Yes, This IS Rocket Science! Part 1

Colorado State University Extension

4-H STEM
Science, Technology, Engineering & Math

Did you ever wonder how rockets can get into space? How do rocket fuels work?

Let's see if we can figure that out!

What you need to gather:

- Film canisters with lid (try to get several different kinds)
- Paper
- Pencil
- Alka Seltzer (at least 12)
- Water
- Tape measure
- Pencil
- Safety glasses
- Color pencils

Optional:

- chalk

Activity 1: Liftoff

1. All these experiments work best outside. If you have permission, use next to a building, and mark with chalk how height the canister travels.
2. Test which canister works the best. Keep all the variables exactly the same (use the exact same amount of water, and the exact same amount of Alka Seltzer).
3. Guess which film canister will travel the highest.
4. SAFETY: Put on your safety glasses.
5. Break the Alka Seltzer into quarters.
6. Fill each film canister ¼ full of water.
7. One at a time, add the ¼ piece of Alka Seltzer, snap on the lid, and turn upside down (so that the canister is sitting on the lid). It will be messy.
8. SAFETY: Stand back, and observe the height travelled.
9. Mark the height with chalk, and measure with a tape measure. Record the height.
10. With the same canister, repeat two more times.
11. Test each additional film canister, duplicating the process above in steps 4-10.
12. Find the average of the three trials for each of the canisters. Which one had the highest flight? Which one had the highest average flight? Was your guess right?
13. Make a graph of your results (free graph paper on the internet). The X axis is the individual canister and the Y axis is height. Use a different color pencil for each canister, and plot your average height for each canister. Write about what you learned.

Activity 2: Proper Fuel Mix

1. Test the proportions of water to Alka Seltzer for the best fuel mix. **Only change one variable at a time.**
2. Use the winning canister from Activity 1 and ¼ piece of Alka Seltzer for all these trails, only change the amount of water.
3. Guess which canister will shoot the highest.
4. SAFETY: Put on your safety glasses.
5. Break the Alka Seltzer into ¼ pieces.
6. Fill the canister ½ full of water.
7. Add the Alka Seltzer, snap on the lid, and turn upside down. SAFETY: Stand back.
8. Observe and mark the height with chalk, and measure with the tape measure. Record the height.
9. Repeat the trial two more times with ½ water.
10. Repeat steps 4-9 three times with the canister ¾ full of water, and record the height after each trial.
11. Repeat steps 4-9 three times with the canister almost full of water, and record the height after each trial.
12. What amount of Alka Seltzer will work best? Guess which canister will shoot the highest.
13. Break the Alka Seltzer into ½ pieces.
14. Fill the film canister ¼ full of water.
15. Add Alka Seltzer, snap on the lid, turn upside down.
16. Mark the height with chalk, and measure with a tape measure. Record the height.
17. Repeat the trial two more times.
18. Break the Alka Seltzer into ¼ pieces, and use three ¼ pieces. Repeat stems 13-16 with ¾ a tablet (3 – ¼ pieces) of Alka Seltzer.
19. Use an 1 tablet of Alka Seltzer. Repeat stems 13-16 with 1 tablet of Alka Seltzer.
20. Find the average height that rocket travelled for the different water levels (½, ¾, and almost full) and the different sizes of Alka Seltzer (½, ¾, or 1).
21. Make two graphs of your results. Include the data from Activity 1, for ¼ full of water with ¼ piece of Alka Seltzer. For the first graph, the X axis is the amount of water (¼, ½, ¾, or 1). On the second graph, the X axis is the amount of Alka Seltzer. (¼, ½, ¾, or 1). On both graphs, Y axis is height. Write about what you learned.
22. Save your canister for next month's Rocket Science!

Source: http://www.spacegrant.hawaii.edu/class_acts/AlkaRocket.html

Colorado State University, Pueblo: Dr. Richard Farrer
My two main research interests are 3-d lithography and the interaction of nanoparticles with cells (collaboration with Dr. Jeff Smith—biology). The underlying theme in both projects is nanoparticles. The majority of circuitry used in electronic devices is flat (2-d), and created through current lithographic techniques. While current lithography produces very small circuits in 2-d, it cannot produce 3-d circuits. Two of the advantages of 3-d microcircuits are reduced size and increased functionality — producing 3-d electronics allows for the creation of electronic components that cannot be produced in 2-d. The work with Dr. Smith involves creating nanoparticles that will interact selectively with cells as means of drug delivery.

If you liked these experiments, 4-H has other activities in Model Rocketry. Check out these projects at:
http://www.colorado4h.org/project_resources/gnr-projects/rocketry/index.shtml