Bottle Rockets for 2015-2016

Division B only
Team and Required Equipment

• Up to 2 team members
• Up to 2 qualified rockets
• **No impound** required

• **Eye Protection #5 (High Impact ANSI Z87+)**
  – Check the lens corners (see example)
  – These are **not** splash goggles
  – More like Racquetball glasses
  – Only **one** warning
General Construction
(Pressure Vessel)

• No larger than 2-liter (2000 ml max)
• Carbonated beverage bottles only
  – Launch pressure is 45-60 PSI. (TBA on that day)
• 2.2cm (22 mm) neck opening (std)
• Labels may be removed, but must be presented at the pre-launch inspection.
• See 5cm rule (below)
The 5 cm Rule

• In order to guarantee the rocket will fit on any launcher. Lowest part of fins/ballast must be 5cm above the opening.

Launchers attach on this flange

5cm (No fins)
Detailed Construction
(Pressurized portion)

• No sanding, painting, or other damage (safety)
• No glue on the Pressure Vessel (safety)
  – Tape is not glue!
  – Duct tape, masking, painter’s tape, or packing tape is OK.
• Preserve the integrity of pressure vessel!
• Rockets with safety violations will not launch!
Upper portions (not pressurized)

• Most anything goes (Tape, Glue, Paint, ...etc)

However:

• Must stay attached to pressure vessel.

• No metal parts or commercial rocket parts anywhere

• No parachutes or other “deployed” drag devices, helicopter blades or flaps.

• No sharp nosecones or spikes

• Rocket must not change shape!

• Intention is to recover only one piece.
New for 2015-2016

• Eggs! – (OMG!)
  – Raw, Grade A, Large – (2.1oz, 60 grams)
  – No survival enhancements applied to eggs. (tape/glue)
• These are supplied on launch day by event supervision. Marked to prove they are not swapped during competition. Survival affects score.
• Tip! - Cushion both launch and landing forces.
• Egg must be inspected by an event supervisor.
• Need to have an accessible cargo bay!
• Tier 1: 2 surviving eggs
• Tier 2: 1 survivor
• Tier3: No survivors.

50% mortality is expected (based on past experience)
Competition Day

• Following the Safety Inspection rockets will be assigned to:
  • Class A (both fully comply with safety and construction)
  • Class B (complies with safety, but not construction- zero time for that rocket) – Tier 2 score
  • Class DQ (any safety violations) - you still get participation points -
• Everyone else is “Not Competing” (worst than last place)
  – 10 minutes to fuel and launch both rockets
    – (launcher, water, eggs and air are supplied)
    – Load eggs, Fuel and place on launcher
    – Remove people to the minimum safe distance (end of launch cord)
    – Pressurize rocket (once this starts, we are committed!)
    – Signal “ready”, countdown, then launch
  – Remaining time is used to fuel, and launch a 2nd rocket
• Each qualified rocket will launch only once.
• No parts to be re-flown, even on a different rocket!
Scoring

• Rockets are timed to 1/100\textsuperscript{th} of a second
  – First ground contact stops the clock (fin, nosecone, ...etc)
  – \textit{Slowed} by a tree, on a building ...etc.
  – Or lost from sight! (Lost eggs count as broken)

• Combined flight time of both rockets.
  – Assuming both rockets belong to same Tier.

• Tie breaker goes to the team with the longest single flight.
  – A) 13.20, 8.80  B) 11.00, 11.00  A) longer flight

• In the case where one rocket (out of two) has any violations, the non-compliant rocket time will not be added in.
Launch Day Weather Items

• Outdoor event, weather cannot cause a foul.  
  However!

• Temperature below 0°C, (32°F, 273°K)
  – Launch equipment functionality
  – Ice pellets sting! (not likely at State)

• Active Thunderstorm (electrocution hazard?)
• Heavy Downpour (Slips, Falls, drowning ?)
• Too much wind to keep in area assigned?
Helpful Hints

• Stability -
  - Long and skinny rockets are easier to make stable than short and fat ones. You can lengthen the body of your rocket by stacking a second plastic bottle on top of your pressurized bottle. A tube made of heavy paper may also be used to add length.
Helpful Hints

• Stability-
  – The safest and easiest way to check your rocket's stability is to do a "swing test." Attach a string to the rocket at its center of gravity. Then, swing the rocket around yourself, holding on to the string, to see if it is stable.
  – If the rocket tumbles and does not straighten out, then it will probably fly badly when launched.
  – Make adjustments to your design, lengthen the body, add fin area, or nose weight, until it no longer tumbles.
  – **Caution**: Weight can (and does) shift during launch!
Helpful Hints

• Leave labels on the bottle
  – one less thing to forget
  – no real drag/weight effects
Questions