

# STEM AT HOME

Science-Technology-Engineering-Math

## Hoop Gliders



### **An exploration into the principles of flight**

Can you make a straw fly farther by adding paper hoops?

Tools and materials needed:

Paper (or index cards)

Scissors

Pencil

Non-bendable, plastic drinking straw

Tape

Ruler

Procedure:

1. Predict how far the straw will fly with and without the hoops.  
Do you think the hoops will make it go farther?
2. Throw a plain straw to see how far it goes.
3. Cut two strips of paper one inch wide, one five inches long the other 10 inches long.
4. Curl each paper strip into a hoop. Tape the ends together.
5. Tape the small hoop to one end of the straw.
6. Tape the large hoop to the other end of the straw.  
Make sure the hoops align with one another.
7. Throw your hoop glider!

Review your prediction – did the hoop glider go farther than the straw alone?

Keep going: Does the length of straw affect how far a hoop glider will fly?

Make a Claim: What length of straw will make your hoop glider flight the furthest? Will a longer straw go further or will a shorter straw go further? Testing Ideas: Make two different hoop gliders (one short and one long) to test your claim.

Test your claim! In a space with ample room to throw, hold one hoop glider in the middle of the straw with the hoops on top and the small hoop facing forward. Throw your hoop glider how you would throw a paper airplane. Use a post-it note or something to mark the place in which the hoop glider landed. Next, throw the other hoop glider in the same manner. Mark the place where this hoop glider landed. Repeat this process several times for each hoop glider to determine if there is a pattern.

Analyze & Interpret Data: Which hoop glider traveled the farthest? The longer straw or the shorter straw? Was your claim correct or incorrect? Why do you think you had the results you had? How could you change this experiment while using the same materials? Try adding more hoops, changing the sizes of the hoops, or further changing the length of the straws.

Communicate Findings: At home try having a flight contest with your family to see who can make their hoop glider fly the furthest.

### **The Science:**

**Weight:** a force that is always directed towards the center of the earth.

**Lift:** the upward force created when a wing (or hoop) is moving through the air. The wing (or hoop)'s curved surface causes the air to go faster over the top creating a region of low pressure underneath, and thus lift. When an airplane (or hoop glider) flies, the wing (or hoop) is designed to provide enough lift to overcome the airplane's weight.

**Drag:** The resistance force of the air pulling against the motion of the aircraft (or hoop glider). Drag is the force opposed to the flight direction. The aerodynamic shape of airplanes (or hoop gliders) help reduce drag.

**Thrust:** Thrust is the propulsion force that moves the aircraft (or hoop glider) through the air. Aircrafts use jet engines to create thrust. In this experiment your arm created the thrust.

### **The engineering:**

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.