

# Copter Engineering

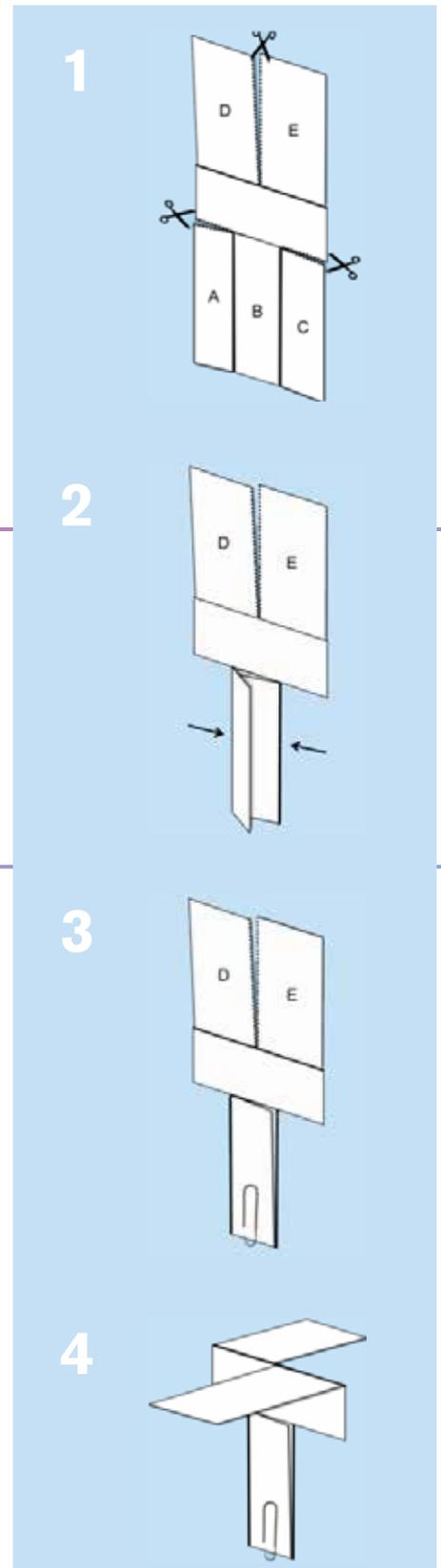
**Ages 3 – 10** Engineer a paper helicopter that will spin to the ground when dropped.

**Activity Time:** 15 minutes

**Materials:**

- A Piece of Paper
- Scissors
- Paperclips
- Stopwatch (optional)

- 1** Use a pair of scissors to cut the paper along **ONLY** the dotted lines as shown in the diagram to the right.
- 2** Fold flap A over flap B, making a crease on the solid line. Then fold flap C over flap B so that the bottom of your copter is a rectangle.
- 3** Add a paperclip (see step 3 in the diagram) to attach flaps A, B, and C together.
- 4** To make the wings (called “rotor blades” on a helicopter) of the copter, fold flap D and E in opposite directions (see step 4), creasing the paper on the solid line.
- 5** Test the copter by holding it straight in front of you and letting it go or by dropping it from a safe, high place.
- 6** Try to make a copter that reaches the ground more quickly. Pick one thing to change, such as wing shape, wing size, or weight. Try timing how long it takes each copter to get to the ground or try testing two copters at the same time.



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## BACKGROUND FOR GROWN-UPS

The shape and size of the wings and the weight of the copter are all variables that affect how fast the copter spins and how quickly it reaches the floor. As the copter falls, it experiences air resistance, which is when air pushes against a moving object, slowing it down. Objects with larger surfaces experience more **air resistance** than those with smaller surfaces. For example, a flat piece of paper falls slower than a crumpled ball of paper, as it has a larger surface and experiences more air resistance. This force acts in opposition to **gravity**, which pulls objects towards the ground. As the copter is falling, the air pushes on the wings and causes them to bend slightly upward. This position causes the air under one wing to push one way and the air under the other wing to push the opposite way, making the copter spin. The faster the wings spin, the more air resistance is created, and the slower the copter falls.

### Extension Activities

- Try designing your own shape for the copter wings!
- What happens when you make a copter with two different-shaped wings?
- Try drawing a design on your copter. Does the design look different as it spins?
- Try using a heavier type of paper for your copter. What do you notice?
- Attach a string to the bottom of the copter and pull it behind you like a kite!

### Questions to Foster Learning:

- What happens as the copter falls?
- What happens when you change the wing shape?
- What happens when you add more weight (paperclips)?
- Can you make a copter that spins quickly? Can you make a copter that spins slowly?

### Additional Resources:

- *Air is All Around You* by Franklyn M. Branley
- [nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-a-helicopter-k4.html](https://nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-a-helicopter-k4.html)

