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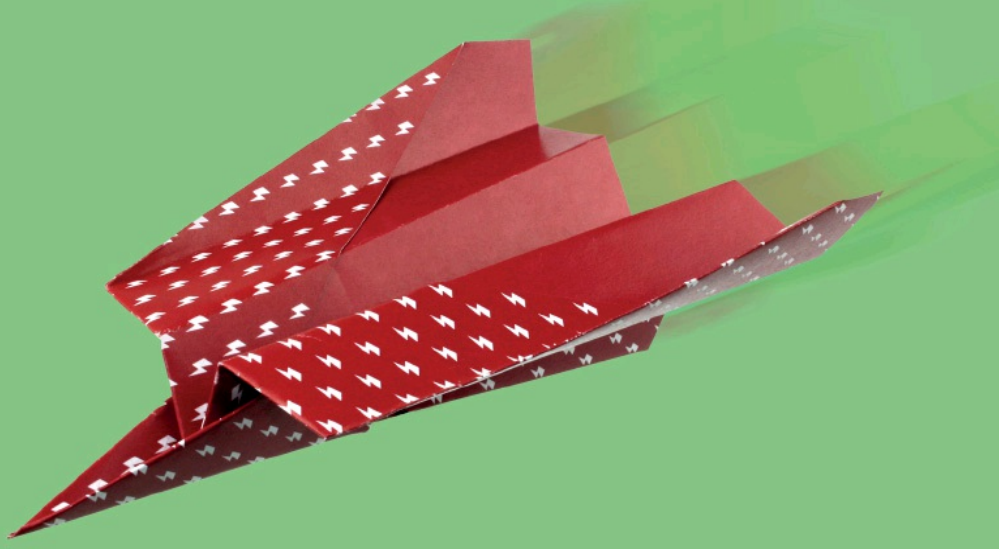

Paper Airplanes

- 20 step-by-step illustrated paper plane designs
- Expert advice on perfecting your folding technique
- Easy lessons on the rules of flight, symmetry, and gravity

Nick Robinson

No one likes a know-it-all. Most of us realize there's no such thing— how could there be? The world is far too complicated for someone to understand *everything* there is to know. So when you come across a know-it-all, you smile to yourself as they ramble on because you know better.

You understand that the quest for knowledge is a never-ending one, and you're okay with that. You have no desire to know everything, just the *next* thing. You know what you don't know, you're confident enough to admit it, and you're motivated to do something about it.

At *Idiot's Guides,* we, too, know what we don't know, and we make it our business to find out. We find really smart people who are experts in their fields and then we roll up our sleeves and get to work, asking lots of questions and thinking long and hard about how best to pass along their knowledge to you in the easiest, most-accessible way possible.

After all, that's our promise—to make whatever you want to learn "As Easy as It Gets." That means giving you a well-organized design that seamlessly and effortlessly guides you from page to page, topic to topic. It means controlling the pace you're asked to absorb new information— not too much at once but just what you need to know right now. It means giving you a clear progression from easy to more difficult. It means giving you more instructional steps wherever necessary to really explain the details. And it means giving you fewer words and more illustrations wherever it's better to show rather than tell.

So here you are, at the start of something new. The next chapter in your quest. It can be an intimidating place to be, but you've been here before and so have we. Clear your mind and turn the page. By the end of this book, you won't be a know-it-all, but your world will be a little less complicated than it was before. And we'll be sure your journey is as easy as it gets.

Mike Sanders
Publisher, *Idiot's Guides*

Paper Airplanes

by Nick Robinson

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Dedicated to my family—my wife, Alison; my children, Daisy and “young” Nick; plus our cats, Brian and Rhubarb.

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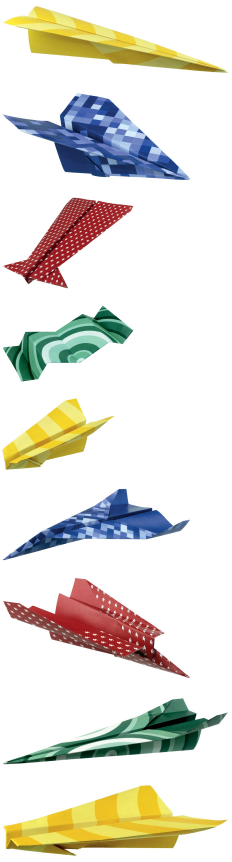
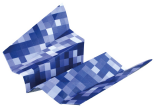


Eagle 

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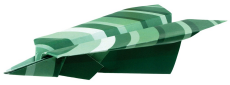
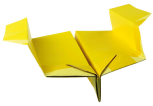
Beaky 

Manta 

Diamond Flyer

Fury

Moth

Key to Symbols

Anatomy of a Plane

Introduction

The sight of an airplane passing overhead rarely fails to delight people—it's a beautiful sight, and it often fills the mind with questions.

Where does it come from? Where is it going? Who is on board? We take planes for granted, yet the first flight took place only a little over 100 years ago. Despite our best efforts, humans cannot fly without a machine to help them, which may explain our fascination with paper planes!

Acknowledgments

Model credits: Fury by Florence Temko. Diamond Flyer by Rob Snyder. Nakamura Glider by Eiji Nakamura. Classic Dart, Canard, Flying Wing, and Champion are traditional designs. All other designs are by Nick Robinson. In this field, it's perfectly possible that others have independently created similar designs.

The author would like to thank all at Alpha books for their input. Special thanks goes to the British Origami Society for its help and support. Thanks to Rob Snyder for encouragement and for checking the folding sequences.

Check out the author's website at www.origami.me.uk

BACKGROUND PHOTOS

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Paper Airplane
Basics

Folding **Perfection**

Paper planes, like real planes, need to be perfectly symmetrical to fly in a straight line. So it's very important that you fold slowly, carefully, and accurately.

If you rush the folding sequence, there's a good chance that your plane won't fly well and you'll have to make it again. "Haste makes waste" very much applies to paper planes. Remember that you want the best flyer, ideally the first time you fold it. However, if all goes wrong, sometimes it's best to toss the plane in the recycling bin and start again.

Make sure you're folding on a flat, clean surface and that the lighting is good. Because to fold to a crease, you have to be able to see it!

Edge to Edge, Corner to Corner

If you fold a plane in half and the edges of the wings don't line up, your plane will fly in a curve, because one wing will be larger than the other. Sometimes when there are several layers of paper, it can be hard to line edges up perfectly, but try your best at all times. A similar problem occurs if corners do not meet. Again, it means that the plane will not be properly balanced.

Crease in the Right Place

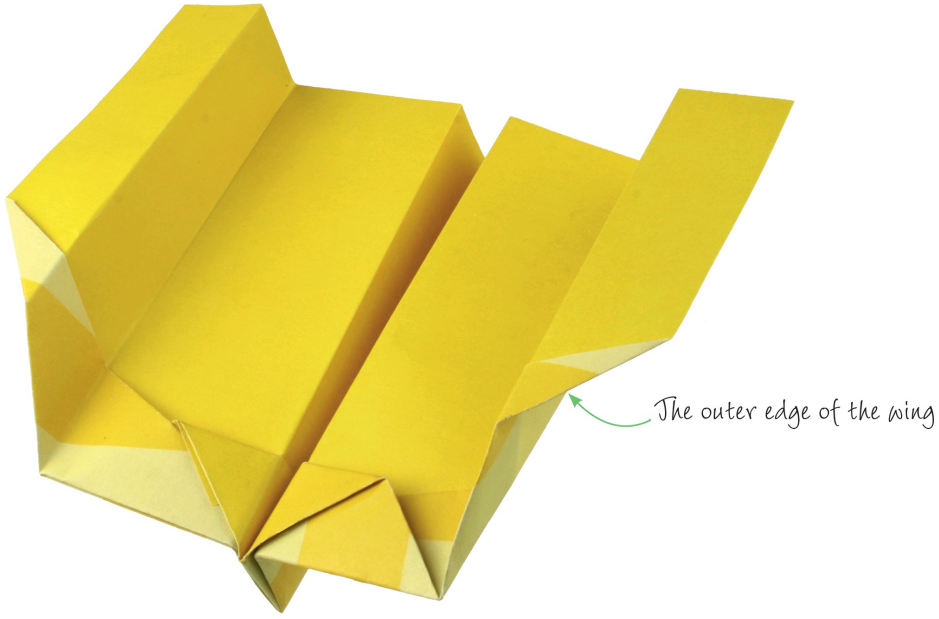
Every crease you make while folding a paper plane will have an effect on the quality of the final model. The key is to not make a crease until you're certain it's in the right place. The best way to do this is to move the upper half of the paper slowly up to the target, then slightly beyond it, then come back and forward, making smaller movements until you're certain it's in the proper place. If you unfold a crease and make another close by, the paper will be "confused," and it may well affect the flight.

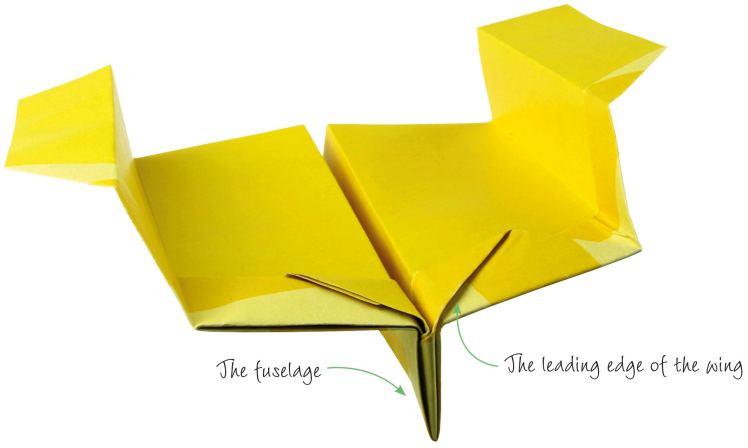
Nothing Lasts Forever

Paper has the natural property of soaking up moisture. (This has the delightful name of **deliquescence**.) As you fly your design, particularly in colder air, this

process will begin to happen, and the wings will start to become slightly floppy.

You may be able to make adjustments to overcome this, but after some time, the plane simply won't fly properly anymore. At this point, you should just park it in the "vintage hangar" (also known as the wastebasket), unless you want to save it for sentimental reasons!





Perfect Creases

Hold the paper with one hand. Using the other hand, place a finger in the center of the intended crease. Flatten out to one side, then to the other. Then let go of the

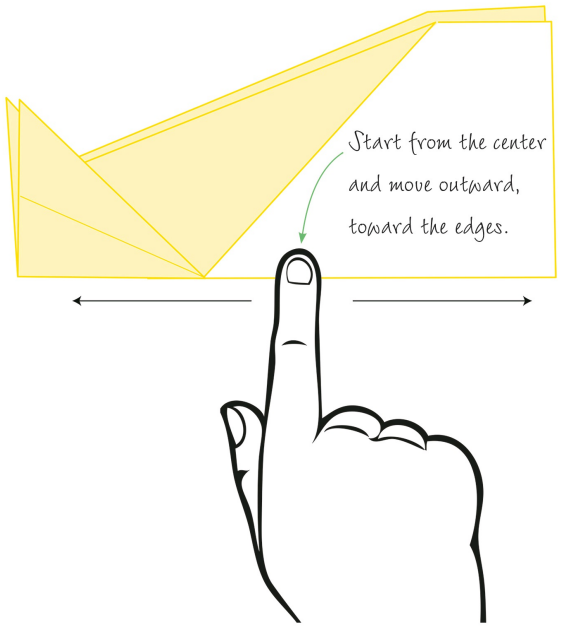
paper and reinforce the crease firmly.

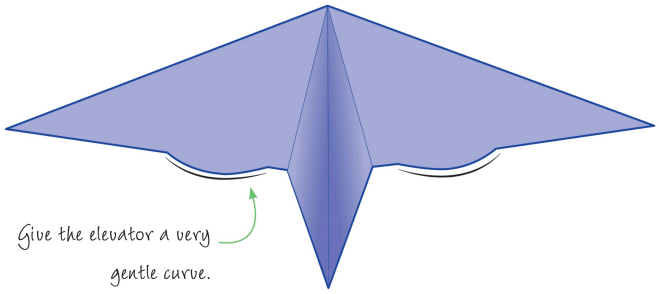
If you're creasing several layers, take care not to move the layers out of line when flattening. If the paper is particularly thick, you may wish to use the end of a ruler or something similar to "iron" the creases into place.

When you fold, you may notice a "bubble" in the paper. Stop folding. Instead, open out and use your fingers to flatten out the bubble before continuing.

Tools

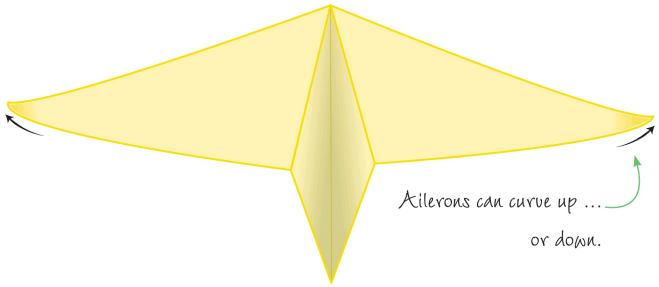
Making sharp creases while folding your paper planes is key so that the air can flow over the wings smoothly and easily. You can make these creases using just your fingers—press the tip of your finger onto the crease and apply firm pressure as you sweep your finger along the crease. Better yet, use your fingernail. However, using a simple tool can make this easier and make the crease even crisper. There's a special tool called a **bone folder** designed to do just this task, but you really don't need to buy one. Any piece of smooth plastic or wood can do the job.





Elevators

Elevators are small curves on the rear of a plane's wings that make the plane fly upward or downward. You should make very gentle curves, or the effect will be so great that the plane does not fly very far. In most cases, you should make the same adjustment to both wings, or the plane won't fly straight. Always test the plane before adding elevators. Your plane may not need them!



Ailerons

Ailerons are similar to elevators, but they are placed on the tips of the wings. You can fold the corners of the wings up or down and make the plane roll to one side. It is usual to add ailerons when you want the plane to roll or bank to one side.

Paper

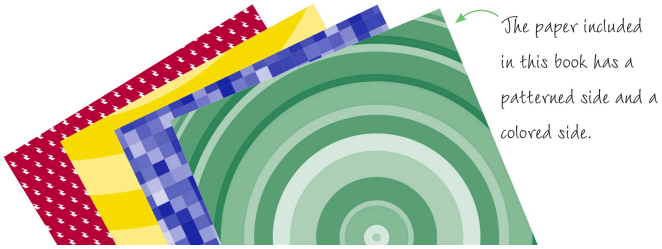
After you have folded all the paper that comes with this book, you'll need to find a new source.

One of the best materials to use is ordinary photocopy paper—it's cheap, it comes in different colors, and it folds well. Or look around the house to see what's lying around—old invoices, extra pages from paid bills, catalogs. Definitely hunt around art or craft shops, where you can find sheets printed with all kinds of designs—your plane will then look much more dramatic and fun.

The paper should not be fairly "stiff." The easiest way to decide if a certain type of paper will work for making paper planes is to try it! With any new kind of paper, you need to fold it and see how it flies. You will quickly learn to recognize "good" paper by making a small fold in it—you want to be able to make nice sharp creases.

Paper Weight

You also need to think about the weight of the paper. Too thick and it adds a lot of unwanted extra weight, which means there may not be enough lift for the plane to fly properly. With paper that's too thin, you may find that the wings can start to droop, especially on designs that have large wings made from a single layer of paper.



Paper Size

If you have some paper that isn't the right size, simply cut it to 8½ × 11 inches (21.6 × 27.9 cm). That's the same size as standard letter paper, and it's the starting size for all the plane designs in this book. However, many of the simpler planes will work very well from paper half the size—so go ahead and experiment with

paper that measures 5½ × 8½ inches (14 × 21.6 cm)! If you fold larger paper, you'll find that most of the designs in this book don't fly as well (although it's fun to try). And you definitely need rectangular paper in any case. Readers outside of North America should note that these designs can be folded from A4 paper with minimal adjustments.

TRY THESE TYPES OF PAPER

- Catalog pages
- Giftwrap
- Glassine
- Newspaper
- Origami paper (if it's large enough)
- Parchment paper
- Scrapbooking paper
- Sheet music
- Thick magazine pages
- Vellum

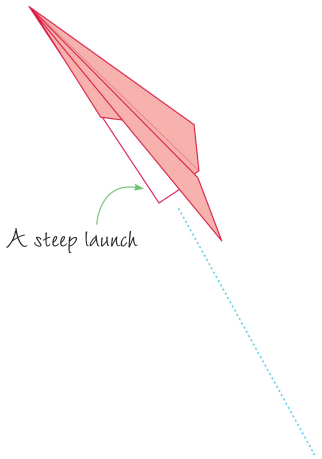
PAPER THAT PROBABLY WON'T WORK

- Construction paper
- Grocery bags
- Kraft paper
- Manila paper
- Paper towels
- Tissue paper
- Tyvek
- Wallpaper
- Watercolor paper
- Wax paper

Learning to **Fly**

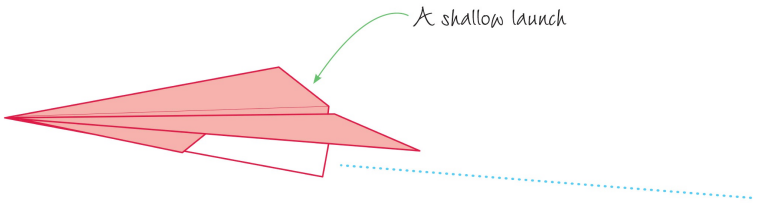
People often expect every paper plane to fly perfectly. But more experienced flyers know they have to make adjustments to get the best results from their planes.

You have to think about three key factors when launching a paper airplane: angle, speed, and trimming. Each of them has a dramatic effect on the way it will fly, known as the **flight pattern.**



Launch Angle

You can adjust the angle at which you launch your plane. Designs aiming for distance need to be launched almost horizontally or with a slight upward angle. For maximum time aloft, you need a steep launch so the plane rises quickly into the air before (ideally) starting a slow, looping descent.



Launch Speed

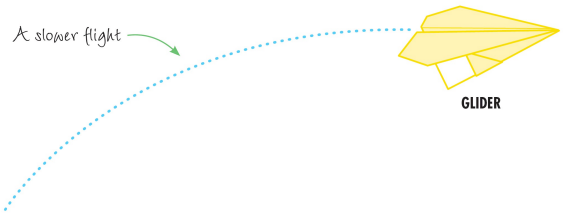
Simpler “flying wing” designs only need the gentlest of launches since they are more delicate. Launch most other designs at a medium speed, although a few

should be launched as fast as you can manage. To stay in the air a long time, the plane must fly as high as possible, so it needs a fast launch.

The basic rule is, if the wings are large, launch your plane more slowly. Designs with a narrow shape are better at long distances and should be launched quickly. Each design has a suggested speed of launch, but by practicing, you'll figure out the best speed for each plane.

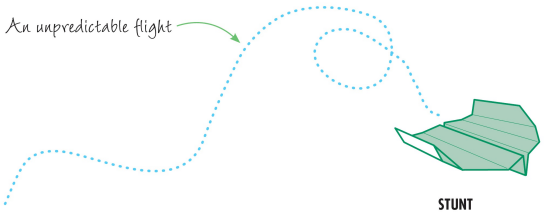
Plane Types

Paper planes fall into three basic types. *Gliders* are best at slow, steady flights in one direction, or perhaps launched high, then turning in slow loops to stay longer in the air. *Darts* are more "pointed" and need a faster launch to travel as far as possible. *Stunt planes* are designed to make acrobatic flights, and it's hard to know where they'll land!



Wing Angles

The angle of the wings (called *dihedral*) affects how a plane will fly. Each plane has a perfect angle, and you'll need to experiment to find it. The wings will usually be angled upward.



Wind

Since they weigh very little, paper planes are easily blown off-course by a passing

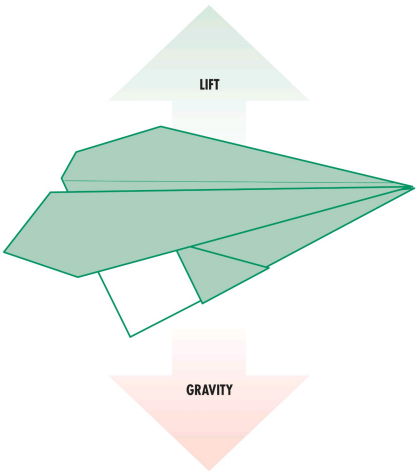
breeze and will not fly well. You have no real control over this, so for serious flying, fly your planes indoors and keep doors and windows closed. The best place is a gym or a large hall, where there is plenty of room in all directions.

Each Factor Affects the Others

Throw slower, and you may need a higher angle of launch. Curl the wingtips, and you may need less wing angle. The only way to find out is to launch your plane, then work out what to change. Make a single change, but keep everything else the same, then re-launch. Repeat this until you have “trimmed” the plane. (Learn more about trimming here.)

Aerodynamics

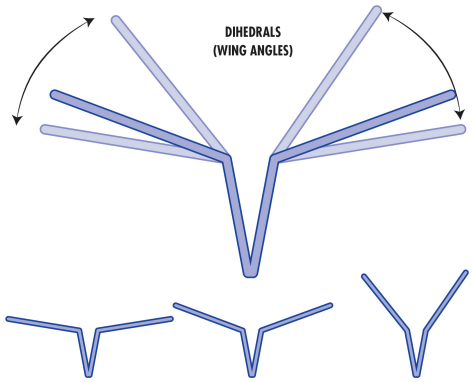
Aerodynamics is the study of moving air, particularly when it meets with a solid object, such as a paper airplane wing.



Lift and Gravity

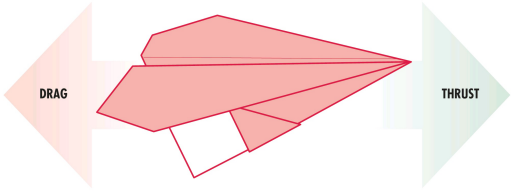
Gravity is a hidden force that causes all things to fall to the ground. But they may not fall at the same rate. Hold a sheet of paper and a small stone in each hand and drop them together. The stone will always hit the ground quickest. The paper will drift from side to side and float downward.

This is because the paper is held up by the air. The wings of a paper plane are designed to give resistance to the air. Also, air flowing over a wing gives it *lift*, so it falls much less quickly. Flight is a constant battle between gravity and lift. If lift is winning the battle, your plane will soar. If not, your plane will take a nosedive to the ground.



Trimming

This means tweaking parts of the plane. Perhaps the most important is the angle between the wings, known as *dihedral*. It's also important to have both wings at the same angle, or the plane will turn to one side or the other. Use the profile given for each model to start with, then experiment!



Thrust and Drag

Thrust is the force that makes the plane move forward. Your paper airplane's thrust comes from your arm. The harder you throw, the more thrust your plane has. However, once the plane leaves your hand, it has all the thrust it will get.

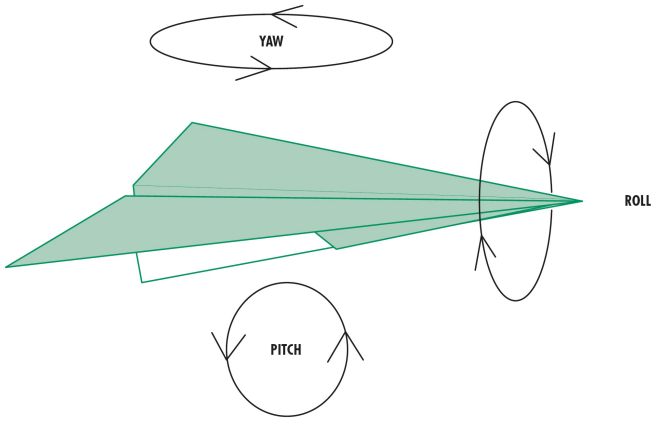
Drag happens when resistance from the air slows down the plane. Imagine you put the flat of your hand into a strong wind. It's hard to move your hand forward. By angling your hand into the wind, there's less resistance. The larger the wings of a plane, the more surface there is for air to slow down the plane. The smaller the wings, the less *drag* a plane has, allowing it to keep flying until gravity pulls it down.

V-shaped Wings

Wings are V-shaped (remember, the angle is called dihedral) to keep the flight of a plane stable, as the lift of each wing is nearly the same. If one wing is flatter, that wing will have more lift, causing the plane to roll.

Trailing Edges

The other part of the plane that affects flight is the paper at the back of the wings (known as the *trailing edges*). If the plane seems nose-heavy and dives, curl the back of the wings up a little. Don't forget, changes should be small, and you should test each time to see what happens to the flight.



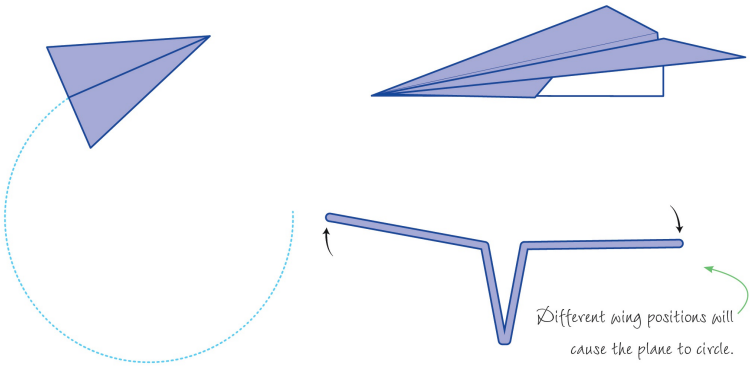
The Three Areas of Stability

Stability is what helps a plane return to steady flying after a strong gust of air or a bad throw. There are three types of stability, and they have unusual names: pitch,

roll, and yaw. *Pitch* is the angle at which the nose of the plane points up or down, or the angle of the length of the plane. Proper pitch keeps the plane flying as well as it can. *Roll* is the level across the wings, and it prevents the plane from spining as it flies. *Yaw* makes the plane turn from side to side. We want the plane to fly straight, without moving left or right.

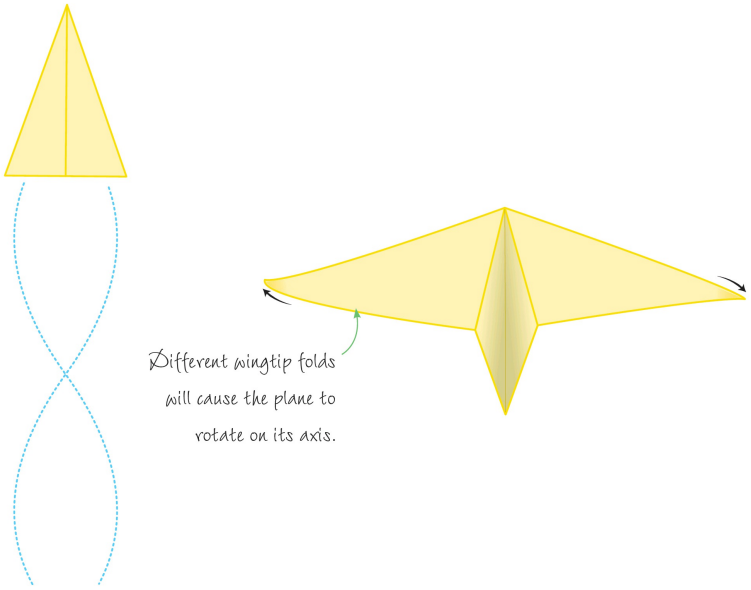
Aerobatic Stunts

Aerobatics are simply acrobatics in the air. Ready to have some fun? Use these suggestions to fly your plane in all sorts of crazy ways!



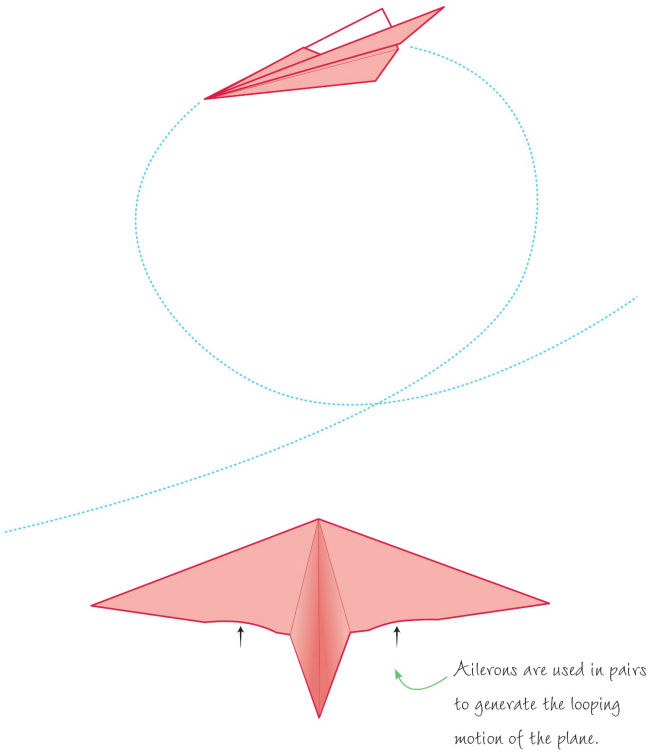
Circles

There are several ways to make your plane fly in circles, either to the left or right. Basically, you need to make the wings different from each other in some way. If you have wingtips with flaps, also called winglets, alter the angle of one or both. If you fold one up and one down, you'll get very dramatic effects, even crashes! Or alter the dihedral. In other words, angle one whole wing slightly up or down compared to the other. A third way is to add a small elevator or aileron to one wing.



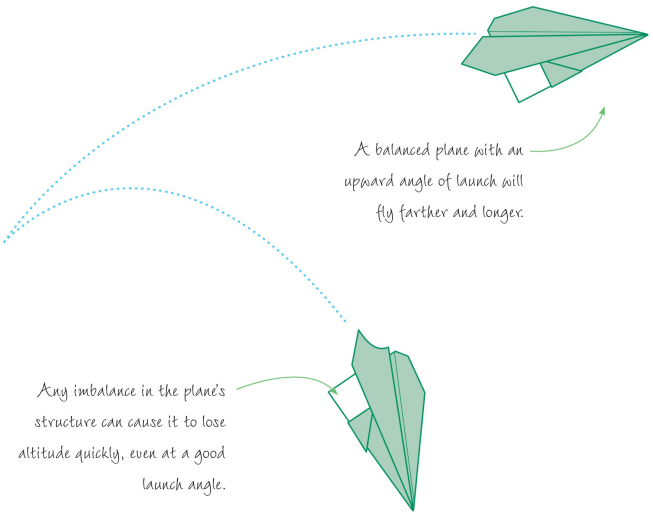
Spins

A spinning plane can be very dramatic! Keep in mind that the spinning action will cause a lot of extra drag, so your plane won't fly as far. The easiest way to achieve spins is to create uneven dihedral. To achieve this, angle one wing upward and the other slightly downward. You can create a similar effect by making ailerons that point in opposite directions.



Loops

To make the plane fly in a loop, you need to add “up” elevators or ailerons. They should be the same on both wings. This will provide extra lift at the back of the wings, so much so that the plane will rise sharply and loop. You’ll be surprised how little is needed to make this happen. When you’re trying *not* to loop, check to make sure you have no unwanted curls on the corners of the wings. “Down” elevators will probably mean your plane will hit the ground before it has a chance to loop.



The Two Key Flight Patterns

While aerobatics are great fun, the two major competition categories are “time in the air” and “distance.” To stay in the air *(aloft)* for the longest time, the key is to gain height as fast as possible. This means launching your plane at a very steep angle. Along with height, you need a subtle elevator or aileron on one wing that will cause the plane to circle as it descends. This circling keeps it in the air for longer.

For long-distance flights, it’s essential that the plane fly in a straight line. To do this, you want it to be perfectly balanced with an even dihedral and no curls on the wingtips. Launch it at a slight upward angle, with plenty of thrust, but not too much, or the wings may distort as you launch. Designs that have narrow wings fly more rapidly but provide less lift, so you need to balance the speed of launch with the chosen design.

Troubleshooting

People often think that if you launch a plane and it flies poorly, there's a problem with the design. Very often, though, your plane just needs a few minor tweaks to trim it so it flies properly.

Try to figure out what's wrong (Does it turn from side to side? Does it dive too quickly?), then fix one problem at a time. Each time you make an adjustment, try a few practice throws to see if you've solved the problem, then move on to the next issue.

As you keep launching the plane, you may find that the wings start to droop or the paper has absorbed moisture from the air. Unfortunately, a really successful paper plane may only fly at its peak for a few minutes. You then have to fold another!

Lack of Stability

Good stability means your plane will fly in a straight line. This is usually just a case of making sure that the profile of your plane is *symmetrical*—both wings must be at identical angles. This is easy to check. Just point the plane directly toward you and compare the parts of the wings. As you adjust, be careful not to add any extra curves, especially at the back of the wings or at the wingtips.

Flight

When you decided whether you want a distance, time in the air, or acrobatic flight, the key adjustments are dihedral, and possibly ailerons and elevators. The key is to understand why the plane flies the way it does and how you can correct it. Remember that any adjustment will react to other changes. For example, if you fold the wingtips further down, it may create less lift, so that you have to (perhaps) adjust the elevators as well.

Wind Strength and Direction

You should really fly planes indoors, but if you fly them outside, check the wind. Wind has two factors, strength and direction. In too strong a wind, good flights are

almost impossible. When flying in just a breeze, make sure it comes from behind you, so that it carries the plane along with it. (This should give you some great distances!) For wind coming from the side, you'll need to adjust the *flying surfaces* to make up for it, but it's not easy to do.

Safety First!

The main thing to think about when throwing paper planes is that they sometimes have a sharp nose. This could be painful and possibly dangerous if it flies into someone's face or eyes. The first thing to do is to warn people when you are launching, so they can duck out of the way if they need to. Secondly, if a design has a very sharp nose, you can cut, tear off, or better still, fold back the tip.

Poor Paper

The paper you use can have an effect on flight. Try any cheap material, but note that certain types of paper (such as construction paper) aren't suitable, since they're flimsy. This leads to drooping wings and torn paper. Other papers quickly absorb moisture from the air, and this will make any plane useless. The thickness of the paper affects the type of design you can fold—complicated designs are hard to make with thick paper, and very simple, small designs need lightweight paper or they won't fly. Standard copy paper is certainly as good as anything, and you can buy packs of 500 sheets very cheaply. Some designs are better from smaller sheets, so try cutting the paper in half. As you make bigger and bigger examples, there will come a point where the weight is simply too great and you won't be able to create enough lift.

A really successful paper plane may only fly at its peak for a few minutes. You then have to fold another!

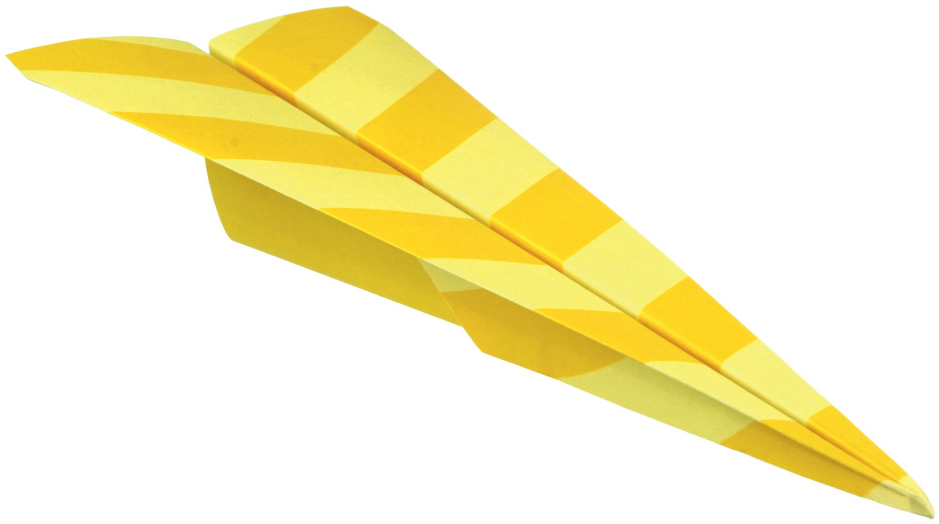
Each part of a paper airplane is interconnected — adjustments to one part can affect other parts.

OPTIONAL EXTRAS

Most people apply strict rules to paper planes; they use folding only, without cutting, gluing, or adding weights. The world record contest for paper planes (both for time in the air and distance) allows for small pieces of tape to hold wings together, but a "pure" origami category was recently added.

Some people happily tape the *fuselage* together or add a paper-clip to the nose, if it helps the plane fly. Others also tear (or cut) small flaps in the wings to act as elevators. You may do whatever makes you happy. There's no doubt that a couple of well-placed staples near the nose will improve the flying characteristics of almost any plane, but you might consider this cheating!

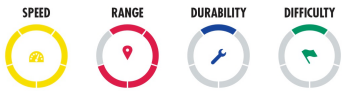
Great Plane
Designs

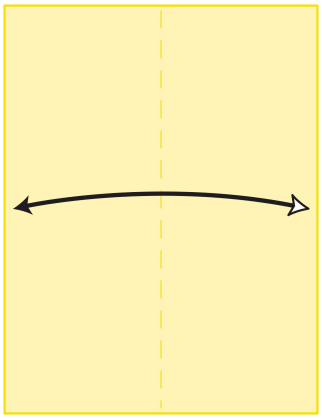


Classic Dart

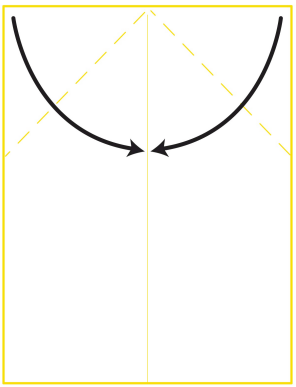
TYPE: GLIDER

This design may well be over 100 years old. The reason it’s still popular is that it flies beautifully and is as simple as it gets to fold up.

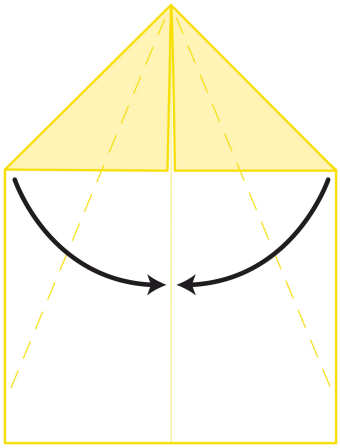




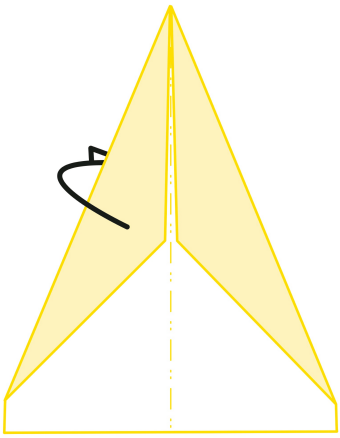
1 With the paper vertical and colored or patterned side up, fold the sheet in half long edge to long edge. Crease, then unfold.



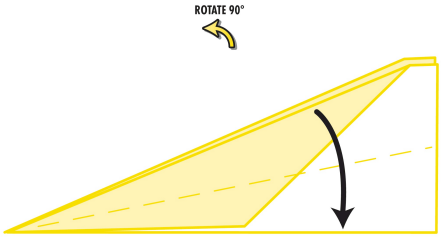
2 Flip the paper over. Fold both of the upper corners down along the imaginary broken line so they lie on the vertical center crease.



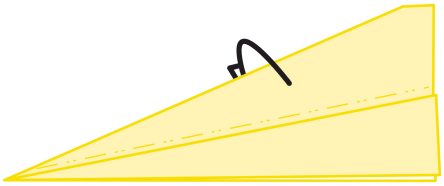
3 Fold both of the upper edges down along the imaginary broken line to the vertical center crease.



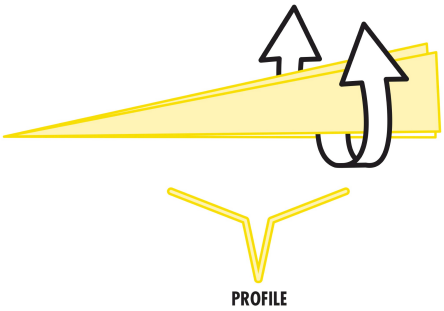
4 Fold the left half of the model behind the right half.



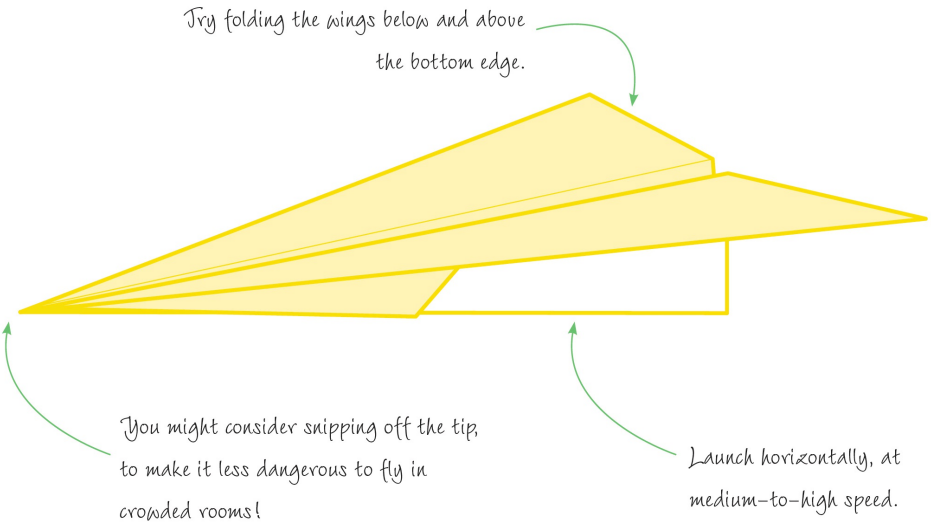
5 Rotate the paper 90° counter-clockwise. Fold the upper layer down along the imaginary broken line to lie along the lower edge. This forms a wing.



6 Repeat on the other side.



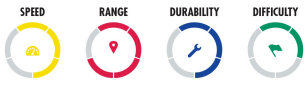
7 Open the wings to match the sketch of the profile shown below the illustration.

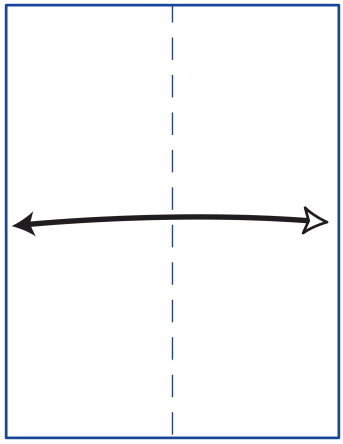


Nakamura Glider

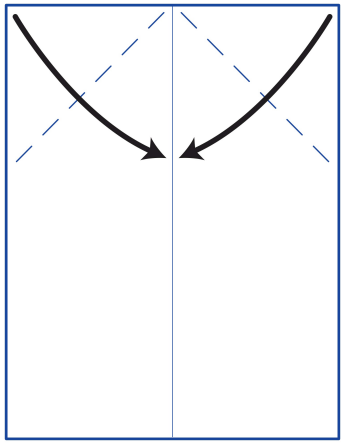
TYPE: GLIDER

This design was created in the 1970s by a Japanese folder called Eiji Nakamura. It is based on classic designs, but incorporates a simple yet clever lock that prevents the extra layers of the wings from opening out.

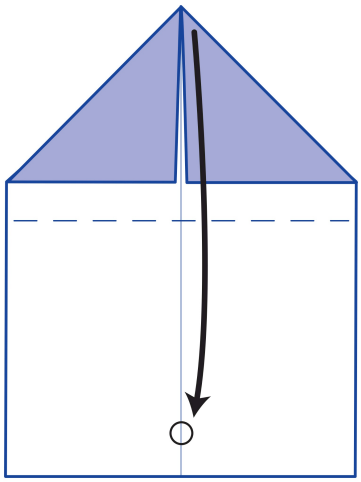




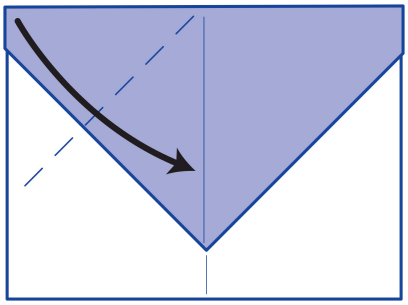
1 With the paper vertical and plain side up, fold the sheet in half long edge to long edge. Crease, then unfold.



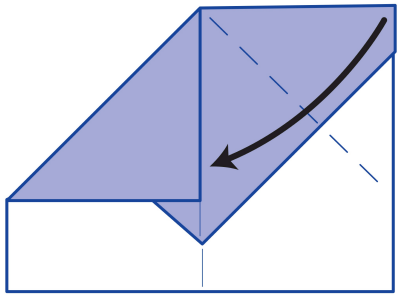
2 Fold both of the upper corners down along the imaginary broken line so they lie on the vertical center crease.



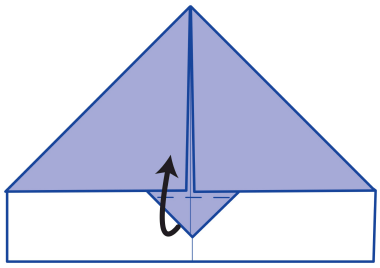
3 Fold the corner at the top down along the imaginary broken line to meet the area circled in the illustration.



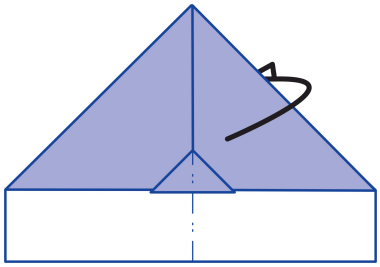
4 Fold the left half of the upper edge in along the imaginary broken line to lie on the vertical center crease.



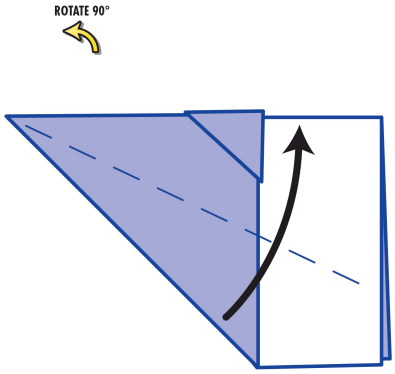
5 Fold the right half of the upper edge in along the imaginary broken line to lie on the vertical center crease.



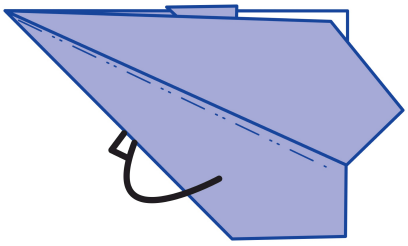
6 Fold the small triangular flap near the bottom up along the imaginary broken line.



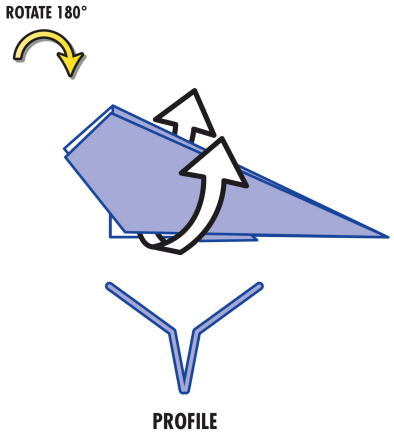
7 Fold the right half of the model behind the left half.



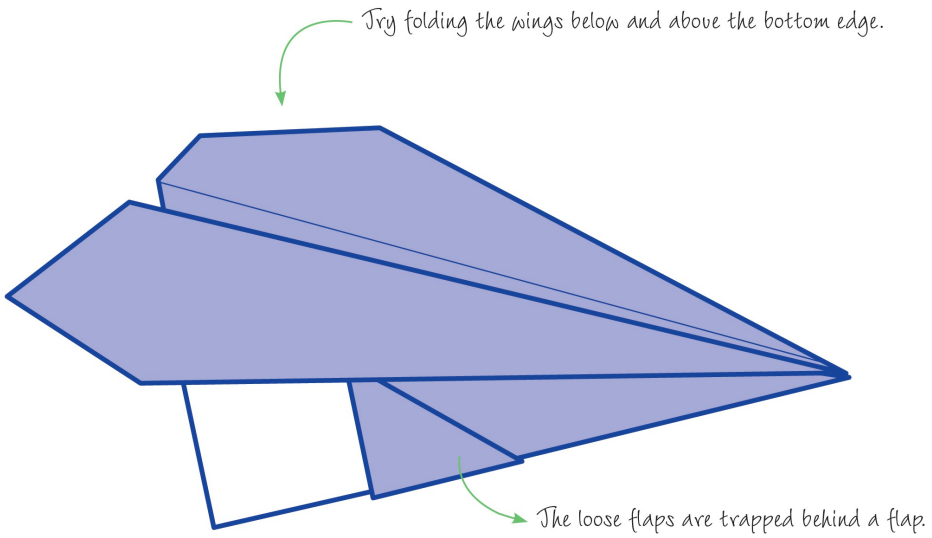
8 Rotate the model 90° counterclockwise. Fold the lower edge of the top layer upward along the imaginary broken line to lie on the horizontal edge.



9 Repeat on the other side.



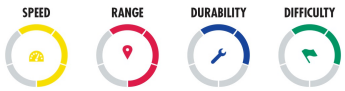
10 Rotate the plane 180°. Open the wings to match the sketch of the profile that is under the illustration.

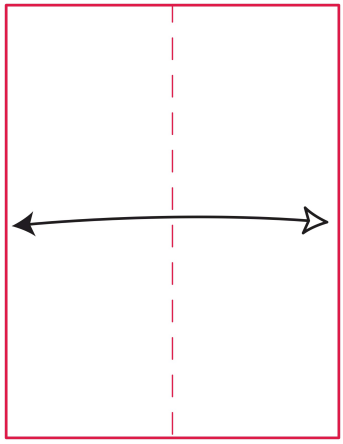


Canard

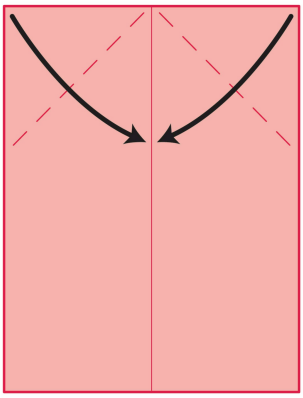
TYPE: GLIDER

French for “duck,” canard refers to a type of fixed-wing aircraft where the tailplane is ahead of the main wings, rather than behind them as in most designs.

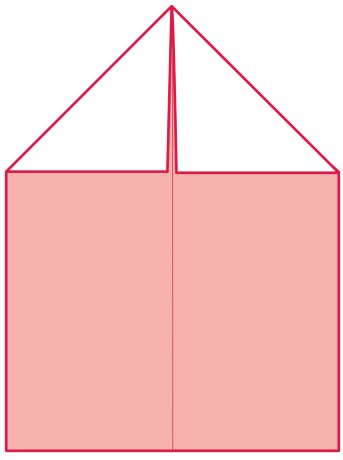




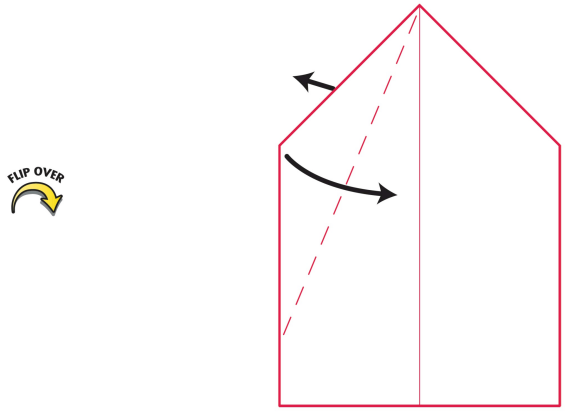
1 With the paper vertical and the plain side facing up, fold the sheet in half long edge to long edge. Crease, then unfold.



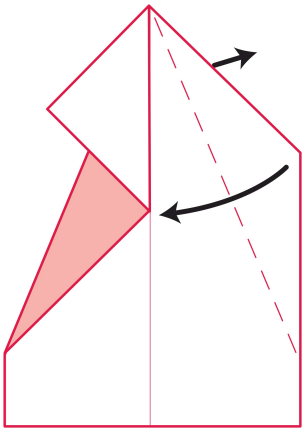
2 Flip the paper over. Fold each of the upper corners down along the imaginary broken line to lie on the vertical center crease.



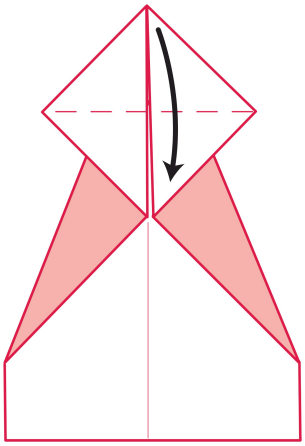
3 This is the result.



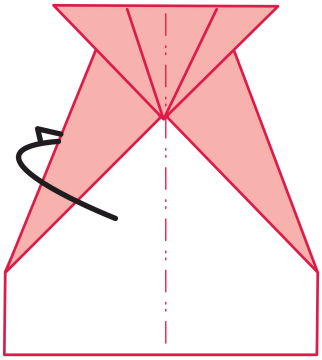
4 Flip the paper over. Fold the upper left edge in to the vertical center crease, along the imaginary broken line, allowing the corner to flip out from underneath.



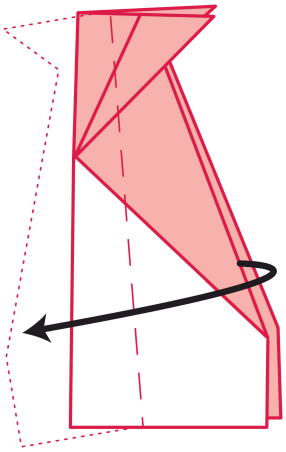
5 Fold the upper right edge in to the vertical center crease along the imaginary broken line, again allowing the corner to flip out from underneath.



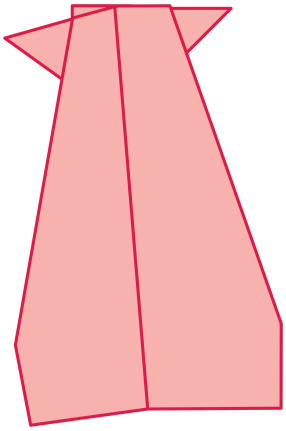
6 Fold the top corner down along the imaginary broken line shown in the illustration.



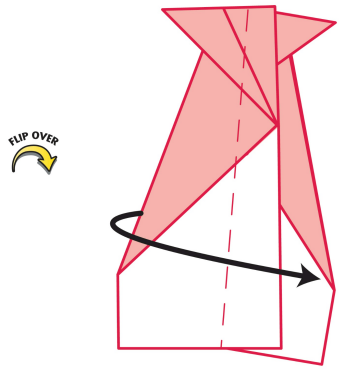
7 Fold the left half of the model behind the right half.



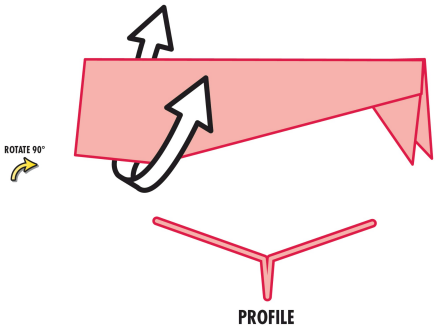
8 Fold the upper layer along the imaginary dotted line in the illustration. This forms a wing. Note that this fold is at a slight angle, rather than exactly parallel to the left edge of the paper.



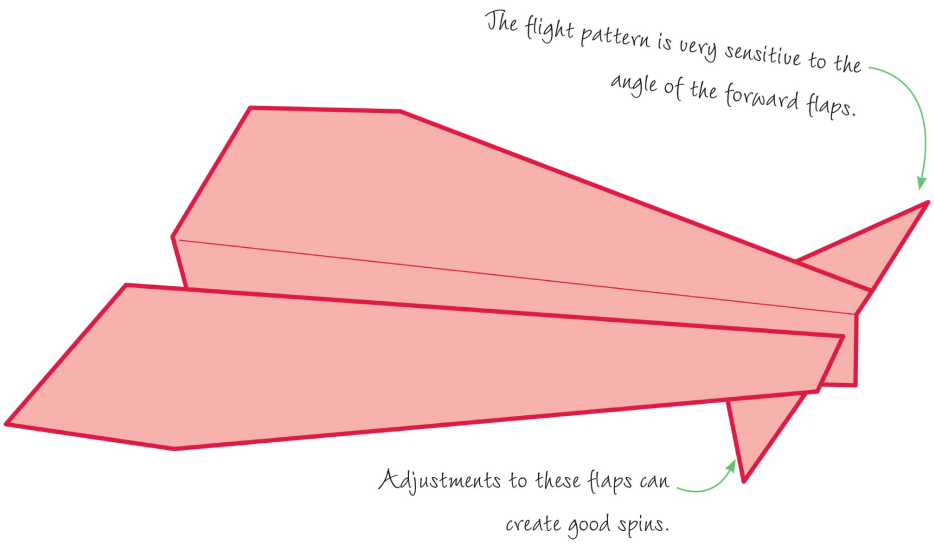
9 This is the result.

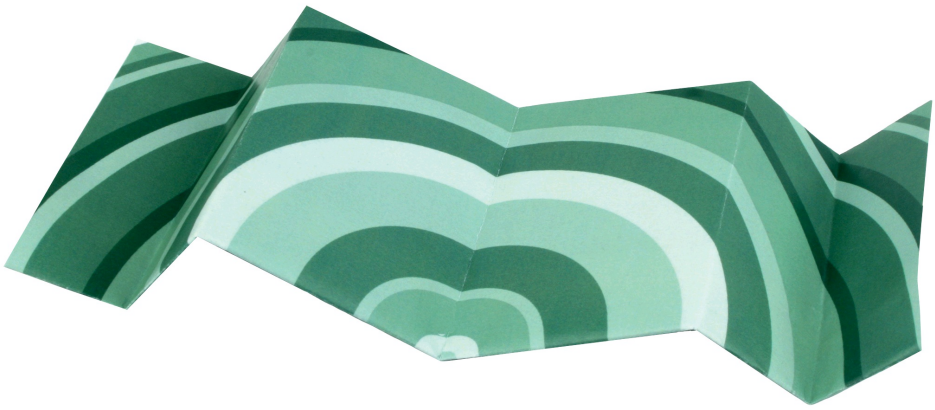


10 Flip the paper over. Fold the upper layer to match the lower one.



11 Rotate the plane 90° clockwise. Open the wings to match the profile sketch shown below the illustration.

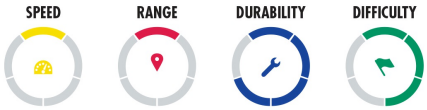

The flight pattern is very sensitive to the angle of the forward flaps.
Adjustments to these flaps can create good spins.

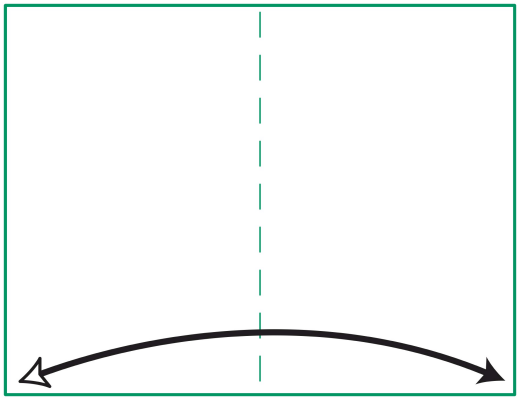


Flying Wing

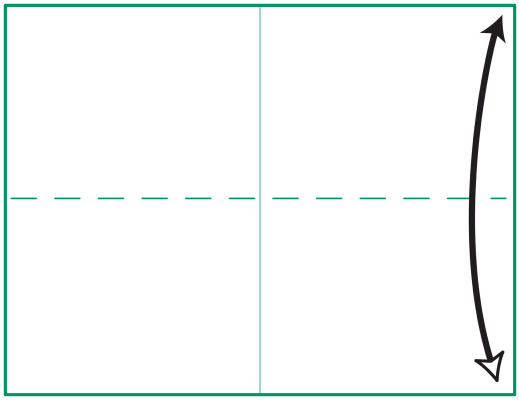
TYPE: GLIDER

Use this simplest of configurations to test aerodynamic principles and see the effect of altering angles and distances between folds.

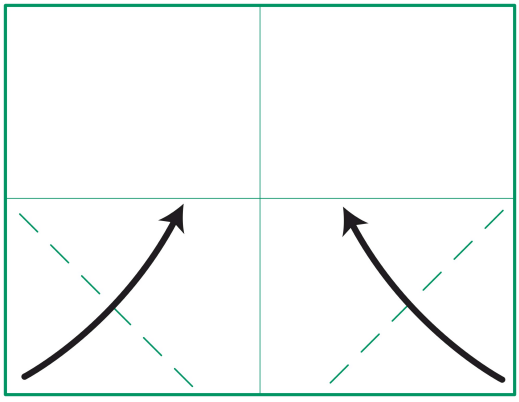




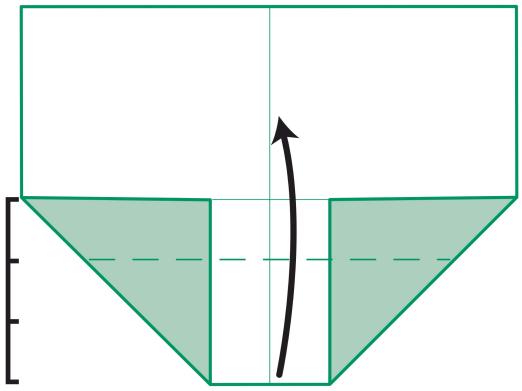
1 With the sheet horizontal and the plain side facing up, fold the paper in half short edge to short edge. Crease, then unfold.



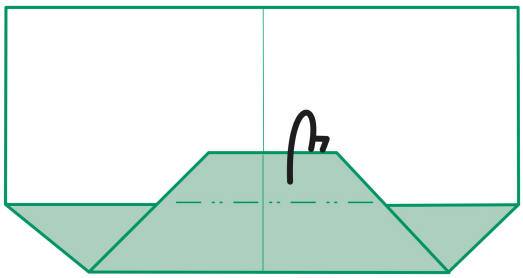
2 Fold the paper in half long edge to long edge. Crease, then unfold.



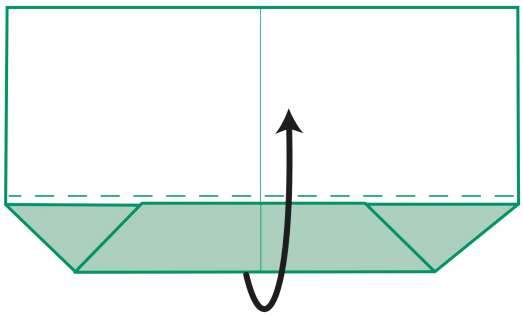
3 Fold both of the lower corners up along the imaginary dotted line in the illustration so they lie on the horizontal center crease.



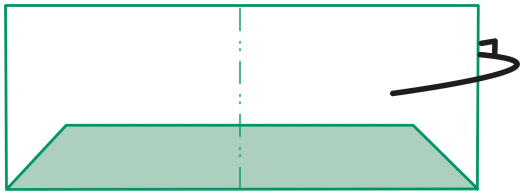
4 Picture an imaginary line along the top third of the bottom half. Fold the lower edge upward along it. To make sure you're keeping the fold perfectly horizontal, line up the vertical crease of the upper layer with the vertical crease of the lower layer.



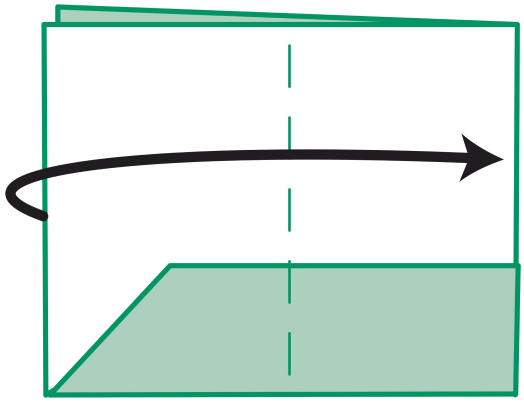
5 Fold the top half of the upper layer inward as far as it will go.



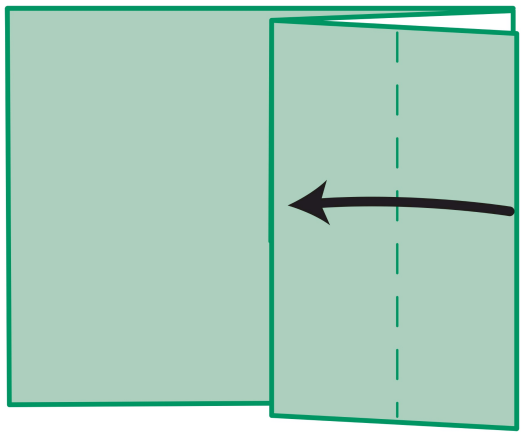
6 Fold the bottom section up.



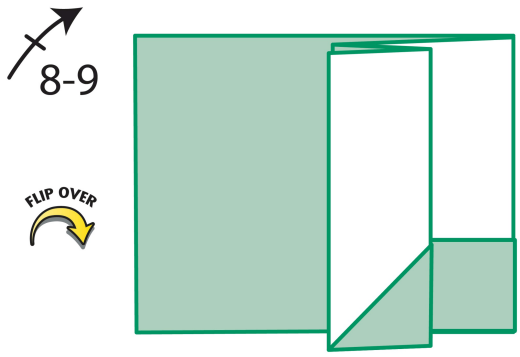
7 Fold the right half of the model behind the left half.



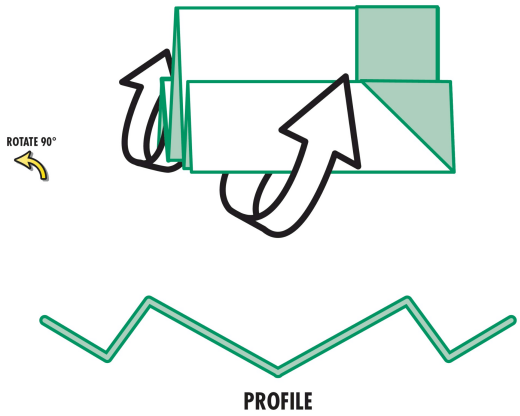
8 Fold the upper layer in half to the right.



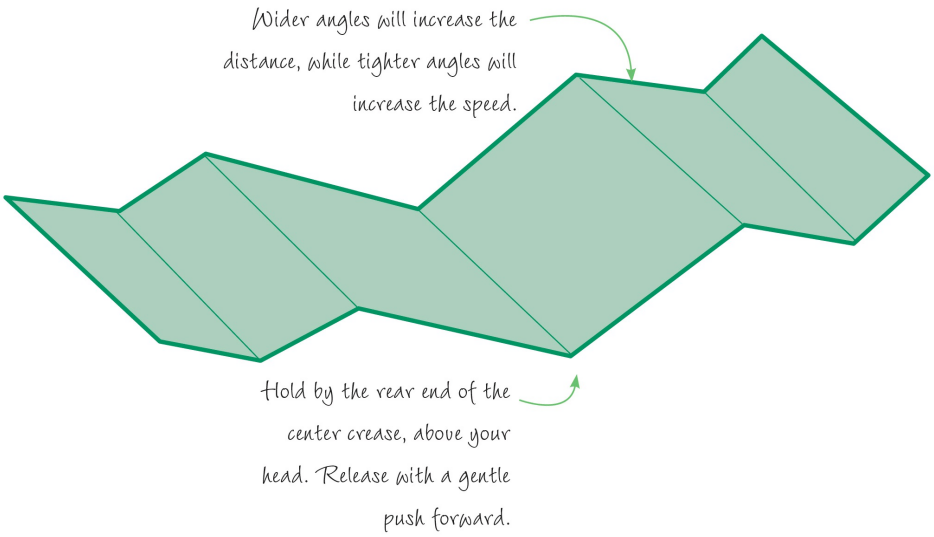
9 Fold the upper layer in half toward the left.



10 This is the result. Flip the model over. Repeat Steps 8 and 9 on the upper layer. (This time you'll fold toward the left in Step 8 and toward the right in Step 9.)



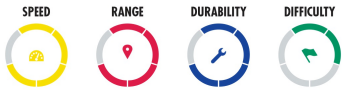
11 Rotate the model 90° counterclockwise. Open the wings to match the profile sketch shown under the illustration.

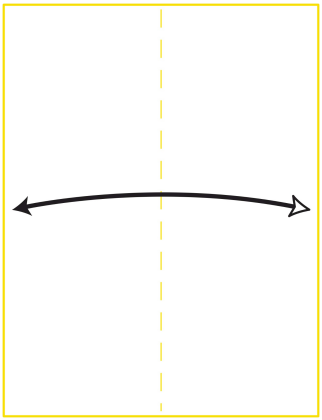


Champion

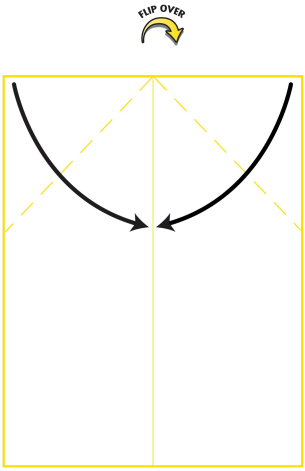
TYPE: STUNT

This design is streamlined and built for speed. It’s a variation of the Classic Dart, but concentrates more weight at the front end.

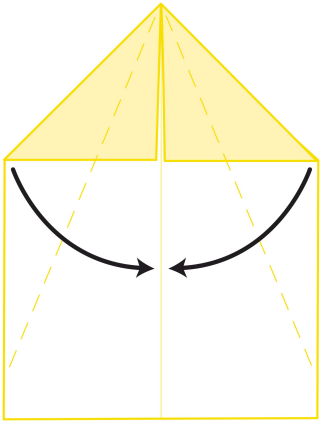




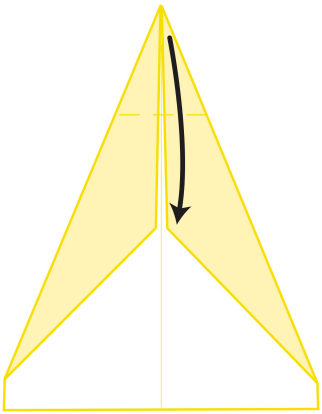
1 With the paper vertical and the plain side facing up, fold the sheet in half long edge to long edge. Crease, then unfold.



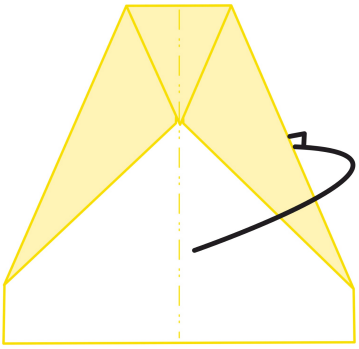
2 Fold each corner of the upper edge down to the vertical center crease, along the imaginary broken line shown in the illustration.



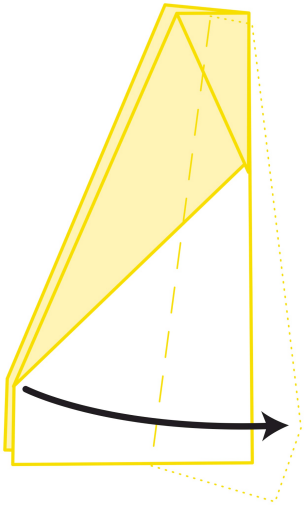
3 Starting at the corner at the top, fold the upper edges in along the imaginary broken line shown in the illustration so they lie on the vertical center crease.



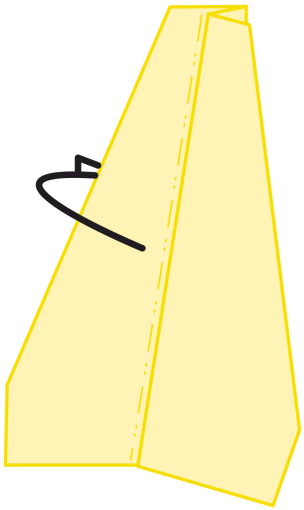
4 Fold the upper corner down along the imaginary broken line shown in the illustration so the point touches the inner corners.



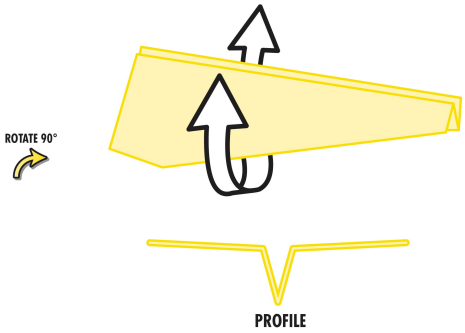
5 Fold the right half of the model behind the left half.



6 Fold just the top layer along the imaginary dotted line in the illustration. Note that this fold is at a slight angle, rather than parallel to the fold on the right-hand edge.



7 Repeat Step 6 on the other side.



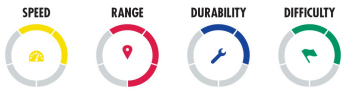
8 Rotate the plane 90° counterclockwise. Open the wings to match the profile.

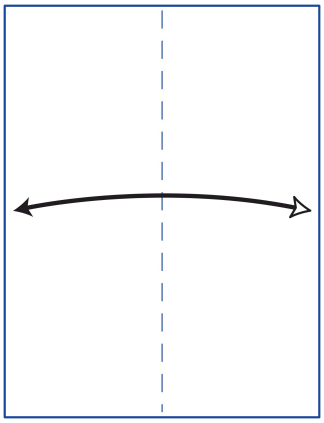
You can alter the plane's stability by changing the angle of the fold in either Step 3, Step 6, or both.

Hawk

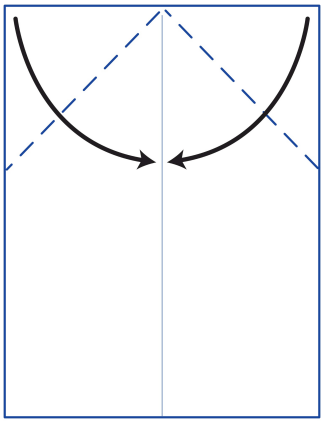
TYPE: DART

The large wings, as compared to the narrow fuselage, give this design plenty of lift.

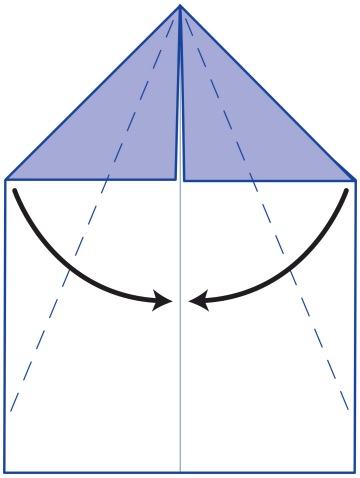




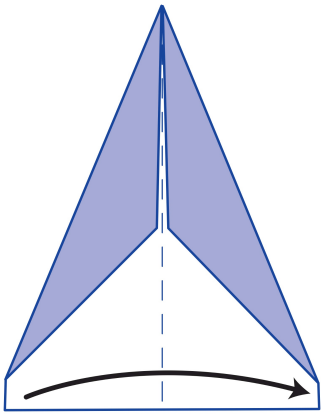
1 With the paper vertical and plain side up, fold the sheet in half long edge to long edge. Crease, then unfold.



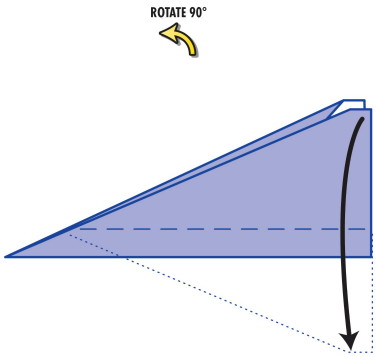
2 Fold each of the upper corners down along the imaginary broken line in the illustration so they lie on the vertical center crease.



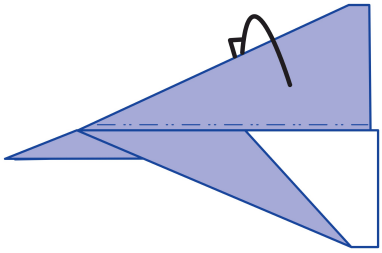
3 Fold both upper edges down along the imaginary broken line in the illustration so they lie on the vertical center crease.



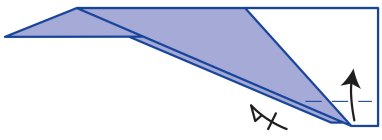
4 Fold the model in half so the left side is on top of the right.



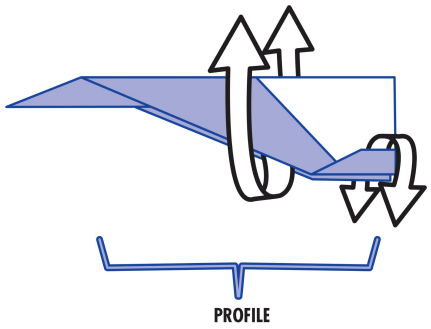
5 Rotate the model 90° counter-clockwise. Fold the upper layer down along the imaginary dotted line shown in the illustration. This forms a wing.



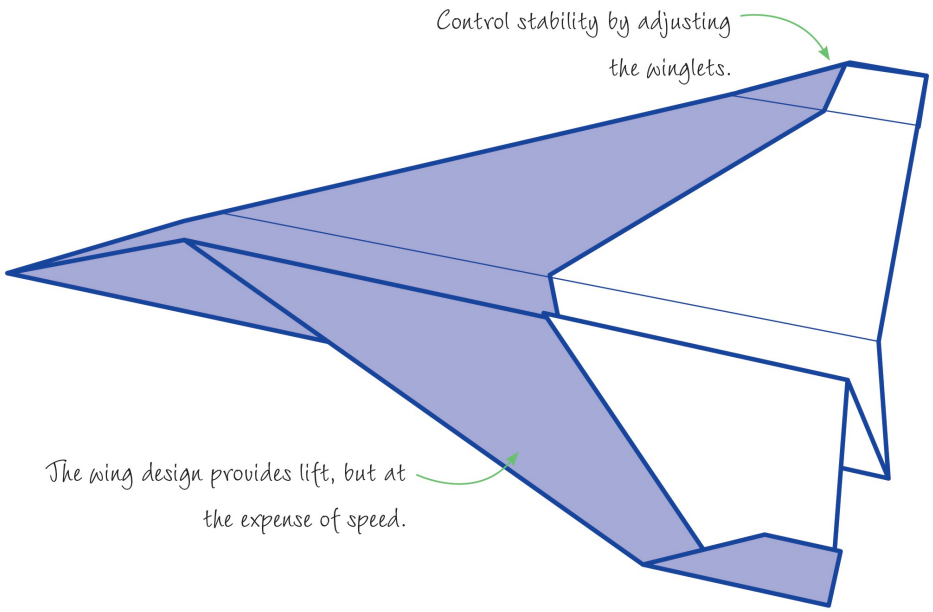
6 Fold down the other side to match, making the second wing.

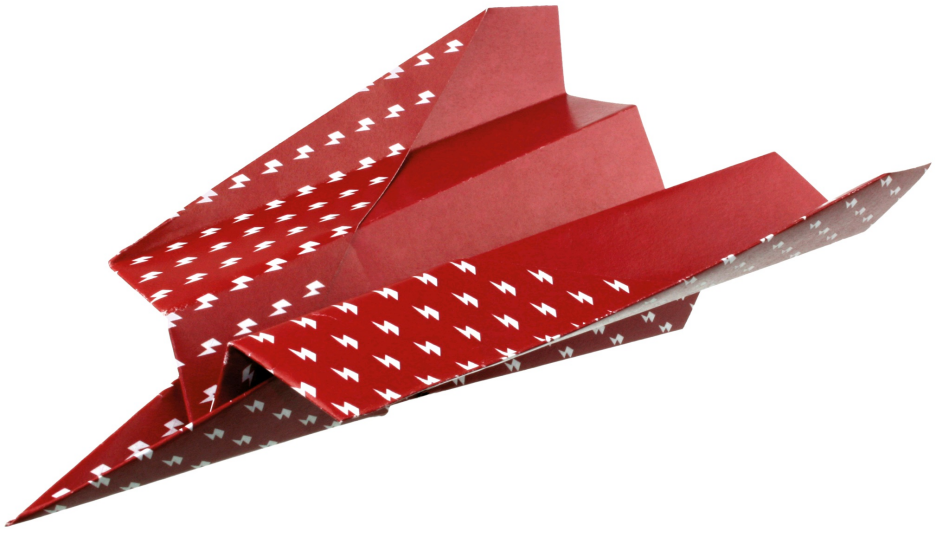


7 Fold the lower tips of both wings upward to create winglets.



8 Open the wings to match the profile.

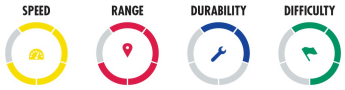


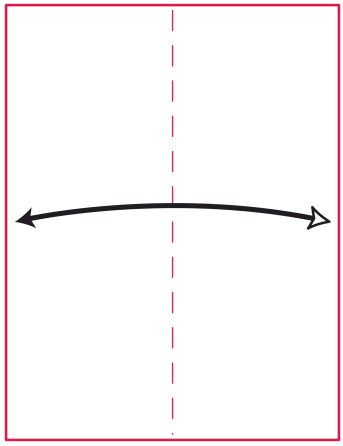


Needlenose

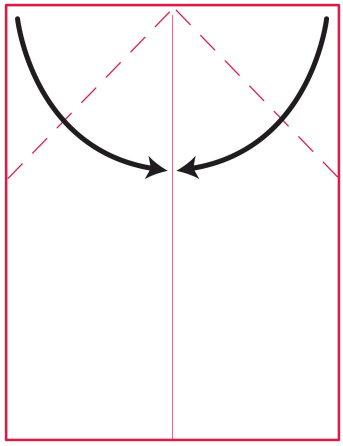
TYPE: STUNT

Experiment with the different fold placements in step 7 to see how you can change the plane’s flight pattern.

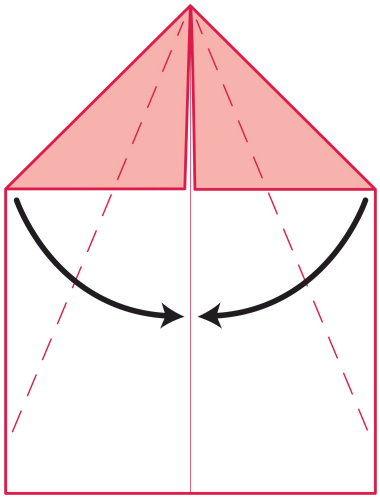




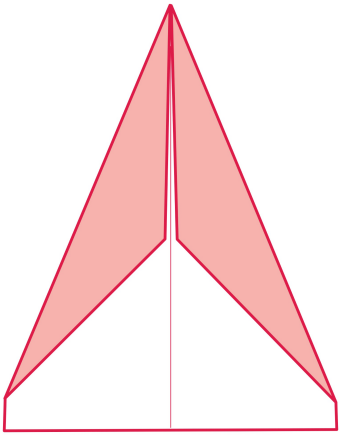
1 With the paper vertical and plain side up, fold the sheet in half long edge to long edge. Crease, then unfold.



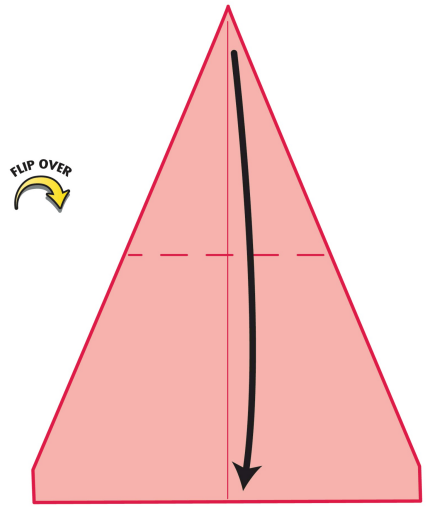
2 Fold each of the top corners down along the imaginary broken line in the illustration so they lie on the vertical center crease.



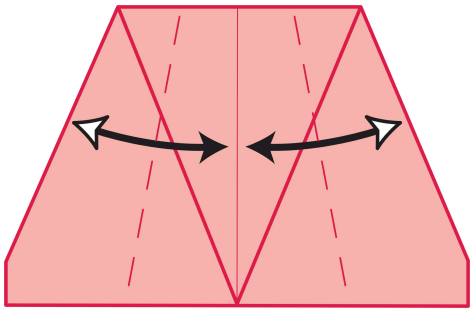
3 Fold both of the short edges at the top down along the imaginary broken line in the illustration so they lie on the horizontal center line.



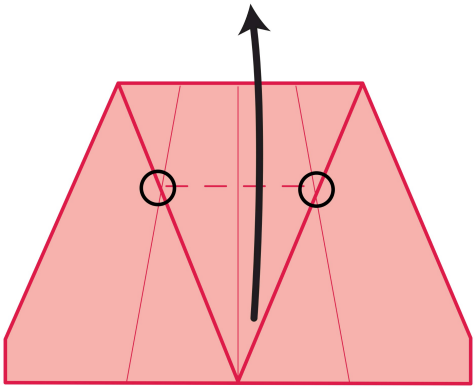
4 This is the result.



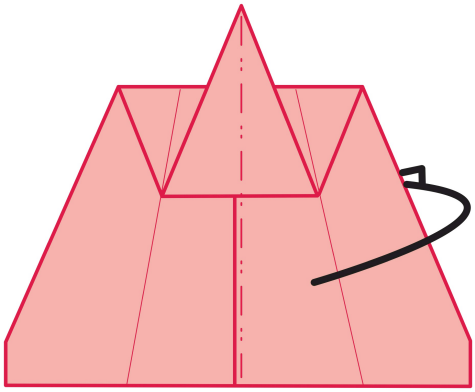
5 Flip the model over. Fold the top corner down along the imaginary broken line in the illustration so the point touches the center of the lower edge.



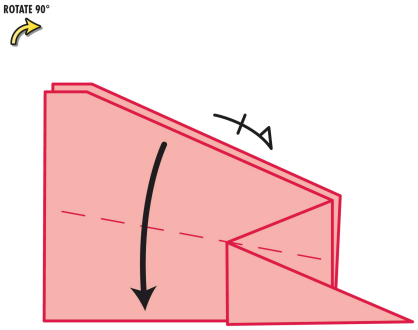
6 Fold both of the long outer edges along the imaginary broken line in the illustration so they lie along the vertical center crease, then unfold.



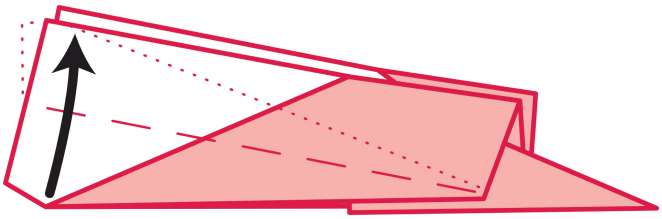
7 Picture an imaginary horizontal line where the edges of the top layer meet the creases you made in Step 6 (as circled in the illustration). Fold the pointed flap up along that line.



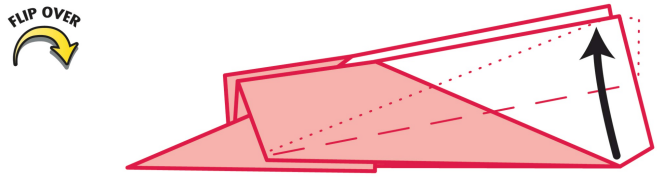
8 Fold the right side behind the left side.



9 Rotate the model 90° clockwise. Fold the top layer down on the existing crease to form a wing. Fold out the wing on the other side, too.

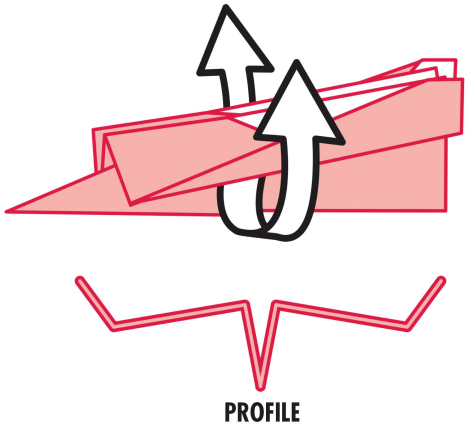


10 Fold the winglet of the top layer up along the imaginary dotted line shown in the illustration.

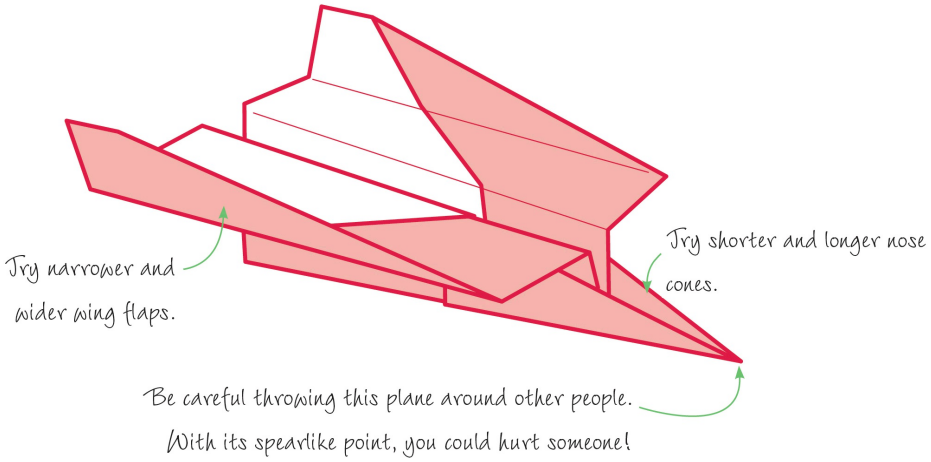


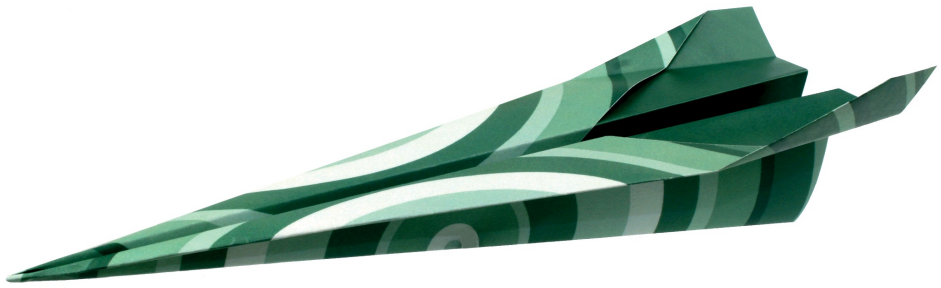
11 Flip the model over. Fold the winglet of the top layer along the imaginary

dotted line.



12 Open the wings to match the profile.

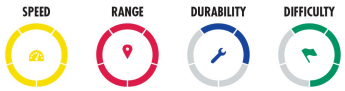


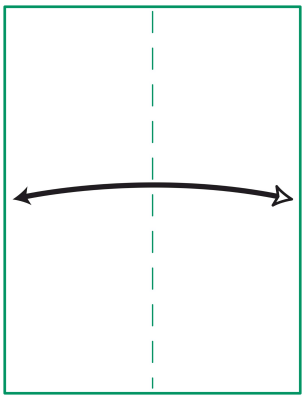


Javelin

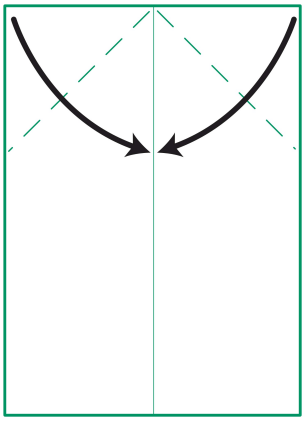
TYPE: DART

This plane is an excellent design for high-speed flight. Adjust the wingtips to maximize stability.

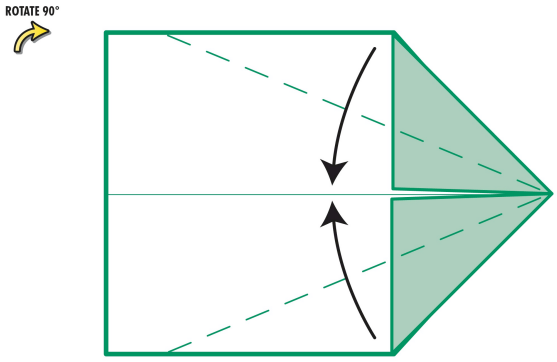




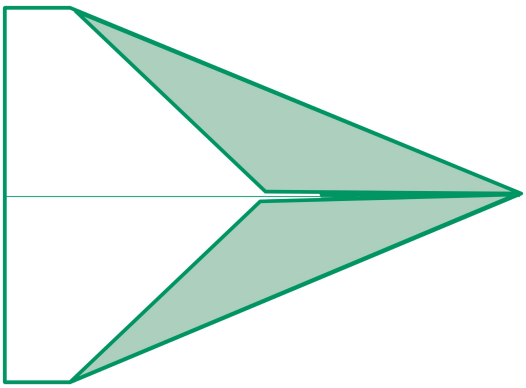
1 With the paper vertical and plain side up, fold in half long edge to long edge. Crease, then unfold.



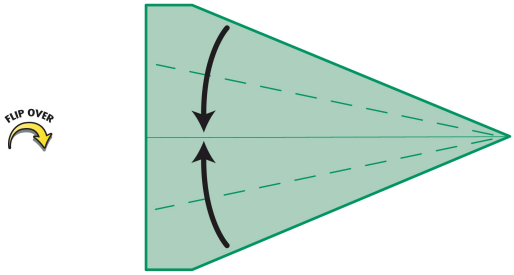
2 Fold each of the upper corners down along the imaginary broken line in the illustration so they lie on the vertical center crease.



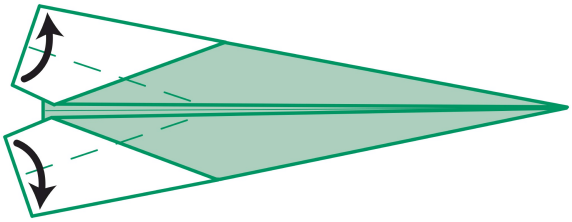
3 Rotate the paper 90° clockwise. Fold both short edges on the right in along the imaginary broken line so they lie on the horizontal crease along the center.



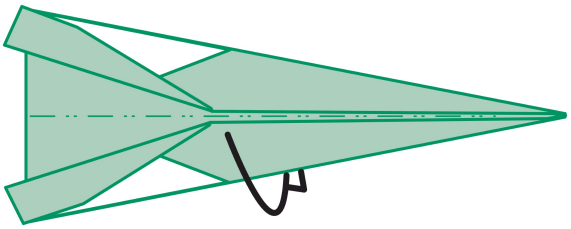
4 This is the result.



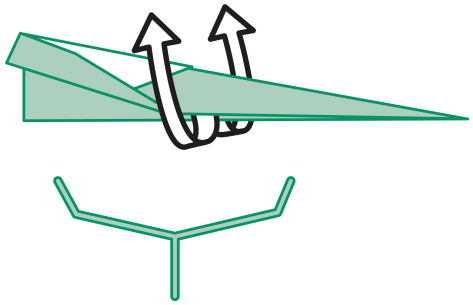
5 Flip the paper over. Fold the long upper and lower edges in along the imaginary broken line in the illustration, so they lie on the horizontal crease at the center. This forms the wings.



6 Fold the ends of the wings out along the imaginary broken lines in the illustration so that the corners touch. This creates winglets.

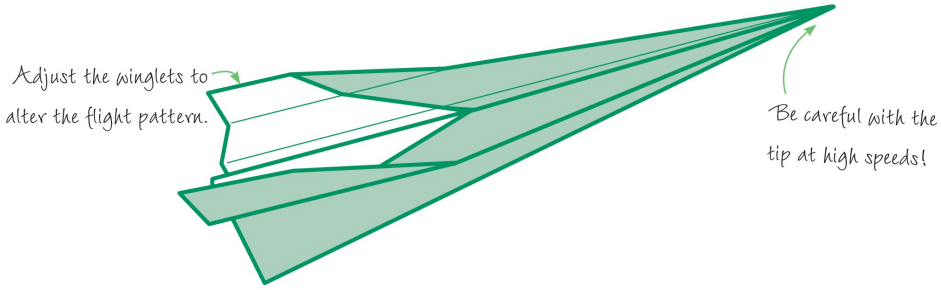


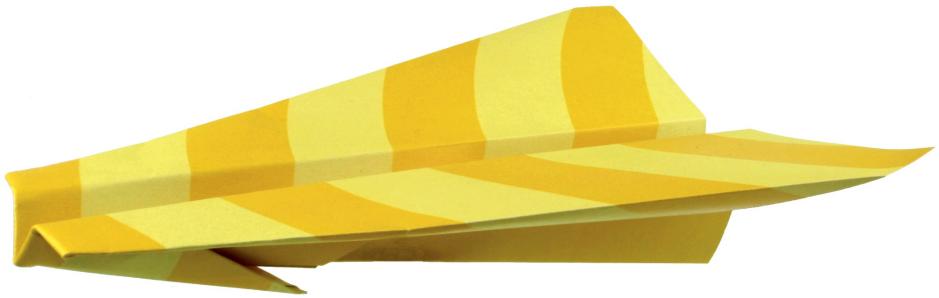
7 Fold the lower half behind the upper one.



PROFILE

8 Open the wings to match the profile.

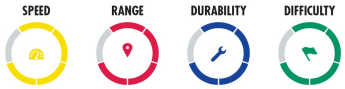


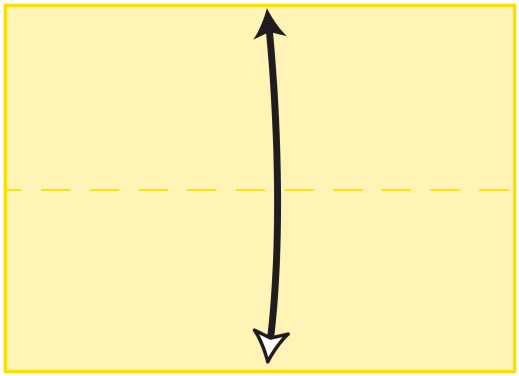


Delta

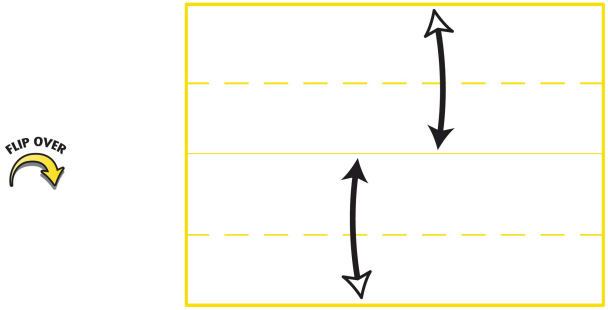
TYPE: GLIDER

The geometry of this design produces a different leading edge to the wings and allows for some neat locking and a pleasing symmetry.

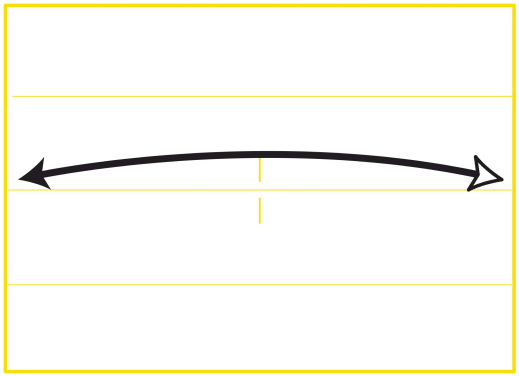




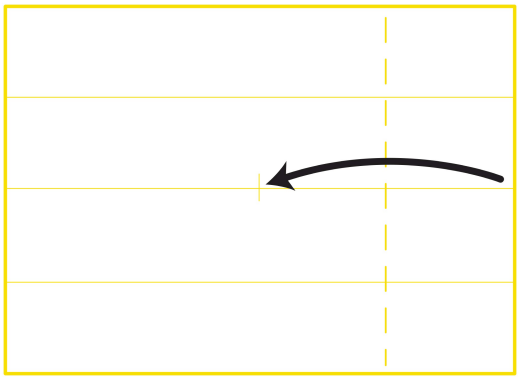
1 WIith the paper horizontal and the patterned or colored side up, fold in half long edge to long edge. Crease, then unfold.



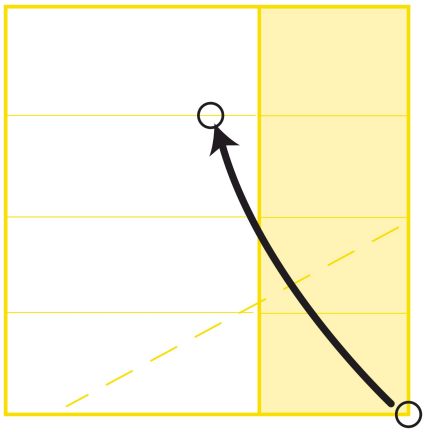
2 Flip the paper over. Fold the upper and lower edges in along the imaginary broken line in the illustration. Crease, then unfold.



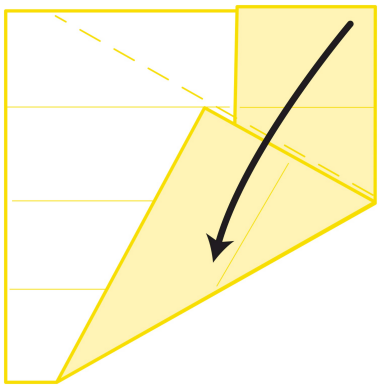
3 Fold in half from right to left, but not fully. Just make a small pinch to mark the center. Unfold.



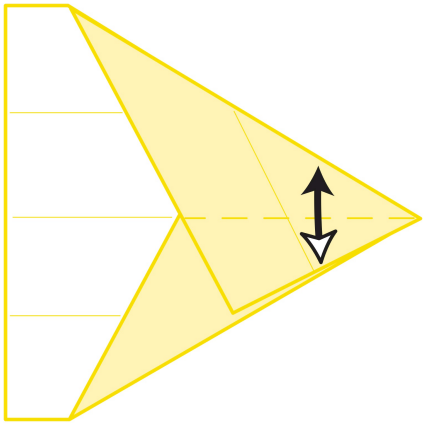
4 Fold the right edge in to the pinch-mark, along the imaginary broken line in the illustration.



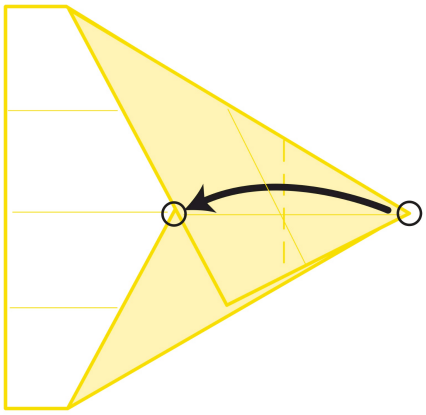
5 Fold the right bottom corner up on the imaginary broken line so that the points circled in the illustration meet.



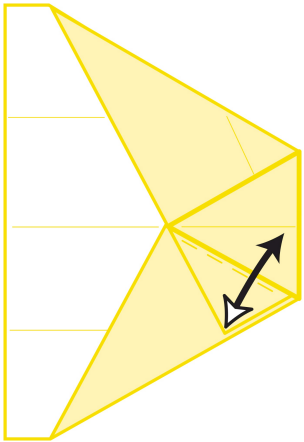
6 Fold the upper right corner down along the inner folded edge and the imaginary broken line shown in the illustration.



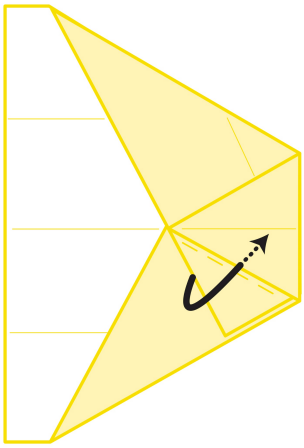
7 Emphasize the horizontal center crease by folding the model outward with the underside inside the fold. Crease. Unfold.



8 Fold the right corner in along the imaginary broken line so the circled points meet.

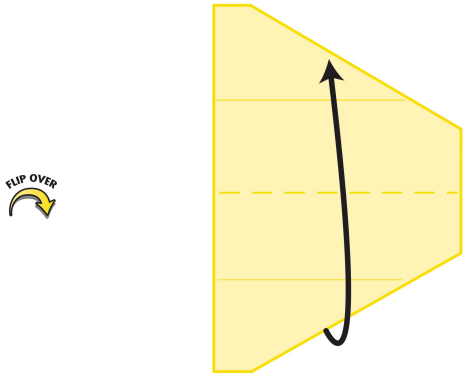


9 Fold the small triangular flap over the edge. Crease it, then unfold.

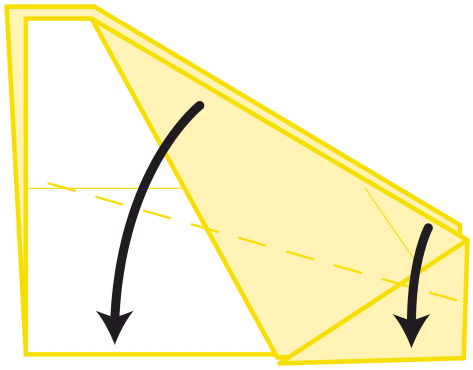


10 Fold the same flap back in, tucking it into the pocket.

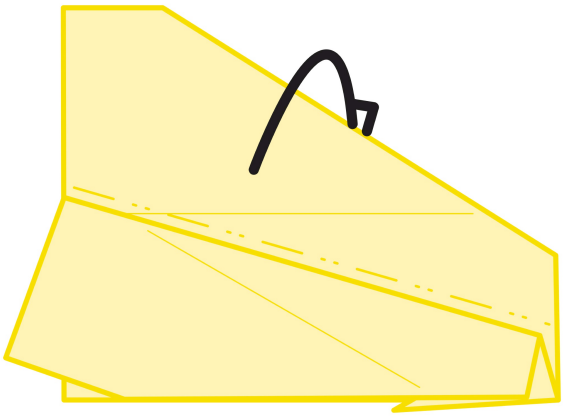
11 This is the result.



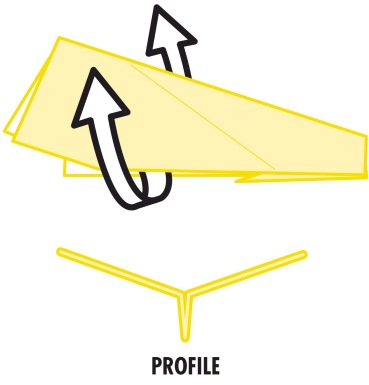
12 Flip the model over. Fold it in half upward.



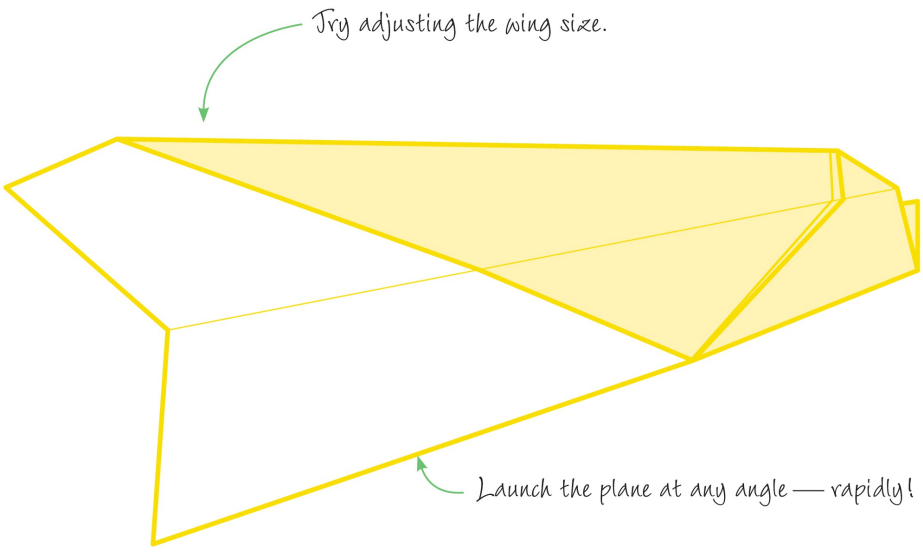
13 Fold the top layer down so its top edge meets the lower edge. This forms a wing.



14 Repeat on the other side.



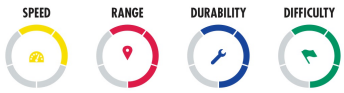
15 Open the wings to match the profile.

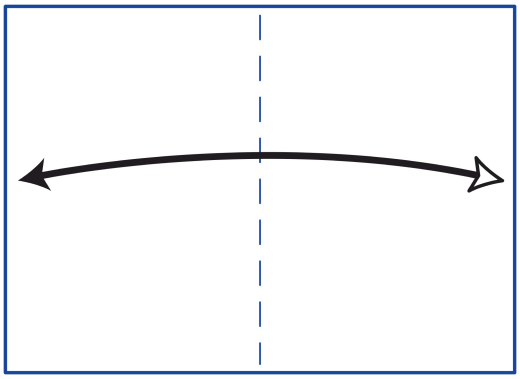

Try adjusting the wing size.
Launch the plane at any angle — rapidly!

Eagle

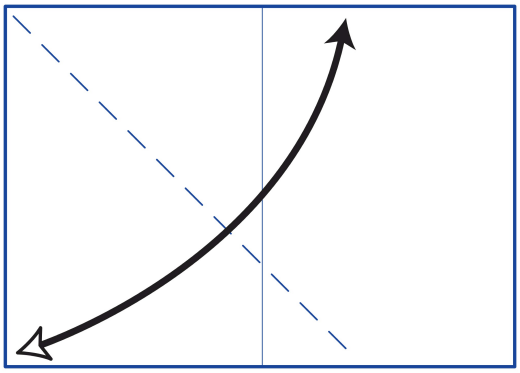
TYPE: STUNT

This design makes elegant use of the paper. In step 9, you might make subtle changes to the wings—experiment to see what effect this has on the flight pattern.

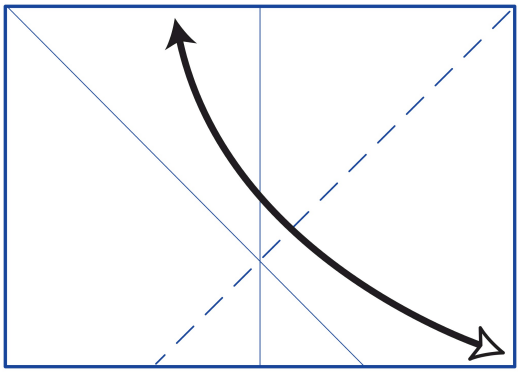




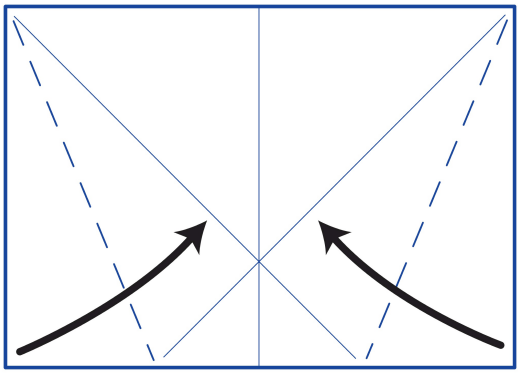
1 With the paper horizontal and plain side up, fold the sheet in half short edge to short edge. Crease, then unfold.



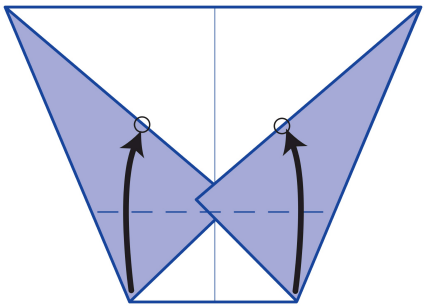
2 Fold the bottom left corner up to the top edge, along the imaginary broken line in the illustration. Crease, then unfold.



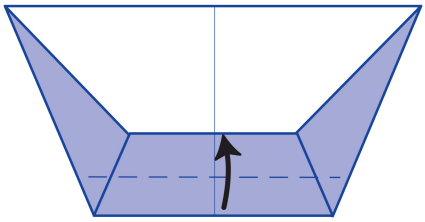
3 Fold the bottom right corner up to the top edge, along the imaginary broken line in the illustration. Crease, then unfold.



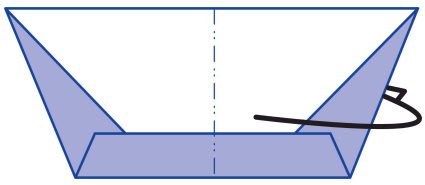
4 Fold both sides in along the imaginary broken line in the illustration, so they lie on the creases you made in Steps 2 and 3.



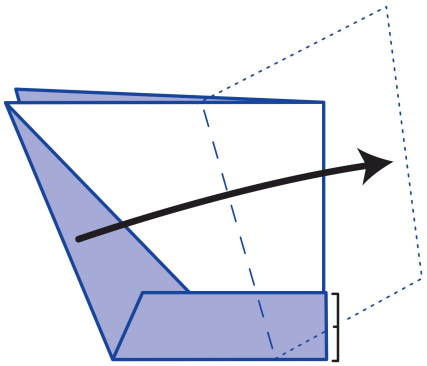
5 Fold the lower edge up so the corners lie on the edges of the flaps that have been folded in, as marked with a broken line and circles in the illustration.



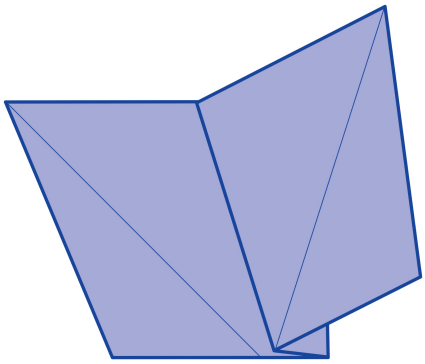
6 Fold the lower section in half upward along the imaginary broken line in the illustration.



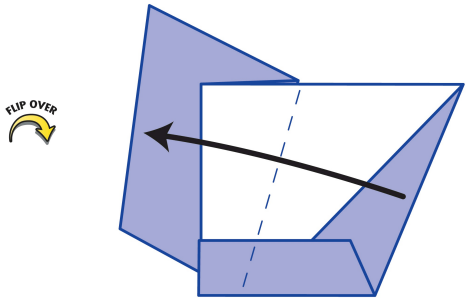
7 Fold the right half underneath the left one.



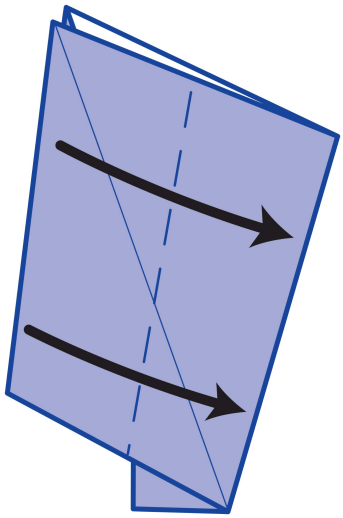
8 Fold the upper flap up along the imaginary broken line in the illustration so its outline matches the outline shown with a dotted line. This forms a wing.



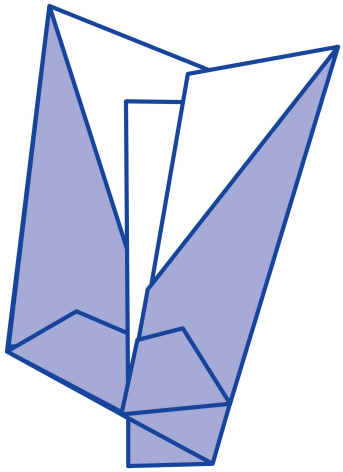
9 Your model will look like this.



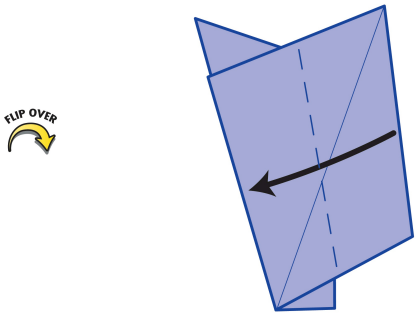
10 Flip the model over. Fold the other wing to match the first.



11 Fold the upper flap to the right along the imaginary broken line in the illustration so its edge lies on the folded edge.

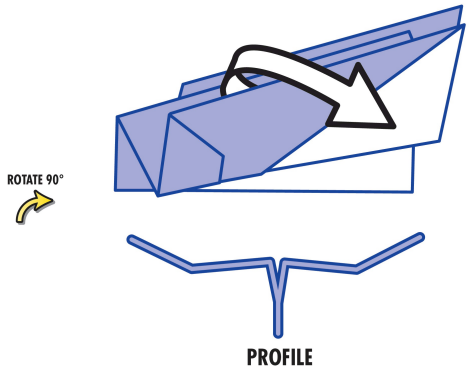


12 This is the result.

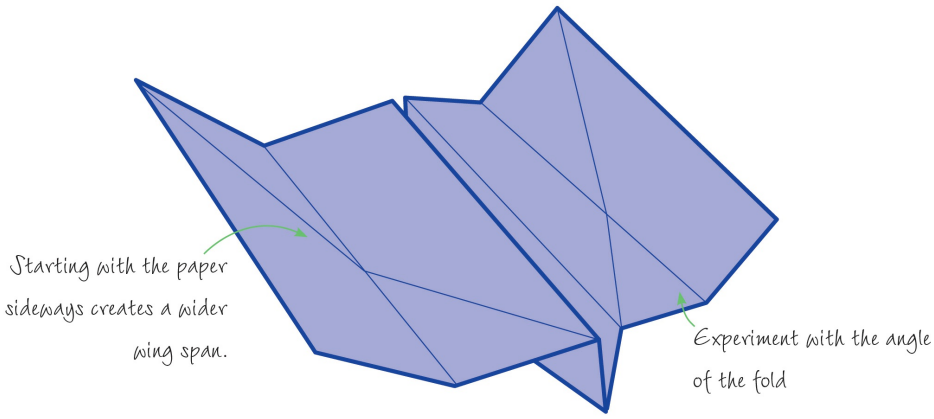


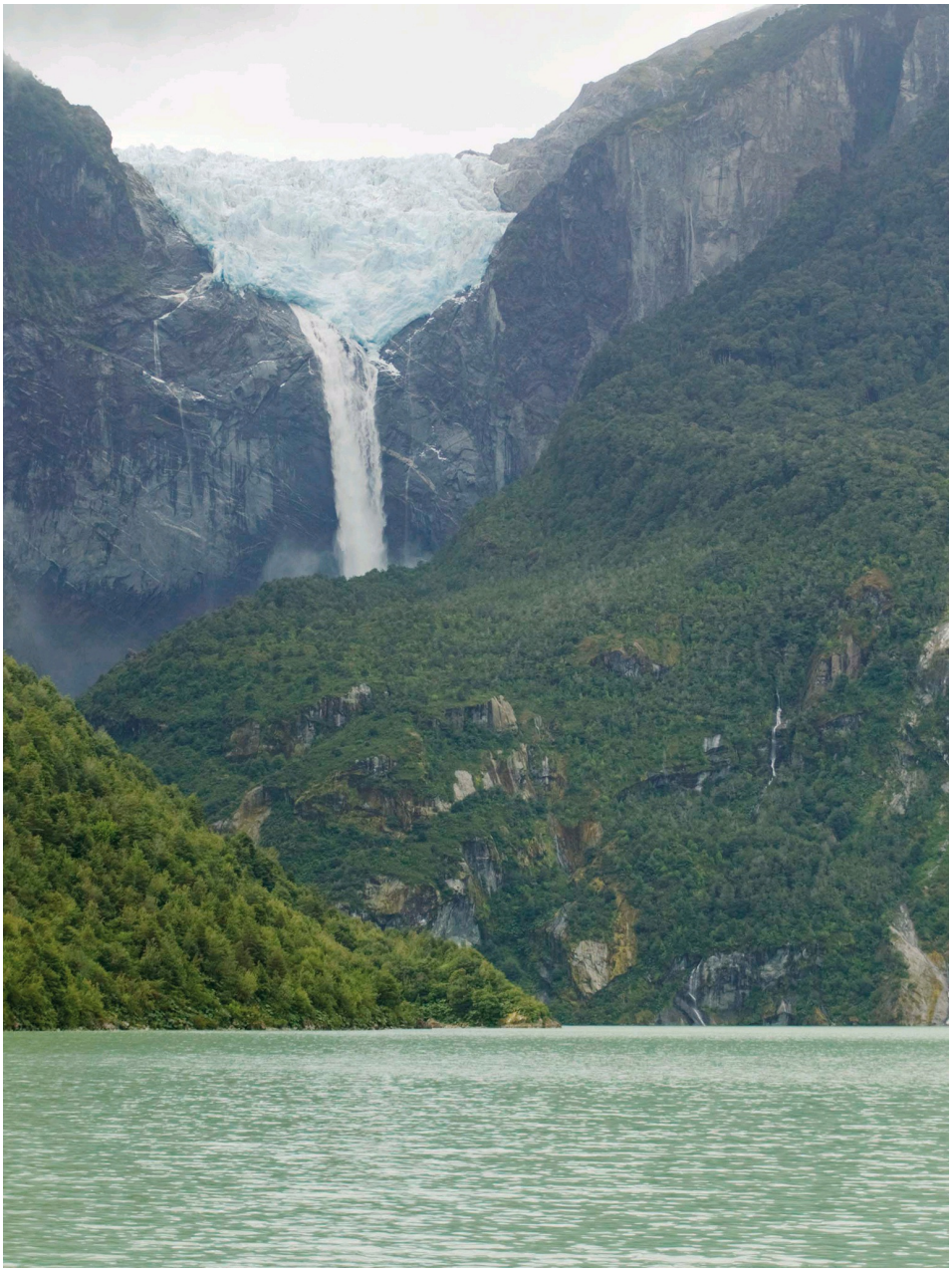
13 Flip the paper over. Fold the upper flap to the left so its edge lies on the

folded edge.



14 Rotate the paper 90° clockwise. Open the wings to match the profile.

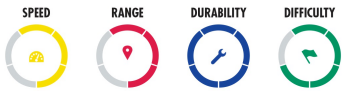


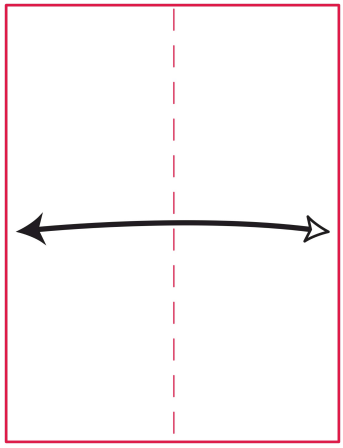


Skylark

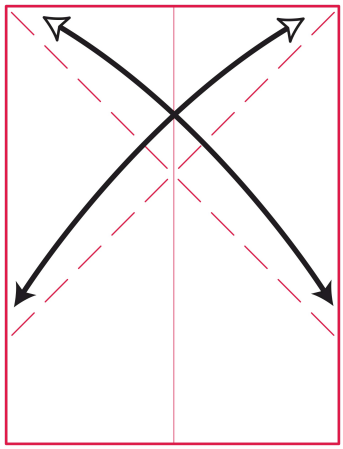
TYPE: STUNT

This model combines several techniques from well-known paper airplane designs to create a new style of flyer.

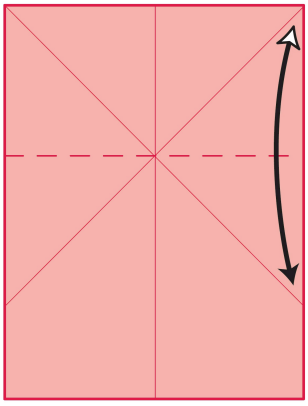




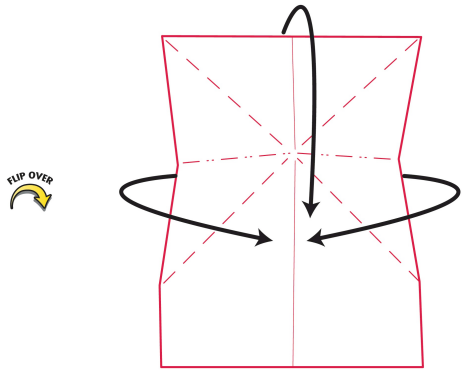
1 With the paper vertical and plain side up, fold the sheet in half long edge to long edge. Crease, then unfold.



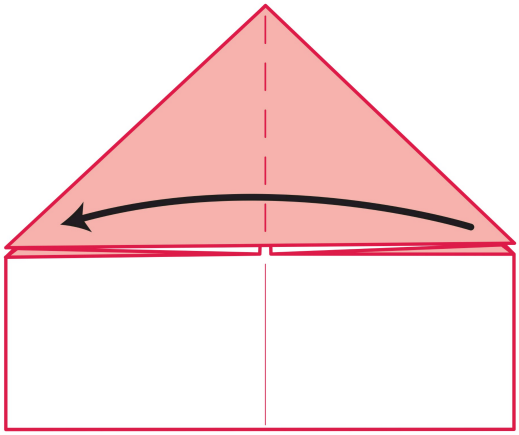
2 One after the other, fold each of the top corners down to the left and right edges, along the imaginary broken line in the illustration. Crease, then unfold them.



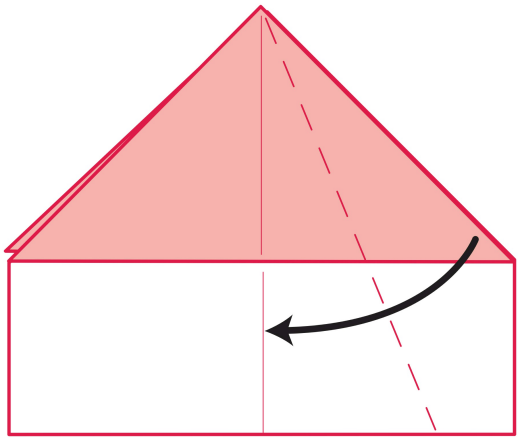
3 Flip the paper over. Fold the top corners down to the ends of the creases made in Step 2, along the imaginary broken line in the illustration. Crease, then unfold.



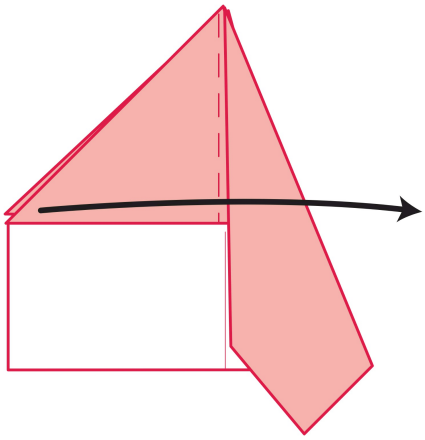
4 Flip the paper over. Collapse the upper section of the paper inward and downward using the creases.



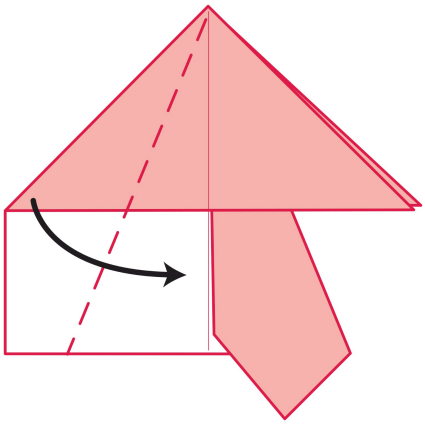
5 Fold the right upper flap from right to left.



6 Fold the upper right edge in to the vertical center crease, along the imaginary broken line in the illustration.

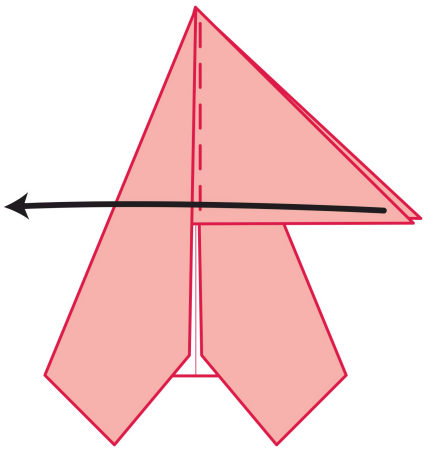


7 Fold the upper flap on the left side, as well as the one beneath it, from left to right.

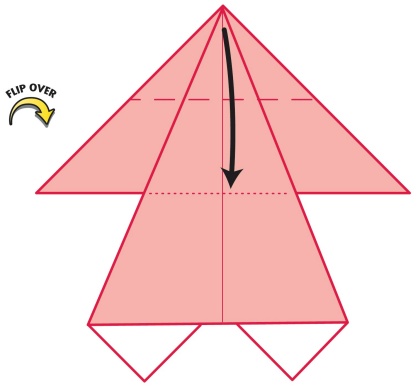


8 Fold the upper left edge down to the vertical center crease along the imaginary

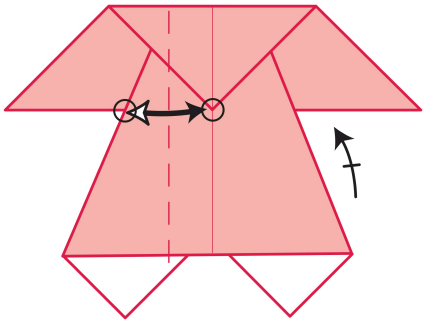
broken line in the illustration.



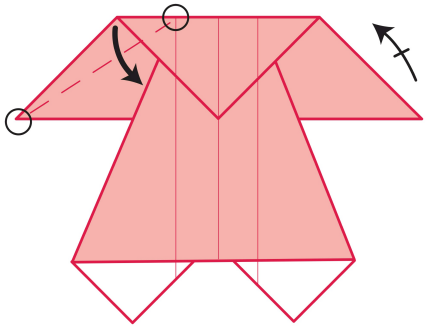
9 Fold the upper flap on the right side from right to left.



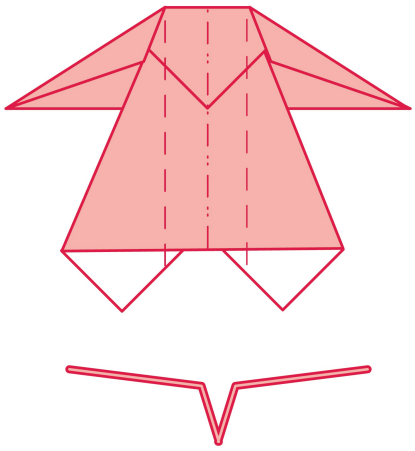
10 Flip the model over. Fold the top corner down along the imaginary dotted line shown in the illustration.



11 Fold the left side along the imaginary broken line in the illustration so the circled points meet. Crease and unfold. Repeat on the right side.

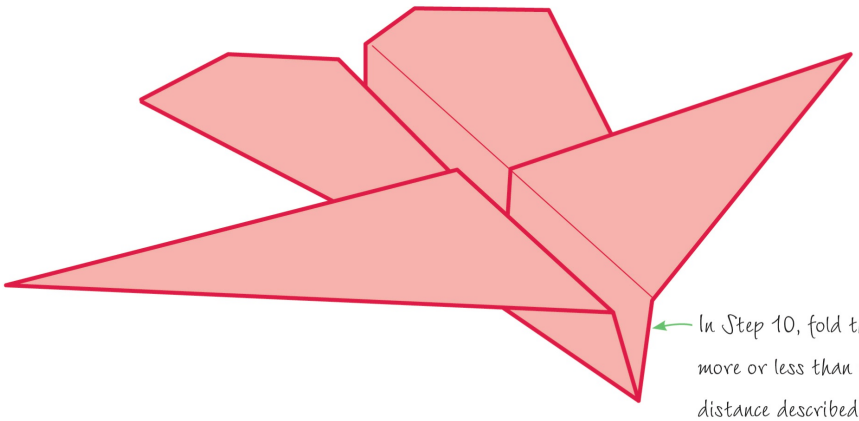


12 Fold the upper left side along the imaginary line between the circled points in the illustration. Repeat on the right side.



PROFILE

13 Fold on the existing creases to match the profile.

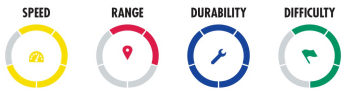


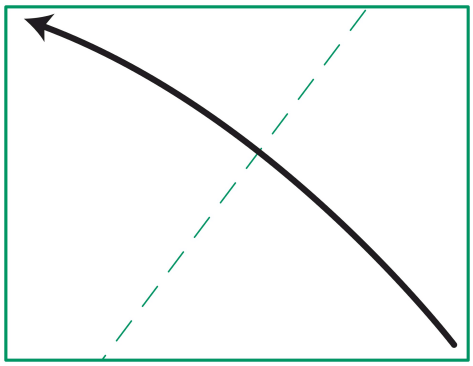
In Step 10, fold the paper more or less than the distance described to see how it affects flight.

Boomerang

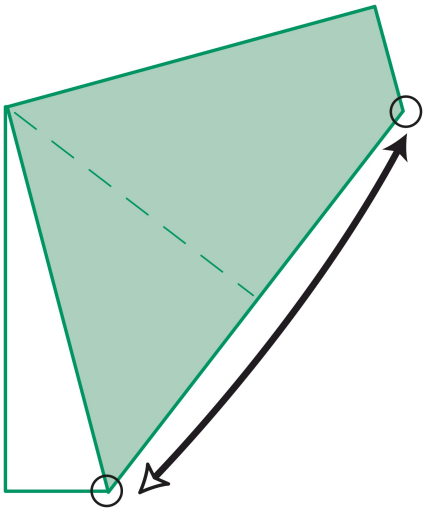
TYPE: GLIDER

This design begins with an unusual fold. It *seems* asymmetrical, but there is actually an even number of layers on either wing, so it is balanced for flight.

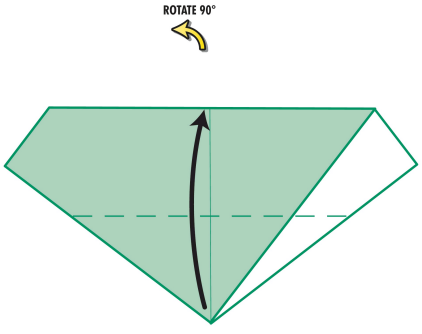




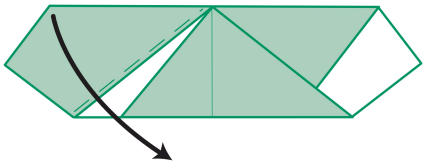
1 With the paper horizontal and plain side up, fold the bottom right corner up to the top left one along the imaginary broken line in the illustration.



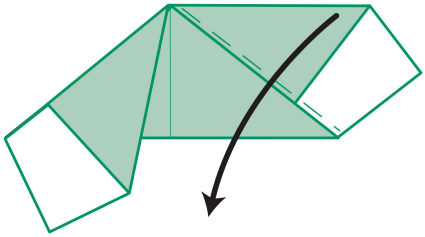
2 Fold the paper in half so the corners circled at each end of the fold in the illustration meet. Crease, then unfold.



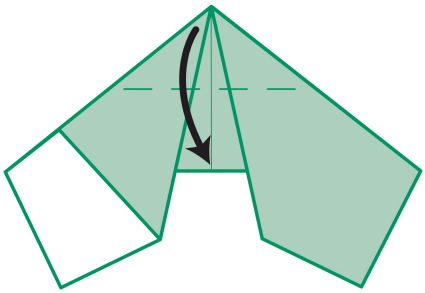
3 Rotate the paper 90° counterclockwise. Fold the lower corner up to the center of the top edge, along the imaginary broken line in the illustration.



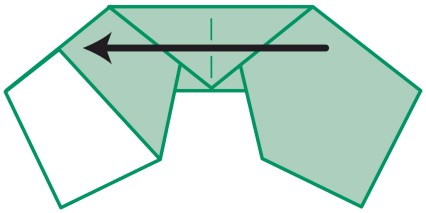
4 Fold the colored section on the far left down along the edge of the white section directly next to it, along the imaginary broken line in the illustration.



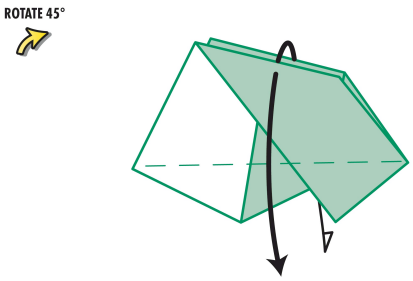
5 Fold the colored section on the far right down along the edge of the colored section directly next to it, along the imaginary broken line in the illustration.



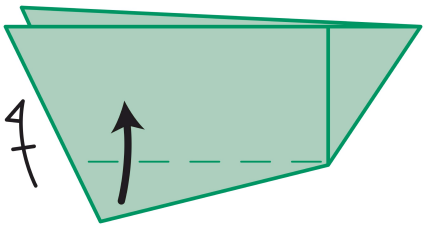
6 Fold the top corner down to the center of the lower edge, along the imaginary broken line in the illustration.



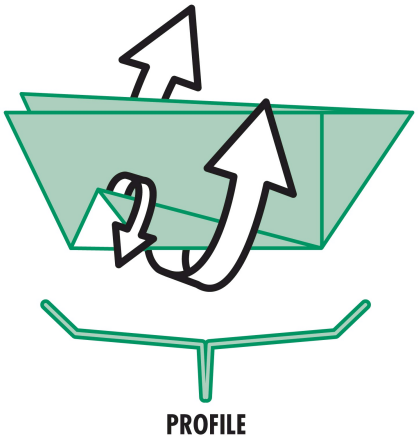
7 Fold the model in half so the right side lies atop the left one.



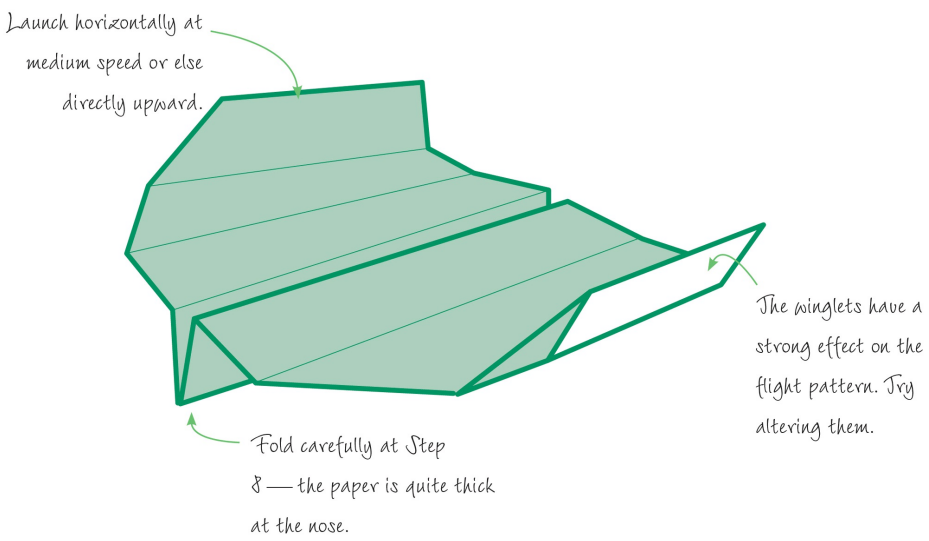
8 Rotate the paper 45° clockwise. Fold both of the top layers down, with the crease running from corner to corner along the imaginary broken line in the illustration. This forms the wings.

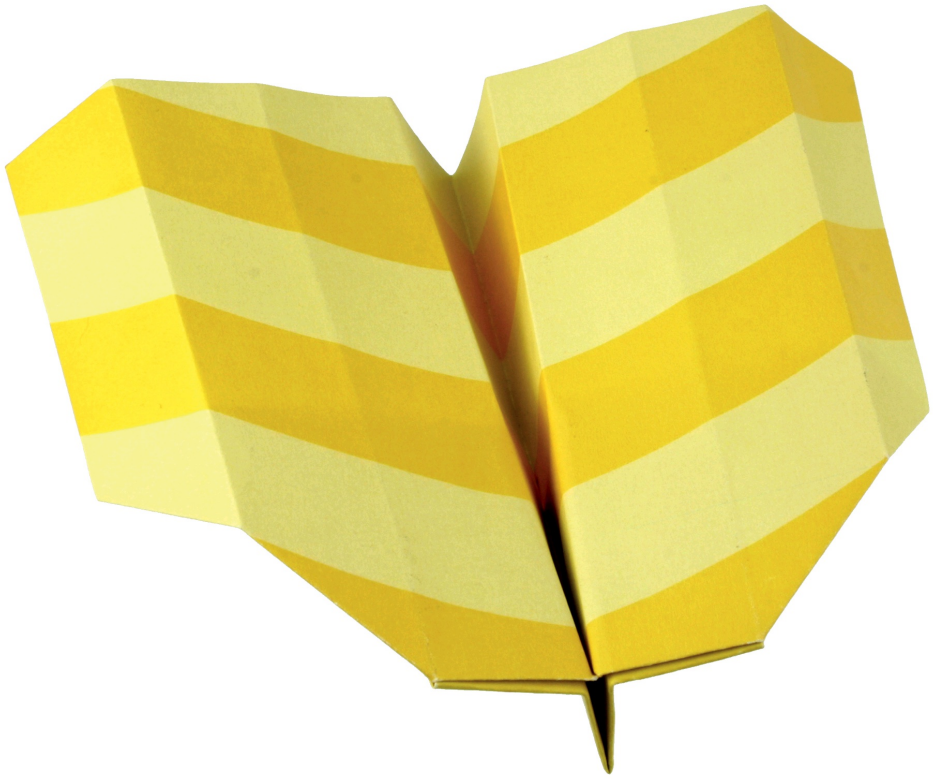


9 Fold the tips of both wings upward along the imaginary broken line in the illustration. These creases are parallel to the upper edge and form the winglets.



10 Shape the wings and winglets to match the profile.

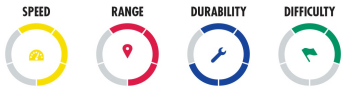

Launch horizontally at medium speed or else directly upward.
The winglets have a strong effect on the flight pattern. Try altering them.
Fold carefully at Step 8 — the paper is quite thick at the nose.

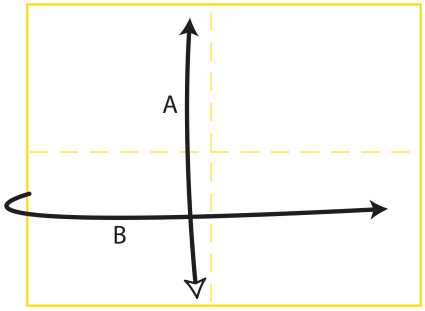


Swallow

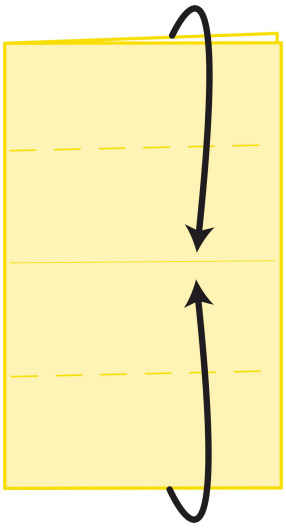
TYPE: GLIDER

This design uses a modification of a design for a traditional Japanese house. Notice the neat move in Step 12, where the layers lock together.

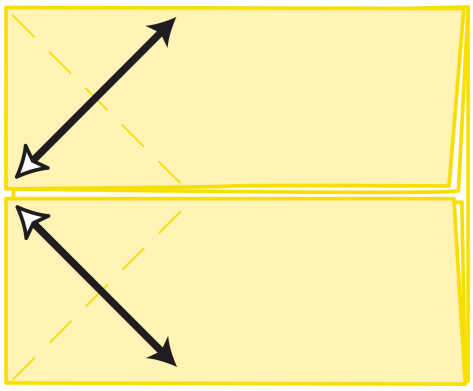




1 With the paper horizontal and plain side up, fold in half horizontally (A). Crease, then unfold. Fold in half short edge to short edge with the left half over the right (B).

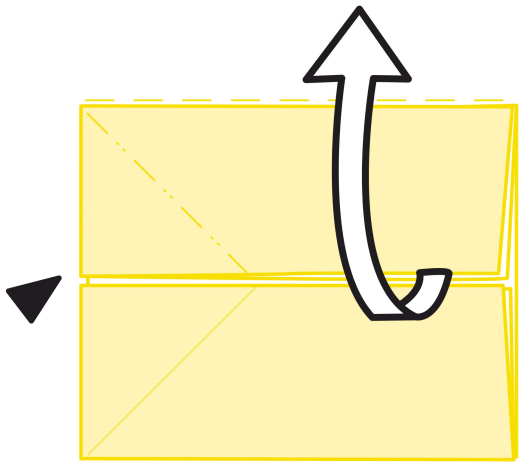


2 Fold both the upper and lower edges in to the horizontal center crease.

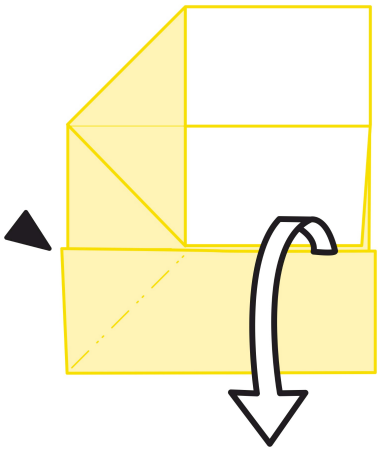


3 Fold both of the inner corners on the left side along the broken line so they lie

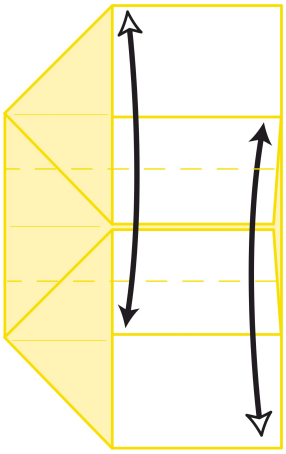
on the outer edges. Crease, then unfold.



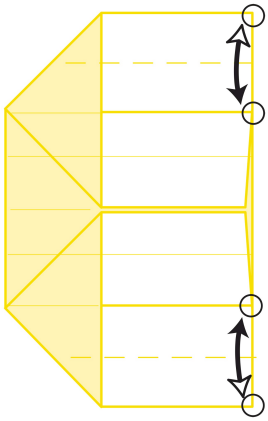
4 On the top section, open a single layer out from the center, folding it upward. Flatten it.



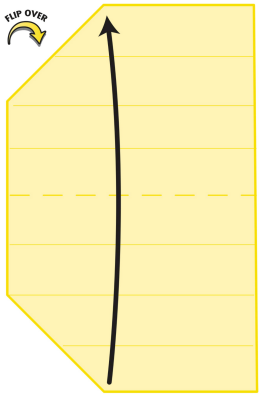
5 Your model should look like this. Open a single layer of the bottom section out from the center, folding it upward. Flatten it.



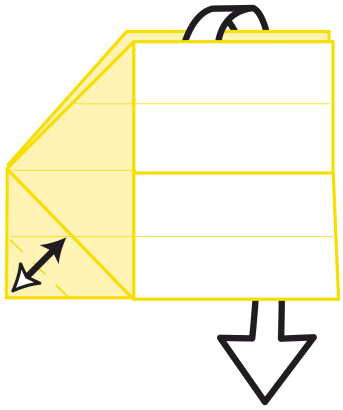
6 One after the other, fold edges to edges along the broken lines, creasing and unfolding each one.



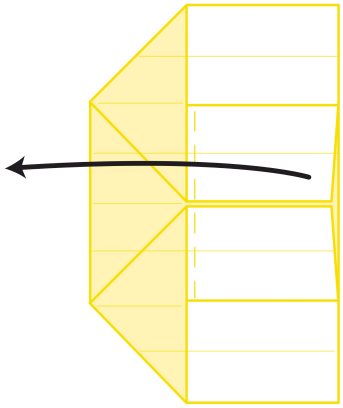
7 Fold the sections at the top and at the bottom along the imaginary broken lines in the illustration. Crease, then unfold. Now the model has eight sections of equal width.



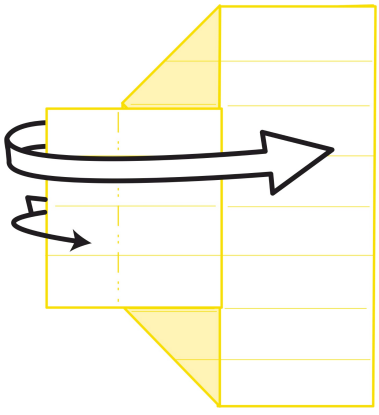
8 Flip the model over. Fold it in half upward along the imaginary broken line in the illustration.



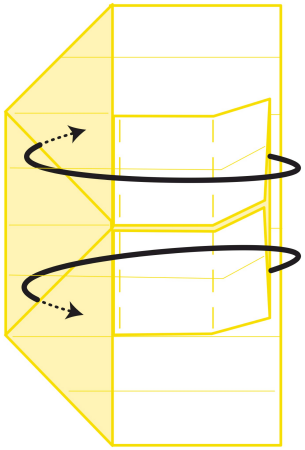
9 Crease up along the imaginary dotted line at bottom left, then unfold. Fold the back layer (the one folded up in Step 8) back down.



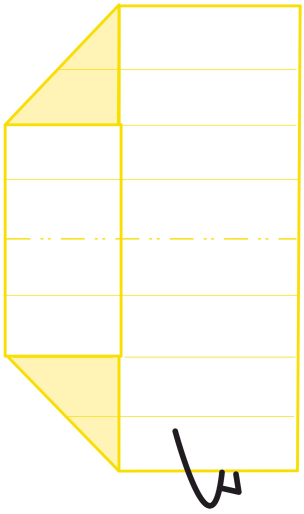
10 Fold the upper layer that is in the center to the left along the imaginary broken line in the illustration.



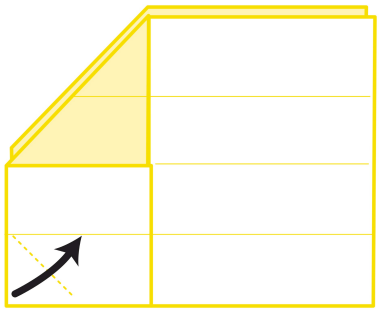
11 Fold the end of the layer that you just folded in Step 10 under along the broken line. Crease, then unfold. Fold the layer back to the right.



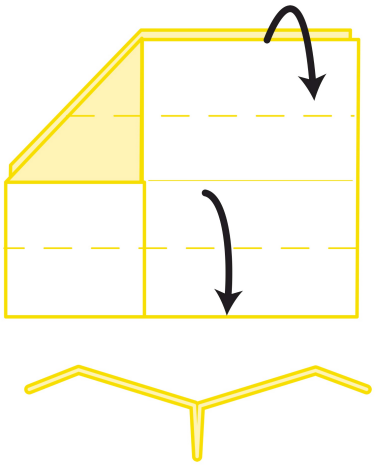
12 Refold the same layer to the left, tucking its corners into the pockets of the layer that is now beneath it.



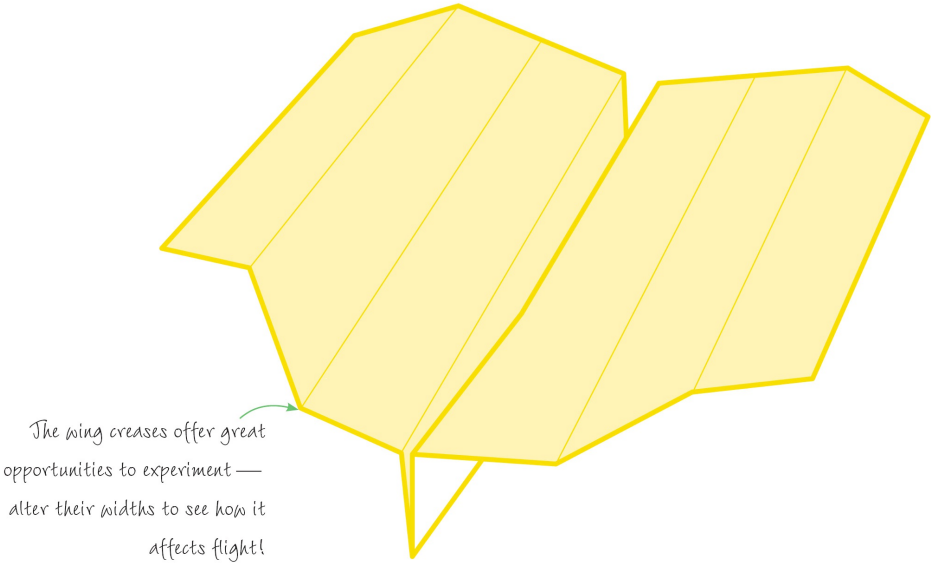
13 Fold the lower half behind the upper half.



14 Carefully lift up a layer and refold the small flap on the crease made in Step 9. If this is too tricky, just skip this step!



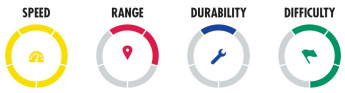
15 Open the wings to match the profile.

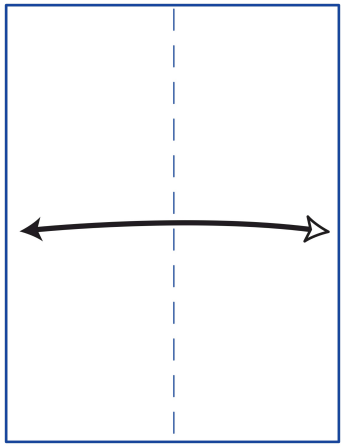


Hornet

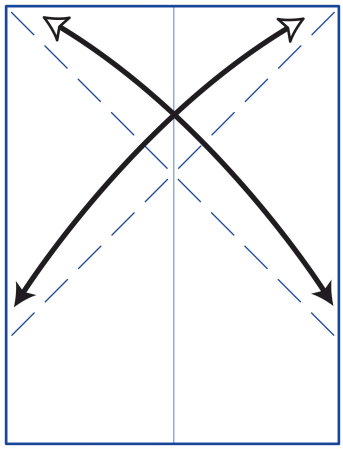
TYPE: DART

This design is unusual because of the two “horns” that point forward. By changing where you fold in Step 5, you can make them longer or shorter.

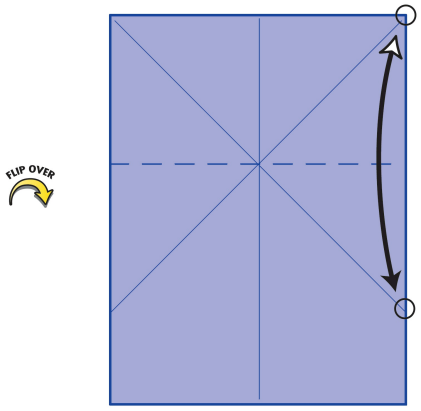




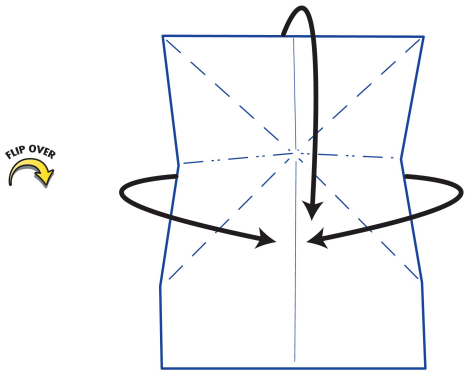
1 With the paper vertical and plain side up, fold the sheet in half long edge to long edge. Crease, then unfold.



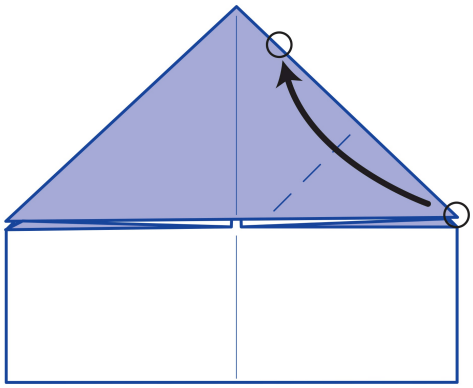
2 Fold the top left corner down to the opposite edge along the imaginary broken line in the illustration. Crease, then unfold. Fold the top right corner down to the opposite edge. Crease, then unfold.



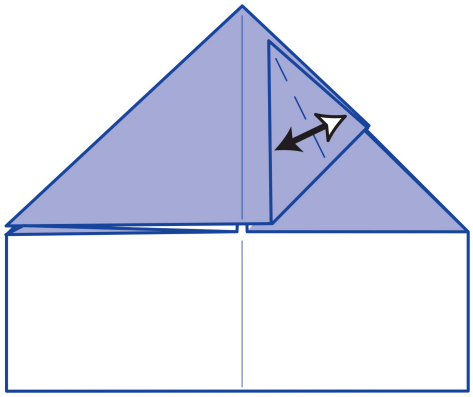
3 Flip the paper over. Fold both top corners down to the ends of the creases along the imaginary broken line in the illustration, so the areas circled in the illustration meet. Crease, then unfold.



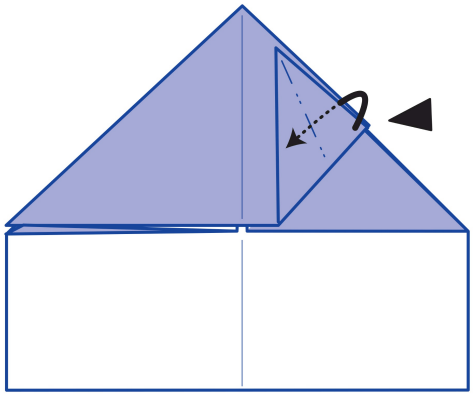
4 Flip the paper over. Using the creases, collapse the paper inward and downward.



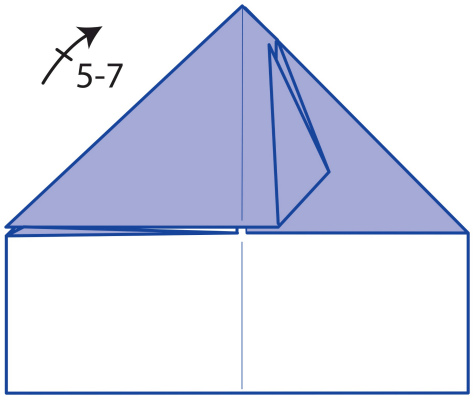
5 Fold the right corner of the upper layer up to the point circled in the illustration, along the imaginary broken line.



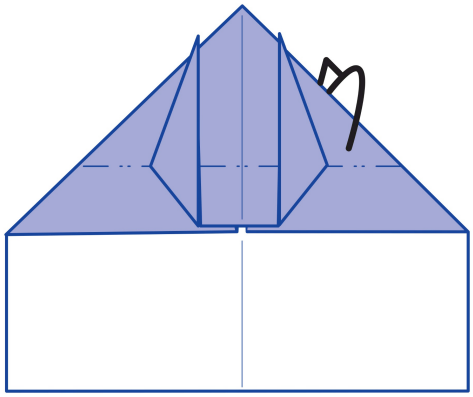
6 Fold the triangular flap in half along the imaginary broken line in the illustration. Crease, then unfold.



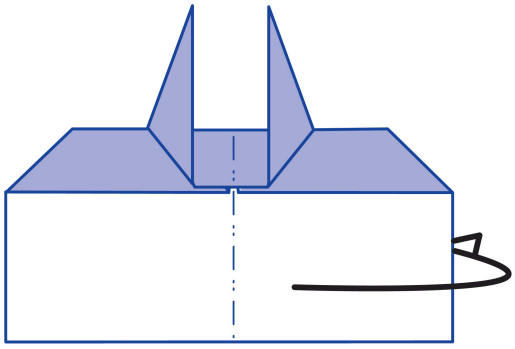
7 Fold the corner to the inside, making a reverse fold. (This is similar to the collapsing that you performed in Step 4.)



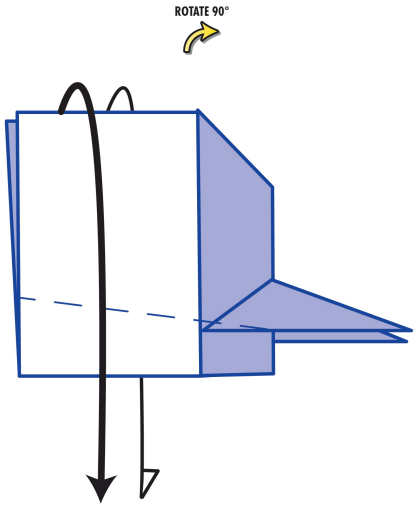
8 Repeat Steps 5 to 7 on the left side.



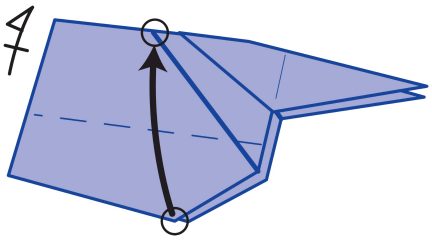
9 This is the result. Fold the top corner behind the rest of the model along the imaginary broken line shown in the illustration.



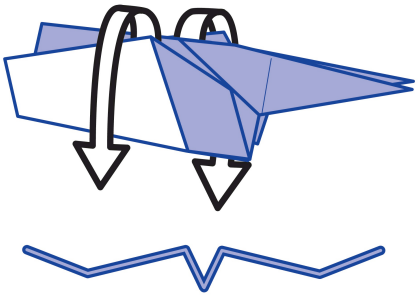
10 Fold the right half of the model behind the left.



11 Rotate the model 90° clockwise. Working first on one side, then the other, fold each flap down along the imaginary dotted line to form wings.

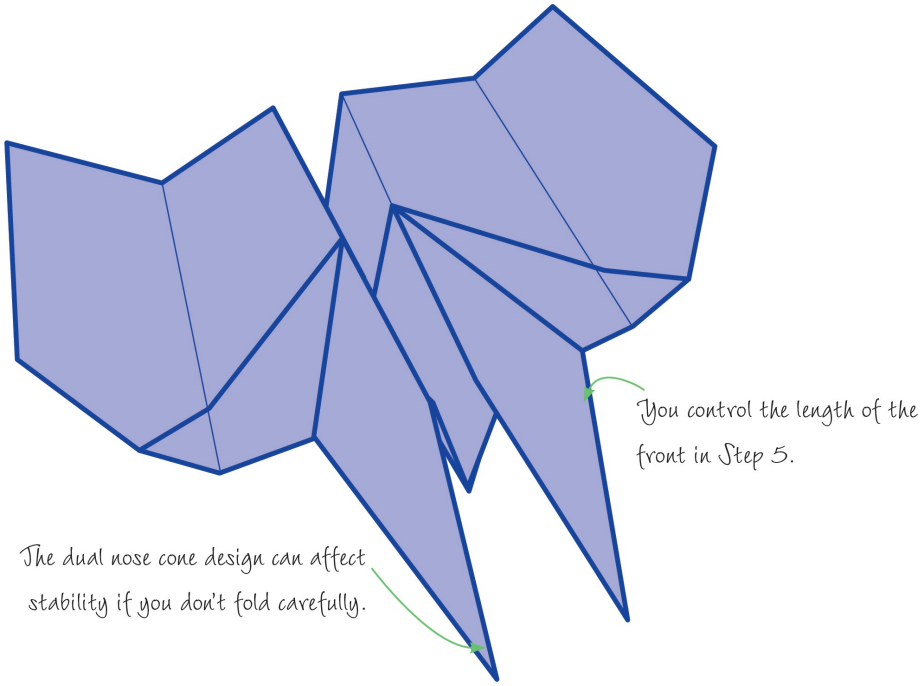


12 Fold the wing on the upper layer up along the imaginary broken line in the illustration so the circled points meet. Repeat on the other wing.



PROFILE

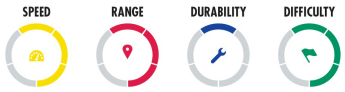
13 Open the wings to match the profile.

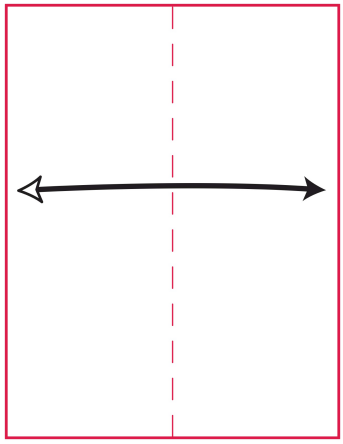


Nightwing

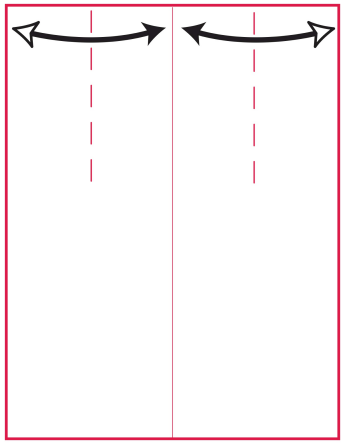
TYPE: STUNT

This is a distance flyer, with a relatively large fuselage for added lateral stability. Keep the “fins” swept as far back as possible.

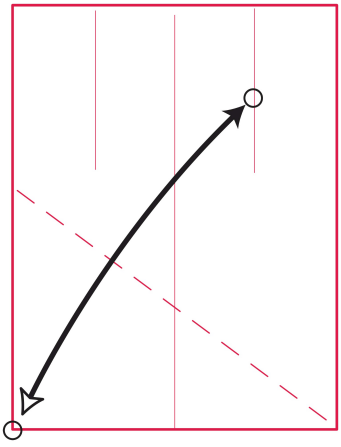




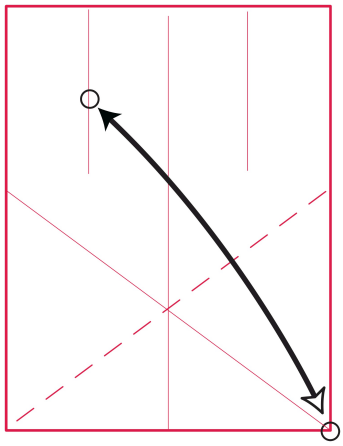
1 With the paper vertical and plain side up, fold the sheet in half long edge to long edge. Crease, then unfold.



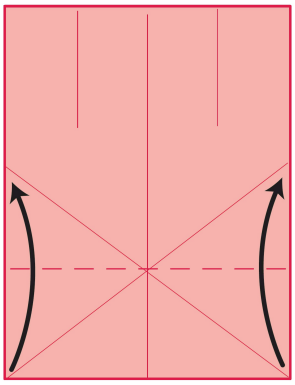
2 Fold the left and right edges to the center, but only crease the top half, as shown with imaginary broken lines in the illustration. Unfold.



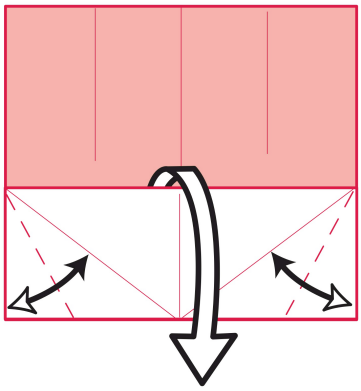
3 Fold the bottom left corner up along the imaginary broken line in the illustration so the circles meet. Crease, then unfold.



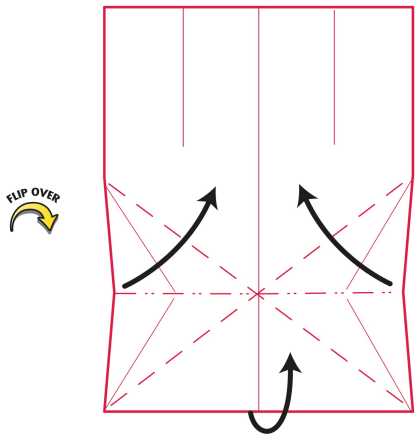
4 Fold the bottom right corner up along the imaginary broken line so it lies on the circle shown in the illustration on the upper left crease. Crease, then unfold.



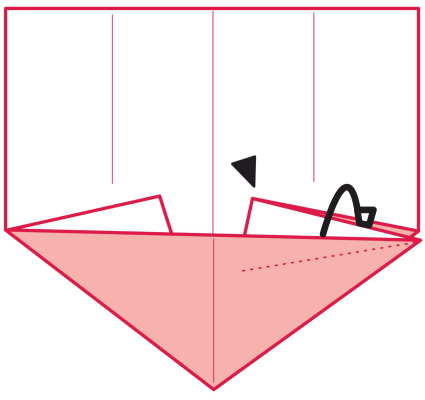
5 Flip the paper over. Fold the lower edge up to the ends of the creases formed in Steps 3 and 4.



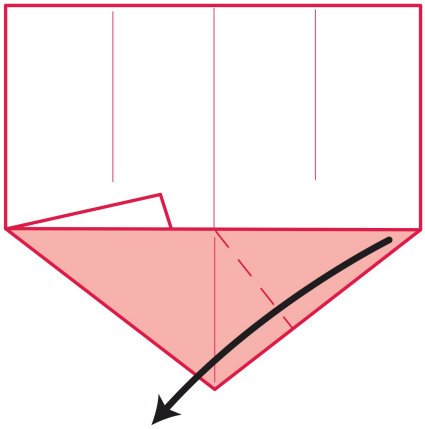
6 Fold both of the short white edges along the imaginary broken lines to lie on the creases. Crease, then completely unfold the paper.



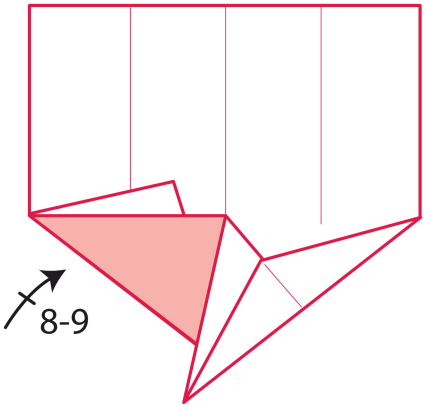
7 Flip the paper over. Collapse it upward and inward using the creases.



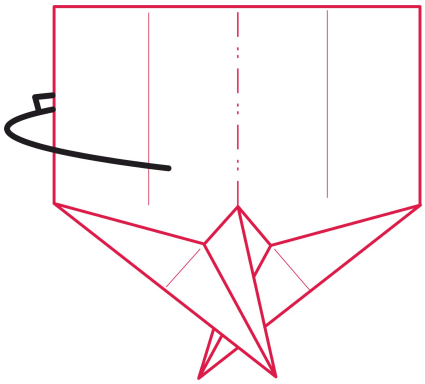
8 This is the result. Reverse fold the right hidden flap down along the dotted line using the existing crease lines as a guide.



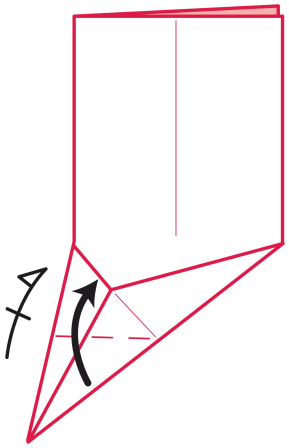
9 Fold the right flap as far to the left as you can, along the imaginary broken line in the illustration.



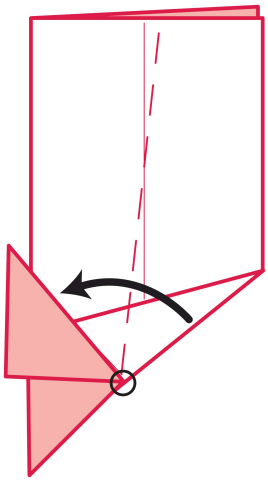
10 This is the result. Repeat Steps 8 and 9 on the left side. The flaps will overlap.



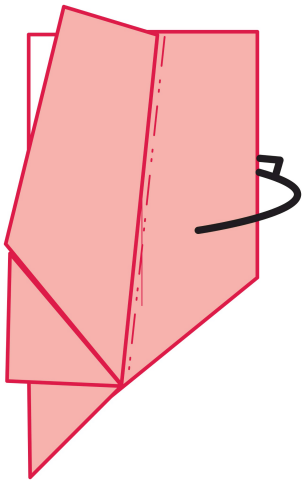
11 Fold the left half of the model underneath the right.



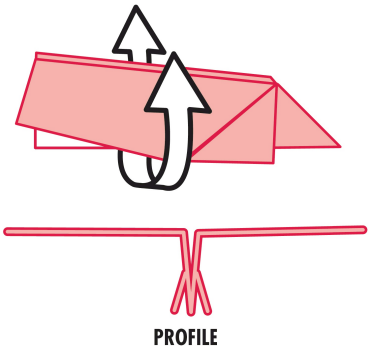
12 Fold only the topmost flap up to lie along the folded edge. Repeat underneath.



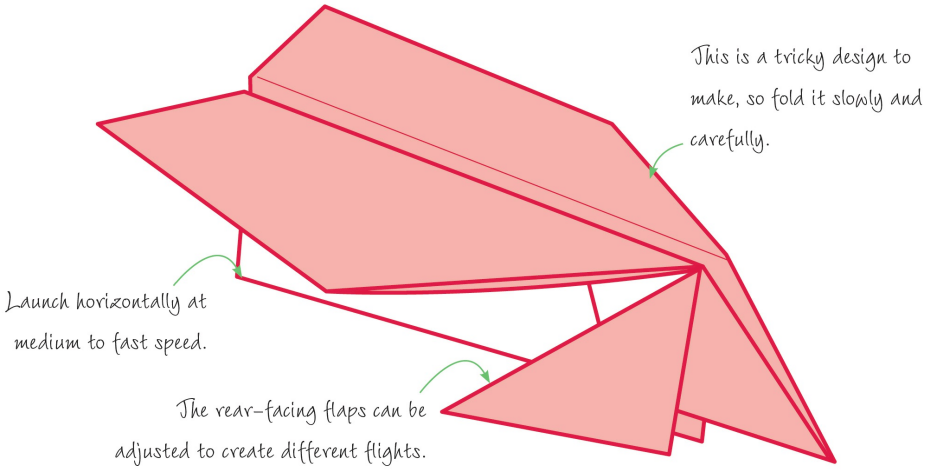
13 Starting at the point circled in the illustration, fold the upper layer up along the imaginary broken line so its edge lies along the edge of the colored flap.



14 This is the result. Repeat Step 13 on the other side.



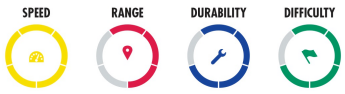
15 Rotate the paper 90° counterclockwise. Open the wings to match the profile.

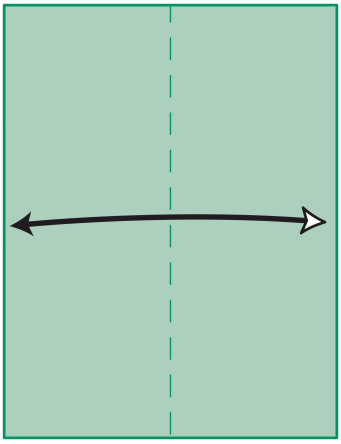


Beaky

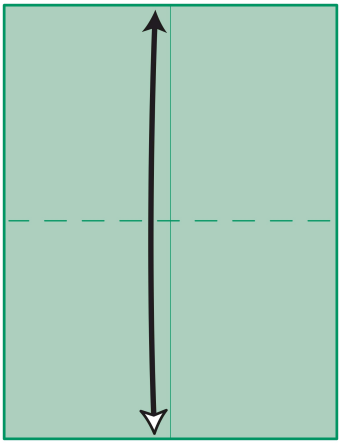
TYPE: STUNT

To encourage an unpredictable and exciting flight pattern, alter the angle of each wing so they are slightly different or curl the rear corner slightly.

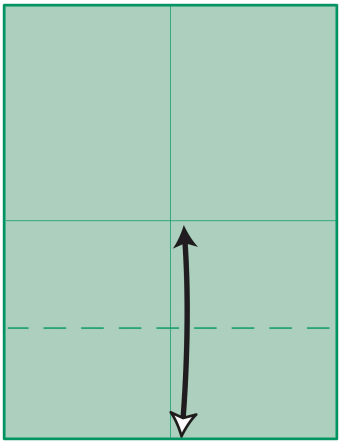




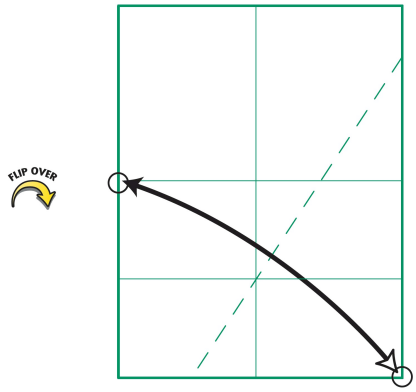
1 With the paper vertical and patterned or colored side up, fold in half long edge to long edge. Crease, then unfold.



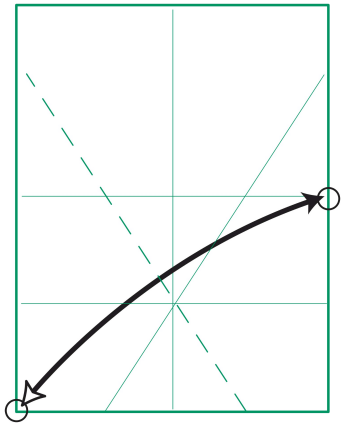
2 Fold in half short edge to short edge. Crease, then unfold.



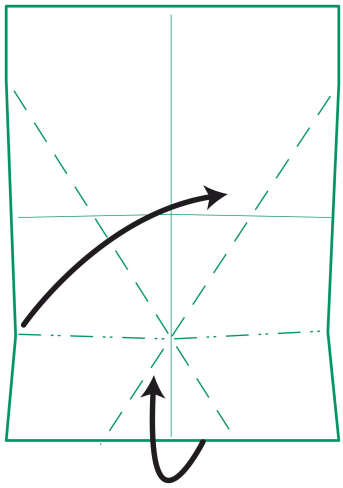
3 Fold the lower edge up to the horizontal center crease, along the imaginary broken line. Crease, then unfold.



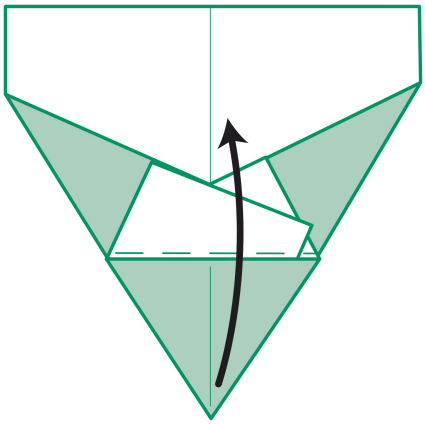
4 Flip the paper over. Fold the lower right corner up to the horizontal center crease, along the imaginary broken line. Crease, then unfold.



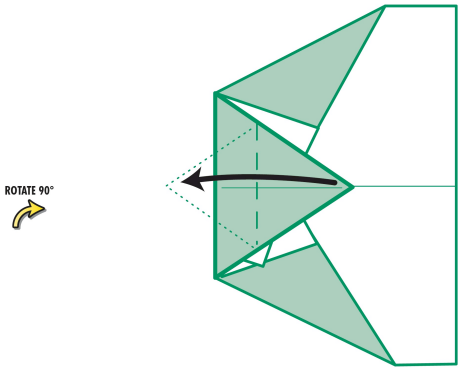
5 Fold the lower left corner up to the horizontal center crease, along the imaginary broken line. Crease. Unfold.



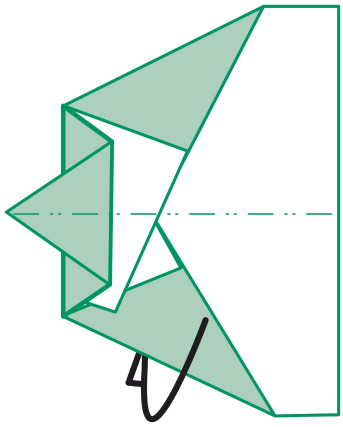
6 Use the existing creases to fold in and overlap the layers.



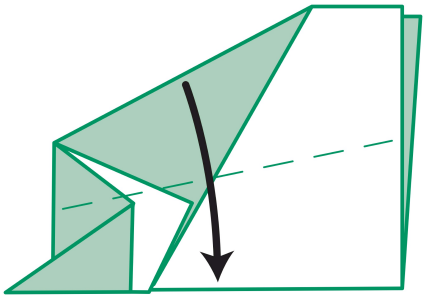
7 This is the result. Fold the triangular area at the bottom upward along the imaginary broken line.



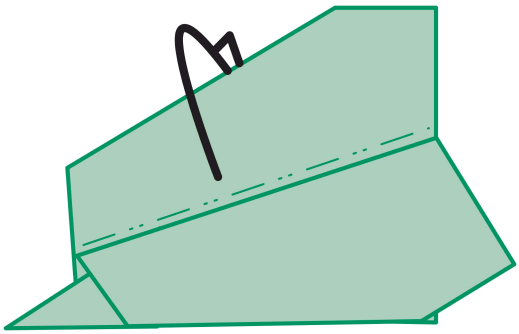
8 Rotate the model 90° clockwise. Fold the triangular flap to the left along the imaginary broken line shown in the illustration.



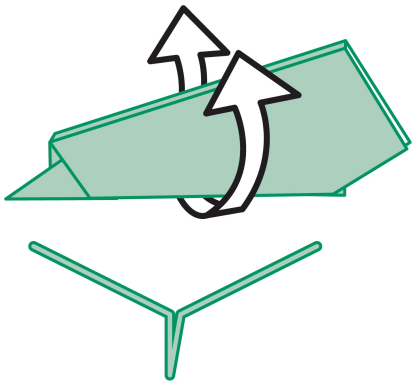
9 Fold the lower half of the model underneath the top half. Because of the many layers, this is tricky, so fold and crease carefully.



10 Fold the upper layer down along the imaginary broken line so it lies along the lower edge. This forms a wing.

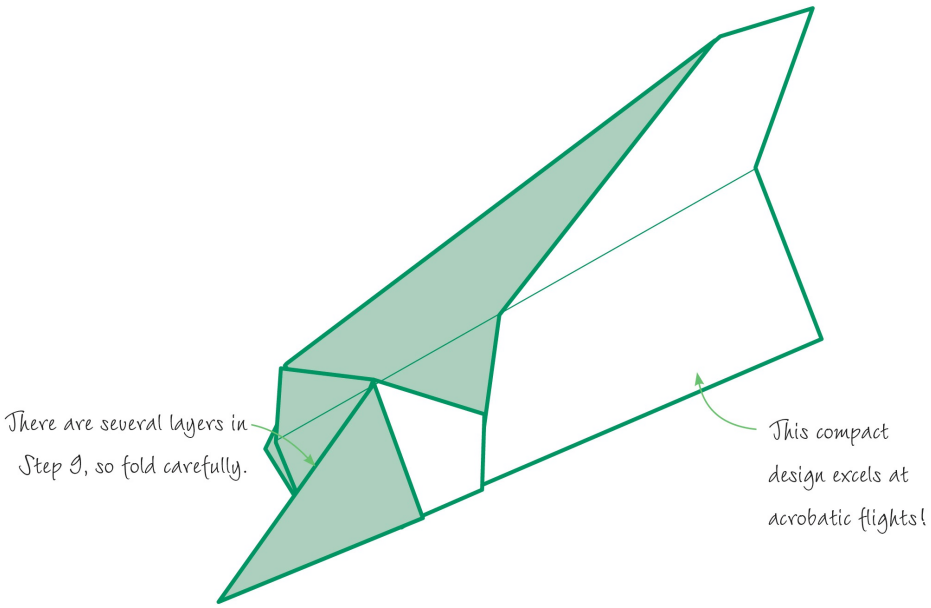


11 Repeat on the other side to make the other wing.

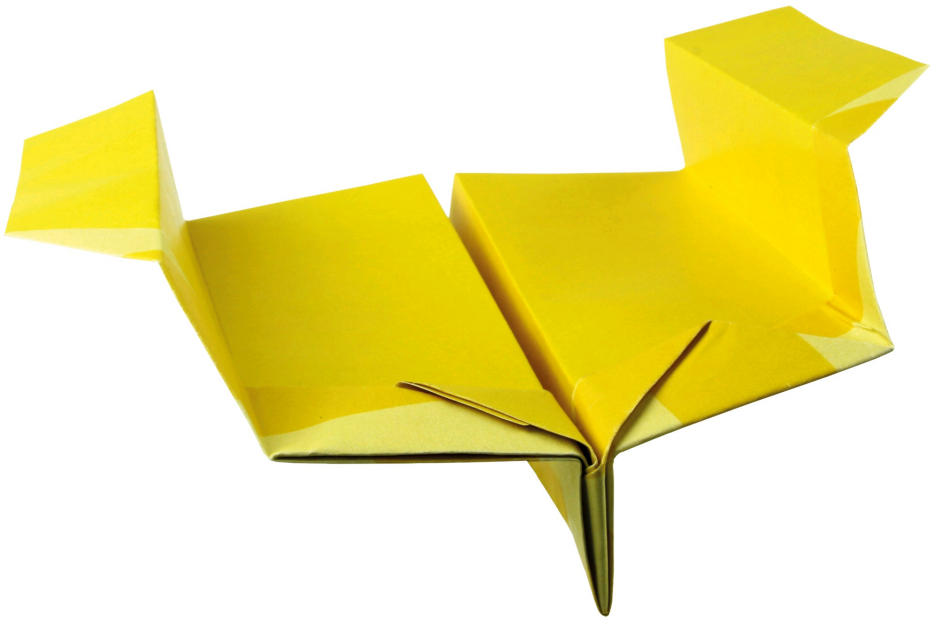


PROFILE

12 Open the wings to match the profile.



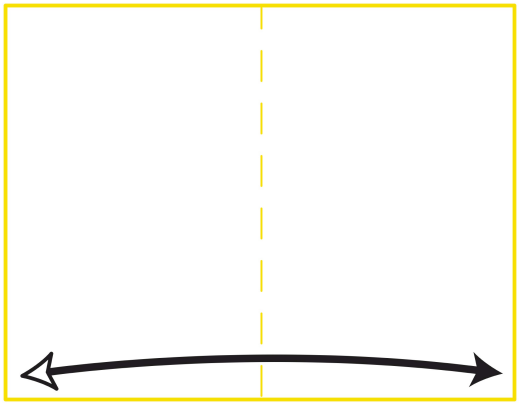
I Love You



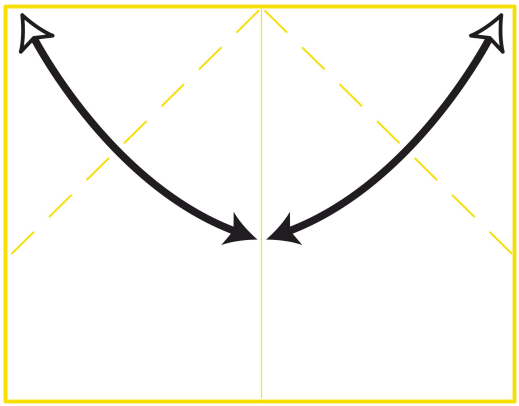
Manta

TYPE: STUNT

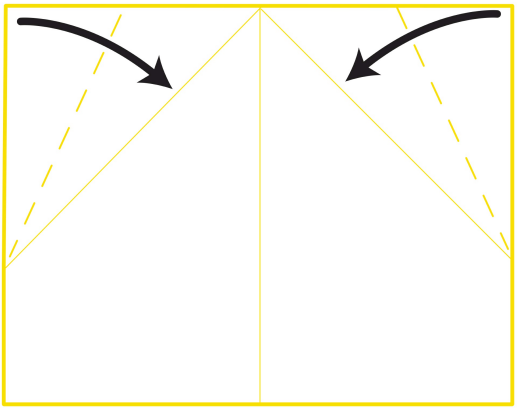
Step 6 is vital to locking the nose. As you work on folding it, refer to the illustration for Step 7 to make sure you understand the fold you're aiming to achieve.



1 With the paper horizontal and plain side up, fold in half short edge to short edge. Crease, then unfold.

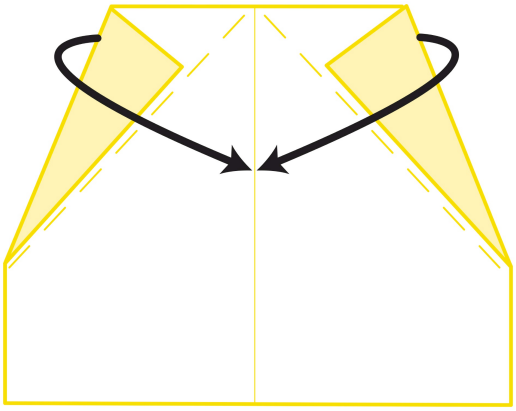


2 Fold each of the top corners down to the vertical center crease along the imaginary broken line. Crease, then unfold.

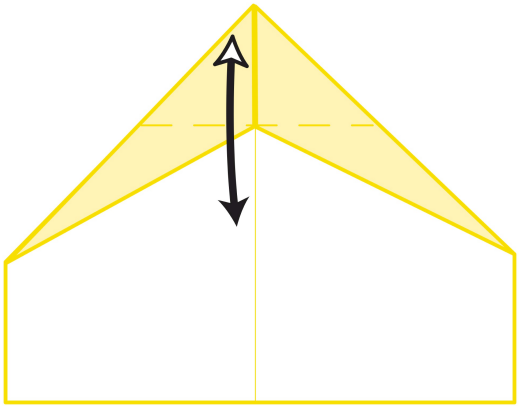


3 Fold the top of the left and right edges down along the imaginary broken lines

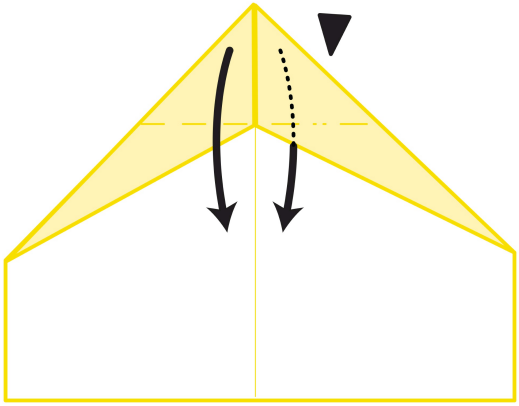
so they lie on the creases formed in Step 2.



4 Fold the colored flaps in along the imaginary broken lines in the illustration.

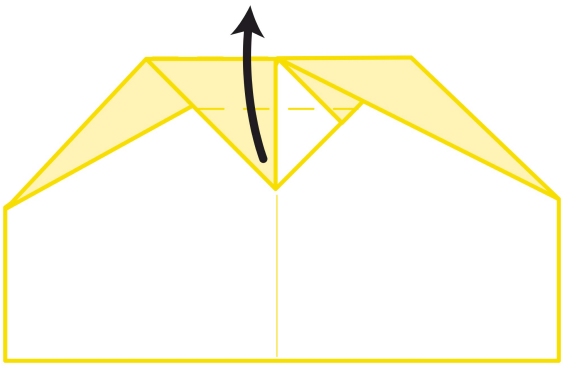


5 Fold the top corner down along the imaginary broken line in the illustration. Crease, then unfold.

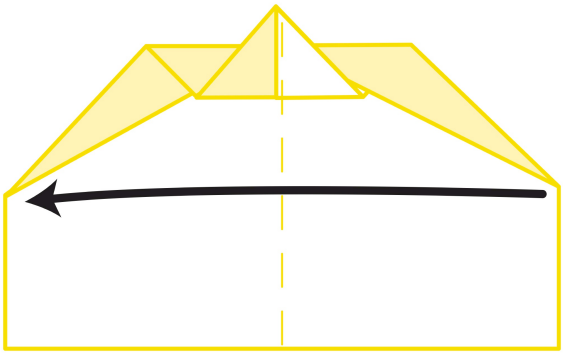


6 Fold the left half of the upper point down. On the right, push the corner in to

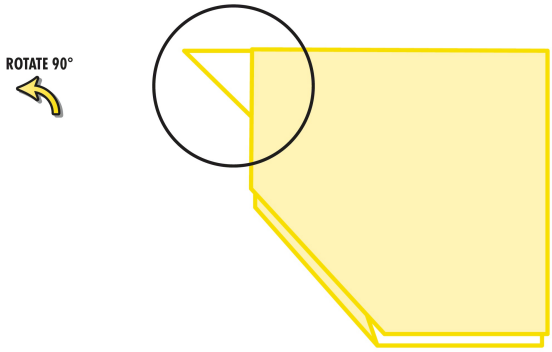
make a reverse fold.



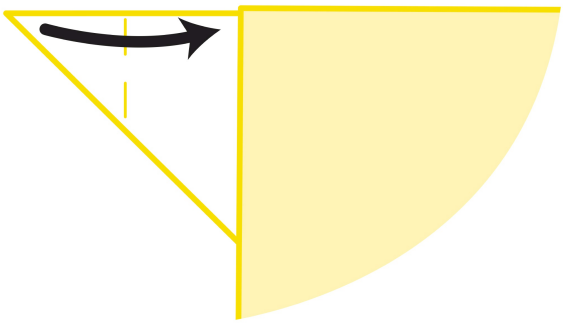
7 This is the result. Fold the flap up as far as you can, along the imaginary broken line.



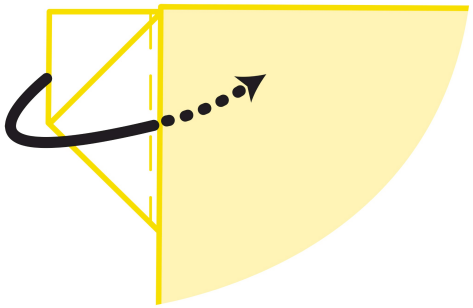
8 Fold the model in half so the right side lies atop the left one.



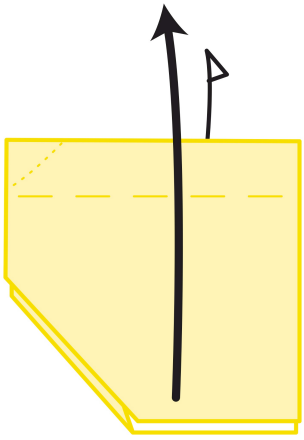
9 Rotate the paper 90° counterclockwise and your model will look like this. The illustrations will now zoom in on the circled area for the next couple of steps.



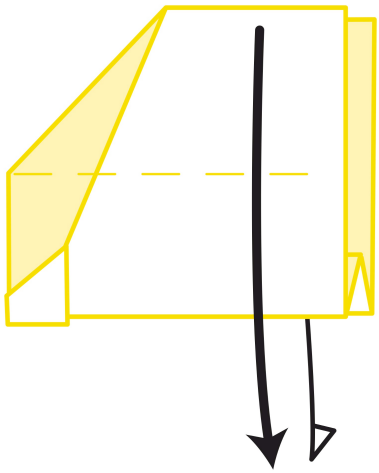
10 Fold the corner in to meet the edge, along the imaginary broken line.



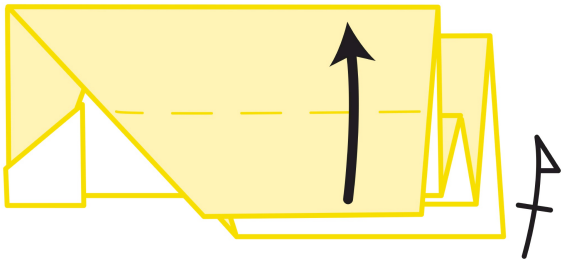
11 Fold the flap in again, along the imaginary broken line, tucking it into the pocket between the layers.



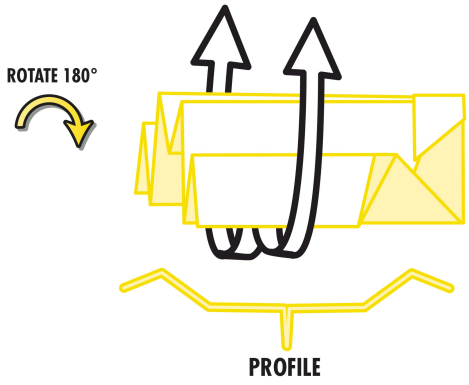
12 Fold the upper layer up as far as you can, along the imaginary dotted line in the illustration, forming a wing. Repeat on the other side to form the second wing.



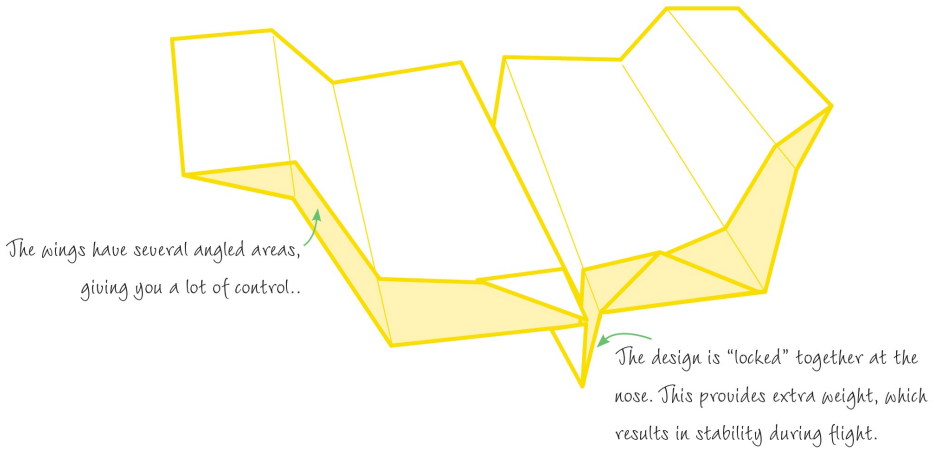
13 Starting at the corner, fold the upper layer down along the imaginary dotted line. Make an identical fold on the other wing.

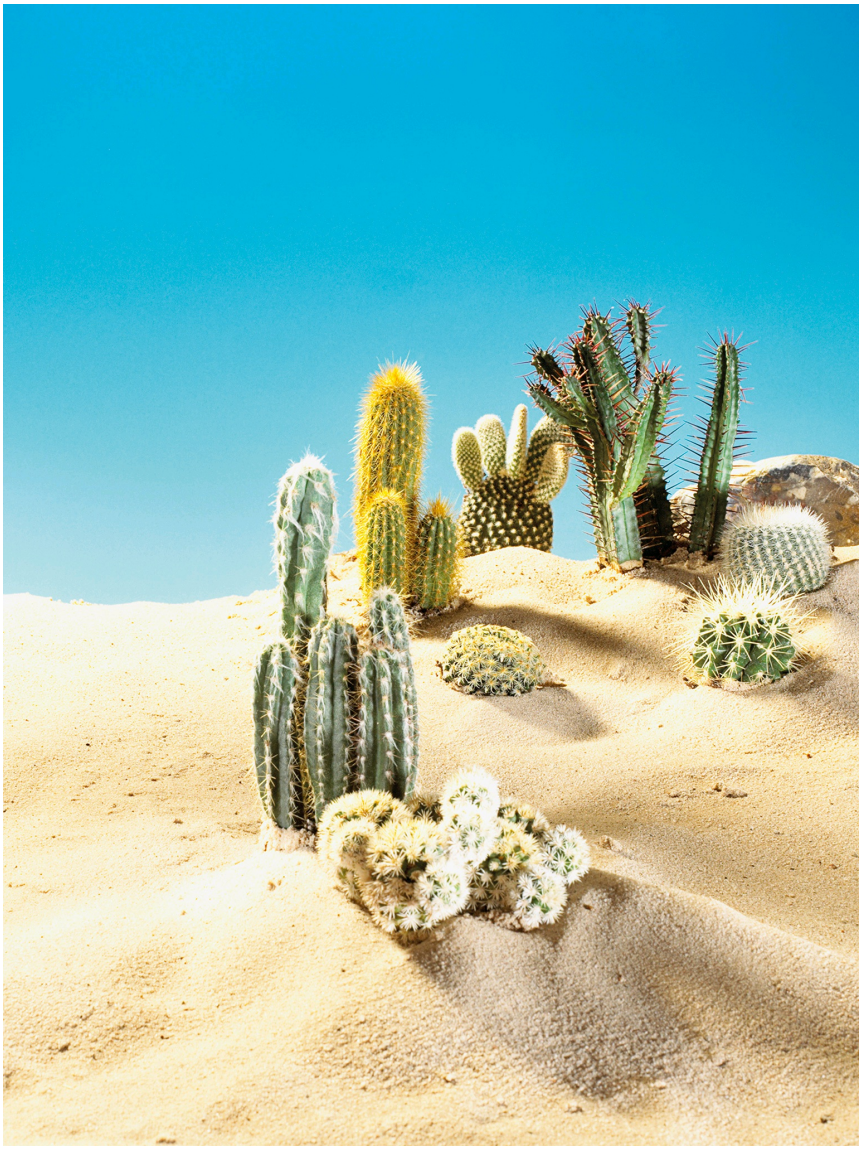


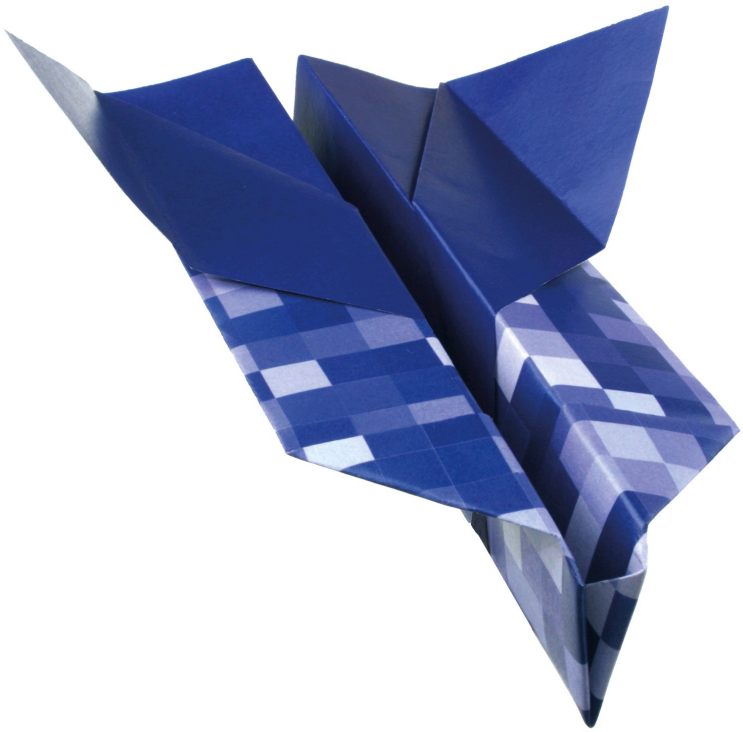
14 On both sides, fold the outer wing sections in half upward, along the imaginary broken line. This creates the winglets.



15 Rotate the model 180°. Open the wings to match the profile.


The wings have several angled areas, giving you a lot of control..
The design is "locked" together at the nose. This provides extra weight, which results in stability during flight.

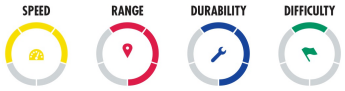


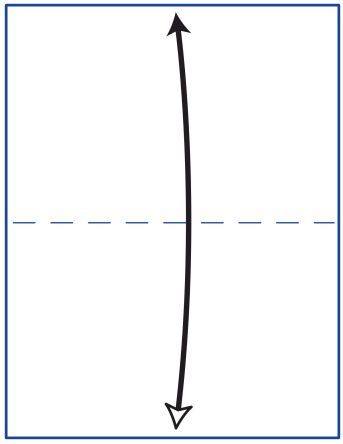


Diamond Flyer

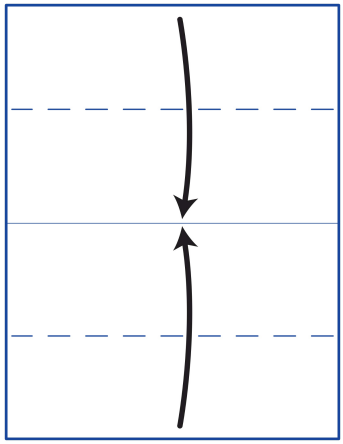
TYPE: DART

Rob Snyder came up with this unusual design. Despite what you might think from its appearance, the folding sequence is very straightforward.

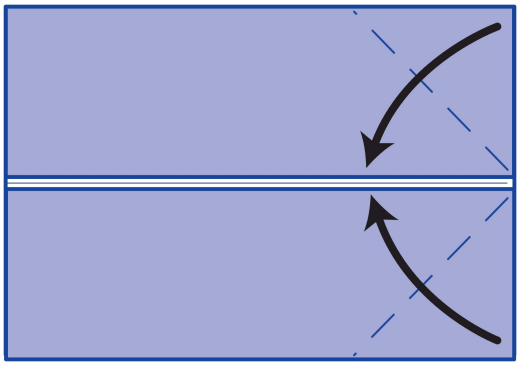




1 With the paper vertical and plain side up, fold in half short edge to short edge. Crease, then unfold.

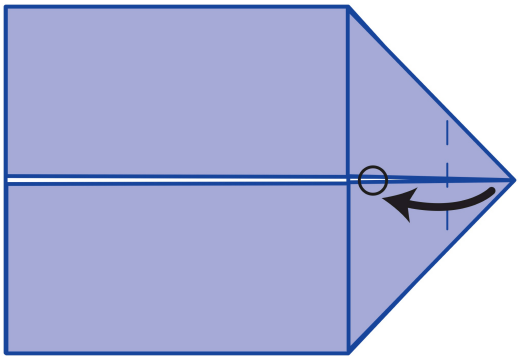


2 Fold both of the short edges in to the horizontal center crease, along the imaginary broken lines in the illustration.

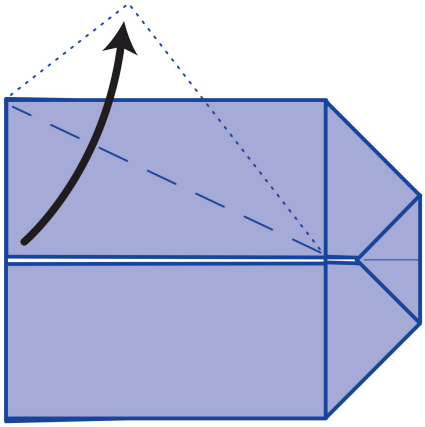


3 Fold the top corner and the bottom corner of the right edge in to the horizontal

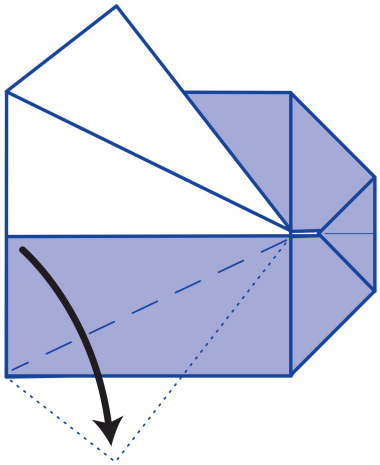
center crease, along the imaginary broken lines shown in the illustration.



4 Fold the right corner in to the point marked with a circle in the illustration, along the imaginary broken line.

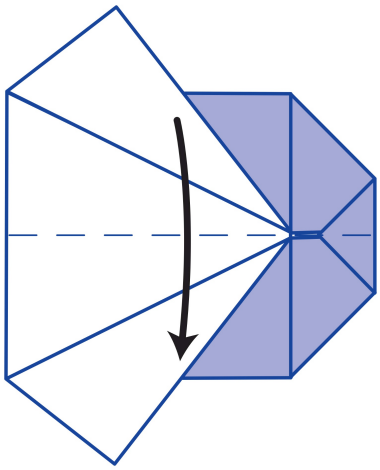


5 Fold the upper left corner up along the imaginary dotted line in the illustration.

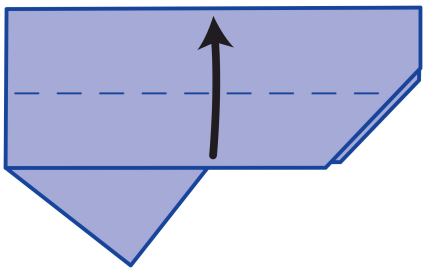


6 Fold the lower left corner down along the imaginary dotted line in the

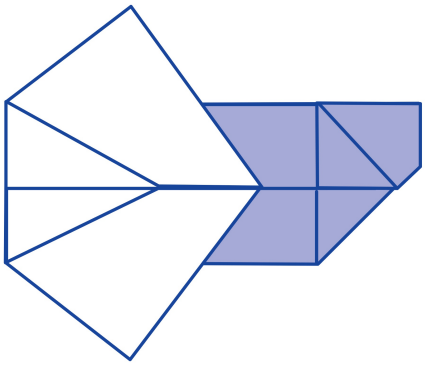
illustration.



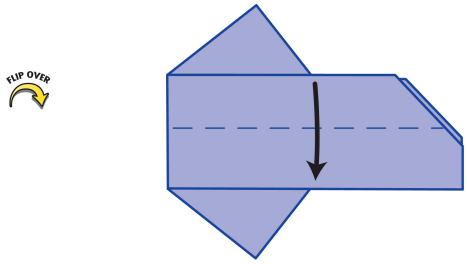
7 Fold the top half down to lie on the bottom half.



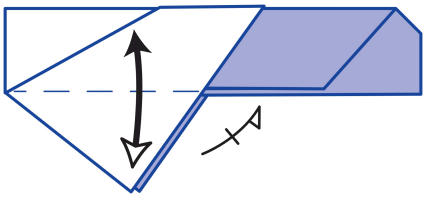
8 Fold the upper layer in half upward along the imaginary broken line.



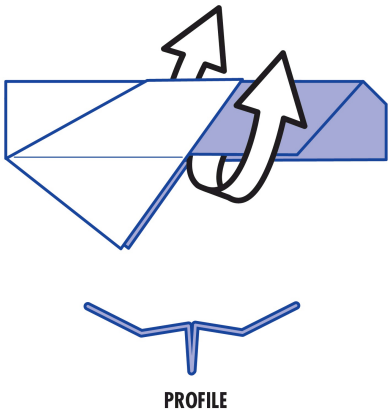
9 This is the result.



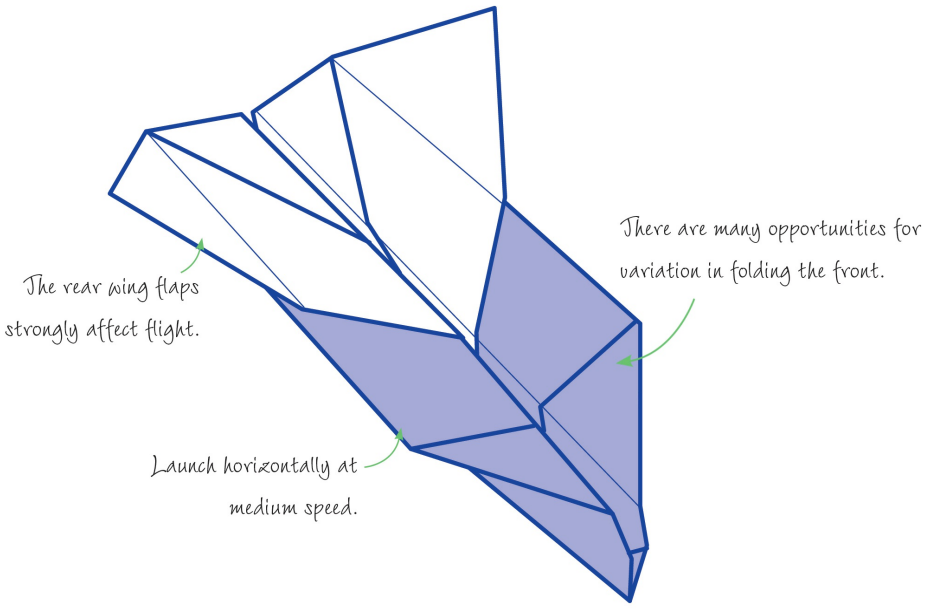
10 Flip the paper over. Fold the bottom section in half downward along the imaginary broken line in the illustration.

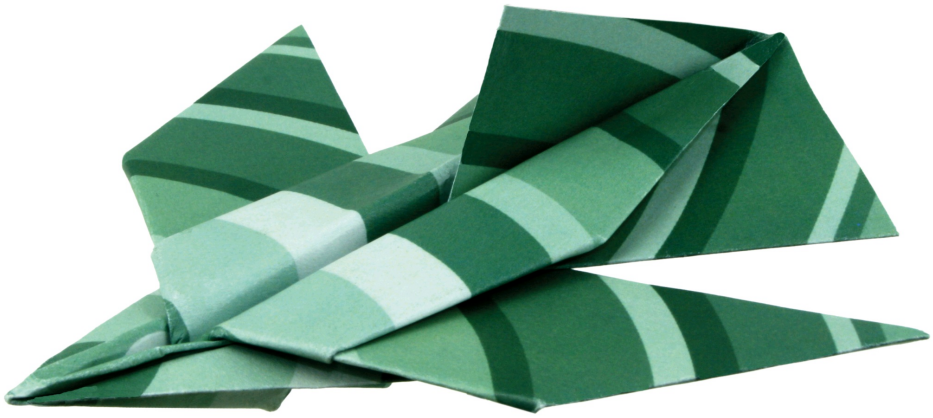


11 Fold the bottom corner up along the imaginary dotted line in the illustration. Crease and unfold. Repeat on the other side.



12 Flip the model over. Open the wings to match the profile.

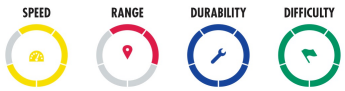

There are many opportunities for variation in folding the front.
The rear wing flaps strongly affect flight.
Launch horizontally at medium speed.

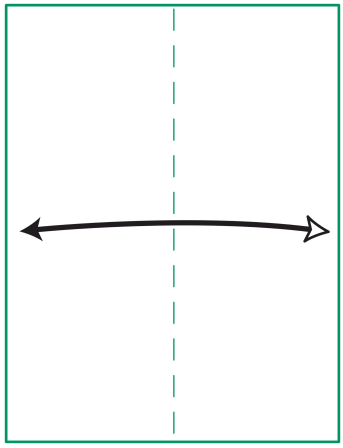


Fury

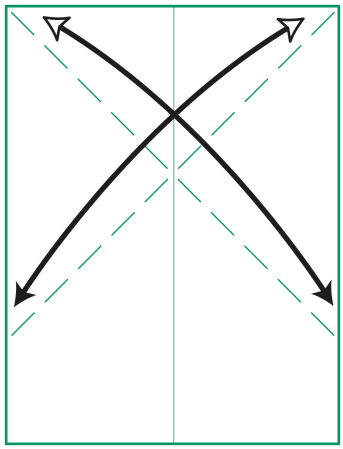
TYPE: GLIDER

This is probably the most complex design in this book, but by no means the most complex one in the world! Follow each step carefully, and don’t rush.

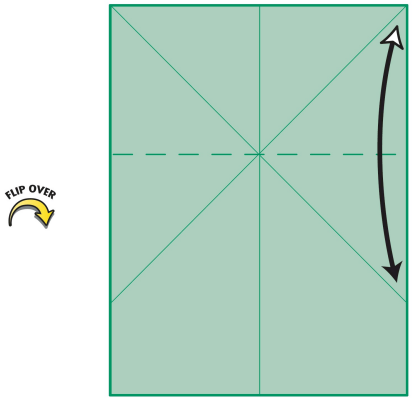




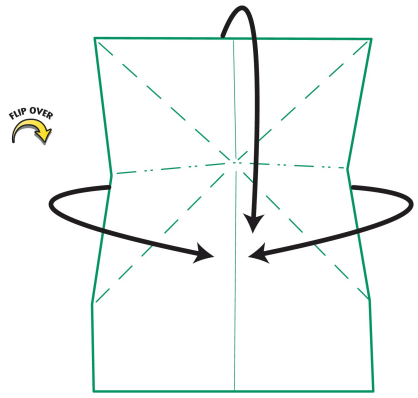
1 With the paper vertical and plain side up, fold the sheet in half long edge to long edge. Crease, then unfold.



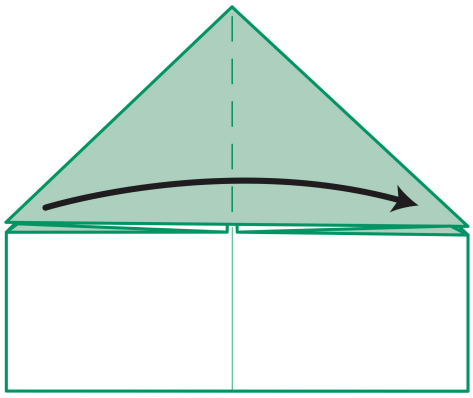
2 Fold the top edge down to the right edge along the imaginary broken line in the illustration. Crease, then unfold. Fold the top edge down to the left edge. Crease, then unfold.



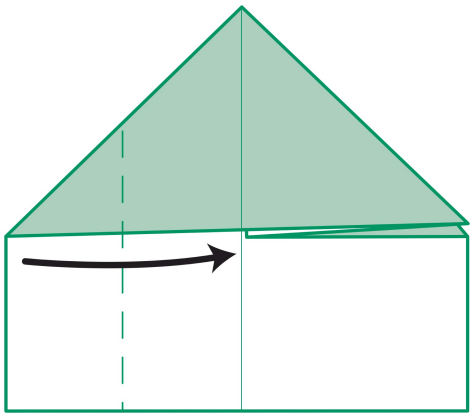
3 Flip the paper over. Fold the top corners down to the ends of the creases, along the imaginary broken line. Crease and unfold.



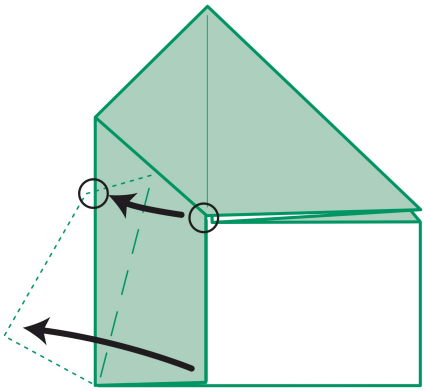
4 Flip the paper over. Collapse the paper downward using the creases.



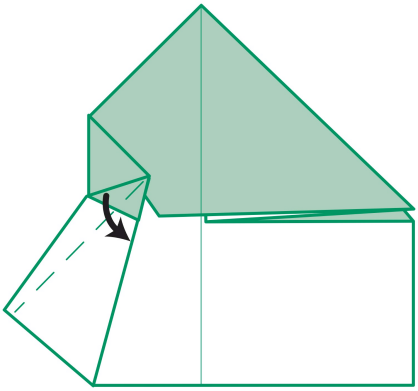
5 This is the result. Fold the upper layer on the left side to lie on top of the right side.



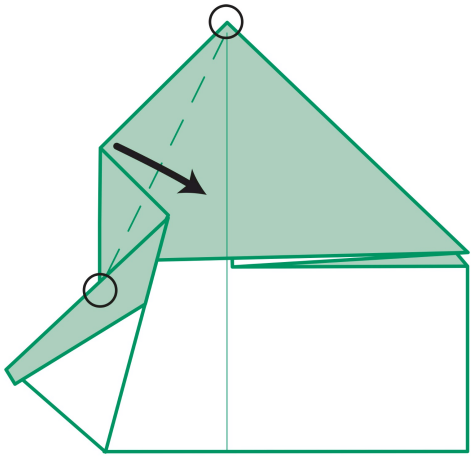
6 Fold the left edge to the vertical center crease, along the imaginary broken line.



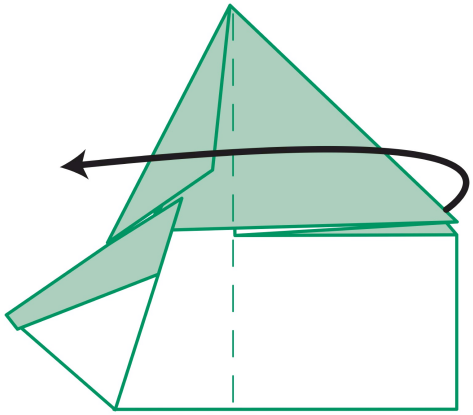
7 Fold out from the lower left corner along the imaginary broken line so the circled points meet.



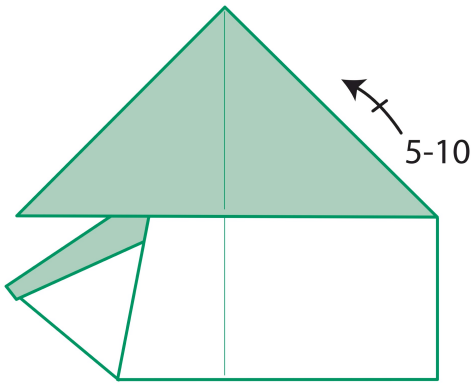
8 Fold the small triangular flap in half toward the right, along the imaginary broken line. Note that its left edge should lie flush against its right edge so that the fold is at the correct angle.



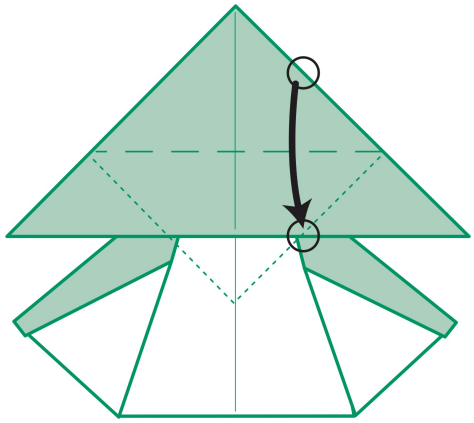
9 The illustration contains an imaginary line between the circled points. Fold to the right along that line.



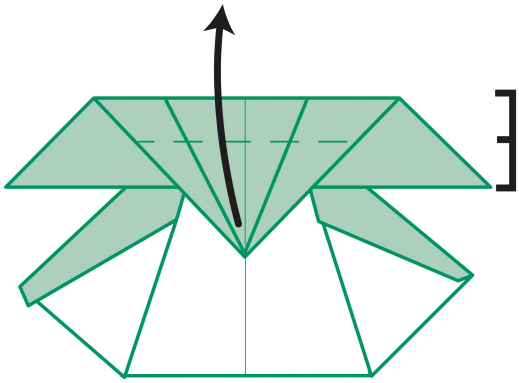
10 This is the result. Fold the upper flap on the right side over to the left side, along the imaginary broken line in the illustration.



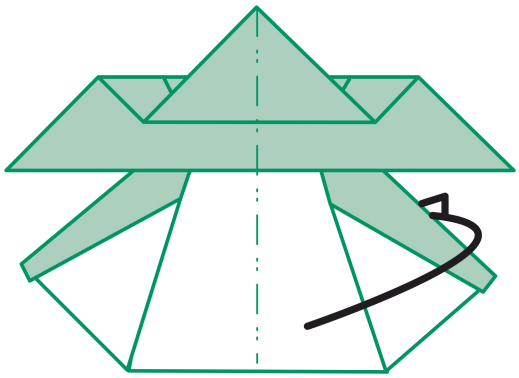
11 Repeat steps 5 to 10 on the right side.



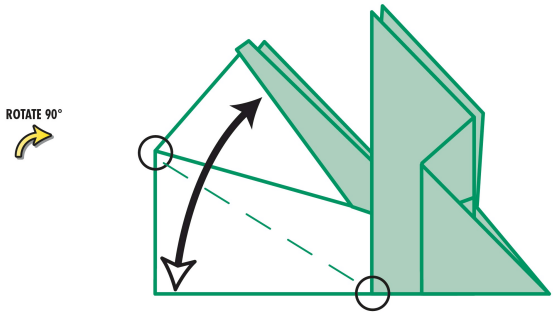
12 This is the result. Fold the top flap down along the imaginary broken line in the illustration so the circled points meet.



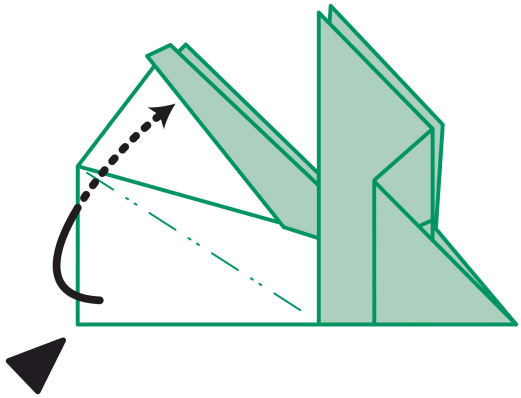
13 Fold the top layer back up along the imaginary broken line, following the guideline in the illustration.



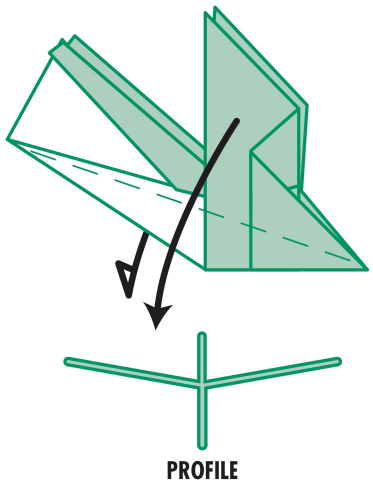
14 Fold the right half behind the left side.



15 Rotate the model 90° clockwise. Fold the lower left corner up along the imaginary broken line between the circled points in the illustration. Crease, then unfold.

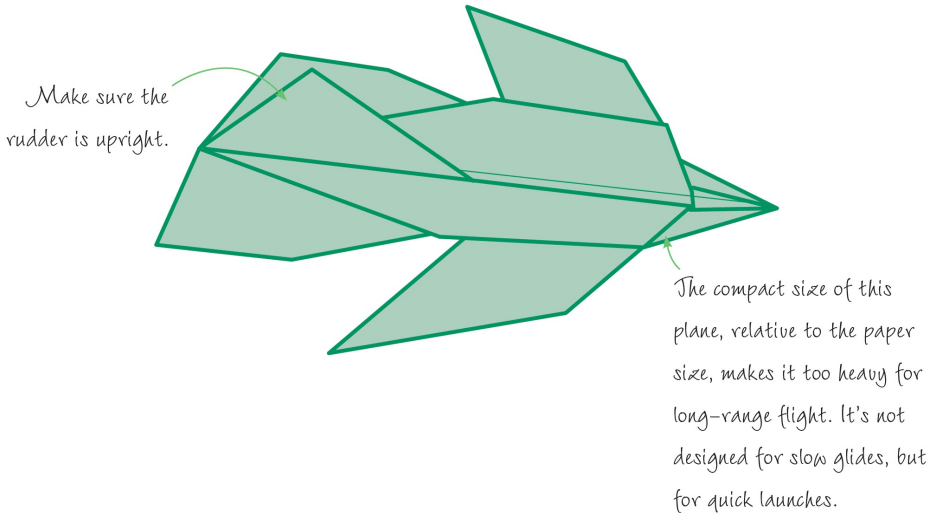


16 Press the lower left corner inside to form a reverse fold.



17 To form a wing, fold the upper layer down from nose to tail along the imaginary broken line shown in the illustration. Repeat on the other side. Open

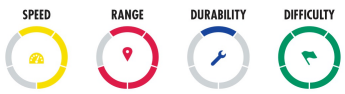
the wings to match the profile.

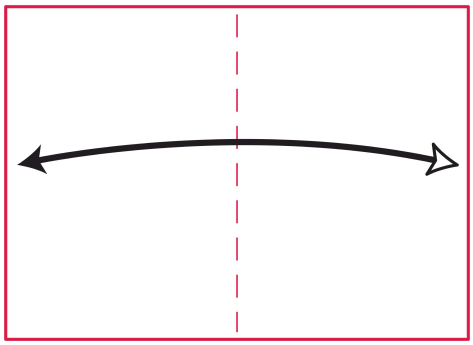


Moth

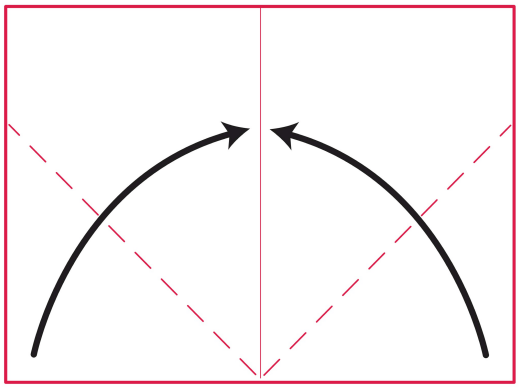
TYPE: STUNT

You may find this plane slightly more challenging, but it’s not a great leap in complexity. The extra effort is worth it—the plane flies well and is very stable.

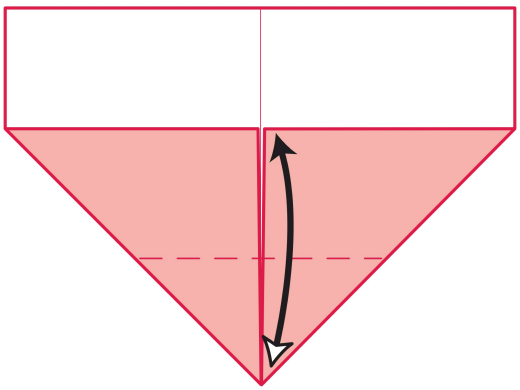




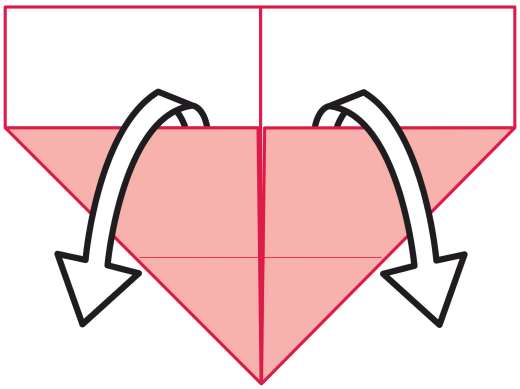
1 With the paper plain side upward and horizontal, fold in half short edge to short edge. Crease, then unfold.



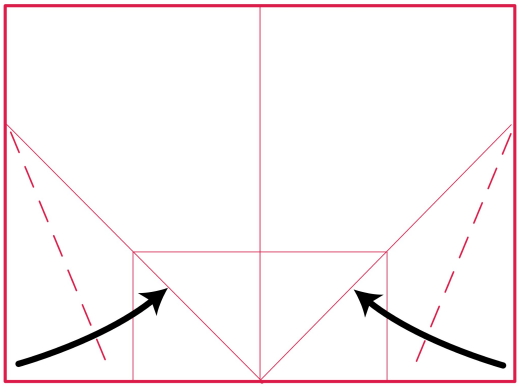
2 Fold each of the lower corners up to the vertical center, along the imaginary broken lines shown in the illustration.



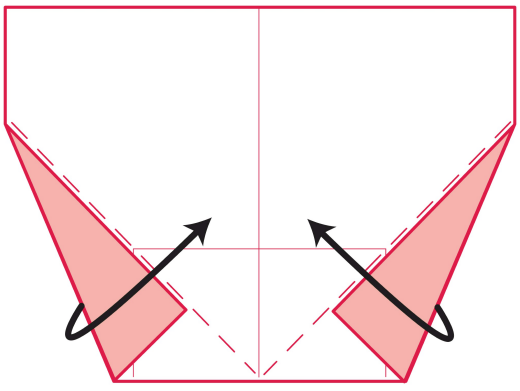
3 Fold the lower corner up along the imaginary broken line to touch the two inner corners. Crease, and unfold.



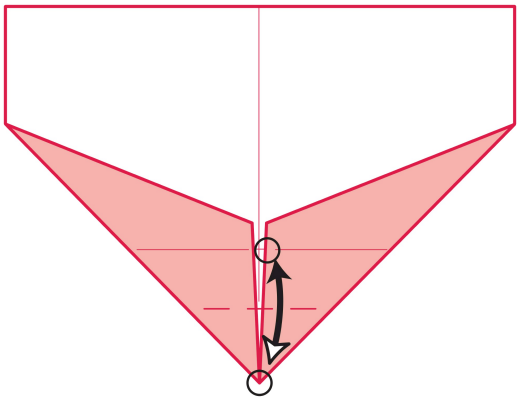
4 Unfold the two flaps.



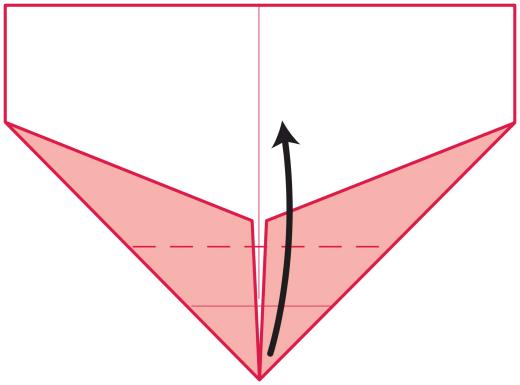
5 Fold both of the lower corners in along the imaginary broken lines so the lower edges of each side lie on the creases.



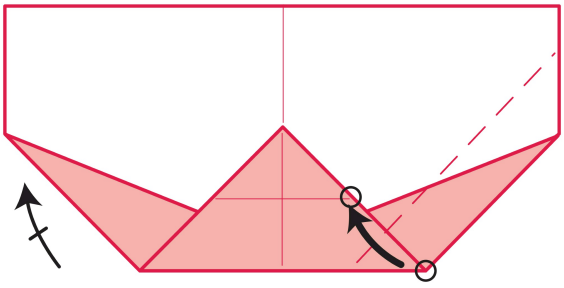
6 Fold over the colored sections along the imaginary broken lines, using the existing creases.



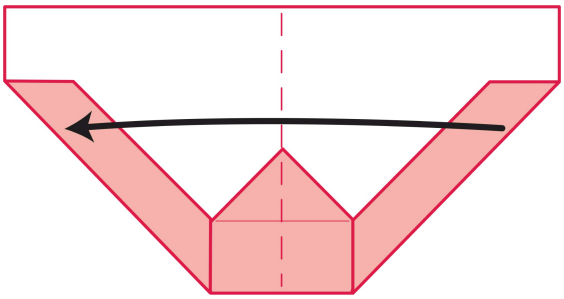
7 Fold the lower corner up along the imaginary broken line in the illustration so that it touches the horizontal crease. Crease, then unfold.



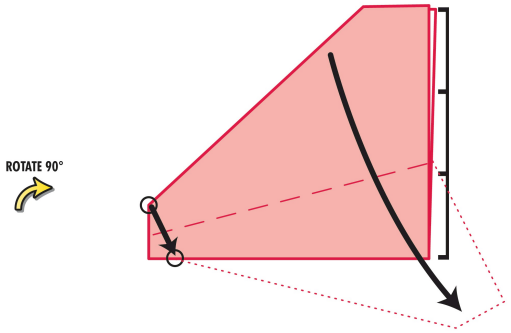
8 Fold the lower corner upward on the existing upper horizontal crease, indicated in the illustration with an imaginary broken line.



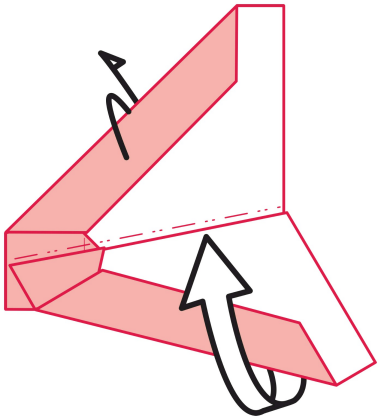
9 Fold the right bottom corner in so that the points circled in the illustration meet. Note that the fold, indicated with a broken line, should be parallel to the right edge. Repeat on the left side.



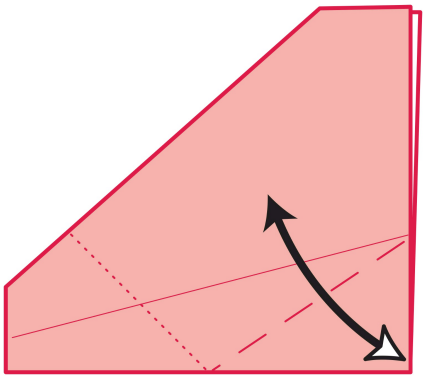
10 Fold the model in half so that the right side lies atop the left side.



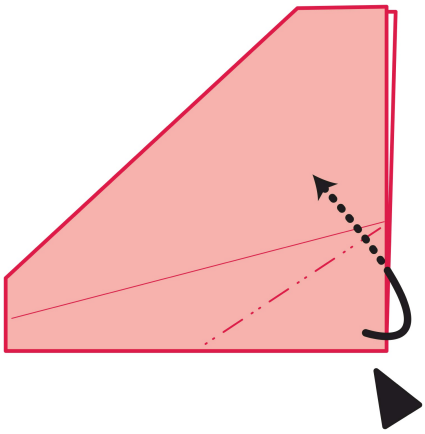
11 Rotate the paper 90° clockwise. To make the first wing, fold the upper layer down along the imaginary broken line so that the points circled on the left side of the illustration meet, and the crease on the right edge is at about one-third of the height of that edge.



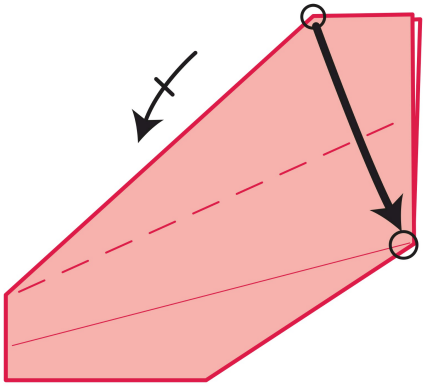
12 Fold the rear wing to match the other, then unfold. Unfold the upper wing.



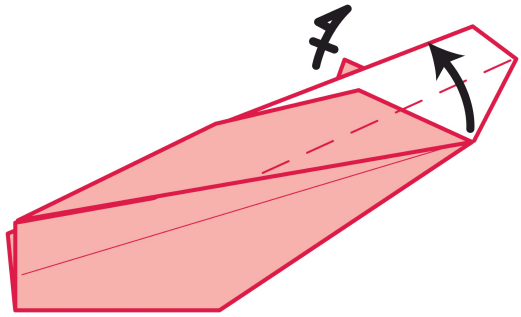
13 Fold along the imaginary broken line shown in the illustration. Crease through all layers, then unfold.



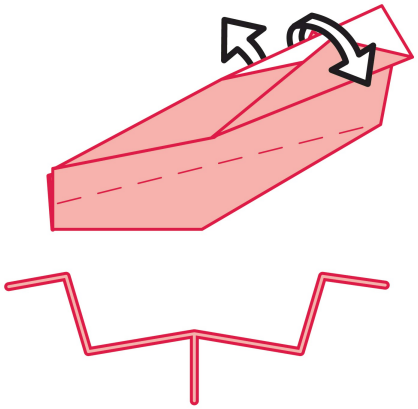
14 Press the corner inside, making a reverse fold.



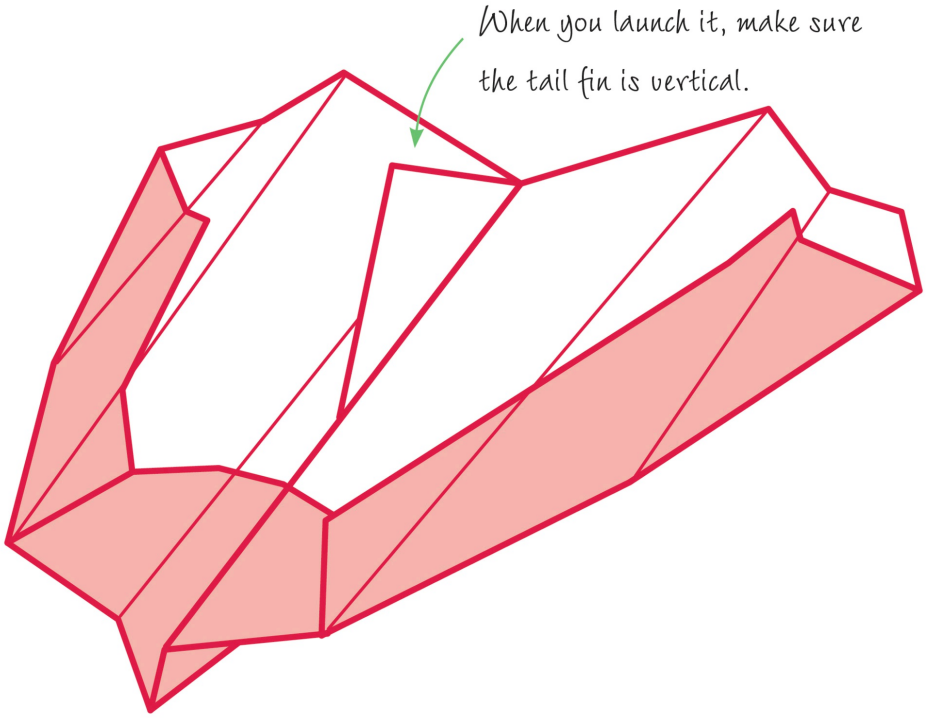
15 Fold a wing down along the imaginary broken line shown in the illustration so the circled corners meet. Repeat on the underside.



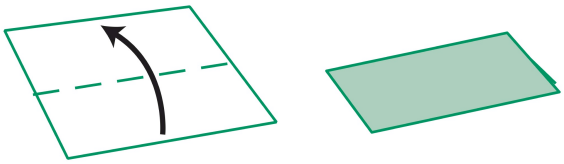
16 Fold the uppermost flap in half upward along the imaginary broken line shown in the illustration. Repeat on the underside.



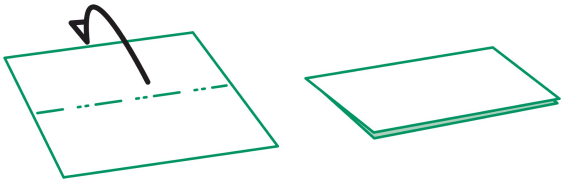
17 Open the wings to match the profile.


When you launch it, make sure
the tail fin is vertical.

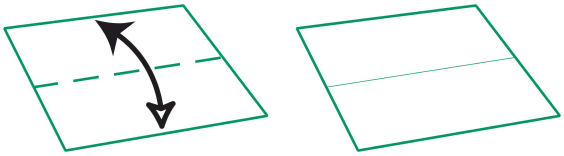
Key to Symbols



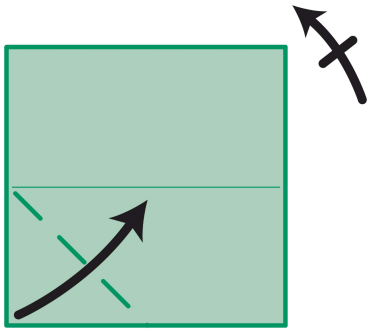
Fold the paper behind. Also known as a mountain fold.



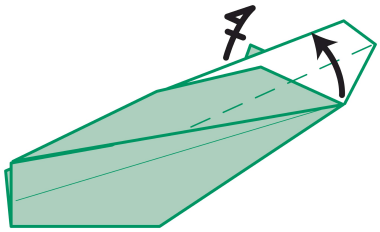
Fold in the direction of the arrow. Also known as a valley fold.



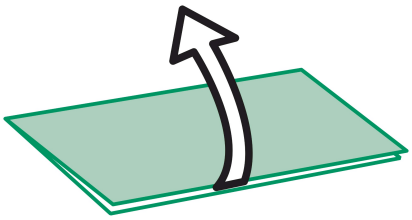
Fold from unshaded to solid arrow, then unfold again to leave a crease.



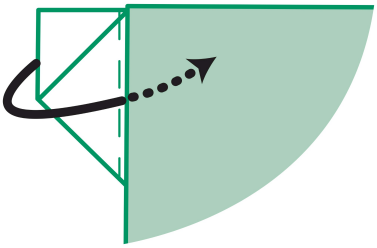
Repeat arrow.



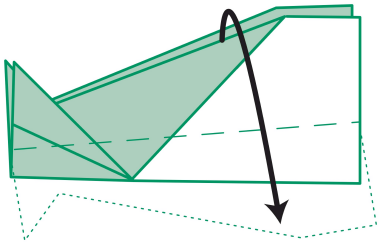
Repeat the fold on the underside.



Pull the paper out or unfold it.

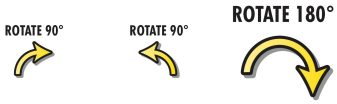


The dotted line indicates where part of the paper is hidden from view.

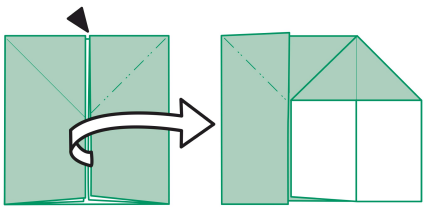


When folded, the edges of the paper should match the imaginary dotted outline.

Flip the paper over from one side to the other.

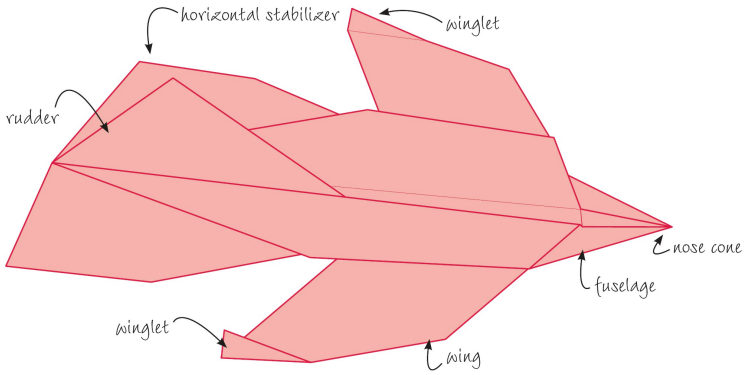


Keeping the paper on the tabletop, rotate it in the amount and direction shown.



The action to be taken happens at this spot.

Anatomy of a Plane



About the Author

Nick Robinson has been folding paper since the early ’80s and has been a member of the British Origami Society for over 30 years nd has served on their council for over 20 years. He edits their bimonthly magazine and maintains their website (britishorigami.info). In 2004, he was awarded the Sidney French Medal, the highest award the society can offer, in recognition of his outstanding contribution to origami. In addition, he is an honorary member of the Society.

Nick has been a professional origami teacher for nearly 30 years, traveling to schools, libraries, youth clubs, hospitals, and art galleries teaching origami and paper artwork. He runs sessions with people of all ages and physical abilities. Tutees have included both the visually and hearing impaired.

Nick has also taught and lectured on origami all round the world, including America, Ireland, France, Germany, Austria, Switzerland, Spain, Italy, the United Arab Emirates, and Japan.

Nick has written and illustrated over 60 origami books (making him by some margin the most published origami author in England), with total worldwide sales into the millions. He has also appeared on television in England and Germany, and has fulfilled numerous commissions for magazine, television, and internet advertising campaigns. Over 300 of his original origami creations have been published in 13 countries around the world, including a Japanese newspaper. He has submitted work to many prestigious exhibitions around the world. In 1994, he won three of the five categories for the International Alice in Wonderland Origami competition.

Nick is in his late 50s and lives in Sheffield, England, with wife Alison, grown-up children Daisy and Nick, plus cats Brian and Rhubarb. As a former professional musician, he still performs live ambient guitar concerts.

You can check out Nick’s origami website at origami.me.uk, where you can find everything you need to know about origami and enjoy his highly popular ori-blog. He is also active on Facebook under Nick Robinson Origami.