

THIS IS ROCKET SCIENCE



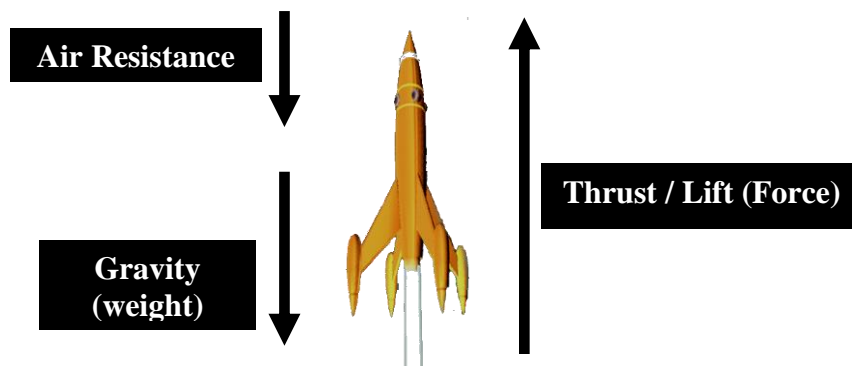
Purpose:

To create an air/powered rocket using paper and tape that is designed to obtain maximum height and velocity once launched.

Background Information: (please read BEFORE starting)

Humans, since early in our history, have looked to the skies above and wondered what lied beyond this world. The biggest obstacle from humans leaving has been **gravity**. **Yes, gravity**. Earth's gravity keeps pulling us down at 9.8m/s^2 (32ft/s^2). When we jump up we always seem to fall right back down to Earth (3rd Law – action/reaction). It was not until some one figured out that we needed to generate a larger force (thrust) than what gravity is pulling down on us did we emancipate (free) ourselves from Earth gravities attractive force.

When a rocket is launched into the sky there are many forces that act on it as it moves through the air. Look at the force Diagram below to see where the forces are directed and the magnitude (size) of the forces.



Newton's Laws of Motion help to explain a rocket in flight. First law states that rockets will stay in motion until acted on by an outside force (this is Inertia). The outside force that will act on your rockets is gravity. If your rocket was able to reach the escape velocity for objects on Earth (~25,000 mph) it would keep traveling forever in space (unless you hit a planet, asteroid or were pulled by the gravitational field of another planet).

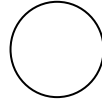
Fuselage (Rocket Body):



- 1.) Select one piece of paper to be the fuselage of your rocket
- 2.) Roll it up around the PVC pipe
- 3.) **VERY IMPORTANT:** Make sure it is not too tight or it will explode during launch. Make sure there is a little space between the paper and the PVC pipe when you roll it.
- 4.) Reread #3 right now.
- 5.) Use tape (**DON'T WASTER**) to secure the fuselage
- 6.) Write your names on it and give your rocket a name (**BIG LETTERS**).
- 7.) Protect it from thieves (See #6).

Pressure Cap:

The pressure cap helps keep the air pressure inside the fuselage. It helps prevent air from escaping out the nose cone. It seems like the pressure cap is not a big deal. **Well, it is.** If you want your rocket to rocket into the sky, make sure you include it and it is taped in place without any place for air to escape.



Fins:

Fins help to **stabilize** your rocket. Without them your rocket would tumble and spin out of control once it left the launch pad.

Designs

To ensure stability and safety, the **minimum number of fins** on a rocket is **three (3)**. Many people choose a 3 or 4 (or more) fin design. There is **no maximum** number of fins you may have, but keep in mind that the **more fins** you have the **more drag (air friction)** you will create. This decreases the efficiency of your rocket.

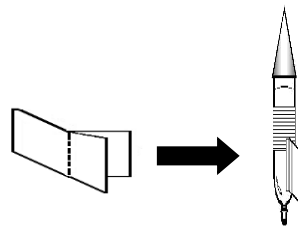
BASIC FIN DESIGNS



Placement on Fuselage:

You want to **place your fins** so you have the **lowest possible center of gravity**. If you were to place the fins above the center of gravity, the rocket would tumble and spin out of control (which is not good rocket science). Research this online for optimal fin placement and design.

1. **Choose** a design and cut it out of paper (trace the other fins using the first fin as a model).
2. Bend a tab on the root edge of each fin. **Trace** the fin base placement onto the bottle. (Make it as **vertical** and as **straight** as possible).
3. Use tape to attach each fin.



Nosecone:

The purpose of the nosecone is to make the rocket **more aerodynamic** (reduce air resistance during flight) and to **house your parachute** (however we will not be using parachutes in our rockets this time around). You are welcome to try different length nosecones to see how changing it affects your rocket. Make sure the nosecone points straight up.

