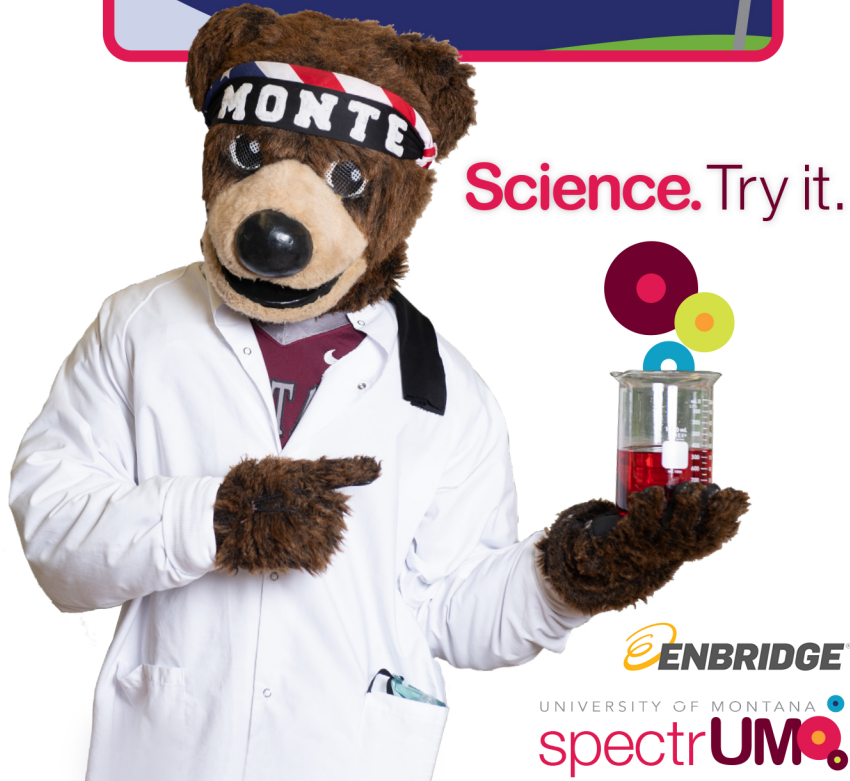
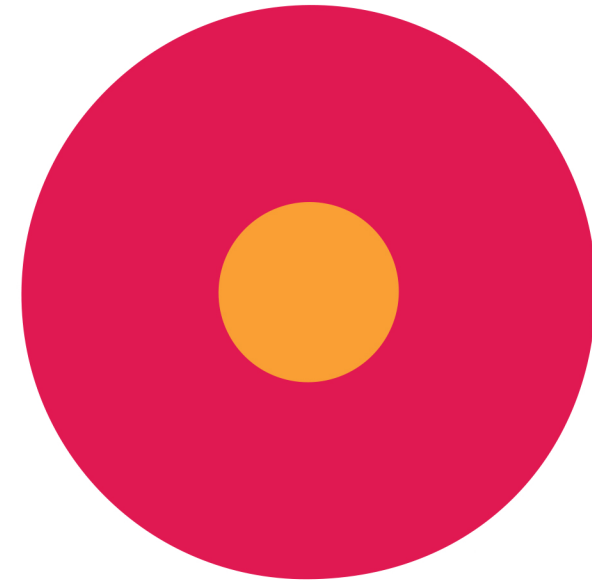


# Directions

spectrUM Discovery Area is located on the Children's Floor of the new Missoula Public Library at 455 East Main Street, in downtown Missoula.



“Stare at spectrUM’s logo for 30 seconds and then look away to a blank wall. What do you see? The colors are reversed because of something called afterimage. **Pretty cool, huh?**”



  
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## Fun with Flight

GRADES 3-5

Explore how airplanes and rockets work. Build a paper straw version of each to test and fly!



  
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# Fun with Flight

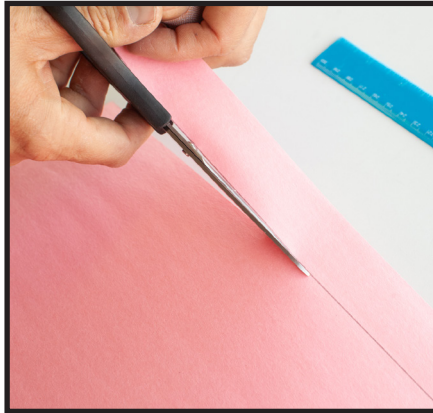
## HOOP GLIDER

### What You Need:

- Paper
- Tape or Glue Dots
- Long Straw
- Scissors (not included)
- Ruler and Pencil (optional)

### Try it

- 1. Cut** two strips out of a sheet of construction paper or copy paper. **Cut the longest edge first**, a little over 1" wide. Then cut the shortest edge, about 1" wide as well.



- 2. Use** the glue dots or a piece of tape and overlap one end of the strip over the other, attaching where they overlap.



- 5. Launch** the rocket by putting it on the ball and stick launcher, pinching the top of the stick, and dropping it straight down. Be careful - they can fly pretty fast and far!



These rockets work by transferring the energy of the bouncy ball when it hits the ground into the rocket, shooting it upward.

### How does this work?

These rockets transfer the energy of the bouncy ball when it hits the ground into the rocket, shooting it upward.

**Experiment** with making bigger or smaller rockets, adding more fins, or trying different shapes.

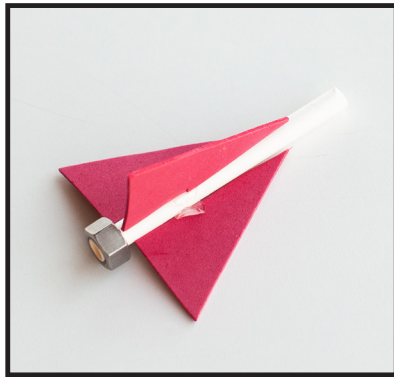
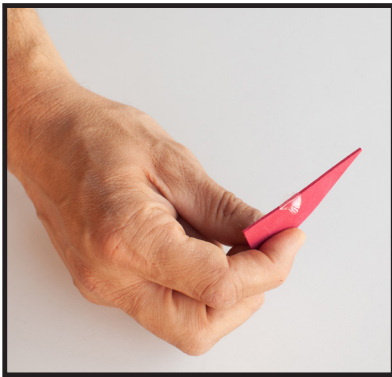
- What can you do to make the rocket tumble more?
- What other items might you add to the rocket to make it more stable?

For more information on designs to try, questions to think about, and examples see our Instructable at [tinyurl.com/bouncyrocket](https://www.tinyurl.com/bouncyrocket) or scan this QR code:



2. **Cut** out a few fins for your rocket from a piece of paper, cardboard, or craft foam. What shape would you like to try?

3. **Attach** the fins to a **short straw** using some glue dots, tape, or hot glue. It's easiest to add the adhesive or tape to the fin, then stick it on the straw. Triangles and squares work well, but so do mustaches, butterflies and leaves!

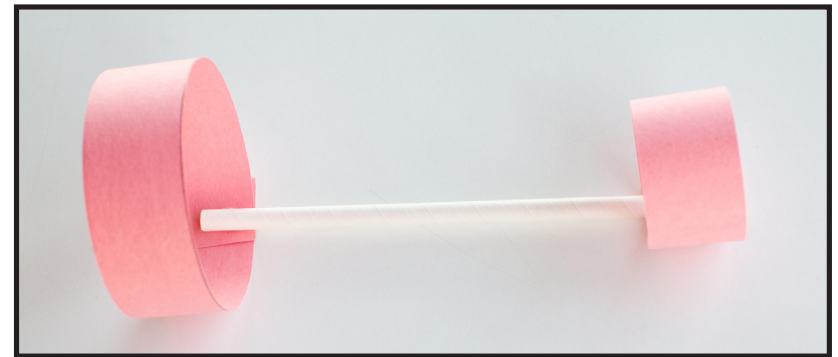
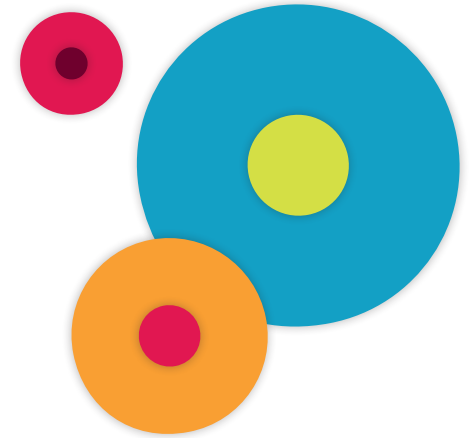


4. **Attach** a hex nut to the rocket anywhere you'd like by twisting it onto the straw clockwise. If it's too loose, add some tape or glue but don't get any inside the straw!



3. **Attach** the larger loop to the **long straw** with a glue dot or piece of tape.

4. **Attach** the smaller loop on the opposite end of the straw with a glue dot or piece of tape.



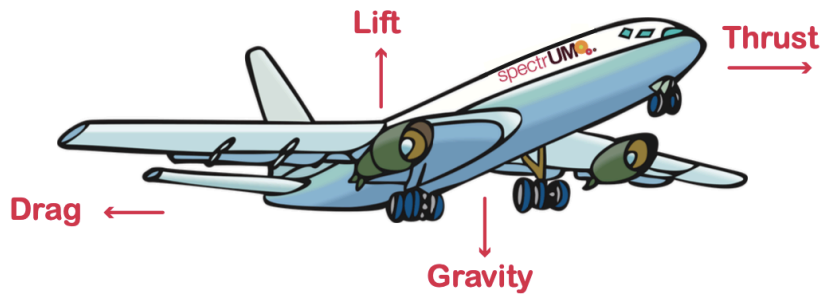
5. **Launch** the hoop glider by throwing it through the air.

**Experiment** with making bigger or smaller loops with other pieces of paper.

- What happens when you throw it with the smaller loop in the back?
- What about with the straw on top instead of closest to the ground?
- What happens if you add an extra loop in the middle?
- What about taping another straw to the one you have to make it twice as long?

Try different designs to see how they fly differently.





## What's going on here?

### This doesn't look like a paper airplane?

It may look weird, but you will discover it flies pretty well. The two sizes of hoops help to keep the straw balanced as it flies. When you throw the plane, you are giving it **thrust**. The big hoop creates **drag**, or air resistance, which helps keep the straw level. The smaller hoop at the front keeps your hoop plane stable and flying on a straight path. When you throw it there is just enough **lift** to keep the plane gliding along and slow its fall to the ground as **gravity** pulls it towards the Earth. These are the four forces of flight, and how these forces interact determines how different designs of aircraft fly through the air.

For more information on designs to try, questions to think about, and examples see our Instructable at [tinyurl.com/funflighthoop](https://www.tinyurl.com/funflighthoop) or scan this QR code:



# Fun with Flight

## BOUNCY ROCKET

### What You Need:

- Bouncy Ball
- Stick
- Short Straws
- Scissors (not included)
- Foam or Paper
- Hex Nut
- Tape, Glue dots or hot glue



### Try it

1. **Push** the dowel into the hole that is drilled into the bouncy ball to make your launcher - but make sure to not poke it through too far!

