



## Curiosity Guide #205

### Flowing Air

Accompanies Curious Crew, Season 2, Episode 5 (#205)

#### Making a Hoop Glider

STEM Challenge

#### Description

Can you make a hoop glider that is a great flyer?

#### Materials

- Heavy paper, like construction, résumé, or notecard paper
- Straws
- Tape
- Ruler
- Scissors. A paper cutter works well if an adult wants to cut strips for a group.
- Measuring tape
- Paper airplane and airfoil wing, to compare the wings' function with that of the hoop glider

#### Procedure

- 1) Measure and cut three paper strips, 1 inch by 5 inches.
- 2) Make a loop out of one strip. Overlap the ends by  $\frac{1}{2}$  inch. Tape in place.
- 3) Make a larger loop by taping the other two strips together. Overlap the ends. Form the loop and tape in place.
- 4) Line up the 2 hoops so that they are standing up on the table.
- 5) Slide the straw through the hoops so that the straw is lying flat on the table, with the small hoop on one end and the large hoop on the other.

- 6) Tape down the straw to the inside of the paper hoops.
- 7) Pick up the glider by the straw.
- 8) Aim slightly up and give the glider a toss.
- 9) Create variations of the glider. Try different sizes of hoops and lengths of straws, or multiple hoops. What happens when you create two hoop gliders and attach them together? What other modifications can you try?
- 10) Test-fly each modification.
- 11) Keep track of your distances with a measuring tape.
- 12) What combination gives you the best flyer?
- 13) Something else to do: Visually compare the airfoil wing you made in Investigation #6, a paper airplane, and the hoop glider. Think about how each of them uses air pressure and/or drag.

## My Results

## Explanation

Although the Hoop Glider looks quite different from a paper airplane, the hoop also acts as a wing. When you look at a paper airplane, there is no curve or bump like you see in an airfoil. It is flat. However, the element of air resistance, or drag, is another contributor to providing lift. As the air hits the lower part of the dragging wing or hoop, the air slows down. According to Bernoulli, if the air slows down, the pressure goes up, so there is a lift for the paper airplane or the glider. The larger back hoop provides drag and lift while the front hoop keeps the hoop glider going straight. The glider stays upright because even though it is falling, each part will fall at the same speed and maintain its position.

**Other things to try:** Just like your Hoop Glider, paper airplanes are fun to make. Did you know that the largest paper airplane had a wingspan over 40 feet wide, and when it flew traveled 114 feet? Wow! In 2012, an aircraft engineer built and flew a paper airplane 226 feet. Who knows, maybe you can beat one of those records someday!

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