



SUPER POWER: Flight!

AEROFOILS



I'm busy investigating how AIRPLANES FLY, but first, I'm a bit hungry so I think I need a cookie.

Every superhero needs a **SUPER-SNACK**, to keep us going on long missions. What could your super-snack be? Do you have a place in your lab where you can eat your snack and chill out after a hard day inventing?

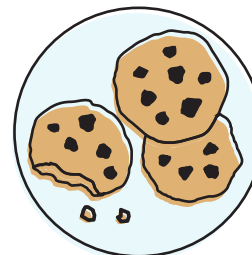
I've got a superhero cookie-jar in my lab, so my snacks are always handy. Ok, now I've had my snack, time to keep working on the **SUPERPOWER OF FLIGHT!**



FOR THIS EXPERIMENT YOU WILL NEED

- Hair dryer
- Square of toilet paper.....
- Plain paper.....
- Cardboard e.g cereal box card.....
- Tape.....
- Table or kitchen counter
- Long wooden skewer or stick.....
- Pencil or pen.....
- Scissors
- Plasticine or blue tack.....

SUPERHERO CHECKLIST



**Delicious
SUPERHERO
SNACK**



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LAB NOTES...

WATCH & BUILD
10
MINS

TO MAKE YOUR AEROFOIL...

1. Watch the video of Nanogirl investigating Bernoulli's principle.
2. See if you can use fast-moving air to create lift by blowing over the surface of the toilet paper like Nanogirl does!
3. If you have one, see if you can use a hairdryer to lift the ping pong ball in the air and keep it there! Make sure you keep it on the lowest heat setting.
4. If you can do that, can you walk around the room, jump on one leg or do a dance move while keeping the ball in the air?
5. If you don't have a ping pong ball, don't worry. Try this instead: Draw and cut out a rectangle of cardboard 18 cm long and 9 cm wide.
6. Measure 7 cm from one end, and draw a line. You now have two smaller rectangles
7. In the larger rectangle, find the middle of the end, measure 2 cm in, and make a mark.
8. Using a pencil, make a hole in the paper at the mark you've made.
9. Fold the rectangle along the line you drew.
10. Line up the two ends of the rectangle and tape them together. You'll have a shape with one flat and one curved side—this is an aerofoil shape, just like a plane's wing.
11. Find the mark you made and use a pencil or scissors to make a small hole through the mark in the top of the card and down through the bottom piece of card.
12. Using a pencil, make your hole bigger by pushing it all the way through and wiggling it a bit.
13. Make a paper straw by rolling a 5 cm strip of paper around a pencil and taping it in place.
14. Thread the straw through the hole in your aerofoil.
15. Cut the straw so that there is only a little bit sticking out then tape in place.
16. Place one end of the wooden stick into the putty and stick upright on a table.
17. Thread the aerofoil onto the stick with the curved surface facing upwards.

BERNOULLI'S PRINCIPLE tells us that fast-moving air creates **LOW PRESSURE**. Airplane wings create low pressure on top of their wings which, makes them easier to push upwards. We call this pushing force '**LIFT**' because it lifts a plane into the air.

You are using the science of low pressure on top of your aerofoil to lift it up the skewer.

Next time you look at an airplane, notice the shape of its wing—you will probably see that it is the same shape that you made today.

Investigate...



Can you use Bernoulli's Principle to lift the aerofoil model all the way to the top of the stick?

Can you make a bigger aerofoil—does it still lift? What about making it a different shape with more or less curve.

What else has wings apart from a plane, and do you think that Bernoulli's Principle is helping them fly?



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JOKE:
Q: What flies when you are having fun, but has no wings?
A: Time

YOUR MISSION:

MASTER THE FORCE OF LIFT WITH BERNOULLI'S PRINCIPLE

MISSION 1: USE YOUR HAIRDRYER

While airplanes make flight look easy, this challenge can be surprisingly tricky!

Can you lift your aerofoil all the way to the top of the skewer just using the hairdryer? When you've done it once, can you do it faster the next time?

Find a stopwatch and write down how long it took you to lift your aerofoil all the way to the top of the skewer.

Does it make a difference if you move the hairdryer closer or further away? You could use your measuring tape to help you work this out.



MISSION 2: NO HAIRDRYER!

If you don't have a hairdryer, how else can you lift something up? Could you blow through a straw or use a fan?

Try blowing across the top of a piece of toilet paper, like Nanogirl in the video. Can you lift it up?



All these activities use the power of your lungs to create the fast moving air like a hairdryer.

Your lungs don't have a hairdryer inside them, instead you have powerful muscles which help your chest to move, which helps you to breathe hard.

MISSION 3: SHAPES

An aerofoil is a special shape which helps create **LIFT**, but you also know that you can lift a round ball with your hairdryer.

Do you think that the round shape of the ball helps it to stay in the air without falling down?

Test this idea out by gathering objects from your house, or garden like an inflated balloon, leaves, feathers, tissues.

Try and lift each one like the ping pong ball, and see if there are any shapes which float better than others.

The shape of the aerofoil forces air to move faster over the top surface, like an airplane wing!

