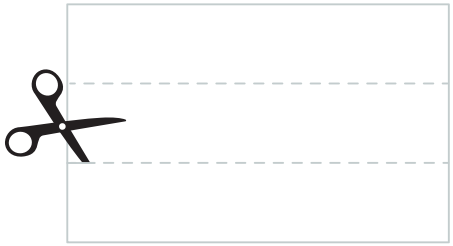
CURIOSITY AT HOME

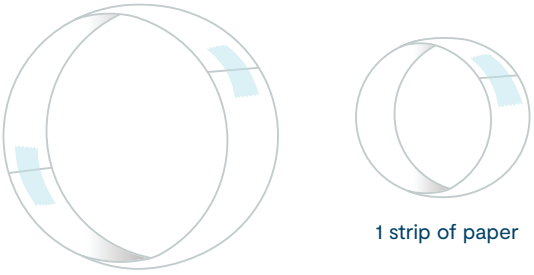
TAKE FLIGHT

What do you think would happen if you tried building a paper airplane that uses hoops instead of wings? Follow the directions below to make a flying contraption, then create and test your own design using paper and other materials!

MATERIALS

- Drinking straws (1 per flyer)
- 3” x 5” index cards (1 per flyer)
- Tape
- Scissors
- Paper (of a variety of sizes)
- Paper clips
- Something to use as a target (like a pillow or hula hoop)
- (Optional) Tape measure or other measuring device
- (Optional) Other building materials such as crafting supplies or recyclables
- Science notebook or paper
- Something to write with

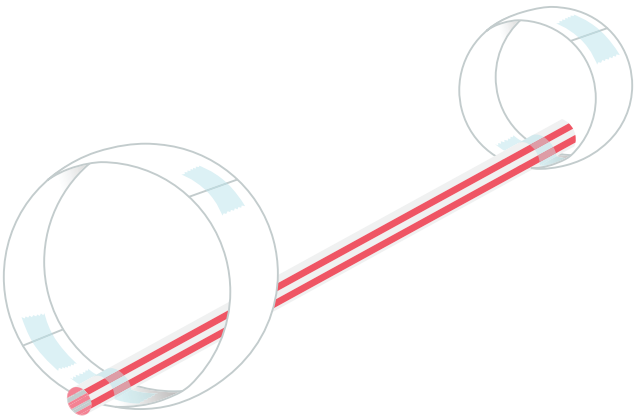




1 strip of paper

PROCEDURE

- To make a hoop flyer:
  - Cut an index card the long way into three 1-inch strips.
  - Curl one strip into a hoop and tape the ends together on both sides.
  - Lay the other two strips end-to-end, to make one long strip. Tape them together to make one large hoop.
  - Tape each hoop to one end of the straw.
  - To make your hoop flyer fly, hold the middle section of the straw and throw it forward. Try flying with the small hoop in the front and again with the large hoop in the front. Which had the better flight?



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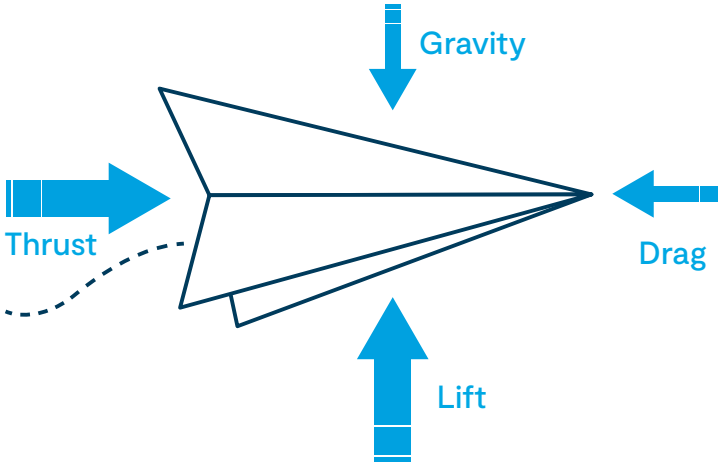
- Test out your flyer.
  - Distance Test: Find a long open space and throw your flyer. Using a tape measure, see how far it went. Record the distance in your science notebook and test it again. It's good to do at least three trials to get a sense of how far your flyer typically goes.
  - Target Test: Prop up a hula hoop or something that can be used as a target (you could use a stuffed animal, pillow, or draw a target on a piece of paper). Choose a short distance to throw the flyer from towards your target. If you hit the target, increase the distance until you cannot hit the target successfully anymore. How far away were you able to still successfully hit the target? Be sure to log that distance in your science notebook!
  - Design another test for your flyer. How high can your plane go? Can it turn to the left or right? What if you race your hoop flyer against a paper airplane?



EXPLORE MORE

There are lots of ways you can adjust this activity to change the difficulty level of your tests, including:

- Instead of circular hoops, what would happen if you folded the hoops on the hoop flyer to be triangle or square shaped? What if you increased or decreased the number of hoops?
- What's the largest paper airplane that you can create that still flies? What about the smallest?
- Can you set up an obstacle course for a paper airplane? Can you set up a course that allows your plane to stop and land in a specific area? Use hoops, targets or other objects for your plane to fly through or land on.
- Challenge others to compete for distance, accuracy or navigating through the obstacle course!

WHAT'S GOING ON?

There are four forces acting on your hoop flyer as it flies. **Thrust** is the forward force created by throwing the flyer, which is counteracted by **drag** as the air surrounding the airplane slows it down over time. As the hoop flyer's wings move through the air, the air also creates **lift**, pushing the flyer upwards. At the same time, **gravity** acts from a distance to pull the plane back towards the earth. If the forces of lift and thrust overpower the forces of drag and gravity, the flyer will stay in the air.

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CURIOSITY AT HOME

TAKE FLIGHT

K–2 GRADE EXPLORATION

- Try throwing your flyer upside down. What happens?
- What might happen if you changed the weight of your plane? Try adding paper clips or removing a part!
- Try to make a plane that does a flip! What do you think made it fly that way?

CURIOSITY AT HOME

TAKE FLIGHT

3-5 GRADE EXPLORATION

- What might happen if you changed the weight of your plane? Try adding paper clips or removing a part!
- Think about the shape of a particular design of plane, or find a picture of one. What would you need to do to create a paper airplane inspired by this design? What makes this particular design successful?
- Is there a way in which you could combine two plane designs together to make a completely new design? Try it out and test your new design.

CURIOSITY AT HOME

TAKE FLIGHT

6–8 GRADE EXPLORATION

- What might happen if you changed the weight of your plane? Try adding paper clips or removing a part!
- Think about the shape of a particular design of plane or find a picture of one. What would you need to do to create a paper airplane inspired by this design? What makes this particular design successful?
- Is there a way in which you could combine two plane designs together to make a completely new design? Try it out and test your new design.