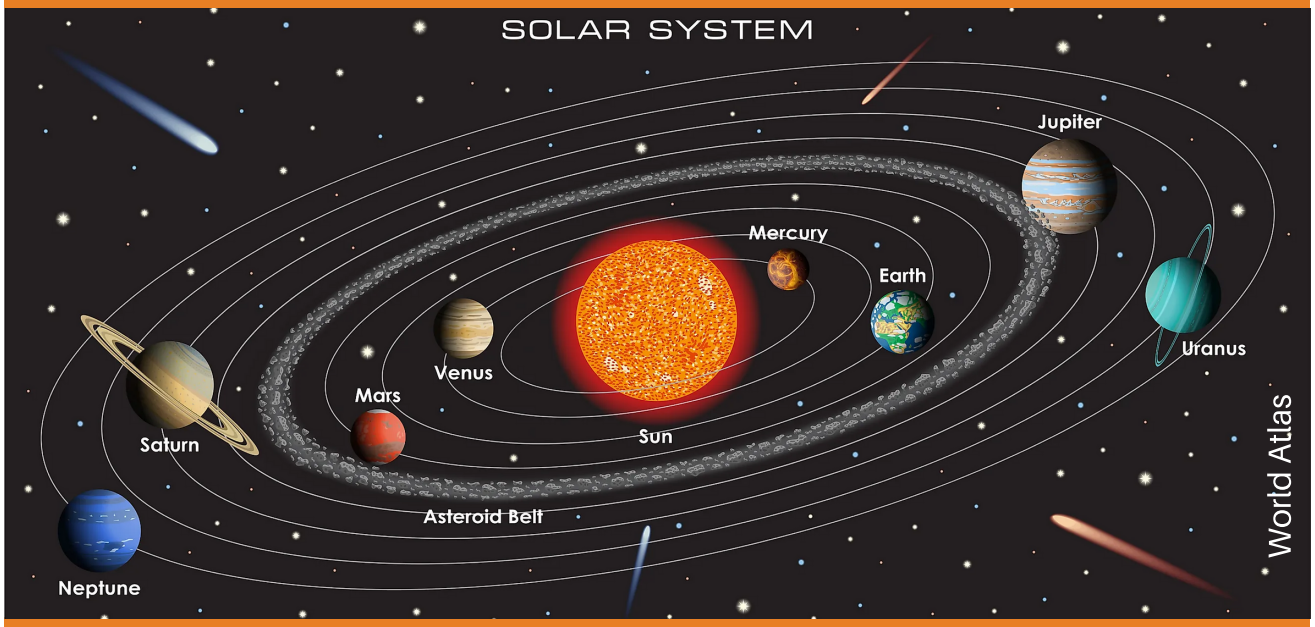
The Solar System



STRAW ROCKETS

Grades: 3-5

Objective: Students will construct, launch and test the design of simple straw rockets, and learn to graph their results of "test flights."

What's Inside?

- Educator's Guide
- Student Worksheets

Source: Jet Propulsion Laboratory of the California Institute of Technology

https://www.jpl.nasa.gov/edu/teach/activity/straw-rocket/

CLASSROOM ACTIVITY

Soda-Straw Rockets

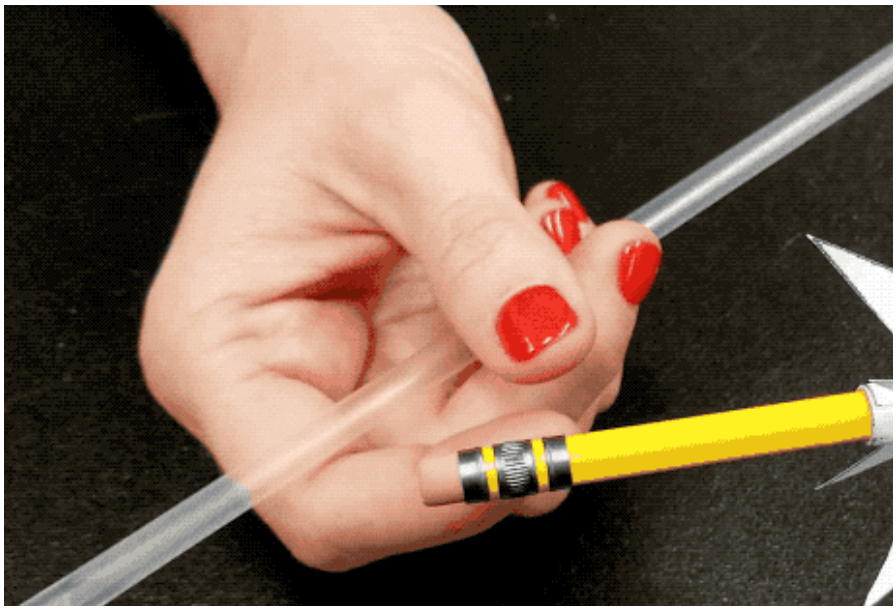
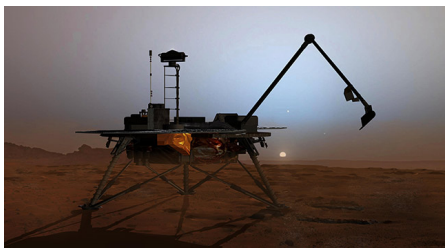


Image credit: NASA/JPL-Caltech | + Expand image



This activity is part of our **Engineering in the Classroom** tool for educators! Click to learn more about the Next Generation Science Standards (NGSS) for engineering, make connections to NASA and discover more standards-aligned activities.

› Explore the tool

Activity Details

Subjects: ENGINEERING

Types: CLASSROOM ACTIVITY, FAMILY ACTIVITY

Grade Levels: 3-5

Primary Topic: MOTION AND FORCES

Additional Topics:
DATA COLLECTION, ANALYSIS AND PROBABILITY
PHYSICAL SCIENCES
THE DESIGN PROCESS

Time Required: Less than 30 mins

Next Generation Science Standards (Website)
3-5-ETS1-3
3-PS2-2
MS-PS2-2
3-5-ETS1-2
MS-ETS1-2
MS-ETS1-3

Common Core State Standards for Mathematics (Website)
2.MD.A.1

Keywords: ROCKETS, MAY THE FOURTH, LAUNCHING TO MARS, PERSEVERANCE, LAUNCH YOUR MISSION, BUILDING WITH PAPER, SCIENCE FAIR, QUICK AND EASY, ARTEMIS

Activity PDF: › Download

Overview

GO TO STUDENT PROJECT

ACTIVITY NOTES

- *For related resources in Spanish, see the Explora Más en Español section below.*

Soda Straw Rockets is an excellent opportunity for students to practice the engineering design process. This activity provides students with a template that creates a rocket that can be launched from a soda straw. They are then challenged to modify the design to see how the changes impact the rocket performance. Length, fin shape or angle can be changed–one variable at a time–to see how the rocket launch performs, and compares to the control design.

Materials

Pencil

Scissors

Tape

Soda straw (plastic or reusable)

Meter stick or meter measuring tape

Rocket template and data log - download PDF

Management

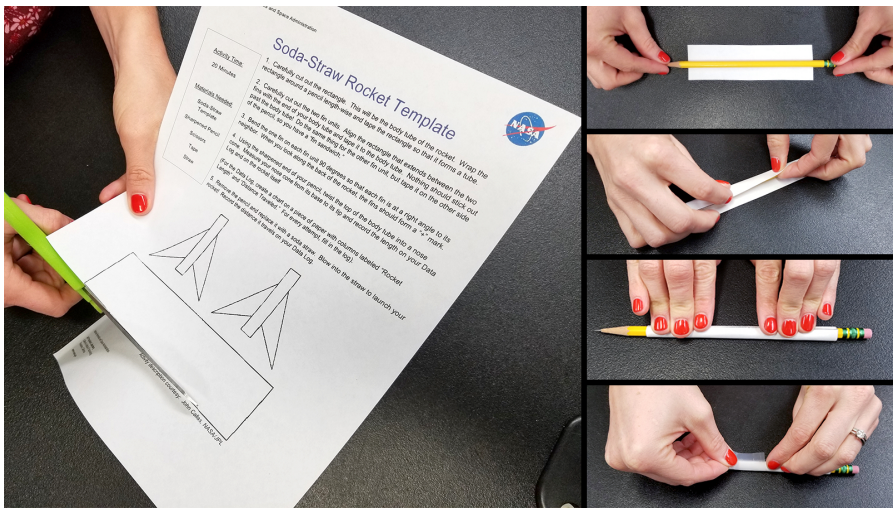
- Move desks or tables out of the way to make room for the rocket launch. Or, consider launching rockets outside, if that's an option.
- Set out tape-markers for distance, if the number of meter sticks or tape is limited. Or, use floor-tile lengths to calculate distance.
- Each student should construct their own rocket even while working in a group.

Background

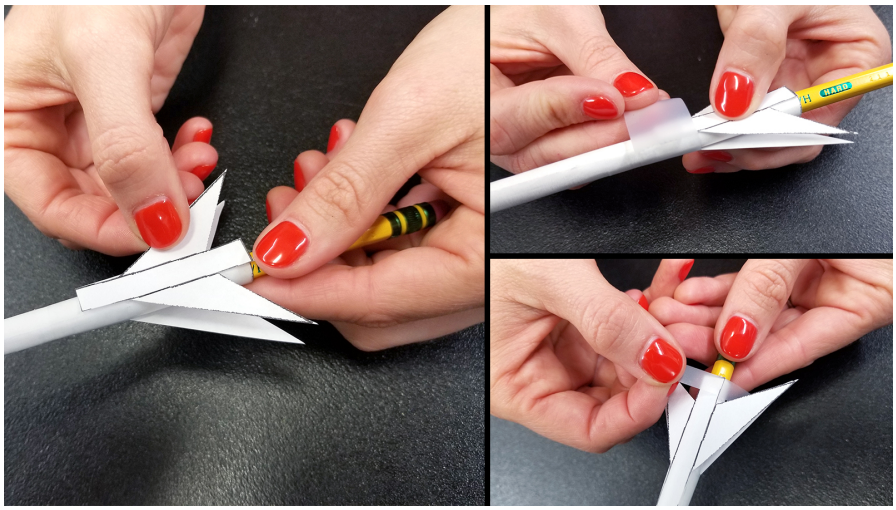
Modern rocket design began near the beginning of the 20th century. While much has been learned and rockets have grown larger and more powerful, rocket designs are still improving. Engineers developing new rockets must control variables and consider failure points when improving rocket designs. By changing one variable at a time, engineers can determine if that change leads to an increase or decrease in performance. They must also consider how their design might fail, and work to improve their design. These incremental changes allow engineers to improve rocket performance and increase the amount of mass they can lift into space.

NASA's Space Launch System, or SLS, is a rocket that will allow for human exploration beyond Earth's orbit. When complete, SLS will be the only rocket capable of sending an Orion crew capsule – the exploration vehicle that will hold the crew – and cargo to the Moon with a single launch. SLS may also create new possibilities for robotic scientific missions to places like the Moon, Mars, Saturn, and Jupiter.

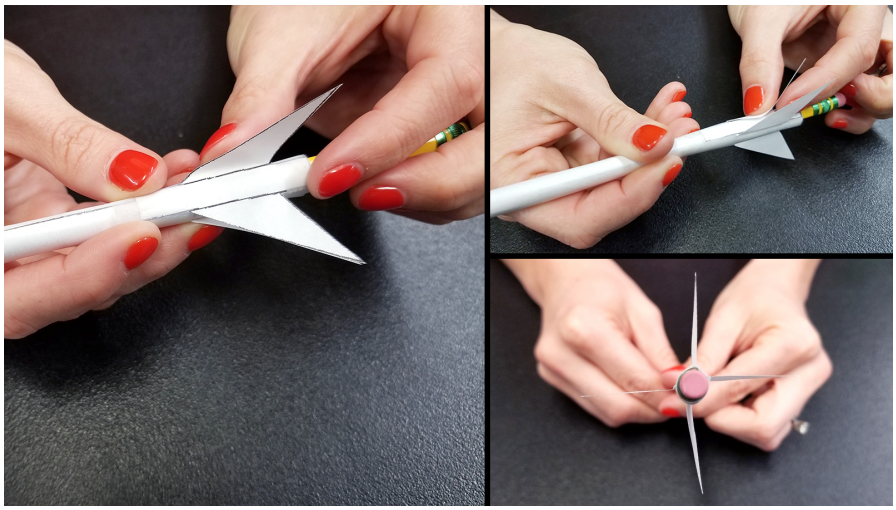
Procedures



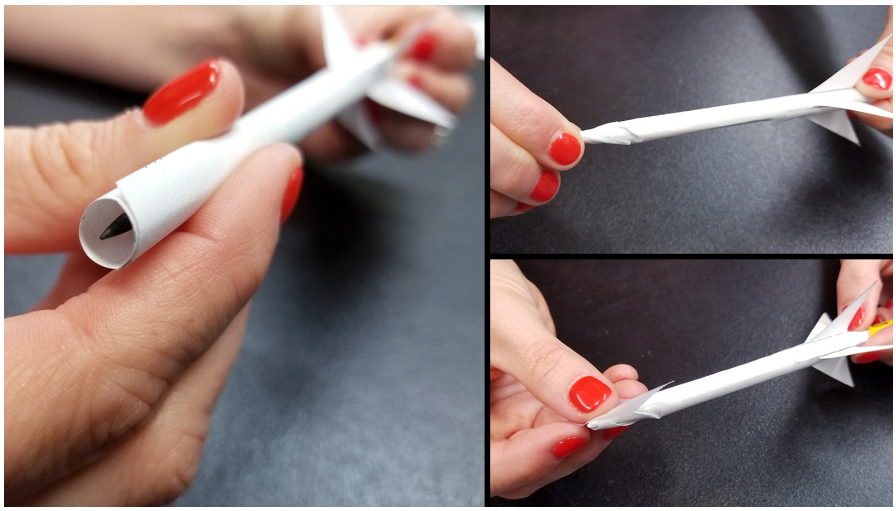
Roll the large rectangle around a pencil length-wise and tape it closed to make the rocket body. Image credit: NASA/JPL-Caltech | + Expand image



Tape the fins at the base of the rocket body to make a "fin sandwich." Image credit: NASA/JPL-Caltech | + Expand image



Bend each fin 90 degrees. Image credit: NASA/JPL-Caltech | + Expand image



Twist and pinch the top of the rocket body around the tip of the pencil to create a "nose cone." Image credit: NASA/JPL-Caltech | + Expand image

1. Have students carefully cut out the large rectangle on the rocket template. This will be the body of the rocket. Have them wrap the rocket body around a pencil length-wise and tape it closed to form a tube.

2. Have students carefully cut out the two fin units. Align the rectangle in the middle of the fin with the end of the rocket body, and tape it to the rocket body. Nothing should stick out past the bottom of the rocket body.

3. Have students do the same thing for the other fin, but tape it on the other side of the pencil to make a “fin sandwich.”

4. Have students bend the part of the fin that looks like a triangle 90 degrees so that each fin is at a right angle to its neighbor. Looking at the bottom of the rocket, the fins should look like a +.

5. Have students twist and pinch the top of the rocket body around the tip of the pencil to create a "nose cone" for the rocket. Tape the nose cone to prevent air from escaping and to keep it from untwisting.

6. Have students measure the nose cone from its base (right where it starts to narrow) to its tip, and record the length in their data log and on the rocket itself. (Once completed, the rocket will be about 13 cm (about 5 in) tall.

7. Have students remove the pencil and replace it with the soda straw.

8. In the designated launch area, away from people and other hazards, have students blow into the straw to launch their rocket.

9. Use the meter stick to measure the distance it travels, then have students record the distance on their data log.

10. Next, have students try improving their design! Make new rockets by altering the template. Try different rocket lengths, fin shapes or fin angles. Repeat the steps above for every launch, having students record each design change and rocket-flight distance in their data log.

Extensions

- Create a class data table. Students can share data and discuss how rocket length affects distance.

- Let students personalize their rockets by coloring or drawing on them.

- Watch this video to learn more about science conducted with sounding rockets.

Explora Más en Español

- Project for Kids: ¡Construye un cohete accionado por burbujas!

Site Manager: Kim Orr
Webmaster: Luis Espinoza

K-12 Students

Make a Straw Rocket

Create a paper rocket that can be launched from a soda straw – then, modify the design to make the rocket fly farther!

Materials

- Pencil
- Scissors
- Tape
- Soda straw (plastic or reusable)
- Meter stick or measuring tape
- Rocket template and data log

1. Cut out and shape the rocket body

Cut out the rectangle. This will be the body tube of the rocket. Wrap the rectangle around a pencil length-wise and tape the rectangle so that it forms a tube.

2. Cut out and attach the fins

Cut out the two fin units. Align the bottom of the rectangle that extends between the fins with the end of the rocket body, and tape the fin to the body tube. Do the same thing for the other fin on the opposite side, making a “fin sandwich.”

3. Bend the fins

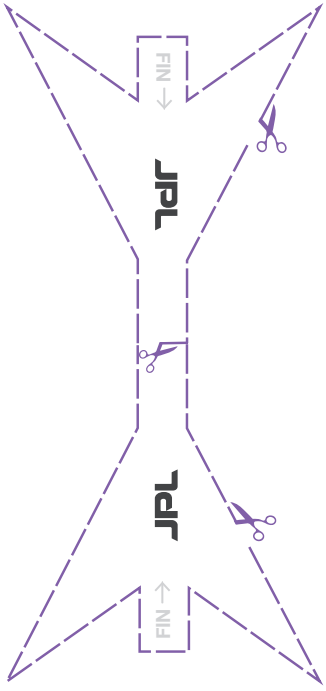
Bend the fins on each fin unit 90 degrees so that they are each at a right angle to each other. When you look along the back of the rocket, the fins should form a “+” mark.

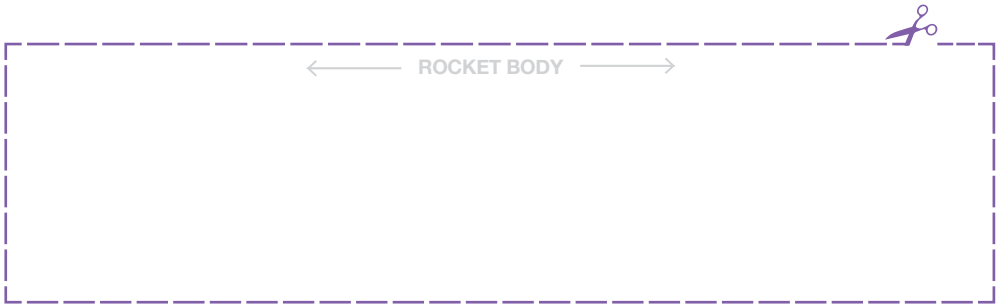
4. Make and measure the nose cone

Twist the top of the body tube into a nose cone around the sharpened end of your pencil. Measure your nose cone from its base to its tip and record the length on the data log and on the rocket itself.

5. Prepare to launch!

Remove the pencil and replace it with a soda straw. Be sure your launch area is clear of people and hazards. Then, blow into the straw to launch your rocket! Record the distance the rocket travels on your data log.





Straw Rocket Data Log

Length of Nose Cone (in cm)	Distance Traveled (in cm)					Notes
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	

Straw Rocket Data Analysis