THE "FLYING SCALE" NATIONALS WINNER

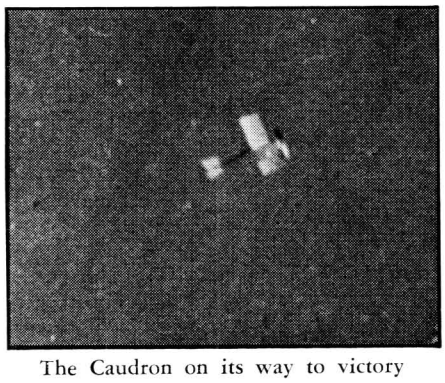
Two views of the remarkable model and the national trophy that it won at the 1938 National Competition

How You Can Build the Super-Detail Model of the Caudron Monoplane That Outflew All Other Contenders

By HENRY STRUCK

UNDER the rules governing the Flying Scale Event at the National Meet, a model to be eligible had to be ". . . an exact replica of a man-carrying machine every part being proportional to the corresponding part of the larger machine. No part of the model may be made larger in proportion to improve performance. The propellers must conform to the original, but may be altered in blade width and pitch."

Now add to this a weight rule of three ounces per hundred square inches of wing area, R.O.G. launching, points for workmanship and detail and you have the ingredients of a really tough but interesting contest.



The Caudron on its way to victory

With the great majority of flying scale model plans or kits doctored in just such fashion as would make them immediately ineligible, the only solution seemed to be to construct a full size ship exactly like a contest model and make a replica of it. This happy thought appearing somewhat impractical, we undertook an intensive hunt for a ready-made airplane with the desired characteristics.

It was not until we had gone back as far as the 1911 types that a fully satisfactory design was unearthed. First of all, the large prop whose diameter was 1/3 the wing span, the comparatively small wing area requiring a low total weight and the long rubber line possible, promised performance. Second, the bellied fuselage lowered the center of lateral area to increase spiral stability; while the combination of long tail moment arm and ample tail surface assured longitudinal stability. Last, but not least, the abundance of detail such as spoke wheels, wire rigging, dummy motor, etc., made the ship one to catch the eye.

This was the Caudron! A tiny ship whose monoplane wing spread a scant twenty-four feet. Powered by a four-cylinder air-cooled motor, a speed in the neighborhood of 75 miles per hour was possible. The pilot controlled his machine by a regulation stick and rudder bar, with the then-popular wing-warping system used for lateral control instead of ailerons.

Now that at last a decision had been reached, there was hardly time enough to construct a good model. Still it was possible because of the simplicity of the plane itself, to devote proper attention to neatness and strength, and to add the details by "burning the midnight oil" before leaving for the Nationals. Well, any way we only had the brace wires and motor details to put on at Detroit the night before the contest.

With John L. Ogilvie, fellow representative of the Queens Aero Model Association, who had also eked out a Caudron, we took our model to the hangar where the preliminary judging was to take place. When the results were tabulated, John had forty-two and we had forty-four out of a possible fifty—just about the best scores made. The

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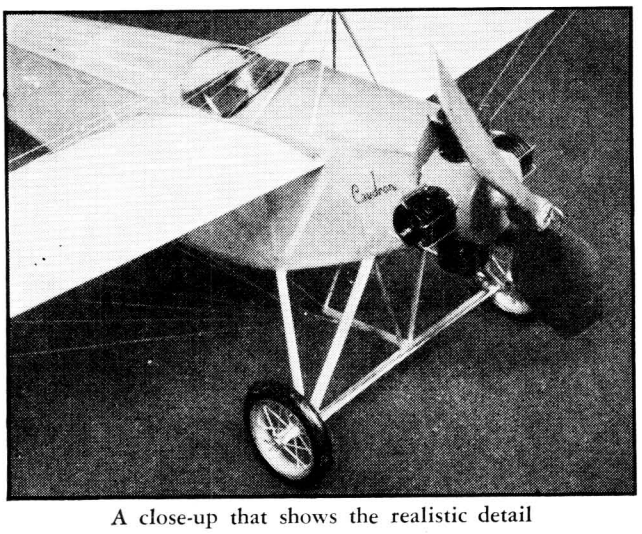

A close-up that shows the realistic detail

Struck launches the plane on its winning flight at Detroit

With these additions one can soon see the military plane taking shape, from the once strictly commercial Waco. There is no "joy-riding" now, this plane is out to do "business"—the business of warfare. After it has been test flighted it is crated and shipped to New York where it goes on its voyage to the foreign government.

This is but one illustration.

Large transport planes can undergo similar changes and soon be transformed into bombardment planes for use by the army. In fact two of the most popular transport plane construction companies are two of the army's biggest dealers. Boeing and Douglas airliners ply between American cities on most every important commercial airline in existence today. Boeing and Douglas both supply the army with great numbers of ships for its service.

Surely, there should be little doubt that commercial aviation offers America its—HIDDEN WINGS FOR THE ARMY.

The "Flying Scale" National Winner

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increasing force of the wind that swept the field curtailed test flying, lending added importance to our scores. But the Caudrons gave noble account of themselves, though flown untried under capacity winds and hampered by the difficult weather conditions, John L. Ogilvie placed second in the Senior class and we won first place and the beautiful William O'Niel Trophy in the Open Class.

With this brief history we now present the plans to build this prize-winning model.

Fuselage

Join plates I and II to obtain a full size side view of the fuselage. Bend the longerons from 5/32" square hard balsa, soaking them in hot water to avoid breakage, and pin them in position on the plans. The top longerons are cut from 5/32" soft sheet balsa to simplify strengthening the body at vital points and also pinned to the drawings. Cement the uprights of 5/32" square soft balsa in place. Both sides should be built at the same time to assure their being alike. Remove the sides when dry and connect them with formers F-3 and F-4, as well as the corresponding bottom crosspieces. Pull the rear of the fuselage together and fit the necessary formers and crosspieces. The nose is joined in similar fashion, thoroughly moistening only the outside of the frame to facilitate bending the heavy structure. Note that the first three crosspieces are doubled to reenforce the nose and the landing gear struts. Check the trueness of the fuselage as the alignment of the finished model is dependent on it.

Cover the cowl with 1/16" soft sheet balsa and add the five turtle-back stringers of 1/16" x 1/8" hard balsa. The wing mounts are bent of 1/16" wire, or bicycle spokes. Cement them in position, reenforcing the fuselage sides with 1/4" copper washers. (See Wing Mount Detail sketch, Plate I.)

Landing Gear

All struts are of bamboo shaped to streamline cross section with knife and sandpaper. The true length of each strut is given on the plans. Point the ends of struts A and B and force them into the longerons, glueing the spreader bar C to their apex. The remaining struts are added as indicated by their alphabetical order. Apply at least three coats of cement to all landing gear joints. A couple of strands of 1/32" rubber are bound around the .049 piano wire axle and held on the bottom of the spreader bar by small hooks bent of pins. (See Axle Detail sketch, Plate I.) The tail skid is hinged to a tripod of 1/16" diameter bamboo struts by a bent pin and aluminum tube fitting. A small loop of 1/32" rubber is employed as a shock absorber. (See Tail Skid Detail sketch, Plate II.)

The spoke wheels are not as hard to make as it may seem. Cut the rims from laminated sheet balsa 3/16" thick and sanded to the proper cross section. Locate the hubs, using long pins to find the exact center. Insert the spokes by pointing the ends of short lengths of 1/32" diameter bamboo, and force them through the rims and into the hubs. For convenience the proper order of fitting has been indicated by numbering the spokes on the plans. Remove the rigging pins and trim the ends of any projecting spokes. Glue 1/4" copper washers to the hubs, slip the wheels on the axle and bend over the end to retain them.

Wing and Tail Group

The wing, stabilizer and rudder are shown on Plates III and IV in half size.

Shape the trailing edges to the conventional triangular section with knife and sandpaper. Mark the scallops with a compass set to the specified radius. Sandpaper the edges to reproduce the effect of tightly-stretched fabric. (See Scalloping the Trailing Edge sketch, Plate III.) Locate the ribs on the trailing edges and pin it to a soft board, raising the front about 3/32" to accommodate the under-camber of the airfoil. Cement the 1/8" thick tip and center ribs in place. Pin the leading edges against the noses of these ribs and add the remaining ribs. Be sure to make left and right panels. When dry remove the frames and insert the spar, the aluminum tube wing mount sockets and the rib stiffeners; Short lengths of aluminum tubing, through which the wing wires are to be passed, are cemented to ribs R-4, 7 and 10.

The stabilizer is flat in section, with a trailing edge made just like that of the wings, constructed entirely of 3/32" thick stock. Form the rudder pivot of .040 piano wire and cement it into a shallow recess in the under-side of the stabilizer centerpiece.

The flag-shaped rudder is also flat in section and contains a 1/16" O.D. aluminum tube to receive the pivot post.

Propeller and Covering

Carve the propeller from a medium hard block of balsa 10" x 1 5/8" x 1 3/16", laid out as shown on Plate IV. Shape the blades to an airfoil section, under-cambering the rear face about 3/32". Trim the blades to the pattern given and sandpaper the prop, using extra care around the hub. Large washers are cemented to both sides of the hub. The free wheeling device is set into the blade and anchored with at least four coats of glue. (See Garami Type Free

Wheeling sketch, Plate IV.) Cover the prop with brown tissue, applying enough coats of dope to make the blades glisten.

The dummy motor also serves as a nose plug. A block 1 7/8" in diameter and 1 3/8" thick is used for the crankcase. A frame of 1/8" x 1/4" hard balsa fitting snugly into the nose is cemented to the rear of the crankcase. Set a short length of hard wood dowel into the front, and drill a hole for the propeller shaft through the crankcase, cementing copper washers with large bushings inserted in place as bearings.

The cylinders are composed of alternate wafers of 1/64" and 1/16" thick balsa. A fragment of razor blade soldered to a discarded compass will simplify the task of cutting them out. Assemble the cylinders on a long pin and mount them on the crankcase.

Form the prop shaft of .049 piano wire, bending the combination winding hook and free-wheeling catch first. Pass the shaft through the prop and crankcase, including a couple of washers between them, and bend the motor hook.

Covering and Assembly

The appearance of a scale model depends greatly on the covering and finish. With this in mind, sandpaper the entire framework carefully in order to remove all bumps and roughness that may spoil the job. Yellow tissue best reproduces the unpainted fabric covering of the original, especially after the model has aged awhile and the brightness of the color fades a bit. Using dope for adhesive, stick the tissue to the edges of the frames only, except on the bottom of the wings where the undercamber of the airfoil requires doping the tissue to every rib. The cowl and the inside of the cockpit are covered with brown tissue and polished with several coats of dope. Spray the surfaces lightly and apply one coat of dope to the wings and tail, though several may be put on the fuselage. Dope the bottom of the wings first and allow them to dry before doing the top. This prevents them from curving upward. Check the alignment of the surfaces frequently while drying, correcting any tendency to warp by holding the frame true.

Assembly and Flying

Mount the rudder on its pivot and anchor the leading edge to the stabilizer with a soft wire fitting to allow adjustment for flying.

The cabane of streamlined bamboo struts is set into the top longerons. A pin bent to "U" shape is cemented to the apex. (See Cabane Detail sketch, Plate I.)

Small hooks also bent of pins are attached to the landing gear strut F. (See Hook Detail sketch, Plate I.)

Slide the wings on the prongs. Tie one end of a length of grey silk thread about eight feet long to one of the small bottom hooks and thread the other end in a regulation sewing needle. Proceed to "sew up" the rigging, completing each wing panel separately. The small rubber band atop the cabane should be stretched slightly to maintain the tautness of the stays. Put a drop of cement on the apex of each group of threads to prevent snarling when the wings are removed. Do not glue the threads in their tubes as this would destroy the flexibility of the wings.

Apply several coats of dope to the dummy motor and wheels to avoid a fuzzy paint job. Use a very small brush and quick-drying colored dopes for best results. The motor has a grey crankcase with black cylinders. The wheels are aluminum up to the rim edge, with the tires black. Detail the motor with scraps of wire and aluminum tubing as shown on Plate II. Black India ink is used for the lettering and applied with a fine pen.

Ten strands of 1/4" flat, or twenty strands of 1/8" flat are needed for a good climb. The model should balance at a point about 2 1/4" from the leading edge of the wing, ballasting the back of the nose plug with clay if necessary. Check glide the ship, wedging a sliver of balsa between the top of the tail plug and the fuselage to correct stalling, or in the bottom to correct diving. Test fly by hand-launching with about 100 winds, adjusting the rudder to circle the model to the right. When a good glide has been obtained, perfect the powered flight by off-setting the thrust line with slivers of balsa between the crankcase and nose. The rubber is capable of taking 550 turns when stretched and wound with a winder, providing enough power to climb the Caudron a good height for maximum performance. Good luck!

BEG PARDON

The International Models Co. January issue advertisement listed their "Pervel Wonder Fabric" as selling at 5c for three 24x36" sheets. This was a typographical error since the correct price is 25c.

Building a Sky King

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should be checked:

(1) The model should be balanced approximately 1/3 back of the leading edge.

(2) Check all surfaces for warps. For flying, the right wing, looking from the front, is slightly washed in so that the model will glide to the right but still climb with the torque under power.

(3) No side thrust or down thrust should be needed.

(4) A model should never be tested with a motor that is not running well. A missing motor causes constant torque changes, making correct adjustments impossible.

Upon arriving at the field make a final check of alignment. Glide the model until a long flat glide is obtained. The model should bank slightly to the right. The model is now ready for powered flight. Give the motor about 1/3 power and a fifteen second motor run. Allow the model to take off unaided from a smooth runway. If correctly adjusted more power can be given on succeeding flights until full throttle is reached. The model should then climb with a steep spiral to the left.

The whole performance of any plane can be changed by a poorly-made propeller. Some standard design propellers may be used but the utmost care should be used in shaping the airfoil. A good finish also adds to the efficiency.