

Bottle Rockets 2009

Egg-O-Naut

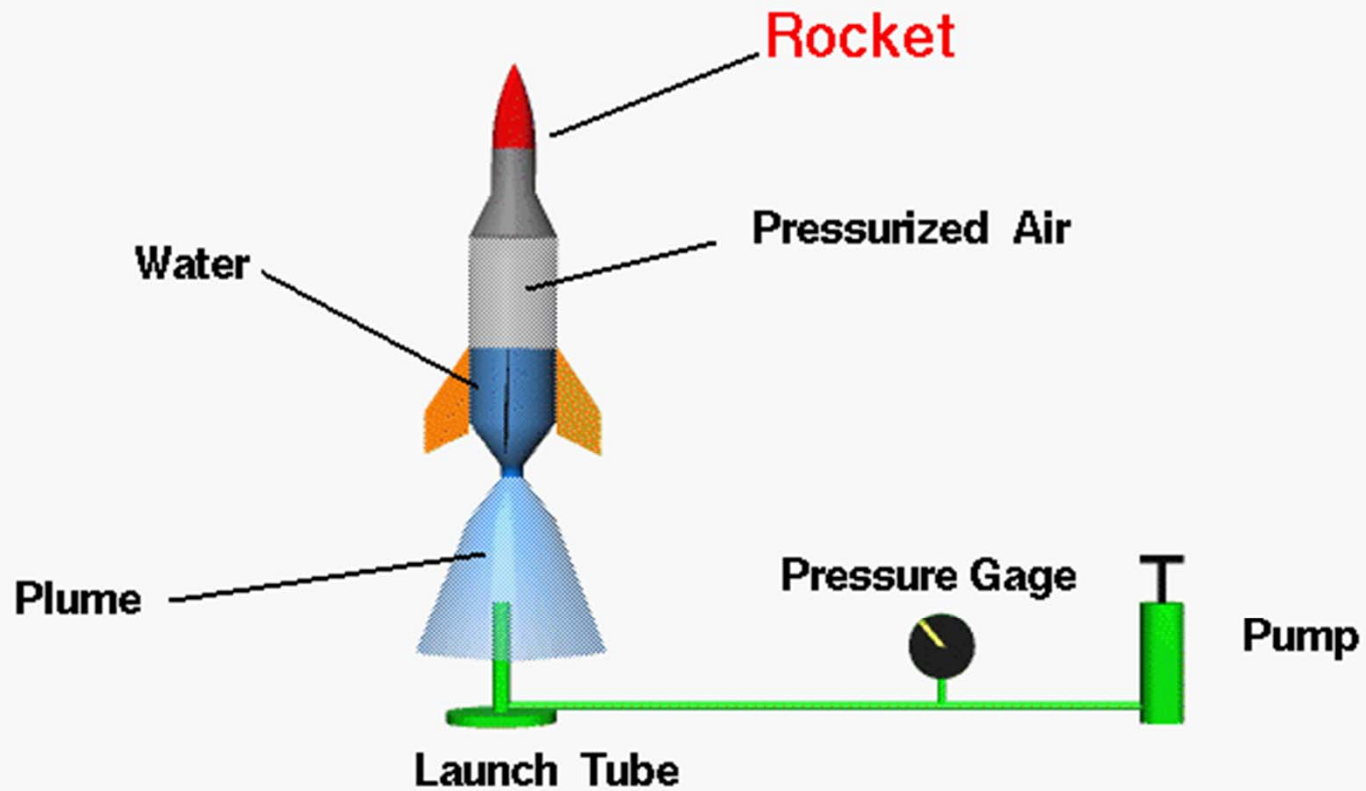
EVENT DESCRIPTION(2009):

B & C-event

Prior to the tournament teams will construct rockets designed to carry an Egg-O-Naut (a raw Grade A large chicken egg), stay aloft the greatest amount of time, and return to earth without breaking the egg.

Each rocket's pressure vessel must be made out of a single 1-liter or smaller plastic carbonated beverage bottles with a neck/nozzle opening approximately 2.2 cm inside diameter

How a Water Rocket Works



Parts of a Bottle Rocket

- Pressure chamber (soda bottle)
- Nose cone
- Fins
- Parachute/Recovery system
- Pay load (large raw egg)



Preparing the Bottle

DO NOT

- Scratch, cut or puncture the pressure chamber!
- Use hot/boiling water
- Knives/Razors
- Chemical solvents
- Hot glue or super glue

Even the smallest of scratches or cuts in the pressure chamber can result in an explosion. Besides the risk of physical injury

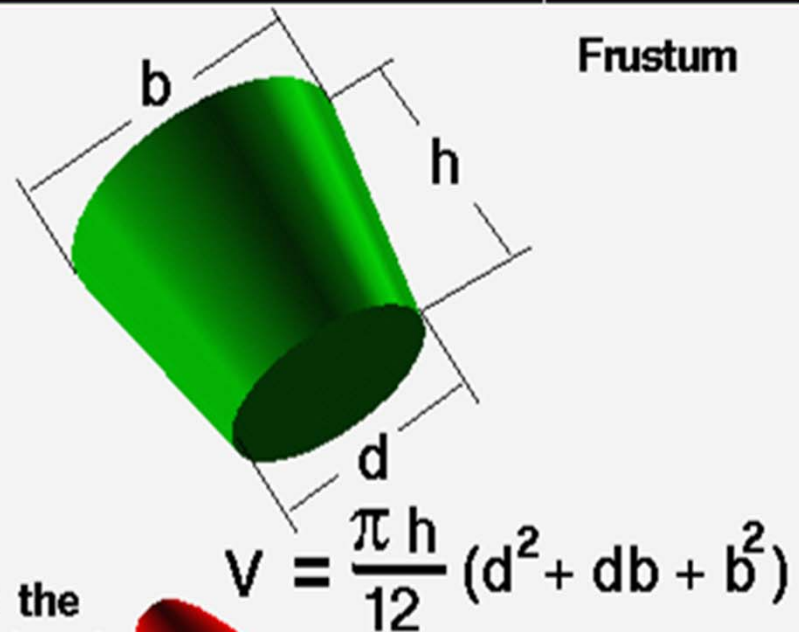
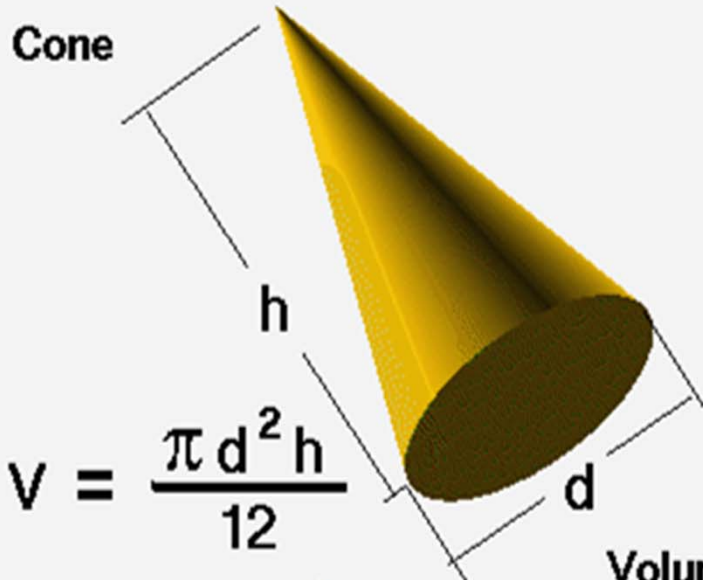
SO Rules

- Labels may be removed from the bottle but they must be presented at the safety inspection
- Metal may be used, but may not be attached to or have direct contact with the pressure vessel at any time. For safety, rockets may not use sharp or pointed metal components or a leading surface consisting of a rigid spike

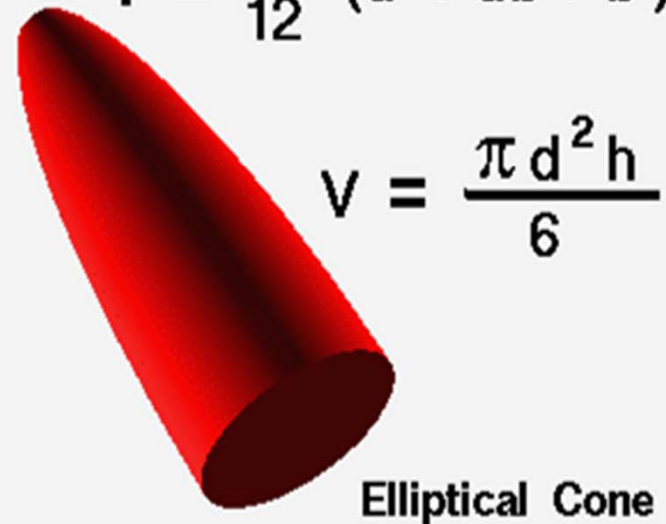
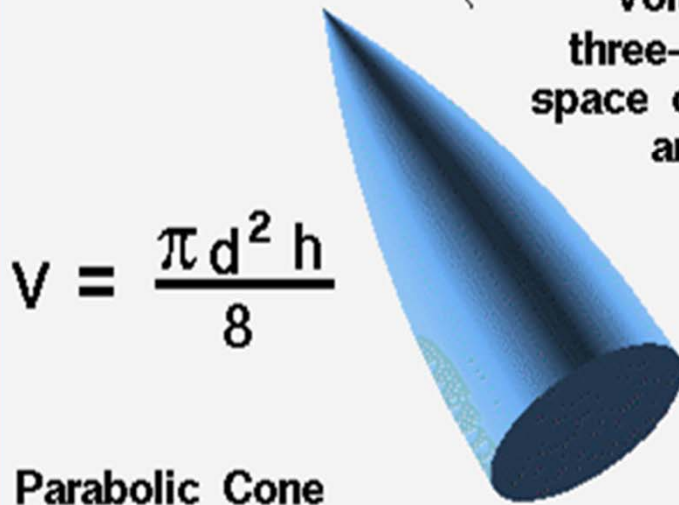
Nose Cones

- Nose cones, along with fins, are one of the most critical aerodynamic components of a rocket.
- A simple paper cone taped on top of the rocket is enough to significantly reduce the rocket's coefficient of friction.
- There are four common shapes used for nose cones:
 - Conical
 - Frustun
 - Elliptical
 - Parabolic

Nose Cones



Volume is the three-dimensional space occupied by an object.



Nose Cones

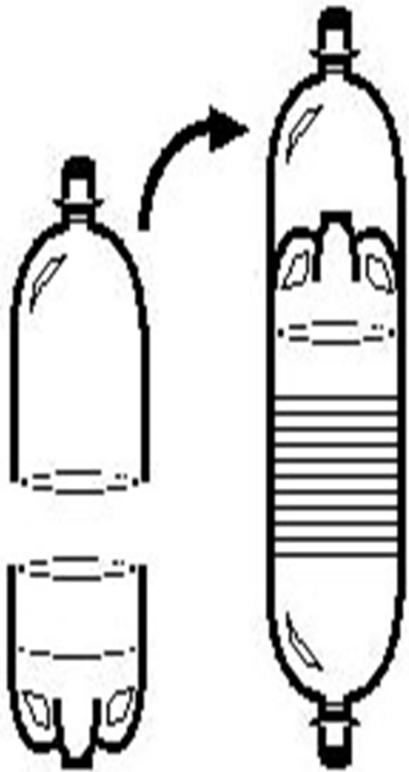
Here are several types of nose cones and the methods used to make them. These are only a few examples, so don't be afraid to be creative. The fins have been removed in the illustrations below for clarity

“The Flounder”



It is the easiest to make but lacks flight stability. The cone is made from poster board or tag board. You can make the cone by simply cutting a large circle out of the poster board (about a 6 inch radius). Attach to the bottle with tape or similar adhesive.

“The Bertha”



These are made by cutting the bottom off a spare bottle and attaching the top portion onto the pressure chamber. One strip of tape should be enough to hold the cone on.

Note: Never cut the pressure chamber

The "Space Needle"



This style of nose cone can be made from a spare bottle, empty paper towel roll, and a tennis ball or racket ball. This type of nose cone adds a great deal of inertial mass to the rocket and makes it really stable. Plastic egg halves will also fit nicely onto the "Space Needle" assembly.



Fins

Fins are the guidance system for your rocket. Without them a rocket lacks stability.

Fins tend to be the single greatest downfall of countless young rocket builders. With the incredible speeds and frightful acceleration generated at launch, many fins get ripped off the rocket body within a fraction of a second

Fins

How many fins do I need?

To ensure stability and safety, the minimum number of fins on a rocket is three (3). Many people choose a 3 or 4 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 you will create and drag slows a rocket down.

Fins

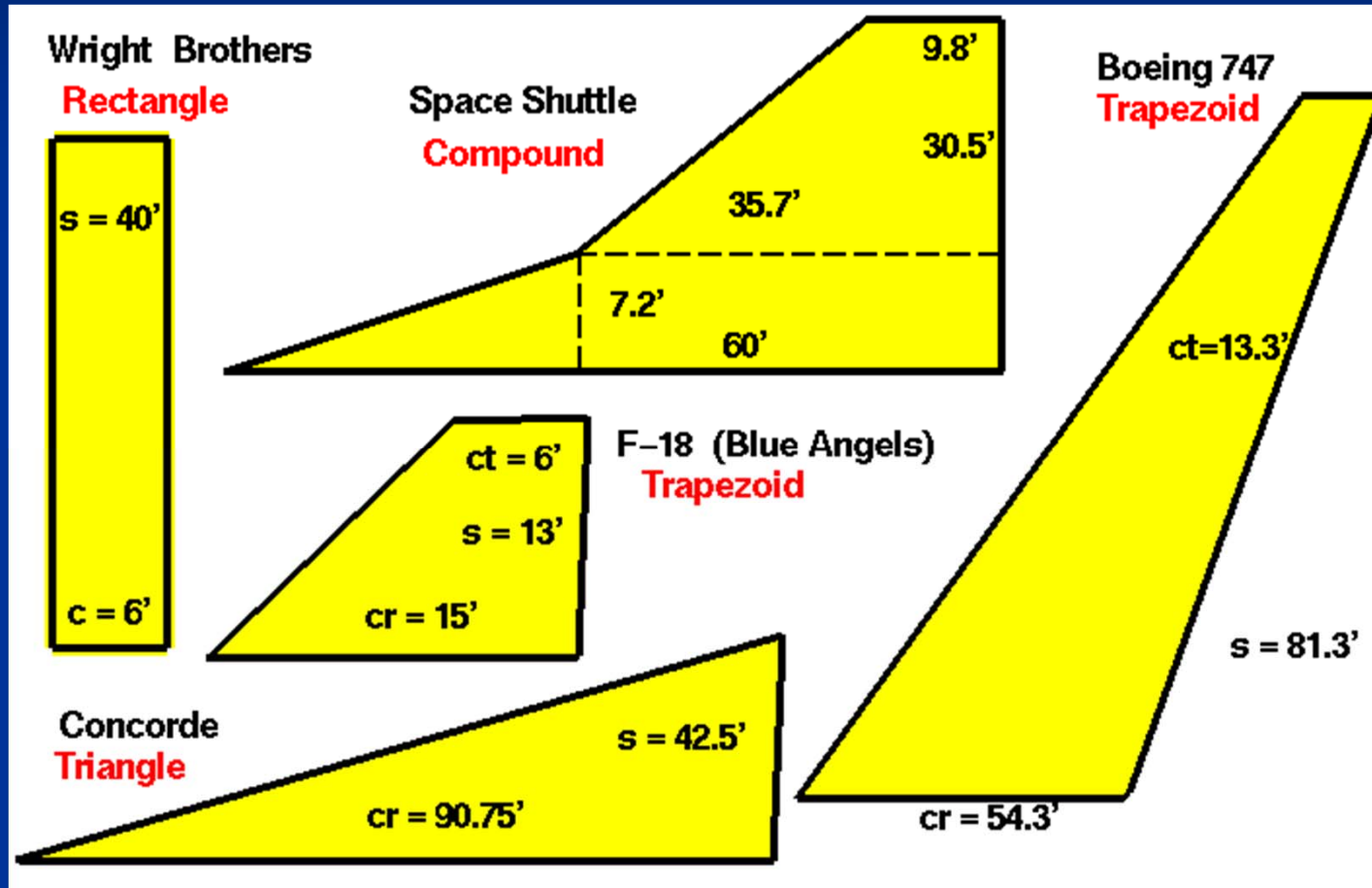
BASIC FIN DESIGNS



No forward swept fins

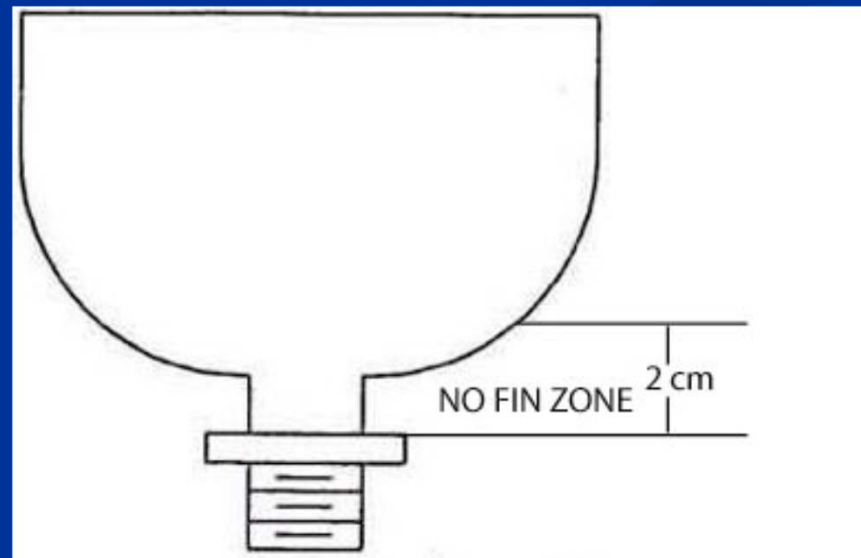


Fins



Fins

All rockets will be launched using the launcher provided by the supervisor. To insure rockets will fit on the launcher, fins and other parts added to the bottle must be 2 cm above the level of the flange on the bottle's neck.



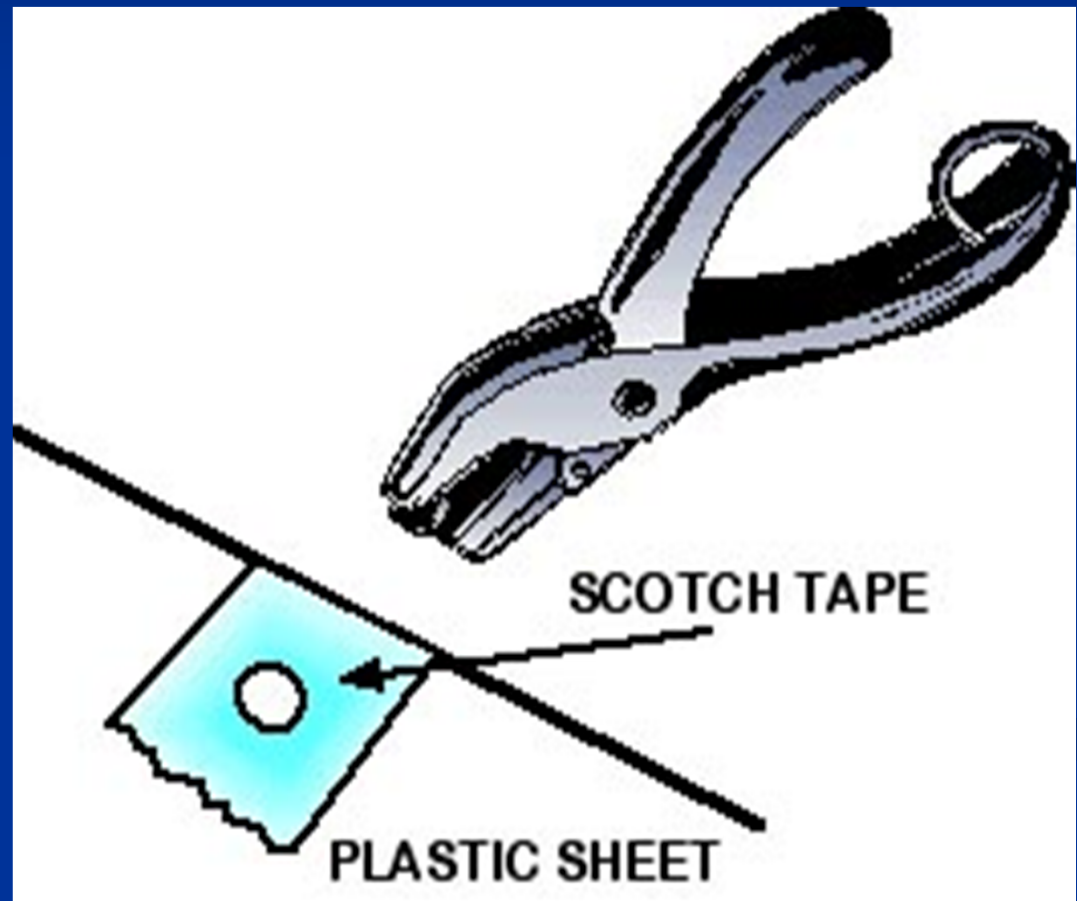
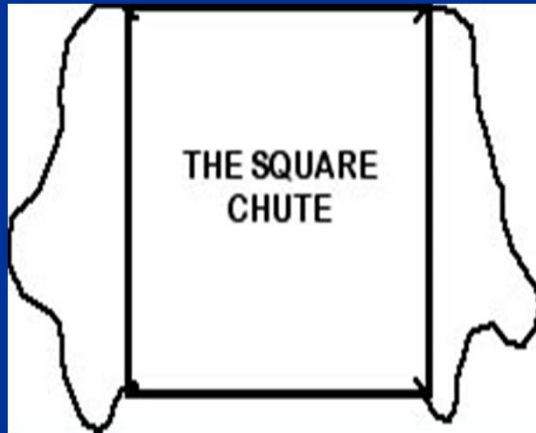
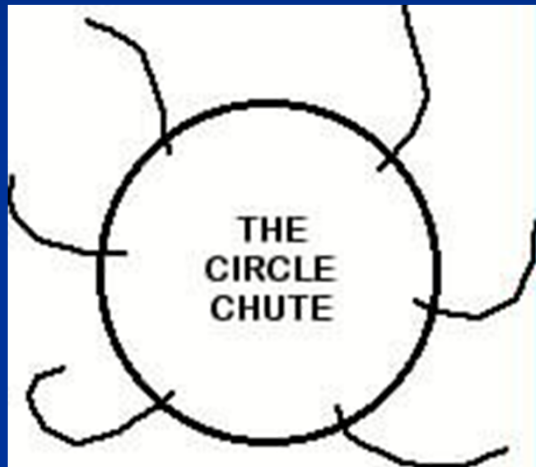
Parachute Systems

By now you may have spent several hours building the rocket of your dreams. It may not be completely obvious to you yet, but as the old saying goes, what goes up... must come down. It's time to think about saving all that precious work by creating a recovery system for your rocket. Here are a few ideas to get you started. Fins have been removed for clarity.



Parachute Systems

Shape of Chutes



Parachute Systems

Parachute materials:

- Tall kitchen garbage bag –or–
- Four-grocery plastic bags
- Kite string Yarn
- Baby Powder
- Scotch Tape



The size and shape of your parachute can be as varied as your rocket. A good rule of thumb is to make your chute about 12 inches across. Your chute could be larger but some rocket styles have narrow nosecones and the chute could get stuck.

Parachute Systems

Making a Circular Parachute

Step 1) Pinch plastic material in the middle and pick it up.



Step 2) Cut across the bottom



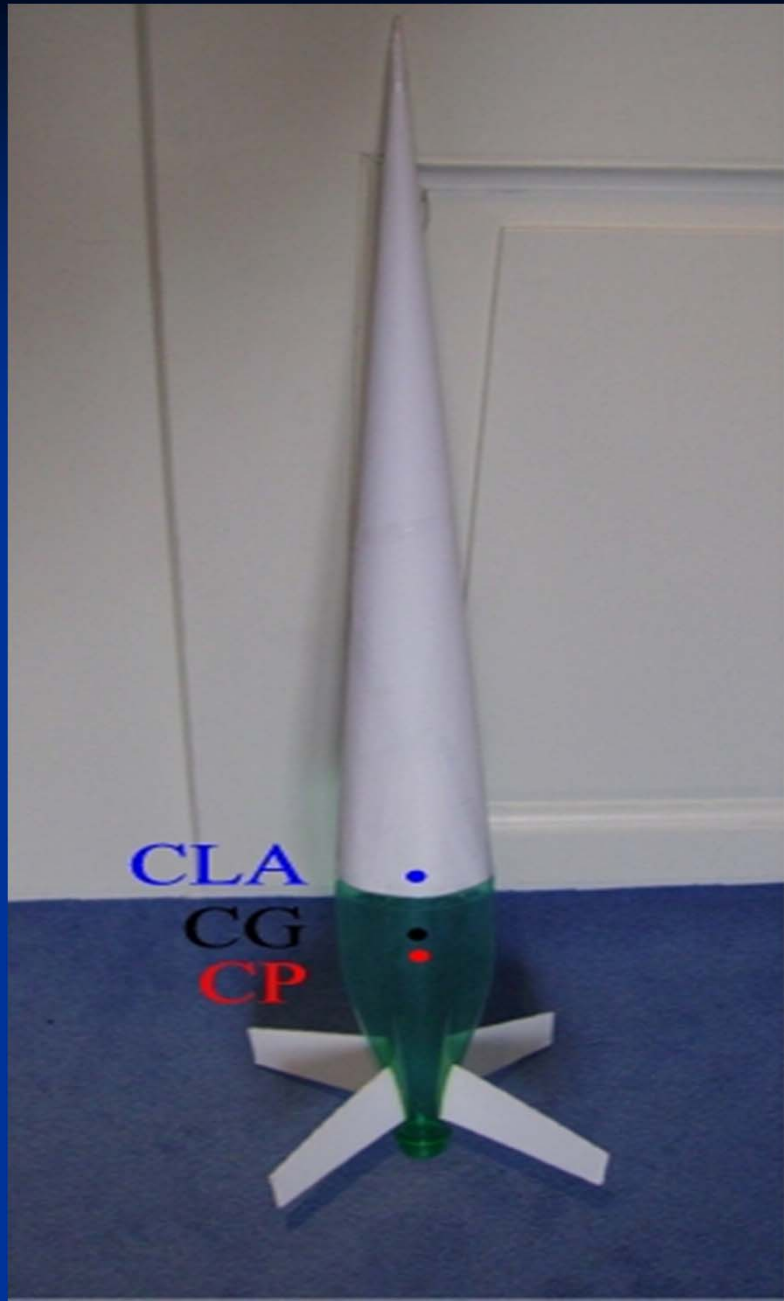
Parachute Systems

The Finished Product



Back Slider

- Backsliders are the rockets that are modified so that at apogee (the highest point in flight) the rocket does not nose dive but instead falls horizontally back to the ground. This horizontal fall catches more air and slows the rocket's descent.
- A backslider can be made by taking your aerodynamically stable rocket and moving the center of gravity so that it is in the same place as the center of pressure.



B and C Rules

- No commercial model rocket parts allowed
- The supervisor will provide raw Grade A large chicken eggs on which they have placed an identifying mark (using a Sharpie or ink stamp) to insure that teams are using the eggs provided. The rocket(s) must be built so that the egg is easily removed. Nothing (e.g., glue or tape) may be adhered to the egg.

B and C Rules

- The rockets and each part that is intended to separate must be clearly marked by the teams in such a way that the judges can easily identify the team and each individual rocket.
- The part of the rocket containing the Egg-O-Naut should be brightly colored if it is to detach from the rocket.

Competition

- All rockets will be launched at 60 psi.
- Teams should arrive at the competition site ready to launch. Teams must bring and **wear** safety spectacles/goggles for loading, launching, and retrieving their rockets and Egg-O-Nauts.
- Following the safety inspection of each rocket, teams will receive 1 egg per rocket, add any amount of water
- The teams will have a total of 5 minutes to launch 1 or 2 rockets they have brought to the competition (only 1 launch per rocket)..

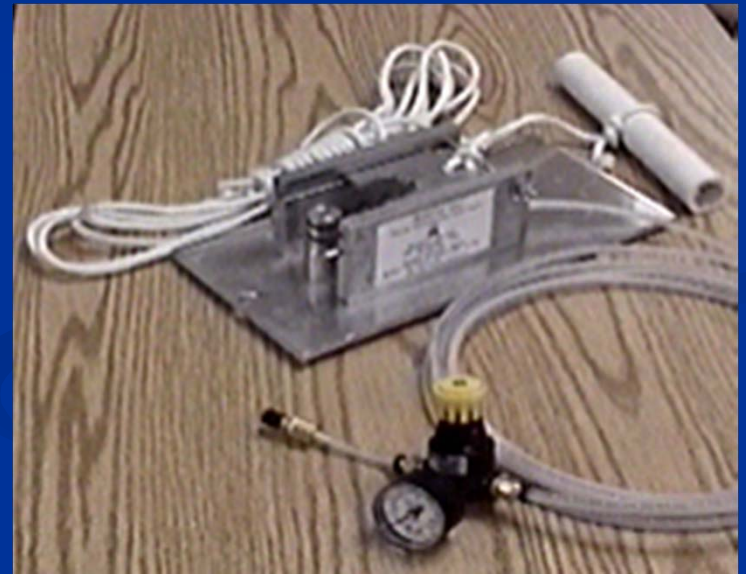
Competition

- The teams will retrieve their rockets and show the rocket or capsule with the Egg-O-Naut to an event inspector. The Egg-O-Naut capsule or wrapping must be opened in the presence of an event official.
- The part of the rocket containing the Egg-O-Naut should be brightly colored if it is to detach from the rocket.

Scoring B and C

- An Egg-O-Naut (or portion of the rocket containing the egg) that completely detaches from the pressure-vessel will receive a **3** second bonus.
- Rockets may use any type of recovery device including parachutes
- Egg-O-Nauts that can be retrieved **and** survive will receive a **15** second bonus.

Example Launchers



Forces on a Rocket

