Lacey M-8 1/2

This sprightly, 50-gram fun flyer was adapted from a semiscale Lacey M-10 specifically for the HiLine Mini-4 electric motor. ■ Roland G. Schmitt, Jr.

THIS DESIGN started life as a 14-gram Bostonian semiscale Lacey M-10. The idea for the metamorphosis came when "cousin" Tom Schmitt, who was still with HiLine, Ltd. at the time, told me that the motor used in HiLine's Mini-6 unit was available without the gearing. (The HiLine motor is now available as the Micro-4.) Don Srull, Tom said, had built and flown several small models successfully using this little gem of a motor and two 50-mAh batteries, so that the entire power train weighed only 20 grams.

I'd pretty well blocked out the Lacey M-10 design, and a quick calculation showed that by enlarging this 48-sq.-in. Bostonian 1.2 times I could convert it to a 70 sq.-in. mini-Electric. So after a quick trip to the local photocopy shop, I had my design. By the time the motor was delivered, the model was all but finished.

The Lacey M-8 1/2 flew off the board, and it's been flying ever since.

Construction: This fun flyer is easy to build; construction is conventional. One caveat, though: Light weight is all-important. Choose your wood very selectively, use only as much adhesive as necessary, and dope all structures and covering as lightly as possible.

Wing: I generally build this structure first.

The builder can choose between sliced or sheet (solid) ribs. I chose sliced ribs because I thought the result would be lighter. Now I'm not so sure, since I felt it necessary to use an auxiliary spar to support the front of the upper cap strips. In either case, choose light but firm, quarter-grained wood of 6- to 8-lb. density. Cut the spars, leading edges, and trailing edges from firm, straight-grained wood of 8- to 10-lb. density.

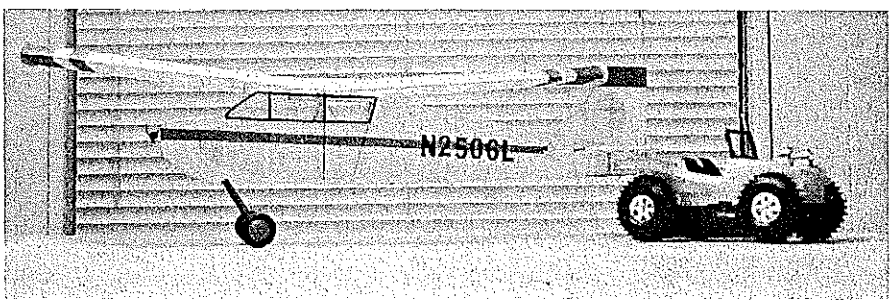
Build both panels flat on the plan. Join them at the center section. Add the gussets, and sand the wing lightly all over. Note that the wing-attach screw location is boxed in with small rectangles of 1/16 balsa. This prevents your having to chase the small, 4-40 screw all over the inside of the covered wing, as I did.

Tail surfaces: These too are built flat on the plan. I recommend building the fin and rudder as a unit, separating them only after they have been joined with the soft copper wire hinges. Sand the tail surfaces lightly all over.

Fuselage: The only deviation from conventional box frame construction—two side frames joined by cross members—is that the two side frames don't match in the cabin area. In the full-scale prototype, this asymmetry was a result of the passenger's door being on the right side (looking forward) and the pilot's door on the left.

Cut the longerons from firm, straight-grained wood of 8- to 10-lb. density. Somewhat lighter wood is acceptable for the uprights, cross members, and diagonals. Note that the top longerons have a severe bend, which can be achieved with the help of either ammonia or a jet of steam.

Since the forward lower longerons are



Big picture: The power train accounts for only two-fifths of this mini-Electric's 51 grams. Above: The wing rotates for storage, just as on the full-scale Lacey M-10.

straight, they may be positioned flat on the building board (allowing for the nose side pieces) when the side frames are joined. I use temporary bulkheads (one at the nose and another at the rear of the cabin area) to maintain exact alignment and squareness while installing the forward cross members and diagonals. When the adhesive has set, draw the tail posts together and secure them with glue. Complete the structure by adding the remaining cross members and diagonals.

It's best to install the short lengths of 1/32-I.D. aluminum tubing for the landing gear and the reinforcing gussets *before* covering the upper and lower surfaces of the nose with 1/32 sheet balsa. Frame the sides and top of the nose with 1/8-in.-sq. balsa and the bottom of the nose with a piece of 1/8 x 1/4-in. balsa, shaped as shown on the plan. Mark the position of the side 1/8-in.-sq. pieces to ensure that they are correctly aligned to support the nose block in the desired location. Another way to get this right is by using a temporary jig made from scrap balsa.

As the plans show, the top center cross member is made from 1/16 plywood and is drilled with two holes, made with a 3/32 drill. Place a drop of thin CyA (cyanoacrylate glue) in each hole, and allow it to harden. Tap the holes with a 4-40 tap, and add a second drop of CyA in each. Tap again after the CyA has completely hardened.

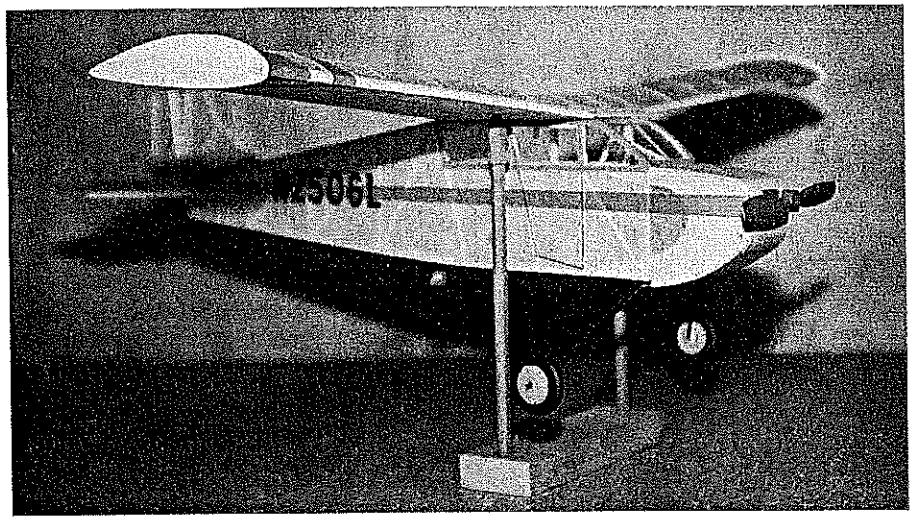
Landing gear and struts; wheels; and tail wheel: Bend the gear as shown from two lengths of .032 music wire. Make sure they are identical. Bind them together with fine copper wire as indicated, or use two short pieces of snug-fitting plastic tubing (such as heat-shrink tubing). If you use tubing, don't make the final 90° bend in each strut until they are joined by the tubing. Insert the struts into the tubing sockets in the fuselage (to obtain correct spacing), and tack the wire bindings—or the tubing—in place with a drop of CyA. Allow this to harden, and withdraw the gear from the fuselage.

Laminate the wheels from two disks of 1/8-in. light balsa. Mark the location for a 1/16 center hole, and drill the hole. Thread in a 2-56 machine screw, and secure it with a washer and nut. Chuck the screw in an electric drill or Dremel tool, and shape the balsa disks with a sanding block or emery board (for shaping fingernails). Remove the screw, and glue in a short piece of 1/32-I.D. aluminum tubing as an axle bearing. Install the wheels on the landing struts, retaining them with a 1/16-in.-long piece of tubing secured with CyA.

Bend the tail wheel from .032 music wire, and fill the center with a small balsa disk. Install the tail wheel on the fuselage.

The landing struts are faired with a piece of bond paper creased down the center. Form the paper over the wire, and glue it in place.

Shape the nose block/motor mount from a piece of soft 1/4-in. sheet as shown on the plan. Make sure it fits snugly in the fuselage nose and matches its contour. After shaping, cut the nose block apart as indicated, using a razor blade, and cut out the center. Glue the parts back together, and sand the unit lightly. Trial fit—but don't install—the motor, making certain you've provided clearance for the armature.



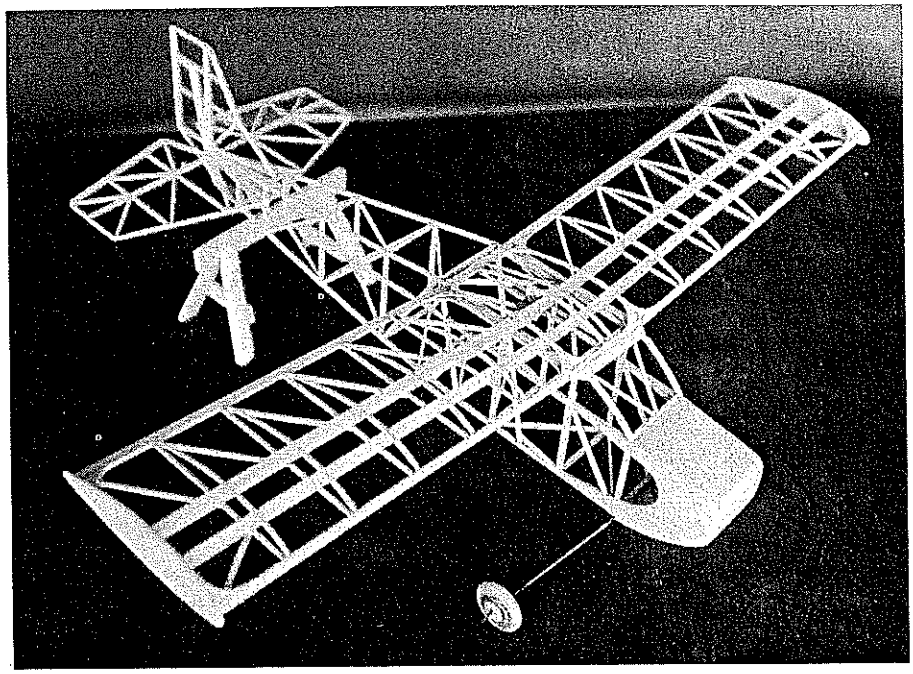
Installing the flight batteries. The model is placed on two pencils set in a block of wood, and the batteries are moved fore and aft until the airplane balances.

Covering and finishing: Lightly sand the entire framework, removing any irregularities or protrusions—defects that would mar your covering. Carefully dope the structure with two coats of Litecoat thinned 50-50, sanding again between coats. Recheck the model for squareness and warps; correct any imperfections that remain.

I used white Japanese tissue on the prototype, attached by applying thinner through the covering. At this point leave the three bays on the bottom of the fuselage uncovered from immediately in front of the wing trailing edge aft. Spray the tissue lightly with rubbing alcohol to shrink it. When shrinking the wing covering, wet only one side at a time, and then pin the structure to your building board with the trailing edge raised 1/8 in. at the tip to provide washout. The tail surfaces should be pinned down flat to minimize warpage after wetting the covering.

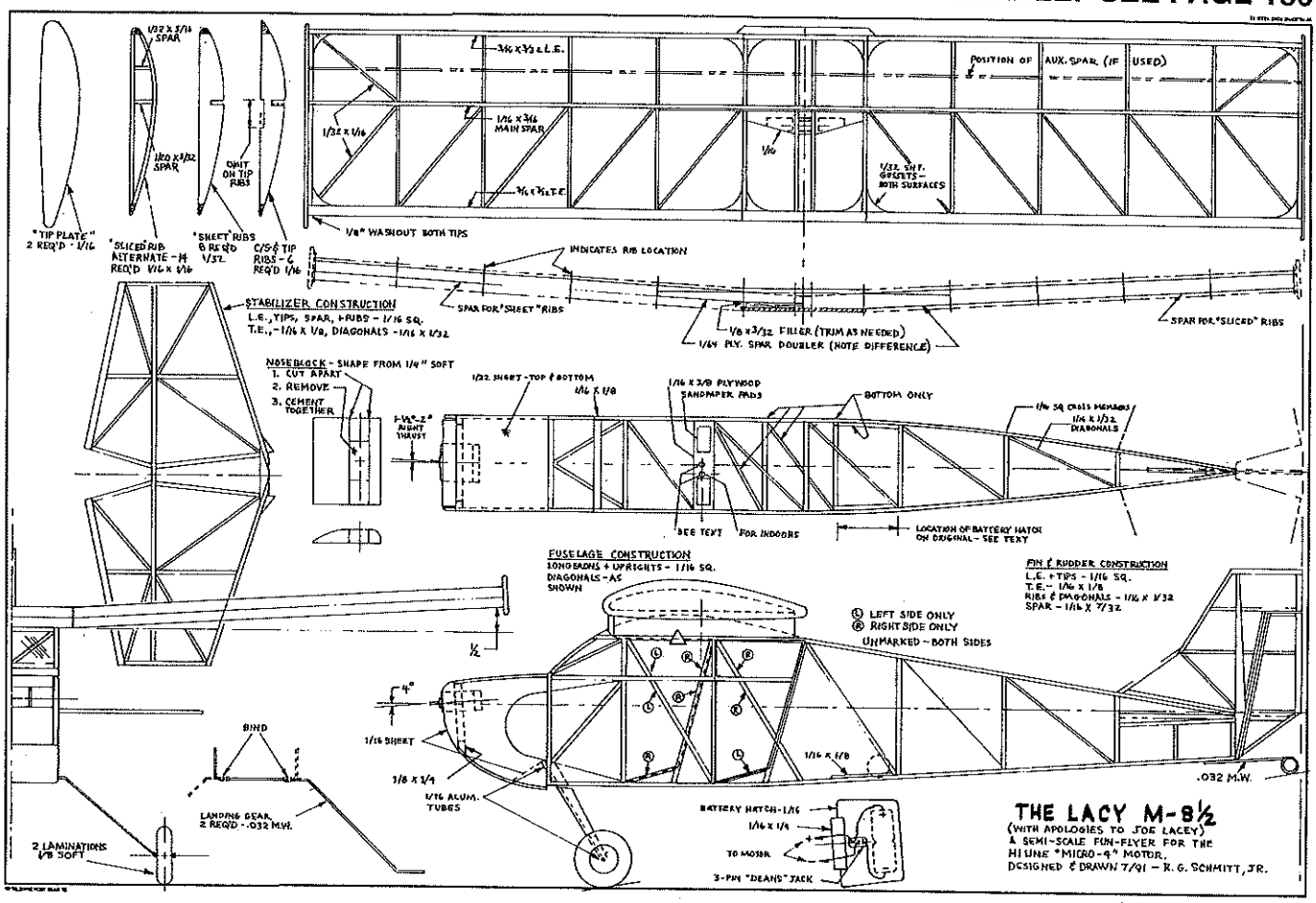
Once you've succeeded in eliminating all wrinkles, give the covering two coats of thinned Litecoat. For the wing panels, I recommend doping one surface at a time, pinning the panel down until the Litecoat has dried. The tail surfaces too should be doped one surface at a time, then pinned down flat to dry.

Lightly sand all surfaces, then repeat this sequence for the second coat. Affix the small, medium-grade sandpaper pads to the top of the fuselage and to the underside of



The completed structure ready for covering. The extensive use of diagonals helps to minimize warpage in a structure as light as the Lacey M-8 1/2.

FULL-SIZE PLANS AVAILABLE. SEE PAGE 186



the wing center section as shown, using model cement. These pads prevent the wing from rotating under normal flight loads, while allowing it to give under impact.

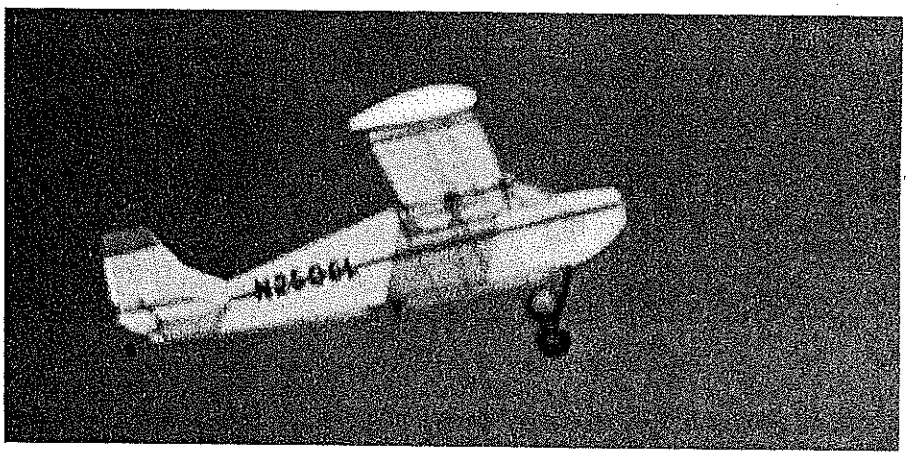
I decorated the model using a method devised by the late Walt Mooney. Florist's tissue, available at most crafts stores, is cut into patterns, strips, and letters/numerals and applied to the airplane with thinner, using the same method as with the tissue. You can indulge in as much ornamentation as desired at very little cost in weight.

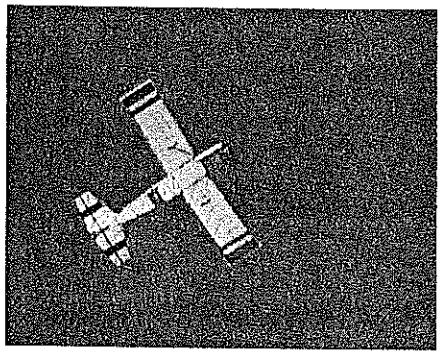
Control surfaces, doors, and access panels can be outlined with a fine-point felt marker such as a Sanford Sharpie. Color the tires with black dope. Make the wheel disks any color you wish, to either match or contrast with your trim color.

Temporarily install the motor at the desired angle in the covered nose block, using model cement as recommended by HiLine. Hold the nose block in place with cellophane tape. Install the stabilizer, cementing it at the spar only. Install the fin and rudder. Plug in the landing gear. Attach the wing with a 1/2-in.-long 4-40 nylon screw. Install the motor with model cement (as recommended by HiLine) for flight tests. You may have to adjust the thrust line later. Attach the propeller.

Your model is now complete except for the batteries, charging jack, and wiring. Mark two points on the underside of the wing, exactly 1 3/8 in. back from the leading edge at the first outboard rib on either side. Take two rubber-tipped pencils of the same height, and place them upright and six inches apart in a block of wood. Position the model on the pencils at the wing marks. To determine the correct fore and aft locations of the batteries, slide the batteries forward and rearward until the model balances horizontally. Installation details for the prototype are shown on the plan.

Continued on page 160





Left: Climbing for altitude. This lightweight fun flyer is best saved for days when the wind is light. Right: An overhead pass, and still climbing. Like most modelers, the author loves to see his craft high aloft and illuminated by the sun.

membership, $30 for a flying membership, or $33 outside the U.S.

See you next month

Lacey M-8-1/2

Continued from page 72

Note that I used a three-pin Dean's connector rather than the charging jack furnished by HiLine, because other models—and my field connector—use a Dean's plug. It isn't necessary to keep the charger connected after charging. Simply insert a plug that has two pins shorted together to establish circuit continuity. This will start the motor for flight.

Test-flying: Select a calm day and an area covered with the proverbial tall grass. Remove the prop, and glide the model into the wind with a gentle but firm launch. Make any necessary adjustments in the glide path by shimming the leading edge of the stabilizer up or down as appropriate.

When you're satisfied with the glide path, reinstall the prop and, still over tall grass, try your first powered flight—but only with a partial (30%) charge. If you have the correct amount of right thrust, the model may be circled in either direction. Like most cabin models, though, it seems to prefer left-hand circles.

Gradually increase the charging time, making trim adjustments as necessary. Warning: That rudder is very sensitive. If you find that the initial right thrust (or downthrust) was incorrect, remove the nose block, dissolve the model cement with thinner, and reposition the motor. When you're completely satisfied with the thrust line, permanently install the motor with CyA, and glue the nose block to the fuselage with four small dabs of cement, one in each corner.

If your model came out heavier than the desired 50 grams, be not of faint heart. Your craft will fly just as well—maybe better—and your motor will run just as well (and without harm) on *three* cells! So relax and have fun.

Fly Electric!

FF Scale

Continued from page 75

and overlapped before binding. Drying could be done overnight or in a microwave. When both thicknesses are sliced through with a razor blade, overlapped balsa will match up nicely.

Getting the skin off the form was done by splitting the part crosswise at the front spar of the wing. In addition, it was split at the rear peg to install a bulkhead and rear peg reinforcement.

To finish off the model, Len partially planked the cockpit fuselage with four-pound balsa sheet and covered the model with J.C.I. silver tissue. He made the three-bladed props from a plastic flower pot.

Ducted-fan FF Scale seems to be here to stay. Ferrell Papic's profile Heinkel HE 178 has been flying for a couple of years with two of Ferrel's tiny modified motors, but never with much altitude. This year, he's put an Astro 02 in it, and the extra power really gets the model up there.

Interested in getting started in Electric? Constant testing and refinements have made Electric very attractive for single- and multiengined Scale models, and flight duration can be controlled by the length of the charge on the Ni-Cd batteries. Need more power? Usually, adding another cell will do the trick. As long as you allow the engine to turn up and don't overload it with a too-big prop, your problems will be practically nil.

Three light FF systems can replace the venerable Astro 02, which has been off the market for a few years. VL Products, 7871 Alabama, No. 16, Canoga Park, CA 91304 (catalog, $1) has an excellent, proven geared motor. Peck-Polymers (P.O. Box 710399, Santee, CA 92072) has a motor famed for its low power requirements. Send $3 to Peck-Polymers for the catalog.