

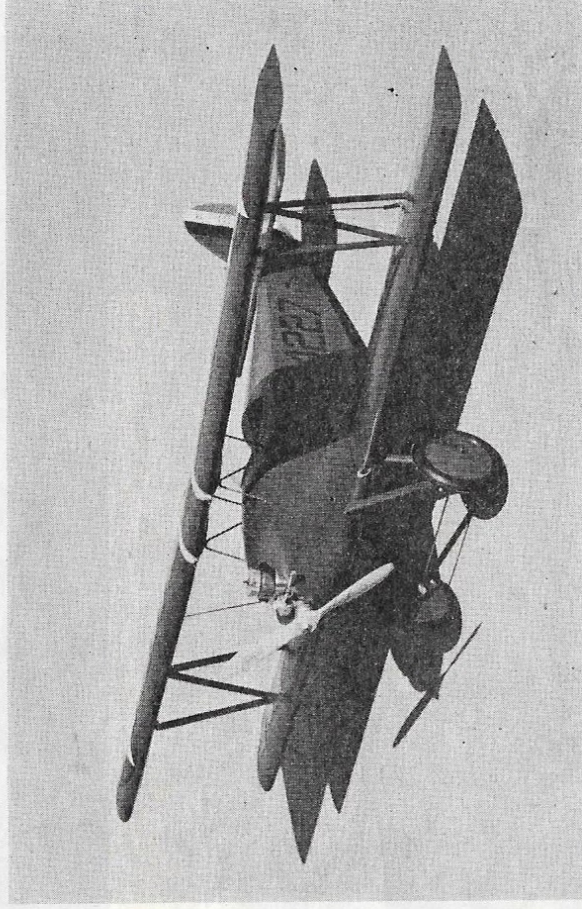
# Sperry Messenger

JESS KRIESER

**THIS** interesting little biplane is ideally suited for home-building. It's small, with a wingspan of only 20'. It had only 56.5 hp. And it featured simple, mostly wood construction that probably would not require special skills or special tools to complete. It was fully aerobatic, and was stressed to a load factor of six.

The fuselage was a simple box, made with square, wood longerons and uprights, with a few semi-circular formers on the turtledeck, and around the nose. The entire structure was covered with  $\frac{1}{8}$ " plywood. Tail surfaces were simple, wood frames, with steel tubing edges. Wing construction was mostly wood, with bandsawed ribs fitted with wide, slotted capstrips. Spars were wood, routed out for lightness. Tips were square, and the wire trailing edge pulled in to give a scalloped appearance when the dope tightened the fabric.

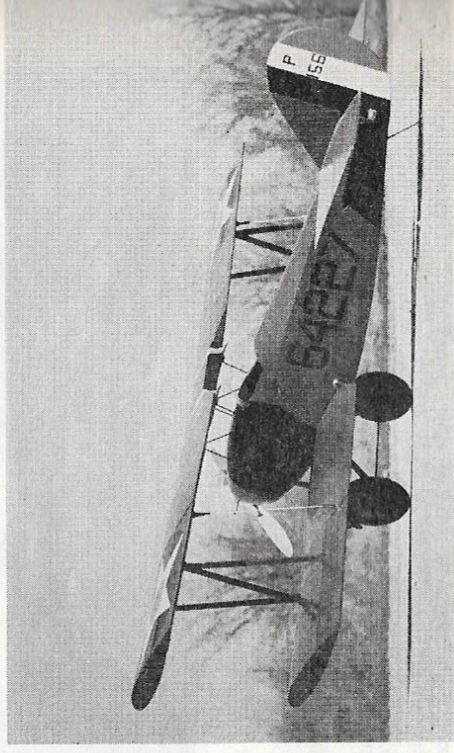
Aileron cables were in the lower wing. Ailerons on the upper wing were actuated by the lower ones through interconnecting struts. We've followed this set-up somewhat in our model, as the aileron servo is in the bottom wing for convenience, and wire pushrods connect the lower ailerons to the upper ones,



Model flying characteristics depend on the power, since large and powerful control surfaces abound — four ailerons, monstrous rudder, and thick, big elevators. Highly maneuverable and yet quite stable.

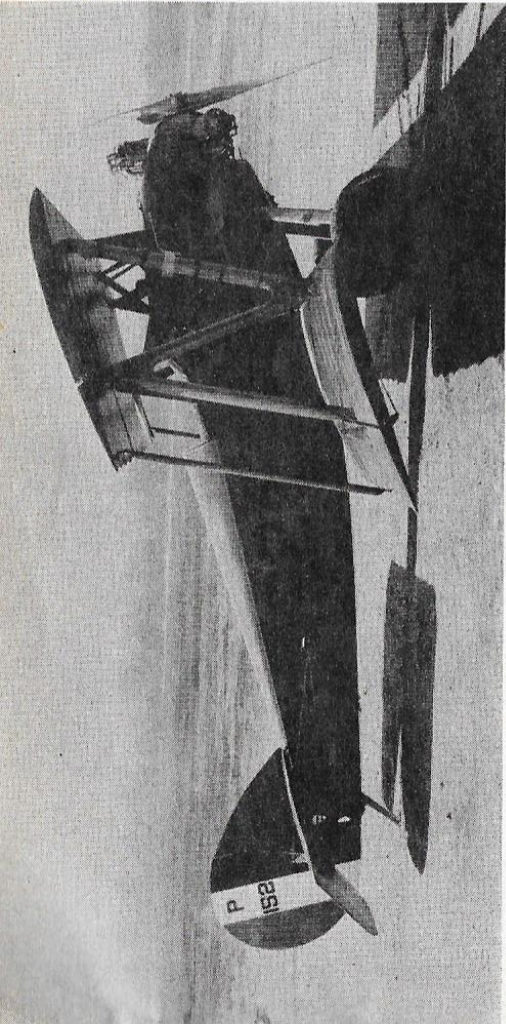


The only departures from true scale are the airfoil, wing trailing edge and construction. In every respect it is a realistic airplane.



Your first scale model? Why not — it has everything going for it! Structurally similar to original Messenger, a fine sport flyer.





Far left: The front-quarter view shows many important details for the scale modeler — the airfoil section, diagonal struts, and engine cowling.

Naturally, the instruments were manufactured by the Sperry Gyroscope Co. This is the cockpit (center left) of Lawrence Sperry's personal plane. Notice the hand-holds in the top wing and the windscreen shape.

Left: Designed to be a soldier's aerial motorcycle, the Messenger was small, nimble, and easily manufactured — 42 of them were built. It was stressed for aerobatics because it had to be rugged for its mission.

Three photos, from Smithsonian Institution.

## From the early days, a delightful RC scale model capable of aerobatics. Recommended power is a .45 — a .60 for you hot-rocks!

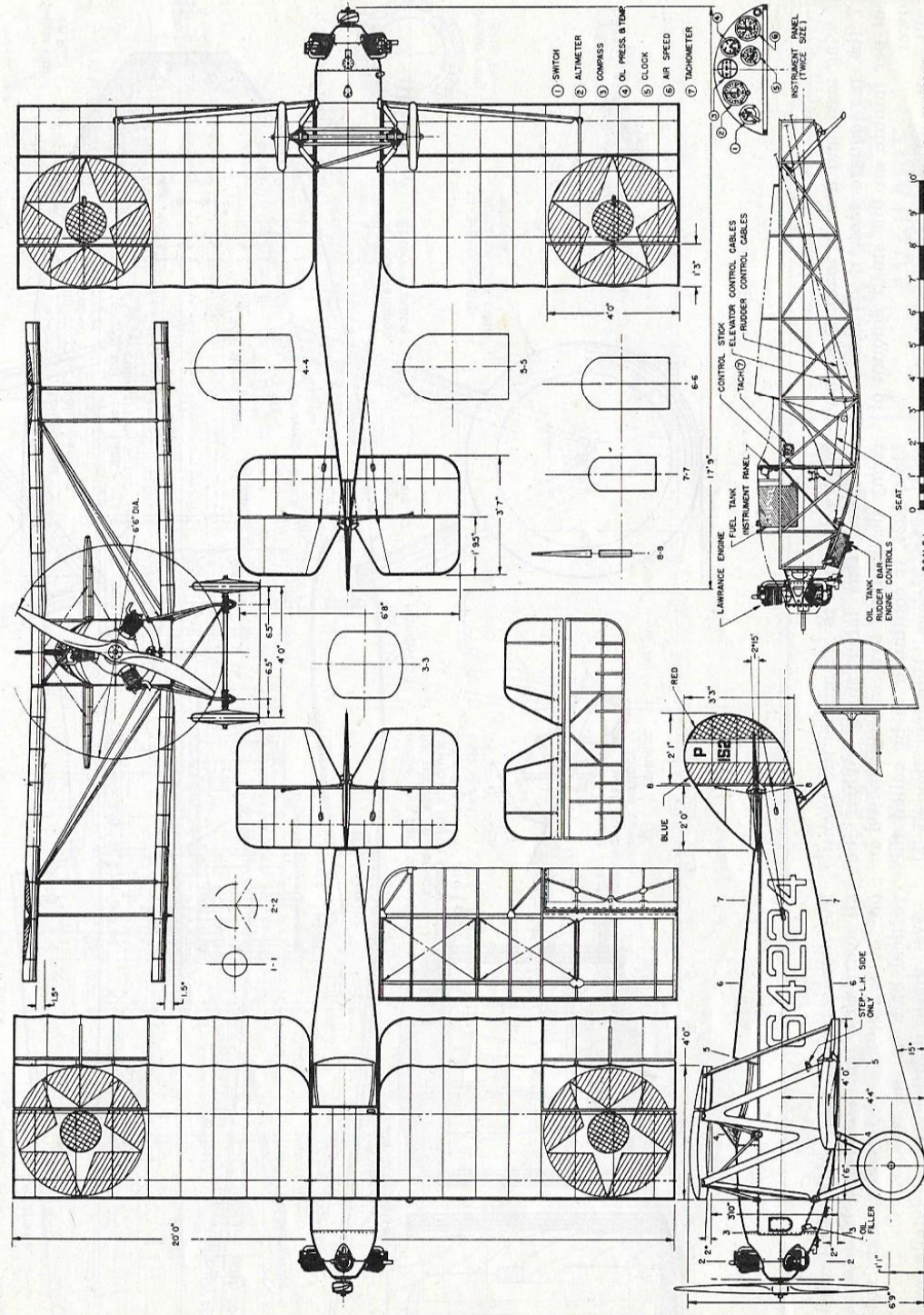
with Kwik-Links to provide final trim adjustments.

Although it bears the name of Lawrence Sperry, the Sperry Messenger was actually designed by Alfred Verville, of the U.S. Army Air Service Eng. Div., Dayton, Ohio. Its origin dates back to the three-year period following World War I. It was through the successful bidding of Lawrence Sperry that the

Messenger acquired his name, as the initial contract to build the Messengers was granted to the Lawrence Sperry Aircraft Co., of Farmingdale, Long Island, in April of 1920. It was in a Messenger that Lawrence Sperry made his famous landing on the plaza in front of the Capitol Building in Washington, D.C., and climbed part way up the Capitol steps as his tail skid didn't bite into the

concrete to arrest the ship on roll-out, and he had no wheel brakes.

A novel three-cylinder engine powered the Messenger. Of air-cooled radial design, and equipped with dual battery ignition, it turned out 56.5 hp at 1,600 rpm, and 64 hp at 1,880 rpm. This gave the diminutive biplane a top speed of 96.7 mph at sea level, with a minimum speed of 45 mph. With only 150 square feet



The scale drawings above were originally seen in AMERICAN MODELER 1962 and recently in AIR PROGRESS HOMEBUILT ANNUAL. A model could be built directly from them too.











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## Sperry Messenger

Continued from page 19

multi, depending on the power you use. The original, shown in the photos, was built by Evan Roberts, and was powered by the new Enya .45. This engine is quite powerful for its size, and with a 11 x 6 Tornado nylon prop. and Idle-X fuel, it turned up 11,400 rpm right out of the box, with no break-in, which results in the Messenger rolling the entire distance of 7 to 8' on take-off, after which it climbs out at 45 to 50 degrees at full power. With the Enya continuing at full throttle, it flies like a jet. Rolls, with ailerons on both wings working, are like corkscrews. But with Enya throttled back to about half power, it tames down into a relatively easy-flying airplane with more scale-like speeds. At half-power, it still does beautiful rolls. Actually, any good .35 would be very adequate power for this ship, and the O.S. Max S-35 would be an ideal choice.

**Wings:** Rib-spacing is scale. In order to preserve the scale appearance of the fabric covered wings, I have kept sheeting on the wings to a minimum consistent with ruggedness. I felt that this called for spruce spars. Start the wings by building both front and rear spars for both wings, joining the separate pieces at the proper dihedral angles with the spruce doublers, and cementing them with either white glue or epoxy. While these are drying, you can make a building jig for the wings out of a few pieces of Celotex, Homasote, or similar material. Cut a piece to the proper width for the center section, and tack this down to a building board. You can attach pieces to either side of this, angling them upward to

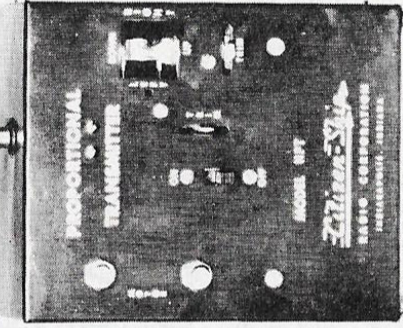


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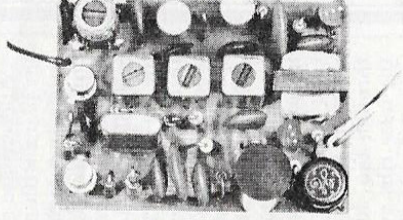
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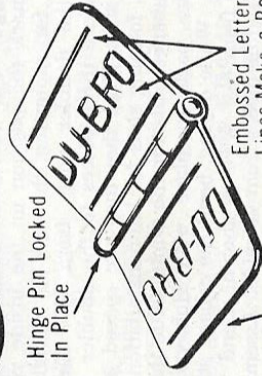
form the proper dihedral angle. Each wing is then built in one piece by cutting out all ribs and slipping them over the front and rear spars, sliding them into approximate position. After you have completed this step, lay the wing plan over the building jig, and place the wing assembly over it. Carefully align each rib into its proper position, and pin to the spars. You can keep the wing flat, in warp-free alignment, by blocking up the spars and pinning them to the building board. Then glue all ribs in position. Check the alignment of the trailing edges of the ribs, and block them up if necessary. Next, glue the trailing edge pieces in position; then add the leading edges with the front dihedral braces. Fill in over the front spar between all ribs with scraps of 1/8" sheet, and sand flush with the tops of the ribs. This provides a surface for gluing the leading edge sheeting in place, and helps lock the entire leading edge assembly, sheeting, and spars into a D-tube when the wing is completed with the lower sheeting in place.

After all of this has dried properly, add the leading edge sheeting. Box-off the aileron areas with pieces of 1/8" sheet and soft 1/4" square filler strips between the ribs. Add the 1/8" sheet piece at the trailing edge of the center section, the angled trailing edge ribs with their 1/16" sheet caps, and sheet the center section. Both wings are identical, except when building the lower wing, be sure to install the wing strut attachment parts before adding the leading edge sheeting, and box-off the servo mounting area before sheeting the center section.

When the wing assembly is thoroughly dry, remove it from the building board and turn it over. Add the 1/8" sheet filler strips over the front spar, between the ribs; then add the leading edge sheeting. When completing the top wing, install the strut at-

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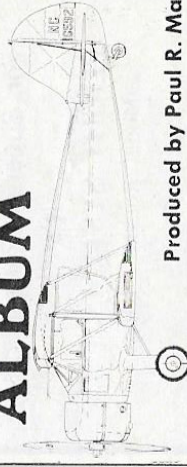
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tachment parts before installing the leading edge sheeting. Complete each wing assembly by adding the trailing edge sheeting, center-section sheeting, cap strips over the angled center-section trailing edge ribs, and the 1/4" sheet wing tips. Carve the leading edge to approximate cross-section, and sand the entire wing assembly to final shape. Notice that the lower wing has a slotted hardwood block installed in the lower surface, to receive the upper rear of the landing gear strut. The lower wing will also require the addition of the aileron bellcrank mounts, bellcranks and pushrods, and part W5-B, with the narrow strip of sheeting which become slotted for pushrod clearance.

Ailerons are simple, and can be built over the plans with no difficulty. Be sure to construct two right-hand, and two left-hand units. Add the micarta tie-rod horns to both upper and lower ailerons, and the control-horns to the lower units. Be sure the tie-rod horns are located properly.

**Tail assembly:** Stab ribs are cut from piece of 1/8 x 1/2", and slotted to receive the spar. Pin the stab trailing edge in position; glue and pin all ribs in position. Align the two center ribs to provide a snug fit for installing the 1/4" sheet fin. Glue the leading edge in place, then cut and glue the tip parts in place on one end. Slide the spar through the slots in all of the ribs, sliding the false ribs over the spar as you push the spar through. Glue the spar to ribs and the tip; then add the tip parts on the remaining end. Nose ribs should now be positioned properly and glued. When the assembly is dry, remove it, add the center section sheeting, and sand to shape.

Elevators are built by pinning the trailing edges in place over the plans, adding the ribs, leading edge, and finally the tip parts. When dry, remove from the board and add the filler blocks at the center for receiving the connecting yoke and the control horn. Sand to shape when dry; add the wire connecting yoke, control horn, and hinges.

Fin and rudder are cut from 1/4" sheet and sanded to shape. The fin is installed in the stab after the stab has been silked.

**Fuselage:** Cut two sides from 1/8" sheet, and mark the position on the inside rear faces for mounting the 1/8 x 1/4" uprights. Cut the doubler parts from 3/32" sheet. There are three pieces to the doubler for each side. Note that they are spaced 3/32" apart, forming slots for later installation of the cabane struts for the wing. Glue these doubler parts in place with Hobbyoxy No. 2. While drying, bend the cabane strut parts from 3/32" wire as shown. Bend the wing saddle pieces from 1/8" wide. Assemble each unit by binding with fine copper wire, laying the struts over the plans to check for proper alignment. When satisfied with their alignment, solder them together.

Next make the 1/16" plywood parts that anchor the bottom of the cabane struts to the fuselage sides. Set these aside, and cut the fuselage triplers from 3/32" sheet. The triplers and cabane struts are assembled to the sides together. Lay the cabane assembly in position in the slots in the doubler; and glue the tripler over it, using Hobbyoxy No. 2. Lay the entire assembly over the plan immediately after gluing to make certain that the cabane is positioned to assure the correct angle of attack for the upper wing. Slide it up or down in the slots as necessary. When satisfied that it is in proper alignment, pin the tripler in place; glue the 1/16" ply retaining pieces over the bent ends of the cabane, at the bottoms. These lock the struts into permanent alignment.

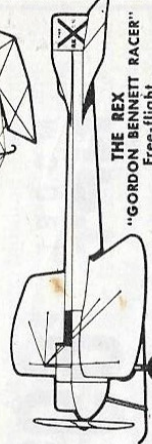
Cut former 1 from 3/16" ply, and former 2 from 1/8" ply. Mark the position of former

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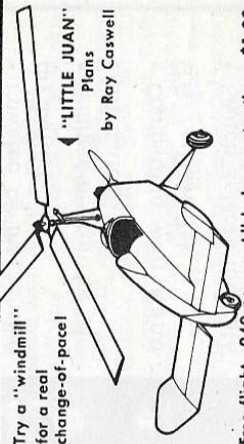


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3 on the sides; glue  $\frac{1}{8}$  x  $\frac{1}{4}$ " uprights to the sides at this position. Add the remainder of the  $\frac{1}{8}$  x  $\frac{1}{4}$ " uprights to the sides at this time. Cut all remaining formers from sheet balsa as indicated, and cut a piece of  $\frac{1}{8}$ " sheet to triangular cross-section to form the tail post.

To assemble the fuselage sides, pin one down to your building board, making certain that it is flat. Glue former 1 and 2 in position, checking with a small square to make certain they are aligned properly. When solidly dry, glue the other side in position, while the assembly is still pinned to the board. Check again for proper alignment. Use white glue or epoxy for this operation. When dry, remove from the board and add the top and bottom parts of former 3. Then pull together at the rear, and glue the tail post in position. Add each top former in proper position as shown, and add the bottom cross pieces of  $\frac{1}{8}$  x  $\frac{1}{2}$ ". At the trailing edge of the lower wing, the fuselage cross pieces — top and bottom — are  $\frac{1}{8}$  x  $\frac{3}{4}$ ".

Install the cockpit floor of  $\frac{1}{8}$ " sheet and the former at the instrument panel. Plank the entire top of the fuselage from the instrument panel back with soft  $\frac{1}{8}$ " sheet, or  $\frac{1}{8}$  x  $\frac{1}{4}$ " strips. Cut out the sheet covering to form the cockpit coaming. Install the tail-skid and tail-skid mounting parts, and cover the bottom of the fuselage with  $\frac{1}{8}$ " sheet. Notice that the very front end of the bottom sheeting is laminated from  $\frac{1}{32}$  and  $\frac{1}{16}$ " sheet, and hinged with a strip of nylon to provide access to servo pushrod connections.

Make the motor mounts by epoxying two pieces of  $\frac{5}{16}$  x  $\frac{1}{2}$ " hardwood together to form each, as shown. Glue these in position in formers 1 and 2 with epoxy. Add the  $\frac{1}{4}$  x  $\frac{1}{4}$ " triangular gussets at the rear face of former 1, and box-off the tank compartment with  $\frac{3}{8}$ " sheet. If you wish, you can fuel-proof the tank compartment with a few coats of fibreglass resin.

Cut a hardwood block to the proper size, as shown, to provide for attachment of the front of the landing gear struts; drill it to receive the wire struts. Then glue it in place, anchoring it in the plywood strut retainers. Epoxy would be desirable. When this detail is completed, you can add the top and bottom cowling blocks to the fuselage, and the three blocks that form the nose. Rough-carve these to approximate shape, then sand the front flat to provide firm gluing surface for the plywood nose ring. Make this ring from  $\frac{3}{16}$ " ply, as shown. You can make it in one piece, or cut the top part away to form a U-shaped ring, which will make installation of the engine easier. Glue this in place with epoxy. When the entire assembly is dry, carve and sand the entire fuselage to final shape. Add the aluminum oil drain tube, the  $\frac{1}{16}$ " plywood strengtheners for the rear hold-down dowel, and the fairing pieces on the cabane struts, and your fuselage is finished. Fuel-proof the nose, inside and out, with a few coats of fibreglass resin.

Check the fit of the lower wing into the fuselage opening, sanding it if necessary, so that it slips easily into place. When satisfied with the fit, add the small fairing block at the leading edge.

**Wing and landing gear struts:** Make a pair of N-shaped interplane struts from  $\frac{3}{16}$  x  $\frac{1}{2}$ " spruce. Epoxy the parts together. You can make these from pine, basswood, or very hard balsa, if you wish. Bend the wire attachment parts to shape, and epoxy them in position and reinforce with small strips of nylon. When making these wire parts, grind the ends of them off to a radius so that they will slip easily into the tubing on the wing. It will also help if you anneal the wire before bending them, to render it

soft and easily workable. To anneal, simply stick a length of  $\frac{3}{32}$ " wire into a gas flame, holding it with pliers, and heat until it's cherry red. Remove it from the flame, and let it cool in the air. When the red glow has disappeared, you can lay it down on a suitable fireproof surface, such as the concrete floor, until it cools enough to handle. Do not quench it in oil or water, but let it cool naturally, in the air. When you are able to handle it, you'll find that it bends very easily. These strut attachment parts are not load-carrying, so the wire can be soft with no problems resulting.

Bend the main landing gear from  $\frac{1}{8}$ " steel wire to the shape shown. This will require some care on your part, as it has a number of bends. But by taking extra care as you proceed, you should be able to form this with little difficulty. Form the two shock cord retainers from  $\frac{1}{32}$ " wire and bind to the bottom of the struts with fine copper wire. Next, shape the strut retainers from  $\frac{1}{32}$ " sheet brass, and slot each as shown. Solder these in place on the bottom of the strut. Cut a piece of  $\frac{1}{8}$ " wire to proper length for the axle, and set it aside.

Turn the fuselage upside down and fit the lower wing into position. Take the landing gear you have just completed, spread the front part slightly to slip the ends into the drilled hardwood block installed in the fuselage, and slip the rear part into the slotted block in the lower surface of the wing. Slip a few rubber bands over the wing to hold in position. This will also secure the landing gear in position. Cut and shape the landing gear fairing pieces from spruce or hard balsa. Epoxy to the struts, but make sure you do not glue these to either the fuselage or the wing. When dry, remove the landing gear and the wing from the fuselage.

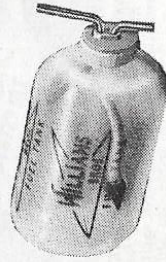
**Covering and finishing:** The prototypes were fabric-covered, and doped the Army khaki-brown color, all over. They were not pretty, nor were they noted for any hand-rubbed finishes. Therefore, to achieve a scale-like finish, you simply dispense with all of the filler coats, wet-sanding, and hand-rubbing. Start by giving the entire structure two coats of clear butyrate, sanding with very fine sandpaper between coats; then silk the entire ship. Apply three or four coats of clear dope to the silk, until the weave begins to fill in. Glue the tail assembly in position at this time.

Add any additional coats of clear dope that may be necessary until the silk is filled in, and the dope no longer goes through to the inside. Sand lightly between coats with No. 400 sandpaper to remove the fuzz that rises on the silk. When you have enough clear dope on the ship, spray or brush on the required number of coats of colored dope. Since there is no khaki-brown dope available, Aero Gloss olive drab was used on the original, and only three coats were necessary. Add the stars, the red, white, and blue bars on the rudder, the lettering on the rudder, and the numbers on the side of the fuselage, and you're finished. Lettering on the rudder can be made from small decals, while the numbers on the fuselage can be cut from decal sheet, or masked off with  $\frac{1}{4}$ -inch masking tape and doped on with black dope.

**Assembly and flying:** All that remains is to install your equipment in the ship, put it together, and you're ready to test-fly. To assemble, place the bottom wing in place, then slip the front of the landing gear struts into the block in the fuselage. Apply rubber bands over the bottom wing to hold it in position, which locks the rear of the landing gear strut into the slotted hardwood block in the lower surface of the wing. Slip the  $\frac{1}{8}$ " wire axle through the slots in the bottom of the struts, and bind



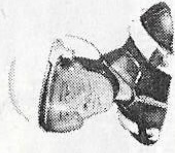
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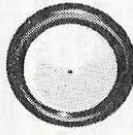
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5" Diameter .....	5.95



## SCALE PILOTS RACING

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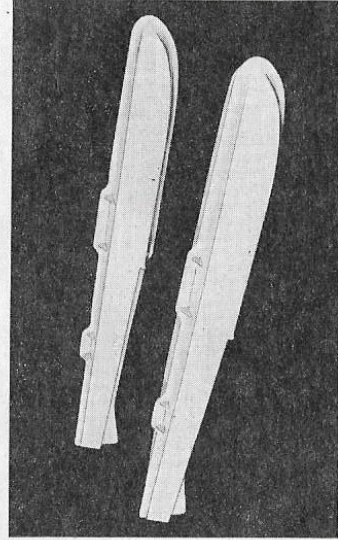
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with small rubber bands to retain in position. Do not bind too tightly, but just snugly enough to retain in place. If you bind this too tightly, you will lose the shock absorbing action. Install the wheels, locating them in proper position, and retaining with a pair of Du-Bro collars on each side of the wheel. Place the wing in position over the cabane, and temporarily hold in place with one rubber band over each strut. Install the interplane struts, shifting the top wing slightly if necessary, to bring everything into proper alignment. Now install the pushrods that connect each pair of ailerons; the Kwik-Link at the end of each will enable you to make fine adjustments for proper alignment.

Before flying, be sure your ship balances at the proper center of gravity position, and that all decalage checks out according to plans. If you have somehow acquired some positive decalage during completion, get rid of it by changing the angle of attack of the stabilizer. With the short-coupling, and the small horizontal tail area, this ship will climb like a homesick angel. You'll have to apply considerable down trim to level it out, if your decalage is off on the positive side.

Although the plans show the installation of reed equipment, by the time the original model was finished by Evan Roberts, most of the members of our flying group had acquired proportional. It was flown on the drawing board, and initial flights were in very windy weather, which didn't seem to bother the ship. From every standpoint it is a most satisfactory flyer.