



# Rocket Stomper Engineering Design



**Time:** 45-60 Minutes

**Skill Level:** Beginning (age 9-11), Intermediate (age 12-14)

## Background

### What is Science Inquiry?

Children are natural scientists. From a very early age they explore the world, ask questions and seek answers. This journey of exploration and discovery is Science Inquiry. Science Inquiry helps young people understand their environment, solve problems and gain knowledge about scientific ideas and processes. In this activity students will use the engineering cycle to design fins on a rocket to achieve a goal such as height or distance of flight.

### Science and Engineering Practices Youth Should Become Familiar With Are:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanation (for science) and designing solutions (for engineering)
7. Obtaining, evaluating, and communicating information

### FYI-

Engineering begins with a problem, need or desire that suggests an engineering problem needs to be solved. Engineering makes use of models to test possible solutions to problems. A simple engineering design cycle consists of six steps:

1. State the Problem
2. Generate Ideas
3. Select a Solution
4. Build the Item
5. Evaluate
6. Present Results

Help the students use these steps to address the engineering challenge of the rocket's fin and nose cone design. When testing the rockets create a flight and landing safety zone to prevent injury-never point the rocket at anybody.

**Watch the Video:** <http://oregon.4h.oregonstate.edu/science-engineering-and-technology>

**Materials List:**

For the Instructor's Preparations

2 liter plastic pop bottle (empty)  
Scissors  
Flexible hose, ~ 7/8" x 48"  
PVC pipe, 1/2" x 18"  
Duct Tape

For the Students:

Construction paper 8 1/2" x 11"  
Index cards for fins  
Scotch Tape  
Scissors  
PVC pipe, 1/2" x 18"  
Duct Tape  
Safety Goggles for launching

**Preparations:** Duct tape the flexible hose to the top of the 2 liter plastic pop bottle. Tape the PVC pipe to the other end of the flexible pipe. The PVC pipe is the launch tube. Wrap the 2 liter pop bottle completely with the duct tape; this will extend the life of each bottle to approximately 30 launches.

**Discuss...**What do students know about how fins and wings help airplanes and rockets fly? Use the FYI section information to explain the engineering cycle. Select a design challenge that the groups agree upon for the rockets. The highest flight? Longest flight? Most spin? Most stable (not wobbly) flight?

**Predict...**Generate Ideas. Select a Solution.

**Experience "What to Do"- What is the plan for the investigation?**

Students will wrap construction paper around a section of PVC pipe and tape it so it slides easily over the pipe. They should then cut out and tape a small nose cone and tail fins of their own design onto the rocket. When the rocket is ready they will slide the rocket over the PVC pipe the launch tube on the launcher. They are ready for lift-off.

**Share ...**Encourage students to discuss what their rocket did and how they might change the rocket's design to have a different result.

**Reflect ...Analyze and interpret the data and results. Discuss among the group.**

What would happen without the tail wings attached to the rocket?  
How would the rocket maneuver differently with 1, 2, 3, or 4 tail wings?  
What other variables could they change in this experiment?

**Generalize ...to real world examples. Construct explanations.**

The students will notice that not all rockets fly the same. Have them experiment with different materials or change other variables. Make sure they only change one variable at a time to better answer the questions they ask.

**Apply ...outside the classroom or club meeting.** Discuss what is making the rocket move? How do rockets differ from other flying machines? How would you apply this learning experience or questioning process to other areas of your life?

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Agriculture Sciences & Natural Resources, Family & Community Health, 4-H Youth, Forestry & Natural Resources, and Extension Sea Grant programs. Oregon State University Extension Service offers its programs and materials equally to all people.