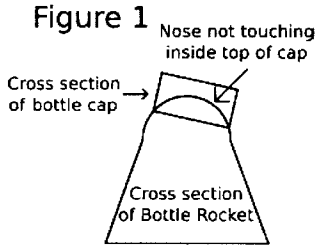
BOTTLE ROCKET

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

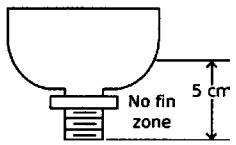
1. **DESCRIPTION:** Prior to the tournament, teams construct up to two rockets designed to stay aloft for the greatest amount of time while carrying a raw Grade A large chicken egg that survives impact.
   A TEAM OF UP TO: 2 **IMPOUND**: No **EYE PROTECTION**: **B MAX TIME**: 10 min. for both launches
2. **EVENT PARAMETERS**: Teams must have eye protection and design, build, and bring up to two rockets to the tournament (only 1 launch per rocket). Parts from one rocket must not be used on another rocket. Event Supervisors (ES) must provide **one** egg **for each rocket**, launchers and water. The ES will mark each egg to ensure that teams are using the eggs provided. Teams must use launcher provided by the supervisor.
3. **CONSTRUCTION PARAMETERS**:
   a. Pressure vessels must be made out of a single **1-liter** or less plastic carbonated beverage bottle with a nozzle opening internal diameter of approximately 2.2 cm (a 1/2 inch Schedule 40 PVC pipe must fit tightly inside the nozzle opening). Bottle labels may be removed but must be presented at inspection.
   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 hot or super glues, spray painting).
   d. Alteration to the structural integrity of the pressure vessel results in a safety violation of the rocket and it must not be launched. The ES assess structural integrity by looking through the nozzle and sides of the bottle for discoloration, bubbles, thinning or cuts in the walls.
   e. The nose of the rocket must be rounded at the tip and designed such that when a standard **1**-liter bottle cap (~3.1 cm diameter x 1.25 cm tall) is placed on top of the nose, no portion of the nose touches the inside top of the bottle cap - see Fig. 1.

Figure 1



   f. Explosives, gases other than air, chemical reactions, pyrotechnics, electrical 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.
   g. Fins and other parts added to the bottle must be 5 cm or higher above the level of the bottle's opening, to ensure rockets fit on the launcher - see Figure 2.

Figure 2



   h. Rockets must not change shape or deploy any type of recovery system during launch or flight.
   i. Nothing (e.g., glue or tape) may adhere to the egg.
4. **THE COMPETITION**:
   a. Following the safety inspection of the rockets, teams are allowed to inspect and select the eggs they will launch. If a team breaks an egg before launch, they may request another egg but have a penalty of **5** seconds subtracted from their score.
   b. Time begins when called to launch. The team has a total of 10 minutes to add any amount of water to the inspected rockets, load the provided eggs, and launch the rockets (only 1 launch per rocket). Any rocket launched before the time expires must be scored.
   c. Rockets must be launched at a minimum of 45 psi and a maximum of 60 psi. Launch psi must be the same for all teams and will be announced at the beginning of the competition. Once 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 or piece of the rocket touches the ground, goes out of sight, or is slowed by an obstruction (e.g., a tree or building).
   e. ES is strongly encouraged to use three independent timers on all launches. **All three times should be recorded and** the middle value of the three timers must be the officially recorded time.
   f. Teams must retrieve their rockets and remove the egg in the presence of the ES.
   g. **The ES must verify with the team the correct recording of data on the team scoresheet.**
5. **SCORING**: Rockets in violation of rules **3.a-f** will not be launched due to safety. Teams that are unable to launch both rockets because of safety violations will receive participation points only. Any rocket that violates construction rule **3.g-i**, or has a competition violation will receive a launch time of zero for that rocket. An irretrievable rocket will be scored as if the egg did not survive. Survival is defined as an egg leaving no wet spot on a paper towel. Ranking within each tier is determined by the highest combined time aloft of both rockets: Tier 1: Launches with 2 surviving eggs; Tier 2: Launches with 1 surviving egg; Tier 3: Launches with no surviving eggs. Ties within Tiers: Tiers 1 & 3 ties will be broken by the greatest time aloft by a single rocket; For Tier 2 ties will be broken by the surviving egg's rocket greatest time aloft.

Recommended Resources: All reference and training resources including the **Bottle Rocket DVD** are available on the Official Science Olympiad Store or Website at http://www.soinc.org

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