

Student Worksheet for Ep. 3: Rocketry

Overview: You're going to build several different fin designs on your rocket body to see how it affects the flight of your rocket.

What to Learn: Rockets are vehicles that launch people and payloads into space. Newton's Third Law of Motion is the principle of action and reaction. With rockets, the action is the force generated by the exhaust gases shooting out the back end of the rocket through the nozzle. This force moves the rocket in the opposite direction.



Rockets need fins for flight stability. During flight, a model rocket can wobble off course by wind. For a rocket to maintain stable flight, the center of gravity (CG) must be forward of the center of pressure (CP). If the nose of the rocket tips to the side during coasting or powered flight, the lift and drag forces move the nose back to the flight direction, meaning that the tail section of a stable rocket will swing the nose back to upright position.

Materials:


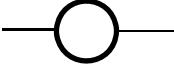
- Sheet of paper
- Two straws (one fits inside the other)
- Tape and scissors
- Measuring tape
- Stopwatch

Lab Time:

You're about to build several different rocket designs.

1. Start with a rocket that doesn't have any fins. How well does it fly?
2. Now add two fins across from each other on the body tube. How well does it fly now?
3. Add a couple more fins and notice any changes to your rocket's flight.
4. After you've played with the experiment a bit, see if you can make the perfect rocket that goes the furthest, but remember, only change one thing at a time so you know which change had which effect on your design.
5. When you're ready, use the data table to track your results, just like a real scientist!

Rocketry Data Table

Type of Airplane <i>(Draw fins as seen from back of rocket)</i>	Time Aloft <i>(units?)</i>	Distance Traveled <i>(units?)</i>	Stability Observations
<i>No fins</i> 			
<i>Two fins</i> 			

Tip: There is a simple test you can do to test to see if your rocket is stable. Tie a string around the body at the CG point. (For a model rocket, make sure you've prepared it for launch, so the engine, wadding and parachute are on board.) Swing the rocket around your head in a circle. The nose points in the direction of rotation for a stable rocket. Unstable rockets will wobble, spin sideways, or go tail-first. You can fix any stability problems by lowering the center of pressure (make the fins bigger) or by moving the CG forward (adding weight to the nose).

