

Balsawood Model Airplane

LEVEL:	11 th and 12 th Grade
TYPE OF CONTEST:	Team
COMPOSITION OF TEAM:	1 - 2 students per team
NUMBER OF TEAMS:	3 teams per Center
SPONSOR:	Alan Brown, UCSC Center MESA

OVERVIEW: Students will design and build a rubber-powered model airplane made predominantly of balsa wood which may be covered with tissue paper or similar material, which will be hand-launched outdoors. The goal of the contest is to keep the model aloft for the longest period of time.

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

- Balsa wood
- Wood dowel
- Tissue paper (available from hobby shops), Saran wrap or equivalent covering material
- 5 ½" (14 cms.) propeller and 16 ½" (42 cms.) x 1/8" x 1/16" rubber (both commercially supplied)
- Rubber 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

STARTING POINT:

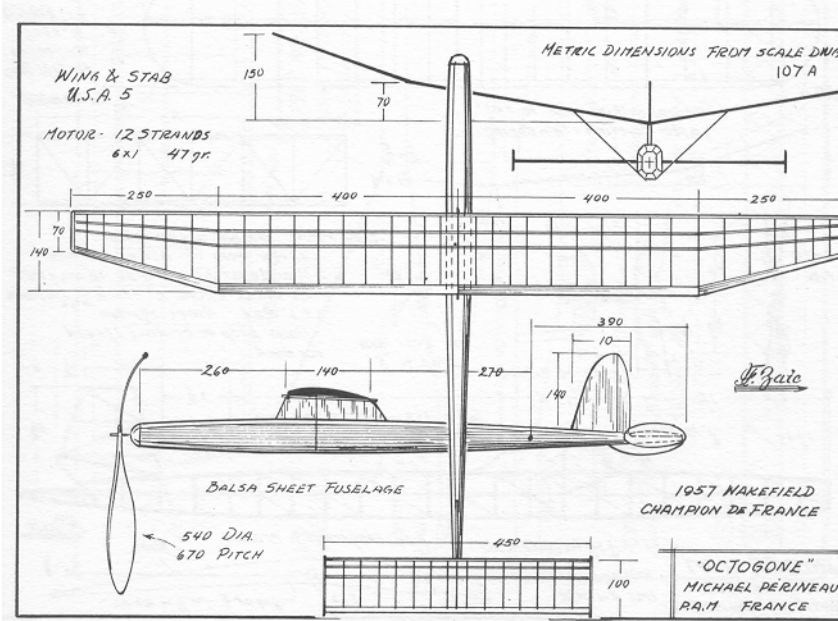
As this is a new competition, it is recommended that students practice with a commercially available kit, the AMA Cub, which can be obtained from the Academy of Model Aeronautics, 5161 E. Memorial Drive, Muncie, IN 47302, tel: 765-287-1256, www.modelaircraft.org. The kits can be obtained in

batches of forty for \$46, i.e. just over \$1 each, and are specifically designed for student purposes. Each kit includes the materials for building the model airplane, and a 5 ½” propeller and a rubber strip, 16 ½” x 1/8” x 1/16”. The propellers and rubber strip are identical to those listed above. They can be obtained individually from Sig Manufacturing Company, Inc., P.O. Box 520, Montezuma, Iowa, 50171-0520, tel: 641-623-5154, www.sigmg.com. The propellers, part number SIGMFGPA550, cost \$24 for 100. Batches of six cost \$5.45, so it is clearly advantageous to have these purchased by University centers and distributed to schools. Similarly, the prescribed rubber for the power source can be purchased in 25 foot- or 50 foot-lengths, part numbers SIGSR25 and SIGSR50, for \$4.69 and \$7.49 respectively. The rubber motor will be more effective if it is lubricated. Experts have traditionally used a mixture of glycerin and green soap, and more recently a silicone emulsion such as ArmorAll.

It is recommended that the students build and fly the AMA Cub models, and then use the propellers and rubber motors from those kits in their own design model airplanes. **Note that neither the AMA Cub nor any other kit-made model may be used in the competition.** In order to keep the playing fields as level as possible for all competitors, it will be a requirement that only the prescribed propellers and rubber motors be used. This will be an important aspect of the judging.

RULES:

- 1) No ready-made kits are allowed. Each model airplane must 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 1:1 scale plan rendering must 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.. The use of CAD is encouraged; however, points will not be deducted if the rendering is hand-drawn. The plan rendering should also state the names of the contestants, their school, and their MESA center. 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 10 of 'Judging'. Two decals will be allowed up to two inches square each.
- 6) The model airplane must 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 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 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.
- 9) 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.
- 10) 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.
- 11) Each model is given three (3) launches. The winning model is determined by the following formula: longest flight time + second longest flight time + plan rendering score
- 12) 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 must be made by the contestants.

EVENT MANAGEMENT:

- 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.
- 3) The propeller and rubber motor must be as prescribed in the 'materials' and 'starting points' paragraphs above.
- 4) Each team will be allowed three non-consecutive launches. Each model must 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 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.
- 5) 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.
- 6) Spectators should not be allowed within the flight area at any time during the competition.
- 7) In the event of a tie, the model airplane with the longer single flight time will be the winner.
- 8) Times will be recorded to the nearest hundredth second.
- 9) Scoring the rendered plan will be based on the following rubric:

	Three-View	Metric Measurements	Proper Labeling	Rendering Quality	Rating	Points (seconds)
	√	√	√	√	Superior 5/5	2
	√	√	√		Good 4/5	1
	√	√			Adequate 3/5	0
	√				Inadequate 2/5	-1
					NONE	-2

10) 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 for 1st, 2nd and 3rd place.

CHECKLIST:

- Model made of materials as listed
- Propeller and rubber motor must be as required by rules
- Rendered plan has three-view showing construction; all metric measurements; 1:1 scale
- Model and plans are properly labeled with names, school and MESA center