

# LEARNING RESOURCE



## PAPER GYROSCOPE FLYER

### MATERIALS

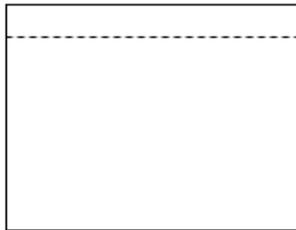
- Paper
- Tape/Paper Clips (optional)

### PREPERATION

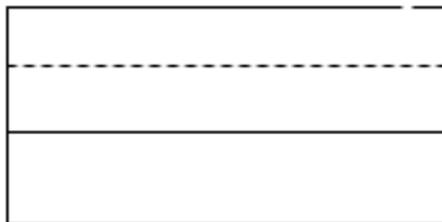
- None required

### INSTRUCTIONS

1. Get a piece of A4 paper in landscape and fold top 3<sup>rd</sup> down.

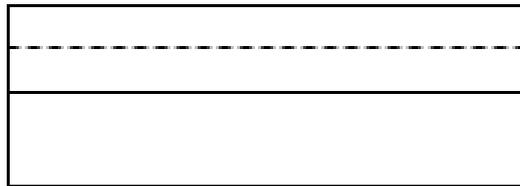


2. Fold the top section down again, so the folded edge is level with short edge from the first fold.

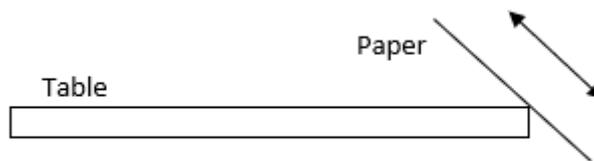


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3. Fold this section down again. Make sure all folds are straight and tight.



4. Now hold the paper by either end, with the folded section against the edge of the table, and pull backwards and forwards. This will produce a curve to the paper.



5. This bit is tricky! Unfold the last fold that you did, but ONLY AT THE ENDS of the paper. Curve the paper around so that the ends meet, then tuck one end into the other (between the folded section and the straight paper) then fold the ends back down to hold in place. If this is too tricky, just use a bit of tape or a paper clip to hold it together. You will end up with a paper cylinder.
6. Hold the cylinder as you would an American football, with the folded area at the front, and throw it. The more spin you can add to your throw, the straighter the flight should be.

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## EXTENSION

- Does the type of paper you use make any difference?
- Does the size of the paper you use have any effect on the way your gyro flyer moves?
- Can you cut fins into your flyer?
- Can you add streamers to the back?
- Why not try making a few changes to see what happens?

## THE SCIENCE BEHIND THE SPIN

The paper cylinder uses both aerodynamics and gyroscopic motion to fly. The front of the cylinder is thicker and heavier, providing momentum. Also much like a plane's wing, this causes the air to flow over and through the cylinder, which provides lift. The "gyroscopic" aspect is created by the spinning motion. The spinning of the cylinder maintains the forward motion and prevents gravity from flipping it or effecting its angle of flight through the air.

Space craft use gyroscopes to maintain their direction and equilibrium once launched, to ensure that they stay on course.