Speeder Bike/Hoop Glider

Objective:
Make a glider and learn about the physics of flight.

Can a speeder fly if it has big holes in it?

Have you ever made a paper airplane? Or maybe you made a straw rocket using our instructions. Your airplane or rocket had a pointed nose, to help it be aerodynamic, or speed through the air fast, without a lot of resistance. If the nose had been open, what would have happened? Would they fly as well?

This project investigates whether a glider designed with open rings can actually assist with lift.

Difficulty Level:
Easy (ages 8-14)/Medium (ages 6-8)

Materials:

- 2 Straws
- Black permanent marker
- Clear tape
- Scissors
- Pencil
- Brown cardstock or construction paper
- Template

Procedure:
1.Color your straws black with the permanent marker. Be careful not to get it on your hands. You may need to use a paper towel to help.

2. Cut the shapes for the Ewok silhouette and the front and back of the speeder bike from the template. Use black for the silhouette and brown for the speeder bike.

3. Make a small ring or hoop shape with the smaller template cut out. Then tape it along the seam to hold it together. Do the same with the larger template cut out? Your shapes should now look like small and large paper rings.

4. Tape two straws, side by side, onto the widest part inside of the bigger hoop.

5. Fold the base of the Ewok silhouette and slide it between the two straws. Once it is in place, take a loop of tape and place it around the folded base of the Ewok silhouette, and over both straws.

6. Tape the two straws onto the widest part inside of the smaller hoop.

7. Test your glider by throwing it overhand. See how far it will go! Make two speeder bikes and have a chase!

8. Try making a speeder bike with a different sized silhouette-- instead of an Ewok, what if you had a Wookie or Stormtrooper? Does it affect how far the glider will go?

9. Can you make a glider with two hoops that are the same size?

10. Can you make a glider that can fly in a loop like the speeder bike that Paploo the Ewok stole from the Imperial Troopers?

Try adding a paperclip to the front of your glider. What happens?

What design will fly the farthest?

What's the Science?

A hoop glider, or ring glider, demonstrates the four forces of flight: thrust, lift, drag, and weight.

The two differently sized hoops keep the straw balanced in flight. The big hoop creates "drag" (air resistance), keeping the straw level, while the smaller hoop in front keeps the glider flying straight.

The weight of the hoop glider needs to be kept light, so that it can attain enough lift to stay up in the air for a while, before being affected by gravity. You provide the thrust when you throw the glider.

Explore More:

You can turn this activity into an experiment! Here are some things you can test:

Mark off a space that is 15 feet long. You can use a measuring tape or yard stick and marking tape. This will be your testing zone.

Make a hoop glider using the instructions. This will be your control. Stand at one end of the tape line and throw your glider. Measure how far it flies.

Now, make some variations on the design. These will be your prototypes that you will test, to see how different designs affect the glider's performance.

Here are some design ideas:

Adjust the placement of your paper rings on the straw

Adjust the size of your hoops-- what happens if you make both hoops the same size?

Make the hoops thicker or thinner in diameter

Make the hoops from different weights of paper

Make the glider with a shorter straw

Attach two or more straws together to make a super long glider

Make more than two hoops

Record a short description of each model in your science journal. Before you test each glider, predict how far you think it will fly. Then test it out, and be sure to record your result. Once you finish testing, look at your data. Can you use it to design the ultimate hoop glider?

Star Wars Connection:

Speeder bikes, or “swoops,” feature in *Return of the Jedi* and several other Star Wars spin-offs. In *Return of the Jedi*, Luke and Leia Skywalker steal two Imperial speeder bikes, and go on a fast and dangerous chase, narrowly maneuvering the dense forest while chased by Imperial Troopers.

George Lucas’ original concept sketches envisioned speeder bikes as a “rocket powered scooter”. Concept artists Nilo Rodis-Jamero and Ralph McQuarrie had two very different ideas about what the fast, dangerous hovercrafts might look like.

The final film used full-scale models ridden by actors, along with miniatures mounted by puppets. Can you tell in the film when a miniature is being used?

The footage was shot with a steadicam recording at a rate of 1 film frame per second, then played at the standard rate of 24 film frames per second, which caused a blurring effect, and made the vehicles appear to be going 20 times faster!

References:

This project was inspired by a project in the book *Star Wars Maker Lab: 20 Crafts and Science Projects*, by Liz Lee Heinecke and Cole Horton.

Take a picture and share it with us, so we can see what you made! For more engineering projects and science activities, subscribe to our newsletter! Have an adult send it to online@scienceworksmuseum.org or share it using the hashtag #ScienceWorksOnline