

Engineering – Balloon Rocket Car!

Ages: 7 - 13

Hello everyone. This is Bill from the Okanagan Regional Library System. Welcome to the fun and inventive world of making STEAM projects in your own home. Each week, I will share a fun and interesting project that you can make using materials commonly found in your own home.

Even though we can't be together right now, we can still learn how to make exciting projects each week!

This week's project: How to make your own Bottle Raft.

Balloon Rocket Car



Make a car that speeds along with a few puffs of air. It works in the same way as a jet airplane or rocket, as a stream of fast-moving air escapes from a balloon and shoots out from the back of the car, pushing it forward. Blow up a balloon and see how fast and far your car can go.

You can make balloon rocket cars with your friends and race against each other. You could even set up a course – a straight one, because there is not steering – and see if you can get your car to cross the finish line first. How do you think you might be able to make your car go faster and further?

Materials Needed:

- Scissors
- Pen
- 2 Wooden Skewers
- 3 Bendy Straws
- Paint Brush
- 4 Bottle Tops
- Paint
- Balloon
- Tape
- Double-Sided Tape
- 2 Pieces of Cardboard (approximately, 30 cm by 20 cm)



Time: 60 minutes plus time for the paint to dry.

Steps:

Because the car's body is made out of cardboard you will need to be careful when cutting it out, so that it does not bend or crease. You can make whatever shape you want – the following instructions show just one design.

1. On one piece of cardboard, draw the shape of your car. Leave space below the car body for a row of rectangles, each about 2 cm wide. For neatness, you can use a ruler. This row will make the tabs needed to stick your car's body onto its base.



2. Use the scissors to cut around the whole shape. You can line the lines for the tabs now or wait until step 11, after you paint the car. If you wait, be careful be careful not to paint over the tab lines. Later, they are going to be folded and attached to the base.



3. Now it is time to make the base of the car. Draw and cut out a rectangle, making the longer sides the same length as the total length of the tabs you drew in step 1. The base needs to be only about 3 cm wide.



4. Your car's wheels are made from the bottle tops. Push the sharp end of a skewer through the center of each one. Be careful not to poke your fingers



5. Paint your individual pieces before you assemble your car. Choose whatever colours you like, but if you want to create a realistic look, paint both sides of the car body.



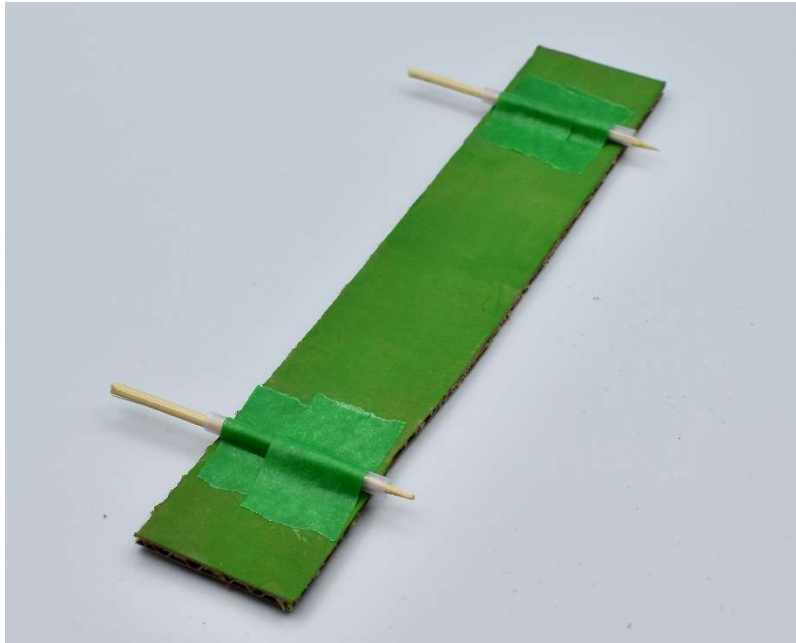
6. Grab one of your straws and cut it into two pieces that are the same as the width of your car's base. These are to hold the axles in place and allow the wheels to turn freely.



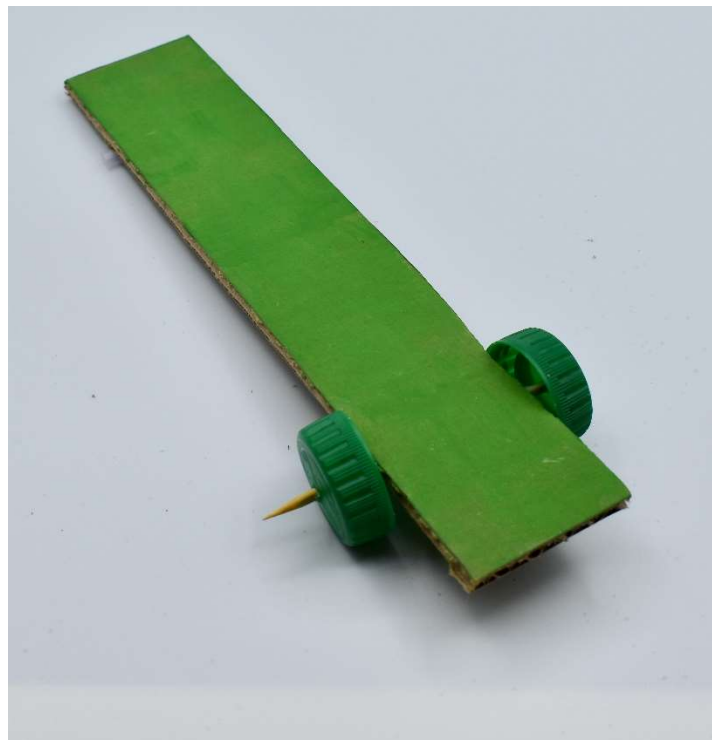
7. Using tape, stick the straws onto the base of your car.



8. Cut two pieces of the wooden skewer, each about twice the length of the straw and with a point on one end. These are the axles for your car.



9. Push the point of one axle through one wheel, from the outside. Then push the axle through the straw. After that, push the axle through the second wheel from the inside.



10. For safety, you can cut off the sharp point of the axle. Now repeat step 9 for the other axle and wheels. If you want, you can add some glue or tape to the tips of the axles to keep the wheels from falling off.



11. Cut the tabs on the car body, if you have not already done so. Fold them back on alternative sides, then add small pieces of double-sided tape to the bottom of each tab and stick them carefully to the base of your car. Check that the tabs are spread out properly and press the body on to the base. Squeeze the tabs firmly, so they stick well. Now you just need a way of making your car go.



12. Cut the end of the balloon. The power to make your car move comes from air which is supplied by your breath, then stored and compressed in the balloon.



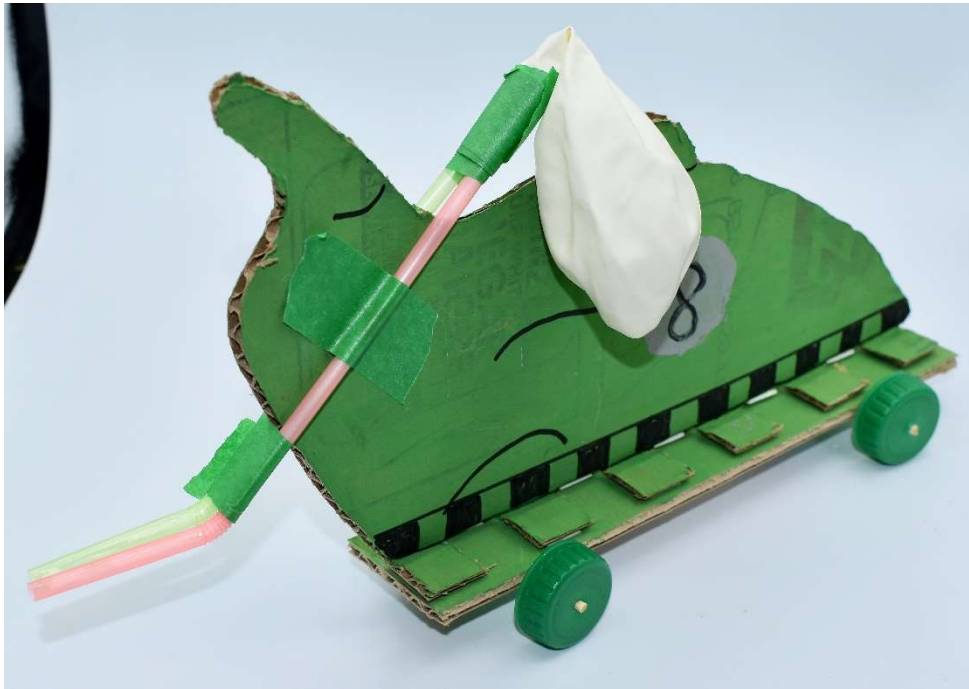
13. Put the lone ends of two bendy straws into the neck of the balloon and wrap some tape around. Make sure you seal the balloon's neck tightly, so that no air can escape.



14. Push the straws down over the back of your car's body and secure them with tape. Bend the short lengths of straw out like exhaust pipes. Use more tape to attach them together.



15. Your car is now finished. Hold the neck of the balloon between a thumb and forefinger, and blow into the open ends of the straws. When the balloon is blown up, pinch your thumb and finger together to trap the air inside. Put the car on a flat surface and let go.



Test and Tweak

Try different car bodies, like an empty plastic bottle. You could have just one straw, to create a better seal so that no air escapes. Try blowing up the balloon to difference sizes. Does the car go further with a larger balloon? Or faster?

The size and material of the wheels will impact the speed of your car. If you have them, try larger wheels made of old DVDs or circles of cardboard. What happens?

The Science behind your Balloon Rocket Car

When you blow up the balloon, the air you breathe out stretches the rubber. The rubber pushes back on the air, and the air escapes the only way it can – down the straws and out. When the air meets the bend in the straw, it bounces and changes direction, so it can escape horizontally. As the air bounces, it pushed the car forward. The more air passing out through the straws, the greater the force pushing the car.

Air Resistance

Cars are designed to be sleek, creating as little air resistance, or drag, as possible. As a vehicle moves, it pushes air out of the way. Pointed vehicles, such as many sports cars, slice through air – they are streamlined and can move very fast. Square – or rectangular – shaped vehicles, including buses, experience more drag, which slows them down much more.

Real World Science – Jets



In a jet engine, spinning turbine blades draw in air. Heating and compression form hot gas that escapes through the exhaust nozzle of the aircraft. As this gas shoots backward, it pushes the aircraft forward at high speed.

STEAM

This activity includes everything you need for a comprehensive STEAM project.

Science: Understanding how air flow and air resistance affects the movement of the car.

Technology: Understanding how changing the shape and/or size of the car and wheels can affect its performance.

Engineering and Art: Constructing and decorating the balloon rocket car.

Math: Measuring the speed and distance that the balloon rocket car can go.