



BOTTLE ROCKET

Read the General Rules in the manuals and on www.soinc.org as they apply to every event.

1. **DESCRIPTION:** Prior to the tournament, teams construct two rockets designed to stay aloft for the greatest amount of time.
A TEAM OF UP TO: 2 IMPOUND: No **EYE PROTECTION:** #5 **APPROXIMATE TIME:** 10 min.

2. **EVENT PARAMETERS:**

- Teams must 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.
- Teams without proper eye protection must be immediately informed and given a chance to obtain eye protection if time allows, otherwise they will not be allowed to compete and scored as a no-show.
- Event supervisors must provide the launcher and water.

3. **CONSTRUCTION PARAMETERS:**

- 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 cm (a 1/2 inch Schedule 40 PVC pipe must fit tightly inside the nozzle opening). Labels may be removed from the bottle but must be presented at the safety inspection.
- 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.
- 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 assess structural integrity by looking through the nozzle and inside sides of the bottle for discoloration, bubbles, thinning or cuts in the walls.
- The nose of the rocket must be rounded or blunt at the tip and designed such that when a standard 2 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 Figure 1). Teams must not use a nose that is sharp, pointed, or consisting of a rigid spike regardless of the material used.
- 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.
- All rockets must be launched using the launcher provided by the supervisor. 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).
- Rockets must not change shape or deploy any type of recovery system.

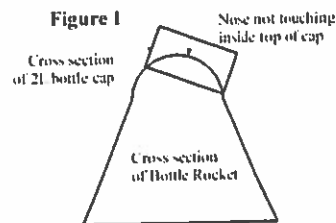
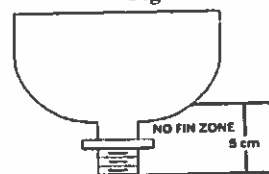


Figure 2



4. **THE COMPETITION:**

- Teams must arrive at the competition site ready to launch. Following the safety inspection of the rockets, teams may add any amount of water to the inspected rocket(s). When called to launch, the teams have a total of 10 minutes to launch the rockets (only 1 launch per rocket). Any rocket launched before the time expires must be scored.
 - Rockets must be launched at 60 psi. Once pressurized, teams must not touch or approach the rocket.
 - Parts of the rocket must not fall off or become separated during launch or flight.
 - 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).
 - Event supervisors are strongly encouraged to use three independent timers on all launches. The middle value of the three timers must be the officially recorded time.
5. **SCORING:** Rockets with construction or safety violations will not be launched due to safety. Teams that are unable to launch a rocket because of construction violations will receive participation points only.
- Ranking within each tier is determined by the combined greatest time aloft of both rocket flights. If a team only launches one rocket then that team will receive only the flight time for that launch.
 - Tiers: Teams with a Tier 1 rocket and a rocket with a violation are scored as if they had only one rocket.
 - Tier 1: Rockets launched without construction or competition violations.
 - Tier 2: Any Launch with competition violations.
 - Ties are broken by the greatest time aloft by a single rocket.

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>

1. **DESCRIPTION:** The objectives of this event are for the team to design and build the lightest bridge with the highest structural efficiency that can span a given opening meeting the requirement specifications.

A TEAM OF UP TO: 2 **IMPOUND:** No **EYE PROTECTION:** #2 **MAXIMUM TIME:** 8 Minutes

2. **EVENT PARAMETERS:**

- a. Each team is allowed to enter only one Bridge built prior to the competition.
- b. Team members must wear proper eye protection during the set-up and testing of the bridge. Teams without proper eye protection must be immediately informed and given a chance to obtain eye protection if time allows. Teams without eye protection must not test and must be ranked in Tier 4.
- c. The Event Supervisor must provide all assessment devices, testing apparatus, two bucket stabilization sticks, and clean, dry sand or similar dry, free-flowing material (hereafter "sand").

3. **CONSTRUCTION PARAMETERS:**

- a. All construction must be completed prior to check-in.
- b. The Bridge must be a single structure designed and built by the team to sit upon two Test Supports (4.b.) at either end of the bridge and support a Loading Block (4.c.).
- c. The bridge must span an opening of 35.0 cm (Division B) or 45.0 cm (Division C).
- d. There is no maximum length or height.
- e. The outside width of the Bridge must be at least 5.0 cm at any height along its span. No portion of the bridge may extend below the top surface of the Test Supports (4.b) prior to testing.
- f. The bridge must accommodate a Loading Block Assembly placed in the center of the bridge span.
- g. All parts of the Bridge must be constructed of wood and bonded by adhesive. No other materials are permitted (e.g., no particle board, wood composites, bamboo or grasses, commercial plywood, structural members formed of sawdust and adhesive, paper price labels or paper).
- h. There are no limits on the cross section sizes or lengths of individual pieces of wood. Wood may be laminated by the team without restriction.
- i. Any commercially available adhesive may be used. Adhesive is defined as a substance used to join two or more materials together. Adhesives include, but are not limited to: glue, cement, cyanoacrylate, epoxy, hot melt, polyurethane and super glues. Adhesive tapes are not allowed.
- j. **Students must be able to answer questions regarding the design, construction, and operation of the device per the Building Policy found on www.soinc.org**

4. **TESTING APPARATUS:**

- a. The Test Base **must** be a solid, level surface as follows:
 - i. **Must** be at least 55.0 cm long x 32.0 cm wide.
 - ii. **Must** have a smooth, hard surface (e.g., hardwood, metal, or high-pressure plastic laminate). The Test Base **must** be stiff enough so it does not bend noticeably when loaded.
 - iii. **Must** have an opening at its center approximately 20.0 cm x 20.0 cm, for bucket suspension.
 - iv. **Parallel lines must be marked across the width of the surface of the Test Base to indicate the Clear Span. A centerline dividing the Test Base in half must be marked on the Test Base; lines at 17.5 cm for Division B, or 22.5 cm for Division C, on each side of the centerline will indicate the Clear Span. The Bearing Zones are the test base surfaces wider than the Clear Span lines. Refer to example on www.soinc.org**
- b. The Test Supports supplied by the Event Supervisor **must** meet the following requirements:
 - i. Two identical supports at least 3.0 cm x 3.0 cm x 15.0 cm.
 - ii. Made of a material that does not noticeably compress when loaded
 - iii. Have smooth, hard surfaces (e.g., hardwood, metal, or high-pressure plastic laminate)
- c. The Loading Block Assembly **must** consist of:
 - i. A square block measuring 5.0 cm x 5.0 cm x approximately 2.0 cm high with a hole in the center of the 5.0 cm x 5.0 cm faces for a 1/4" threaded eyebolt.
 - ii. 1/4" threaded eyebolt (1" nominal eye outside diameter), no longer than 4" and a 1/4" wing nut.
- d. A chain and S-hooks that are suspended from the Loading Block assembly.
- e. An approximately five gallon plastic bucket with a handle to be suspended from the chain and hook