



# Hoop GLider

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You won't believe how simple this glider is to make – or how well it flies!

## Materials

- Light card or thick paper
- Ruler
- Straw
- Tape
- Scissors
- Pencil

## Safety First!

Before you throw your glider, make sure you have plenty of space around you and the glider's path is clear (remember, it may not fly completely straight!). We recommend conducting all test flights outside, but if this isn't possible, a straight hallway would also work.

## Instructions

1. Cut two strips of card about 1.5cm wide, one from the long edge of the card (about 30cm long) and the other from the short edge (about 19cm long).
2. Use tape to make your strips of card into hoops. (Tip: use the smallest amount of tape possible so it doesn't add too much weight to your glider.)
3. Tape one hoop to each end of the straw, making sure they are lined up.
4. To throw your glider, hold it with the hoops pointing up, and the small hoop at the front.

## Further investigation...

- Experiment with different types of throws. What happens if you throw your glider upside-down or back to front?
- Try making more gliders with different sized hoops or different lengths of straw. Which ones fly the furthest? Which designs don't work very well?
- You could even add more hoops to the same glider - how does this affect how well it flies?

## What's happening?

There are four forces acting on a glider as it glides through the air:

- **Lift** pushes the glider upwards
- **Weight** (gravity) pulls the glider towards the ground
- **Thrust** pushes the glider forwards
- **Drag** (air resistance) is caused by air pushing back on the glider in the opposite direction to thrust.

These forces need to be balanced for the glider to stay in the air.

When you throw the glider, you create thrust as you push the glider forward and release it. The circular shape of the wings on the glider creates lift.

Eventually, weight overcomes lift, and the plane falls to the ground. When drag overcomes thrust, the plane stops moving forwards. To help the glider stay in the air longer, consider how you might achieve the following:

- Increase lift - the curved shape of the wings helps create lift. Does a bigger or wider wing create more lift?
- Reduce weight - could you use fewer or lighter materials to make the glider?
- Increase thrust - the thrust for an aeroplane is provided by an engine, but for your glider it's all up to you and your throwing action. How could you provide more forward force for your glider?
- Reduce drag - flying machines and animals are usually fairly pointy at the front, so they can slice through the air more effectively. (You can test this yourself - try holding a sheet of paper vertically and dropping it, then hold it flat like a tabletop and drop it again. Which one reached the ground more quickly?) How can you improve the shape of your glider to reduce the amount of air hitting it front-on?

Sometimes, making one change can affect more than one of these forces. For example, a larger hoop-shaped wing might create more lift, but it will also be heavier and weigh your glider down.

## Check your understanding

1. What are the four forces that affect a flying or gliding object?
2. Draw a diagram of your glider and use arrows to show the direction of each force.
3. Where does your glider's thrust come from?
4. Describe how changing the shape, size, or orientation of the glider's wings affected its flight.
5. Describe how changing the length of the glider's body (straw) affected its flight.
6. Which of your gliders worked the best? Why?