



May the Force Be With You

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Blast Off!

OVERVIEW

Did you know that fireworks are considered the earliest form of rockets? NASA uses rockets to launch satellites and probes into space, powered by burning solid, liquid or gas rocket fuel. Let's dive into force, pressure, and thrust and how they all work together to move objects.

Force- defined as the amount of push or pull

Thrust- mechanical force that pushes a rocket through the air

Pressure- amount of force exerted on an area

Pressure = net **Force** divided by **Acceleration**

$$P=F/A$$

Today we will be making a balloon rocket! Keep in mind the above vocabulary and how force, thrust, and pressure interact throughout the experiment.

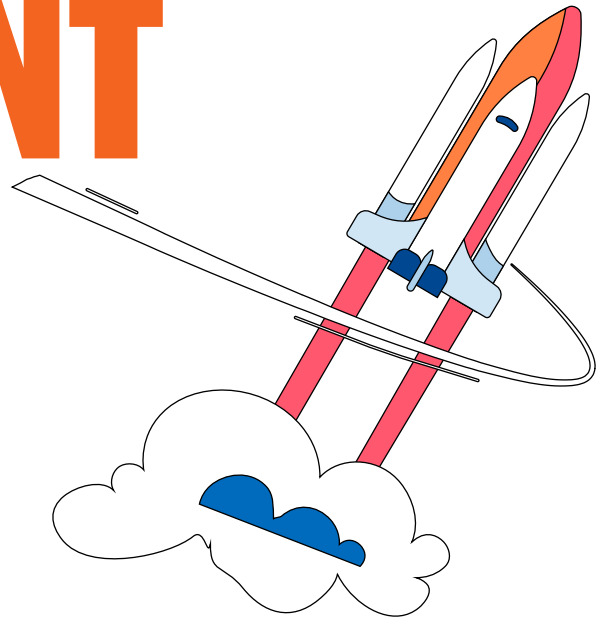
“According to Newton’s Third Law of Motion, as the gas is released from the balloon and pushes against the outside air, the outside air pushes back. As a result, the rocket is propelled forward by the opposing force. This opposing force is thrust.”



EXPERIMENT

MATERIALS

balloon
straw
string
tape



STEPS

1. Tie one end of a string to a chair, doorknob, or other support.
2. Put the other end of the string through a straw. Then pull the string tight, and tie it to another support in the room.
3. Blow up the balloon a small amount, and pinch the end of the balloon to keep the air inside. Do not tie the balloon.
4. Tape the balloon to the straw so that the opening of the balloon is horizontal with the ground. You may need two people for this: one to keep the air pinched inside the balloon and the other to tape the balloon to the straw.
5. While holding the balloon opening closed, one person should pull the balloon all the way back to the end of the string (the starting line) so that the balloon opening is against one support.
6. Let go of the balloon and watch it move along the string.
7. Repeat steps 3-6 but this time fill up the balloon with more air and compare the differences.

ADDITIONAL CONTENT

Attached below is the link to another resource for designing and creating a Mars rover. **PARENTAL SUPERVISION** is suggested due to the use of hot glue materials. Visit this website for another take on creating your Mars rover:

<https://www.youtube.com/watch?v=9xhEXDrMMLg>



EXTRA EXPERIMENTS

FURTHER THE EXPERIMENT

To further your experiment use bottle caps and tape them to the balloon. See how many bottle caps you can have on your balloon and still get the balloon to the finish line. Share your results on flipgrid!!

You can also attach a small paper cup to the balloon with string and tape. Add marbles, paper clips, and other small objects to the cup, increasing the weight in the cup after each trial. How much weight or how many objects can your rocket carry?

SPACE-TIME SNACK

Make your own fruit rocket! You will need wooden skewers and any kind of fruit you would like! We used cantaloupe, strawberries, and bananas. Be creative!



Resource: <https://www.sciencefriday.com/person/chemical-educational-foundation>

Additional Resources: <https://www.nasa.gov/centers/wallops/multimedia/index.html>

