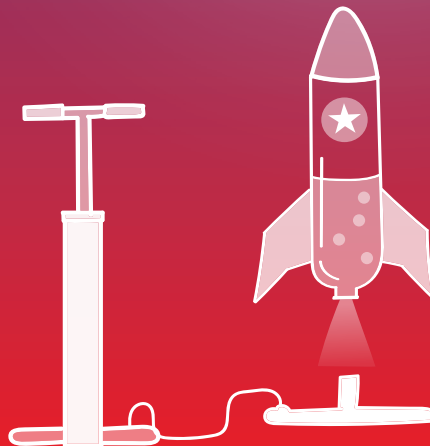
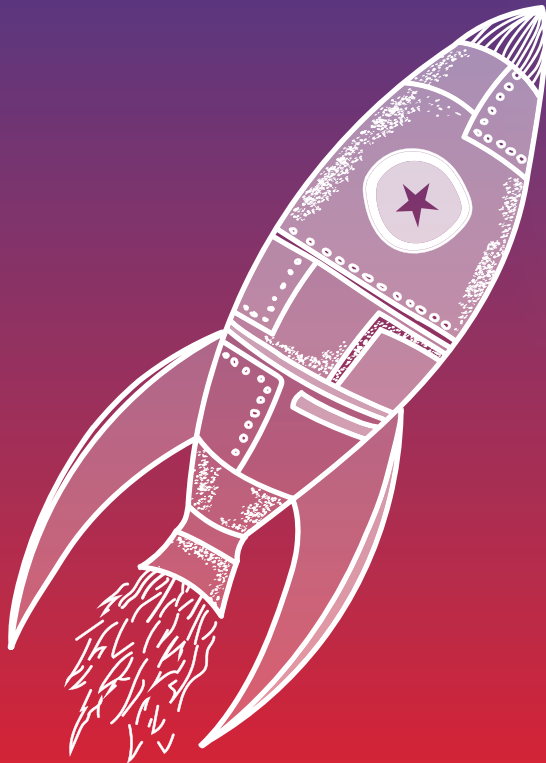


DREAM. BUILD. BECOME.

ACE METAL FOUNDATIONS

By IACMI

Water Powered Rocket



Water-Powered Rocket



Prior Knowledge

Students may have seen rockets launch in videos or during science demonstrations. They may know that rockets move upward with great force and speed. Students may also understand that pushing something in one direction can cause movement in another direction.

Water-Powered Rocket

Lesson Overview

In this activity, students design and build a simple water-powered rocket using a plastic bottle and cardboard fins. The rocket is launched using air pressure from a bicycle pump.

Students observe how air pressure and water combine to create thrust that launches the rocket upward. Through building and testing their rockets, students explore basic ideas related to motion, pressure, and force.

The launch portion of the activity is conducted by the teacher in a safe outdoor area.

Vocabulary

Force: A push or pull that can change how something moves

Gravity: A force that pulls objects towards the ground

Unbalanced Forces: When forces are not equal and cause an object's motion to change

Thrust: A strong push that moves a rocket upward



Figure 1: A rocket uses thrust to push downward gases out of its engines, lifting it into the sky.



Figure 2: A rocket uses thrust to overcome gravity as it exits Earth's atmosphere.

Water-Powered Rocket

The Foundations of Motion and Thrust

Gravity is a force that pulls objects on Earth downward at all times.

For an object to move upward, another force must push upward with greater strength than gravity. When forces are not equal, they are called unbalanced forces, and motion changes.

In this activity, air is pumped into a rocket that contains water. When the rocket launches, water is pushed forcefully downward. This creates a strong upward push on the rocket called thrust. At that moment, the upward force is stronger than gravity, so the rocket moves upward into the air.

As the water finishes spraying out, the upward push becomes weaker. Gravity then becomes the stronger force again. This causes the rocket to slow down, stop rising, and fall back toward the ground.

Engineers must think about gravity and other forces when designing rockets and deciding how strong the upward push needs to be.

Materials

Note: This activity uses recycled cardboard and plastic water or soda bottles supplied by either the teacher or the students

Materials Supplied in Kit

Shared

- 1 air pump with air needles
- 1 wine cork
- 1 roll of duct Tape

Materials Supplied by Teacher

- Plastic water bottles of 20 oz soda bottles
- Scissors
- Markers (optional)
- Construction paper (optional)



Water-Powered Rocket

Activity Directions

Step 1: Prepare the Cork

This step should be performed by an adult, not a student.

- Prepare the cork by trimming it so that it is just a bit longer than the inflating needle



- Insert a bamboo skewer into the center of the cork. It may help to pierce the cork from both ends several times. *Use caution.*

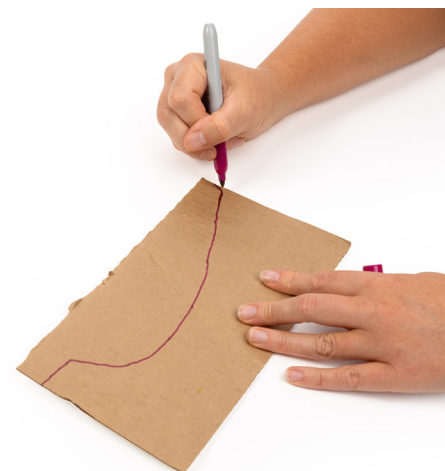


- Insert the inflating needle into the cork



Step 2: Create the Rocket Fins

- Draw one rocket fin on the cardboard surface. The rocket fin will need to extend at least 4 inches below the bottle's opening to ensure enough clearance for the pump for launch
- Cut out the rocket fin and trace it onto the cardboard two more times to create two more fins and cut them out as well for a total of 3 equally sized fins



Water-Powered Rocket

Activity Directions Continued

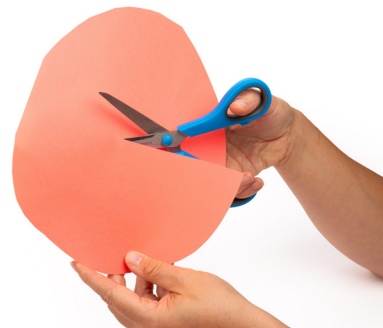
Step 3: Attach the Fins to the Rocket

- Turn the bottle upside down so that the mouth of the bottle is facing downward
- Use duct tape to attach the fins evenly near the bottom of the soda bottle
- Ensure that fins are evenly spaced for stability



Step 4: Make the Nose Cone (Optional)

- Cut out a circle of construction paper
- Cut a straight line from the edge of the circle to the center of the circle
- Fold the circle to form a cone shape



Step 5: Attach the Nose Cone

- Place the cone on the top of the inverted bottle
- Tape the nose cone to secure it to the rocket body



Water-Powered Rocket

Activity Directions Continued

Step 6: Fill the bottle one-third of the way with water



Step 7: Prepare for Launch

- Attach the air pump to the receiving end of the inflating needle
- Insert the cork into the mouth of the bottle
- Set the bottle down on a flat surface, away from rooftops, cars, etc.



Step 8: Launch the Rocket

- Kneel to support the pump's base and use the pump to add air to the bottle until the pressure causes the rocket to lift off



Water-Powered Rocket

Discussion Prompts or Reflection

- What happened when air-pressure built up inside the bottle?
- Why did pushing water downward make the rocket move upward?
- What could you change to make the rocket fly higher or straighter?

Variations and Enrichment

- Students may change the amount of water in the bottle and observe how launch height changes.
- Students may design different fin shapes or sizes and compare how straight the rocket flies.
- Students may redesign their rocket after testing and compare results between launches.
- Teachers may introduce simple measurement (such as estimating height or distance) to compare launches.

Foundation Exploration

- **Aerospace Engineers** design rockets and spacecraft that launch into the air and travel through space.
- **Mechanical Engineers** design systems that use force, pressure, and motion to move objects.
- **Manufacturing Engineers** build and test rocket parts to make sure they are safe and work correctly.
- **Technicians and Assemblers** put rocket components together carefully so launches happen as planned.