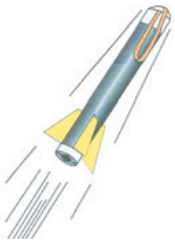
Discover Primary Science and Maths
www.primaryscience.ie

DESIGN AND MAKE A FOAM ROCKET

Activity

DESIGN AND MAKE A FOAM ROCKET - and investigate its flight path.



Equipment

For each rocket:

- Foam pipe insulation (½" diameter) – 30 cm length
- Wide rubber band - (6 mm. size 64 works well)
- Duct tape
- Cardboard or styrofoam food tray (for fins)
- Scissors
- Long tape measure
- Metre stick

Suggested class level

3rd - 6th Class

Preparation

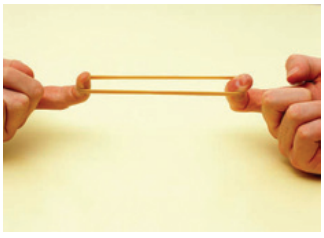
3rd/4th may need to have the slits in the pipe insulation cut for them.

They may also need to be given a template for the fins.

A large room with a high ceiling or the school hall - or, ideally, the playground on a calm day - would be suitable for launching the rockets.

Children can send them quite high!

Background information



This rocket is based on stored energy.

When you pull back the elastic band, the elastic band stores this energy. When you let it go, it releases this energy as it returns to its original length. *(See DPSM activity 'Design and Make a Catapult' – also based on stored energy).*

The foam rocket is stabilised by the fins, which keep it pointed in the desired direction.

Technically the foam rocket is a rocket in appearance only. Real rockets get their energy from burning fuels emitting gases from the back of them, which send them forwards. See DPSM activities 'Rocket Launch' and 'Make a Rocket' which are based more on the principle of real rockets.

DESIGN AND MAKE A FOAM ROCKET

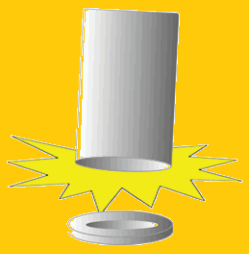
Trigger Questions

What are rockets? H
(Cylinders full of materials which produce gases).

How do they work?
(Gases going out the back of the rocket push it forward, like an untied blown-up balloon goes forward when you let it go and the air goes out the back)

What are rockets used for?
(Sending space machines into the air with great force to get outside Earth's gravity)

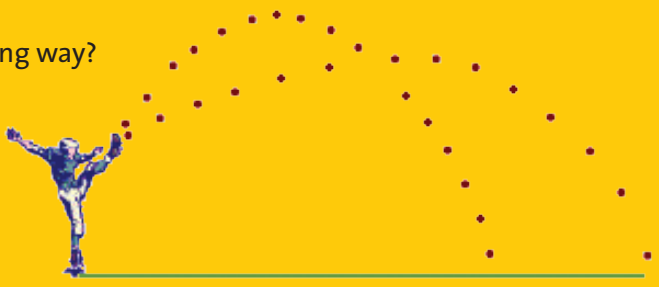
See DPSM activities 'Design and Make a Catapult' *(related to stored energy)* and 'Make a Rocket' (using a film canister) for more Trigger Questions on the themes of stored energy and rockets.



If you sent your rocket straight up into the air where do you think it would land?
(At or near your feet!).

If you want to throw a ball a very long distance how would you throw it?
Very hard? Very high?

Or kick a football a very long way?
Does the angle matter?



Content

SCIENCE: Energy and Forces

MATHS: Measures: Length
Shape and Space: Angles
Data: Representing and Interpreting

Skills

Predicting, experimenting, observing, recording, analysing.

Designing and Making (Exploring, Planning, Making, Evaluating)

Cross-curricular links

Geography:
Planet Earth in Space

Art: Rocket design

Ireland esero

Discover Primary Science and maths
www.primaryscience.ie

DESIGN AND MAKE A FOAM ROCKET

Activities

1. Design and Make a Foam Rocket

The following is a suggested way of making a foam rocket, but children should be encouraged to use their own creativity in relation to design:

(see diagrams)

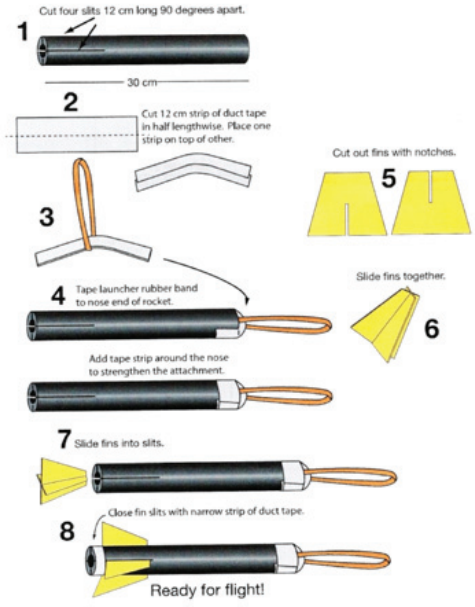
- Using scissors, cut one 30-cm. length of pipe insulation for each rocket.
- Cut four equally-spaced slits, each about 8 cm. long, at one end of the tube. This will be the tail of the rocket. The fins will go into these slits.

Front of rocket:

- Cut a 12 cm. length of duct tape down the middle to make two pieces. Place one piece over the other, sticky to shiny side, to make the tape extra-strong.
- Place a (single strand of a) rubber band across the top of the foam tube. Tape the rubber band down to the tube, using the double strength duct tape at right angles to the rubber band. Press the tape down to the sides of the tube.
- Reinforce this tape with another length of tape wrapped around the top end of the side of the tube.

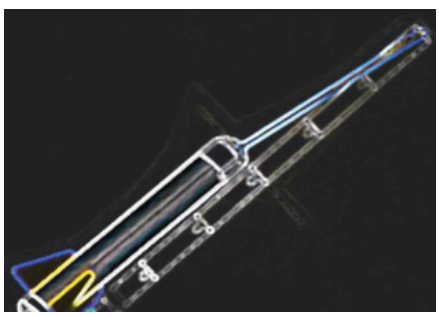
Fins end of rocket:

- Cut four fins from cardboard (or Styrofoam food tray). A suggested way is as follows:
- Cut a 10 cm. square, draw a diagonal and cut along the diagonal (forming 2 isosceles triangles). Then cut half-way down the height of one triangle and half-way up the other. Now nest the fins together, and place them in the slits.
- Close off the slits with another piece of duct tape wrapped around the foam tube.



Launching the Rocket:

- Loop the rubber band over the end of the metre stick. Pull on the fins end of the rocket, holding it below the fins, as you point it up into the air.
- Now let the rocket go.
- What happened to the rocket?



DESIGN AND MAKE A FOAM ROCKET

Questions

a. What is the shape of the path of the rocket? Draw it.
(An arc of a circle).

b. What force sends the rocket up?
(The thrust from releasing the stretched elastic band).

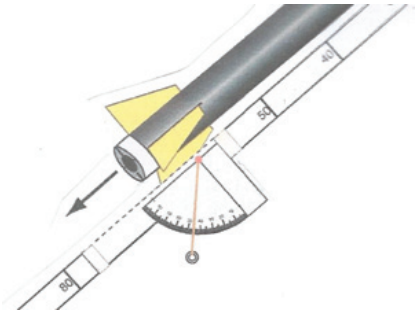
c. What force brings the rocket down?
(Gravity).

Measure the distance the rocket travels.

2. Children can compare the launch angle to the distance the rocket travels, as follows:

- Print the quadrant pattern on card.
- Cut out the pattern and fold it on the dashed line.
- Tape the quadrant to the metre stick so that the black dot lies directly over the 60cm. mark on the stick.
- Press a drawing pin into the black dot.
- Tie a string to the drawing pin and hang a small weight to the string. Make sure the string hangs freely.

(If you are using a plastic metre stick attach the string to the black dot with a blob of blu-tack).



How will you make this a fair test?

What will you keep the same?
(Stretch the rubber band the same amount each time – e.g. the nose is aligned with the 30 cm. mark on the metre stick each time).

What will you change?
(The angle of the rocket).

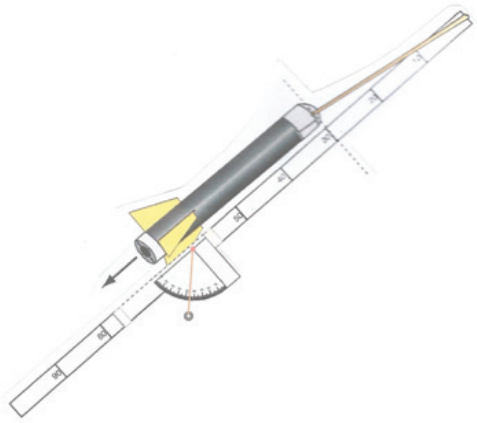
Maths

Using the Launcher

- Loop the rubber band over the end of the metre stick. Pull on the fin end of the rocket until the nose is aligned with the 30 cm mark. Tilt the launcher up at the chosen angle as indicated with the string and weight on the quadrant.

(Launching from the ground or a chair is not essential, but helps to make the launching more stable).

DESIGN AND MAKE A FOAM ROCKET



You can watch a video at the following website to see how the launcher is used:

http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Rockets.html

To help measure long distances the children can measure, and place markers at, 1 metre intervals, starting at 5 metres and going up to 20 metres.

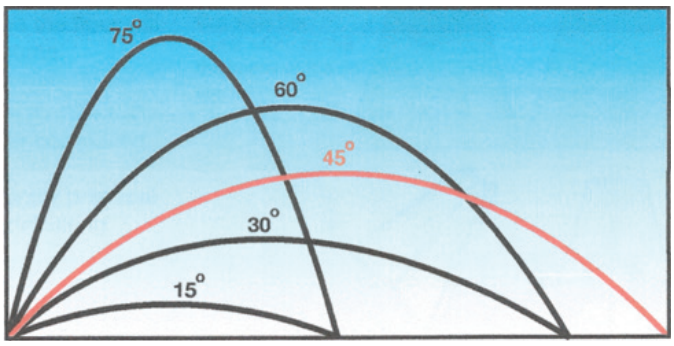
They should repeat this and then take an average.

Younger children could place cones where their rocket lands.

They can then tilt the rocket to a different angle and record the distance travelled for different angles.

They can then draw a graph of distance travelled versus angle of launch.

LAUNCH ANGLE (°)	DISTANCE (METRES) 1	DISTANCE (METRES) 2	DISTANCE (METRES) AVERAGE
30			
45			
60			
75			



Rocket launch angle versus range

Question:

From your data, what launch angle gave the longest flight path?

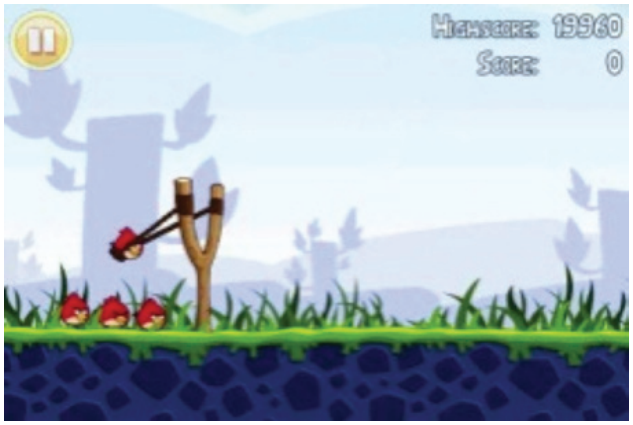
They may find that this is approximately 45°

Follow-up Activity

Experiment with different sizes and shapes of fins, different lengths of rubber bands, etc. and see if this affects the movement of their rockets.

DESIGN AND MAKE A FOAM ROCKET

Children Can:



Play the game 'Angry Birds' if they have access to a Smartphone.
It is very relevant to the angle for launching things.

Add various shaped soft items to the nose of the rocket.
Do they make any difference to the flight?

Did You Know?

Things that are sent into the air, and that have no power of their own (e.g. a ball, but not an aeroplane) are called PROJECTILES.

Gravity gradually brings them down.

In sport the speed and angle of projectiles are very important, e.g. football, golf, table tennis ....

Isaac Newton was a famous scientist who was very interested in activities related to movement and there are famous laws named after him, called Newton's Laws of Motion.

Useful Websites:

This activity is based on one from the American Space Agency (NASA website):

www.nasa.gov/audience/foreducators/topnav/.../Foam_Rocket.html

For lots of activities and information about rockets, astronauts, space exploration, space shuttles, solar system, and galaxies, have a look at the American Space Agency's Kids Club:

www.nasa.gov/audience/forkids/kidsclub/flash/index.html

DESIGN AND MAKE A FOAM ROCKET

Launcher Quadrant Pattern

(Actual Size)