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!

## Management

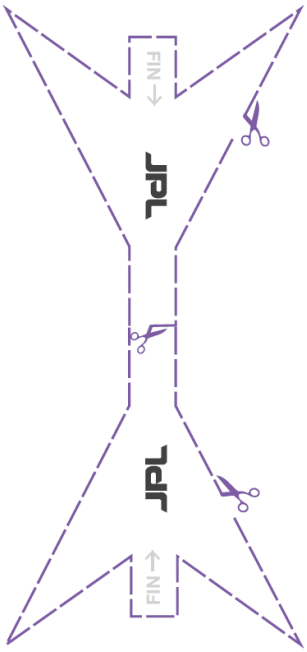
- Move desks or tables out of the way to make room for the rocket launch. Or, consider launching rockets outside, if that's an option.
- Set out tape-markers for distance, if the number of meter sticks or tape is limited. Or, use floor-tile lengths to calculate distance.
- Each student should construct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

## Materials

pencil, copy paper, tape, scissors, soda straw (plastic or re-useable), meter stick or tape measure




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.

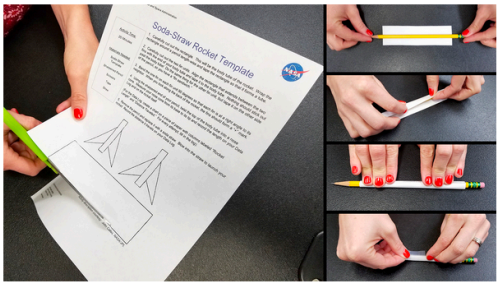
6. Have students measure the nose cone from its base (right where it starts to narrow) to its tip, and record the length in their data log and on the rocket itself. (Once completed, the rocket will be about 13 cm (about 5 in) tall.

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

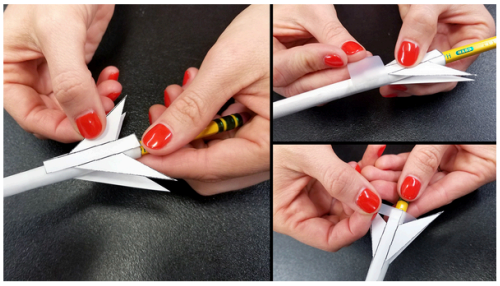
8. In the designated launch area, away from people and other hazards, have students blow into the straw to launch their rocket.

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

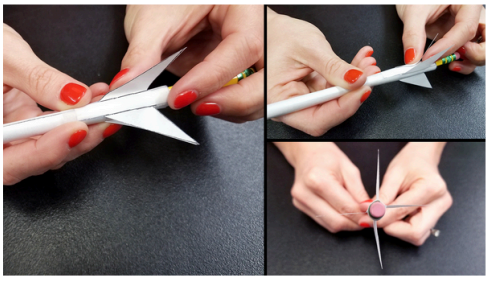
10. Next, have students try improving their design! Make new rockets by altering the template. Try different rocket lengths, fin shapes or fin angles. Repeat the steps above for every launch, having students record each design change and rocket-flight distance in their data log.



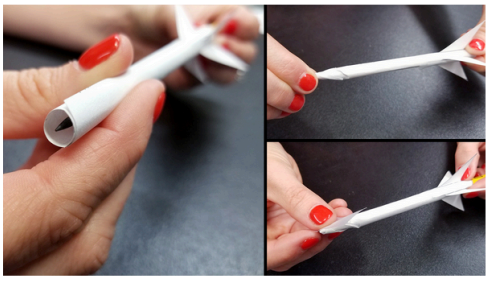

Roll the large rectangle around a pencil length-wise and tape it closed to make the rocket body. Image credit: NASA/JPL-Caltech | + Expand image



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

# 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 | |
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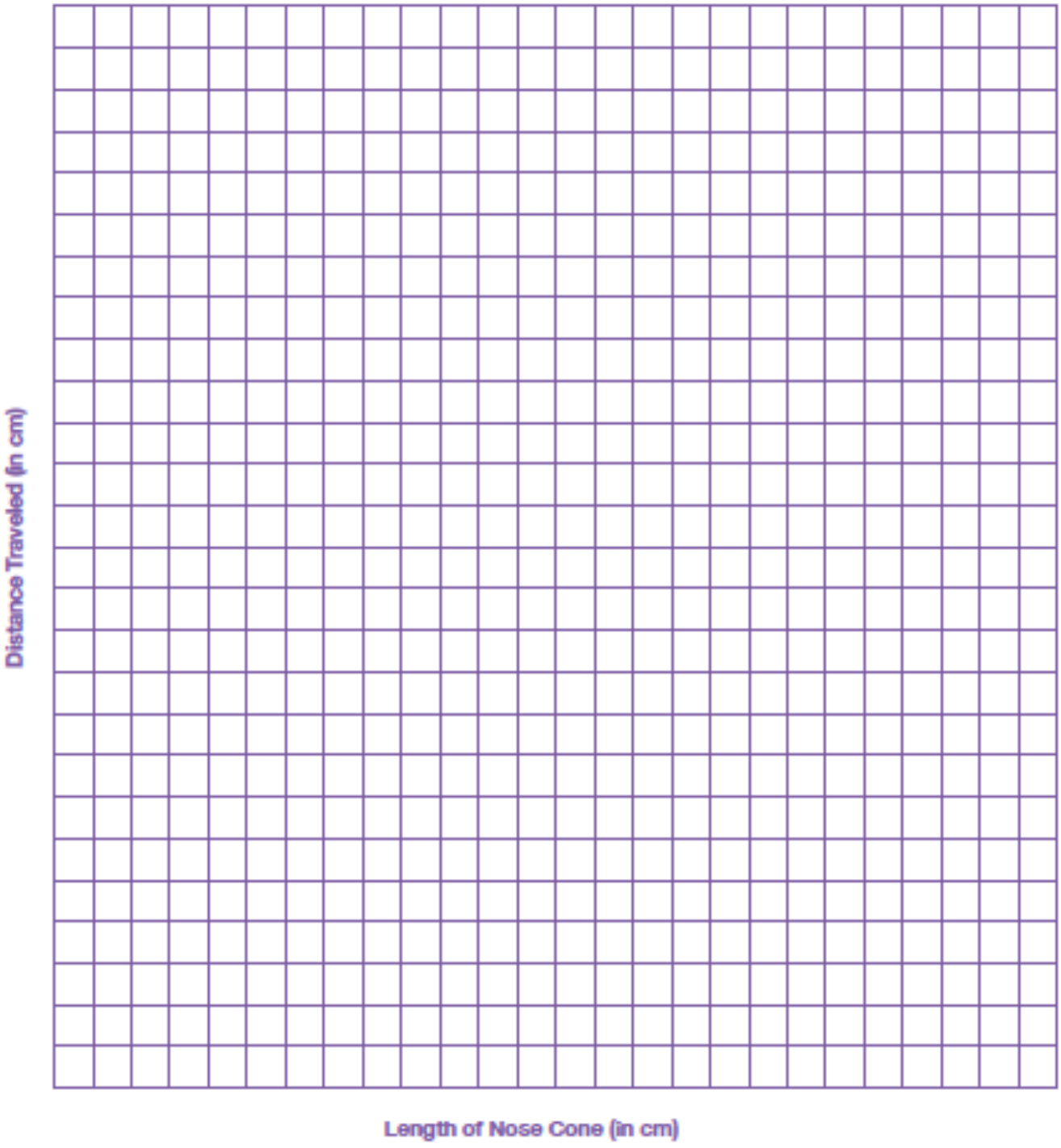
# Straw Rocket Data Analysis




**Conclusions:** Summarize how changes in the length of the nose cone (and other changes such as, size of the fins, number of fins, angle of fins) effected the distance the rocket traveled and the stability during flight.