The Engineering Design Process , Critical Thinking Questions and Things to Test With Your Rockets

Blow Rockets: Your breath forces air out of the straw and up into the air. This pushes your rocket up (thrust).

- If you point your launcher straw straight up, straight down, at an angle, or straight ahead how does it affect the flight of your rocket?
- If you blow softly or as hard as you can, or in a long/short breath does it change the way your rocket flies?
- Do all things that go up come back down?

Squeeze Rockets: *When you squeeze the water bottle you force air out of it and into the straw. Since the straw is smaller than the water bottle, the air is rushing to get out (think of a crowd of people rushing to get out one door after school). This air builds pressure and has enough force to push the rocket up as it escapes. (Example: a shaken soda bottle or the mentos experiment)*

- **Does the amount of force in the squeeze affect the rocket's flight?**
- **What happens if you try to launch using a larger bottle?** Bigger bottles hold more air so they can produce more air pressure and thus more thrust.
- **Do the number, placement, or shapes of fins affect the flight?** Yes, aerodynamic shaped rockets create less drag and therefore fly faster and higher. Symmetrical fins on the bottom of the rocket act as stabilizers to keep it flying straight.
- **Why do you think the rocket goes up when you stomp?**

Stomp Rockets: Your stomp forces air out of the bottle. The launcher tube opening is smaller than the bottle so the air is forced to "wait its turn to get out" just like kids rushing to get out the door after school. This air trying to rush out creates pressure inside the bottle. As it escapes the pressure (thrust) pushes the rocket up.

- **How does the speed of it as it goes up compare to the speed when it heads toward the ground?**
- **Does the amount of force in the stomp affect the rocket's flight?**
- **Would a bigger bottle work better than a smaller one?** Bigger bottles hold more air so they can produce more air pressure and thus more thrust.
- **What would happen if the launcher tube was longer/shorter/wider?** The longer the launcher tube is, the more air can be inside it so there is more air to be pushed out. However, that means more force would be needed to get the air out and it also means that there will be more of a delay between the stomp and the launch as the air moves through the tube.
- **Do the number, placement, or shapes of fins affect the flight?** Yes, aerodynamic shaped rockets create less drag and therefore fly faster and higher. Symmetrical fins on the bottom of the rocket act as stabilizers to keep it flying straight.

Water Rockets:

- **Does the amount of water in your rocket affect its flight?** (Yes, more water means less room for air. Less air means less air pressure created by air trying to escape through the small launcher opening. This means less force to push the rocket up.
- **Does the amount of air you pump into your rocket affect its flight?** (see answer above)
- **What is the purpose of the fins?** Symmetrical fins on the bottom of the rocket act as stabilizers to keep the rocket flying straight.
- **Would a bottle with a different shape have a different result? Try a rectangular prism shaped water bottle.** Aerodynamic shaped rockets create less drag and therefore fly faster and higher.
- **Does the size of the bottle affect the flight? Try a water bottle.**
- **Does the temperature of the water make a difference**? (Make sure you control your variables by using the exact same amount of water in your hot and cold tests.)
- **Does salt water create a different result than fresh water?** Make sure you control your variables by using the exact same amount of water in your salt and freshwater tests.)