



# Aircraft challenge Hoop glider v. paper airplane

## The experience:

**Note from Henry:** The hoop glider is a funny looking aircraft, but it really flies!

### Physics

Paper airplanes, hoop gliders, and real airplanes all work based on the same principles of physics. Throwing the hoop glider or paper airplane creates a forward moving force called thrust. In a real airplane, thrust comes from the propeller or jet engine. As the plane flies, air moves above and below the wings or hoops creating lift. Wing and hoop size matter for lift. There is friction between the air and the plane which creates drag. Plan shape, the aerodynamics, matters for drag. The final force at work when a plane flies is gravity, which will pull anything with mass back down to earth. Together, thrust, lift, drag, and gravity are what make planes and gliders fly.

### Hoop glider

#### Materials:

- straw
- index card (3x5)
- ruler
- tape
- scissors
- optional: crayons, pens, or markers for decorating the hoops

#### Directions:

1. Use the ruler to divide the index card into three sections that are 1-inch wide.
2. Cut along the lines to make three strips. Now is the time to decorate the hoops if you want a colorful glider.
3. Tape one strip together to make the small hoop.
4. Tape the other two strips together to make a larger hoop.
5. Tape the small hoop to one end of the straw. (This can be a little tricky.)
6. Tape the large hoop to the other end of the straw.



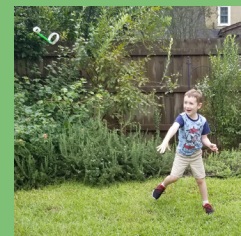
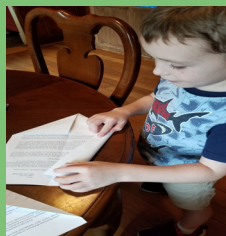
### Basic paper airplane

#### Materials:

- office paper, 8.5x11 size. Reuse paper from work if possible. (Henry's airplane was made from a page of a draft NPDES permit.)
- optional: crayons, pens, or markers for decorating.

#### Directions:

1. Fold the paper in half long ways then unfold
2. Fold down the top corners to the center line.
3. Fold in half again.
4. Fold the wings down.



#### Challenge:

Go outside or to a large room where an adult says it's OK to throw things. Throw the hoop glider and the paper airplane from the same spot. Which traveled farther?

Change the configurations: Move the hoops around to see if the distance between the hoops changes the aerodynamics. If you have more index cards, try more hoops, bigger hoops, or wider hoops. Fold longer or shorter wings on the paper airplane to see if the plane will travel farther. You can learn more patterns for folding paper airplanes from a library book or from websites such as <https://www.foldnfly.com/>.

**Recycle the paper when the challenge is over.**

#### References

- <https://www.scientificamerican.com/article/bring-science-home-paper-planes-drag/>
- [https://www.alcosan.org/docs/default-source/kidscorner/hoop\\_glider\\_tutorial.pdf](https://www.alcosan.org/docs/default-source/kidscorner/hoop_glider_tutorial.pdf)