

# RUBBER POWERED AIRPLANE C – SoCal Trial Event

1. **DESCRIPTION:** Prior to the tournament teams will design, construct, and test free-flight rubber-powered airplanes to achieve maximum time aloft.

**A TEAM OF UP TO:** 2

**IMPOUND:** None

**TIME:** 8 minutes

2. **EVENT PARAMETERS:**

- a. Teams may bring up to two airplanes, any tools, and their flight log.
- b. The Event Supervisor must provide all measurement materials and timing devices.

3. **CONSTRUCTION PARAMETERS:**

- a. Airplanes may be constructed from student design, published plans, and/or commercial kits. Kits must not contain any pre-glued joints or pre-covered surfaces.
- b. Any materials except Boron filaments may be used in construction of the airplanes.
- c. The total mass of each airplane, excluding the rubber motor, must be at least 5.0 g.
- d. Each airplane must be built to fit into a FedEx Large Box® (L1: rectangular and shallow in shape), advertised to have interior dimensions of 12-3/8 x 3 x 17-1/2 inches (approximately 31.4 x 7.6 x 44.4 cm), while in flight configuration.
- e. Each airplane may have any air frame configuration (tractor, pusher, canard, bi-plane, twin propellers, etc.) and need not resemble a conventional “airplane” shape.
- f. Airplanes may only be propelled in-flight through the release of mechanical energy stored in wound rubber motors. No other energy source may be used to keep the airplane aloft.
- g. Propeller assemblies may be student-built or purchased. Variable pitch propellers that include mechanisms to actively change the blade diameter or angle must not be used. There are no restrictions on the number, size, or construction of each propeller assembly.
- h. Rubber motor(s) may include one or more strands or loops of rubber. Attachments such as O-rings and lubrication are permitted. There are no other restrictions on the dimensions, weight, or number of rubber motors that power the airplane(s).
- i. The airplane(s) must be labeled with student’s school name and team number.
- j. Students must be able to answer questions regarding the design, construction, and operation of their airplane(s) consistent with the Building Policy found at [ww.soinc.org](http://ww.soinc.org).

4. **THE COMPETITION:**

- a. The event must be held indoors. Tournament officials must announce the dimensions of the flying site (approximate length, width and flyable height to the lowest ceiling obstruction) in advance of the competition. Tournament officials and the Event Supervisor are urged to take steps in advance of and on the day of the competition to turn off the HVAC. Air currents should be minimized by keeping doors and windows closed while airplanes are in flight.
- b. The competition area shall be cordoned off. Once students enter the competition area to compete they cannot leave the competition area until they are finished competing. They must not receive outside assistance, materials, or communication. Spectators must remain outside the competition area.
- c. Students must present their airplane(s) and flight log for inspection before their 8-minute Flight Period. The Event Supervisor will notify the student if the airplane(s) or flight log are not in compliance with the rules and what penalties, if any, will be incurred as a result.
- d. The flight log must include data for at least 10 test flights with at least the following parameters: rubber motor size, approximate number of winds at launch, and flight duration. Additional parameters are encouraged but not required in the flight log.
- e. Size conformance for the airplane(s) will be demonstrated using the following procedure with a FedEx Large Box® provided by the Event Supervisor:

- i. The student will load the airplane (with or without propeller assemblies and rubber motor(s) installed) into a provided box through the standard open end without causing any significant deformation of the airplane.
  - ii. While the student is holding the box, the Event Supervisor or a designated volunteer will pass a ruler along the face of open end of box. The ruler must not contact the airplane. The sealing flaps on the open face will be folded back, outside of the box.
  - iii. Next, the student will tip or fully invert the box which must cause the airplane to slide out of the box under its own weight. Pulling on the airplane, shaking the box, or tapping on the box must not be necessary to remove the airplane from the box and will not be permitted.
- f. To account for potential small variations in the manufacture of the FedEx Large Box®, the Event Supervisor will supply at least two boxes to be used at check-in. An airplane that passes the size conformance procedure for at least one of the provided boxes will be considered acceptable. An airplane that cannot pass the size conformance procedure for any of the boxes provided by the Event Supervisor will violate the rules.
  - g. A self-check station, within the competition area, may be made available to students for checking their airplanes prior to a team's official check-in with the Event Supervisor and/or the designated volunteer(s). A FedEx Large Box® shall be located at the self-check station.
  - h. Each team will be given an official 8-minute Flight Period, starting when their first official flight begins. During the Flight Period, students may conduct practice flights and up to 2 official flights. All flights will be assumed to be official flights unless clearly declared as practice flights to the Event Supervisor before the flight. Students may also repair and adjust their airplane(s) during this time.
  - i. At the discretion of the Event Supervisor multiple official flights may occur simultaneously. Teams may elect a re-flight in the unlikely event of a collision with another airplane. Practice flights may occur throughout the competition but must yield to official flights. No practice flights will occur in the final half-hour of the competition except for teams that declare a practice flight during their Flight Period. The Flight Period shall be extended at the discretion of the Event Supervisor to accommodate any re-flight necessitated by a collision with another airplane or to avoid conflicting simultaneous launches.
  - j. Students must launch their airplanes(s) by hand while standing or kneeling at floor level. No external equipment may be used in contact with the airplane during the launch. Students may not steer their airplanes in flight.
  - k. An official flight time shall be the time aloft, beginning when the airplane leaves the student's hands and ending when any part of the airplane hits the floor, the airplane becomes lodged on an obstruction (such as a beam, light fixture or basketball backboard), or the Event Supervisor otherwise determines the flight to be over.
  - l. Event Supervisors are strongly encouraged to utilize three independent timers on flights. The median of the three times should be recorded as the official flight time, in total seconds and hundredths of seconds (Ex: 147.21 seconds).
  - m. The Event Supervisor will verify the recorded official flight time(s) and any incurred penalties with the students.

5. **SCORING:**

- a. A team's score is the duration of the team's longest official flight, in total seconds and hundredths of seconds, reduced by any penalties. Teams shall be ranked based on this score, with the highest score being the winner of the event.
- b. Ties shall be broken using the score calculated with the team's second longest official flight.
- c. Teams with an incomplete flight log shall have 10% deducted from each official flight time.
- d. Teams with no flight log shall have 30% deducted from each official flight time.
- e. Teams that violate any rule(s) under CONSTRUCTION PARAMETERS or THE COMPETITION will be ranked behind all teams that do not violate any rules.