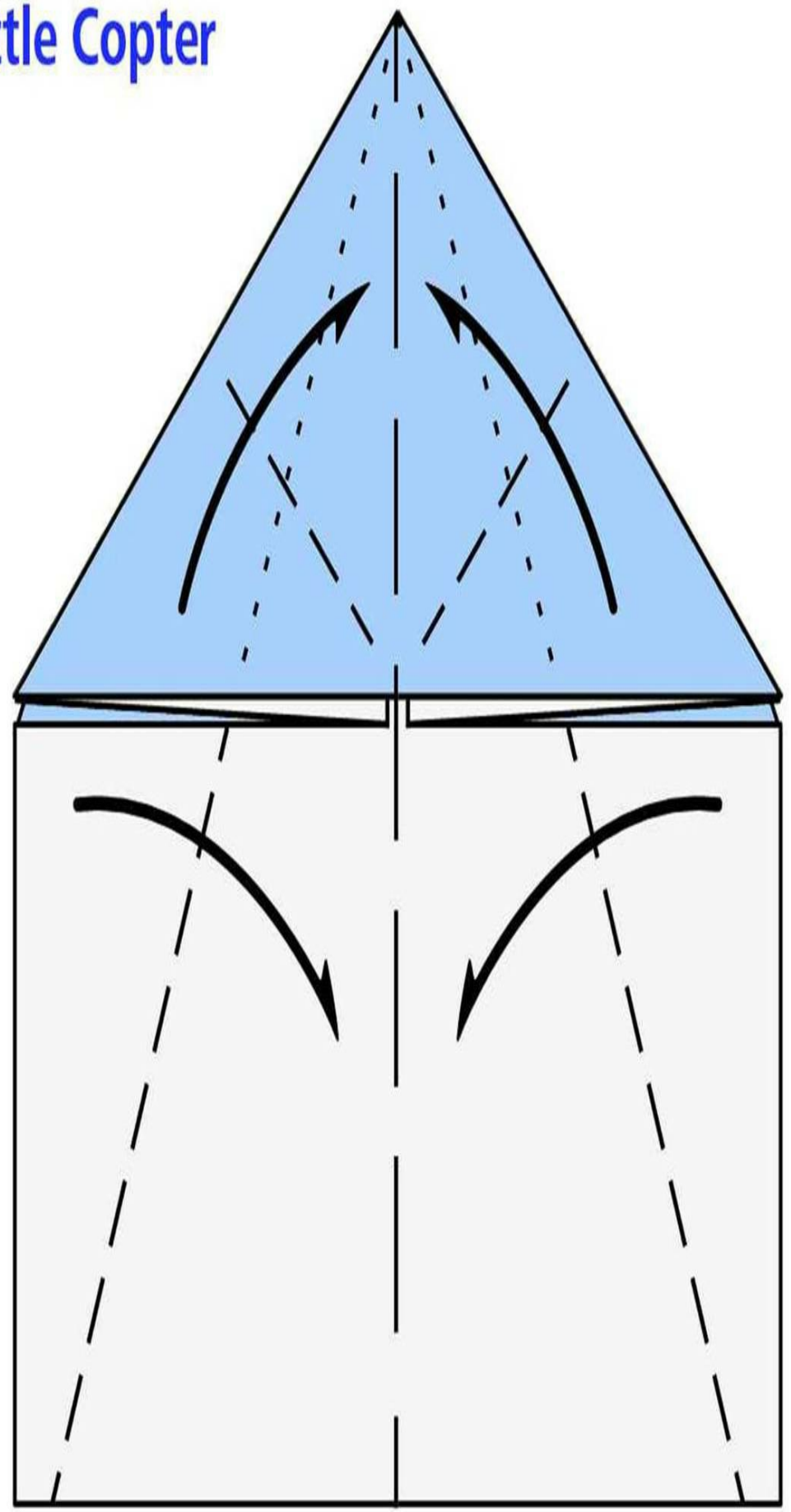
2 Shuttle Copter



3 Shuttle Copter

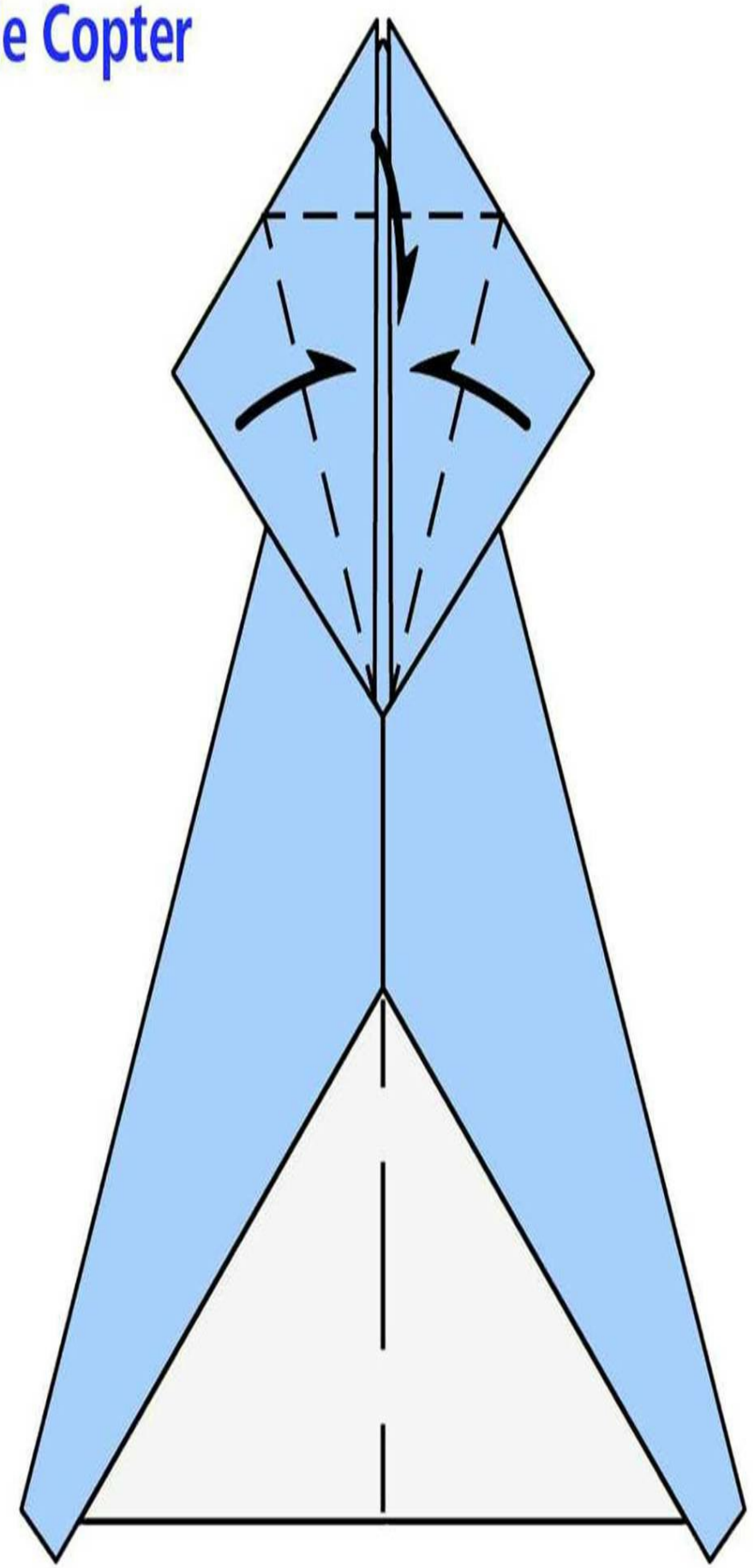


4 Shuttle Copter



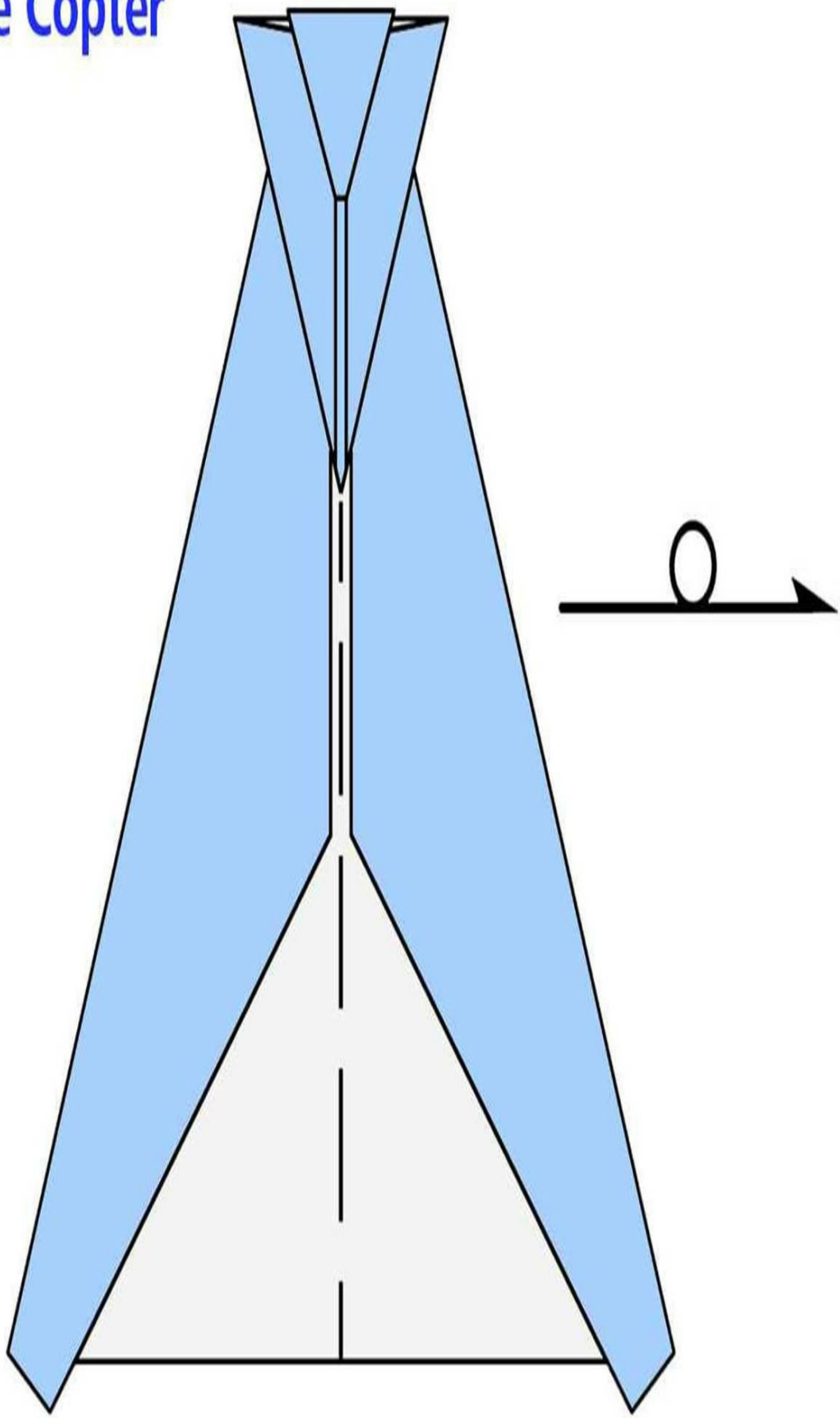
In Step 4, fold upper flaps into the center, and fold sides in to center, noting hidden fold indication under upper flaps.

5 Shuttle Copter

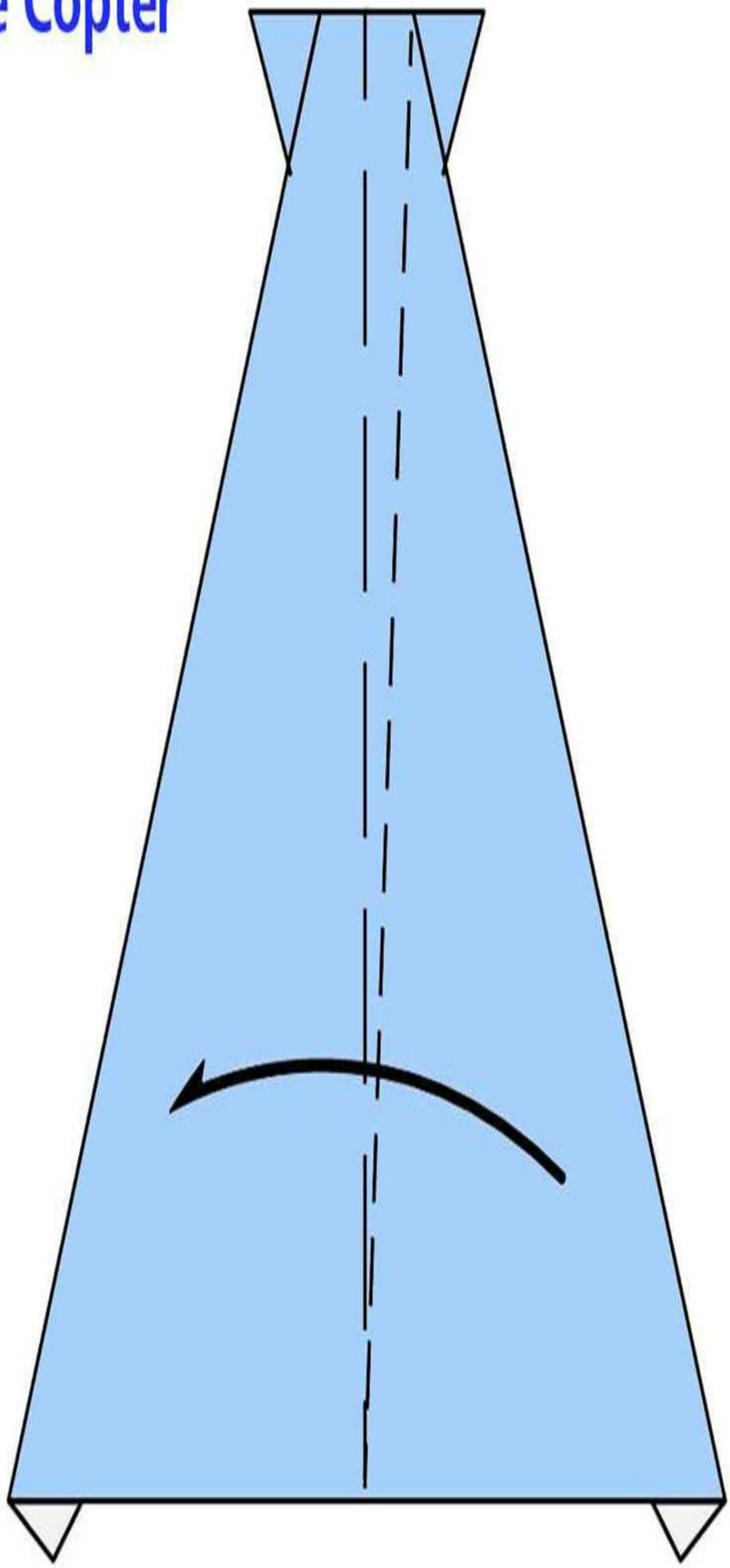


In Step 5, fold upper sides in and tuck their corners into the top section as you fold it down.

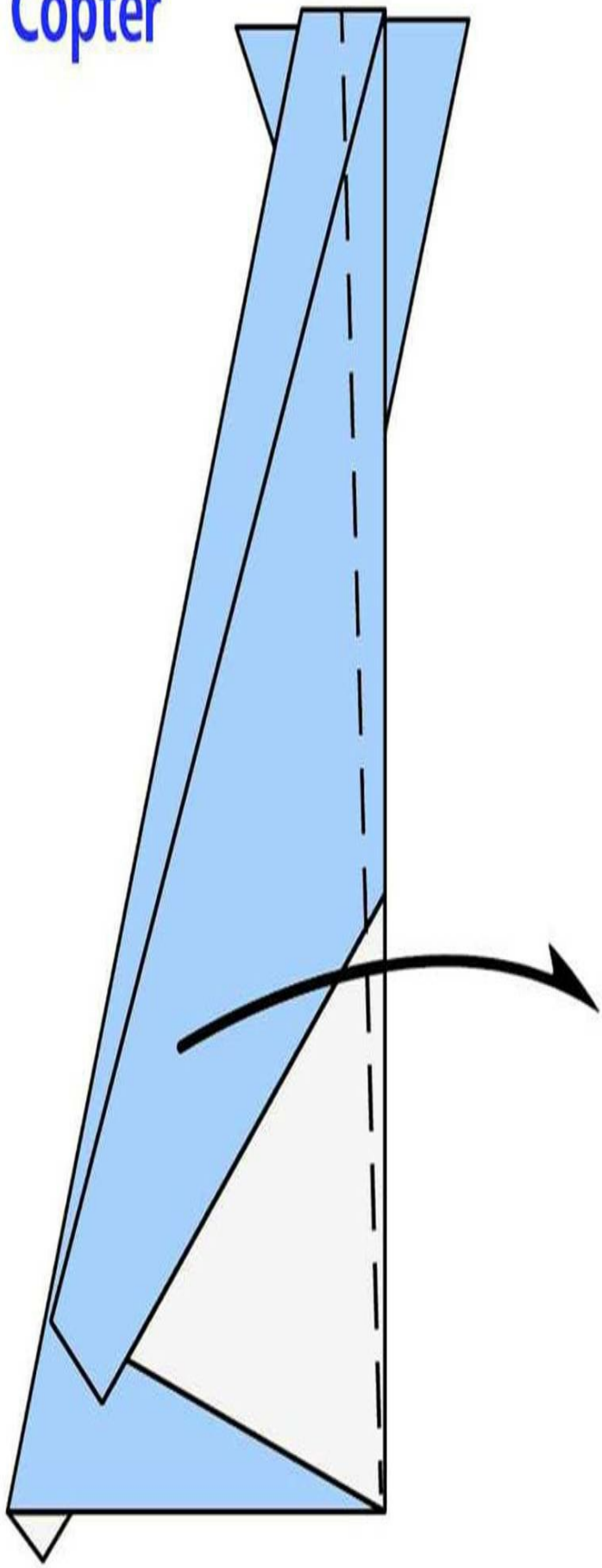
6 Shuttle Copter



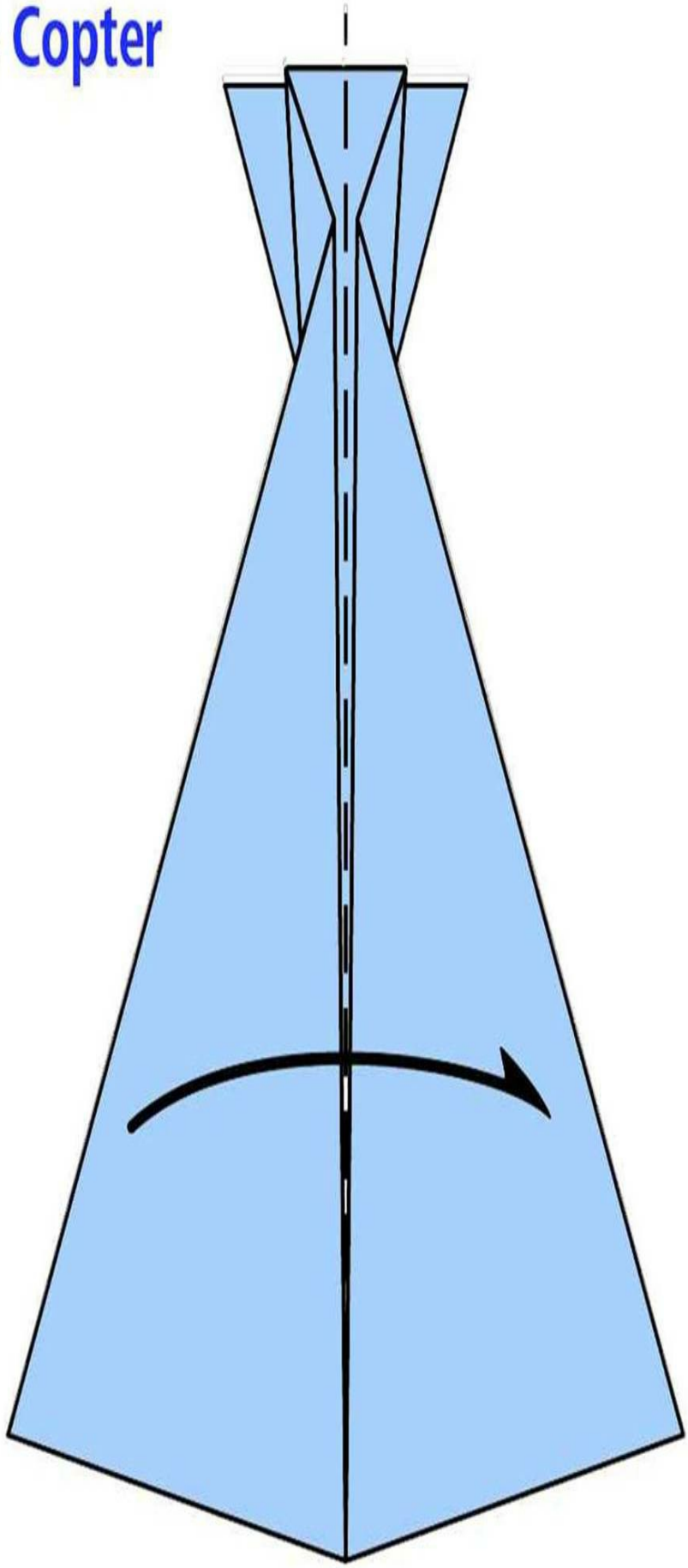
7 Shuttle Copter



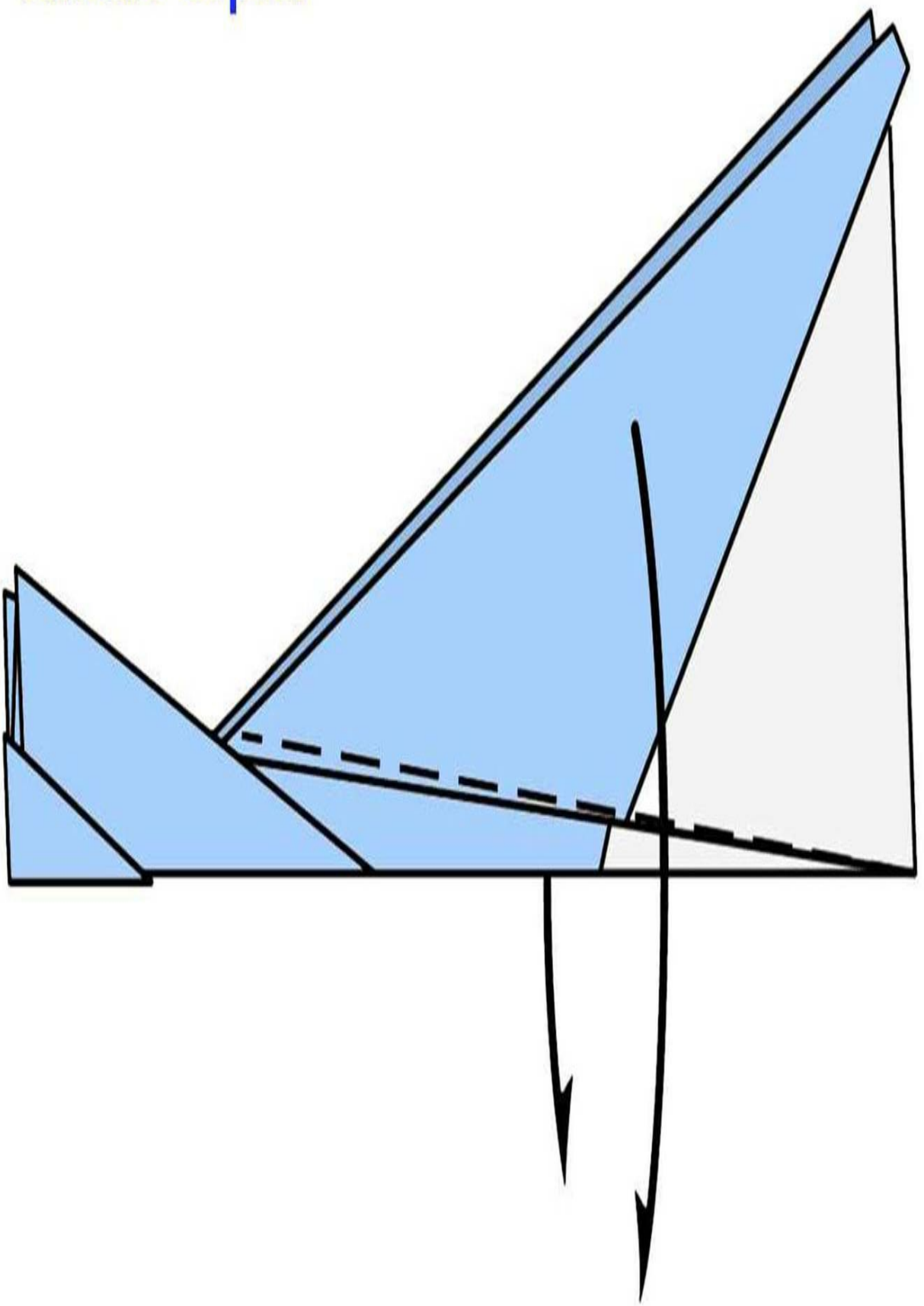
8 Shuttle Copter



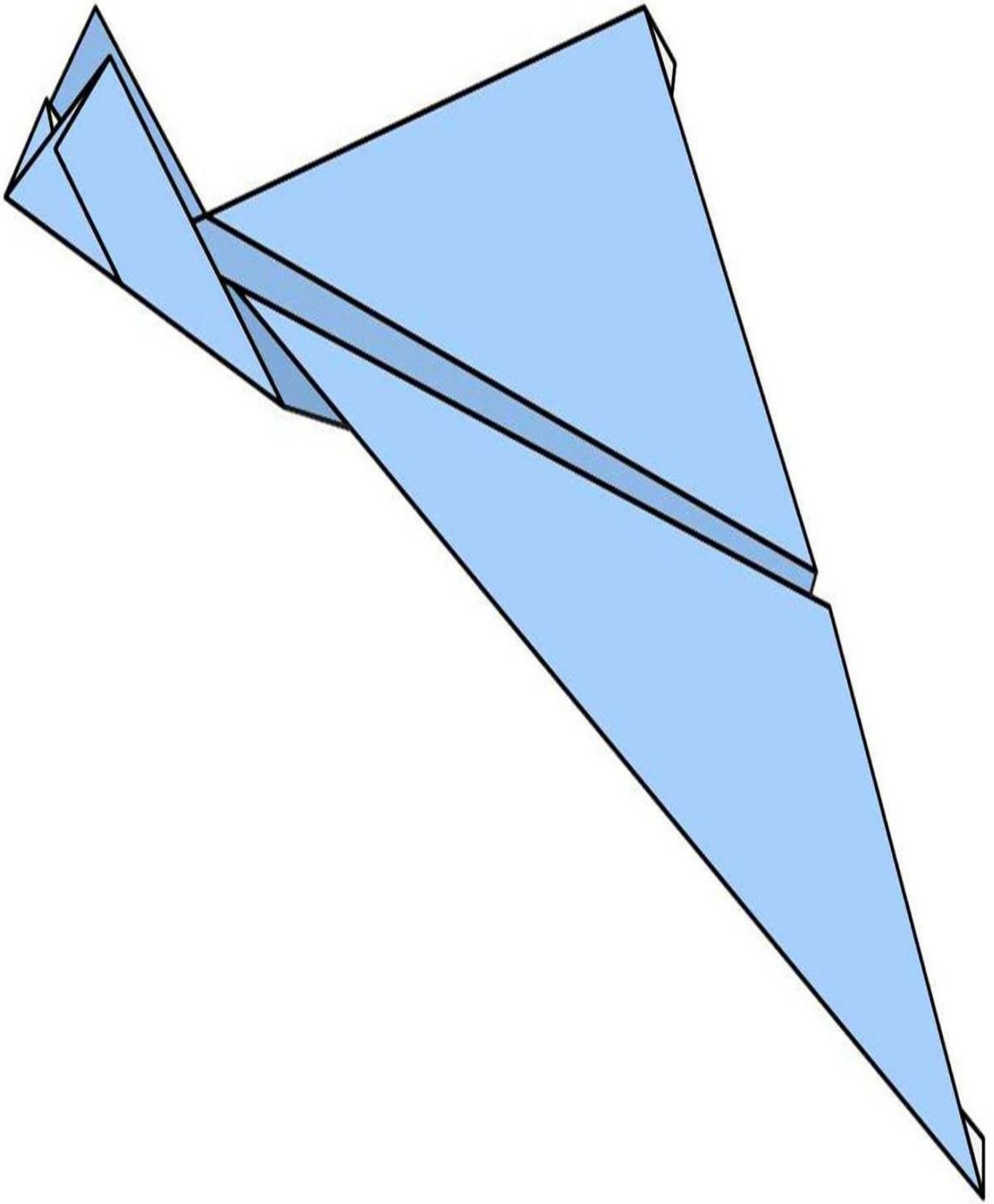
9 Shuttle Copter



10 Shuttle Copter



11 Shuttle Copter



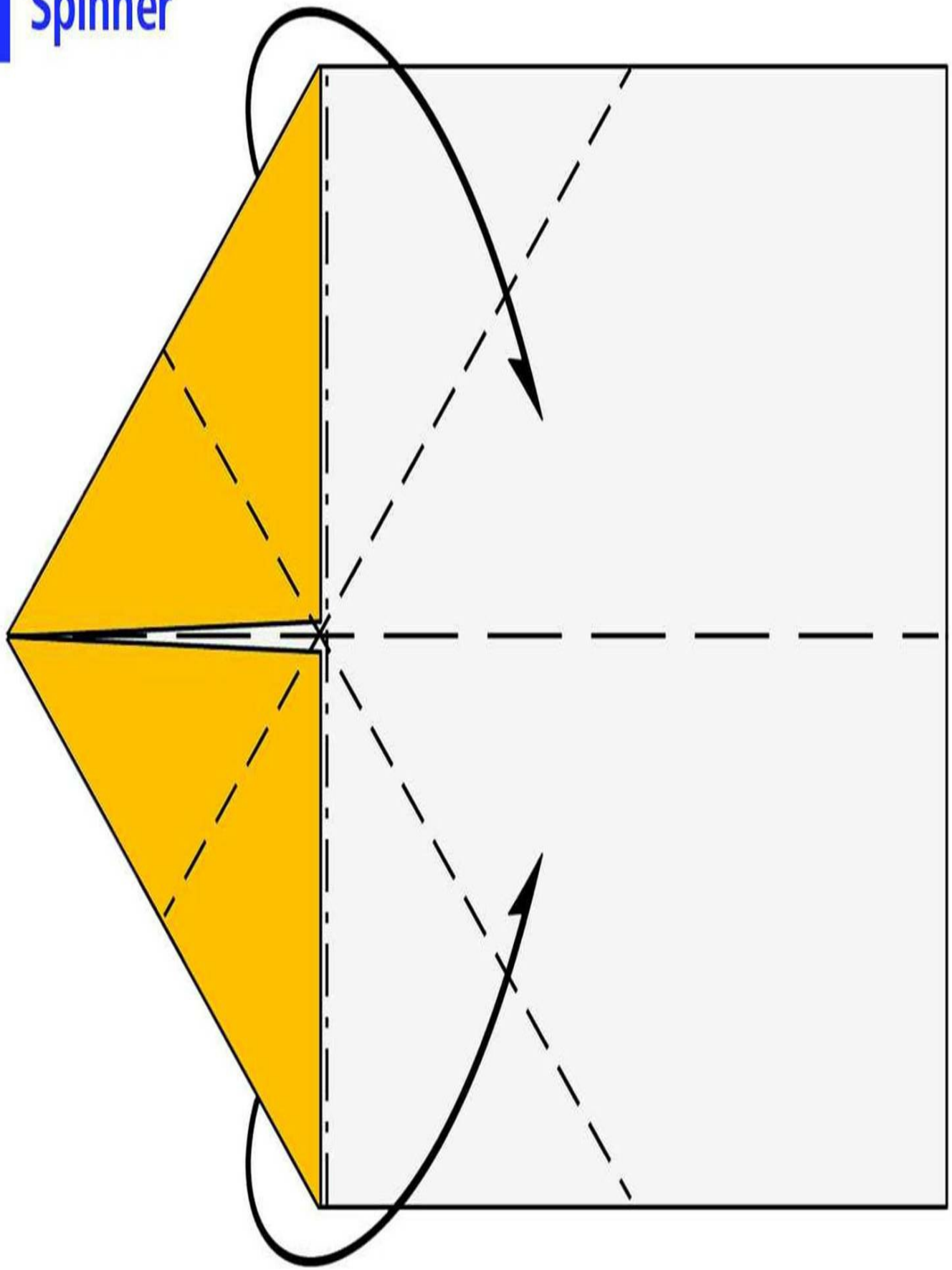
The completed Shuttle Copter. Thrust the craft straight up in the air as hard as you can. This model is best thrown from the top of a building or cliff. The nose cone is heavy enough to give your throw momentum. When it reaches maximum height from the energy of your throw, it will begin to rotate as gravity takes over, and then gently spin to earth.

Spinner

This craft will catch anyone's eye as it streaks rudely past, spinning on its way to meet its target; ideal for schoolroom antics.

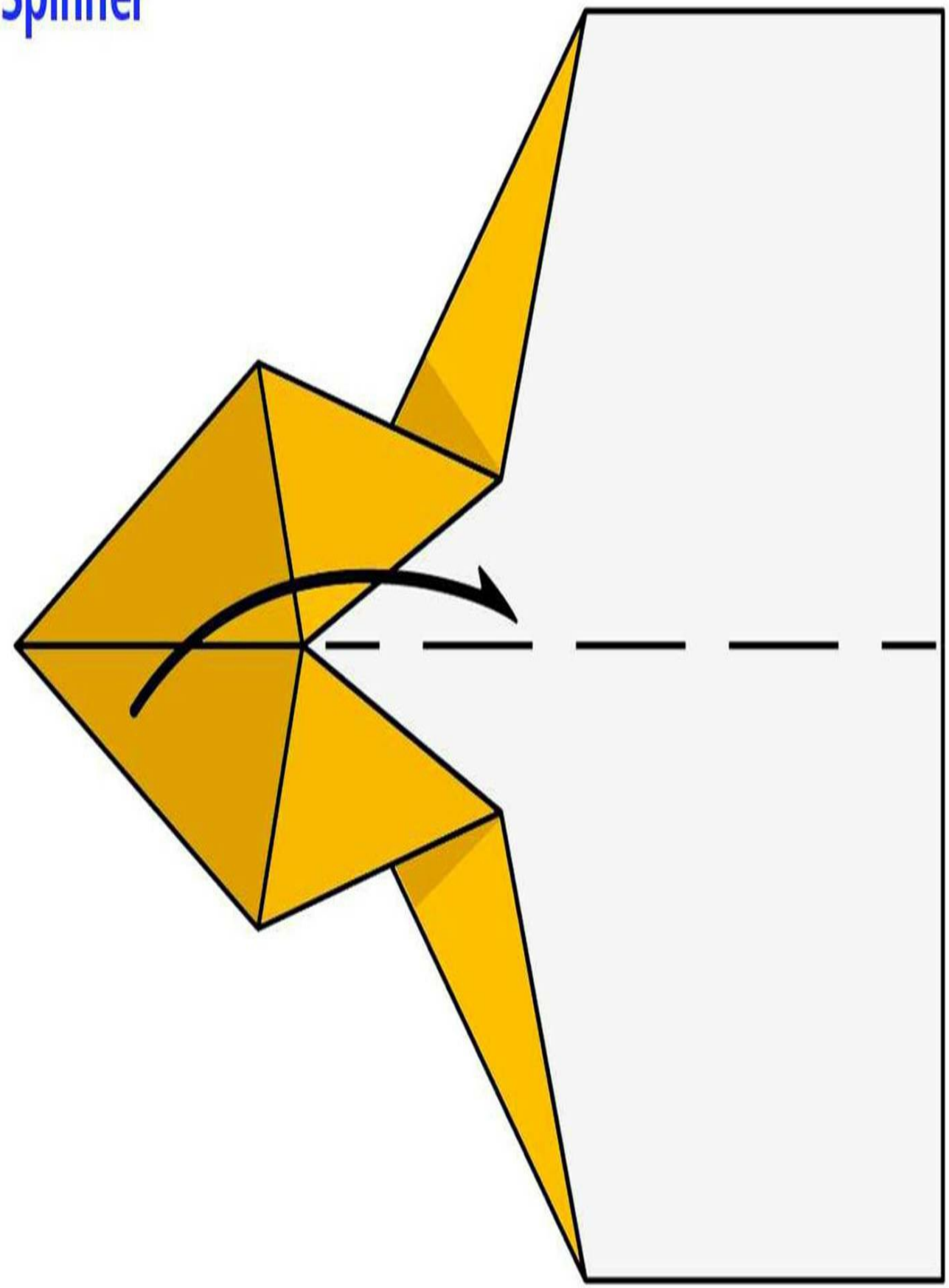
This model has a different basic fold but uses the same folding principle as the Super Looper, where you make creases and collapse the sides together.

1 Spinner

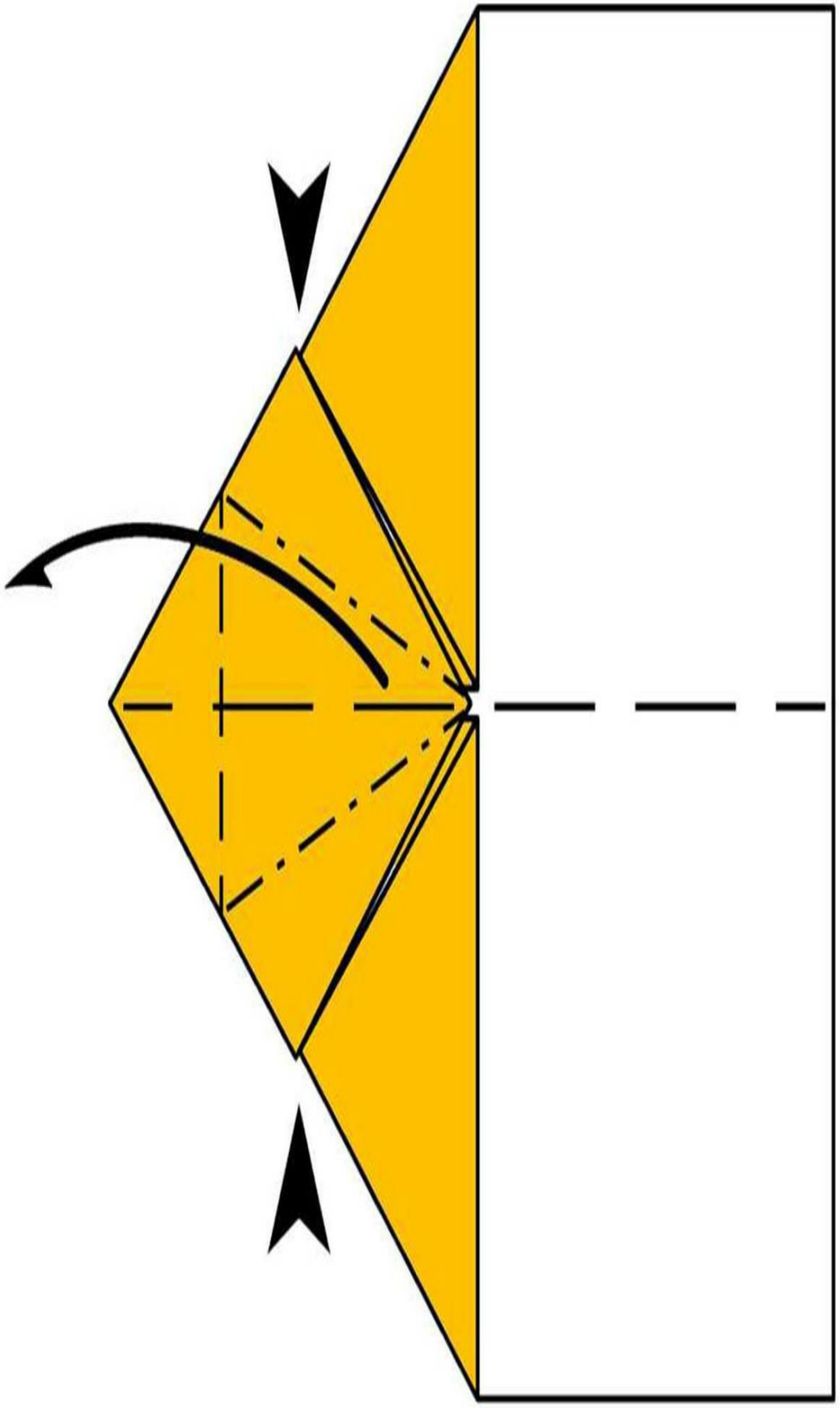


In Step 1, begin with a sheet of paper with the corners folded in, and having a center crease. Now make diagonal crease-folds and bring the sides together. Step 2 shows this procedure almost done.

2 Spinner

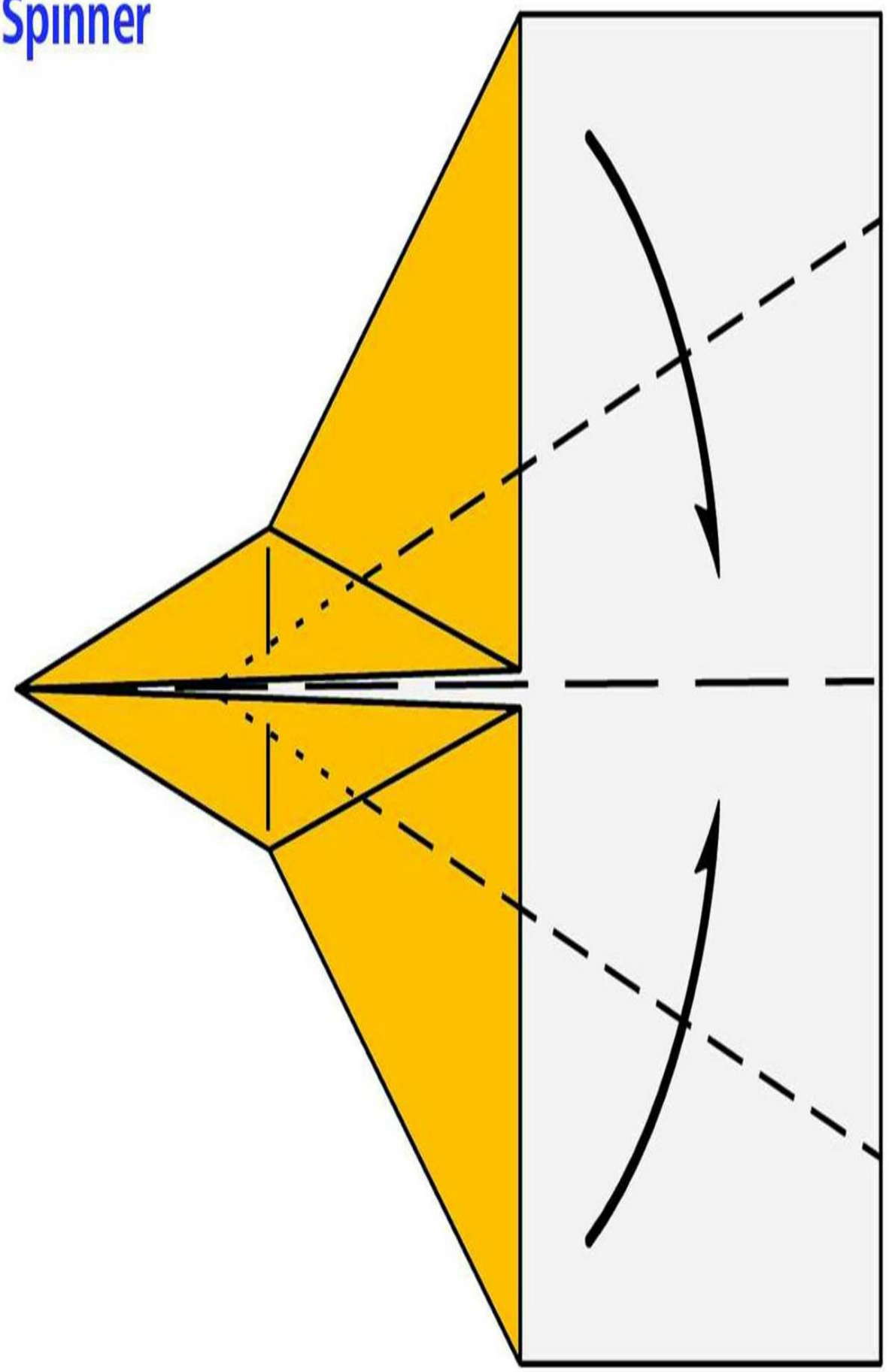


3 Spinner



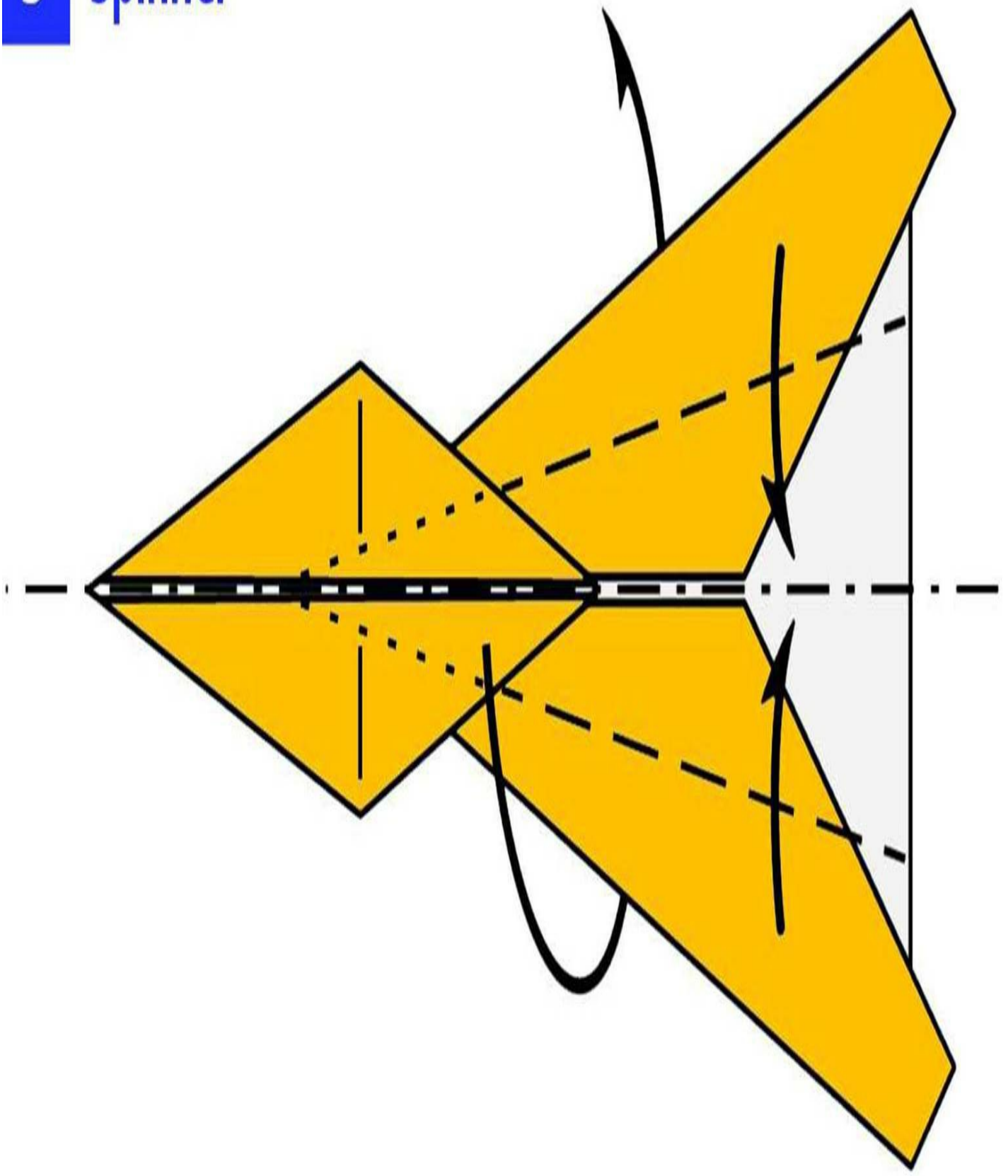
In Step 3, crease and then open out the triangle section, while pushing in the sides and folding to the left.

4 Spinner



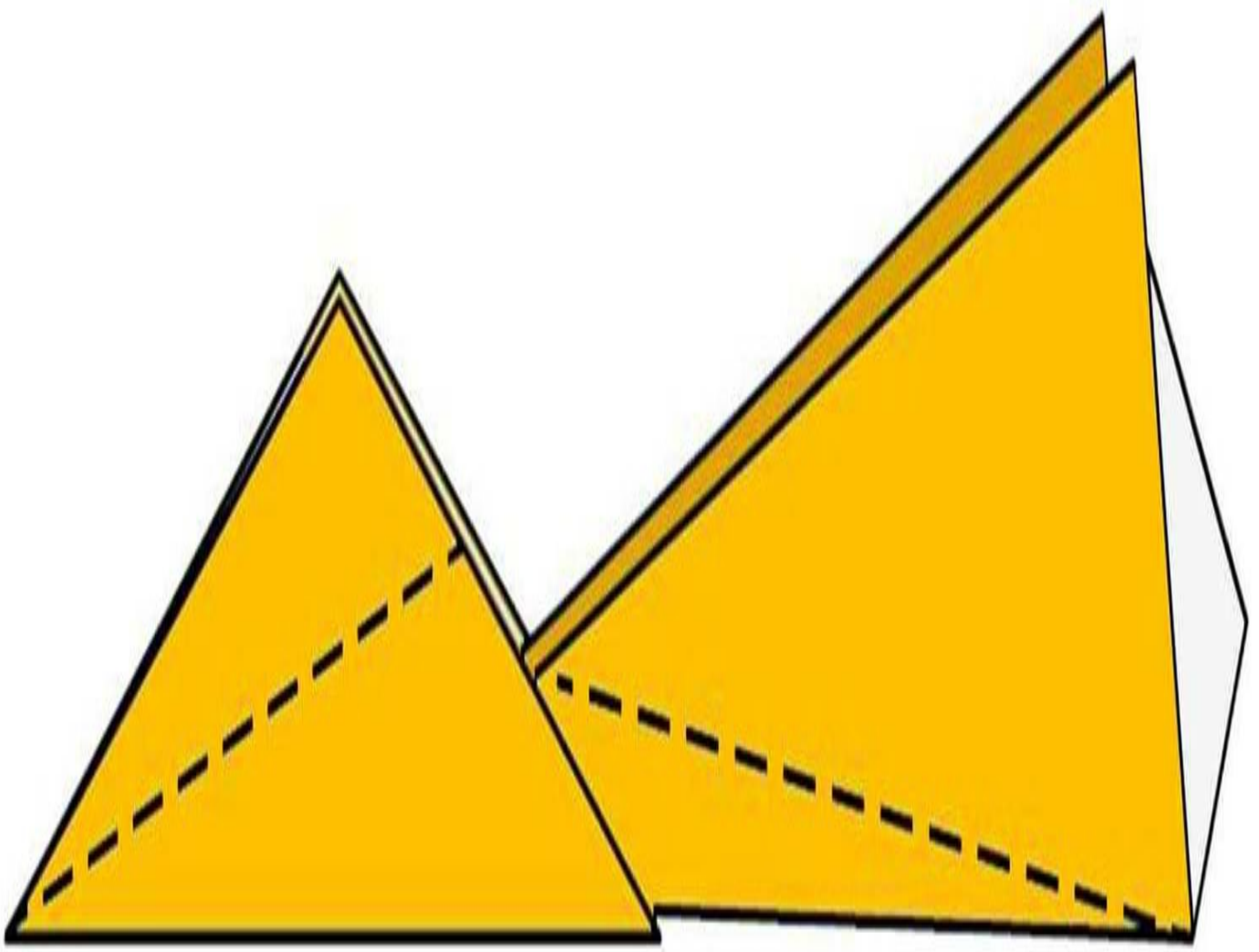
In Step 4, fold sides in along the dashes indicated, including the hidden dotted lines.

5 Spinner

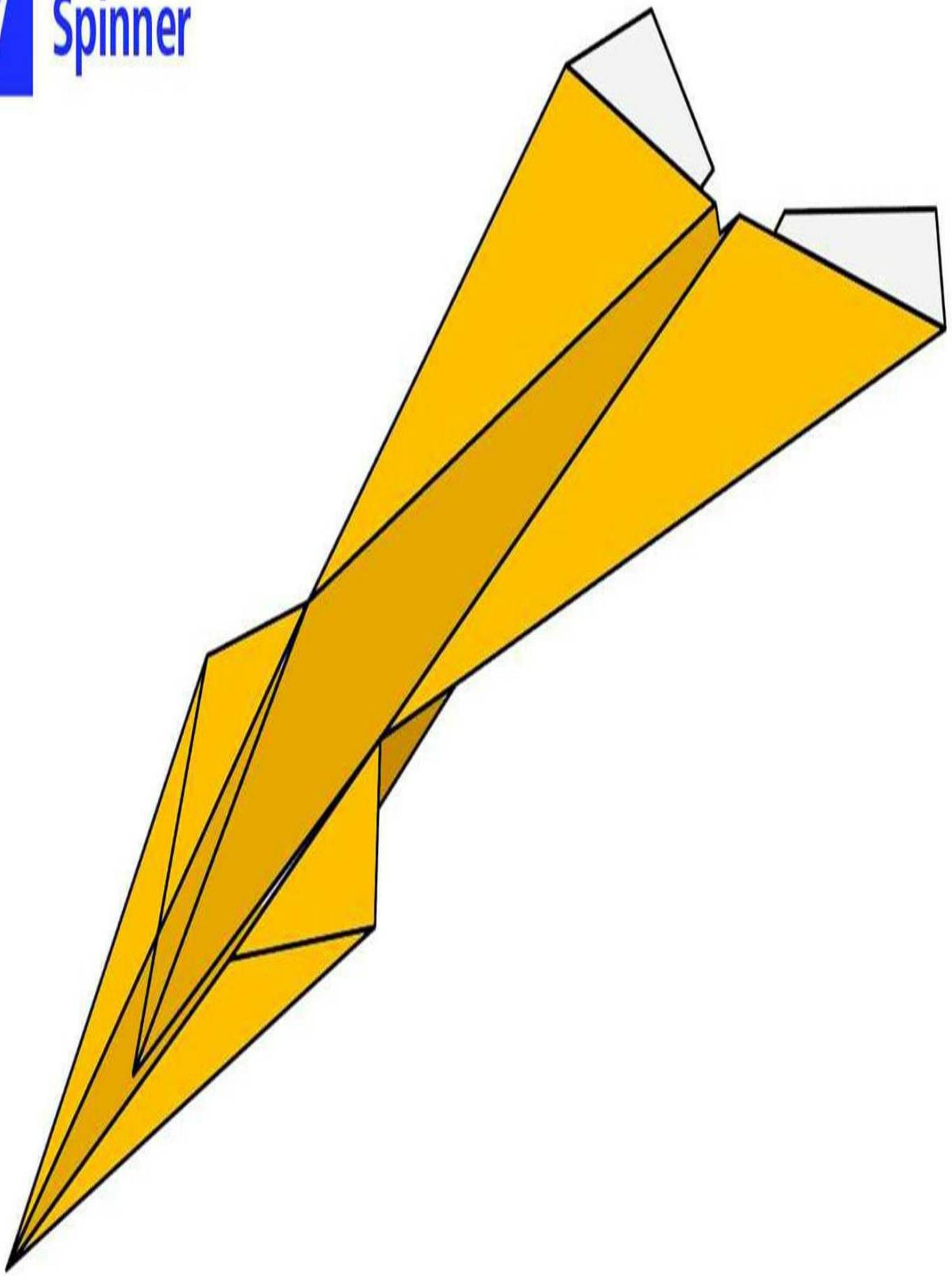


In Step 5, fold sides in again, and then fold lengthwise in half.

6 Spinner



7 Spinner

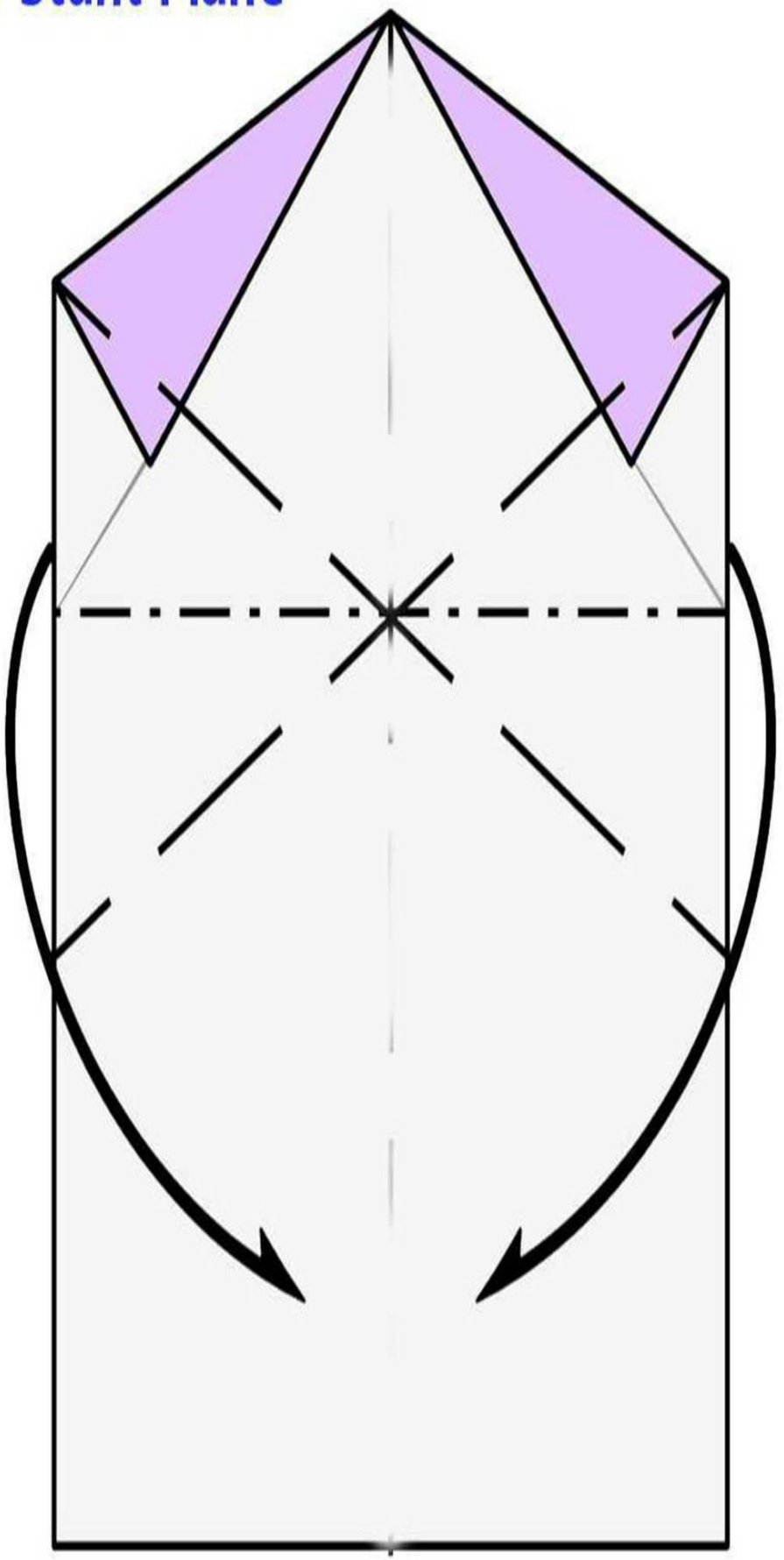


The completed Spinner is ready to annoy! Opposite-angled wings enable the spin action. Experiment with this craft by adjusting the wing angles and see how it performs.

Super Stunt Plane

Similar to the Super Looper, this one does loops, circles and flies high to catch ocean breezes, or wherever there is wind. Great for throwing in open windy areas such as the park, beach, Congress etc.

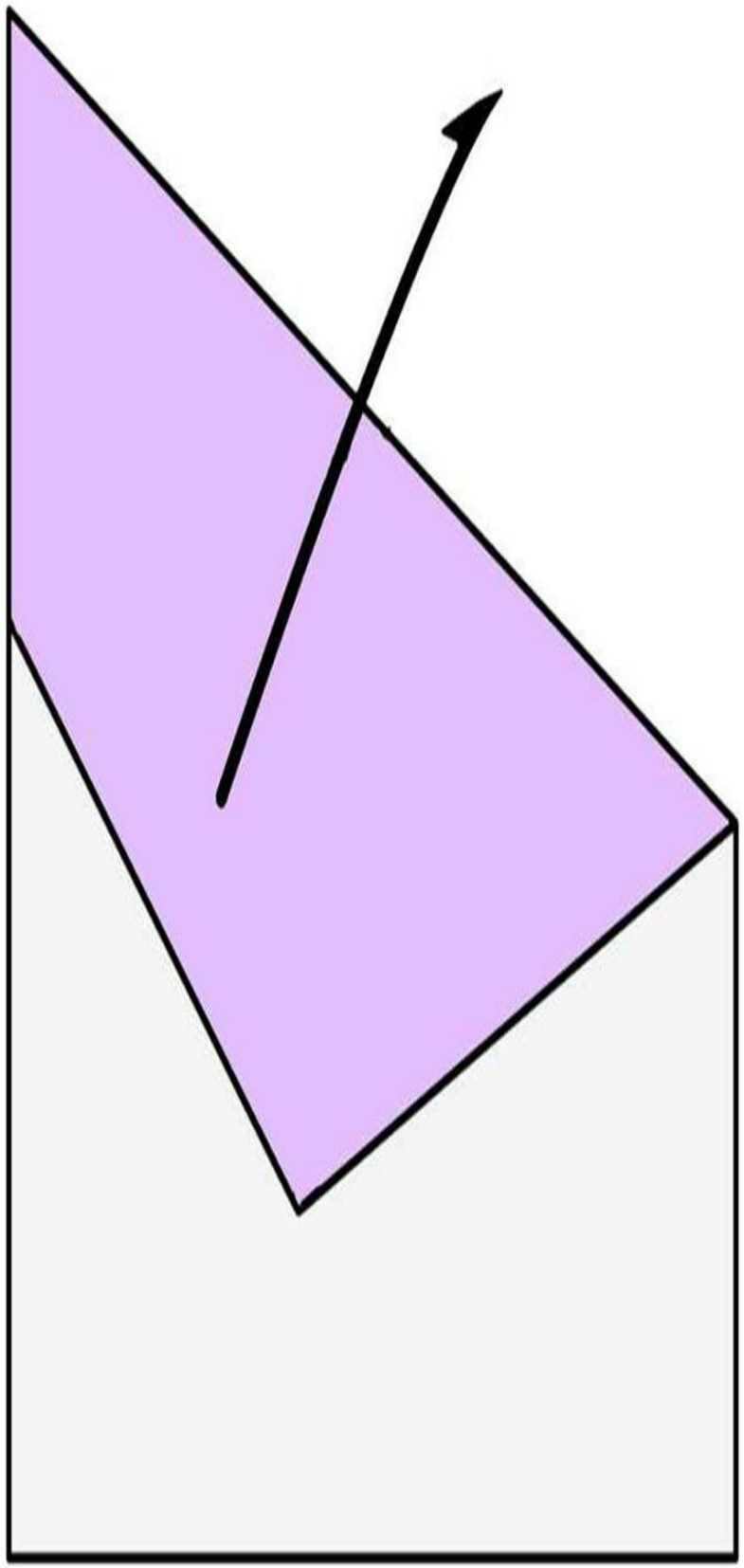
1 Super Stunt Plane



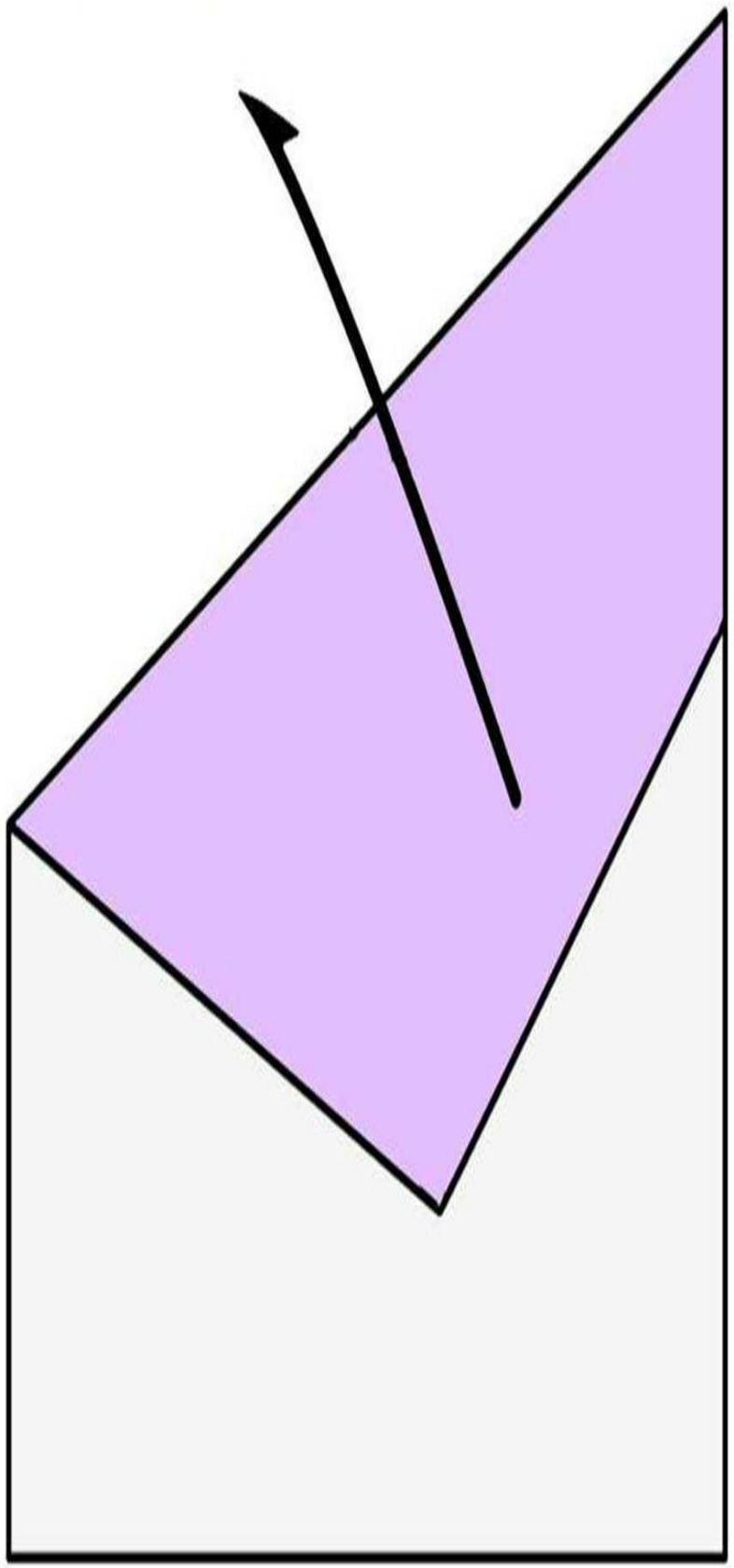
Before you start with Step 1, make the usual center crease, have corners folded in as for a regular dart, unfolded, and then folded to meet the new shallow-angle creases.

In step 1, make the intersecting diagonal creases (shown in the following three steps), plus a horizontal one that also intersects the diagonals. You will then be bringing the sides together to form a slightly different basic fold from the Super Looper.

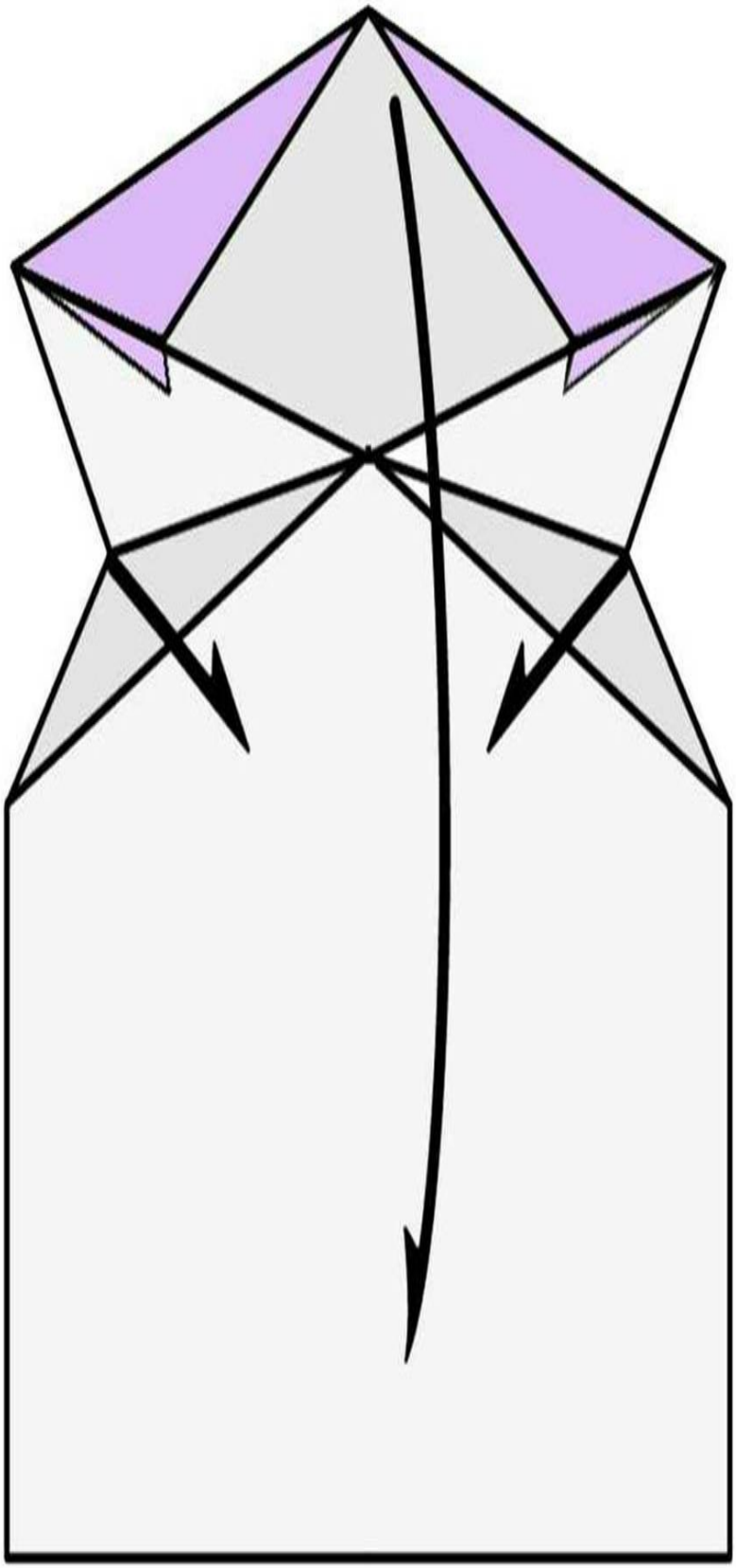
2 Super Stunt Plane



3 Super Stunt Plane

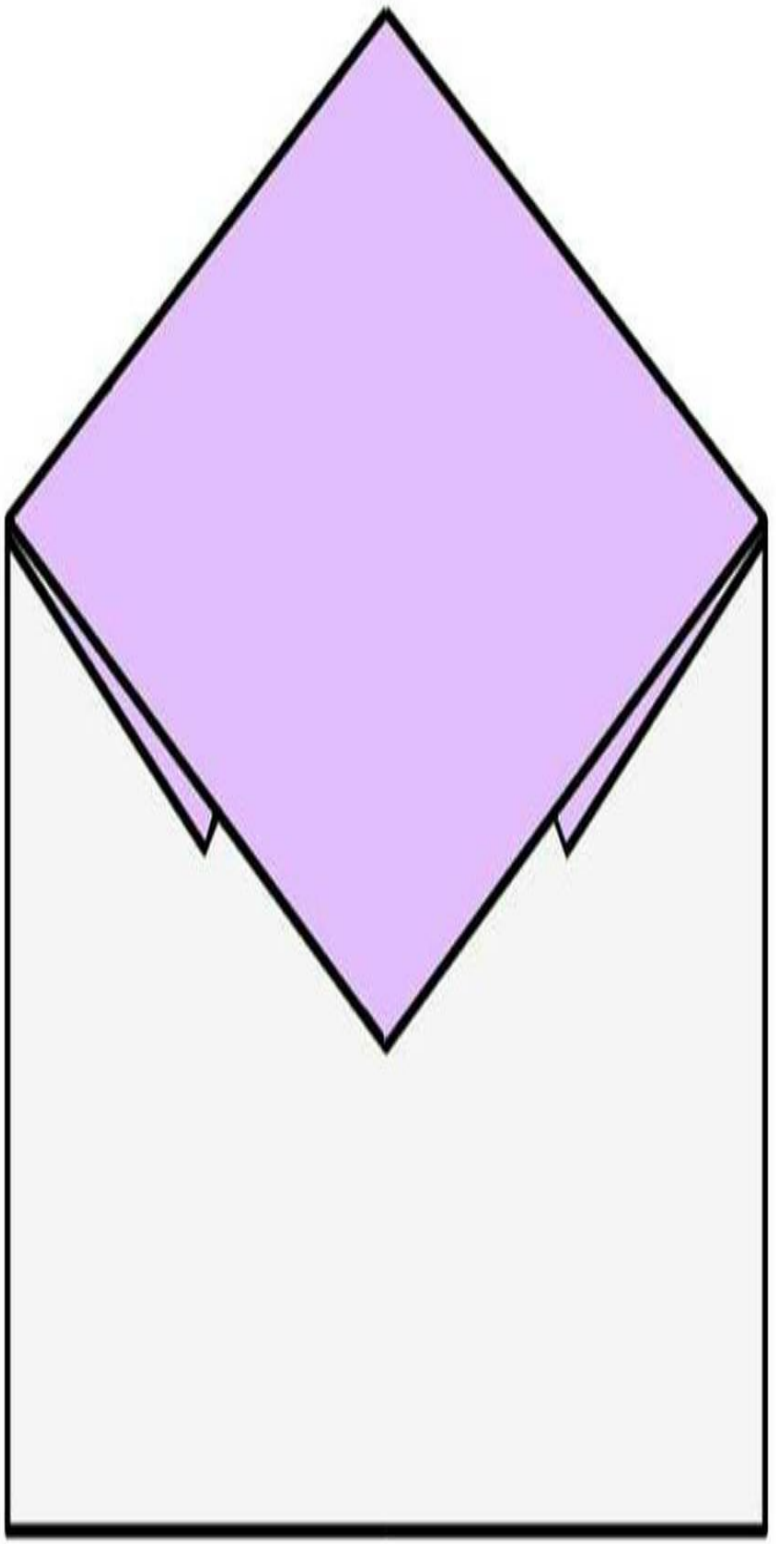


4 Super Stunt Plane



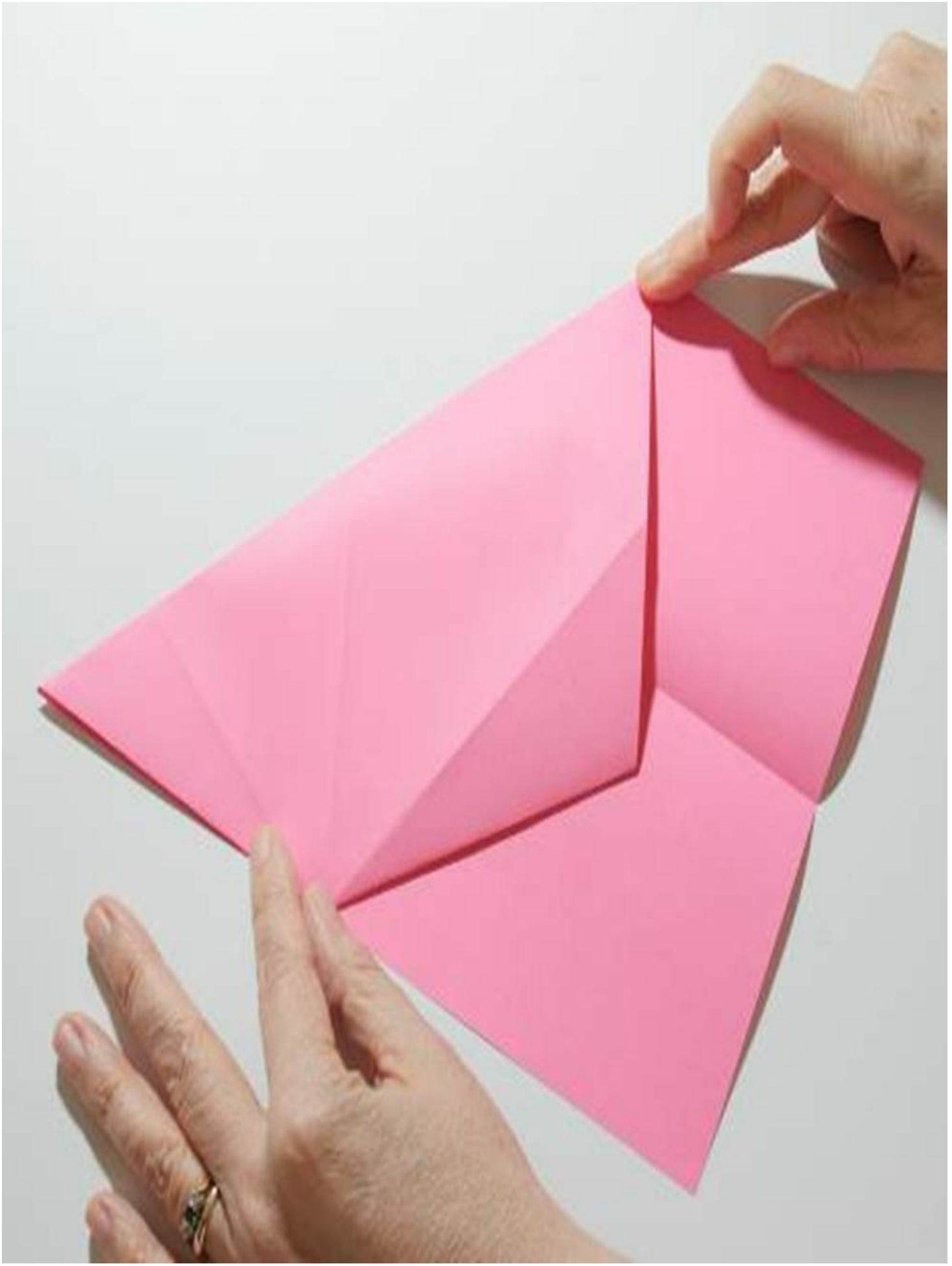
In Step 4, we are bringing in the sides and top to make our basic fold.

5 Super Stunt Plane



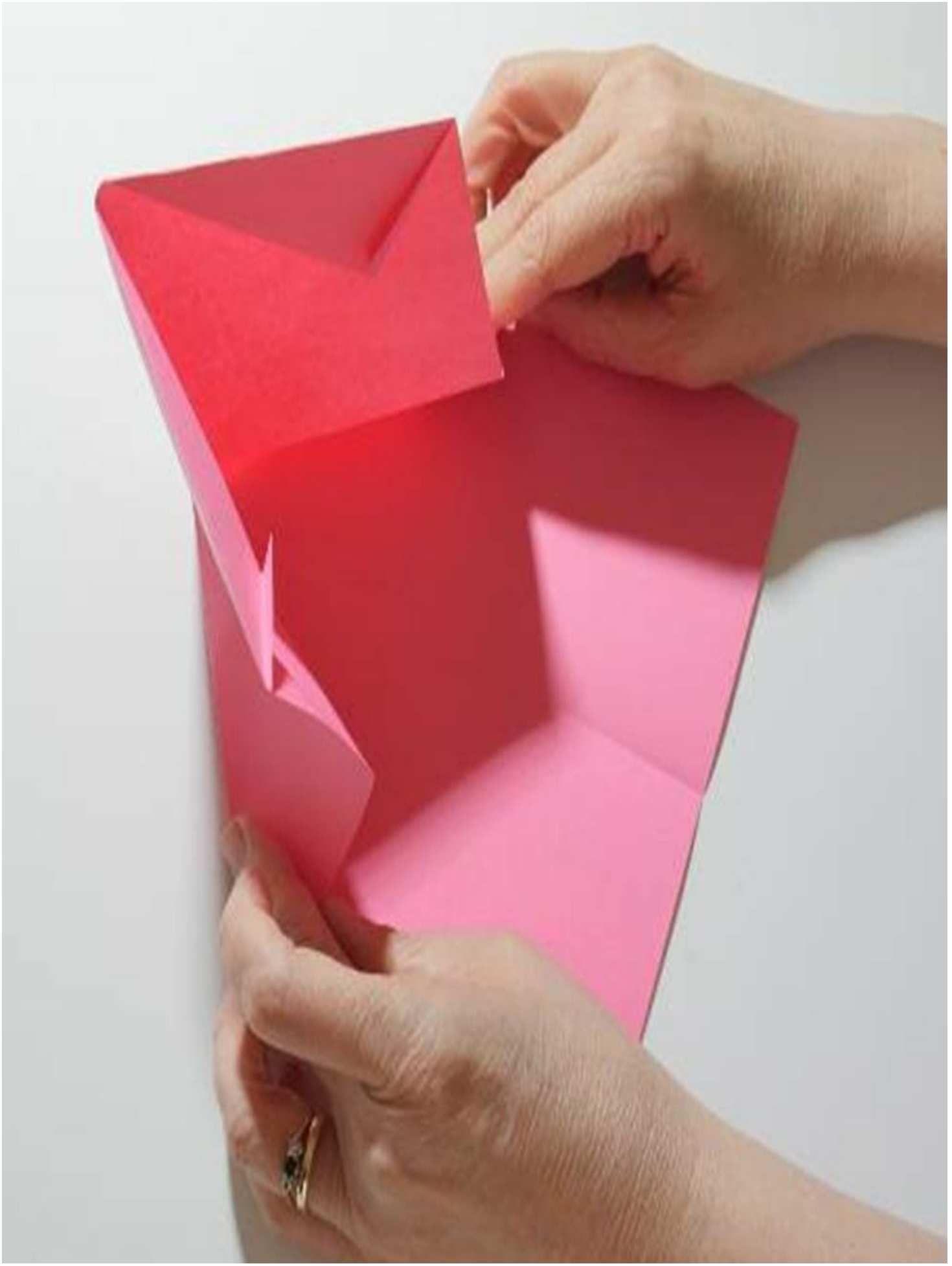
Step 5: Basic fold done! If you are having trouble, please follow these photos…

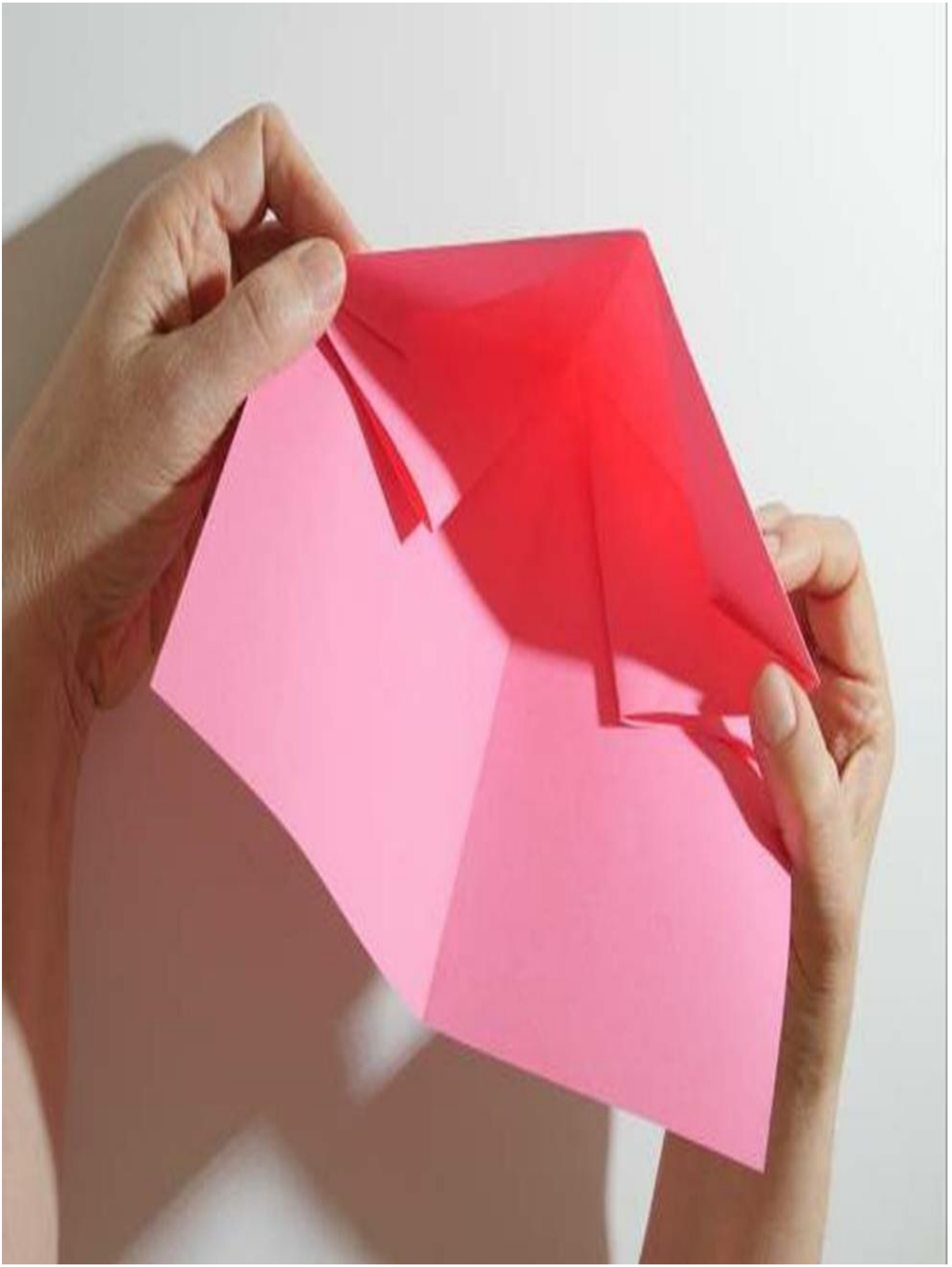
Fold/unfold diagonals and then turn the model over.



Make a horizontal crease where the diagonals intersect.

Push in center, pop up sides, and bring them together.

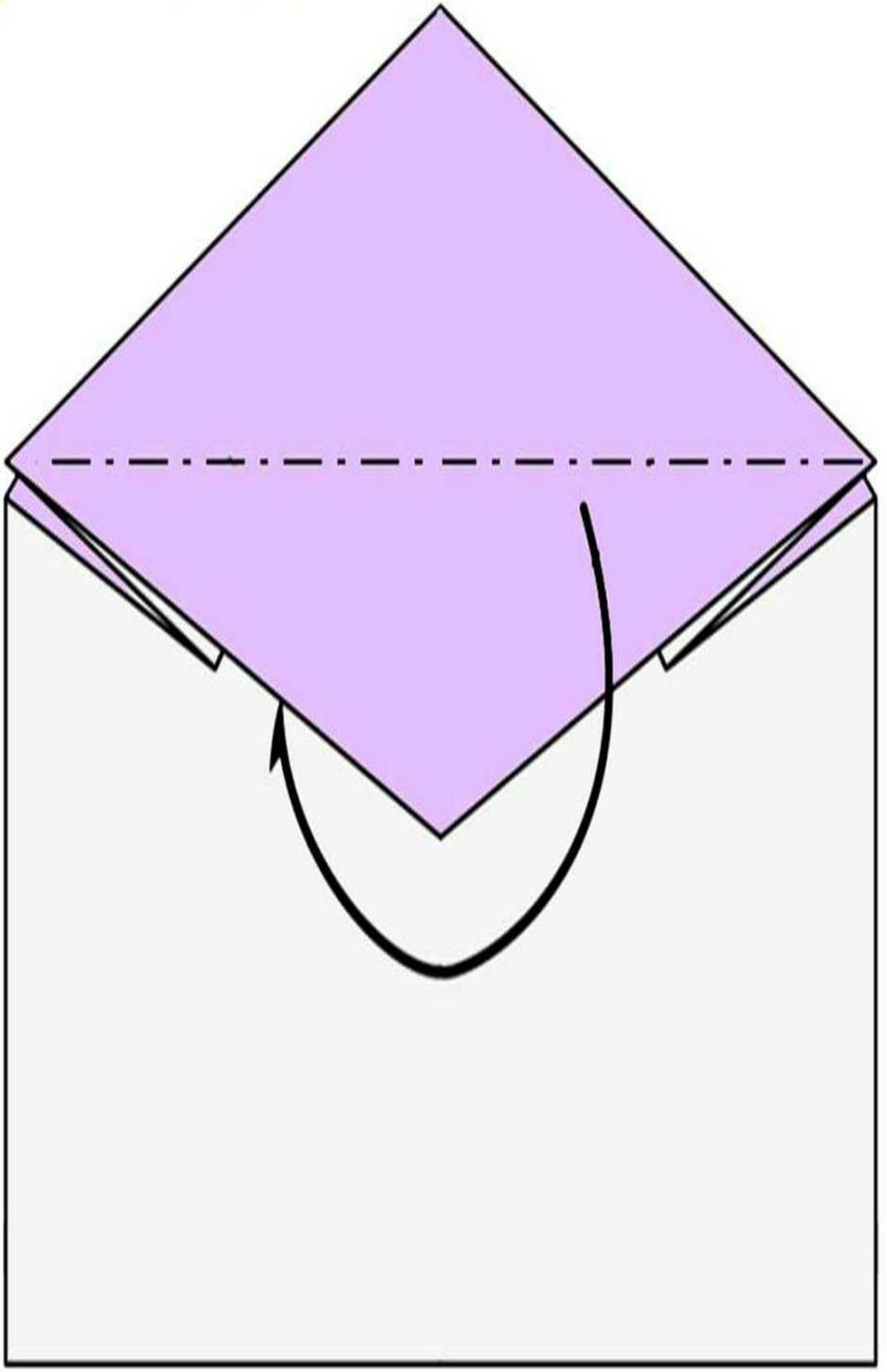




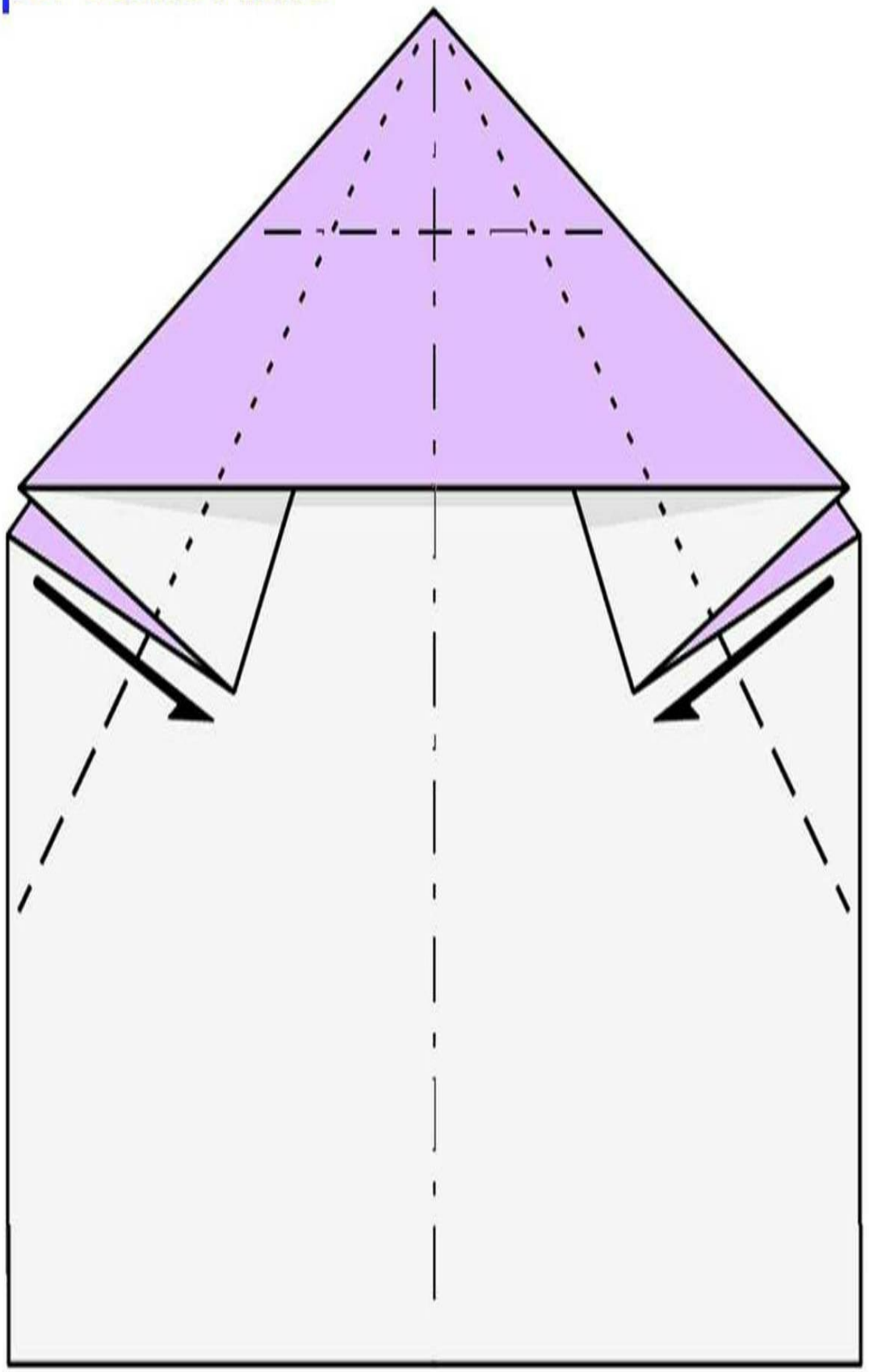
Flatten the fold…

Done!

6 Super Stunt Plane

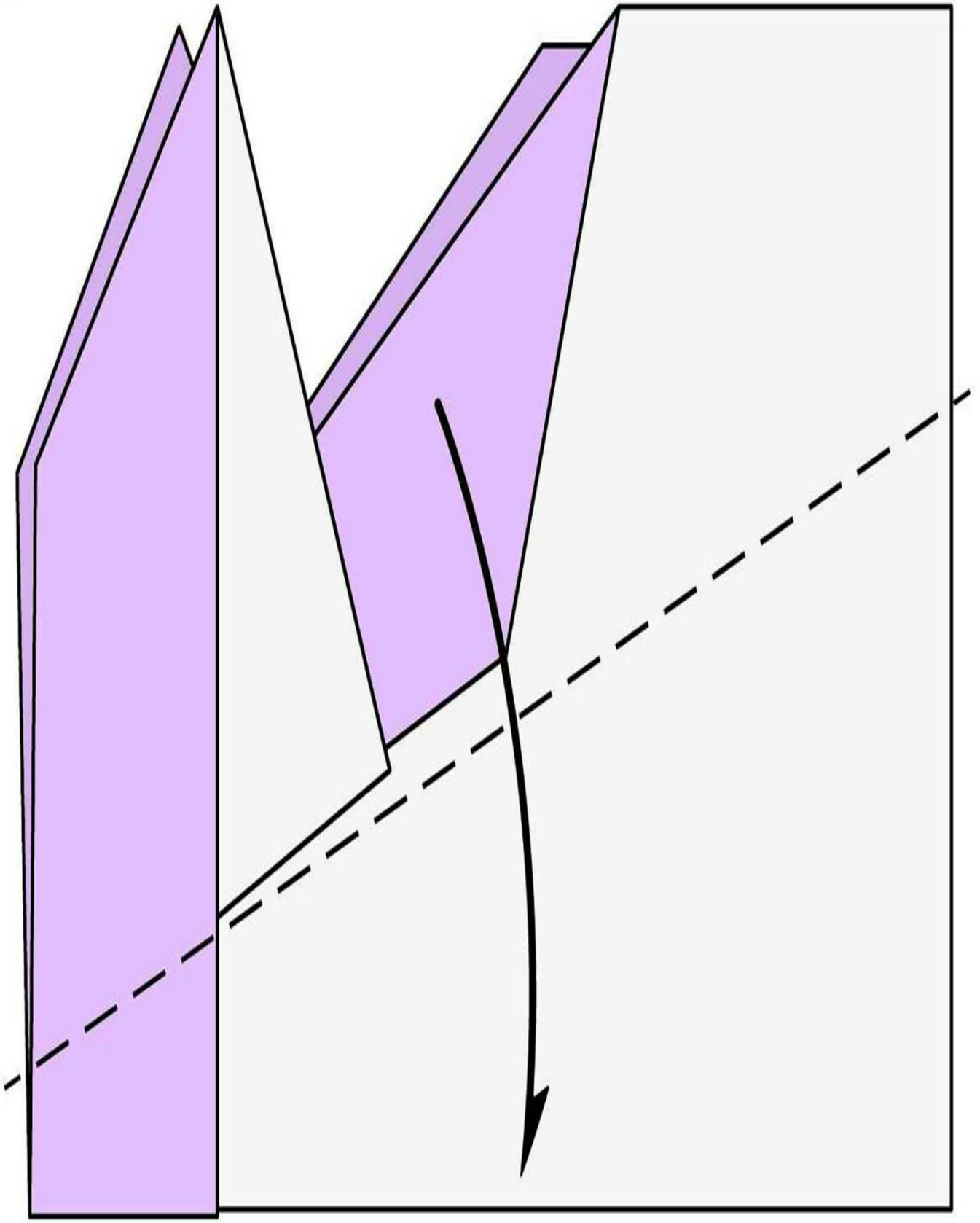


7 Super Stunt Plane

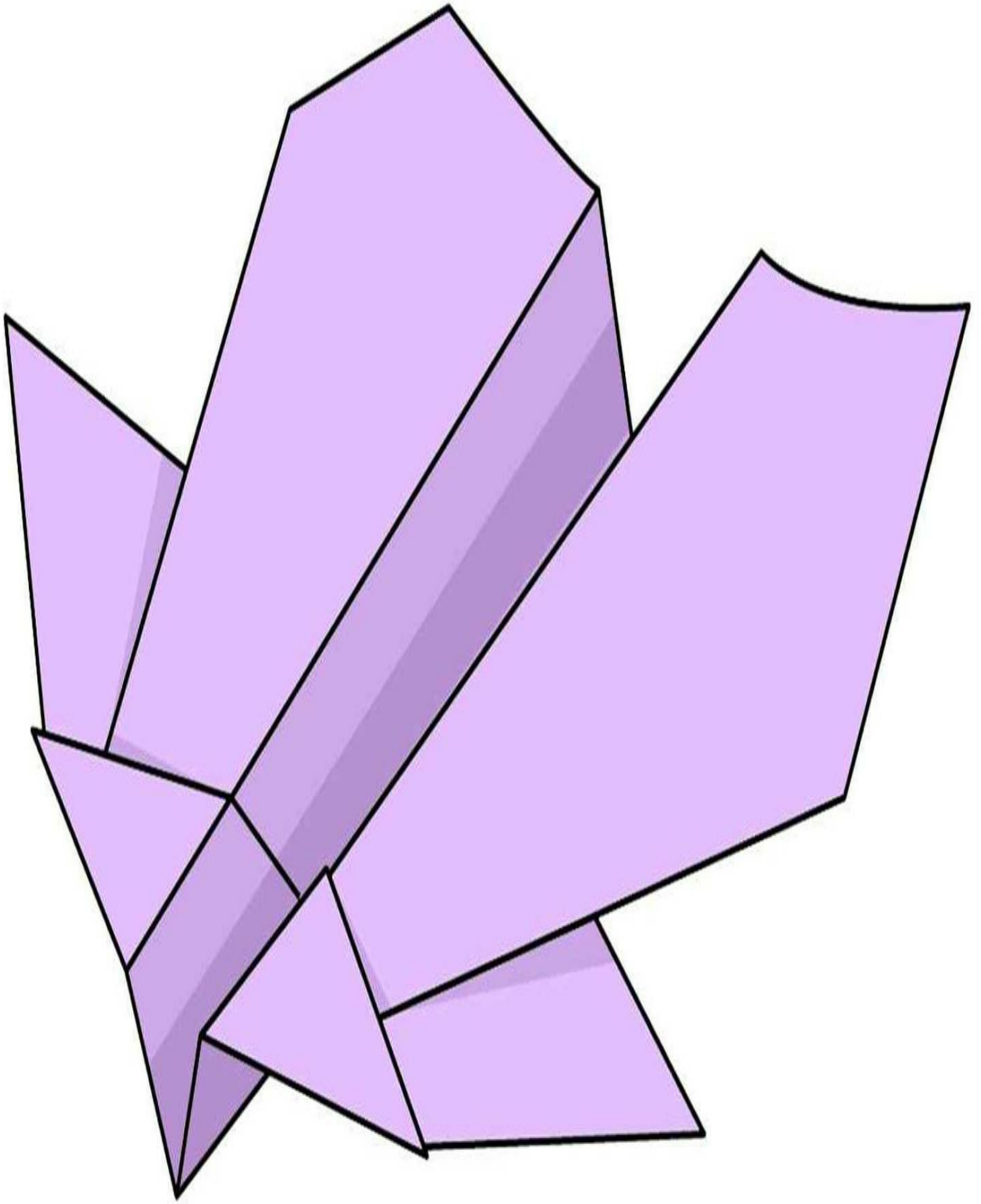


In Step 7, fold sides in, noting hidden folds. Fold the nose section behind, and then fold in half and swing the paper about to face you for Step 8.

8 Super Stunt Plane



9 Super Stunt Plane



Completed craft; for loops throw vertically with force. For circles throw upwards and away from you with underside facing you. It should return for you to catch.

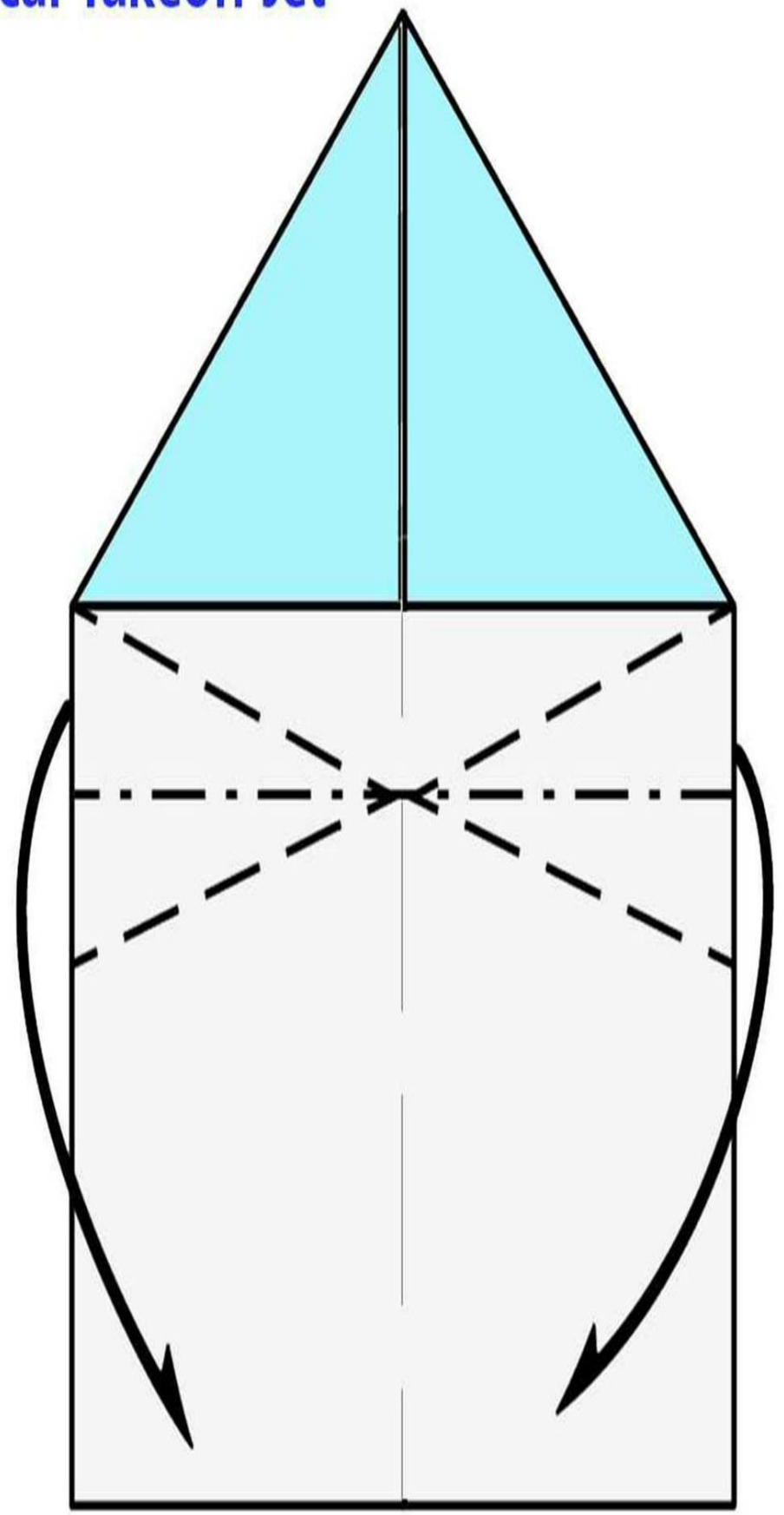
To catch an upward draft, curl front wing-trails up slightly and then curl up the tail wing trailing edges.

Vertical Take-off (Jump) Jet

While it doesn't quite look the part of a sleeker jet, this craft does glide and land well on any surface as its steep angle of descent makes it suitable for landing on shorter runways… such as the aircraft carrier in the book, *Paper Boats!*.

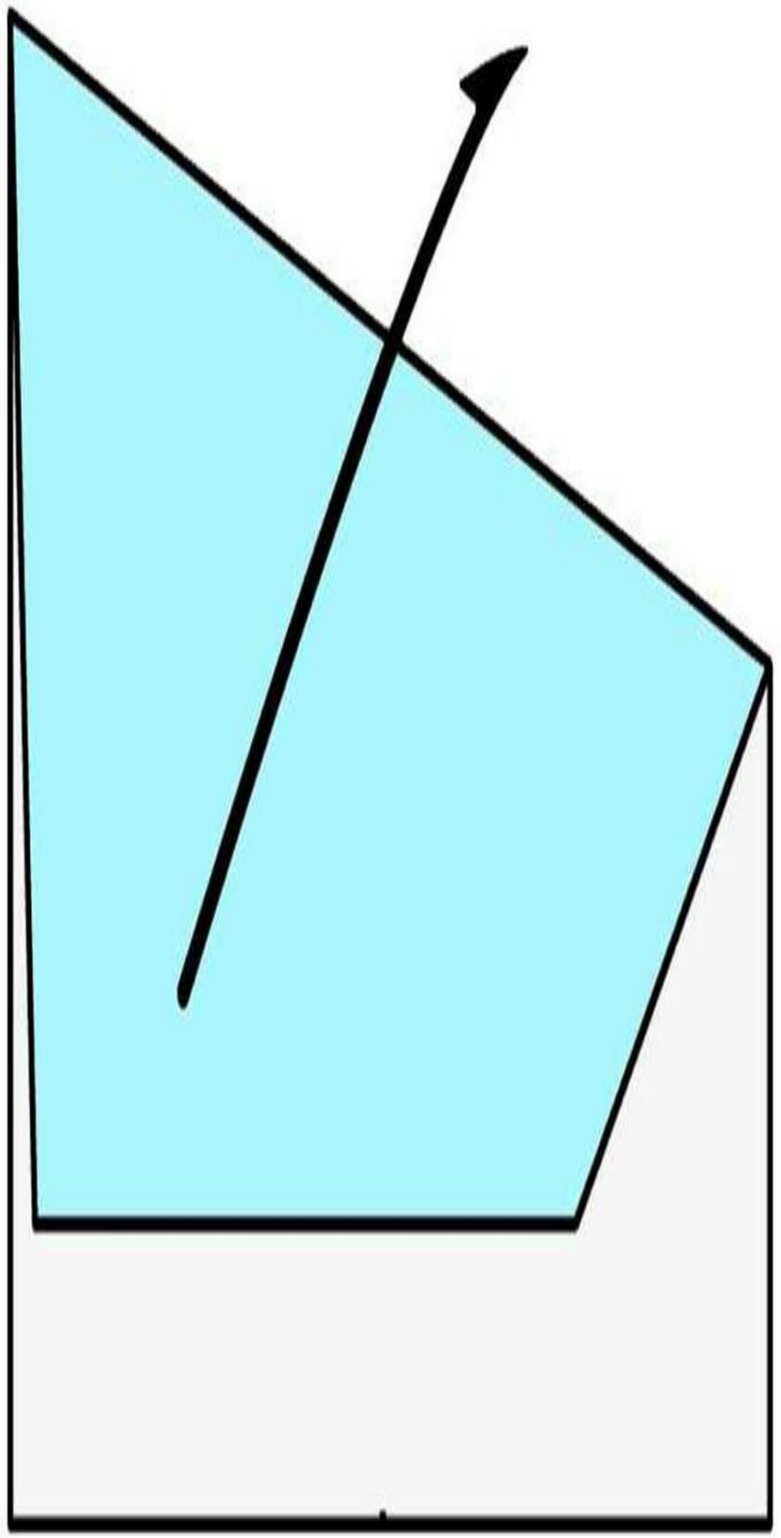
This model uses a similar base fold to that shown for the Super Stunt Plane; however you do not need to make shallow angle folds at the beginning. You should be good at basic folds by now :)

1 Vertical Takeoff Jet

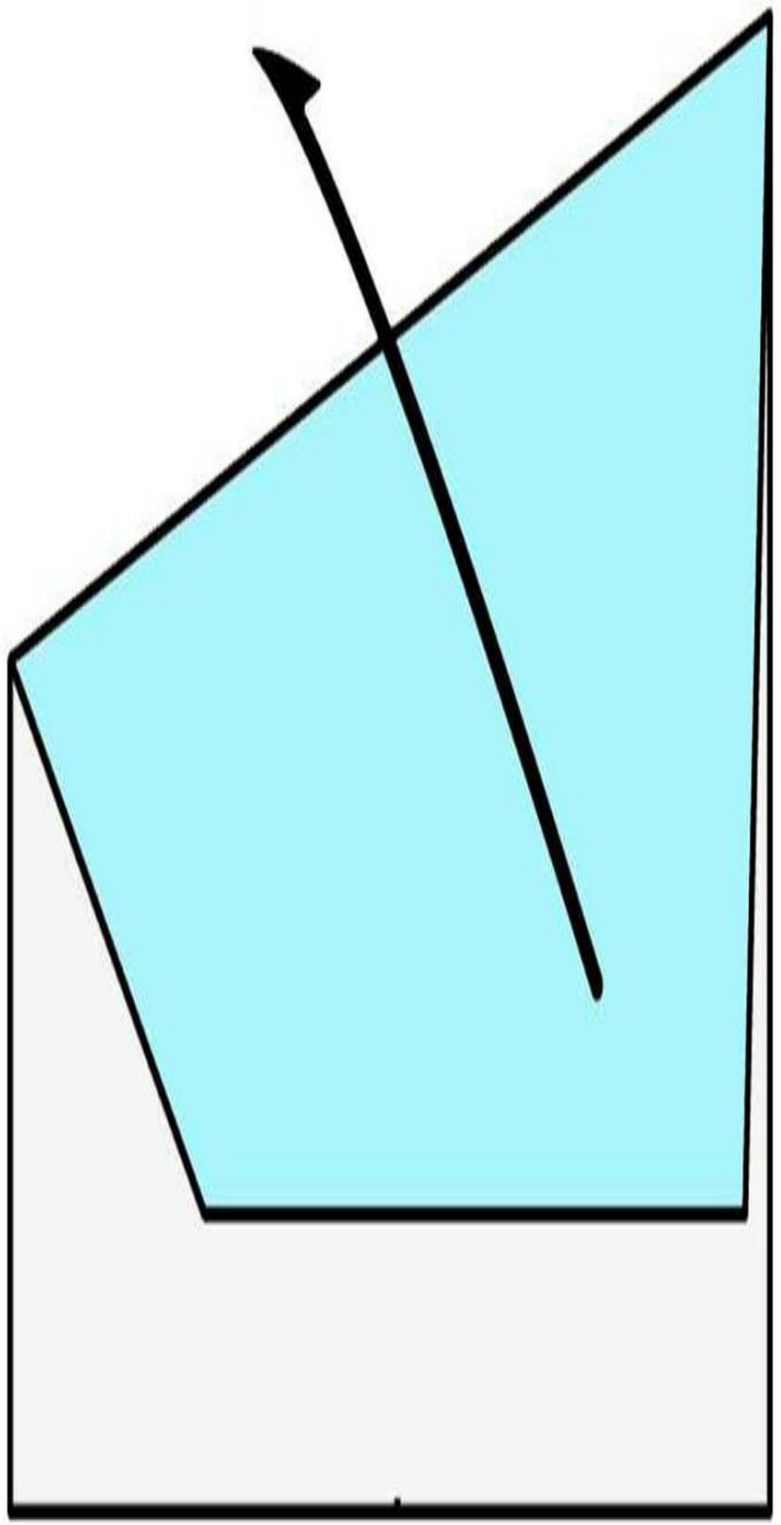


In Step 1, begin with paper having the corners folded in as for a regular dart. Make creases and complete the basic fold shown in Steps 2 – 6. The horizontal dot-dash (mountain fold) line means you crease behind.

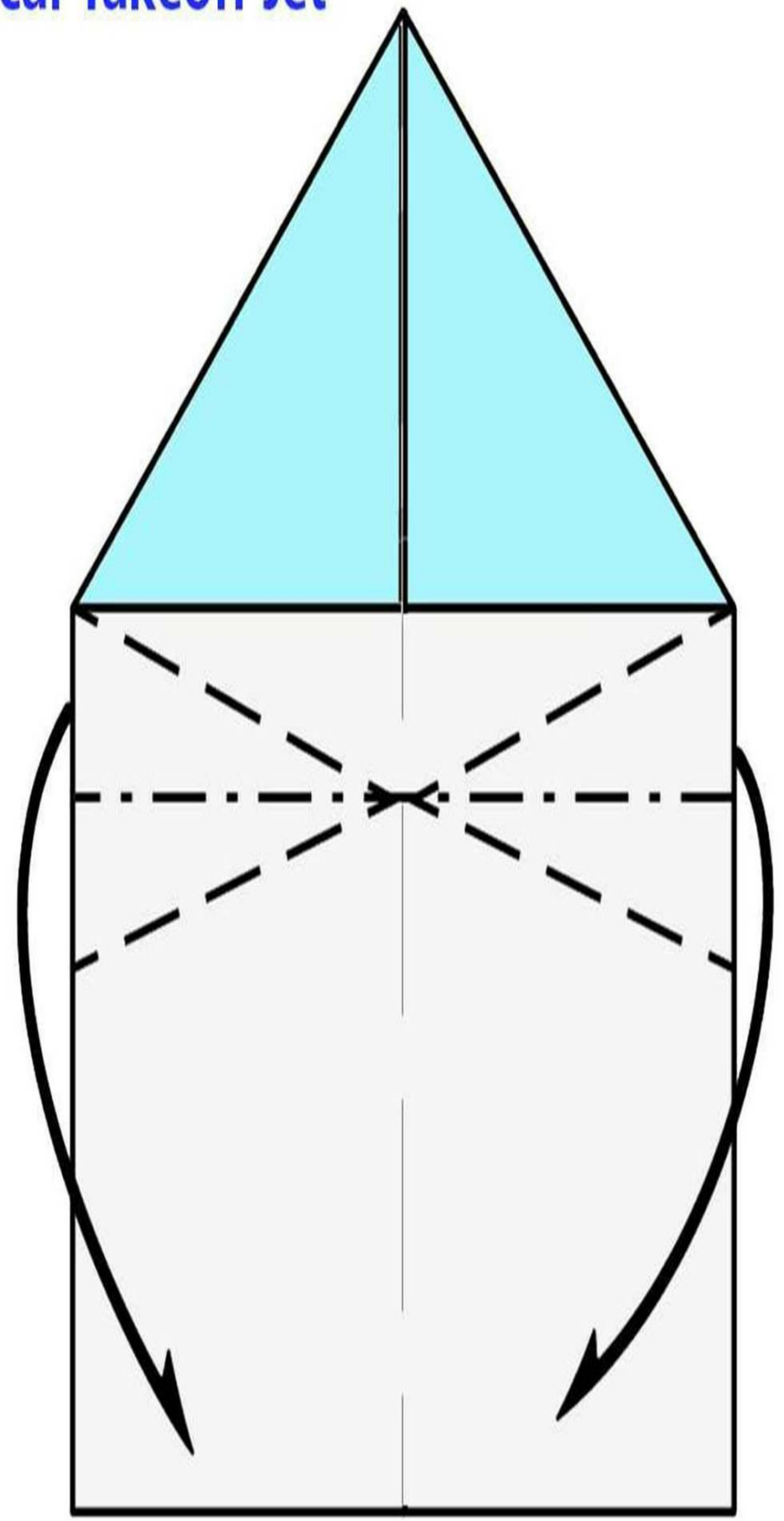
2 Vertical Takeoff Jet



3 Vertical Takeoff Jet

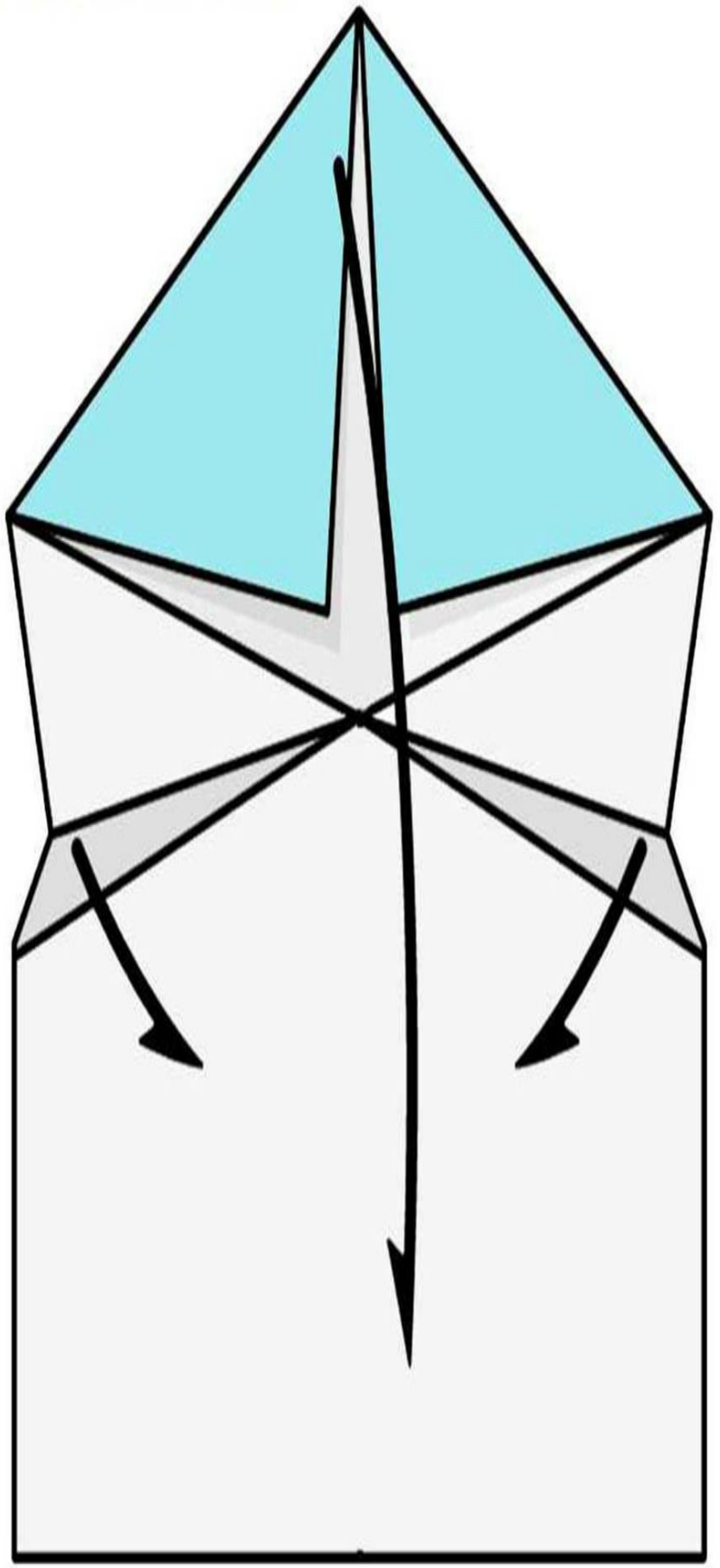


4 Vertical Takeoff Jet

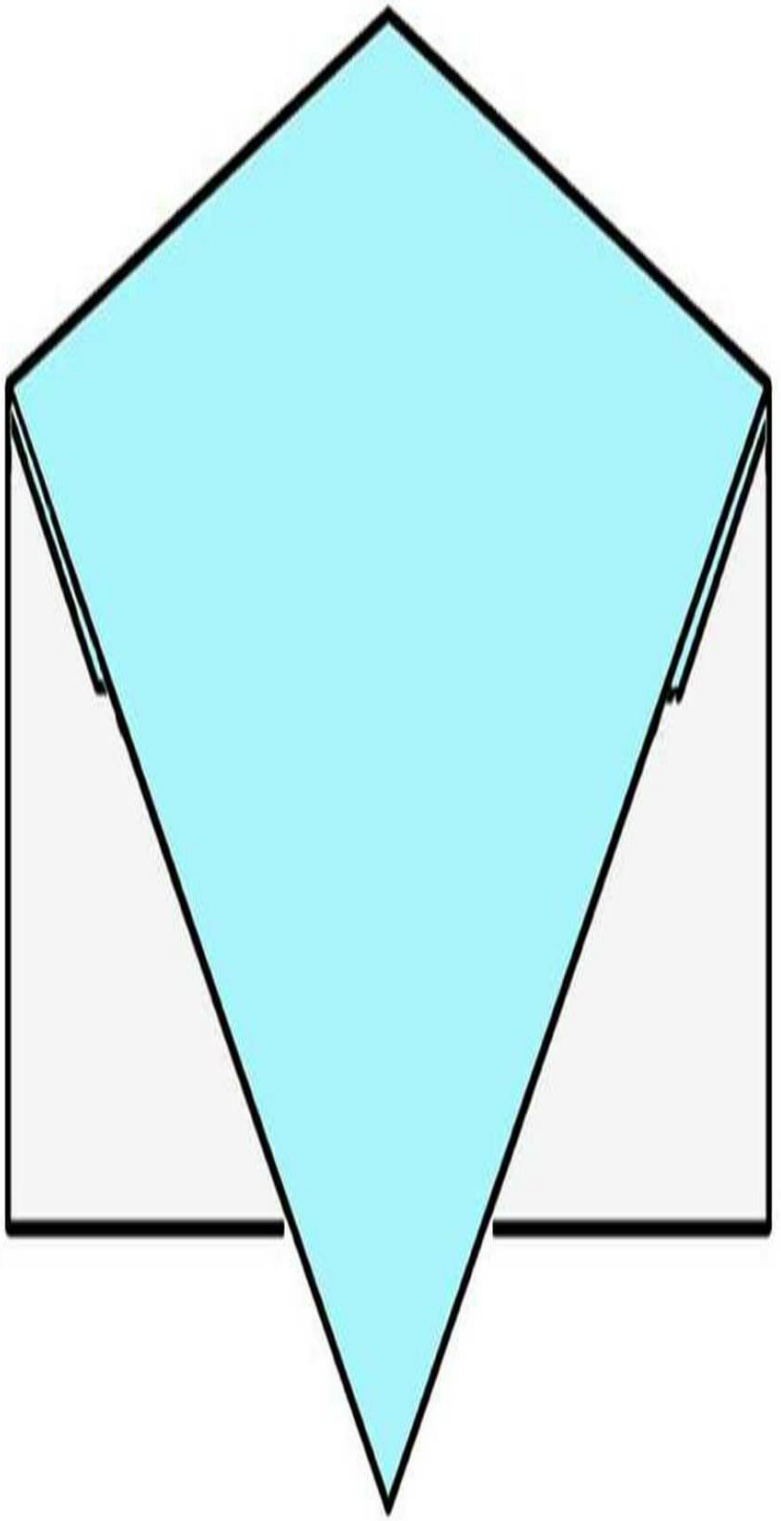


In Step 4, now that you have made your creases, the sides and top should come together easily.

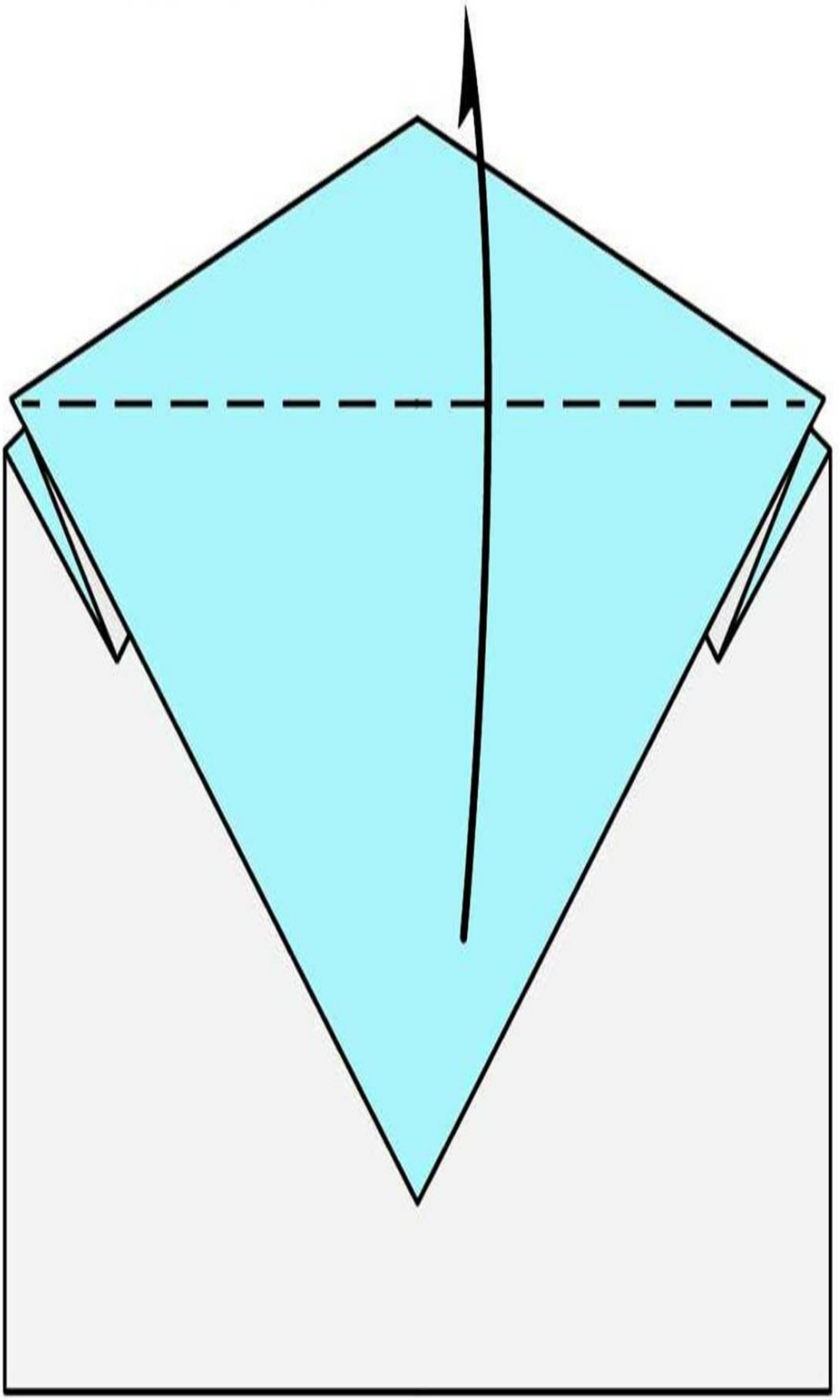
5 Vertical Takeoff Jet



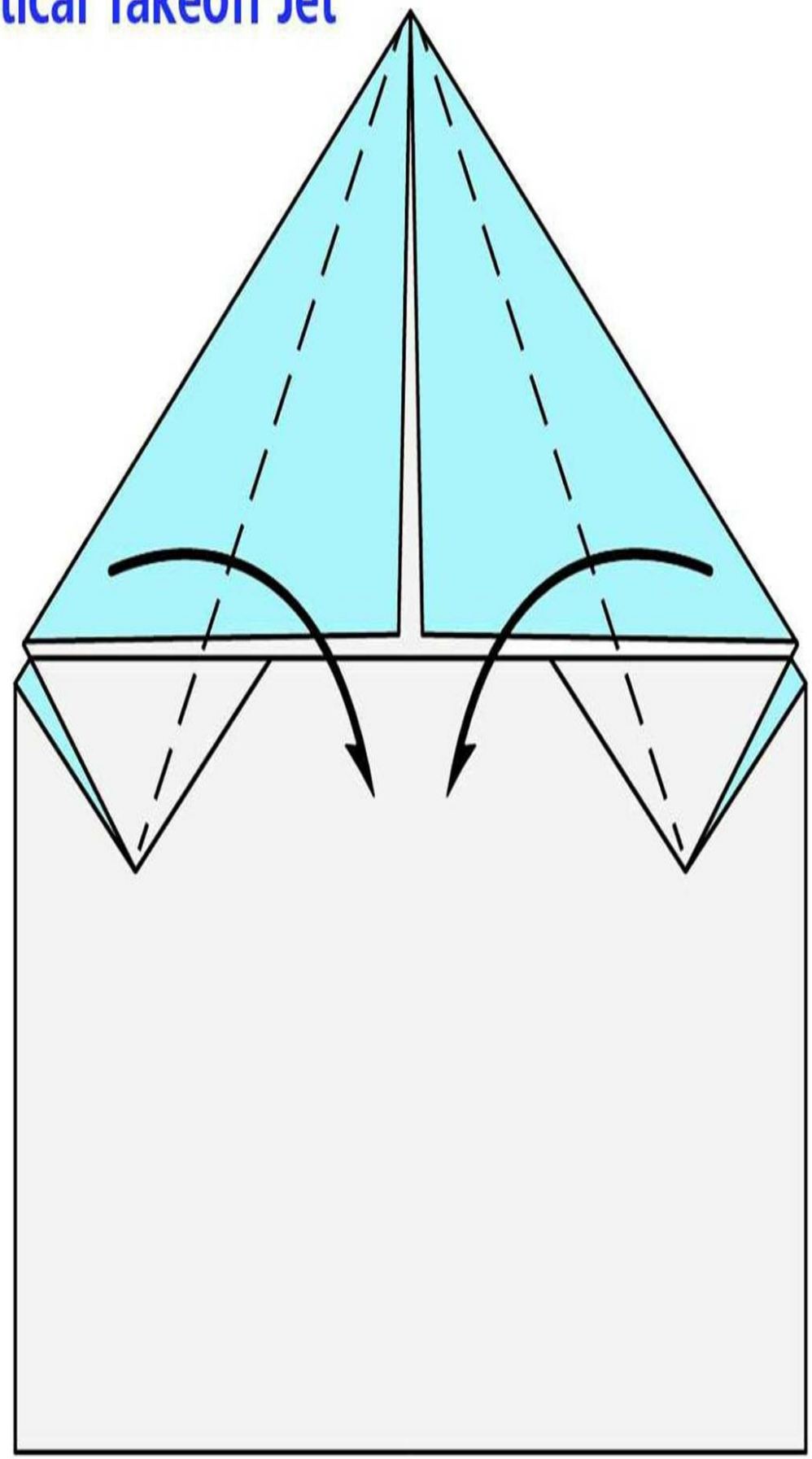
6 Vertical Takeoff Jet



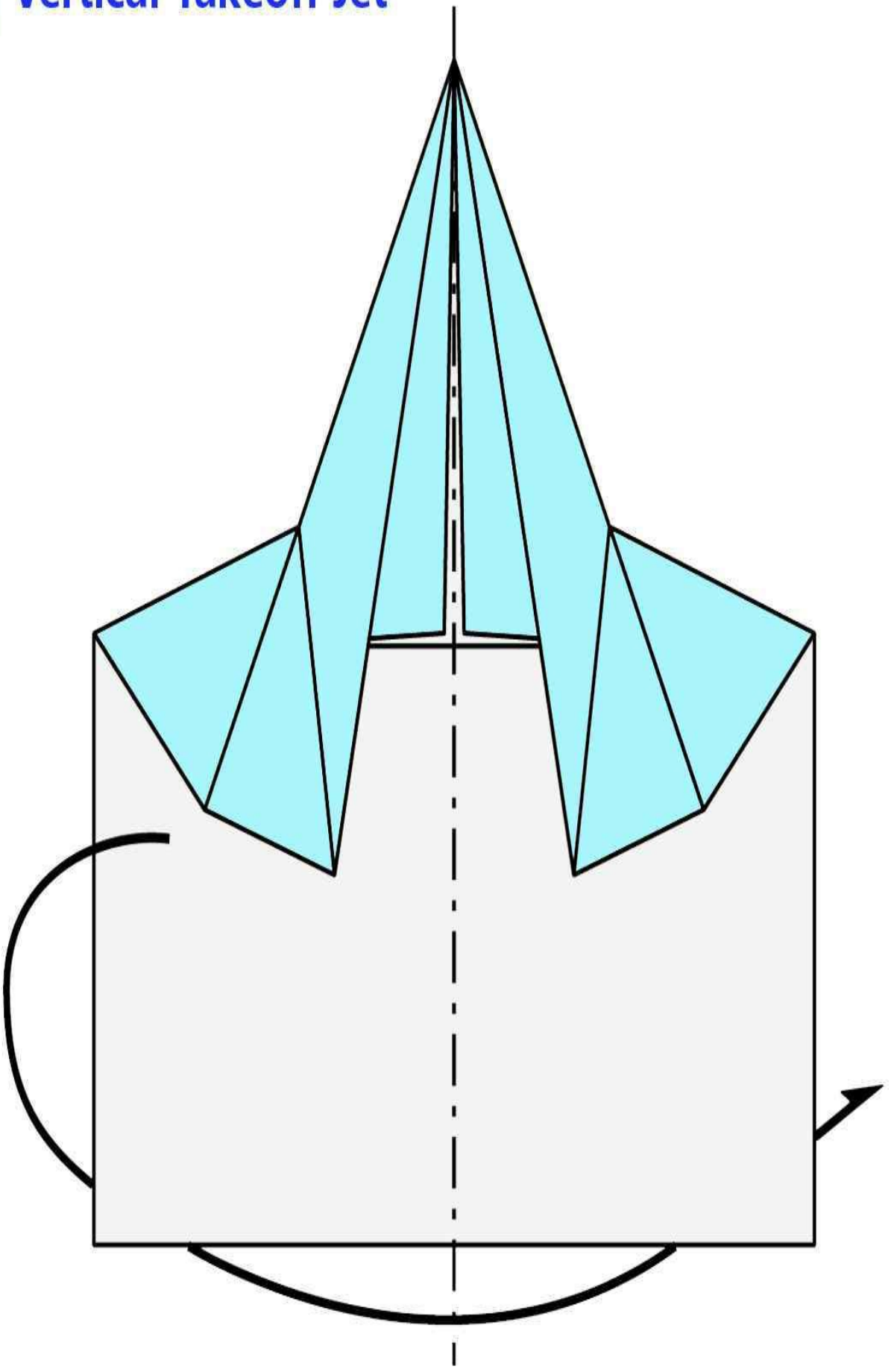
7 Vertical Takeoff Jet



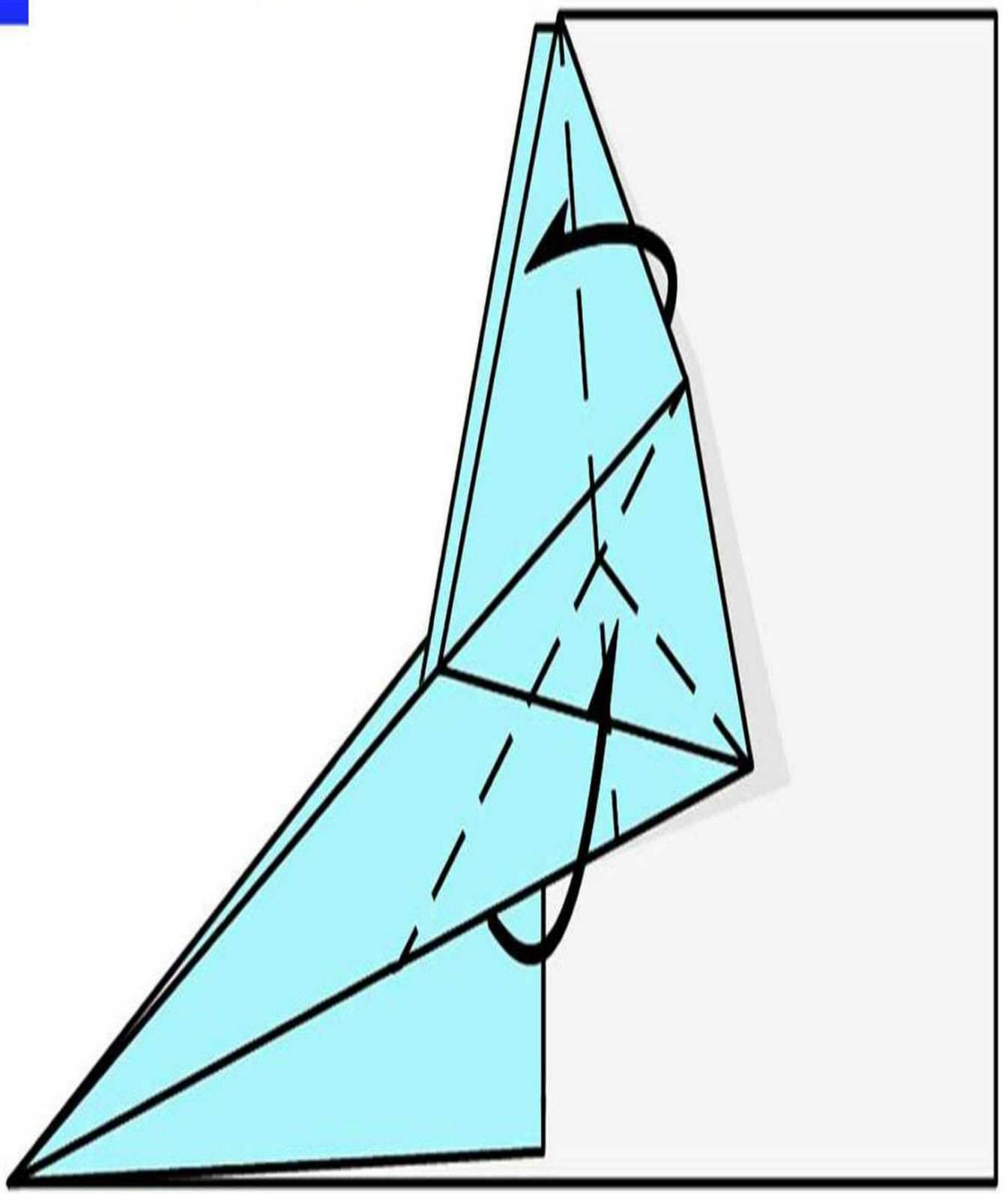
8 Vertical Takeoff Jet



9 Vertical Takeoff Jet

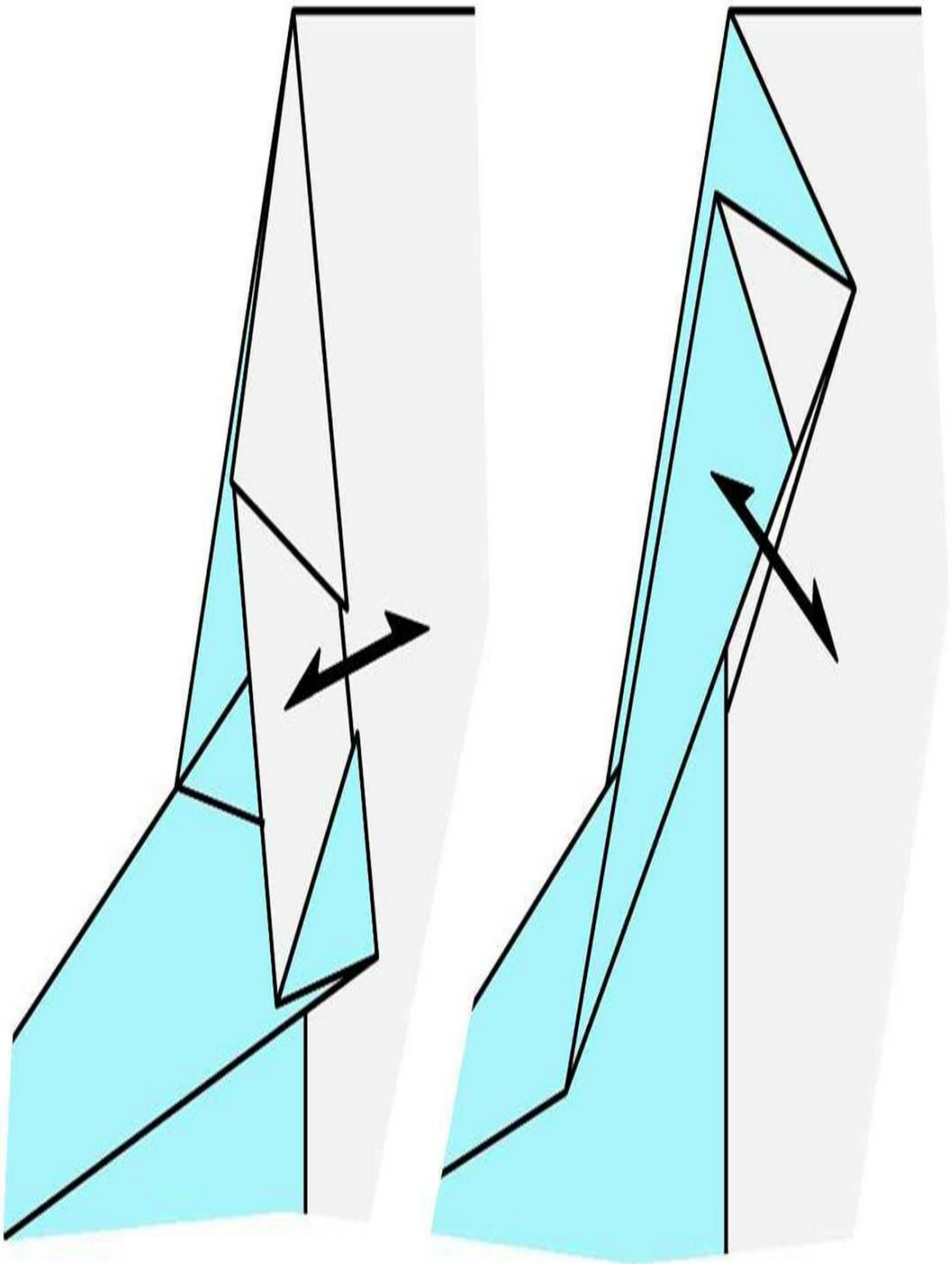


10 Vertical Takeoff Jet

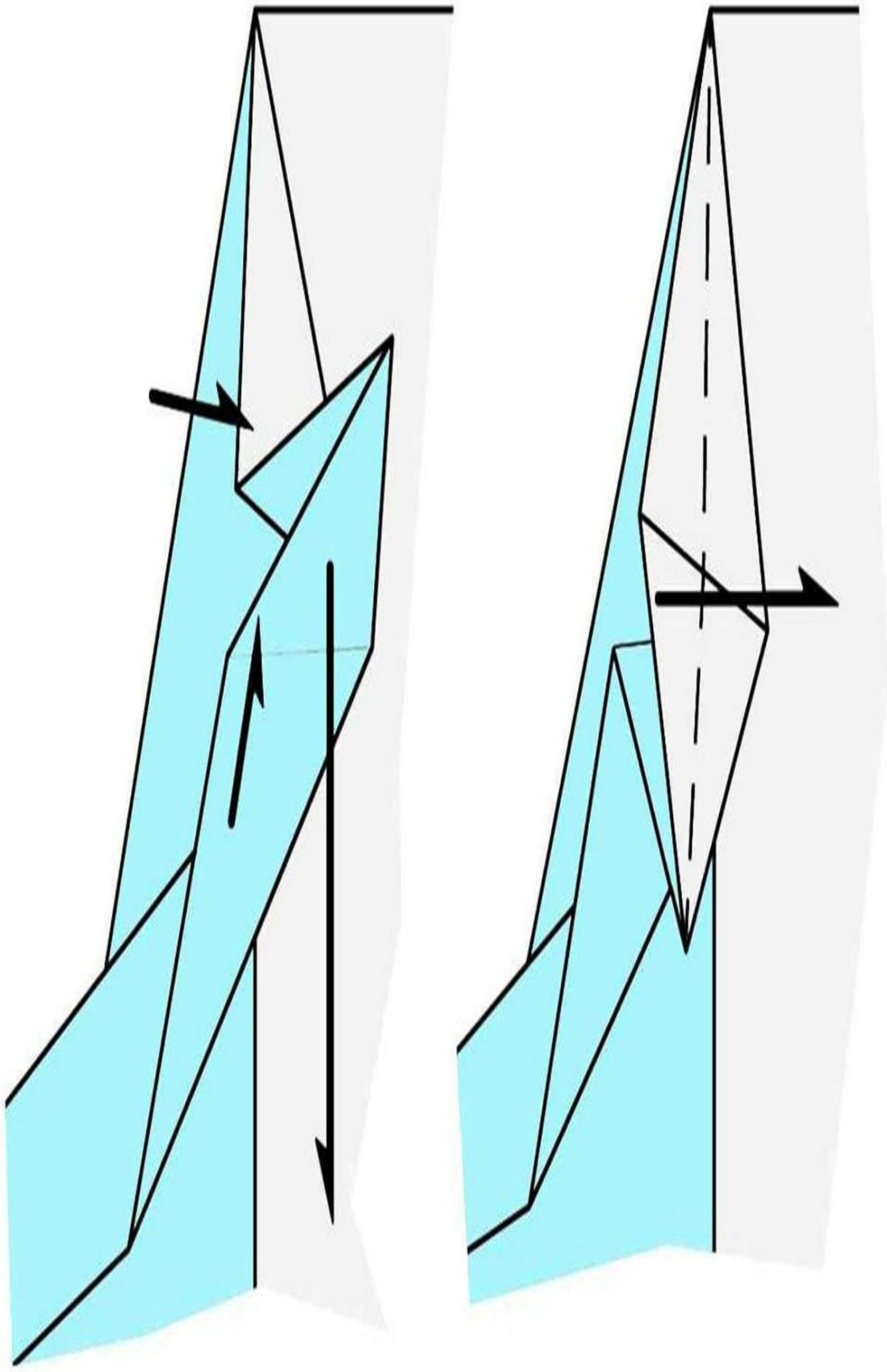


In Step 10, make the creases and pinch the edges together to form a rabbit/bunny ear; this will become our undercarriage. The next steps show cutaways of the undercarriage folds in detail.

11 Vertical Takeoff Jet

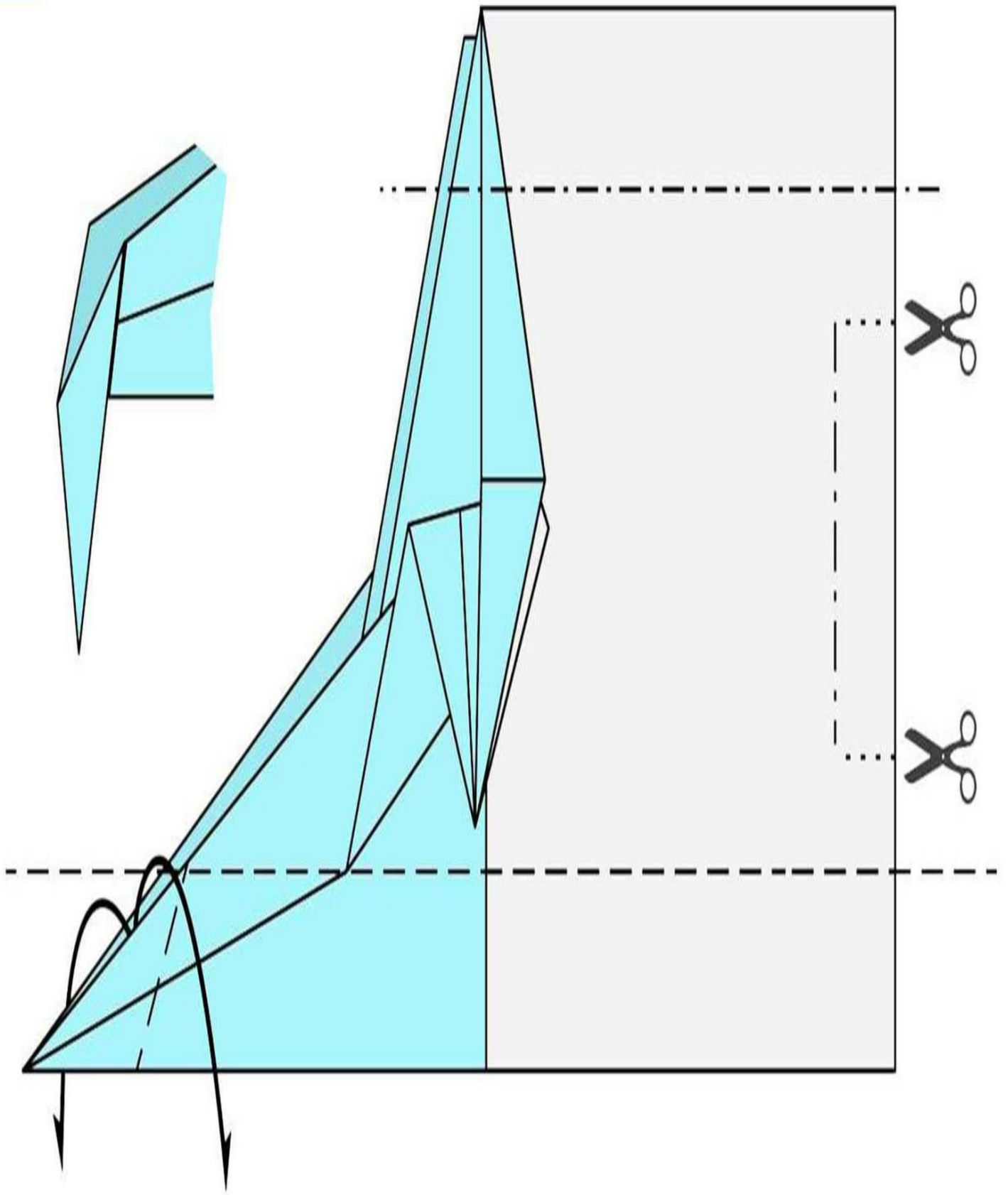


12 Vertical Takeoff Jet



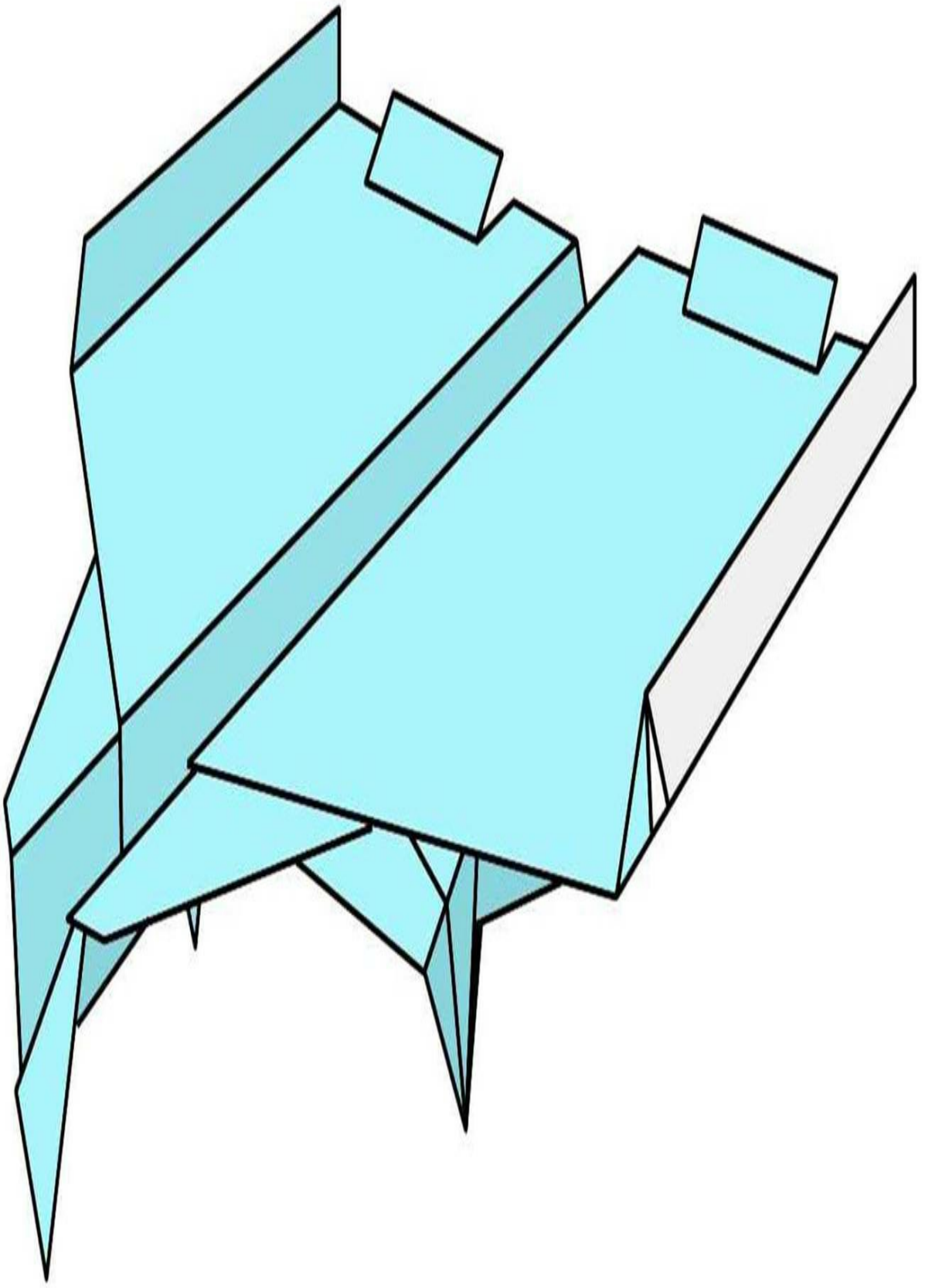
In Step 12, swing down the rabbit ear and flatten. Next, fold upper flap to the right for reinforcement.

13 Vertical Takeoff Jet



In Step 13, your undercarriage will look like this. All you need to do is fold the nose section: reverse-fold (inside out) to make a 90 degree-angle nose/forward landing leg, and then fold wings and fins, and finally add tail lift if necessary.

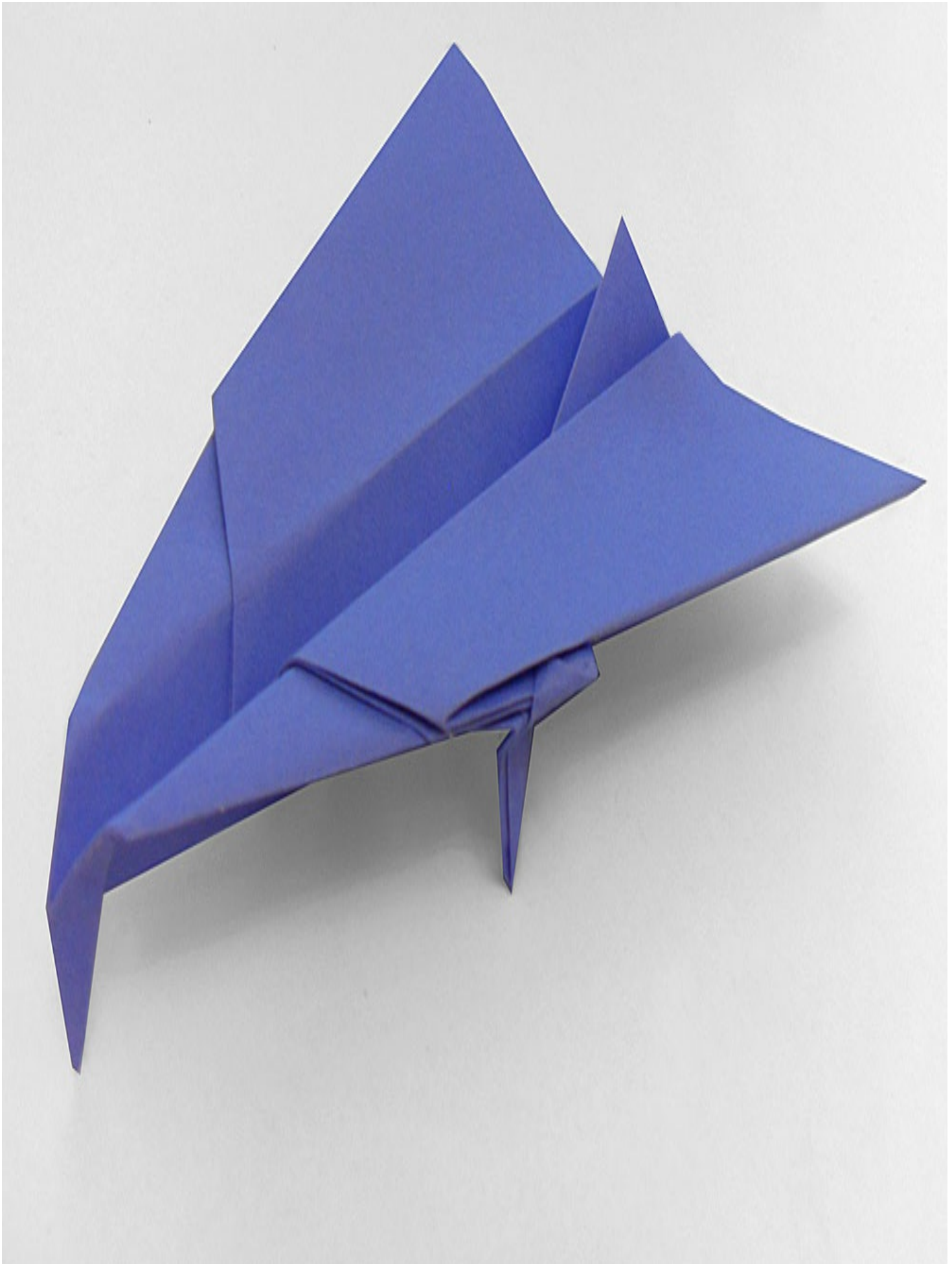
14 Vertical Takeoff Jet



The completed jet; throw horizontally with a gentle motion. Do not launch at high angles as it will stall.

Modification experiment

For a sleeker-looking version, it's possible to experiment with the wing span by doing a clever inverse fold at the top section of the undercarriage (before making the wing fins) and angling back the wing edge to the trailing wing tips. I'll leave the experimentation up to you, but here is my first attempt…

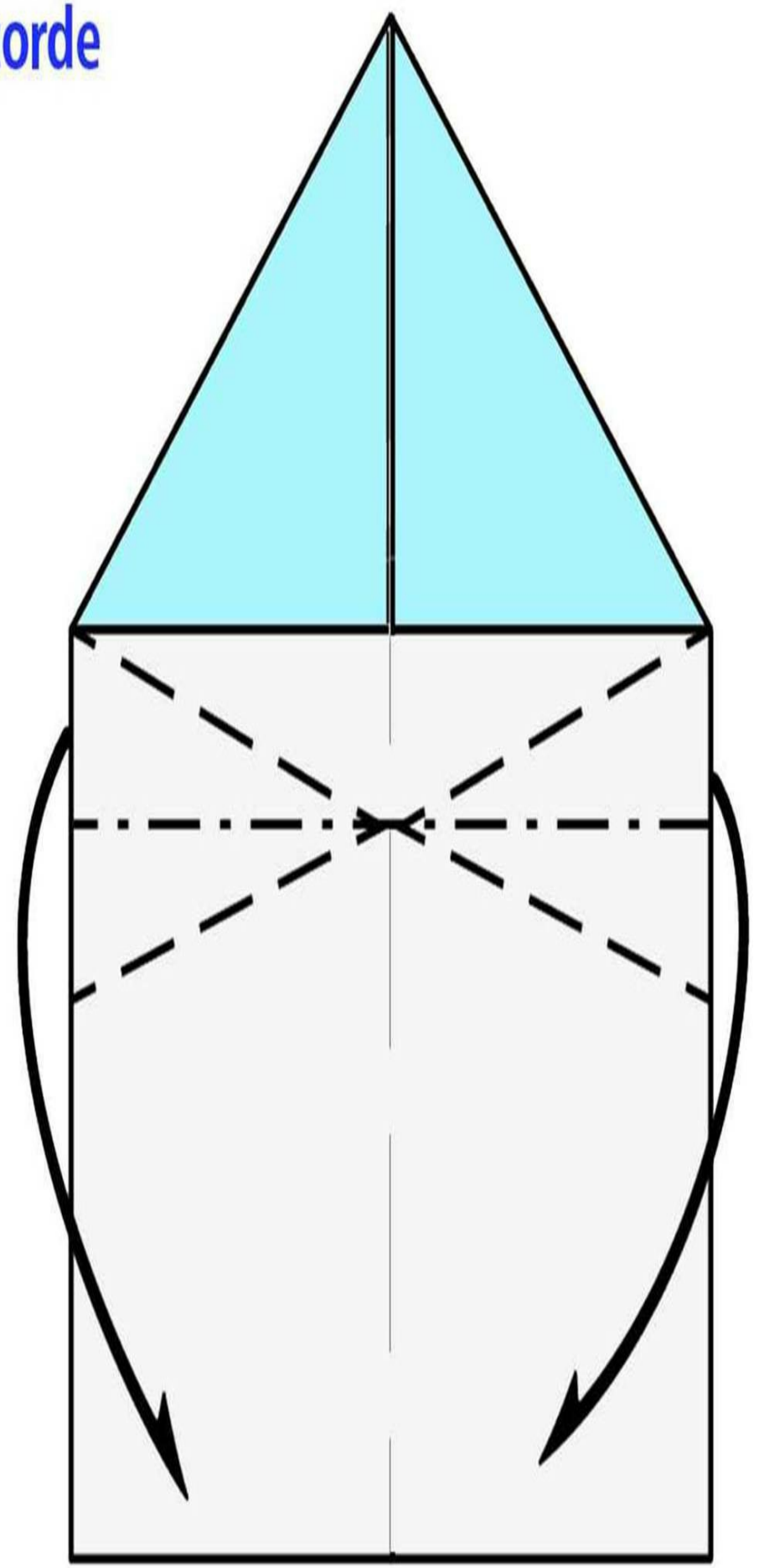


Modified jet

Concorde

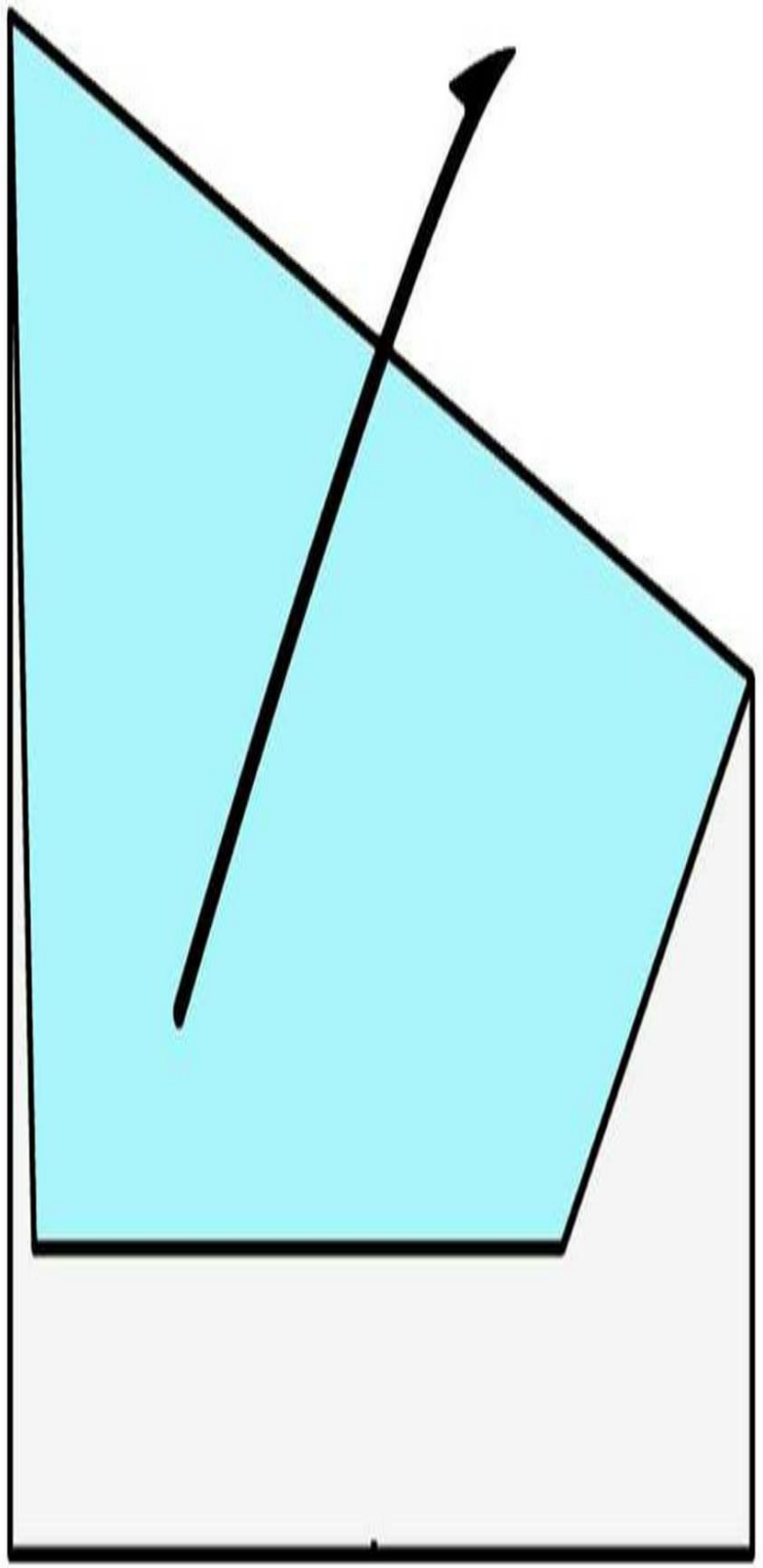
This graceful craft can once again streak across the skies and it's relatively easy to make, and noise-free! This model uses the same basic fold as the Vertical Takeoff Jet.

1 Concorde

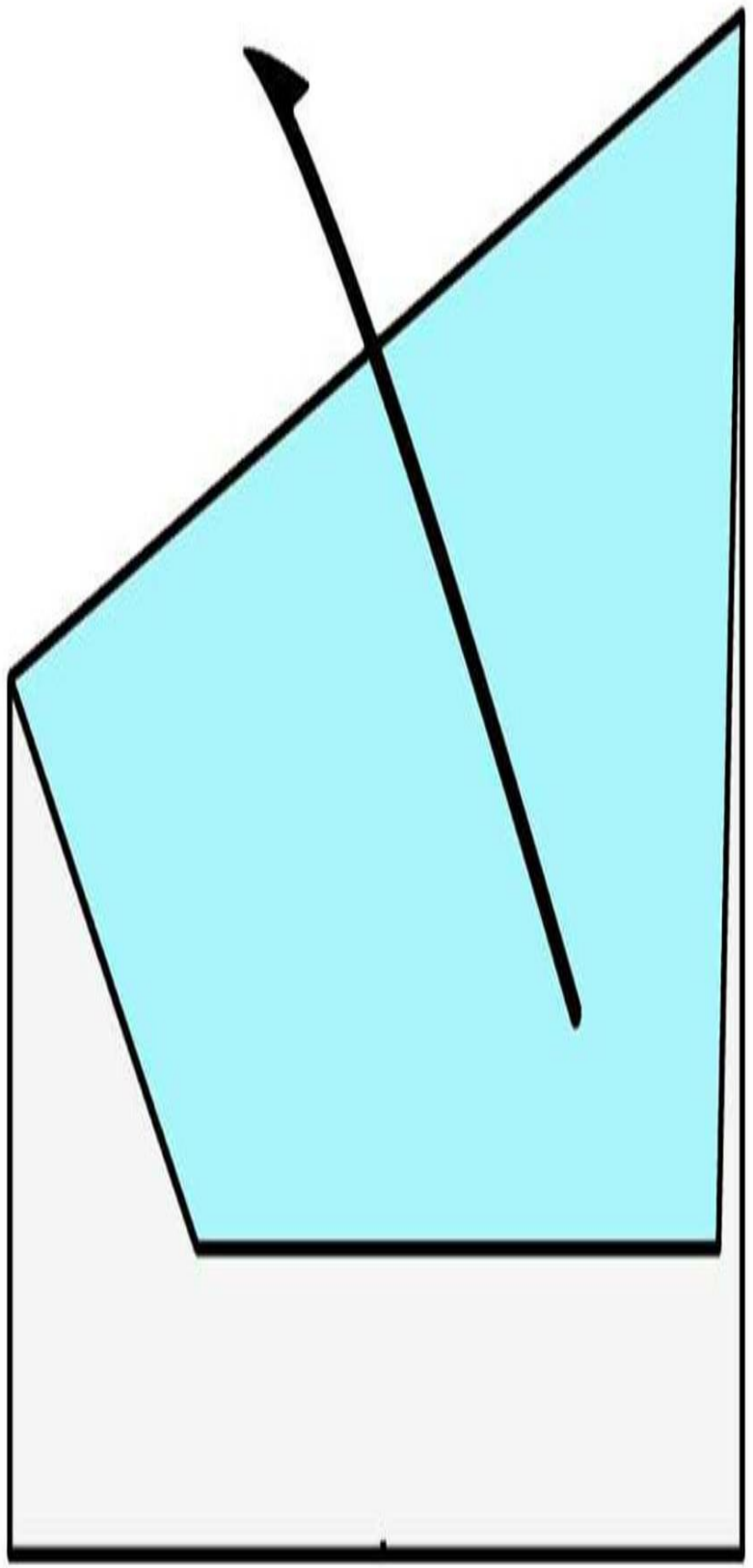


In Step 1, begin with a center crease fold and the top corners folded in as for a regular dart. Now make creases for preparing the basic fold as shown in Steps 2 – 6.

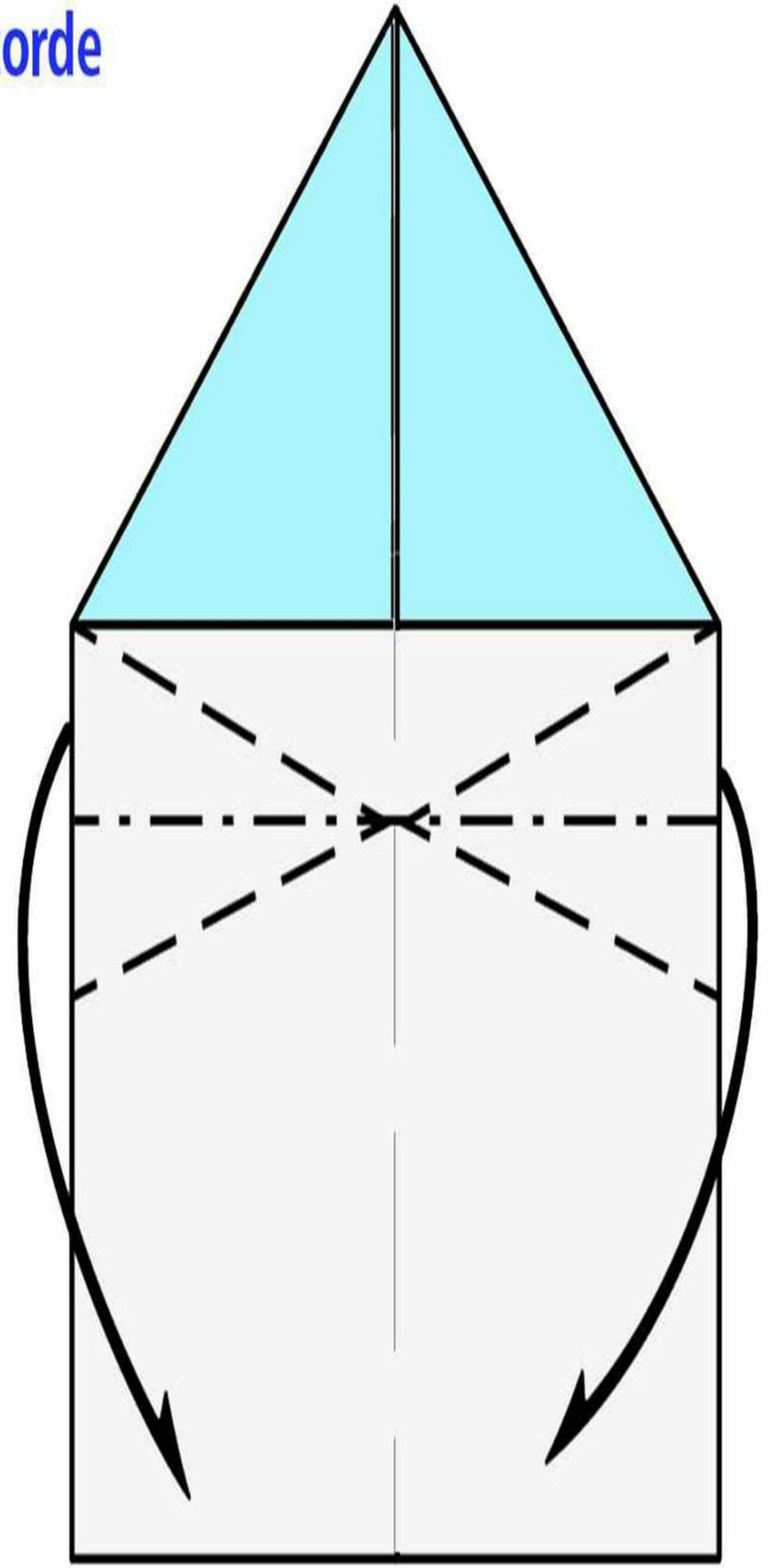
2 Concorde



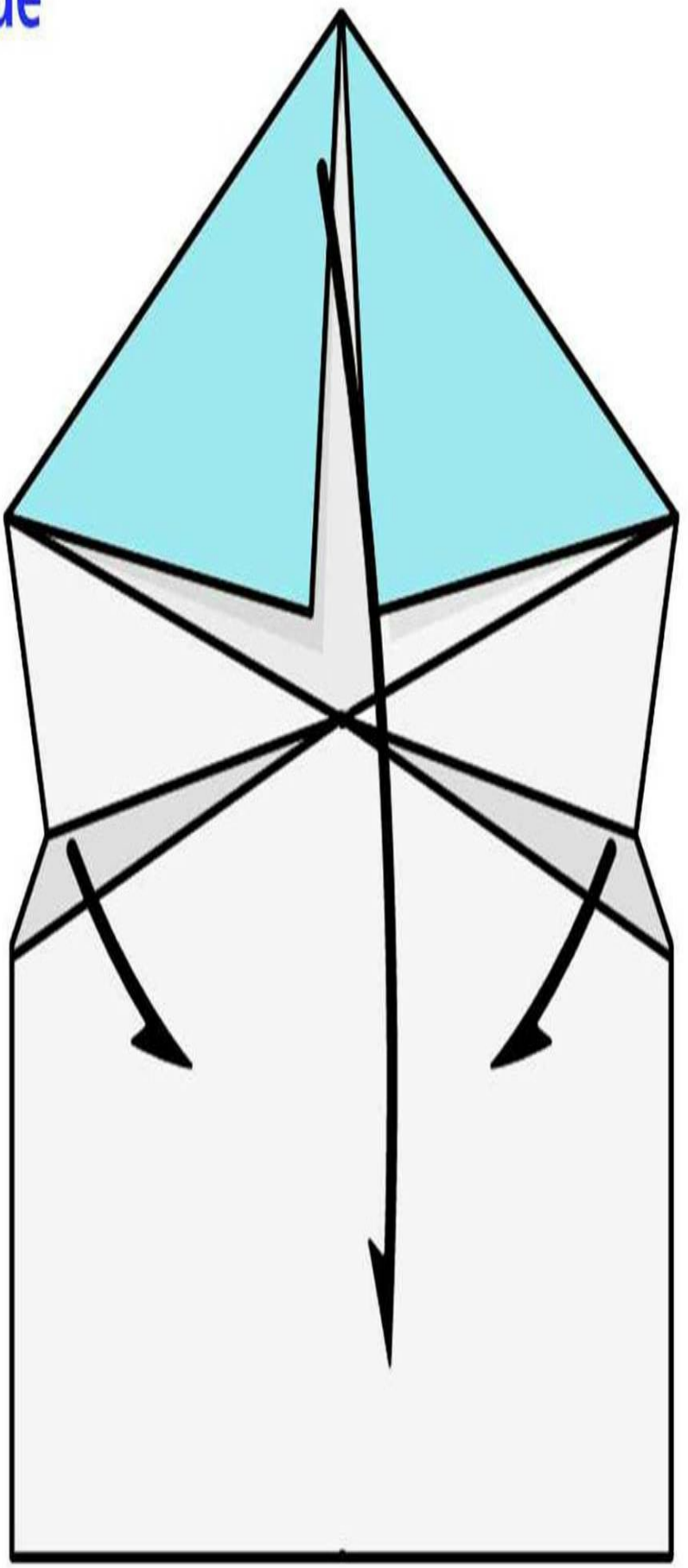
3 Concorde



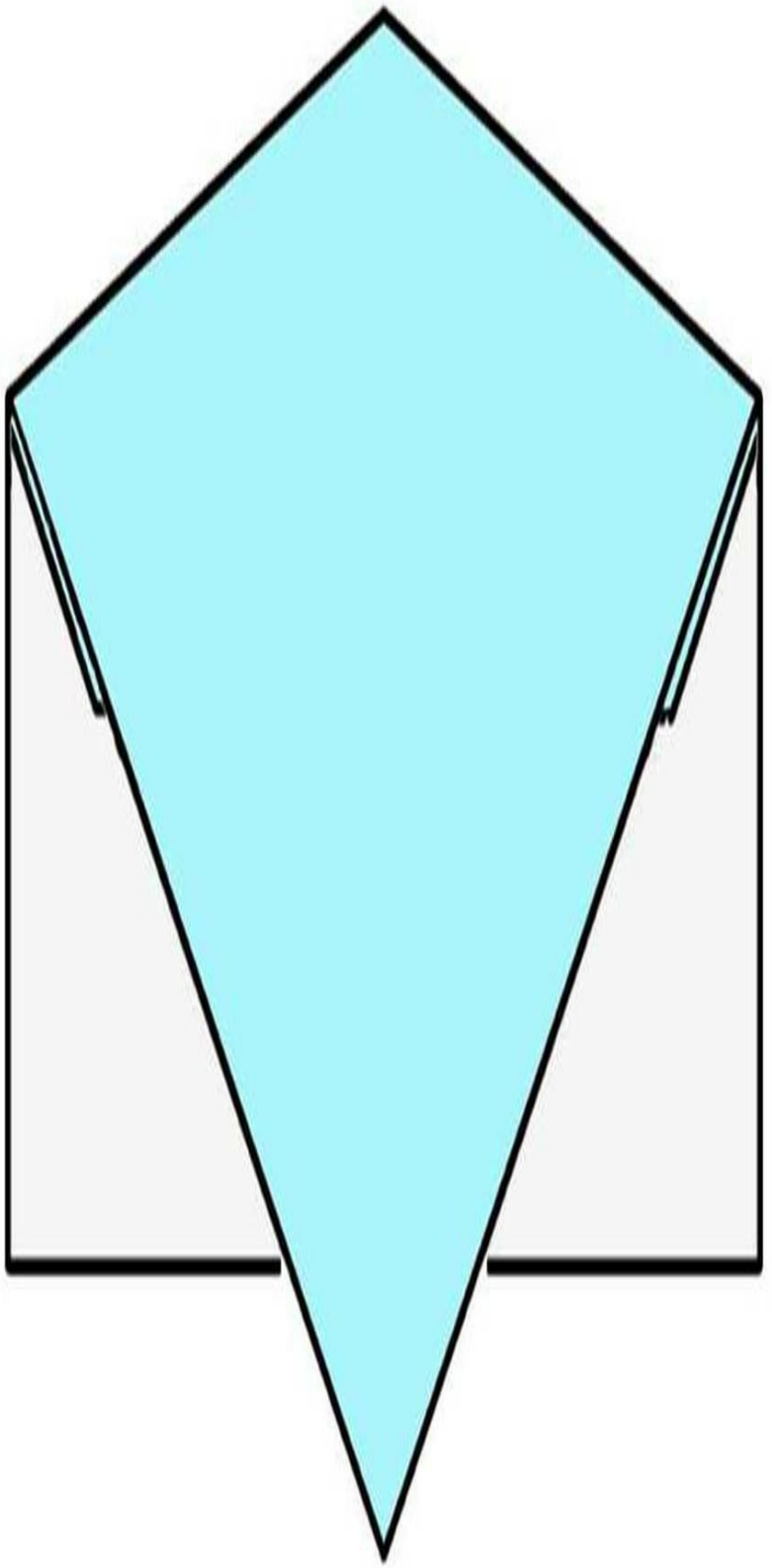
4 Concorde



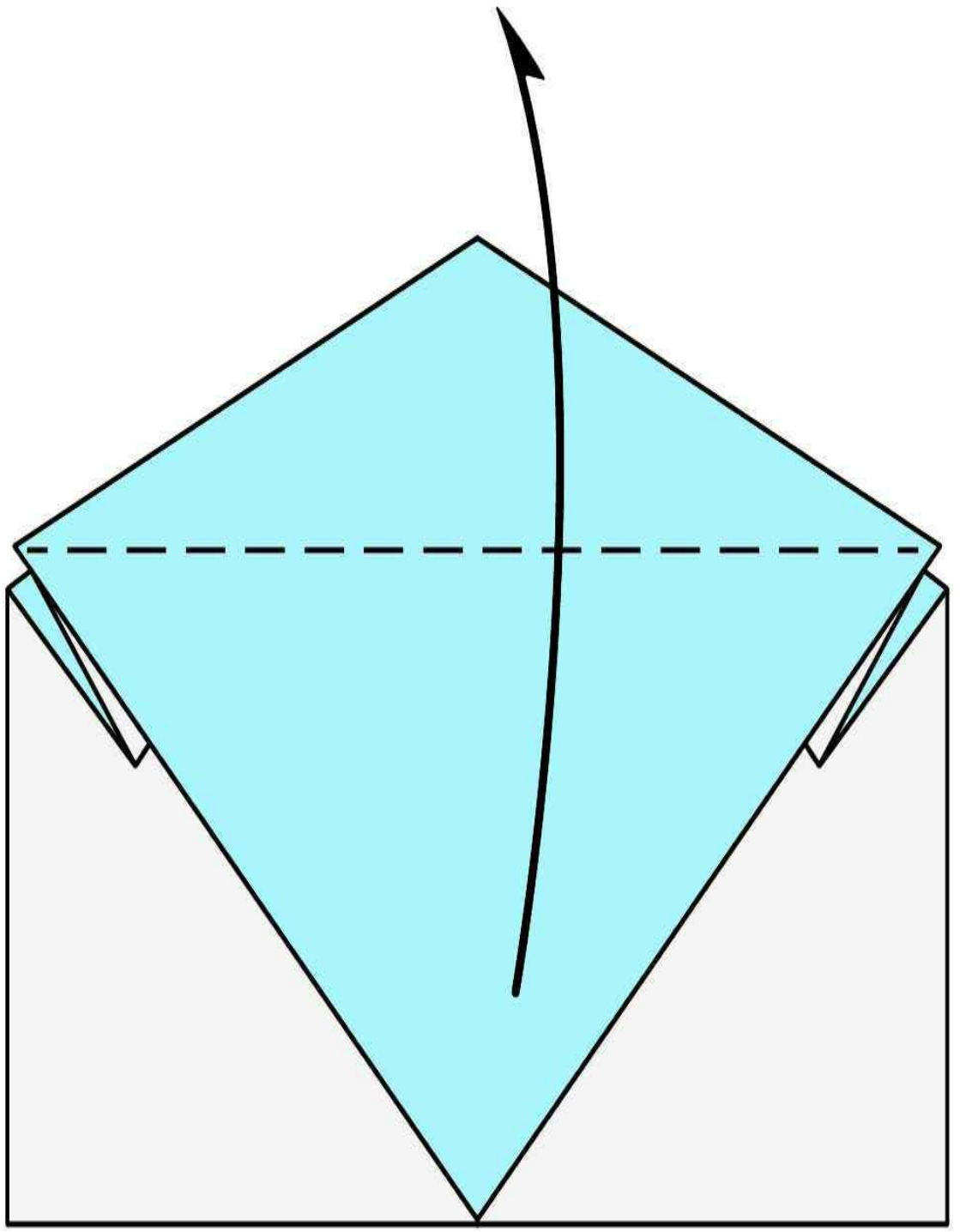
5 Concorde



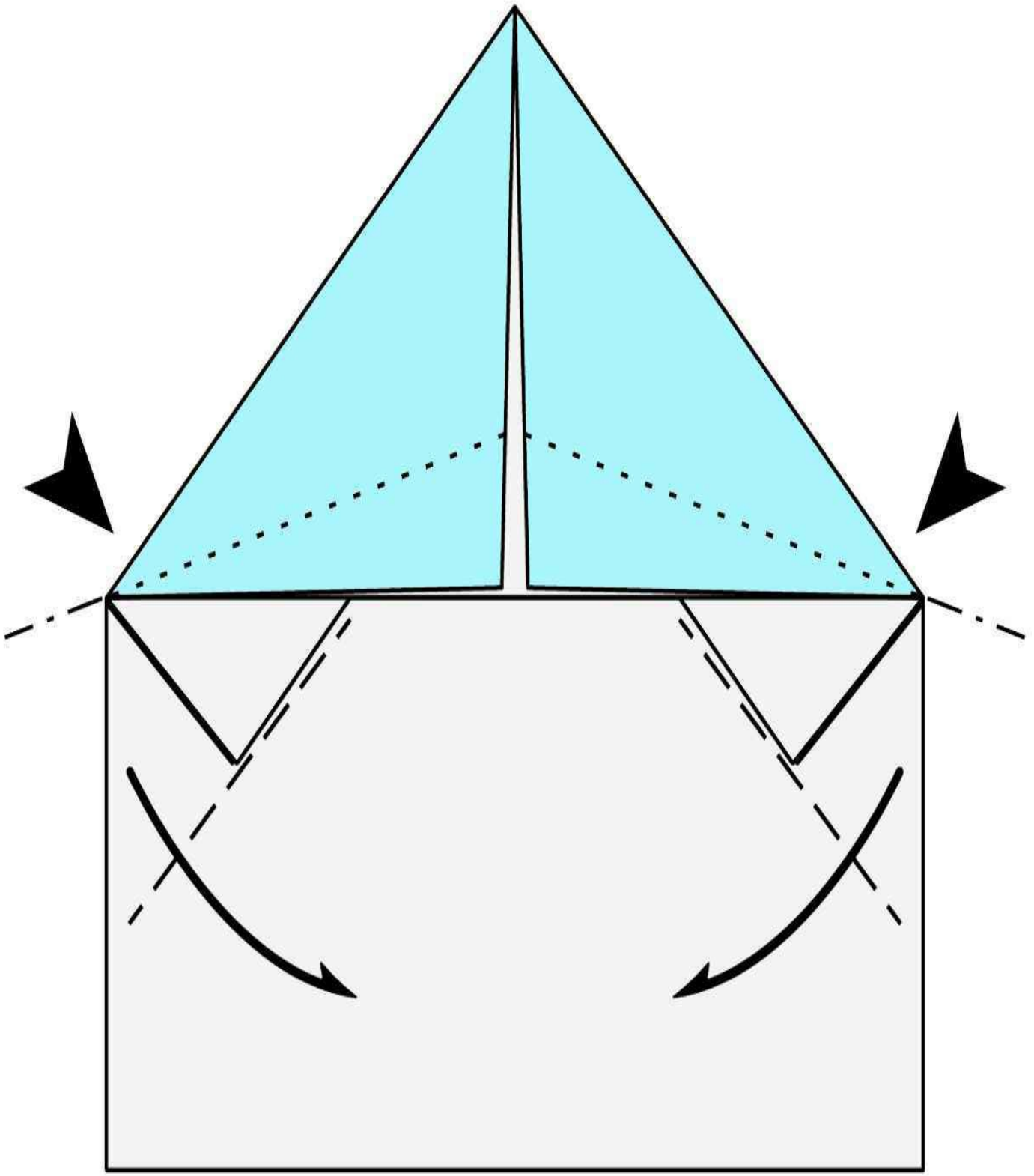
6 Concorde



7 Concorde

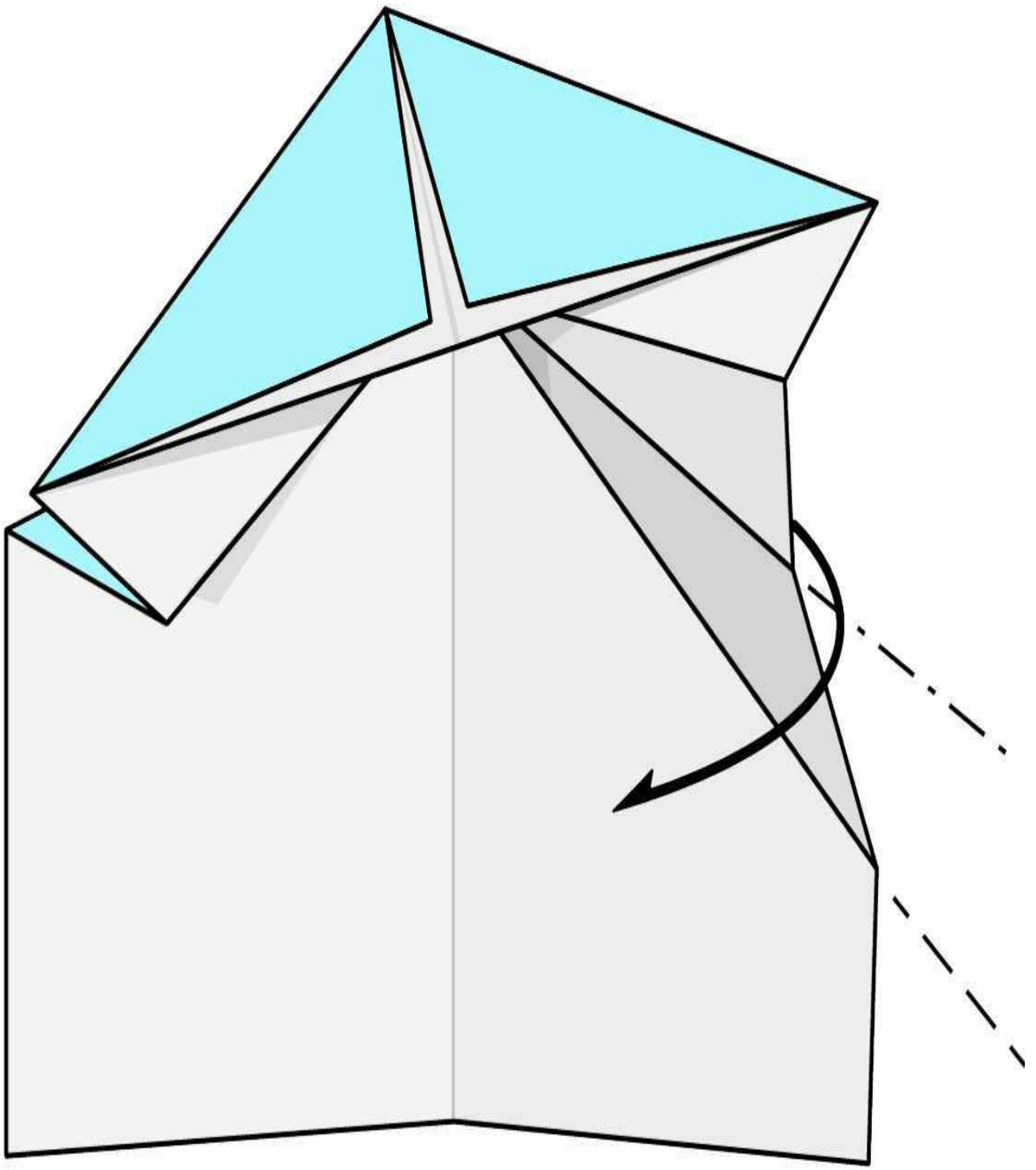


8 Concorde

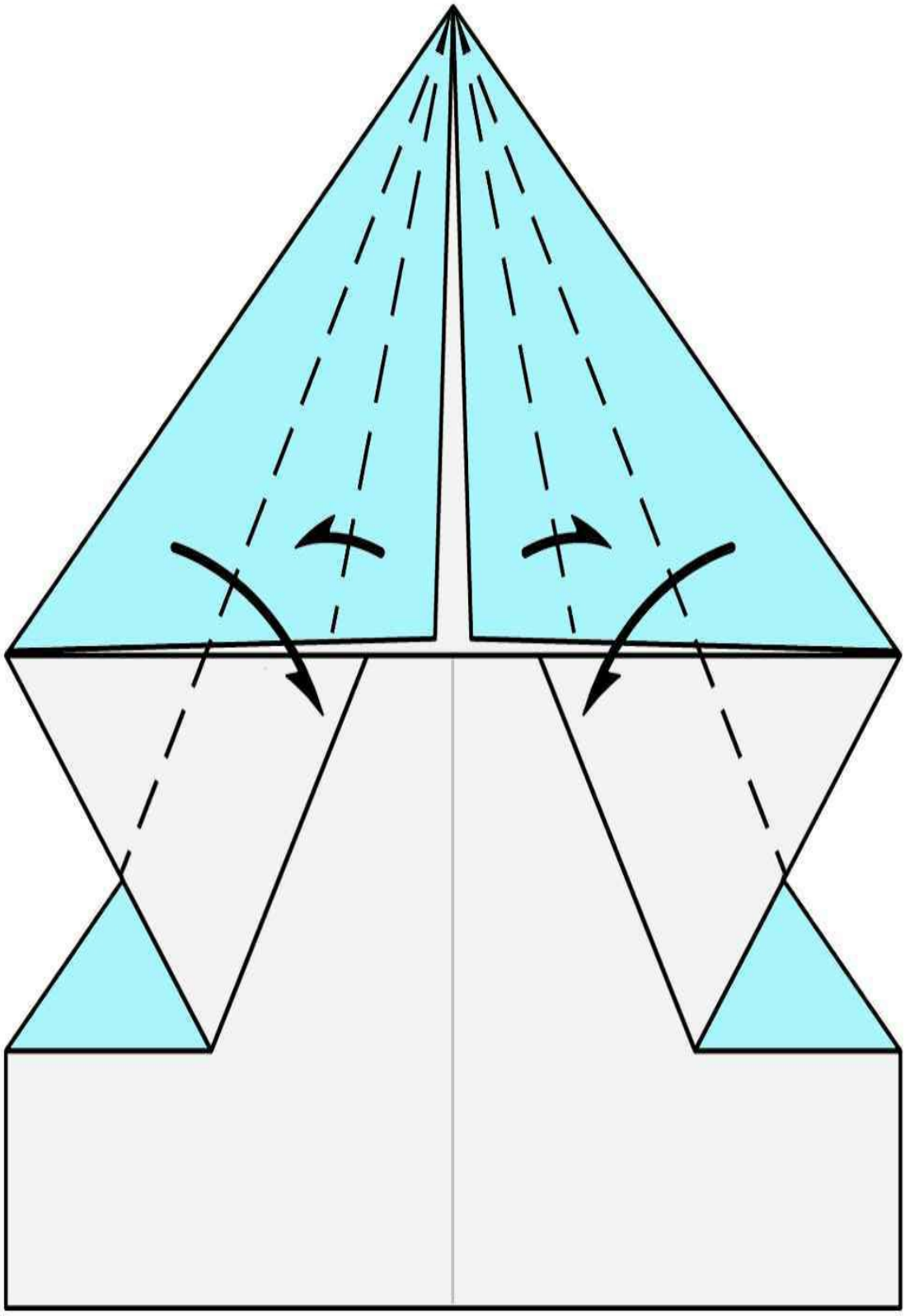


In Step 8, inverse-fold the right and left lower flap edges by opening out the fold and bringing the sides inwards. Note the hidden edge underneath; you are mountain-folding along this edge to complete the inverse fold. Step 9 shows the fold half-complete.

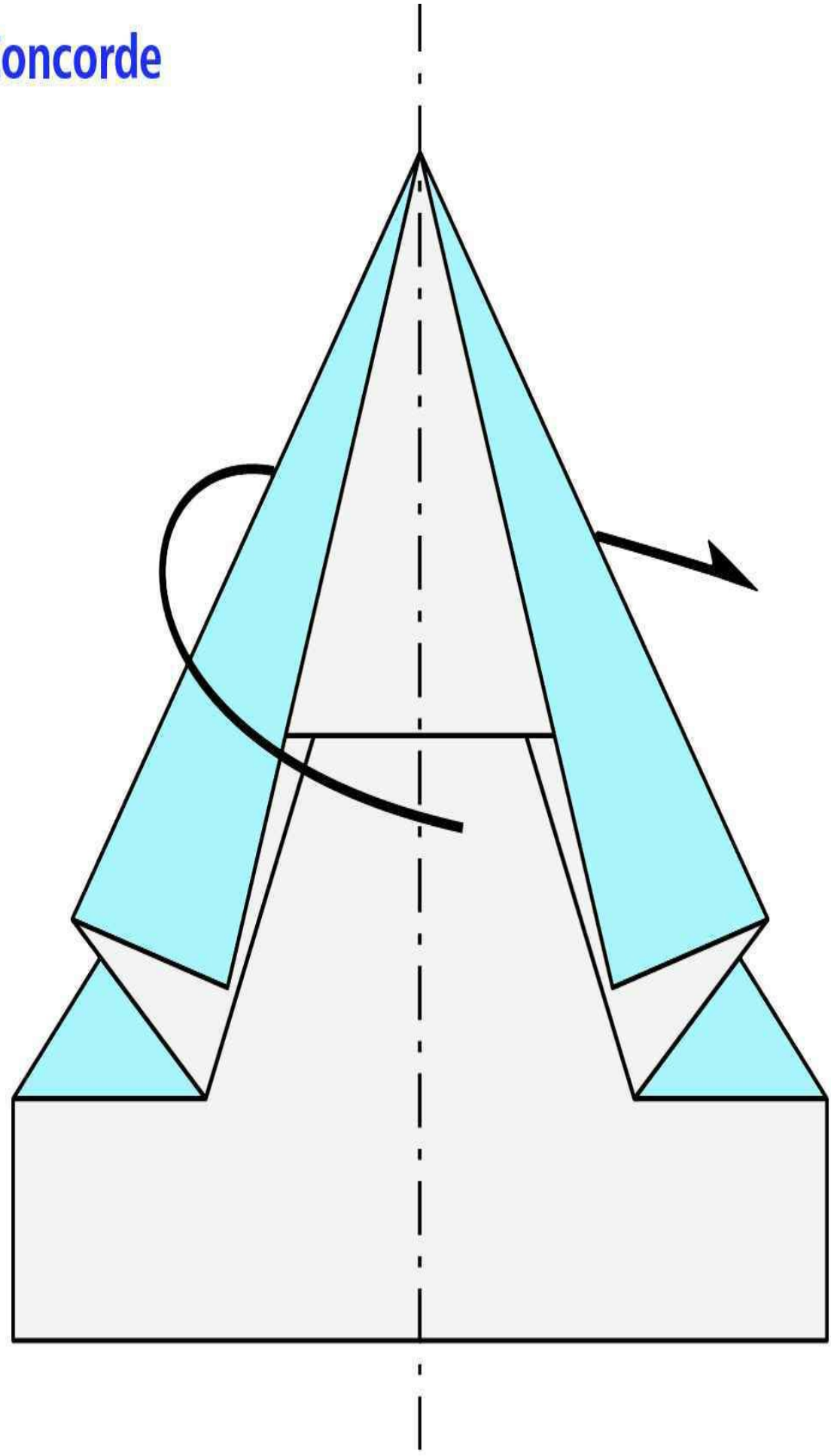
9 Concorde



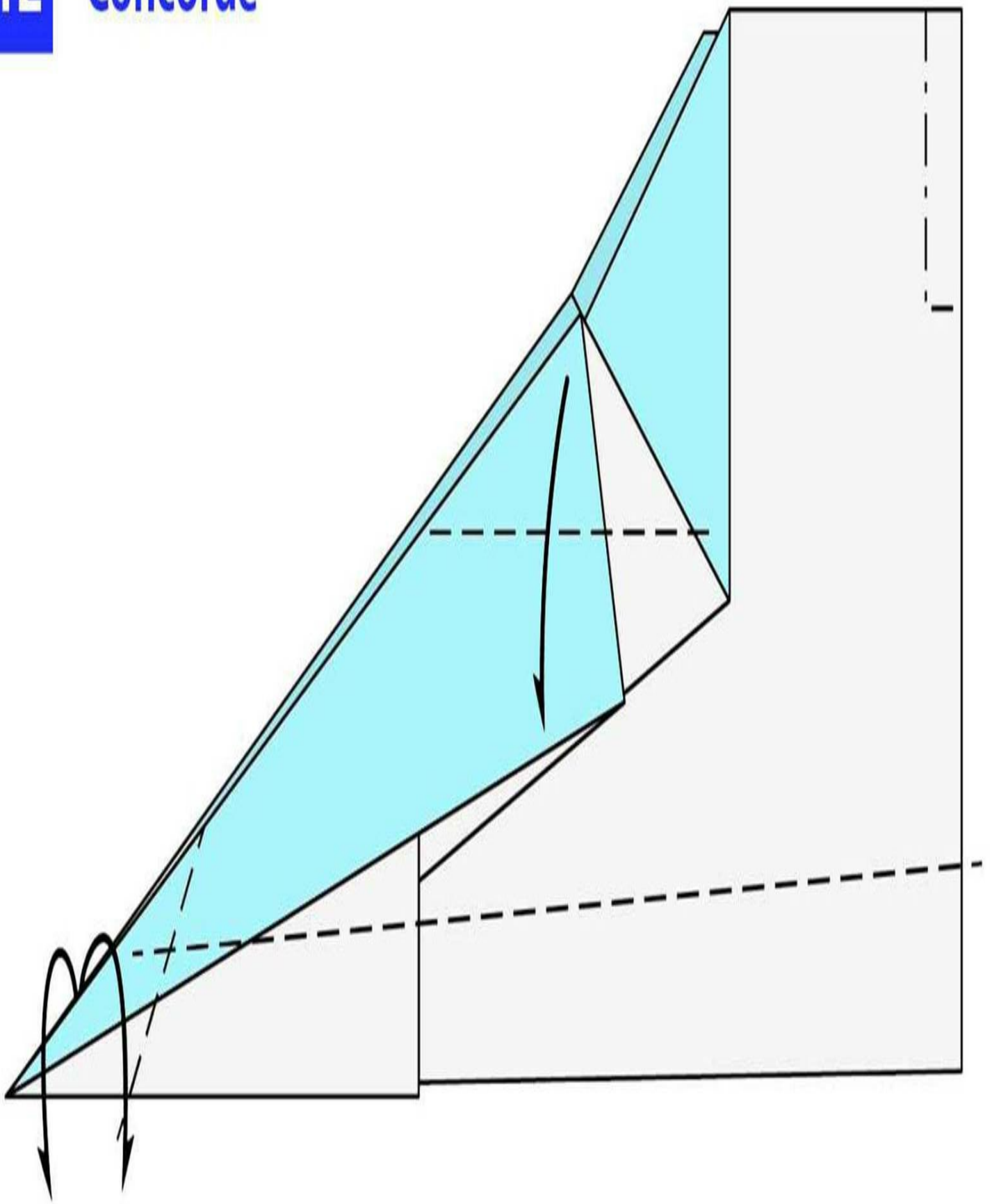
10 Concorde



11 Concorde

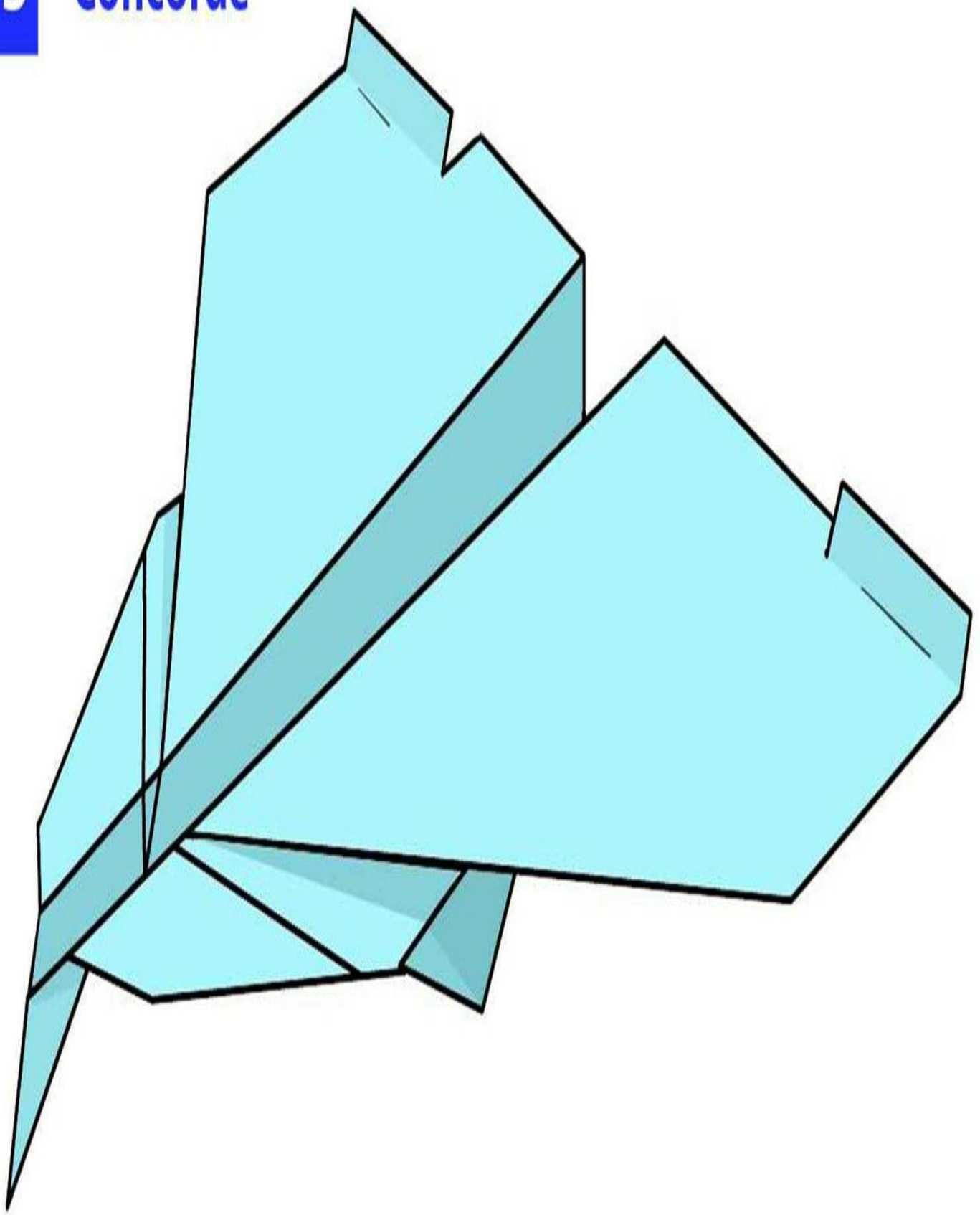


12 Concorde



In Step 12, crease and open out the nose section, and reverse the fold (making it inside out). Fold down the simple landing gear on both sides and add tail lift for stability.

13 Concorde



The completed Concorde; throw horizontally with a gentle forward motion. It will glide well before landing gracefully. There is a video of this on the **Paper Plane Lab** YouTube channel.

The following photo shows the Concorde parked in *The Hangar* (from *The Best Advanced Paper Aircraft Book 3*).

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