Electrostreak

Electric-powered models have proven they can fly for extended periods of time, go fast, and climb with authority. This model combines all three in a go-for-broke aerobatic configuration that changes opinions about Electrics wherever it's flown. For four channels and 05-size motors. ■Tom Stryker

THE FIRST TIME I arrived at the local flying field with this model, I attracted little attention when I took the little red plane out of the car and attached the wing. No one at our exclusively glow-powered-model field noticed as I obtained the appropriate frequency pin and preflighted the craft.

A few heads turned, though, when I silently walked to the flight line, faced into the wind, and lifted the plane over my right shoulder. With the sound of a few four-

Our author's wife, Joy, poses in front of historic Churchill Downs (home of the Kentucky Derby) with Tom's electric-powered, surprisingly aerobatic model.

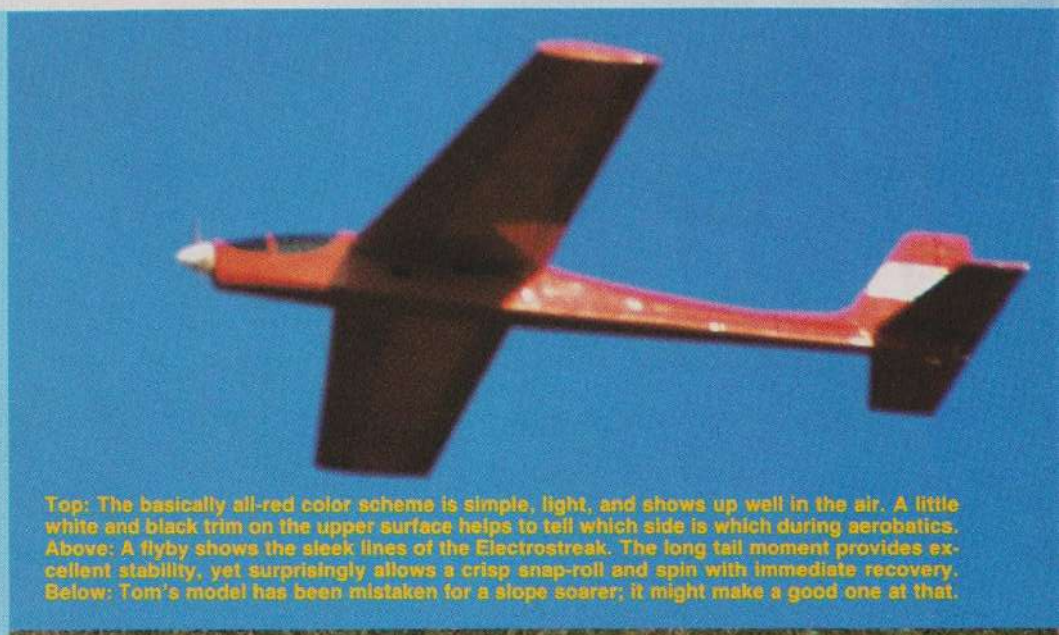
strokers flying in the background, the Electrostreak could not be heard at all as I launched it and then let it gracefully climb to altitude.

Soon every eye there was on the sleek little plane as it began performing loops, rolls, snaps, spins, and hammerhead turns. Comments could be heard like: "Wow! What *is* that?" "What engine is on that? I don't hear anything." And "Is that Electric? I don't believe it! I didn't think Electrics could perform like that!"

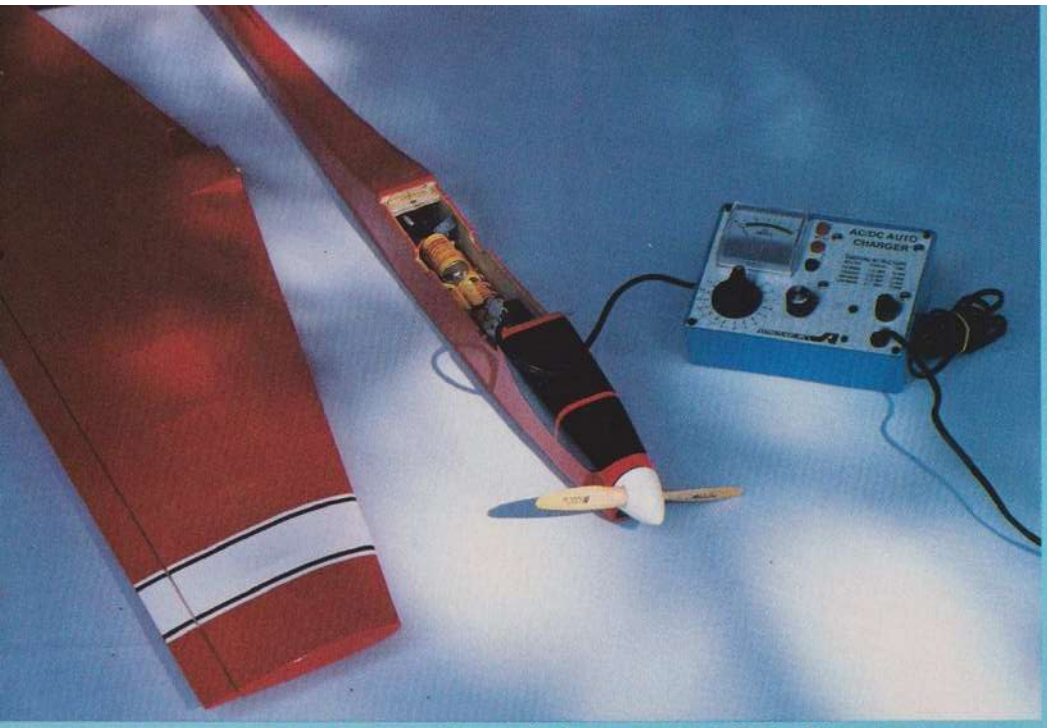
I, too, used to be skeptical of electric-powered flight. Having never seen one fly, I had just accepted the well-known "facts" like "They are too heavy," "They don't have enough power," and "They don't fly very long." It wasn't until I built and flew the Electrostreak that I disproved all of those statements—both for myself and for everyone else who has seen or flown it.

When I first considered building an electric-powered aircraft, I began with a fact-finding mission to the local hobby shop. There I found a good selection of Leisure systems that had been relegated to an inconspicuous location because of low local interest. I was surprised at how reasonable the cost was. For around 55 bucks I bought an 05 direct-drive motor, on-off switch, and a six-cell 1,200 mAh battery pack. Another $30 later for a fast-charger, and the propulsion system was complete.

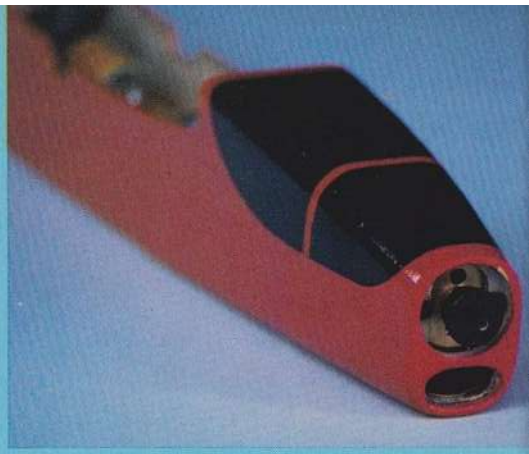
I needed an airplane that would fit my requirements. It had to be fully aerobatic, so four-channel controls were needed. It should have no landing gear (to reduce weight and drag), and it should be easy to



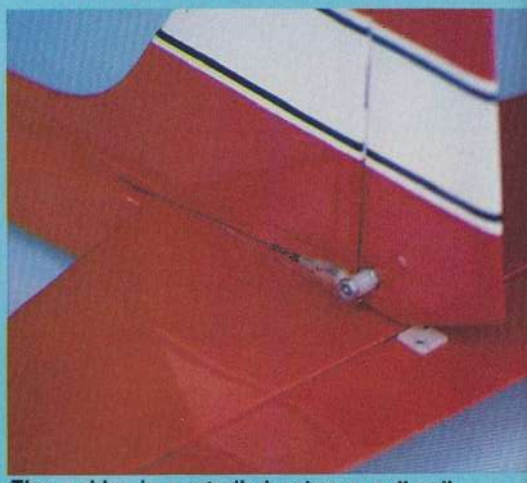
Top: The basically all-red color scheme is simple, light, and shows up well in the air. A little white and black trim on the upper surface helps to tell which side is which during aerobatics. Above: A flyby shows the sleek lines of the Electrostreak. The long tail moment provides excellent stability, yet surprisingly allows a crisp snap-roll and spin with immediate recovery. Below: Tom's model has been mistaken for a slope soarer; it might make a good one at that.



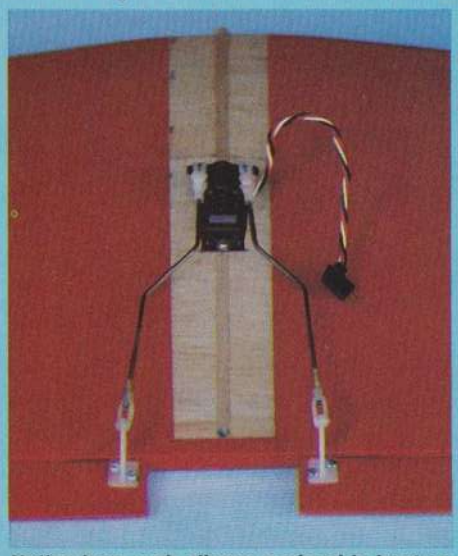
An Astro AC/DC Auto Charger recharges the battery in about 20 min. There is a large selection of chargers available in all price ranges due to the increasing popularity of electric power.



With the prop and spinner removed, the motor and air intake can be seen. The mounting holes in F1 will fit both the Leisure and Astro Cobalt motors, but the size of the opening in former F2 is different for each motor.

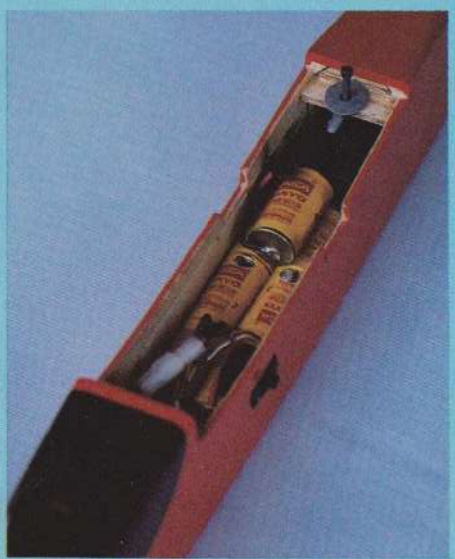


The rudder is controlled using a pull-pull cable system made of nylon-coated steel leader line. This setup is very solid and extremely light. Perfect for an Electric model.



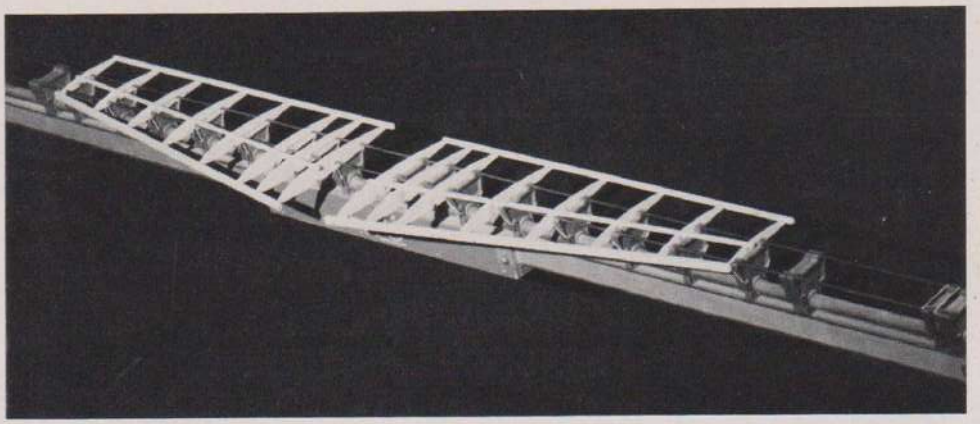
Notice how each aileron pushrod is bent so it exits the fuselage through the slots in the wing saddle. They hook directly to each control horn for a positive, lightweight system.

At the tail end is the combination air/pushrod/antenna exit hole. The tail skid is not necessary, being left over from an unsatisfactory attempt to add landing gear, which turned out to be more drag than it was worth.

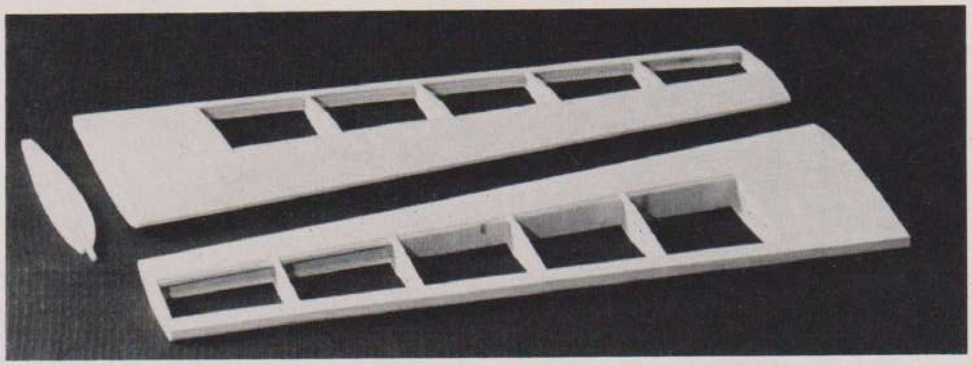


A crowded radio compartment is the sacrifice for a sleek, good-performing aircraft. Just behind the seven-cell hump-style battery pack are the elevator and rudder servos.

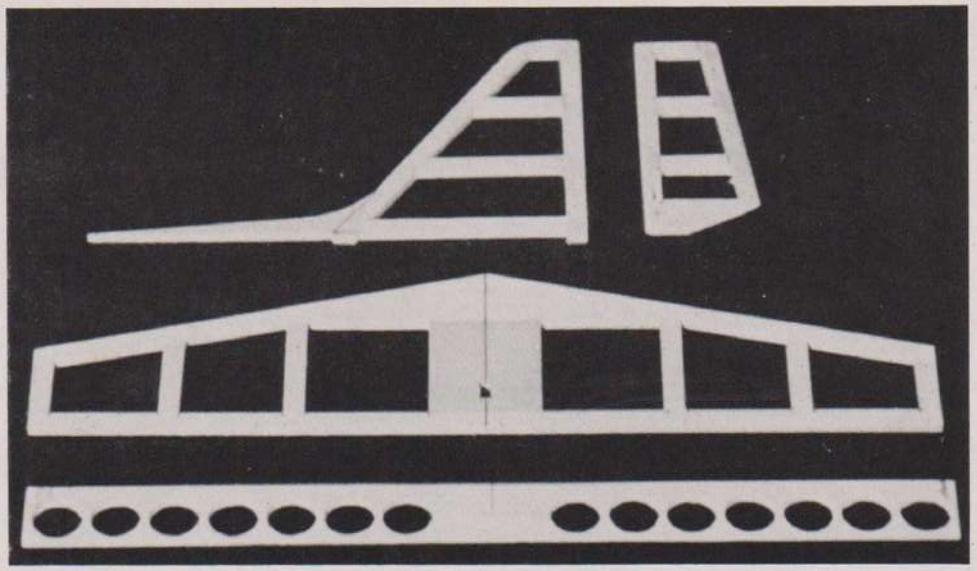
Our author and his Electrostreak model. Tom says at first nobody noticed the little red plane. Then they saw it fly, and that was the end of that. Since this photo was taken the model has been named the Best Non-Scale Aircraft at the RC World Flying Festival held in Orlando, FL.



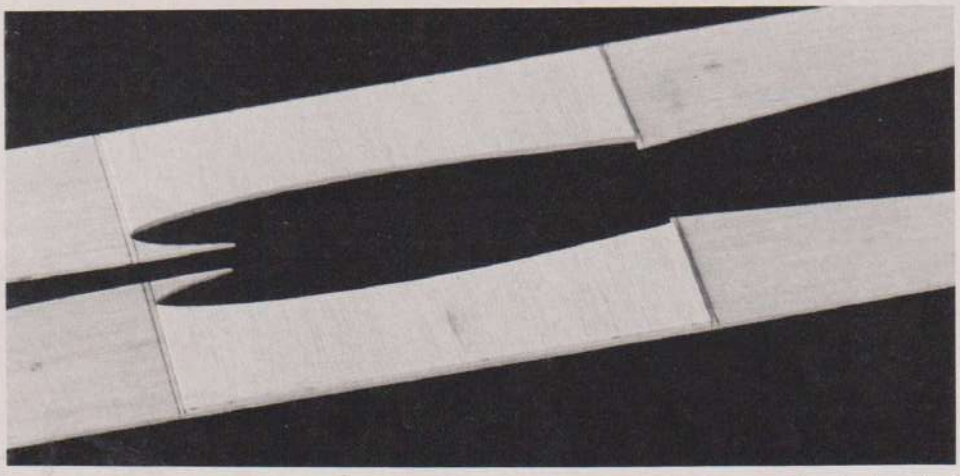
The wing is initially framed up in an A-Justo-Jig to assure correct alignment. After the top sheeting is glued in place, the wing must be removed from the jig to add the bottom sheeting.



The completed wing halves and wing center section just prior to joining. Notice the shear webs (see text for additional details on these) which are vital to the strength of the wing.



The tail section is easily built up from 3/16 medium balsa, resulting in a strong, light structure. It's always important to build lightness into a model, but for an aerobatic Electric it is a must.



Add a 1/16 balsa doubler to the fuselage sides to strengthen the fuselage and protect against repeated hand launchings. Note the direction of the grain in the doubler as it's shown here.

hand launch—so a shoulder-wing layout was chosen.

Additionally I wanted to avoid those unsightly cooling holes in the bottom of the fuselage that are common in most Electric designs. Thus I devised a flow-through system in which the air is forced just below the spinner to travel completely through the fuselage and exit under the elevator. A semi-symmetrical airfoil was desired, so a Jim Denaro Taper Ace was employed in drawing each rib for the tapered wing planform.

Construction goes very quickly, as there is less to do with this model as compared to one which is glow-engine powered. There is no major reinforcement needed and no landing gear mounts to build. The Electrostreak is built entirely with medium-viscosity Super Jet cyanoacrylate (CyA) adhesive, and (naturally) no fuel-proofing is necessary.

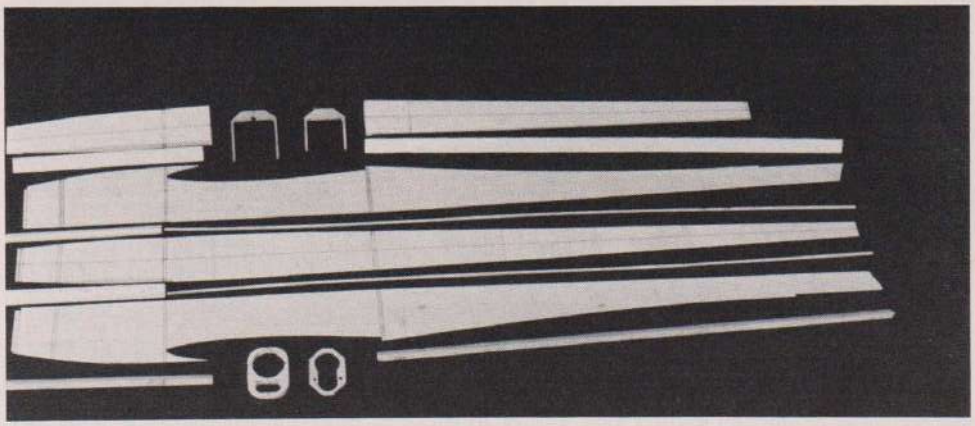
An important first step prior to beginning construction is a trip to the local hobby shop with your postal scale in hand. Each piece of balsa you select should be as light as possible, the only exceptions being the 1/8 and 3/16 sheets used, respectively, for the wing spars and stabilizer parts. All of the 1/16 balsa is very light four- to six-pound contest grade (this can be obtained from Sig Mfg. Co. or Lone Star Models).

Begin wing construction by cutting out the 1/16 wing ribs. The plans show holes for use with an A-Justo-Jig, which works well with this model. Some type of jig is a must to ensure a true, unwarped wing. If you use an A-Justo-Jig, align each rib and add the top spars and leading edges. Then attach the trailing edges and sand them to conform with the taper of the ribs. Add the top leading and trailing edge sheeting, then the center sheeting and the cap strips. Remove the wing from the jig and install the bottom spars.

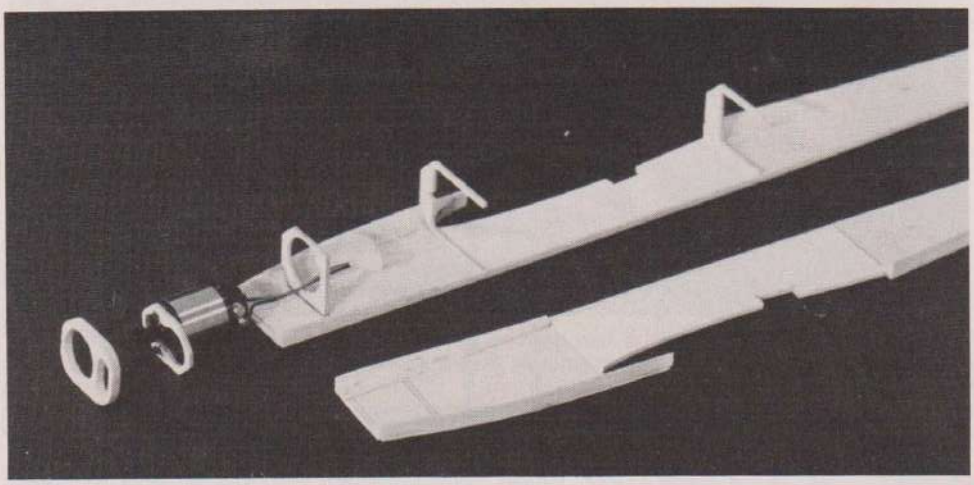
Attach the shear webs, being sure each one is securely glued to both spars and filleted to the ribs on either side. Notice that the webs on the front of the spars only extend to R-4, while the rear ones extend to R-6. Also note that the grain of the front webs runs parallel with the spars and the grain on the rear webs is perpendicular to the spars.

When you are satisfied that the shear webs are securely fastened, add the remainder of the sheeting and cap strips to the bottom of the wing. Attach the 1/16 wing tips to the end of each wing. Finish by carefully shaping and sanding the wing leading edge.

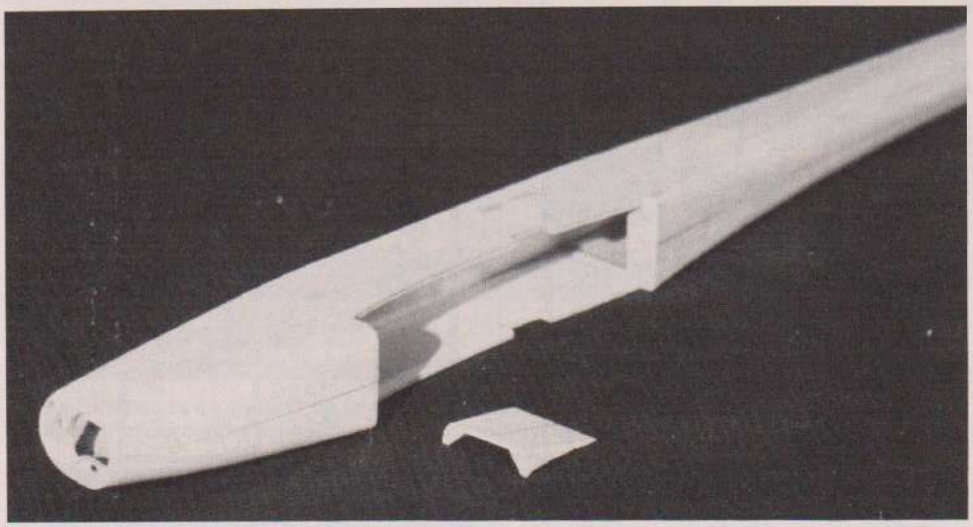
Cut out the 3/16 wing center section and trial-fit the 3/16 wing hold-down dowel. Remove the dowel and attach the center section to one wing half. Then *very carefully* glue the other wing half to the center section, being sure both sides are lined up perfectly and there is no dihedral. I use Super Jet for this entire joining process and so far haven't had any problem with its strength—but you may prefer to use 5-min. epoxy to give you time to make adjustments before it hardens. Attach the 1½-in. nylon or fiber-



All fuselage parts are cut out to form, a "kit." From this point, assembly is quick and easy using any medium-viscosity cyanoacrylate (CyA). Remember to cut F2 to match your motor.



The fuselage sides are partially assembled as here just prior to joining the two sides. The motor is fastened to F1 before F1 is glued to the fuselage sides. To assure the motor will fit properly, care must be taken to position F1 with the correct amounts of down and right thrust.



After all sanding is complete, the wing fillet (shown here by itself) is cut away from the fuselage and attached to the front of the wing. Fuselage notches are for the aileron pushrods.

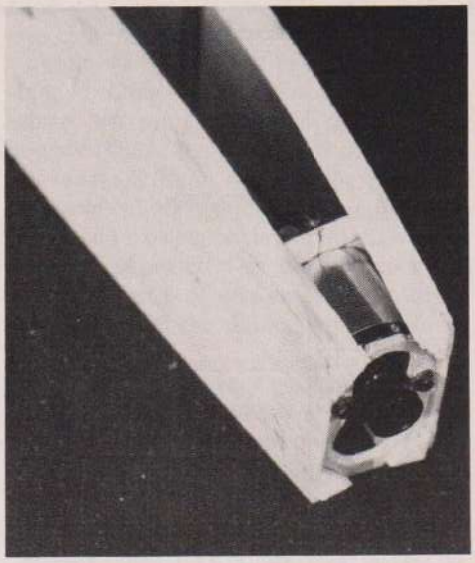
glass reinforcing tape with Super Jet or epoxy, and insert the wing hold-down dowel. Finally, trial-fit the ¼ x 1-in. aileron stock to the rear of the wing, and cut out the hinge slots.

The tail surfaces are built with 1/16 medium balsa. Assemble the parts over the plans, being sure of a good fit in all the corners. Taper the rear of the rudder and elevator, then cut lightening holes in the elevator with a Dremel sanding drum (or similar). Sand a V-shape on the front of the rudder and elevator, and slot them for hinges.

The fuselage is a simple box structure. With a little carving and sanding, you can transform it into a sleek, rounded shape.

Cut out the fuselage sides and add the bottom stringers and triangle stock. Cut a few relief slots partially through the front/top triangle places to help them bend to the outline of the fuselage. Attach the 1/16 crossgrain doubler to the radio compartment area. With a block backing, sand the inside of the rear triangle stock pieces so they will fit flush together when the fuselage sides are joined.

Using the fuselage top/bottom view on



Insert the motor and F1, glue the sides together, and allow time to dry. Remove the motor (from the rear), sand the front flush with F1, and glue the nose block into place.

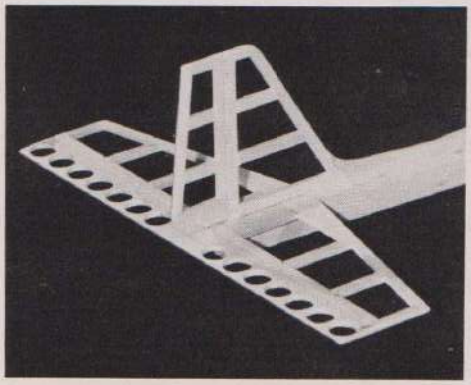
the plans, cut out the 3/32 top sheeting. Butt enough pieces of 1/16 balsa together, crossgrain, to cut out the entire bottom sheet as one piece. This should alleviate the need for a fuselage jig, although it certainly wouldn't hurt to use one anyway.

Cut all formers (F1 to F4) out of 1/8-in. aircraft ply. Trial-fit your motor through F2, and sand F2 to provide a snug fit. Attach formers F2, F3, and F4 on one fuselage side, then carefully add the other side. Slide your motor through F2 (from the rear) and mount F1 to the motor with the two mounting screws. Adjust F1 to its correct location, then pull the fuselage front together and securely glue F1 in position. This will assure a good fit with proper downthrust and right thrust when you reinstall the motor later.

Remove the motor and add the nose block and the top/front sheeting. Then align and join the rear fuselage sides and add the remainder of the top and bottom sheeting. Install the wing-bolt mounting plate and generously fillet around it with Super Jet and accelerator.

Now, the fun part! With an X-Acto knife and a strip of 150-grit sandpaper, carve and shape the top and front of the fuselage, while referring to the cross sections on the plans. When you're satisfied, finish sanding the fuselage with 400-grit sandpaper. Remove the wing fillet from the fuselage by cutting immediately behind F3.

Trial-fit the wing to the fuselage, then secure the wing fillet in place on the front of the wing. Tack-glue the stabilizer in position, and be sure that it is closely aligned with the wing. With the entire plane framed up and assembled, the weight at this point should be between six and eight ounces. "What!" you say; six to eight *ounces?* Don't worry. It's easier than you think to keep it this weight if you took your time at the hobby shop to pick out the lightest balsa. If yours is a little overweight, go over the entire aircraft a time or two with sandpaper, especially the rounded areas on the top and front of the fuselage.



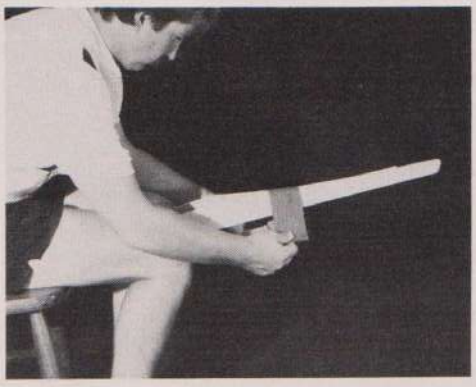
The control surfaces are hinged and trial-fitted at this point. They're not permanently installed until the model has been covered.

Cover the entire aircraft with MonoKote or some other lightweight iron-on material. Keep the color scheme simple to avoid unnecessary weight. Every fraction of an ounce you can save is important. No fuel-proofing is required, so the entire covering process is quick and easy.

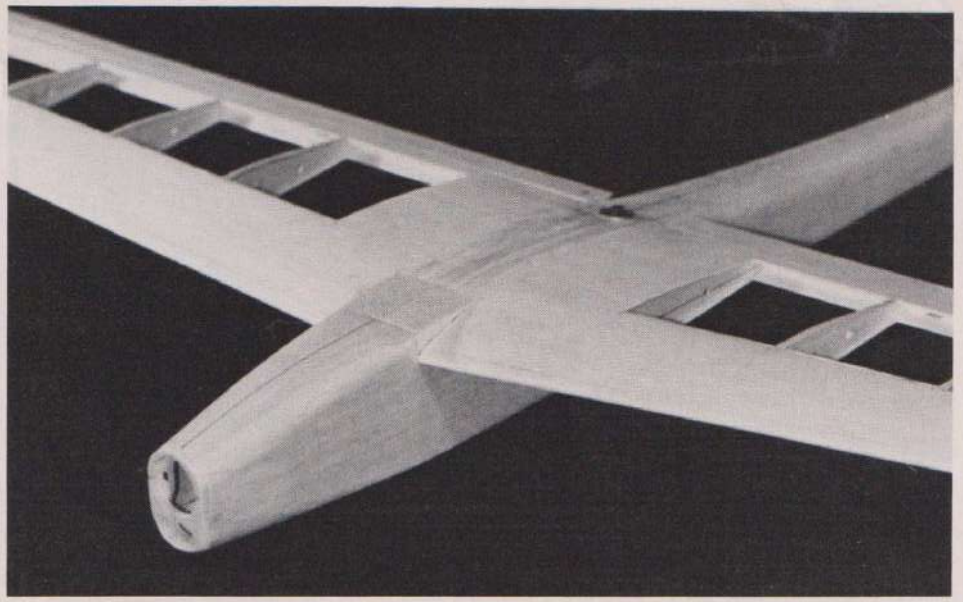
Motor/radio installation. Because of the small size of the Electrostreak, careful planning is essential. The motor battery will take up most of the radio compartment, so the smallest possible radio components should be used. The prototype Electrostreak uses a Futaba FP-R4H micro receiver, four S-33 micro servos, a 250 mAh battery pack, and a mini switch harness.

Most components can be mounted using either double-sided sticky tape or Velcro with adhesive backing. In either case, spread a thin coat of epoxy on each balsa surface to be contacted; when they've dried, clean them thoroughly with alcohol. This assures a good surface for the adhesive on the tape or Velcro for adherence. Foam packing is neither necessary nor desired. Vibration is not a factor, and it is essential to save space. Also, the flow of air through the fuselage must not be blocked.

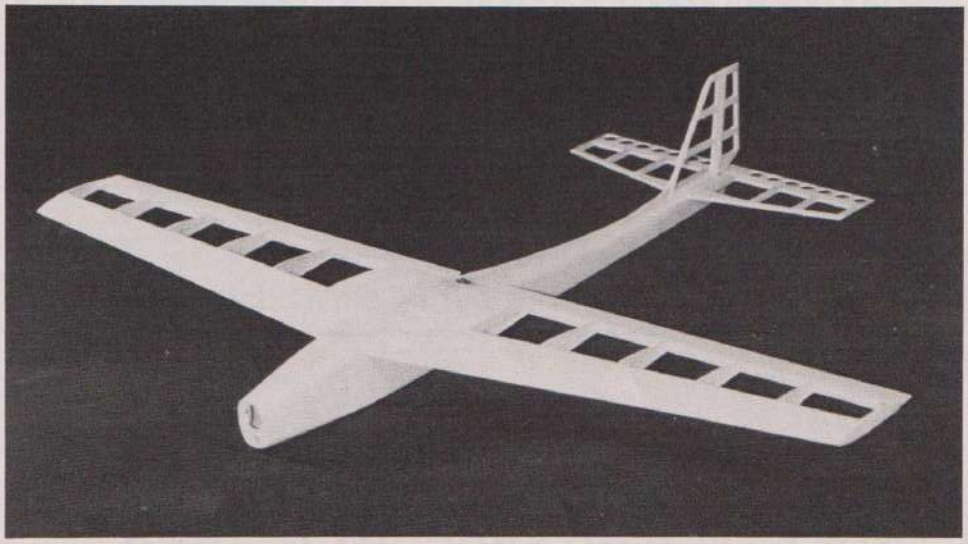
Install the motor through the radio compartment. Next, mount the receiver immediately behind F4. Install the elevator and rudder servos just ahead of F4 using ⅛-in. plywood mounts. In the prototype Electrostreak, these two servos are mounted sideways—with the forward (rudder) servo



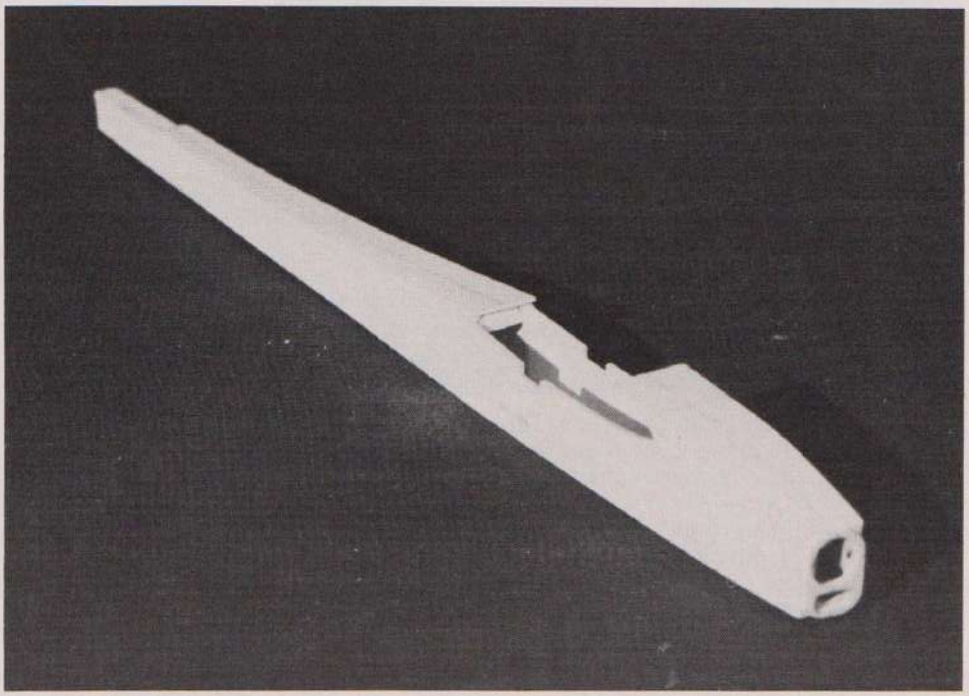
After some carving with an X-Acto knife and rough sanding with fairly coarse sandpaper, our author buffs the top of the fuselage with 400-grit paper to achieve a smooth, rounded appearance. You'll be surprised how many onlookers will ask if it's a fiberglass fuselage.



The wing is trial-fitted, aligned, then secured to the fuselage with a simple 6-32 engine mounting bolt and blind nut. (A dowel in the wing center section holds the leading edge of the wing in place.) A good-size washer is placed under the head of the bolt to protect wing's surface.



The entire aircraft framed up and ready to cover. At this point the model should weigh 6½ oz. Covering will add another 1 to 1½ oz. Ready-to-fly weight should come out to somewhere between 32 and 34 oz., the vast majority of that being made up of the motor and the batteries.



The fuselage is rather boxy looking before carving and shaping begins. Centerlines drawn on each piece help assure proper alignment and fit. Sturdiness and lightness are paramount.

raised ⅛ in. higher than the rear (elevator) servo to allow clearance for the pull-pull cables. These cables work very well for the rudder and add practically no weight. The elevator is connected with a conventional balsa pushrod.

The motor switch is attached directly to the side of the throttle servo, and both are mounted to the side of the fuselage just to the rear of F3. The battery is mounted across from (and a little forward of) the throttle servo. The battery will actually straddle the side post of F3 but will present no problem if you put one strip of Velcro or sticky-tape ahead of F3 and one strip behind F3.

The motor battery is mounted to the floor of the fuselage with either Velcro or sticky-tape in the center of the radio compartment. A six-cell (1,200 mAh) pack will present no problem—but if you use seven cells, the seventh cell will have to go toward the rear of the fuselage and may have to be turned 90°d to clear the aileron pushrods.

The aileron servo is mounted with ⅛-in. ply mounts and is situated as deep into the wing as possible. Notice the two bends in each aileron pushrod shown on the plans. The bends allow the pushrods to exit the fuselage and provide a direct hookup to each aileron. The slots in the fuselage sides where these pushrods exit also provide extra exits for cooling air.

Charging. Refer to the instructions for the particular battery/charger combination you have. Hobby shops can be very helpful here, because of the recent interest in Electrics brought on by the popularity of RC cars. Most chargers are designed to fully charge a battery in 15 minutes, although I have found it to take more like 20 minutes. As a rule most batteries begin to feel warm to the touch when they are fully charged—but, again, refer to the instructions for your battery/system. If your charger has AC capability, you may want to put on the first charge at home so you'll be ready when you arrive at the flying field.

The 1,200 mAh cells seem to work best for our purposes. They put out a constant amount of power until they are exhausted, at which time they drop off almost all at once. Some of the smaller cells (800 mAh, etc.) provide good power at the beginning of the flight and gradually taper off; this can be quite annoying when flying an aerobatic sequence.

Flying. Choose a prop using the recommendations on the plans or on the motor manufacturer's instruction; balance the prop carefully. If you use a wooden prop, take a couple of extras with you to the field; the gear-less landings will occasionally cost you one. Recheck the model's balance, both front-to-rear and side-to-side.

Hand-launching the Electrostreak is easily accomplished by holding it at the center-of-gravity (CG) with one hand (don't forget the transmitter in the other!), trotting a few

steps forward, and tossing it forward in a level attitude. If it is the first test flight, try a few clicks of up-elevator trim to ensure that it will not dive immediately after the launch. Allow a few seconds of level flight to build up speed before beginning a climb.

The Electrostreak was first flown with a Leisure 05 competition-wind motor, Cox gray 6-4 prop, and a G.E. six-cell 1,200 mAh battery. Straight-and-level flight was quite fast, or at least it appeared that way with its sleek lines. Rate of climb, however, was a little low. All basic maneuvers, such as rolls inside and outside loops, hammerhead turns, snap rolls, and spins could be performed. It simply needed a few seconds of straight-and-level flight between each maneuver to gain speed. This is a good combination for the budget-minded flier that still offers good performance.

Later the Leisure motor was removed and an Astro Cobalt 05 installed in its place. This was easily accomplished, the only modification needed being to wrap masking tape around the rear of the smaller Astro Cobalt's case so it would fit snugly through the hole in F2. The two mounting holes in F1 aligned perfectly. The six-cell battery was replaced with a seven-cell Sanyo 1,200 mAh pack.

Performance with the Astro Cobalt is no-

Electrostreak/Stryker

ticeably better. The model climbs briskly immediately after launch, and it is up to performing altitude almost before you know it. Level speed is increased a bit over what it was, and several more maneuvers can be added to your routine. Figures such as loops with a snap roll on top, four- and eight-point rolls, square loops, and successive rolls from one end of the field to the other are now quite possible.

Although I've yet to time a flight (I'm always having too much fun), airborne time seems to be in the seven- to nine-minute range. It's certainly enough time to exhaust all the aerobatic maneuvers in my repertoire, even with repeating a few! Flight times can be increased considerably by climbing, turning off the motor, and setting up a leisurely glide. Then turn on the motor and climb back up as you near the earth. You may even catch a thermal!

When the battery begins to give out, start setting up your landing pattern. There is no big rush here, as the battery will slowly drop off over a period of a minute or so. This will give you time to make it back to the runway if you have strayed off it—or if you just need to stretch out a glide slightly to land at your feet. You'll be surprised at how fast and flat it glides, so give it plenty of room on the final approach.

Be sure the motor is off prior to touching down. The Leisure motor will usually windmill all the way down, and the prop will flatten out without difficulty when it touches the grass. The Astro Cobalt has a bit more "compression," and the prop will usually stop as the plane slows just prior to landing. If the prop stops in a vertical position, simply bump the throttle; hopefully it will stop in a better position the next time. You may occasionally break a $1.50 prop, but that's about the only expense you'll incur in maintaining the Electrostreak.

This design is easy to build and maintain, and it is enjoyable to fly. Both motors I have used are very good in their own rights. The Leisure motor with the six-cell battery performs nicely and is relatively inexpensive. The Astro Cobalt with seven cells offers increased performance but with a proportionately higher price tag. Other motors may also work well, although I have no experience with them.

The other fliers now definitely take notice of the little red plane when it arrives at the flying field. The Electrostreak is changing people's minds about the capabilities of electric-powered flight. I'm sure it will change yours if you try it.

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