



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

A TEAM OF UP TO: 2

IMPOUND: No

APPROXIMATE TIME: 11 minutes

2. **EVENT PARAMETERS:**

- a. Teams may bring up to 2 airplanes, any tools, their flight log, and two stand-alone calculators of any type.
- b. Event Supervisors will provide all measurement tools and timing devices.
- c. Participants must be able to answer questions regarding the design, construction, and operation of the device per the Building Policy found on www.soinc.org.

3. **CONSTRUCTION PARAMETERS:**

- a. Airplanes may be constructed from published plans, commercial kits, **competitors' designs, and/or other sources of design.** 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 airplane.
- c. Total mass of the airplane throughout the flight, excluding the rubber motor, must be 8.00 g or more.
- d. **The wing must not exceed 45.0 cm horizontally projected wingspan and must not exceed 9.0 cm chord (straight line distance from leading edge of wing to trailing edge, parallel to the fuselage). The horizontal stabilizer must not exceed 28.0 cm horizontal projected span and must not exceed 7.0 cm chord.**
- e. The propeller assembly may be built by the participants or purchased pre-assembled. It may include a propeller, a shaft, a hanger, and/or a thrust bearing. The maximum diameter of the propeller is **24.0 cm**. Variable-pitch propellers that include mechanisms to actively change the blade diameter or angle must not be used.
- f. **A rubber motor not to exceed a mass of 1.50 g, including any attachments such as O-rings, must be the sole power for the airplanes after release. It will be massed separately from the airplane. Motors may be lubricated before and/or after check-in. Up to 6 motors may be checked in.**
- g. Participants may use any type of winder, but electricity may not be available.
- h. The airplane(s) must be labeled so that the Event Supervisor can easily identify to which team it belongs.

4. **FLIGHT LOG:**

- a. **Teams must submit a Flight Log along with their plane. The log must include the following:**
 - i. **Materials used to construct the plane**
 - ii. **A labeled diagram or picture that identifies and describes the parts**
 - iii. **Appropriate metric units for all numerical values**
 - iv. **A front cover labeled with the Team Name and the Team Number for the current tournament**
 - v. **Team name, team number, and appropriate metric units for all numerical values**
- b. The submitted Flight Log should contain recorded data covering 6 or more parameters (3 required and at least 3 additional) for 10 or more test flights prior to the competition.
 - i. The required parameters are:
 - (1) Motor size before windup
 - (2) Number of turns on the motor or torque at launch
 - (3) Flight time
 - ii. The team must choose 3 additional data parameters beyond those required (e.g.; turns remaining after landing, estimated/recorded peak flight height, the motor torque at landing, etc.).
- c. **If a 3-D printer, laser cutter, CNC machine or similar device was used as a tool to build the team's device, or any component thereof, the following information must also be supplied in the log.**
 - i. **Information about the tool hardware, software, materials, and supplies used**
 - ii. **Details of the source of any digital files (e.g.; CAD, STL, OBJ) utilized by the tool including but not limited to when and where the file was obtained, including the web address if downloaded from the internet**
 - iii. **Descriptions of how the team constructed the final device from the tool created components**
- d. **All submitted logs will be returned to teams.**

5. **THE COMPETITION:**

- a. The event will be held indoors. Tournament officials will announce the room dimensions (approximate length, width and ceiling height) in advance of the competition. Tournament officials and the Event Supervisor are urged to minimize the effects of environmental factors such as air currents. Rooms with minimal ceiling obstructions are preferred over very high ceilings.



- b. Once participants enter the cordoned off competition area to trim, practice, or compete they must not receive outside assistance, materials, or communication. Only participants may handle aircraft components until the event ends. Teams violating this rule will be ranked below all other teams. Spectators will be in a separate area.
- c. At the Event Supervisor's discretion:
 - i. Multiple official flights may occur simultaneously according to the Event Supervisor's direction.
 - ii. Test flights may occur throughout the contest but must yield to any official flight.
 - iii. No test flights will occur in the final half-hour of the event's last period, except for teams that declare a trim flight during their 8-minute Flight Period.
- d. A self-check inspection station may be made available to participants for checking their airplanes prior to check-in with the Event Supervisor.
- e. Participants will present their event materials (airplanes, motors, and logs) for inspection immediately prior to their Preflight Period.
- f. All motors will be collected at check-in and will be re-issued to the team only for their Preflight Period and 8-minute Flight Period. Time taken during the Preflight Period will impact a team's final score (see 6.b.). Timers will follow and observe teams as they are winding their motors. Event Supervisors will return flight logs after inspection.
- g. A team's Preflight Period ends with their first flight, trim or official, which starts their 8-minute Flight Period or if 3 minutes passes after their motor has been returned, whichever comes first.
- h. Any flight beginning within the 8-minute Flight Period will be permitted to fly to completion. Participants may make adjustments/repairs/trim flights during their official 8-minute Flight Period. Before their launches, participants must indicate to the Timers whether a flight is official or a trim flight. A flight is considered official if a team fails to notify a Timer(s) of the flight's status. Teams must not be given extra time to recover or repair their airplanes.
- i. Teams may make up to a total of 2 official flights using 1 or 2 airplanes.
- j. Time aloft for each flight starts when the airplane leaves the participant's hand and stops when any part of the airplane touches the floor, the lifting surfaces no longer support the weight of the airplane (such as the airplane landing on a girder or basketball hoop) or the Supervisors otherwise determine the flight to be over.
- k. Event Supervisors are strongly encouraged to utilize three (3) timers on all flights. The median flight time in seconds to the precision of the device used is the official time aloft.
- l. Participants must not steer the airplane during flight.
- m. In the unlikely event of a collision with another airplane, a team may elect a re-flight. The decision to re-fly may be made after the airplane lands. Timers are allowed to delay a launch to avoid a possible collision. The 8-minute Flight Period does not apply to such a flight.
- n. The Supervisor will verify with the team the data being recorded on their scoresheet.
- o. Teams filing an appeal must leave their airplane(s) and Flight Log in the event area.

6. **SCORING:**

- a. The base score is the Team's longest single official flight time. Ties will be broken by the longest non-scored official flight time.
- b. Motors will be held by the Event Supervisor until they are returned to the team signaling the start of the Preflight Period. Once a team has been re-issued their motors, prior to their 8-minute Flight Period, a timing official will start a Preflight Period stopwatch. If their first airplane flight (powered or unpowered), trim or official, is launched within 3 minutes of the return of motors a 5% bonus will be added to the base score. After 3-minutes have passed since the return of motors, the 8-minute Flight Period will start and no bonus will be awarded.
- c. A bonus of 10% of the flight time will be added to the flight time of an airplane that has the entire surface of the wing between at least 2 ribs or at least one of the wingtip fences completely marked with black marker or black tissue. If no ribs are present, the whole surface must be black.
- d. Teams with incomplete flight logs will have 10% of their flight time deducted from each flight.
- e. Teams without flight logs will have 30% of their flight time deducted from each flight.
- f. Teams that violate a rule under "CONSTRUCTION" or "THE COMPETITION" that does not have a specific penalty will be ranked after all teams that do not violate those rules.

Recommended Resources: The Science Olympiad Store (store.soinc.org) carries a variety of resources to purchase for this event; other resources are on the Event Pages at soinc.org

This event is sponsored by the National Free Flight Society (NFFS)