PING PONG PARACHUTE B

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

1. **DESCRIPTION:** Prior to the tournament, teams will design, build, and bring up to two bottle rockets to the tournament to launch a ping pong ball attached to a parachute to stay aloft for the greatest amount of time.

   A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 5 minutes

   EYE PROTECTION: B

2. **EVENT PARAMETERS:**
   a. Teams must provide up to two rockets, two unaltered standard ping pong balls, and two parachutes.
   b. Parachutes must be attached to ping pong balls with tape only. The ping pong ball attached to the parachute assembly makes up the parachute payload system.
   c. Event Supervisors must provide a launcher (that uses a Schrader valve), an air pump, a pressure gauge, and timing devices. Teams may bring their own manual bicycle pump with a pressure gauge to use, but it must attach to the launcher provided by the Event Supervisor. **Event supervisors are encouraged to make multiple launchers available with slightly differing connection widths (21.5 mm - 22.0 mm diameters). Connection of the air pump to the launcher must be completed before timing begins for the students. Connection to the launcher must be completed before timing begins for the students. If a rocket is not maintaining pressure with one launcher, students must be allowed to change launchers (if available) while the timer is stopped.**
   d. This event should be held inside with a high ceiling (greater than 20 feet recommended). Tournament directors must provide the ceiling height (in feet) to teams **with as much advance notice as possible.** Extreme care must be taken to protect the floor and ceiling of any inside facilities used for practice and competition. **Tournament officials are encouraged to reduce air flow (HVAC, doors opening, etc.) as much as possible.**

3. **CONSTRUCTION PARAMETERS:**
   a. Rocket pressure vessels must be made from a single 1-liter or less plastic carbonated beverage bottle with a nozzle opening internal diameter of approximately 2.2 cm and a standard neck height from flange to bottle's opening of under 1.6 cm. The bottle label must be presented.

Figure 1

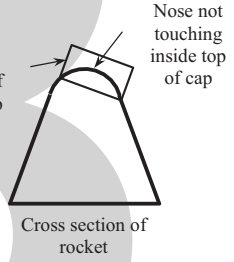
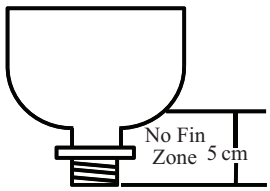


Figure 2



   b. 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).
   c. The nose of the rocket must be rounded or blunt at the tip and designed such that when a standard 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).
   d. 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. Metal of any type is prohibited anywhere on the rocket or parachute payload system.
   e. 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).
   f. All energy imparted to the rocket/parachute payload system must originate from air pressure provided by the **air pump through the launcher; water is not allowed to be used**. Gases other than air, explosives, liquids, chemical reactions, pyrotechnics, electrical devices, elastic powered flight assists, throwing devices, remote controls, and tethers are prohibited at all times.
   g. **Mylar/ultrafilm materials must not be used in any part of the parachute or rocket.**
   h. **Participants must be able to answer questions on design, construction, and operation of the device per the Building Policy found on www.soinc.org.**

4. **PRACTICE LOG:**
   a. During inspection, each team must present a flight log of recorded data. Data must include five or more parameters (three required and at least two additional) for 10 or more test flights prior to the competition. The required parameters are: 1) pressure (psi), 2) estimated peak flight height (feet), 3) time aloft (seconds). The additional parameters are chosen by the team (examples include: number of fins, parachute diameter, etc.)



b. An incomplete flight log is a flight log that is missing at least one of the required or additional parameters or does not include data for at least 10 total flights.
c. **Teams must use their data to justify their pressure choice. Teams without a flight log or an incomplete flight log will not be allowed to be pressurized beyond an event-supervisor determined safe pressure that will be the same for all teams without complete practice logs and will ensure rockets will not reach the ceiling. Additionally, teams without a flight log will have their final score multiplied by 0.7 and teams with an incomplete flight log will have their final score multiplied by 0.85.**

5. **<u>THE COMPETITION</u>:**
   a. Teams must arrive at the competition site ready to launch with proper eye protection to have their rocket(s) inspected for safety.
   b. Teams will have 5 minutes to make a total of two launches using the same rocket or two different rockets.
   c. When called to launch, teams will load their rocket onto the launcher. Once the rocket is loaded, but NOT pressurized, teams will place the parachute payload system on or in the rocket. After the payload parachute system is loaded it cannot be manipulated. Teams will then pressurize the rocket to the pressure (psi) of choice based on their practice log data. The Event Supervisor will check the gauge on the pump to ensure the rocket is pressurized to the psi chosen and justified by the team's data.
   d. The Event Supervisor will make sure 3 timers are ready and then signal a team member to make a loud announcement of, "3, 2, 1, LAUNCH!" Then a team member will proceed to launch the rocket. After launching, the team will prepare for the next launch.
   e. Timing begins when the rocket separates from the launcher and stops when the parachute payload system lands. The parachute payload system must separate from the rocket.
   f. If the parachute payload system does not separate from a rocket, timing is from when the rocket separates from the launcher to when any part of the rocket touches the ground. **This launch is penalized with a multiplier of 0.90.**
   g. If any part of a rocket or parachute payload system hits the ceiling or any part connected to the ceiling (e.g., a rafter, light, basketball hoop) **during the ascending portion of the launch**, then timing is stopped at the instant of contact. That launch is **penalized with a multiplier of 0.25.**
   h. If a rocket fails to separate from the launcher because of a problem with the supplied launcher then the launch never occurs and the launch can be restarted.
   i. All times for each launch must be recorded for breaking ties. Time aloft is recorded in hundredths of a second. The middle value is the officially recorded time.
   j. Teams filing an appeal must leave their rocket(s), parachute payload system(s), and Practice Log(s) in the event area.

6. **<u>SCORING</u>:**
   a. High Score wins.
   b. Ranking is determined by the greatest time aloft of a parachute payload system from a single launch.
   c. Rockets and/or parachute payload systems violating 2.b. and/or 3.a.-g. will not be launched. Teams with a rocket unable to make any launches will receive participation points only.
   d. Ties will be broken by the greatest time aloft of the parachute payload system from each tied team's other launch.
   e. **Penalties will be assigned to a launch as follows:**
      i. **A 0.90 multiplier will be applied to launches where the parachute payload system does not separate from the rocket.**
      ii. **A 0.85 multiplier will be applied to launches where the team presents an incomplete practice log.**
      iii. **A 0.70 multiplier will be applied to launches where the team does not present a practice log.**
      iv. **A 0.25 multiplier will be applied to launches where any part of the rocket or parachute payload system strikes the ceiling or any part connected to the ceiling on the ascending portion of the launch.**