

Hot Air Balloons

Worksheet

Learning outcomes

By doing this activity and learning more about hot air balloons, you will begin to understand energy in motion.

Introduction

Hot air balloons float in the sky for pretty much the same reason that boats float on the sea. A boat floats because it's supported by the water beneath it: the weight of the boat (pulling downward) is exactly counterbalanced by the pressure of the water beneath it (pushing upward). Hot air balloons float because the air caught inside the balloon is heated up by a burner, making it less dense than the air outside. As the burner heats the air, it expands the balloon and causes it to rise.

Sir Isaac Newton came up with 3 laws of motion that are normally applied to objects moving in straight line, but there are plenty of objects that spin, we know this because we live on one! These laws are still applicable and used today!

Which of these three laws apply more to a hot air balloon?

Newton's First Law:

An object will remain at rest unless acted upon by a force. Once moving that object will continue to move in a straight line forever unless acted upon by a force

Newton's Second Law:

Force equals mass x acceleration ($F=ma$)

Newton's Third Law:

For every action, there is an equal and opposite reaction

Activity on next page...

Activity - Creating a hot air balloon

Applying Newtons law to hot air balloons

You will need:

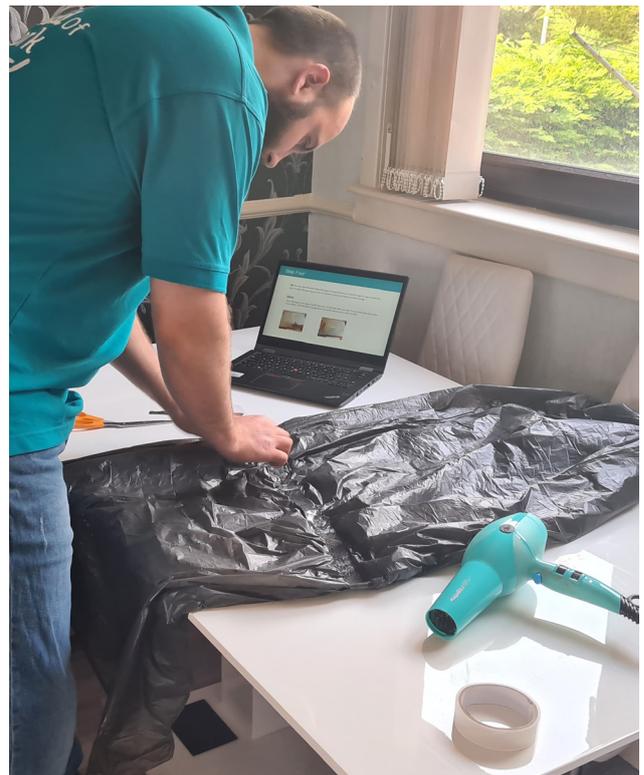
- Two thin Bin Liners
- Pair of Scissors
- Hairdryer
- Sticky Tape

It's advised that you ask an adult to help you with this experiment – they'll have fun with it too!

1. Take one of the bin liners and cut along the bottom where it is closed (you should see a seam – cut it off). You will now have a bin liner that is open at both ends



2. Put this open-ended bin liner part way inside the second bin liner that is still intact (about 5cm in should be fine)

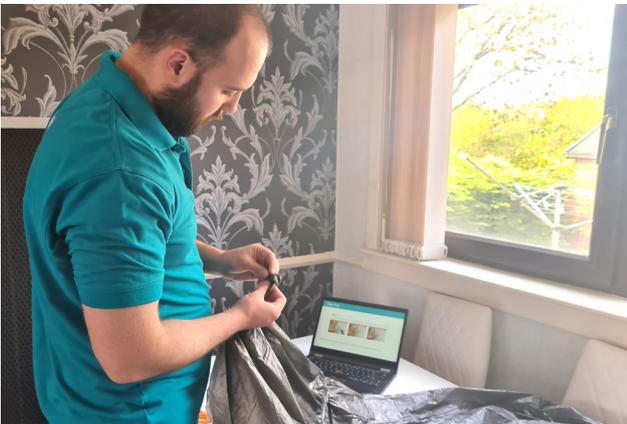


3. Cut a length of sticky tape and tape down one side of the joined bin liners Flip it over and repeat on the other side

Top tip! The sticky tape will attach easily to the plastic of the bin liners but not come off easily! So, make sure that you place the tape in the exact spot you want it, otherwise if you try and remove it, it will rip the bag.



4. There will be gaps at the edges of the bin liner joins, so stick these down with tape. To ensure that there are no holes in your balloon, waft the balloon through the air and quickly close the end to check for holes. Tip! Use the minimum amount of tape on your balloon, otherwise the extra weight will affect the launch.



6. Get your hairdryer and put the end inside the hole, switch it on the hot setting and medium speed. Once you have filled up the balloon, let it go and watch it float upwards!

TIP! Be very careful when using the hairdryer - don't leave it on too long or have it on too hot as the plastic could start to burn.



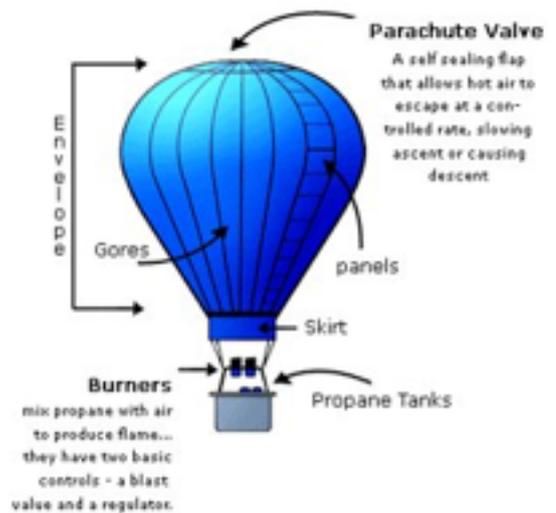
The Science Behind This!

Air is made up of matter just like everything else around us – air is a gas. Although we can't see them, the molecules inside a gas are spaced out but it's those molecules that are what will make the balloon rise.

First, we must heat up the air inside the balloon, as this will cause the molecules to move around faster, taking up more space, thus filling the balloon.

As the air molecules inside the balloon are heated, they also become less dense than the air molecules surrounding it outside, and if something is less dense than that which surrounds it, it floats!

In real hot air balloons, in order to bring the balloon back down to the ground the pilot will open a flap at the top of the balloon and allow the denser, cooler air to mix with the warmer air inside, and so it will slowly sink back down to the ground. In your homemade hot air balloon, once the air inside cools down, it will sink back to the ground and you can try it again!!!



Let's look at some jobs roles that use the skills you've used in the experiment today.

If you enjoyed learning about the forces in today's experiment, you might like to become a [Physicist](#) (1) and study the world around us and the scientific laws that make objects behave as they do. Your research would help develop all kinds of technology.

If you were interested in designing, building or maintaining aircraft, you might want to read more about being an [Aerospace engineer](#) (2)

A [Materials engineer](#) (3) would research and test materials that could be used in aircraft.

Remember companies that design and build airplanes and helicopters also need people in other roles such as finance, marketing and human resources. You can find out about lots more job profiles at [My World of Work](#) (4).

Website list

1. Physicist <https://bit.ly/2XgpAo2>
2. Aerospace engineer <https://bit.ly/2WO5Dpu>
3. Materials engineer <https://bit.ly/3cPfG3g>
4. My World of Work Job profiles <https://bit.ly/2WN7hb6>