



Rolls-Royce

# Cub Scout Scientist Badge

## Part A The Physical World



# Making a hot air balloon

## Leader's notes

### You will need:

#### Type 1: an indoor balloon

- Thin pedal bin liners
- Toaster
- Cardboard (cereal box).

#### Type 2: an outdoor balloon

- Thin black bin liners (preferably biodegradable)
- Masking tape
- Scissors
- Hair dryer.

### Safety:

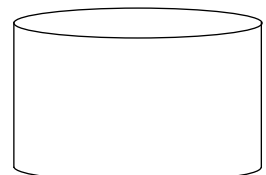
Care must be taken with the toaster – an adult should supervise this. Plastic can cause a choking hazard.

### How to make a simple indoor hot air balloon:

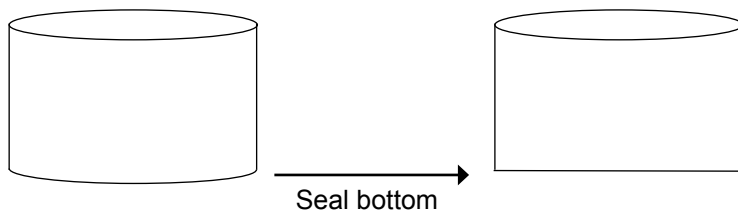
1. Cut the cardboard so that you can make it into a tube that will go around the toaster
2. Open out a thin pedal bin liner and place the open end over the cardboard tube
3. Place the toaster under the cardboard tube and switch on
4. As the heat from the toaster warms up the air it will rise and fill the plastic bag. This will cause it to rise
5. To make it more stable add some tape to the bottom of the bag.

### How to make a simple outdoor hot air balloon:

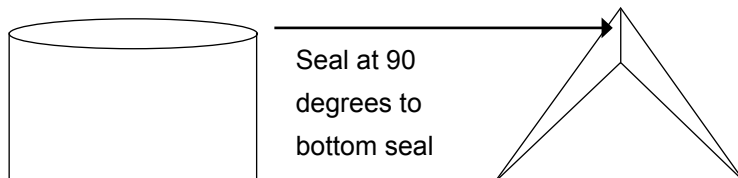
1. Cut the sealed ends off four black bin liners
2. Cut the bin liners down the long side to make four sheets of plastic
3. Join all the sheets together by taping along the longest sides
4. Make the long sheet into a tube



5. Seal one of the ends of the tube with tape



6. Seal the opposite end at 90 degrees to the previous seam to make a pyramid shape



7. Cut off one of the corners so that you have a hole of about 15cm in diameter
8. Turn the balloon so that the hole is pointing down
9. Use a hair dryer to blow hot air into the balloon.

On a sunny day the Sun should help to keep your balloon flying by keeping the air in the balloon hot.

Releasing the balloon can cause littering – remember to collect the balloon when it lands. If the balloon goes a long way the use of biodegradable bags will make sure that the minimum amount of litter is produced.

## How does it work?

- The particles in hot gases have more energy and move more quickly than particles in cold gases
- This faster moving particles move further apart
- When particles are further apart they are less dense (lighter)
- Less dense gases rise
- The hot air balloon rises because the overall density of the balloon and hot gas is less than the density of the air around it.