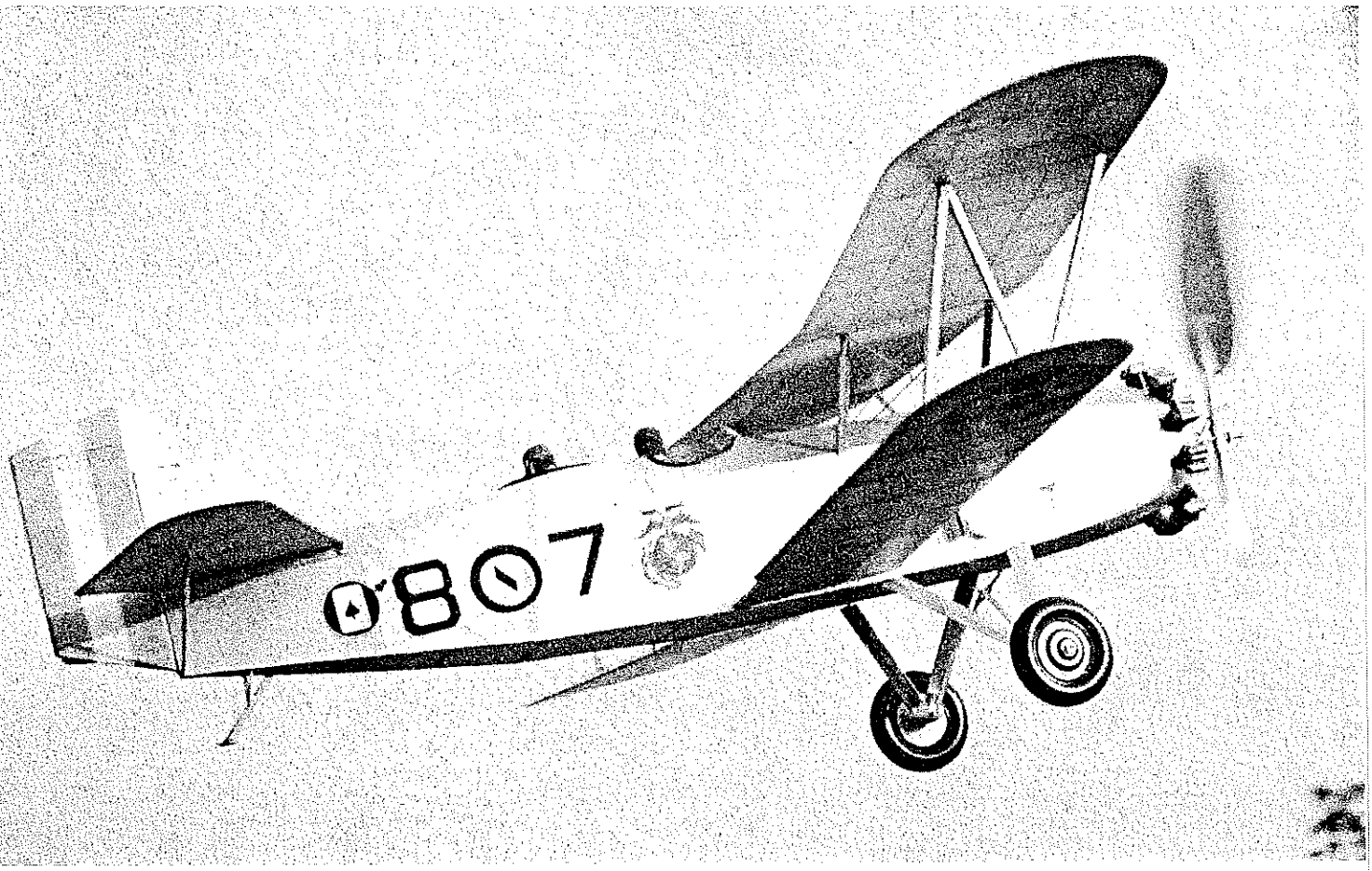


Difficult to distinguish from the full-size plane, the OC-2 heads up for another flight. This particular airplane was the author's rubber-powered version flying on four strands of 3/16-in. rubber. The plane flew quite well on rubber but didn't have the endurance afforded by Electric power.

CURTISS OC-2 FALCON

For the Scale Free Flight biwing enthusiast, this versatile 24-in.-span craft just might fit the bill. Specifically designed for the Mini-6 electric motor system, the model can be easily adapted for rubber-powered flight as well.

■Don Srull

MANY SCALE MODEL subjects, while ideal for the new small electric motor systems, are not suitable for rubber power. They're limited-application airplanes. The Curtiss OC-2 gives the modeler more options—it's a very good rubber-powered subject *and* an outstanding electric-powered flier. It also happens to be one of my all-time favorite airplanes!

The inspiration for the model described here came from a beautiful Peanut design by Pres Bruning. It was flown successfully for over two years on rubber power before being converted to mini-electric power. After literally hundreds of flights and countless hours of flying, it was lost, to everyone's surprise, in a late afternoon thermal at our local flying field.

If built according to the plans and kept reasonably light, the OC-2 can be flown with either mini-electric or rubber power. The Scale Free Flight fan will find this model a rewarding and realistic flier. If you haven't yet tried mini-electric Scale flying and you have some Scale Free Flight experience, give the little Curtiss OC-2 Falcon a go.

The original Curtiss OC-2 was a Navy derivation of the famous Curtiss Falcon series of Army two-seat fighters. When the Falcon was accepted for use by the Navy in 1927, the planes were modified for air-cooled Pratt & Whitney Wasp radial engines in place of the Packard and Liberty liquid-cooled engines previously used.

The first of these modified Falcons were delivered to the Marine Corps in 1928. The large size and heavy weight of the F8C-1, however, yielded performance far below that required of a specialized fighter aircraft. As a result, the airplane (redesignated OC-2) was relegated to an all-purpose role. This included observation and air evacuation, as well as fighting and dive-bombing. The last of the 24 OC-2s operated by the Marine Corps was retired in 1935.

Construction

This model is designed especially for the HiLine Mini-6 motor. The model's 135 sq. in. of wing area puts it at the upper size limit for high-drag biplanes that can be flown successfully with the mini-electric motor systems. That means the aircraft should be built as light as possible and must

be properly trimmed to achieve optimum flight performance.

Except for the wing spars and leading edges, use very lightweight balsa throughout. Also, firm, stiff balsa should be used for the fuselage longerons. Resist any temptation to beef up or reinforce the structure—it has more than adequate strength for its intended purpose.

Fuselage. Build two identical sides using 3/32-sq. balsa. Join the two sides by adding the crosspieces and formers. Bend the cabane struts from 1/32-dia. piano wire, and carefully glue them to formers F5 and F6 before attaching the latter to the fuselage frame.

Make up the landing gear legs from .045 piano wire, then attach them to the bottom of the fuselage in the slotted crosspieces. Reinforce both the cabane and landing gear with small pieces of silk.

Add the 1/16 x 1/8-in. stringers. Complete the cockpit decking and then the nose sheeting. Carve the nose block piece F1 to shape after facing it with 1/64 ply sheet. Make sure the cutout fits the HiLine motor. Ensure that you have approximately 3° right thrust and 2° downthrust when the motor is mounted.

Cover the landing gear legs with heavy paper fairings attached with white glue. Don't cover the cabane struts with paper fairings at this stage.

If you intend to fly the OC-2 at some point with rubber power, now is the time to install a rear motor peg support. A strip of 1/4-in.-wide 3/32 sheet balsa in front of the fuselage upright at section F11 will allow you to drill a hole and very easily add a 1/8-in.-dia. aluminum tube rear motor peg after the model is complete.

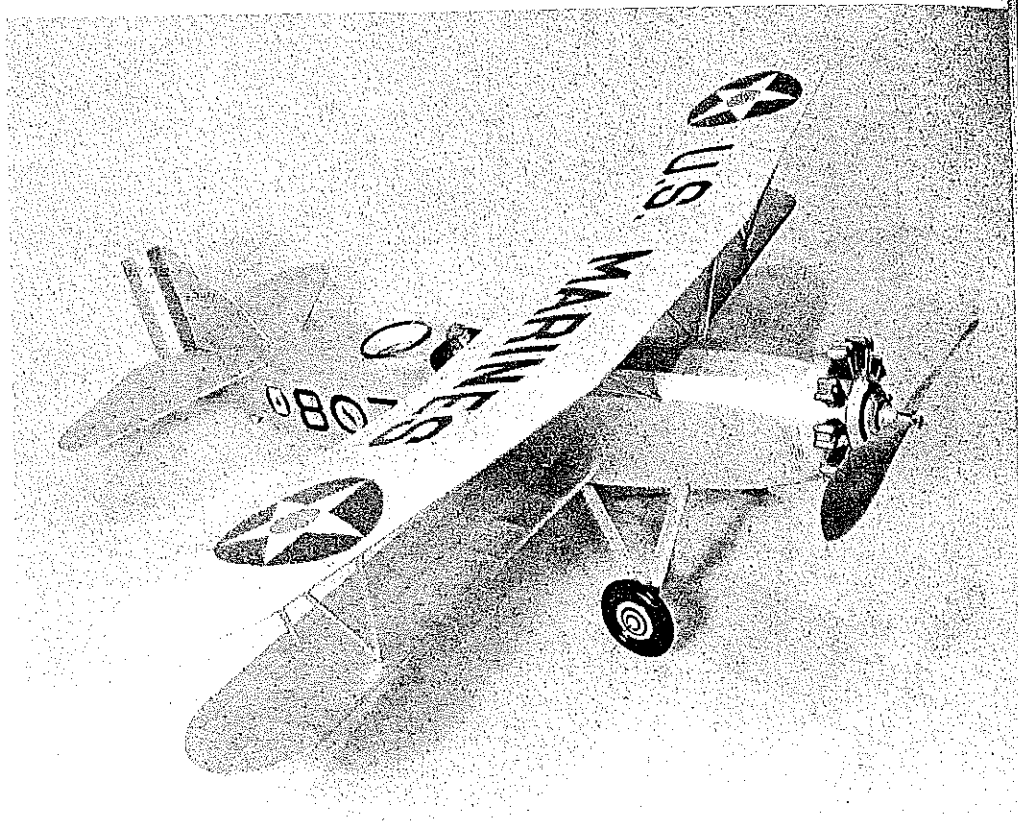
Sand the fuselage structure, apply two coats of thin dope, and set it aside until ready for covering.

The tail surfaces are of conventional construction. Use light, straight balsa stock. Don't forget to build the rudder as a separate movable surface. Although not shown on the plans, the elevator can also be built as a separate movable surface to simplify initial flight trimming. Sand the structures, and apply several coats of thin dope.

Wings. Cut all the ribs from lightweight balsa sheet. Use firm, straight balsa strip for the spars and leading edges. Complete both wings, and build in the indicated dihedral. Sand the wings to final shape, including the leading and trailing edges.

The critical stage in any biwing construction is fitting and rigging the wings. Take your time and get it right, because what you do here will determine how well the whole airplane lines up.

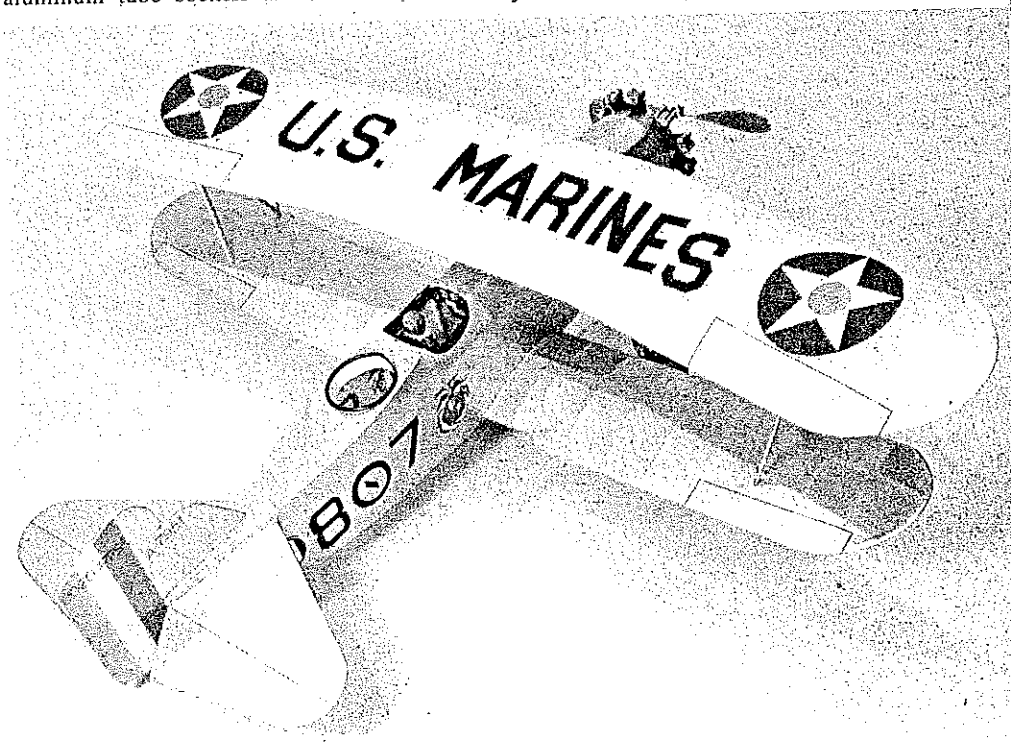
First fit the bottom wing into the fuselage cutout. Do any minor sanding or cutting that may be required for a good fit. Make sure the wing is lined up by sighting straight down on the model. Both wing tips must be equidistant from the tail post. Spot glue the lower wing in place (use a type of glue that can be easily removed later with dope thinner).



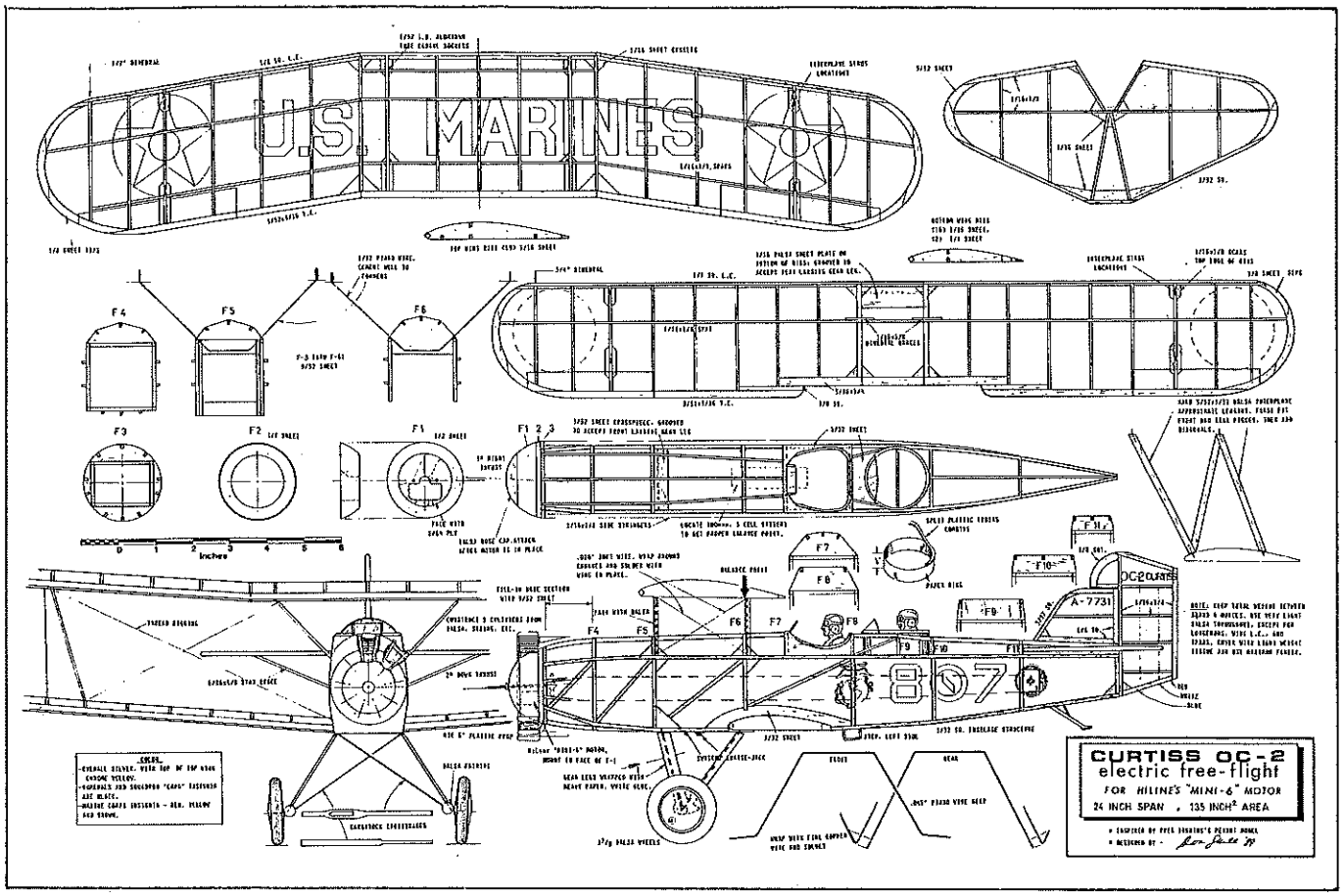
The uncowled nine-cylinder Wasp radial engine of the OC-2 is a prominent scale detail. Williams Bros. plastic cylinders with vacuum-formed heads make a simple and realistic facsimile.

Place the fuselage and lower wing assembly on either wooden blocks or books, and tape it down so that it can't move while fitting the upper wing. Drill 1/16-dia. holes in the upper wing gussets where the 1/32-I.D. aluminum tube sockets are fitted. Glue 1/4-in.-long pieces of tubing into these holes, and carefully slide the wing in place.

Check the wing's approximate alignment by sighting the model from the front, top, and sides. Make any minor bends in the cabane wires necessary to align the top wing with the fuselage and bottom wing. Go slowly and make only small corrections



The distinctive swept upper wing of the Curtiss Falcon series and the unique fin shape give the OC-2 its classic Golden Age look. The swept upper wing also enhances stability.



each time. Final tweaks should be made to bring the wings into perfect alignment when measured with rulers or pieces of thread.

With the wing still in place, add the diagonal braces to the cabane. Don't omit these braces, as they provide tremendous strength and stiffness to the upper wing mount. Wrap thin steel (or copper) wire around the upper and lower ends of the cabane struts, and spot solder them in place. Kevlar thread or heavy carpet thread fixed with CyA (cyanoacrylate) may be used in lieu of wire.

Before removing the wing from the cabane struts, make up and fit the interplane struts. First cut the front and rear struts to size (remember that the right and left struts should be the same size). Add small metal pins to each end to reinforce the strut-to-wing joints. Temporarily fit the struts in position, then carefully cut and glue in the diagonal interplane strut. When dry, these assemblies will be rigid and can be removed from the wings.

Disassemble the model, and add the reinforcing gussets around the cabane attach points. The heavy paper fairings around the cabane struts can now be attached.

The electric motor system is installed by sheeting a small area on the bottom of the fuselage between the landing gear legs with 3/32 balsa. This sheeted area should be large enough that the HiLine switch and charger plate can be attached. Gluing these units from the inside will make them almost flush with the bottom of the fuselage. The three 100-mAh-cell flight pack must be installed so that it can be moved fore and aft to achieve the correct balance point.

This can be done by gluing a 1-in.-wide strip of hard 1/16 balsa inside the fuselage just above the bottom wing from section F6 back to F10. This 5½-in.-long platform is fixed to the fuselage uprights with 3/32-sq. crosspieces. When the battery is positioned for the correct center-of-gravity, it can simply be glued to this platform with a few drops of CyA. If and when the battery needs replacement, it can be pried loose and replaced via the front cockpit. It can also be installed with Velcro or rubber hold-downs. Use your imagination—just don't add unnecessary weight!

Solder the necessary connections for your mini-electric motor system, and attach the motor to the front of former F1 with small sheet metal screws. Attach the 6-in.-dia. plastic prop, and shim the motor as required to achieve about 2° downthrust and 3° right

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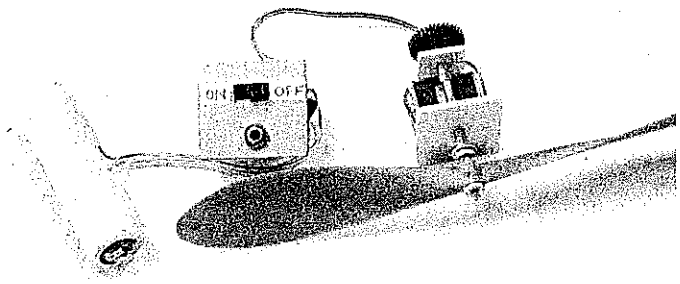

Left: The author showing off his venerable rubber-powered OC-2 Falcon. Still in excellent shape after hundreds of flights, it was finally lost to an unusually strong thermal that swept over the field. Above: The HiLine Mini-6 electric motor system complete with prop and a three-cell (100 mAh each) battery and switch. The entire rig weighs about 1½ oz. and provides ideal power for scalelike flights that can keep the airplane aloft for up to 1½ min. Photos by Tom Schmitt.

RN, Zaic *Yearbooks* . . . stuff you need which the hobby shop in the mall never heard of. If these brand names are unfamiliar to you because your local hobby shop does not stock them, you have got the point that most quality stick-and-tissue kits are manufactured by cottage industries and distributed by small mail order houses such as Airman's Supply.

A couple of issues back I ran something of the history of *Air Trails* magazine as compiled by Associate Editor Ross McMullen. I got a letter from Bruce Thompson (Toronto, Canada) saying:

"The *Air Trails* history is not complete . . . it first started in 1928 (Vol. 1, No. 1 was dated October), was a pulp size, and had only aviation stories in it. It was published by Street and Smith. *Bill Barnes* started with Vol. 1, No. 1 (February 1934) and continued until September 1935 as a pulp size."

I recently got my copy of the new AMA Supply and Service catalog. I strongly recommend the books, *Rubber Powered Model Airplanes* authored by Don Ross and *The World of Model Airplanes* by Bill Winter, as having much useful how-to-do-it information. I cannot recommend the books by Charles Hampson Grant *(Aero Science of Free Flight* and *Gateway to Aero-Science)* except for their historical interest. They *are* of interest for that but do not have the kind of practical, "here is how to do it" information of the Ross and Winter works.

The most recent edition of the *MECA Swap Sheet* (Model Engine Collectors Association) has an ad for gaskets for a number of engines. If you have a need, contact John Zandecki, 267 Lincoln Creek Rd., Centralia, WA 98531. Include the usual SASE. In the same issue is a fella saying the Anderson Spitfire .65 is back in production using the original dies and tooling! Send a SASE for details to Marvin Miller, 250 Bronco Rd., Soquel, CA 95073 (tel. 1-408/475-6858).

Tell you what. Send a SASE to MECA, 3007 Travis, West Lake, LA 70669 and request an application blank, join up, and then I won't have to read the *Swap Sheet* to you like this.

Keep those cards, letters, pictures, old Ardens you don't want, etc., coming my way!

Bell Anchor/Biltright

Continued from page 78

being another form of wood fiber, after all). If the Good Lord had wanted airplane wings made of metal, he would have made trees out of aluminum (I don't know what this means, but one of the crew from the tug boat says it is something pilots of full-size airplanes say a lot).

Let's go! Get out your glue, your little sharp knives, your Band-Aids, your materials, and your sense of humor . . . you'll need that the most. This hobby/sport should be fun first and foremost. Don't take it so seriously that you can't chuckle at yourself once in a while. We poor souls stuck out in the faraway places can still enjoy life as long as we have an airplane of some kind . . . *any kind* . . . to play with. So when the balmy breezes brush your brow or the sun seems just a tad too hot, think of us down here on this cold, windy rock managing to have what fun we can. Did I mention that the tug was a Swedish craft with an all-female crew? *Vive le model aviation!*

(Editor: You did notice the cover date month, didn't you?)

Curtiss OC-2/Srull

Continued from page 82

thrust. This is a good starting point; final adjustments will be made during actual flight tests. Charge up the battery pack, and make sure everything works properly. Give the entire framework a final sanding before covering.

Covering and finishing. Plyspan or a similar lightweight tissue should be used. Since there are no decent silver-colored tissues available, the overall aluminum doped finish of the OC-2 is best simulated with aluminum dope over white tissue. I covered my model with white Plyspan tissue except for the top of the upper wing, which was covered with yellow Plyspan and lightly sprayed with yellow dope.

After covering the model, shrink the tissue with a fine spray of water, or preferably with a brushed coat of isopropyl alcohol (the regular 70% drugstore variety works fine). I find that alcohol shrinks the tissue a little more gently than water and is less prone to warp light structures. Pin down the structures while they're drying to further minimize the chance of warping. Since the

dihedral won't allow the wings to be pinned down in one piece, they'll have to be shrunk panel by panel.

If any small wrinkles remain, don't shrink them out with alcohol; a little water in the offending area will usually work. If not, trim out the problem area and re-cover it. Remember that the tiniest wrinkle on an aluminum-colored surface will stick out like the proverbial sore thumb.

When completely satisfied with the covering, apply two or three coats of Sig Litecoat or a similar low-shrink dope. Using an airbrush, lightly fog on a coat of Sig butyrate (or similar) aluminum dope. Remember to keep the finish *light*.

Mask and spray the registration numbers and the U.S. Marine Corps markings on the upper wing. Cut the masks from tracing paper, and apply a light coat of 3-M Scotch Spray Mount Adhesive to hold them in place. The 3-M is repositionable contact cement with a very low tack and is perfect for this type of work.

The Marine Corps logo and the Ace of Spades squadron emblem are too complex for masking. I drew and painted them on tissue paper, cut them out, and adhered them to the model with double-sided tape. They could also be attached with white glue.

Detailing the nine-cylinder Wasp radial engine is important in maintaining the OC-2's distinctive character. The basic engine can be built starting with Williams Bros. plastic cylinders. The cylinders can also be made from paper tubes wrapped with string. In any case the cylinder heads and valve covers will have to be carved from scraps of balsa or formed from plastic.

Since there are nine cylinders, I found it easiest to build a complete cylinder head from scraps of wood, plastic sheet, and bits of tubing. I then vacuum formed nine identical heads from this master. These were mounted atop paper cylinders which had been wrapped with heavy string to simulate the cooling fins.

I painted the completed cylinders black and gunmetal, then carefully mounted them in nine equally spaced holes cut in F1. After all the cylinders were attached to F1, wire

pushrods were added. The balsa nose piece that finishes up the nose section is added after final flight trimming and thrust adjustments have been made.

If you can't find a set of wheels in the proper size (I luckily had a perfect set from an old Guillow model), turning your own balsa wheels is easily done. Start with a sandwich of ¼-in. balsa sheet laminated to each side of a 1/32 ply disk 1⅞ in. in diameter. Glue a piece of ¼-in. dowel through the hub center, and chuck the wheel blank in a drill. Using various sticks of sandpaper, turn and carve the wheels to shape.

Of course, the OC-2 won't look right flying around without a crew. The pilot and observer figures can be carved from balsa or foam. Additional surface details can be inked on with a technical pen or a small Sharpie brand waterproof felt-tip pen. A great many interesting surface details can be seen in the photos of the OC-2 contained in Pete Bower's fascinating book, *Curtiss Aircraft 1907-1947.*

Assemble the model, making sure all the flying surfaces line up properly. Use either an airplane-type glue or, for a lighter bond, small spots of CyA. The CyA will facilitate disassembly for future repairs or maintenance.

After adding the interplane struts, stabilizer struts, and the landing gear wires, the plane is ready for flight testing. At this point second thoughts about flying this pretty little ship may crop up. Don't be timid—this bird's a terrific flier and will look even more impressive in the air!

Flying. Check all flying surfaces for warps, and straighten any you find before attempting to fly. Check the balance point. Install the battery pack by whatever method you're using, shifting it as necessary to achieve the center-of-gravity shown on the plans (the rear cabane strut is the correct spot).

Test flying should be done in calm weather and over the softest surface you can find (tall grass is best). Try some hand glides to rule out any major trim problems. Since the glide will be fairly slow and steep, about all we want to accomplish with the glide test is to make sure the model doesn't turn sharply to either side, pitch up into a stall, or pitch down into a dive. If built carefully as indicated on the plans and in the text, the model should fly close to final trim right off the board.

Adjust the tail surfaces slightly to correct any unwanted tendencies that showed up in the glide test. A slow, straight, somewhat mushy glide is what you're after at this stage.

The next step toward full-power testing will be short and low-power flight tests. Install a 4¼-in.-dia. Williams Bros. prop (available from HiLine). This prop will not fly the model but will provide enough thrust for an extended power glide or level flight when the airplane is properly trimmed.

For the first tests, charge the battery only enough for a 15- to 20-second motor run. Make *slight* adjustments to the rudder and

stabilizer to achieve smooth, level power glides with only a slight indication of turn (my model turned in large left circles in both power and glide mode).

Gradually increase the run time, and use small pieces of clay to weight the nose, tail, or either wing tip to achieve as perfect a flight path as possible. When you're completely satisfied, install a 5½- to 6-in.-dia. plastic prop and increase the charge time. If a little more power is needed, try a 7-in.-dia. Peck-Polymers plastic prop.

When trimmed and powered properly, the Falcon will climb at a very slow and realistic rate in wide circles for one to 1½ minutes, then cruise at its maximum altitude for a short while before descending in slow, wide circles to gentle landings. On a calm day with near-maximum charges the model will turn in breathtaking flights of over two minutes. The glide may not resemble that of a Wakefield, but this Free Flighter can sniff out thermals if tempted. After all, it *is* a Falcon!

Heli Rotors/Wang

Continued from page 88

of Hiller paddles. Since the Bell control system lacks a stabilizer damper, the Helicopter is stable and not aerobatic in flight. At 150 lb. and powered by a 350cc gasoline engine, this is a very large Helicopter. You don't want to get anywhere near that 10-ft.-dia. main rotor! The MF-1 uses 60-size Competitor main rotor blades for tail blades.

Notice the pictures of the Schluter fixed-pitch S-head, and the S-head on my Schluter Helibaby with a Hughes 500 body. This system was introduced by Mr. Schluter back in 1978. It's a two-bladed articulated rotor with flap hinge offset, not to be confused with a teetering head rotor. Flap hinge offset provides better control response than a freely teetering two-bladed main rotor such as is used on a full-size Jet Ranger. Kyosho's new Concept 30 is an example of a collective-pitch Helicopter with a two-bladed flap hinge offset articulated main rotor.

Another picture shows Hirobo's DDF (Dual Dampened Flapping) head on a GMP Stork. The DDF combines the features of a teetering rotor head and one which is articulated with flap hinge offset. The entire hub can teeter about a center pin, while each rotor blade can flap up and down individually. The result is a "softness" that makes for very stable flight characteristics.

The original Hirobo Shuttle, introduced in 1985, also had individual blade flapping design. However, the flapping head was overly soft. While this was excellent for beginners, it also caused the blades to strike the tail boom on hard landings. Hirobo recognized the problem and has equipped all of its Shuttles since 1987 with a floating axle design similar to that found in the Schluter Champion and the Miniature Aircraft X-Cell. With the new head the Shuttle is both stable and aerobatic.

In one experiment I removed the stabilizer bar assembly to see how the Stork would perform as a flybarless Helicopter. I