## **De Luxe** By Richard Ealy



**THIS** model is the author's "dream job" of a full sized plane. From past experience with rubber powered models, and with knowledge gained studying aircraft design, it was decided to combine realism with practical construction. In an earlier issue of MODEL AIRPLANE NEWS my idea of contest rules was outlined in the "Airways" column. With these rules in mind the plane was built to garner a maximum in: (1) Design Points (possible 33-1/3%); (2) Construction Points (possible 33-1/3%); (3) Flight Performance (possible 33-1/3%). The plane climbs in a right circle and pulls out smoothly due to its fine aerodynamic setup. Glide is in large right circles.



**FUSELAGE**—First enlarge the plans to full size. The side view and top view of fuselage with rudder and tail shown are all that are necessary at first. In the conventional method lay out the sides using 1/4" square hard balsa (or pine) for longerons, crosspieces and diagonals. Glue gussets of 1/16" mahogany plywood to all joints on the inner side as shown.

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Since the upper longeron is a straight line, the sides can be turned upside down and the workbench used as a jig while placing in crosspieces. Cut crosspieces at Stations 14-11/16 and 21-5/8. These station designations also represent the distance back from the nose of the ship (marked 0). The crossections are about equal at these two points and the sides should be propped up vertically.

To keep the fuselage rectangular, it is advisable to temporarily tack crosspieces at Sta. 14-11/16 on lower longeron and at 21-5/8 on upper longeron. Pull the front end together and place crosspieces to fit Sta. 4-5/8. After glue is dry at front, the upper longerons should be tapered, so that the total width at end is 3/16". The lower longerons need not be tapered as they are cut off at their intersection. Pull the longerons together and glue. Using 1/4" square stock, cut crosspieces to fit and later the diagonals. Both upper and lower diagonals run in the same direction.

Next glue on the floor and upper motor mount gusset. View A shows in detail how to install the motor mount clips -5. The wire key -6 is held in place by the vertical screws. The wire passes through slot of horizontal screwhead and prevents it from turning when the motor mount is fastened on later. Be sure to set the clips back 1/32" so the plywood bulkhead 4-5/8 will have a flush face to be glued to. Make the landing gear clips -7 and fasten with 2-56 machine screws as shown in view B to the side gussets only. Drill through the vertical holes but omit screws until making the landing-gear later.

Now make the plywood bulkheads 10-11/16, 14-11/16 and fasten the wing hooks -8 with 2-56 screws. Notice that the bulkhead at 10-11/16 is on the aft side, while 14-11/16 bulkhead is on the forward side of their respective station points. Make up the trailing edge clip -9 and the battery rod clip -10. Both are attached with 2-56 screws to forward side of plywood bulkhead at 18-13/16. The rudder spar is a piece of bass 3/16" x 5/8" cut to length shown at 42-19/32.

Taper it as shown and bore a 5/16" hole in the center so the rudder adjustment tube will move freely laterally. Glue the spar in place and let dry before going further. The elevator spar can be trimmed in the meantime from bass 3/16" x 5/8". The elevator spar is glued to front side of the rudder spar at the thrust center-line. Check the elevator spar tips for alignment by placing fuselage on flat workbench and measure the tips. The tail wheel is a pair of rubber sink washers 3/4" dia. glued back to back with rubber cement. A piece of 1/8" 0. D. dural tube makes a fine press-fit bearing. Mount the tail wheel assembly -11 on a

piece of 1/16" plywood with a slot long enough to limit the action as shown. Use 2-56 screws. A typewriter spring 5/8" long provides the right amount of tension when hooked to a 2-56 screw on the rudder spar.

TAIL AND RUDDER—Trace the inner edge of the tail outline on tracing paper. Glue the paper to a piece of 3/4" or 1" pine and bandsaw to the line. Make only half the tail template but allow about 2" more for attaching the balsa strips. Cut 6 strips 1/4" wide by 36" long from 1/32" medium balsa and soak in hot water. The strips are pulled one at a time under tension around the pine template. All 6 are put on in quick succession and allowed to dry in the sun or oven. Thin some glue out and glue one upon the other, starting with inner one and working out. Make two halves and splice, glueing rear edge only. A piece of hard sheet balsa must be added as noted to fill out the trailing edge. A pencil centerline is scribed lightly around entire outer edge to work with. The trailing edge is sanded from 1/4" down to 3/16" in the rear. Do not taper the trailing edge yet or round the leading edge. Slip the open leading edge through fuselage and flue to spar tips, horizontal crosspieces above 38-19/32 and vertical piece of 1/4" sq. at rear of fuselage. Cut strips of 3/32" hard sheet balsa, 11/16" wide and cut to fit at each rib station. Use a divider and mark pencil point 1/3 back from leading edge for each rib. Each rib should be about I/16" deeper at this point than at the spar depth to form a nice streamline. The ribs can be trimmed down with a knife. Lastly the leading and trailing edges are cut to fit, then sanded with fine paper.

The rudder construction is approximately the same except that a hard balsa spar 5/16" x 5/8" is placed behind the bass spar. It has to have a 3/16" hole bored through bottom end to receive -12, the rudder tube adjustment arm. Use dural or fine steel wire (1/32" dia. or less) for hinges. Assembly -12 is mounted by wrapping silk around the sheet metal clip and a piece of 1/4" sq. wood. The glue will hold on metal only in this way. It is then placed in fuselage and the torque arm pushed through the hole' in the bass spar and into the above mentioned 3/16" hole and glued. The elevator fillets are first made to slide over the "tail in their right position. The contours or outline are cut after removing the fillet from tail. Then a radius of 1/2" can be carved in and sanded. Add a rib to the outer side of the fillet last after glueing fillet to fuselage. Rudder fillet is made likewise. Use very lightest balsa for these and for the fuselage forward blocks which are not mounted until later.

LANDING GEAR—A visit to the local airplane junkvard rewarded us with a second hand-streamlined tie rod, 3/16" diameter and 3' long. This is the minimum length. The front strut is the two turnbuckle ends brought together and riveted as shown in view B. Before joining these two halves, place the straight pieces in a drill press holding the threaded end in the chuck. The threads can then be removed by holding a file to the revolving wire. Turn down to 1/8" diameter. The rear strut is wider as can be measured from top view of fuselage. The bend lines on rear strut should be on an angle of about 25° inward of a straight bend. The wire will still tend to open out on the leading edge, but this can be remedied by placing center section of rear strut in a vise and trueing up by applying force inward with a crescent wrench. The ends are tapered to fit as shown at axle end in view C. It might be wise at this point to sandpaper all the cadmium plating off so the completed landing gear can be chrome-plated.

Clamp strut ends together at their correct place and put the four soft brass clips over center portion of each strut as shown in view B. Clips made from 1/32" x 3/8" strip. The 2-56 screws omitted before on -7 may now be put through the vertical holes to hold the landing gear on. The lugs may be soldered to struts while accurately held in place this way. Insulate floor from soldering with card-board or washers. A 1/32" thick soft brass sheet gusset is bent 180° and slid over intersection of struts. The top open part of gusset and trailing edge can be squeezed with a pair of pliers. Trim brass off flush with back edge. Drill 3/32" holes as shown and rivet with round head soft iron rivets. By soldering the gaps and filing the solder fillets and rivet heads, a beautiful appearance will follow when the whole gear is chromed.

The fuselage side blocks can be cut to fit the fuselage contour and glued on. The coil strap should be mounted before adding lower blocks. The upper and lower blocks are in pairs and should be glued together first. The top blocks were hollowed out to approximately 3/8" thickness. The lower blocks are made to fit the required contours and then hollowed out. A gap the thickness of the floor will show between intersection of side and bottom block and must be filled with 1/16" balsa sheet. The outside is then carved to fit the stations shown from 4-5/8 to 18-13/16. Then sandpaper. The ignition can be made up and dropped through from the hole aft of 18-13/16 to front. The fuselage bulkhead stations on top and bottom aft of 18-13/16 need 3/32" sheet balsa to support the 1/8" x 3/8" stringers. Each lower one is shown. To make upper ones, use lower one on each side below and halve the difference. Trapdoors are made

from 1.' V thick soft sheet and have wire hooks inside with rubber band for tension, to cover rudder adjustment.

**MOTOR MOUNT**—The sheet aluminum alloy motor mount shown was designed to mount an *Ohlsson Gold Seal* by the three radial lugs. The newer *Ohlsson 60* and some Class C motors have a slightly larger mounting diameter which may cause a slight dimension enlargement at the forward end. It is best to make a stiff paper pattern and experiment to suit your particular engine. The original mount was bent from .041 soft aluminum and then heat-treated. To those who have no way of heat-treating, it is best to use a thinner gauge of aluminum alloy sheet (about .032 17 ST) which is plenty strong and a little lighter in weight.

**COWL**—The top, front and bottom pairs of blocks are first glued. From the diameter, contours and dimensions shown, it is possible to hollow each pair separately. The three pairs are then glued together. When dry, slip over engine and mount and wherever impressions show cut away for clearance. Even with a larger motor mount there is still room for keeping it inside this cowl. The rear bulkhead of plywood is identical with Sta. 4-5/8. Glue it on and add remaining side blocks made from 1/2" stock. The two dural tubes are cemented in and the cowl can be slid into place on fuselage. Use your knife and carve cowl contours to fair in with fuselage sides. The spinner is a "Hillcrest" plastic spinner 2" in diameter, trimmed off slightly in rear with sandpaper to 1-7/8" diameter. A mounting nut comes with it.

**WING**—Lay out the front view of front spar full size. Splice as shown but omit gussets at present. The rear spar is drawn into plan. A note on drawing shows how to locate spar with reference to the datum line. The rear spar is spliced and when dry the two can be placed together and compared. Any changes needed to correct disparities in the two should be made and the plywood gussets glued and clamped to each side of the splices. Make an aluminum sheet template of the rib which is an N.A.C.A. 2412. Make four ribs of pine or redwood 3/16" thick. The spar cutouts are wider due to gussets. The ribs are each placed at a dihedral intersection and the assembly of | spars and ribs aligned on a flat work-bench. When glue is dry, add balsa ribs out to last dihedral point.

The wing tip is same construction as tail only strips are medium balsa 1 16" x 1/2" x 36". The square leading edge is inserted and the outer ends include the main rib at intersection of dihedral. The wing tip outline is a butt-joint to the rib and trailing edge. The cap is set into the leading edge last and corners rounded with sandpaper. The same 2-56 screws 1/2" long hold the -1 hatch clip to front spar as the wing hooks -2. The hatch clip -3 uses one of the 2-56 screws that holds the trailing edge clip -4 underneath. The clip -4 must be separated from underside of wing by 1/32" washers so that the clip -9 at the bulkhead 18-13/16 can slide in and help secure the trailing edge.

The hatch is covered with celluloid and is shown in detail. It is easily detachable for servicing with two Dzus fasteners. Forward part of fuselage from 18-13/16 to 4-5/8 and the cowl are covered by doping silk to it. The fuselage is covered with one piece by doping to a lower longeron (which has had corner sanded flat to 1/8" wide) and going up and over fuselage and down to other lower longeron. The bottom piece is added last. The wing is covered in quarters and the tail by halves The whole plane should be doped two or three times sanding lightly between coats. Original was sprayed with yellow and trimmed in blue lacquer.

**FLYING**—Adjust rudder to turn in right circles by setting it over 3/16" to right of centerline at rear. No motor offset necessary. Wing is held on by rubber bands between hooks -2 and -8.



DE LUXE

