Yes, This IS Rocket Science! Part 2

Colorado State University Extension

4-H STEM
Science, Technology, Engineering & Math

Does the shape of the nosecone affect the flight? Do the shape of the fins affect the flight? How about the length of the fuselage?

Let's see if we can figure that out!

What you will need to gather:

- Tested film canister (from part 1)
- Paper
- Pencil
- Alka Seltzer
- Water
- Tape measure
- Scissors
- Scotch tape
- Pencil
- Safety glasses
- 5x8" index cards
- Color pencils
- Styrofoam meat tray

Optional:

- chalk

Activity 1: The Nose Cone

1. We are testing the most effective nosecone for your Alka Seltzer rocket.
2. Optional: decorate the index card.
3. Use the canister you picked as the best from Part 1, Activity 1. Roll the index card into an 8-inch-tall tube around the film canister, with the open end of the canister flush with the bottom of the index card. If your film canister has a lid that closes on the outside of the canister, be sure that your index card is flush with the lip on the lid (so you don't have to close the lid on the paper).
4. Tape the index card tube to the canister. You do not want these two parts to separate.
5. Tape the 8-inch-long seam of the paper tube.
6. Cut three triangular fins from a Styrofoam meat tray and tape them onto the rocket. (We will be testing fin design later.)
7. Make a small paper cone and tape it to the top of the rocket. (What is the function of the nose cone?)
8. Guess what nosecone design will give you the best flight (think about long, wide, streamline, etc.).
9. Test using the water/Alka Seltzer fuel ratio you determined gave the best projection from Part 1, Activity 2. Remember to record the height your rocket travelled.
10. In engineering challenges, try to think outside the box while designing the best nosecone. Remember to leave everything else the same. If your fins or fuselage need to be repaired or replaced, use the same design. You will modify those later. Keep your data, and always run 3 trials. Take your averages and graph your results.

Activity 2: The Fins

1. Once you have your favorite nosecone design, you can test the fin shape. What do fins do?
2. Guess which fin design will give you the best flight (think about how long, wide, placement on the fuselage, number of fins, etc.).
3. Cut three fins from a Styrofoam meat tray, changing the shape, and tape them onto the rocket.
4. Test using the water/Alka Seltzer fuel ratio you determined gave the best projection from Part 1, Activity 2. Remember to record the height your rocket travelled for 3 trials of each design.
5. Leave everything else the same. If your nosecone or fuselage need to be repaired or replaced, use the same design. Record your data, and always run 3 trials for each design. Find your averages and graph your results.

Activity 3: The Fuselage

1. You now have determined the best nosecone and fins. Is the length of your fuselage optimum?
2. Guess what length fuselage will work best.
3. Try longer (9, 10") and shorter (7, 6") lengths, testing each length 3 times, and recording the height for each trial.
4. Remember to leave everything else the same. If your nosecone or fins need to be repaired or replaced, use the same design. Record your data, and always run 3 trials. Find your averages and graph your results.

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

Colorado State University—Dr. Paul Wilber

Prof. Wilbur has taught courses in aeronautics and space propulsion for many years. He does research on ion propulsion of space vehicles. Ion thrusters use electrical power derived from the sun (through photovoltaic cells) or from nuclear-electric power-plants to accelerate positively charged ions to very high velocities. Typically the resulting thrust is low and the thrusters are operated for long periods of time. They are very efficient. Ion thrusters are currently being used to position Earth satellites and to propel the Dawn Spacecraft to the planetoids Ceres and Vesta.

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