

BOTTLE ROCKET

1. **DESCRIPTION:** Prior to the tournament, teams will construct two rockets designed to stay aloft for the greatest amount of time.

A TEAM OF UP TO: 2 **IMPOUND:** No **EYE PROTECTION:** Z287+ **EVENT TIME:** 10 min

2. **EVENT PARAMETERS:** Teams must bring rockets, carbonated beverage bottle labels (if removed), and safety glasses. Teams must wear safety glasses during the loading, launching, and retrieving of their rockets. Teams may also bring funnels, measuring cups, and/or other tools to help prepare their rockets. Event Supervisors will provide water rocket launcher, water, score sheets, and timers.

3. **CONSTRUCTION PARAMETERS:**

a. The rocket pressure vessel is the part of the rocket that attaches to the launcher and is filled with water and air. The pressure vessel must be made out of a single **2 liter** plastic carbonated beverage bottle with a neck/nozzle opening internal diameter of approximately 2.2cm (a ½ inch Schedule 40 PVC pipe must fit tightly inside the nozzle opening). Labels may be removed from the bottle but labels must be presented at the safety inspection to prove the bottle is carbonated. Rockets without labels must not be launched, as this is a safety issue.

b. Only tape must be used to attach fins and other components to the pressure vessel. No glues of any type may be used on the pressure vessel. Glue may be used in other parts of the rocket assembly. Metal of any type and commercial model rocket parts are prohibited anywhere on the rocket.

c. 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 any glues, spray painting). Event supervisors must assess the structural integrity by looking through the nozzle and sides of the bottle for discoloration, bubbles, thinning or cuts in the walls. Rockets violating this rule must not be launched, as this is a safety issue.

d. Rockets must use a blunt or round nose. The nose must be designed such that when a standard 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). Teams must not use a nose that is sharp, pointed, or consisting of a rigid spike regardless of the material used. Rockets violating this rule must not be launched; this is a safety issue.

e. All rockets must be launched using the launcher provided by the supervisor. Fins and other parts added to the pressure vessel must be 5 cm or higher above the level of the bottle's opening to ensure rockets fit on the launcher (see Figure 2).

f. Total weight of the rocket prior to filling with water shall be 100-250 grams. The maximum length shall not exceed 1 meter.

g. Explosives, gases other than air, chemical reactions, 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. Rockets violating this rule must not be launched, as this is a safety issue.

h. The school name and team number must be clearly marked on all rockets.

4. **THE COMPETITION:**

a. All rockets must be launched using the launcher and water provided by the supervisor.

b. Only one launch is allowed per rocket.

- c. Teams must arrive at the competition site ready to launch. Teams must bring and wear safety glasses for loading, launching, and retrieving their rockets. Teams must also present labels from the pressure vessel if labels were removed. Following the safety inspection of each rocket, teams will add water to each rocket. When called to launch, the teams will have a total of 10 minutes to launch the rockets brought to the competition (only 1 launch per rocket). Only rocket(s) launched before the time expires will be scored. Pieces from 1 rocket cannot be recycled for use on the second rocket.
- d. All rockets will be launched at **50 psi**. Once the rocket is pressurized, no contestant may touch or approach the rocket.
- e. Parts of the rocket must not fall off or become separated during launch or flight.
- f. Time aloft is recorded in tenths 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 a tree, building, or other obstruction.
- g. Event leaders are strongly encouraged to use three independent timers on all launches. The middle value of the three timers should be the officially recorded time.

5. SCORING:

- a. Rockets that violate a safety related rule under Construction Parameters will not be launched and will receive participation points only.
- b. Ranking within each tier is determined by the greatest combined time aloft for both rocket flights.
 - i. Tier 1: Rockets launched without any violations
 - ii. Tier 2: Any launch with competition violations, or a non-safety construction violation.
- c. Ties in tiers 1 and 2 are broken by the better score of each tied team's longest single rocket flight.

