

# COPPERHEAD

By William Noonan

**FOR SHEER REALISM, THIS COMPOSITE FIGHTER CAN'T BE BEAT. FOR SPEED AND GOOD LOOKS, IT IS ONE OF THE BEST CONTROL-LINERS**

**N**EXT to the actual building and flying of models, I believe any modeler gets most enjoyment out of simply getting together with the guys and having a real bull session, discussing the pros and cons of various types, wing loading, construction, etc.

Although the next door neighbors may complain about one of your pals showing how his new "Colossus Super 60" gives out early on a Sunday morning, or the lady across the street may shake her head doubtfully when you demonstrate to a friend how your ten-minute-without-a-thermal job acted, the modeler undoubtedly gains new knowledge of a subject or idea he was ignorant of by participating in these shindigs. One of these discussions involving construction, proportion of a model, power, etc., greatly influenced the design of the Copperhead.

First, size in relation to power was the topic. Although preference varied as to the ideal "universal" size, a 32-inch span was considered a good all-round dimension, allowing engines of practically any displacement to be used. The design was conceived primarily with realism in mind, speed not being a factor.

For realism, it embodies the characteristics of a great many of today's fighting planes: in it may be seen the influence of the Republic P-47, or perhaps the Jap Zeke or Tojo. The model was designed with no specific airplane in mind; I just wanted a model that would resemble a modern fighter. In spite of a fairly high power-to-

weight ratio, the average speed was better than anticipated. The original model was powered with an engine of .23 cu. inch displacement; motors of greater displacement should substantially increase the speed and maneuverability.

Backbone construction (laying a "keel" directly over plans then cementing bulkhead halves in place) was accepted as the most practical and accurate. The old method of first building a box frame, then gluing formers on top, bottom, and sides, was decided to be a little on the heavy side as well as taking more time to build.

The design itself follows the trend of modern fighter aircraft: elliptical wing, bubble canopy, and radial-type engine cowling. Typical, wide, wing-mounted landing gear facilitates smooth take-offs and landings.

It is true that in designing a model (or full-size airplane, for that matter) one thing has to be sacrificed for another: super finishes mean added weight, droppable gear means more abuse on the model, etc. In the case of the Copperhead, the external installation of the bell crank somewhat spoiled the appearance, but ease of adjustment and maintenance make up for this. Mounting controls outside fuselage are used so alterations can be made on the bell crank-to-elevator linkage to insure smooth and efficient operation.

Accessibility of ignition was another thing that was not overlooked. The hatch was made removable far enough aft so that there was

enough room in the uncovered portion of the fuselage to allow shifting of batteries and coil, to obtain correct balance.

All points taken into consideration, the design of the Copperhead is realistic and practical.

**Construction:**—Probably the most unorthodox feature of the model is the blister canopy. This was made possible by the use of a liquid, similar to thinner, which makes celluloid soft and pliable. After soaking a sheet of celluloid of the proper dimensions in this solvent, it can easily be molded into practically any form.

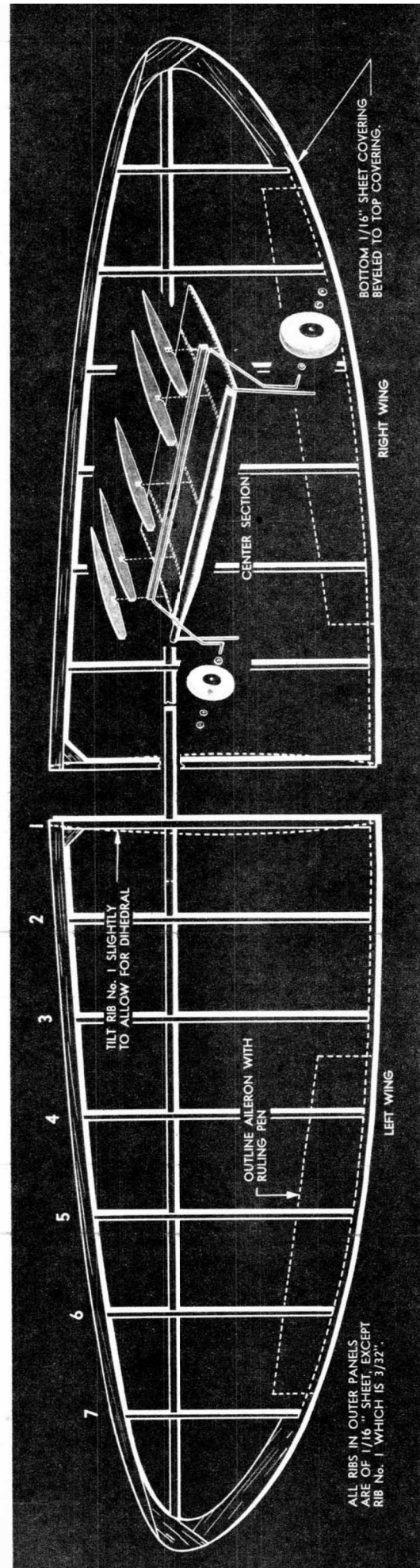
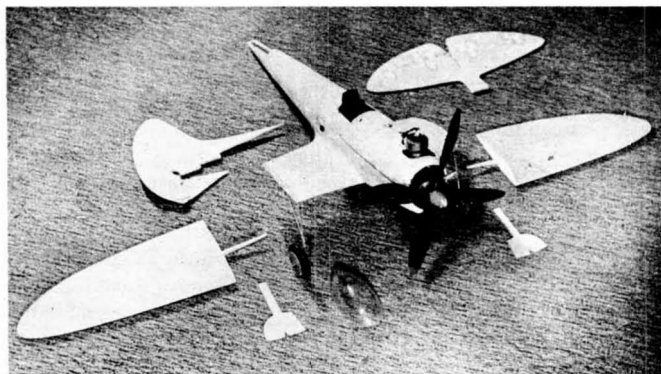
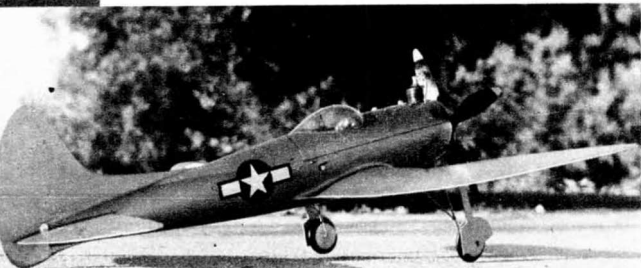
The blister is easily molded with use of previously mentioned solvent, or the celluloid may be heated and stretched over hardwood (pine) mold. In the case of the original, a trailing antenna lead weight was used as a mold, but very few people have access to such an object, so a pine or hard balsa block shaped from tracing side and top views off plans makes the form. Trim away excess celluloid from completed molding and fit to fuselage in correct place over cockpit, which has been cut to coincide with canopy. Wait until model is finished to glue blister in place, even though it may be a temptation to do so as soon as mold has stiffened.

After accurately enlarging plans, place waxed paper over them, using thumb tacks to secure corners. Now, procure a piece of plywood (Mom's breadboard would be swell) or any other piece of smooth wood and start cutting bulkheads (formers) E, F, G, H, I, J, K, and L from a good grade of medium  $\frac{3}{32}$ " sheet balsa. After these have been cut and notched, set them aside and cut bulkheads A, B, and C (nose) from  $\frac{1}{4}$ " medium-hard balsa. Cut or saw firewall bulkhead D from  $\frac{1}{4}$ " plywood. If radial mounting of Ohlsson "23" is preferred to beam mounts, use same procedure when cutting plywood as in forming firewall. Also, omit oblong holes in bulkheads D and E, meant for receiving beam motor mounts.

Pin  $\frac{3}{16}$ " straight-grained square stock along top and bottom keels. Do not pierce wood with pins; simply line keel pieces up accurately on plans by pushing pins alongside of wood. Note on plans that portions under the wing and in the cockpit and the engine projection hole at the top of the cowling are built on plans and later removed.

Place all bulkheads in correct positions on plans, having previously applied model cement to notches into which keel fits. A, B, C, D, E, F, and G, it is noted, are separated a little above the thrust line to allow inspection hatch to be removed. After cement has dried, start laying tapered strips of soft  $\frac{3}{8}$ " by  $\frac{3}{32}$ "

● Three views of the model. A flight shot just as it was taking off. A view showing the model stripped down prior to assembly. Completed model shows realistic details.



ALL RIBS IN OUTER PANELS ARE OF  $\frac{1}{16}$ " SHEET, EXCEPT RIB No. 1 WHICH IS  $\frac{3}{32}$ ".

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## Copperhead

along framework. A good fit is necessary. When half is dry, remove from plans, glue corresponding formers on opposite side, repeat planking procedure.

Obtain correct fuselage contour by first shaving planking with sharp modeler's knife or razor blade, then sanding with progressively finer sandpaper. Cut turtleback between bulkheads H and I to separate hatch.

Cut hole for engine to stick through. The size depends on type used.

Cement a piece of 1/16" plywood between motor mounts and between bulkheads D and E. This forms a wall for the hatch screw nut, as well as stabilizing the motor mounts.

The wiring may be installed now, using a standard wiring diagram. Make certain of a neat, secure soldering job to prevent headaches when on the field. Positions of coil and batteries is indicated on plans; they are easily accessible for wiring. Before bolting motor in place, it is a good idea to shellac the inside of the fuselage, between formers C and D, to prevent spilled fuel and exhaust oil from penetrating. It is wise, also, to drill a small hole just forward of bulkhead D for a fuel drain, thus lessening the fire hazard.

**Wing:** Trace outline of wing center section and both panels on 1/16" medium sheet balsa. Mark off rib positions in pencil; set outer panels aside and start work on center section. Pin this piece to work bench, placing pins along the approximate center line running spanwise. Now glue 1/4" by 1/8" spar in place. Bend rear landing gear leg out of 3/32" diameter piano wire. This piece runs along center section spar and is secured by means of thread binding or



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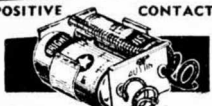
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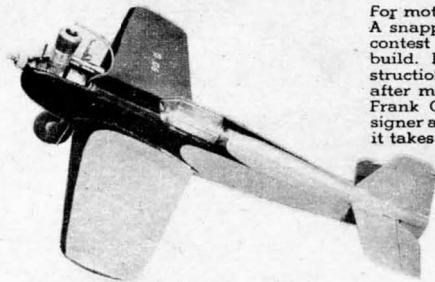
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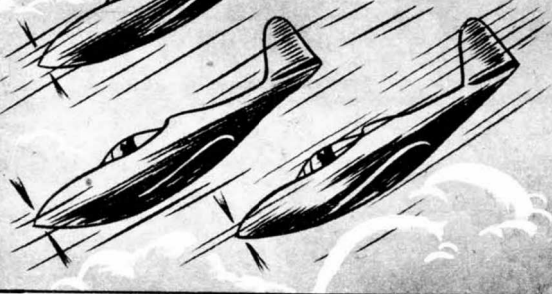
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grooved blocks and then cemented to spar and 1/16" sheet covering. It is glued in place while center section is pinned to bench. Next, cut a piece of hard 1/4" square balsa the length of the center section and cement the front 1/16" diameter piano wire to it, binding with thread. This piece does not form the leading edge, but is glued behind the 1/4" leading edge. Now place ribs 1a, 1b, and center rib in place. These are cut from 3/32 inch hard sheet. Note that they do not reach clear to the trailing edge, for a 3/16" beveled border is left at the trailing edge to join bottom covering. Glue 3/32" plywood gusset in corner at rib 1a and spar; this is the bellerank mount. A hole is drilled for the bolt to come through, and the nut is cemented in place.

Build the outer panels the same as the center section, pinning the 1/4" L.E. in place along with the tapered 1/4" by 1/8" spar, placing ribs 1 to 7 in position and gluing 1/8" tip on. After this is done, cover all three sections with 1/16" sheet, starting by cementing sheet to the leading edge, working aft. Slide spar stubs, on which glue has been placed, into holes provided in center section rib 1b and allow to set. Then place one-inch strips of linen at dihedral break to insure strength. The dihedral, by the way, should be automatically formed by the bevel of the spar stub.

Now take the fuselage and cut away portion shown on plans as part to be removed later; this includes the lower part of bulkheads F and G. Fit the wing in place in this cavity, then fill in under wing with soft block balsa, trimming to conform to fuselage lines. Make a shallow fillet from plastic purchased in tubes at your hobby shop. Solder landing gear legs together, after having bound joint with fine wire. Slip wheels on and solder two washers on end of axle, about 1/16" apart, to wedge fairing in.

Cut control-line guide from 1/16" plywood, then cut a 1/16" slot along the outer side of rib No. 7 in the sheet covering under the wing. Cement in place.

**Tail Group:** The tail surfaces are easily made, as they are cut from 3/16" medium sheet stock. Trace outlines of wood, making certain the movable elevator fits correctly with the outline of the stabilizer. The elevator is cut in two different pieces, these two being joined by a length of 3/16" square pine or similar hardwood. Control fitting is then cemented in hole that has been drilled in left elevator. The hinge is made of strips of approximately 1/2" by 3 1/2" linen, detail shown on plans.

The tail wheel is cut from 3/32" plywood, and 1/16" I.D. washers are glued in the center to act as bearings.

Cover entire model with gas model Silkspar, the fuselage being covered with strips about 1 1/2" to 2" in width wrapped around, with grain running lengthwise.

Give the model seven coats of dope, three clear, four pigmented. The original was doped silver on the underside and opalescent blue on top, but this choice is left to the discretion of the builder.

Fly model in calm weather. If wind is blowing, launch downwind, this allows model to gain flying speed and control wires to become effective. Suggested prop to use with "23" is a 9" diameter with a 10" pitch.

Speed is governed by engine used. The original has averaged about 40 mph in 32 flights.

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