

## Balsawood Model Airplane

<b>LEVEL:</b>	Grades 9 - 12
<b>TYPE OF CONTEST:</b>	Individual/Team
<b>COMPOSITION OF TEAM:</b>	1-2 Students
<b>NUMBER OF STUDENTS:</b>	Preliminary – As determined by your local MESA Center Regional – 3 for 9 <sup>th</sup> /10 <sup>th</sup> Grade; 3 for 11 <sup>th</sup> /12 <sup>th</sup> Grade per Center
<b>SPONSOR:</b>	James Mills, Sato Academy, CSU Long Beach MSP

**OVERVIEW:** Students will design and build a rubber band-powered model airplane made predominantly of balsawood which may be covered with tissue paper or similar material, which will be hand-launched indoors or outdoors. The goal of the contest is to keep the model aloft for the longest period of time. **Participation logistics, limits, and competition facilities may vary by host site. Advisors and students are responsible for verifying this information with their center director.**

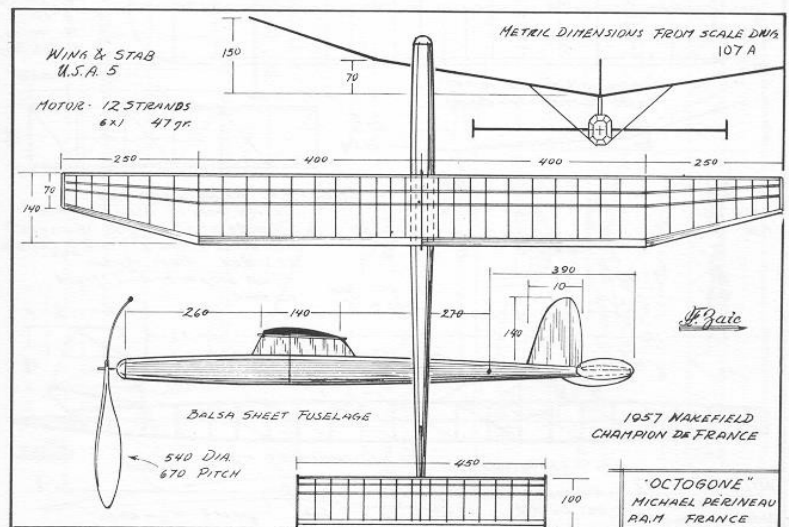
**MATERIALS:** The following are the ONLY materials that may be used to build the model airplane:

- Balsawood
- Wood dowel or stick
- Tissue paper (available from hobby shops), Saran wrap or equivalent covering material
- 5 ½" (14 cm.) commercially made propeller and 16 ½" (42 cm.) x 1/8" x 1/16" rubber (both commercially supplied) OR a propeller designed and made by the student(s) using the same rubber power. The propeller size is restricted only for the commercial one. There are no size or material restrictions on student created propellers, however operational safety should always be a consideration.
- Rubber band lubricant (see note under 'Starting Point')
- Glue, any type
- Pins, steel wire, and thread
- Modeling clay
- Paint, stickers, decals, markers and ink may be used as needed for decoration or for identification

**GENERAL RULES:**

- 1) No ready-made kits are allowed. Each model airplane should be designed, constructed, launched and repaired by contestants.
- 2) There is no restriction on the size or weight of the model airplane.
- 3) Any model airplane that incorporates additional materials not mentioned above will be disqualified.
- 4) A scale plan rendering should accompany the model for evaluation. It should include a three-view drawing that includes the major dimensions of the model airplane in metric units and shows the structure of the model and scale used. The use of CAD is encouraged; however, points will not be deducted if the rendering is hand-drawn, but not freehand. If there is no drawing or if the drawing is freehand, 2 seconds will be deducted from the total flight time. The plan rendering should also state the names of the contestants, their school, grade, MESA center and scale used. This example is for a more complicated model, but should give the students and the judges some idea of what we are looking for.

- 5) The contestant's name(s), school, and center should be clearly visible on the model airplane. They should be identified using a sharpie pen or equivalent. **Do not use a separate tie-on label, as this will be considered to be a part of the model when it is turned in for judging.** Failure to correctly identify the model as noted will result in a 10% deduction from the final score as calculated in item 12 of 'Judging'.



- 6) The model airplane should be competition-ready when turned in for inspection at MESA Day. No modifications to the model or removals or additions are allowed after it is submitted to the judges for inspection. The design drawing should be submitted for judging at the time the model is inspected.
- 7) The model airplane should be ready to be launched within 30 seconds of being called by the judges. As winding the rubber band motor may take longer than 30 seconds, it is recommended that contestants have the model ready to be launched prior to their flight call.
- 8) The propeller/rubber band motor provided by the center must be hand wound without mechanical assistance.
- 9) The model airplane will be launched by a team member. He or she will release the airplane from the judging area in any direction and at any angle he or she prefers.
- 10) The release height of the model airplane shall not exceed six feet above ground level as measured by a stick held vertically next to the contestant during launch. Launches above six feet shall be counted as an unscored launch, thereby reducing the number of scored launches.
- 11) The contestant releases the model after being given the "OK" from the official timer. Timing

starts as soon as the model is released and stops when the model airplane hits the ground or comes to rest against any obstruction.

- 12) Each model is given three (3) launches. The winning model is determined by the following formula:
  - a. Longest flight time + Second longest flight time + Plan Rendering = Score
- 13) Repairs are allowed between flights. However, no changes may be made to the basic design of the model airplane once the competition is under way. Repairs shall be made by the contestants only.

### **JUDGING:**

- 1) Once an entry has been registered it may not be altered or repaired to meet technical inspection.
- 2) No part(s) of the model airplane may be removed or added after the specification check has occurred. No backup models will be allowed. No tools or materials will be supplied at MESA Day except a specified rubber motor.
- 3) The propeller and rubber band motor should be as prescribed in the 'materials' and 'starting points'.
- 4) The center will provide a new prescribed rubber motor after the airplane has passed inspection. The original rubber motor on the plane will be collected by the judges at this time.
- 5) Each team will be allowed three non-consecutive launches. Each model should be ready for competition when called. The model should be launched within 30 seconds of being called or contestants will forfeit that launch. As winding the rubber band motor may take longer than 30 seconds, the judges should give all contestants sufficient advance notice of their ready time that they can achieve this time comfortably. Typically, contestants should be warned a couple of places ahead of their actual flights. Three stopwatches will be used by three judges for timing flights. The flight time will be determined by taking the middle value of the three times.
- 6) The judges will determine where the launching site should be. They will ensure that there is sufficient space available that the model airplanes can circle and fly downwind without hitting obstructions. Typical dimensions might be a thirty-meter radius circle, and eighty meters downwind.
- 7) Spectators should not be allowed within the flight area at any time during the competition.
- 8) In the event of a tie, the model airplane with the longer single flight time will be the winner.
- 9) Times will be recorded to the nearest hundredth second.

10) Scoring the rendered plan will be based on the following rubric:

Three-View	Metric Measurements	Proper Labeling	Rendering Quality	Rating	Points (seconds)
√	√	√	√	Superior 4/4	2
√	√	√		Good 3/4	1
√	√			Adequate 2/4	0
√				Inadequate 1/4	-1
				NONE	-2

11) Overall scoring is determined from this formula:

longest flight time in seconds + second longest flight time in seconds + rendered plan score

**AWARDS:**

- Awards will be given per grade level: 9<sup>th</sup>/10<sup>th</sup> grade and 11<sup>th</sup>/12<sup>th</sup> grade.
- Medals will be awarded for 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> place based on the best Score.

**ATTACHMENTS/APPENDIX:**

- Specifications Checklist

**SPECIFICATIONS CHECKLIST**

*\*Note: As the name above implies, this list is intended simply as a guide for meeting the required competition specs. It should not be treated as an official judging document.*

- Model made of only the listed materials (student made propeller exempted)
- Propeller and rubber band motor are as required by rules
- Rendered plan has three-view showing construction; all metric measurements; scale
- Model and plans are properly labeled with names, school, grade and MESA center.