

## Rocket Construction

You will be constructing rockets in this activity.

You will need:

- ❑ Estes rocket engine
- ❑ Duct tape or other adhesive
- ❑ Cutting utensils
- ❑ Supplies: paper, tag board etc.

### Launch mechanics

Take a look at the rocket launcher. The launch rod is there to keep the rocket going pretty much vertically during the first second of the launch when slight instabilities might make it veer “off course”.

- ❑ Do not attach anything to your rocket that is going to interfere with the launcher.
- ❑ You will need a launching lug (so rocket travels along the rod). A piece of a straw works well.
- ❑ Do not cut the rocket engine. These are combustible!
- ❑ You need access to the bottom of the engine to insert an igniter plug just prior to launch.
- ❑ Do not use anything dangerous for mass... like metal, depleted Uranium etc.

### Aerodynamics

What makes a rocket or plane stable in flight. Basically you want your center of mass in front of your center of pressure.

- ❑ Toss a tube of paper (like a paper towel tube). Does it fly straight? or does it wobble?
- ❑ What can you do to stabilize your rocket?
  - Nose cone?
  - Fins or wings?
  - Mass?

Every rocket must pass a stability test to be eligible to launch.

- ❑ Swing Test:
  - Connect a string to the center of mass of your rocket.
  - Swing the rocket in a circle – you want the nose pointing in the direction of travel.
  - Try low velocities and high velocities.
- ❑ Symmetry:
  - If the rocket is not symmetric then you need to do swing tests for different orientations.

There is no one correct design. You just need to make sure your rocket flies straight. There is no substitute for experience so a bit of trial and error is to be expected.

If you have ever made a paper airplane you can try to figure out what made it stable and apply generalizations to your rocket design/construction.