

Curriculum topics

- Forces
- Motion
- Gravity
- Newton's Laws
- Engineering/Design

Subjects

- Earth & Space Science
- Engineering
- Physical Science

Grade range: 3 – 8

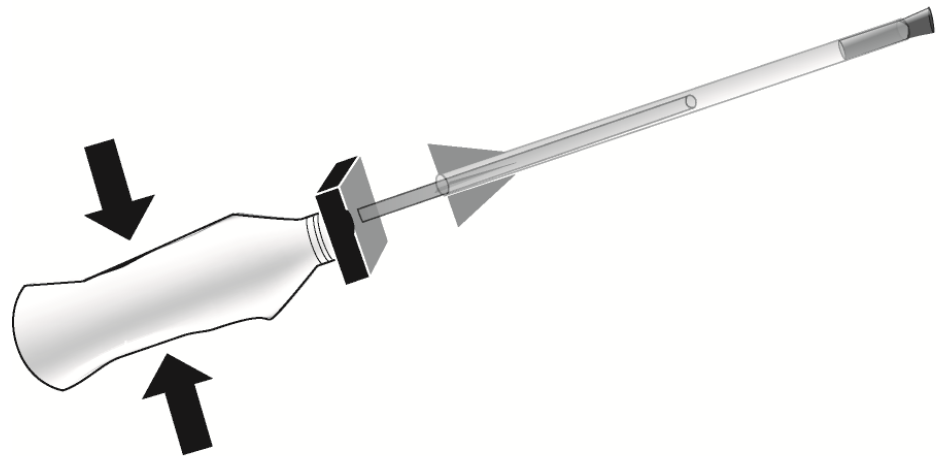
Who we are: Resource Area for Teaching (RAFT) helps transform the learning experience by inspiring joy through hands-on learning.

PUFF ROCKET

A cool way to propel yourself to new heights!



Hypothesize, experiment, collect data and analyze forces and motion with straw “rockets” and an easily made launcher. The stronger the force, the farther and higher the rocket flies! What changes can be made to improve the rocket’s flight? Find out through experimentation, trials and error, and creative fun!



Share Your feedback!

<http://bit.ly/RAFTkitsurvey>

Materials

Materials in the kit may vary but generally, this kit contains the following:

- Plastic bottle, squeezable (1)
- Adhesive foam with hole (1)
- Plastic straws, jumbo (2)
- Plastic straw, diameter fits inside jumbo (1)
- Foam dowels (2)
- Adhesive labels
- Not included: Scissors

WARNING: CHOKING HAZARD – Small parts not for children under 3 yrs. Adult supervision required.

To Do and Notice

1 Watch this video and follow along if you need visual support with assembly (<https://bit.ly/2UswyoC>). Remove the release paper on the adhesive foam. Squeezing the round sides of the foam helps with peeling off the paper. Center the adhesive foam over the bottle mouth and attach.

2 Insert the smaller diameter straw through the hole in the adhesive foam until it feels like it is in the bottle. If you have a straw with a scoop end, insert the scoop end into the foam.

3 Press and roll a foam dowel to create a tip for the straw rocket. Insert the rolled foam dowel into one end of a larger diameter straw. Leave some foam sticking out of the straw. Repeat for second rocket.

4 Add fins to the rocket using tape or adhesive labels (see below).



5 Insert the open end of the straw sticking out of the bottle into the straw rocket. Make sure the straws slide together easily. If not, check that the straws are round, straight, and smooth. Adjust or replace as needed to create a loose fit.

6 Aim a straw rocket in a safe direction and give the bottle a quick squeeze. If rocket does not blast off, check to ensure a loose fit between the straws.

7 Keeping the same angle, launch a second rocket. Did one rocket fly farther or straighter? What caused the difference in performance?

8 Test different launch angles or make other physical changes to one rocket. Repeat steps 1-2. How does the flight differ between the “control” rocket and the modified rocket? Explore other launch variables by adjusting the depth of the launcher straw within the bottle.

9 **Share** student learning with RAFT! Submit photos/video via email at education@raft.net or on social media ([Facebook](#), [Twitter](#), [Instagram](#)).

Core Content Skills:

Science & Engineering (NGSS)

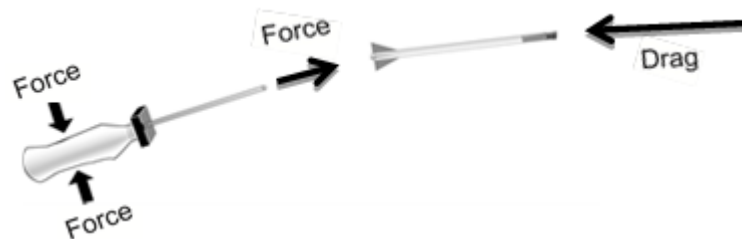
Developing and Using Models, Planning and Conducting Investigations, Forces and Motion, Definitions of Energy, Types of Interactions, Cause and Effect

Social Emotional Learning

- Self-awareness
- Self-management
- Responsible decision-making

The Content Behind the Activity

Objects at rest stay at rest unless acted upon by a force. The straw rocket stays put until an unbalanced force is introduced. Squeezing the bottle puts pressurized air into the chamber formed by the two straws. When the force exerted by the pressurized air is greater than the force of gravity acting on the rocket's mass, then the rocket will move (see below). An upward-angled flight will move up and forward. All directions of motion are resisted and slowed by **drag** (air resistance). At the maximum height, the upward component of the momentum is reduced to zero by gravity and drag. The rocket continues forward, due to the remaining forward component of the momentum, and downward, due to gravity. The Puff Rocket provides opportunities to learn basic principles of motion and use the scientific method: hypothesize, experiment, collect data, analyze, and re-test comparing control to modified rockets. Rocket design is classic Newtonian physics in action.



Reuse

This kit uses 100% reusable materials designed for other uses. To continue making a positive impact in reducing waste, reuse these materials in other projects. Additionally, any unused materials can be collected and delivered back to RAFT.

Feedback

Please comment on this kit by taking this short survey: <http://bit.ly/RAFTkitsurvey>. Let us know of any material concerns (missing, broken, or poorly fitting parts) as well as any suggestions for improvement.

Visit <https://raft.net> to view related activities!

- Hovercraft
- Foam-Tipped Stomp Rocket
- Pop Rockets
- Staple Remover Catapults

Resources

- RAFT Puff Rocket assembly video - <https://bit.ly/2UswyoC>
- Rockets 101 - <https://bit.ly/2WD9qqf>
- Examples of balloon-powered rockets - <https://to.pbs.org/2J8Z0qj>