**BOTTLE ROCKETS**

**DESCRIPTION:** Prior to the tournament, teams design and construct one rocket designed to stay aloft for the greatest amount of time.

**1. EVENT PARAMETERS:**

a. Teams must design, build, and test one pressurized water rocket. Teams must wear eye protection during the loading, launching, and retrieving of their rockets. Teams may also bring their own funnels, measuring devices and other necessary tools to prepare their rockets.

b. The teacher will provide the launcher and water.

**2. CONSTRUCTION PARAMETERS:**

a. PRESSURE VESSEL: Rocket pressure vessels must be made out of a single 2 liter or less plastic CARBONATED beverage bottle with a neck/nozzle opening internal diameter of approximately 2.2 centimeters (a 1/2 inch Schedule 40 PVC pipe must fit tightly inside the nozzle opening).

i. Labels: Labels may be removed from the pressure vessel bottle

ii. Attachment: Only tape may be used to attach fins and other components directly to the pressure vessel.

iii. Materials: Metal of any type and/or commercial model rocket parts are prohibited anywhere on the rocket.

iv. Structural Integrity: The structural integrity of the pressure vessel must not be altered. This includes, but is not limited to: physical, thermal, or chemical damage (e.g., cutting, sanding, using hot or super glues, spray painting). Alteration to the structural integrity of the pressure vessel results in a safety violation of the rocket and it must not be launched. Event supervisors must assess the structural integrity by looking through the nozzle and sides of the bottle for abrasions, discoloration, distortion, bubbles, thinning or cuts in the walls.

b. NOSE: Rockets must use a blunt or rounded nose. The nose must be designed such that when a standard 2 liter bottle cap is placed on top of the nose, no portion of the nose touches the inside top of the bottle cap (see Figure 1).

c. FINS: Fins and other parts added to the bottle must be five centimeters or higher above the level of the bottle’s opening to ensure rockets fit on the launcher (see Figure 2).

d. ENERGY: Explosives, gases other than air, chemical reaction, pyrotechnics, electric or electronic devices, elastic powered flight assists, throwing devices, remote controls, and tethers are prohibited at any time. All energy imparted to the rocket at launch must originate from the water/air pressure combination.

e. RECOVERY SYSTEM: Rockets may use any type of free-fall recovery system; however, the recovery system must be judged as safe and not violate any other rules.

**3. THE COMPETITION:**

a. Teams must arrive at the competition site ready to launch. Following the safety inspection of rockets, teams may add any amount of water to the inspected rockets. All rockets must be launched using the launcher provided by the supervisor.

b. When called to launch, the teams have a total of 3 minutes to launch their rocket (only 1 launch per rocket).

c. All rockets must be launched at 60 psi. Once the rocket is pressurized, teams must not touch or approach the rocket.

d. Time aloft is recorded in hundredths of a second. Timing begins when the rocket separates from the launcher and stops when any part of the rocket touches the ground, goes out of sight, or comes to rest on an obstruction (e.g., a tree or building).

**4. SCORING:**

a. Ranking within each tier is determined by the greatest time aloft of a single rocket

i. Tier 1: Any launch without construction or competition violations.

ii. Tier 2: Any launch with competition violations.

iii. Tier 3: Rockets with construction violations will not be launched due to safety. Ties may result in this situation.

iv. Failure to properly wear eye protection will result in disqualification.

b. Ties in tiers 1 and 2 are broken by the better score of each tied team’s other rocket.