Stomp Rocket

Maker Challenge Title **Stomp Rocket**

Grade level Target grade = 9 and *scalable* down to grade 8 and up to grade 10

Subject area(s) Measurement, Number and Operations, Physics, Problem Solving, Reasoning and Proof

Estimated Time Required _____ minutes

Header image

	Image file: https://www.jpl.nasa.gov/edu/images/activities/sr_stomp.png ADA description: Stomping on a plastic bottle with its open end taped to the end of a piece of PVC pipe. Source / rights: NASA JPL Caption: Hopefully you'll be pleasantly surprised with how far your rocket goes!

Maker Challenge Recap - goal of the lesson

For this maker challenge, students decide on specific design aspects using specific supplies. They are given open-ended problem: design and create a stomp rocket that flies further than their classmates'. Students need to decide the size of the fuselage, fins (if any), and cone (if any).

Using the design process, students will construct a rocket which will be launched by stomping on a plastic bottle connected to a PVC pipe. The bottle and PVC will be placed on the 2x4 and elevated using the wooden block. The students will launch their rockets at no fewer than three different angles and

They will measure the time of flight, measure the distance flown, and calculate horizontal speed. The rockets will be launched at 30°, 45°, and 60° angles. Students will measure the 30° and 45° angles, and make an estimate for the 60° measurements before launching. After the third launch, students will be able to make changes to their rockets to increase distance flown.

Maker Materials & Supplies

rocket: 8.5 x 11 copy paper (white or different colors), tape (electrical if possible), scissors, crayons, colored pencils, method to create a circle (compass, empty coffee can, etc)
2-liter plastic bottle
launcher: 2-liter plastic bottle, 3 foot 2x4, wooden block, protractor
tape measure
graph paper
instructions

Kickoff

Who has seen fireworks? Have you seen fireworks that go up and up and up until they explode into a shower of colors? Have you seen fireworks that got a little too close to you? Mathematics and physics play a vital role in launching fireworks. In this project, we will use the engineering design process of coming up with an idea, bringing the idea to life, testing the idea, and improving upon it to explore how launch angle affects vertical and horizontal distance. Working in pairs we will do this by creating a rocket, launching it at different angles, and measuring how far it flew. Your goal is to make your rocket fly further than the other teams'.

Things to consider before beginning include:

- Before doing any testing, what design aspects do you think will help your rocket?
    - Weight
    - Shape or size of nose cone
    - Fins
- What do you think will hinder your rocket?

Resources

- Consider beginning with a video explaining how rockets work: https://www.youtube.com/watch?v=jI-HeXhsUIg (6:25)
- For students who are struggling with beginning their rocket, you may show them this video: https://www.youtube.com/watch?v=AweP9Rbryhs (the first 3:13 is the relevant portion)
- To help foster the design process, consider having students keep a design journal and incorporate it into their grade for this project

Maker Time

Sketch initial ideas for your rocket.
What are the physics involved?
What's going well?
Would rocket fins help? Why or why not?
Would a nose cone help? Why or why not?

Wrap Up

Discuss which rocket had the shortest flight.
Discuss which angle the rocket flew the furthest.
Why do you think that is?
Did you see design elements used by other teams you thought were a good idea?

Attachments

Instructions for the activity
https://docs.google.com/document/d/1Im08yimLIuIpqCmyCSRlj3nrtVz5qYpWJ0AGskdMNPk/edit?usp=sharing
Make Design Journal
https://www.teachengineering.org/content/documents/TE-design-journal-template_v4_tedl.pdf

Tips

- Students may launch from the same angle twice to acquire more accurate measurements.
- Students may launch a second time to achieve a further distance after adjustments have been made to their rockets.

Other

Contributors

Steve Marks

Supporting Program

Joule Fellowship, College of Engineering at the University of Connecticut

Acknowledgements

This maker challenge was inspired by NASA JPL's Stomp Rocket activity (https://www.jpl.nasa.gov/edu/teach/activity/stomp-rockets/).

Copyright

Maker Challenge Testing Info