



KS4

## Paper Planes

These seemingly simple items can provide a lot of great science opportunities to explore the world of aerodynamics. Even NASA has produced instructions on how to fold a plane!

### Things to consider to help your plane fly

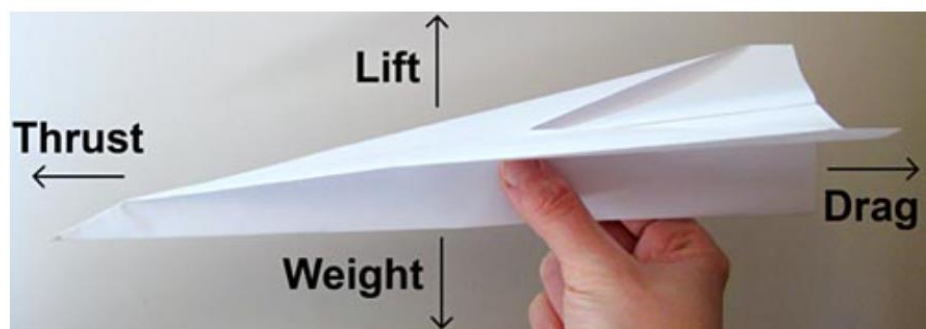
**Drag** The smoother something is the easier the object will travel through the air. This is because it takes up less space and causes less drag. The less drag the quicker it flies.

**Thrust** The thrust is the force of the aeroplane flying through the air. The strength of your throw gives the thrust. In a real aeroplane the engine provides the thrust.

**Weight** The weight of your aeroplane may have effect your aeroplane. In very simple terms the lighter something is the easier it is to fly. Does size really matter? Will a bigger plane fly further?

**Lift** The shape of the wing can have a big impact on this. Generally longer, thinner wing = more lift

*You could calculate the wing aspect ratio. Wing aspect ratio = wing length (cm) / wing width (cm)*



### The Challenge

To demonstrate the greatest distance flown in a straight line

(There are lots of other aims you could look at for example: precision to hit a target, longest time of flight, simplest design to cover a set distance)

### Setting up the challenge

Remind students of the need to be scientific in their testing and discuss the need for fair conditions for each flight to avoid any bias. These could include: Using the same person to throw the plane each time; Making sure the conditions are equal each time; Measuring the length of flight accurately and recording it in the same way; etc.

## What can you alter in your design?

- Its shape
- The number of folds
- Its weight (either by adding extra weights or looking at construction materials)
- Whether it has a tail or not
- The design ie make it more complicated or intricate (e.g. adding more folds) make it fly further?
- Can sellotaping folds help it fly better?
- How can paperclips or bulldog clips help?
- What are the best angles to shape the nose?
- How important is accurate or firm creasing?
- Wing length
- Top trouble shooting tips – if your plane is having trouble flying smoothly consider giving your plane’s wings some extra stability. Try trimming 1.5cm off each wing, then cutting and folding the ends once more to make new wing tips. If your glider veers to the left, curl up the rear edge of the left wing (and vice-versa: so if it turns right, turn up the right wing). If it dips, curl up both rear edges.

## Some design ideas



**The Spyder:** Interesting to look at, flies in an unusual way.



**The Monkey:** Fast, stable and with a long range.



**The Dart:** An old classic design. A simple paper aeroplane that even a beginner can make



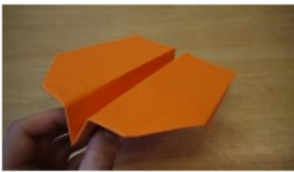
**The Lion:** Simple, stable and reliable.



**The Merlin:** More complex, can fly faster and further than The Lion.



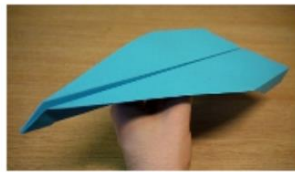
**The Piranha:** Fast, accurate, designed to knock other paper aeroplanes right out of the sky.



**The Squirrel:** A plane specifically designed for stunts



**The Streamer:** Looks cool, can cope with a very hard throw; but needs careful calibration to stay on course



**The Condor:** A simple, slow glider. Great for target practice.

**Remember the best scientific discoveries come from trial and error!**  
**Good Luck!!!**