

Clouds and Glider Racing

Do you know about gliding?

Do you know what a glider can do? It's an awesome way to fly, and glider pilots fly hundreds of kilometres at speeds of over 100kph just using renewable energy from the sun and the wind.

Your challenge: to show how convection makes hot air rise and clouds form, and learn how this helps gliders race.

What you need:

- A clear 2l plastic drinks bottle with the top cut off. Use sticky tape to attach a piece of white to the bottle to make a good background to observe what happens
- The smallest jar or bottle you can find and string to make a handle for the small jar long enough to lower it to the bottom of the large bottle
- Hot and cold water and food colouring or ink to colour the 'thermal' so you can observe it



The experiments:

Convection occurs when one part of a gas or liquid heats up. Convection occurs exactly the same way in both **gases** and **liquids** as they are both **fluids**. When a fluid is heated in one area, it expands and becomes less dense. Since it is less dense, it will rise through the other fluid. These experiments show that hot air rises by convection, and look at how that happens. As gases and liquids behave the same way, we can use water to simulate air in our experiment. It's much easier to do the experiment with water!

The small jar will contain be our thermal and the large drinks bottle will be the surrounding air and sky into which our thermal will rise.

We'll do three experiments:

1. Hot water with food colouring or ink in the small jar and cold water in the drinks bottle
2. Warm water in the jar, only slightly warmer than the cold water in the bottle
3. Cold water in the jar and warmer water in the bottle

Q: Why do you think we are doing these three experiments? A:

Method:

- Make a results table something like this:

Thermal/Small Jar	Surrounding air /Bottle	Observation
Hot	Cold	Write what happens
Warm	Cold	Write what happens
Cold	Warm	Write what happens

- Fill the drinks bottle – our ‘sky’ - $\frac{3}{4}$ full with cold water – leave room at the top as we need to leave space for our ‘thermal’ to fit without spilling any!
- Fill the small jar – our ‘thermal’ - with hot water and food colour or ink – fill it right to the top
- Note the time and lower the thermal VERY CAREFULLY into the drinks bottle
- Observe what happens over the next minute or two
 - where does the coloured water go?
 - how does the water move – all at once or in separate bubbles? Does it swirl around?
 - does all the water end up the same colour? If so, how long does it take?
- Clean the experimental apparatus
- Repeat with water in the ‘thermal’ **only very slightly warmer** than the water in the ‘sky’
- Repeat with hot water in the ‘sky’ and cold water in the ‘thermal’



Discuss your results with your teacher to be sure you understand how convection caused what you saw happening.

We hope you had fun demonstrating convection and how hot air rises and finding out how we race gliders!

Find out more about GLIDING at the links below, all types of AVIATION at airleague.co.uk & CAREERS at stem.caa.co.uk/careers-in-aviation-and-aerospace

We hope to see you on an airfield soon!