

MAKE A TWIRLING PAPER FISH AND HELICOPTER

Make two simple paper objects and explore how they move through the air

What you'll need:

- A sheet of paper (new or used)
- Scissors
- Pencil (optional)

Make the fish:

1. Cut two paper strips, approximately 11.5 cm by 2.5 cm.
2. Lay your strip in front of you so that it's wider than it is tall.
3. About 2.5 cm from one end of the strip, cut a slit from the top that goes halfway to the bottom.
4. About 2.5 cm from the other side, cut a slit from the bottom that goes halfway to the top.

Tip: It might help to draw the cut lines on your paper with the pencil before cutting.

5. Join the ends by sliding one slit into the other. Now they should be crisscrossed.

Feeling creative? Grab some markers and do a little decorating!

Now you're ready to launch your paper fish. Check out different launch techniques on page 3.

See page 2 to make your helicopter.



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Make the helicopter:

1. Lay your strip in front of you so that it's wider than it is tall.
 2. Fold the top edge of your strip down to meet the bottom edge, making it even thinner. Then unfold.
 3. Now fold it in half the other way, but this time don't unfold.
 4. Turn your strip so that the fold is at the top and the opening is at the bottom.
 5. Fold the folded (top) end down again, about 2.5 cm. Then unfold.
- Now you have four folds: one long one and three short ones.
6. Now cut the helicopter blades.

Tip: It might help to draw the cut lines on your paper with the pencil before cutting.

7. Starting from only one end, cut along the long fold, but stop when you reach the first short fold. The cut should not go any further.

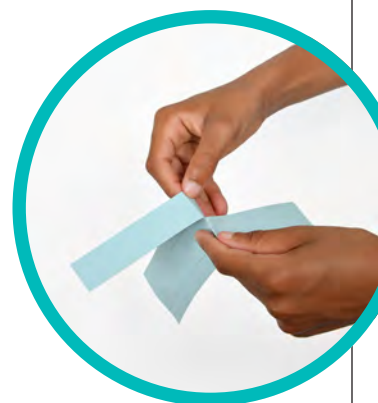
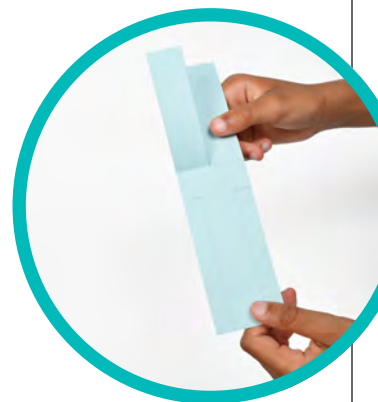
8. Now you're going to create a ballast by adding extra material to give your helicopter more weight and stability. Your long-fold cut stopped at the first short fold. Find the second fold and skip it. Find the third fold—this is where you make your next cuts.

9. At the third fold, make a cut about 0.5 cm towards the centre from one side and another cut the same size, from the other side.

10. These cuts create two flaps, one on either side of the strip. Fold both flaps toward the centre of the paper strip, one on top of the other. This makes a skinny stick opposite to the blades.

11. Now fold the blades down, one towards you, and the other away from you. Then push them back up slightly to form a "V" shape.

Now you're ready to launch your paper helicopter. Check out different launch techniques on page 3.



MAKE A TWIRLING PAPER FISH AND HELICOPTER

Launch your twirling paper creations:

To launch the fish, hold it gently above your head, then let it go. Watch it spin to the ground. Why does the fish spin that way?

To launch the helicopter, pinch it gently under the blades, hold it above your head and let it fall. Why does the helicopter spin the way it does?

Experiment with your launch technique. Throw it up, throw it down, let it go gently. Launch it in several different locations—try outdoors—and from different heights. Does that change way it flies?

Can you use something to keep it in the air longer? Can you make it fall more quickly or more slowly?

Make it from other types of paper, or change the length of the cuts. How does changing the design change the performance?

How does it work?

Aerodynamics is the science of how objects move through air and the forces that affect their motion.

As the paper fish moves down through the air—because of gravity—the fish “tails” catch the air and get pushed over, forcing the fish to spin on its side, horizontally. Can you design a fish that spins vertically?

The helicopter blades push on the air as they descend. Because they then get slightly twisted, some of the air starts moving sideways, which forces the blade upwards, causing them to turn.

Can you figure out why the helicopter stays vertical while it spins round and round? (Hint: think about the ballast.) Can you launch it by spinning it really quickly into the air? Does that change its motion?

