

DESCRIPTION: Prior to the tournament, participants will construct and test up to two rubber-powered model airplanes to achieve maximum flight times. The event **must** occur inside and the room dimensions (approximate length, width and ceiling height) should be made available to teams in advance of the competition. Directors and supervisors are urged to minimize the effects of environmental factors such as air currents (e.g., doors, fans, etc.).

A TEAM OF UP TO: 2

TIME: time for the 1st flight plus 8 minutes

1) **CONSTRUCTION**

IMPOUND: No

- a) A rubber-motor-powered, propeller-driven airplane may be constructed from published plan(s), commercial kit and/or a student's design as long as the specifications below are satisfied: **1) Airplanes may not use solid balsa wings or tail assemblies. 2) Except for propeller assemblies, kits must not contain pre-assembled parts, pre-glued joints or pre-covered surfaces.**
- b) Airplanes **must** be constructed only from wood, paper, plastic film covering and glue except for the propeller assembly, ribbon assembly and motor hooks. The major components (wing assembly, tail assembly, propeller assembly and motor stick) may be attached to each other using thread, music wire, malleable wire, paper or plastic tubes, and/or rubber bands. Plastic or rubber o-rings may be used to attach the motor to the airplane and propeller drive. Any dense material may be used for ballast.
- c) Total mass of the airplane throughout the flight, excluding the rubber motor, must be 8.0 grams or more.
- d) **The airplane may use up to 2 wings (biplane), however the wings must overlap vertically and the horizontally projected wing span of the assembled airplane must not exceed 40.0 cm, such that it will pass through uprights 40.0 cm apart.** The maximum wing chord (straight line distance from leading edge of wing to trailing edge, parallel to the fuselage) of **any single wing** must be 10.0 cm or less. The maximum horizontally projected stabilizer span is **28.0 cm**
- e) The propeller assembly may be built by the competitor(s) or purchased pre-assembled. It may include a propeller, a shaft, a hanger, and/or a thrust bearing. Bushings may be placed in the propeller or thrust bearing to reduce wobble or friction. The propeller must be a single two-bladed commercially made plastic propeller with a maximum diameter of **18.5 cm**. Longer propellers may be trimmed to meet this specification. Trimming/shaving/twisting is also permitted to balance and/or reduce the mass of propeller or to change its pitch.
- f) A rubber motor not to exceed a mass of 2.0 grams (including any attachments like o-rings) must power the airplanes and will be massed separately from the airplane. Motors may be lubricated before and/or after check-in. All qualified motors will be impounded after check-in and will be available to the teams only for official flights.
- g) The airplane(s) must be marked so that the judges can identify to which team they belong.

2) **THE COMPETITION:**

- a) Once teams enter the testing/flying area to compete, they may not leave the area or receive outside assistance, materials or communication until they are finished competing. Only competitors and judges will be allowed in the testing/flying areas. The event director shall have a separate designated area away from the competitors' area for coaches, parents, and other spectators. Any team violating this paragraph shall be disqualified.
- b) At the event supervisor's discretion, test flights may occur throughout the contest but will yield to any official flight. **Before beginning their test flights, teams must have an official stamp or mark their log confirming it shows data for 10 previous flights.** No test flights will occur in the last half-hour of the event. Multiple airplanes may test fly at once. A self-checking inspection station may be made available to students for checking their airplanes. The use of any type of winder is permitted.

- c) Each team must present a flight log of recorded data for at least 6 parameters for at least ten test flights prior to the competition. The three required parameters to be recorded are: 1) motor size before windup, 2) number of turns on the motor at launch, 3) flight time. The team may choose the 3 additional data parameters beyond those required, for example, turns remaining after landing, estimated/recorded peak flight height, estimated flight path diameter, the torque at launch, etc.
- d) Timing for each flight starts when the airplane leaves the student's hand and will stop when any part of the airplane touches the floor. If the model comes to rest on something other than the floor, another watch will be started. If the model comes free within ten seconds, timing continues. If not, timing ceases and ten seconds are deducted from the time for the official score. The timing official will measure and record the time aloft to the nearest tenth of a second for each flight. Steering the model is prohibited.
- e) **After their first flight ends, teams will be given 8 minutes to prepare for and launch a second official flight with either their 1st or 2nd plane.** Any flight beginning within the 8-minute period will be permitted to fly to completion. Participants may make adjustments to the airplane; however, time for such adjustments will be part of the 8-minute period. **Teams will not be given extra time to recover or to repair their airplane.**
- f) During the flight of one team's airplane, the event supervisor may permit other official flights **once** the prior airplane has started its descent. In the unlikely event of a collision, a team may elect a re-flight. The decision to re-fly may be made after their airplane lands. The eight-minute period does not apply to such flights.
- g) Bonus: At the State level, a 15 seconds bonus may be earned by having the airplane release a ribbon during the flight anytime after the first 15 seconds and before the airplane lands. At the National level, a 20 second bonus will be awarded if the ribbon is released from 30-45 seconds into the flight. The ribbon size must be at least 1.0 cm wide X 10.0 cm long and readily seen. The ribbon and any parts to be released will not be included in the mass of the airplane nor in the mass of the motor.

SCORING: The winner is the team with the longest flight time for either flight. Ties will be broken by the longest time of the other flight.

- Teams with incomplete flight logs will have 10% of the flight time deducted from each flight.
- Teams without flight logs will have 30% of the flight time deducted from each flight.
- 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 the rules.

National Science Education Standard: Content Standard E: All students should develop abilities of technological design and understandings about science and technology.

See: <http://www.soinc.org/events/wrightstuff/> for additional information

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