Launch a Stomp Rocket

Discover how scientists and engineers design rockets by creating and launching your own paper rocket!

Part A: Making the Rocket

Materials Needed:

2 sheets of paper, 20-inch length of PVC pipe, masking tape, scissors. *Optional:* Science payload printables, markers or colored pencils.

Note: Make the rocket before making the launcher, as you need to use the 20-inch PVC pipe for both.

Instructions:

Step 1: Roll a piece of paper snugly (but not too tightly) around the 20-inch length of PVC pipe. Then tape the paper to itself, completely covering the seam. Be careful not to tape the paper to the pipe! This will be the rocket *fuselage*, or body.

Step 2: Slide the fuselage off the PVC pipe. Check that it slips easily off the PVC form, so that it will fit on the launch tube later.

Step 3: Make a nose cone by folding one end of the paper over and taping it closed. Use plenty of tape. Check that the rocket is airtight by blowing through the rocket from the bottom and checking for leaks.

Step 4: To make fins, cut out paper triangles and tape to lower part of the fuselage. Make sure not to cover up the opening at the bottom of the fuselage.

Step 5: *Optional:* Cut out the science payload printables (or draw your own) and tape them to your rocket. Add one communication tool and one data collection tool. Decorate your rocket with markers or colored pencils!

Activity and images adapted from:
NASA JPL: www.jpl.nasa.gov/edu/teach/activity/stomp-rockets/
NISE Network: www.nisenet.org/catalog/exploring-solar-system-stomp-rockets

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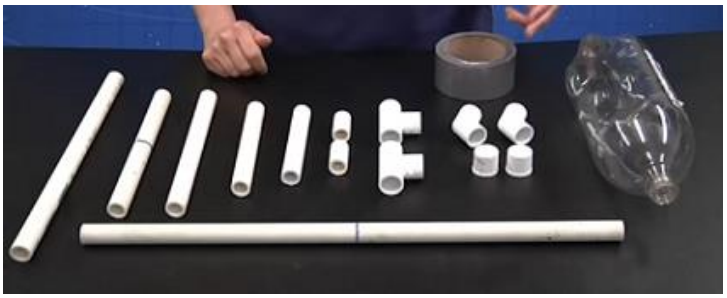
Part B: Building the Launcher

Materials Needed:

- Empty two-liter bottle (#1)
- Electrical tape (#2)
- 20-inch PVC pipe (#3)
- (2) Elbow slip connectors (#4, #10)
- 7-inch PVC pipe (#5)
- (2) Tee slip connectors (#6, #8)
- (2) 2-inch PVC pipe (#7, #9)
- (2) 10-inch PVC pipe (#11, #14)
- 8-inch PVC pipe (#12)
- (2) Slip caps (#13, #15)

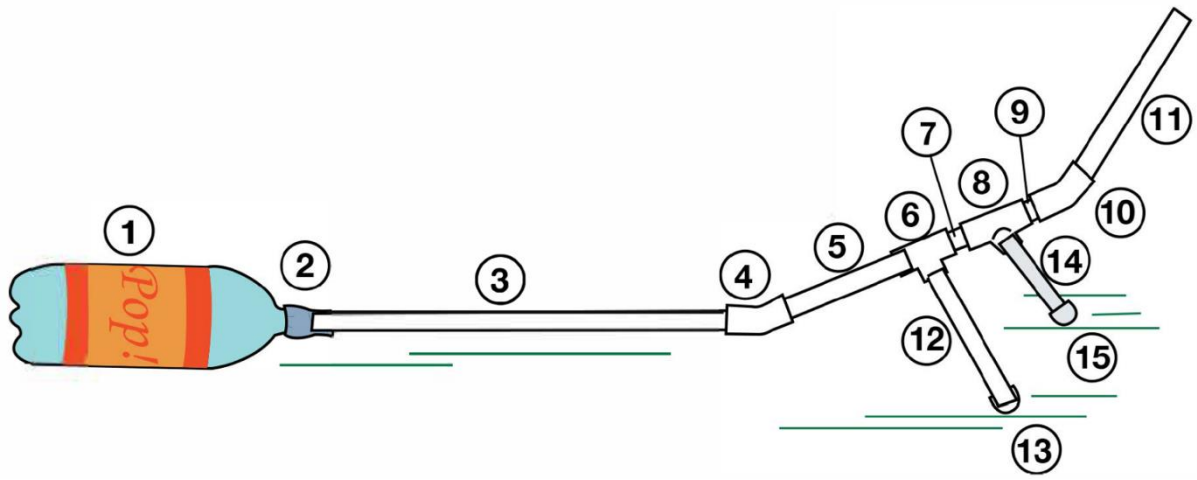


Instructions:

Step 1: Insert the end of the 20-inch PVC pipe (part #3) into the neck of the bottle. Tape it securely with electrical tape.

Step 2: Follow the construction diagram below to assemble the launcher. Match the pipe lengths with the part numbers in the above list.

Step 3: Swing the two legs outward or inward until each touches the ground, forming a tripod. Your launcher is now ready to use!



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Launch a Stomp Rocket, continued

Part C: Launching Your Rocket

Safety Note: Use caution when launching the stomp rockets. Aim the rockets away from people, and keep everyone clear of the launcher and landing area. Stomp using just one foot. Do not run up to or jump on the bottle. Retrieve rockets after they have landed.

Step 1: Choose a launch site. Go outside and find an area that is clear of people and other hazards.

Step 2: Make sure the rocket launcher is stable on the ground by adjusting the legs. If needed, aim the rocket into the wind by turning the launcher.

Step 3: Slip your rocket on the end of the launch tube, and stand next to the bottle.

Step 4: Do a 3-2-1 countdown. On "Launch!", firmly stomp on the bottle, perpendicular to the long axis (see picture).

Step 5: Watch your rocket soar! How high did it go? Did it fly smoothly, or did it wobble?

Step 6: Make improvements to your design, and try again! Try different fuselage lengths, nose cone shapes, fin shapes, or fin sizes.

Launch Tips:

Stomping: Be sure to stomp on the bottle across the bottle label, perpendicular to the body of the bottle. This is the most flexible zone of the bottle. If you stomp on the bottom end of the bottle, it will often shatter.

Aiming: Adjust the PVC legs of the launcher to aim your rocket. If it is a windy day, launch your rocket into the wind; this helps compensate for rocket drift and makes it easier to track and retrieve.

Reinflate the bottle after each launch. Place your hand in a fist around the open end of the launch tube. Blow into your fist to re-inflate the bottle (do not put your mouth directly on the launch tube). Bottles can be reused for multiple launches.

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Launching Rockets

Scientists use rockets to launch spacecraft, satellites, and astronauts into outer space.

Many rockets carry scientific instruments. Scientists on the ground can use these instruments to explore Earth, the solar system and beyond. Scientists have used rockets to study the aurora, X-rays from the Sun, meteorite impacts on Jupiter, and much more!

In Interior Alaska, the University of Alaska operates Poker Flat Research Range, the world's only scientific rocket launching facility owned by a university. Every year, scientists at Poker Flat launch scientific sounding rockets, mostly to study the aurora.

Left: Rocket Launch at Poker Flat. Image: NASA/Chris Perry.

In this activity, you made a paper model of a kind of spacecraft called a *sounding*, or research, rocket. These rockets carry scientific instruments, called the *science payload*. Sounding rockets follow an arc-like path into near-Earth space and then fall back. The science payload spends just 5 to 15 minutes in space before falling back to Earth, but this brief time is just long enough for scientists to get the measurements they need.

Right: Antares Rocket Launch, 2013. Image: NASA/Bill Ingalls.

Testing a rocket. Image: NASA/Marshall Space Flight Center.

The design of a rocket influences how well it can fly. Over the last 100 years, rockets have grown larger and more powerful, but rocket designs are still improving. Engineers design and test each part of a rocket. By changing one variable at a time, they can determine if that change leads to an increase or decrease in performance. Then they adjust their design and try again.

Discover more about rockets:

spaceplace.nasa.gov/launching-into-space/en/

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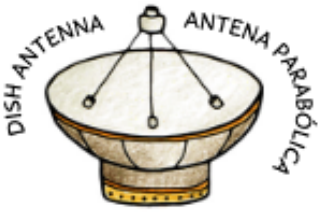
Science Payload Printables

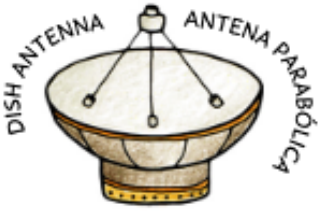
Sounding rockets, like other spacecraft, are equipped with special tools to collect data and help researchers answer questions about the universe. This part of the rocket is called the *science payload*.

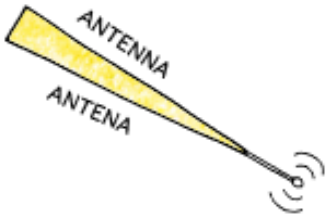
Choose at least one communication tool and one data collection tool for your rocket's mission. Why did you choose those tools?

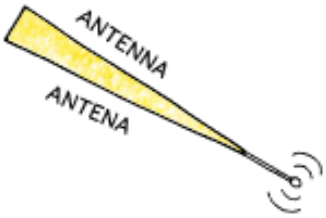
Communication Tools

A rocket sends and receive messages from Earth with a *satellite dish* or *antenna*.





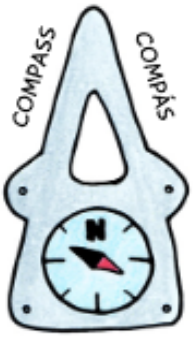


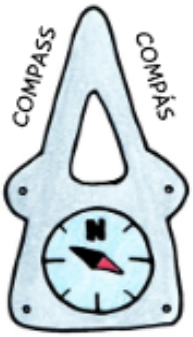


Data Collection Tools

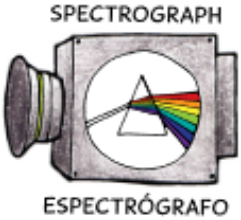
These tools make observations, take measurements, or collect samples.

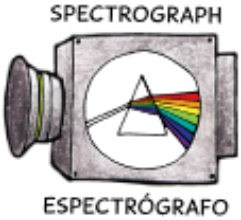
A **particle collector** takes samples of tiny bits of material.



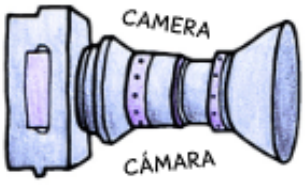


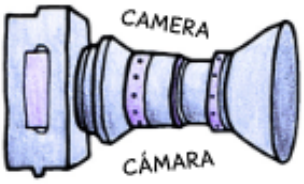
A **compass** can detect invisible magnetic fields.





A **spectrograph** separates wavelengths of light and records the data.





A **camera** uses light to collect images of objects.

Images and information from NISE Network:
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