



### Constructing

The students construct a model rocket, which will fly upward in the air.

The students work in teams. Give each team the materials they need to build the model rocket. However, do not give them any instructions on how to make it – the students should experiment on their own. Only when they have no ideas or have doubts should you give them any hints on different solutions.

### Materials – for one team (to prepare 1 rocket)



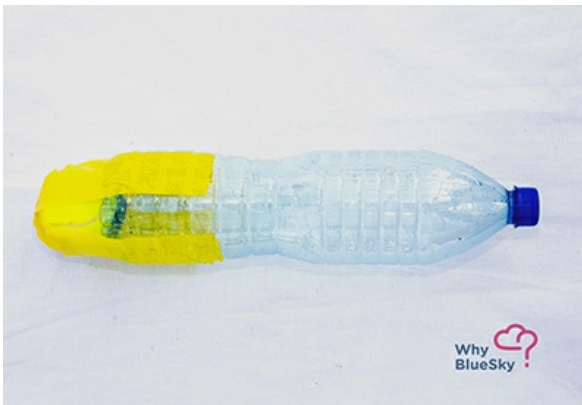
- a 1.5 l plastic bottle (e.g. a mineral water bottle),
- a tennis ball,
- foam or construction paper or colored paper,
- sticky tape,
- scissors,
- marker

### Execution

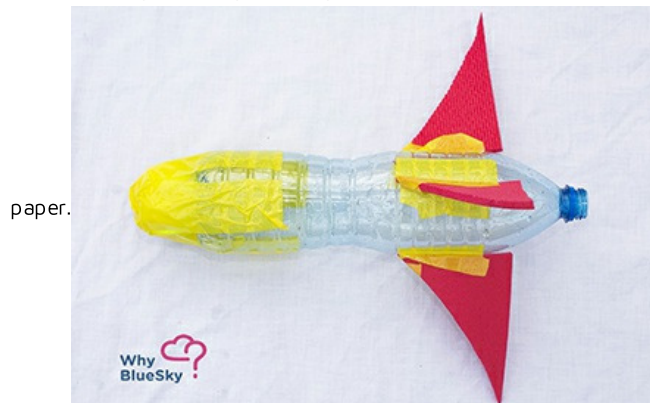


(the instructions below are only a suggestion on how to make the model rocket)

1. Set the bottle upside down.
2. Stick the tennis ball (the ballast) to the bottom of the bottle.

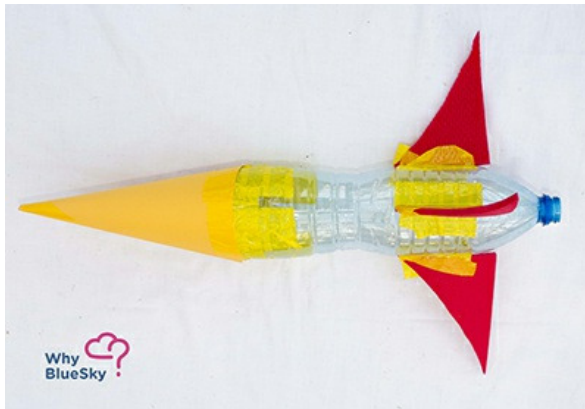


3. Cut out and glue triangular wings for the rocket from the foam or construction paper or colored



4. Using construction paper or colored paper prepare and glue on the fairing (the “tip” of the

rocket).



Give your rocket a name.



#### Experiment

While students are making their model rockets they will perform an aerodynamic test – they will check whether the center of gravity is located in the right place.

#### Aerodynamic test

It is important that the center of gravity has been properly established in the rocket, as this enables the machine to fly in the intended direction. If the center of gravity is too close to the center of the rocket or at wing height upward flight will simply not be possible.



To give them an idea of where the center of gravity should be you can show the students a dart. To be able to reach a dart board without any complications, a dart has its center of gravity towards the front end of the barrel.

#### Method I – testing with hands (see instruction photos)

The students hold their rocket in their hands in a horizontal position. They feel where the center of gravity is: they look for the point where you need to catch the rocket so that it maintains its equilibrium, i.e. is balanced evenly and neither of its ends tips in any direction.

Conclusion: the center of gravity lies closer to the fairing. This point is determined by the tennis ball.

#### Second method – fan test (see instruction photos)

Needed for the test:

- a pedestal fan or hairdryer
- a rubber band
- string

#### Execution:

1. Hold the rocket horizontally, place a rubber band on it.
2. Thread the string through the rubber band and tie it onto a handle – hang the rocket from a door handle.
3. Move the rubber band along the length of the rocket in search of the center of gravity.

Conclusions: When turned on the fan or a hairdryer imitates the movement of air that takes place with a real rocket. If the rocket maintains its position horizontally, this means that the center of the model's gravity has been correctly found. The rocket may pitch to one side, but it should return to its horizontal position.



Presenting results

See whether your rocket shoots up into the air!

**Materials:**

- air hand pump
- a valve
- a cork from a bottle
- a funnel
- water – approx. 1.5 l
- the model of a rocket prepared in class

**Execution:**

You can launch the rockets yourself or choose a volunteer or volunteers from each group to perform this task. The person chosen for the task should put on a raincoat, since the rocket will eject water as it rises upwards (during pumping).

Best, if the students perform the test:

1. Pour water into the rocket with the funnel. Pour different amounts of water into each rocket to check if this has any influence on the height the rocket reaches.
2. Put the cork into the neck of the bottle.



3. Set the bottle (fairing) facing upwards and pump.



4. The rocket is launched into the air and the water pours out of the rocket.

