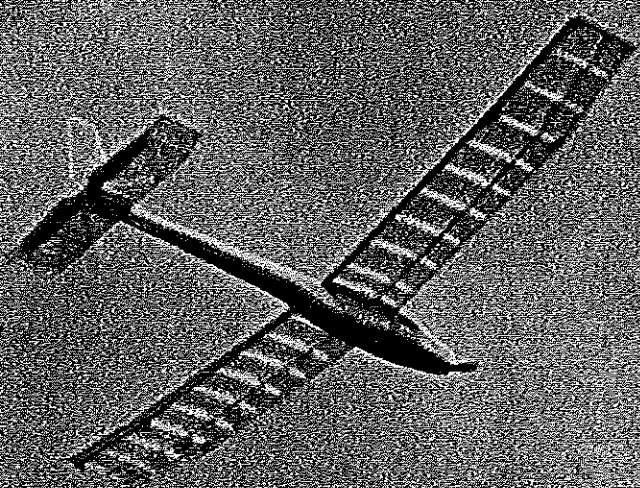
#433

**If you've been following our series on Electrics, you may be ready to try one. Watts Up is an electric-powered RC glider that not only flies nicely, but is easy on the budget and builds quickly. It's for an 035 electric motor and two-channel controls.**

ELECTRIC POWERED planes offer a relatively new and challenging aspect to the realm of RC flight. Electric-powered gliders in particular offer a unique fascination; a seemingly effortless, almost noiseless, ghost-like powered assent to altitude (go ahead—a little to the left, bank right, sniff out a thermal as you guide your rising craft), then the neat transition to glide as you shut off the motor. Your creation reaches out on its own, to play tag with those elusive currents of rising air.

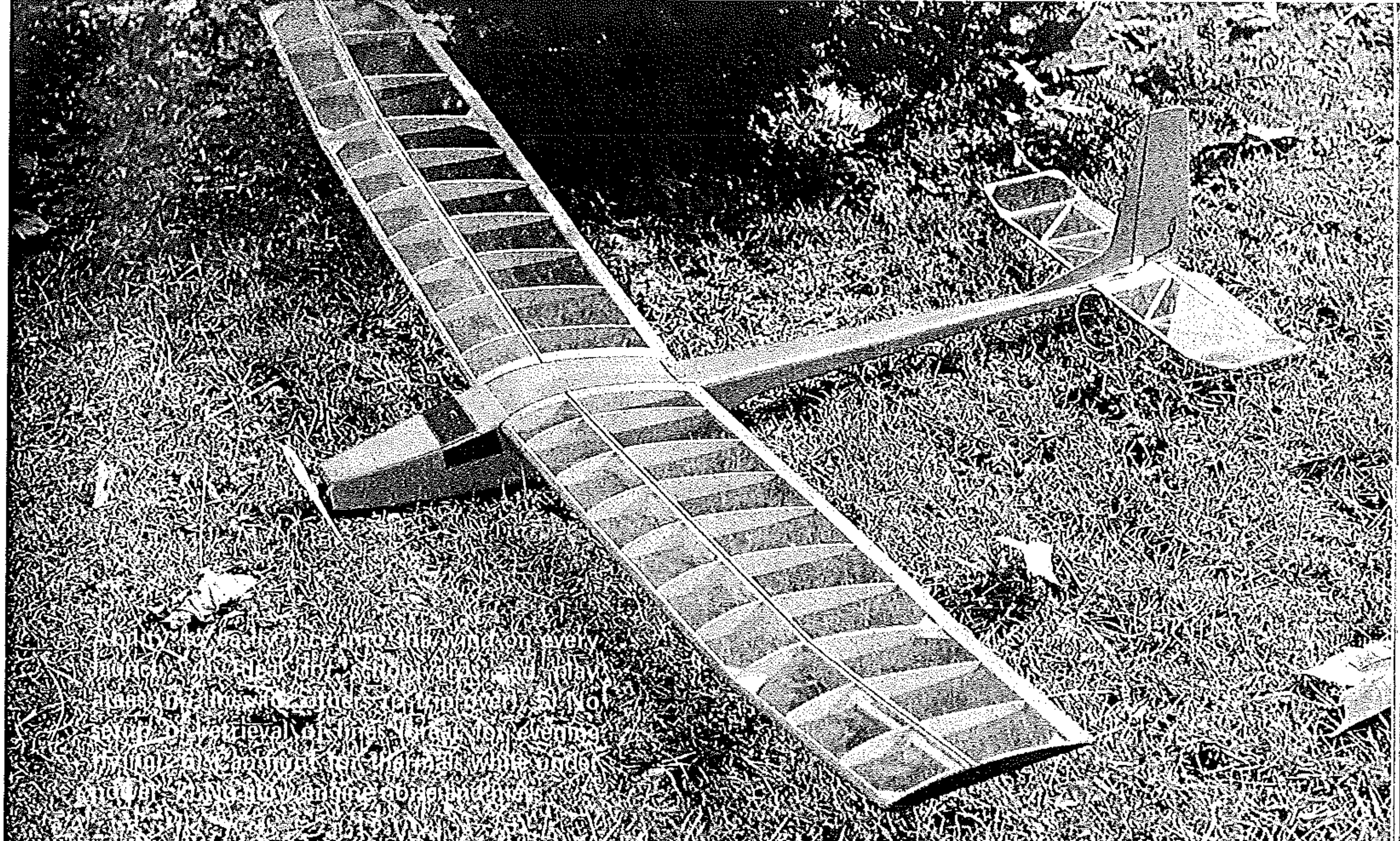
Electric-powered gliders work—and work very well. They have several advantages over hi-start, winch, and glow engine launches. Examples: 1) Higher launch altitude than hi-start; 2) Much less launching area required; 3)

If you build a Watts Up, you will enjoy many views similar to this as the plane returns home in lazy circles after it does a little thermal hopping.



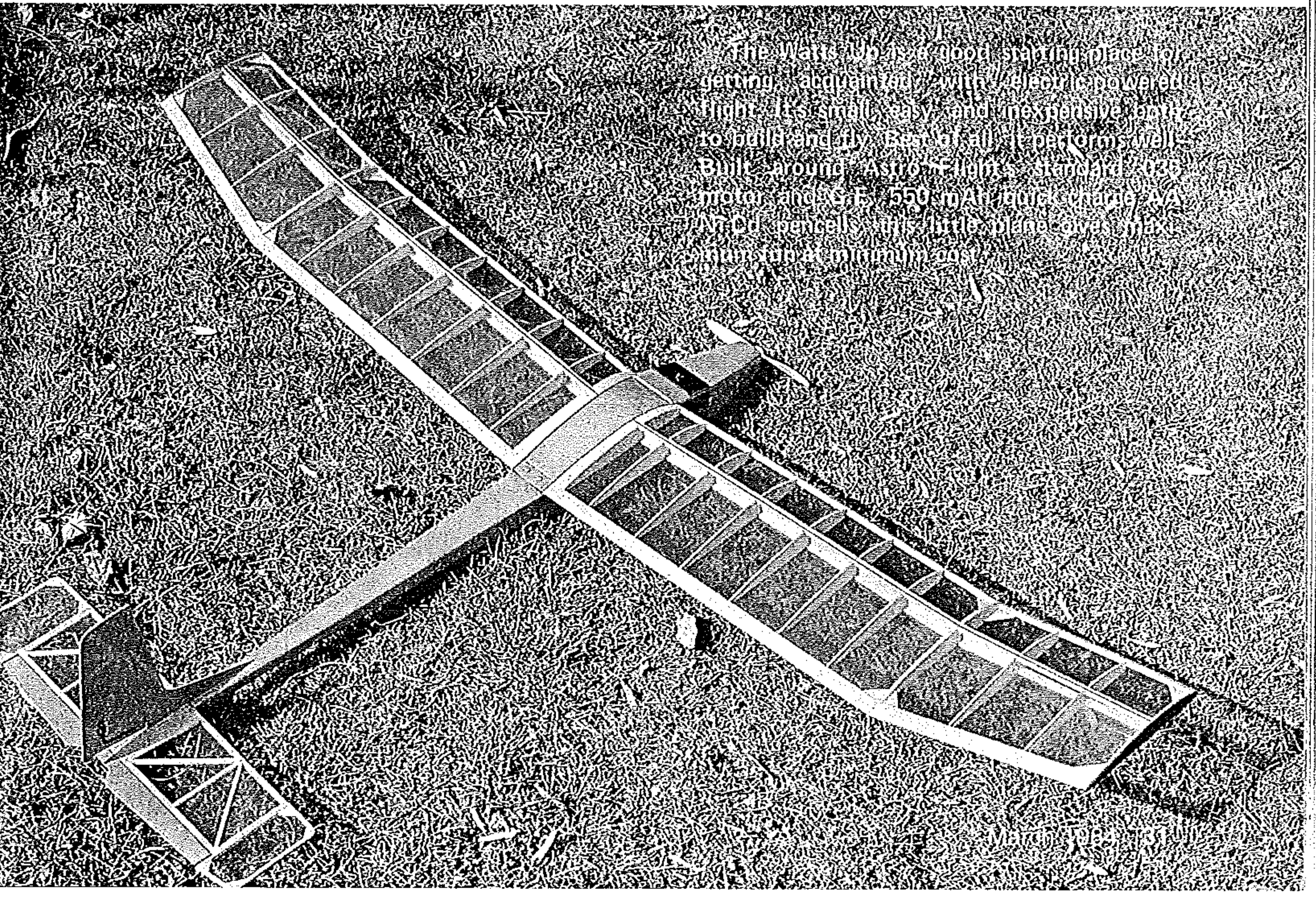
# WATTS UP

Kenneth Marron

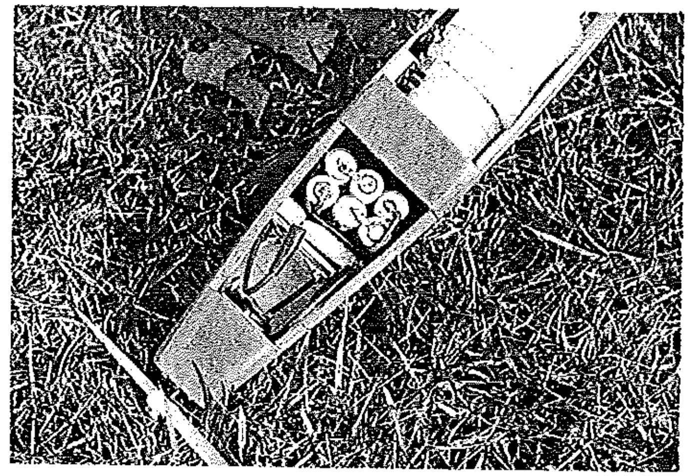


Ability to easily fly into the wind on every launch ... [illegible] ... Not ... retrieval ... [illegible] ... flying ... thermals while under ... [illegible]

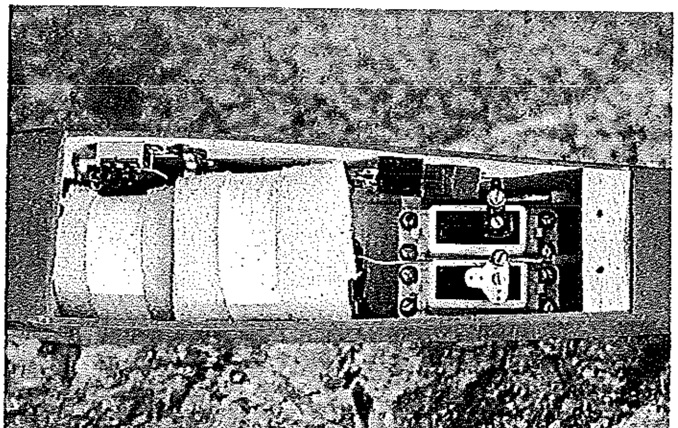
With only a 52-in. wingspan, the Watts Up is easily transported to the flying field. It exhibits very satisfactory gliding ability and hands-off stability. The transparent Solarfilm covering is lightweight, and it shows off the structure very nicely. Adding the same opaque covering that is on the fuselage to the wing center section creates the illusion that the wing is in two parts (really, the wing is a one-piece structure).

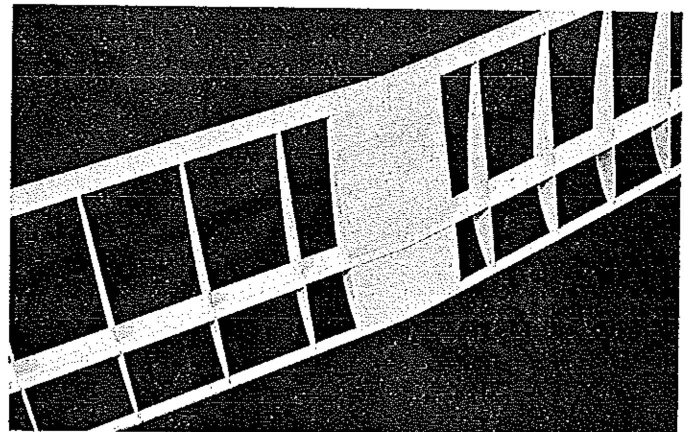


The Watts Up is a good starting place for getting acquainted with electric-powered flight. It's small, easy, and inexpensive both to build and fly. Best of all, it performs well. Built around Astro Flight's standard .035 motor and G.E. 550 mAh quick-charge AA NiCd pencells, this little plane gives maximum fun at minimum cost.



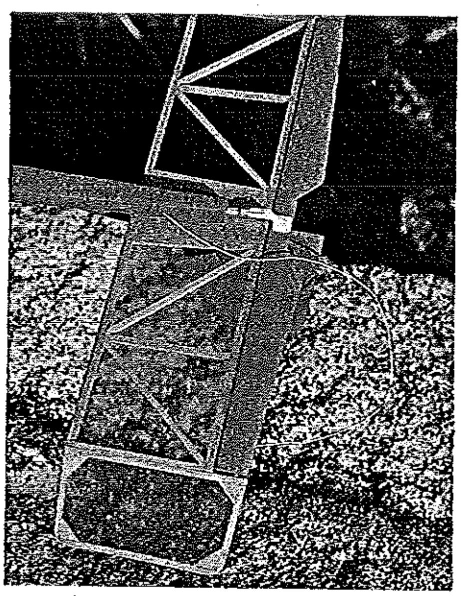
Left: A fully-charged 6-amp motorcycle battery is adequate for recharging the motor power pack four or five times. Having just one extra pack keeps down-time to a minimum. Here, the author is changing packs for another flight. Right: There's easy access to the motor battery when the hatch is removed. Battery is connected with mini alligator clips for easy one-hand attachment. Fuse is CyA-glued to the front of the battery partition.





Left: Note the relationship of the motor ON-OFF switch and the elevator servo. Receiver switch and charging jack are on the upper left. The radio battery and receiver are wrapped in lightweight foam. Right: Using thin spruce spars with webbing between produces a strong but light wing.

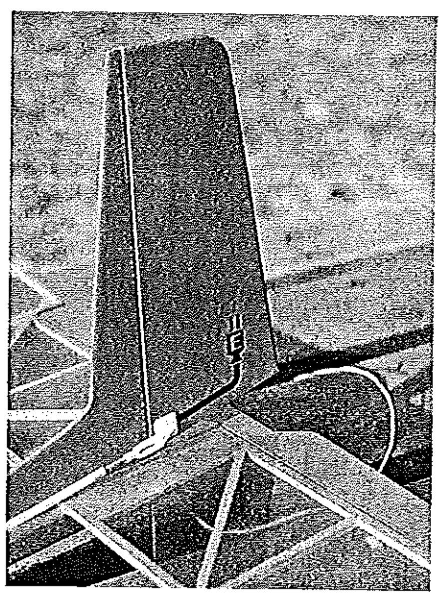
Three prototypes exist. The one presented in the plans and pictures has a span of 52 in., 365 sq. in. of area, and 20-oz. weight ready to fly. The weight breakdown: wing, covered, 3.5 oz.; fuselage with tail, covered, 3 oz.; motor and battery, 7.5 oz.; radio, 5 oz. with 100 mAh battery pack.



Elevator pushrod exits cleanly from the rear of the fuselage. Radio antenna runs most of the fuselage length, then exits on the right.

If you have not had much building experience, you should review the article on gluing techniques in the March 1983 *MA* before getting underway.

**Wing construction.** Twenty ribs are cut after making a template from 1/16 (or even 1/32 plywood, which can easily be cut with a modeling knife. The template is secured to a sheet of light 1/16 C-grain balsa with pins; a #11 X-Acto blade is then used to cut around the template. Very uniform results are achieved with this method.



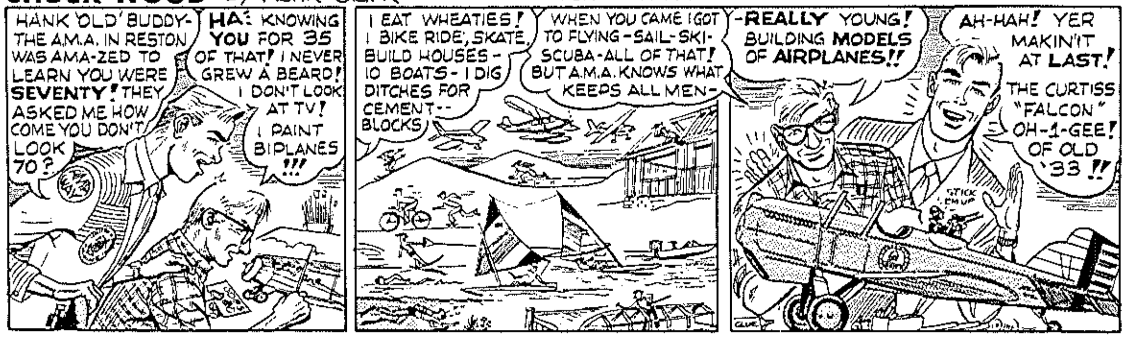
Carl Goldberg Models mini-horns are used with Nyrods. Thread hinges operate freely. If sewn neatly, they give a good appearance.

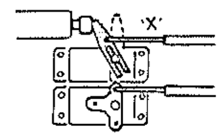
Cover the plan with plastic film. Begin building both main panels at the same time, as follows: Pin a straightedge to the plan along the T.E., and butt the 5/8-in. T.E. pieces together at the centerline; pin in place. Pin the bottom 1/4 × 3/32 spruce spars on the plan after checking alignment with the notches in the ribs. With a razor plane or sanding block, remove from the bottom of the L.E. (the edge facing the building board) approximately 1/32 in. This will allow the ribs to sit flush on the plan. Pin the 1/4 sq. L.E. in place. Use a triangle to assure vertical and horizontal trueness, and glue all of the ribs with a cyanoacrylate (CyA) (except W-A and B and the outermost W-1 ribs on each panel). The top spar is installed later.

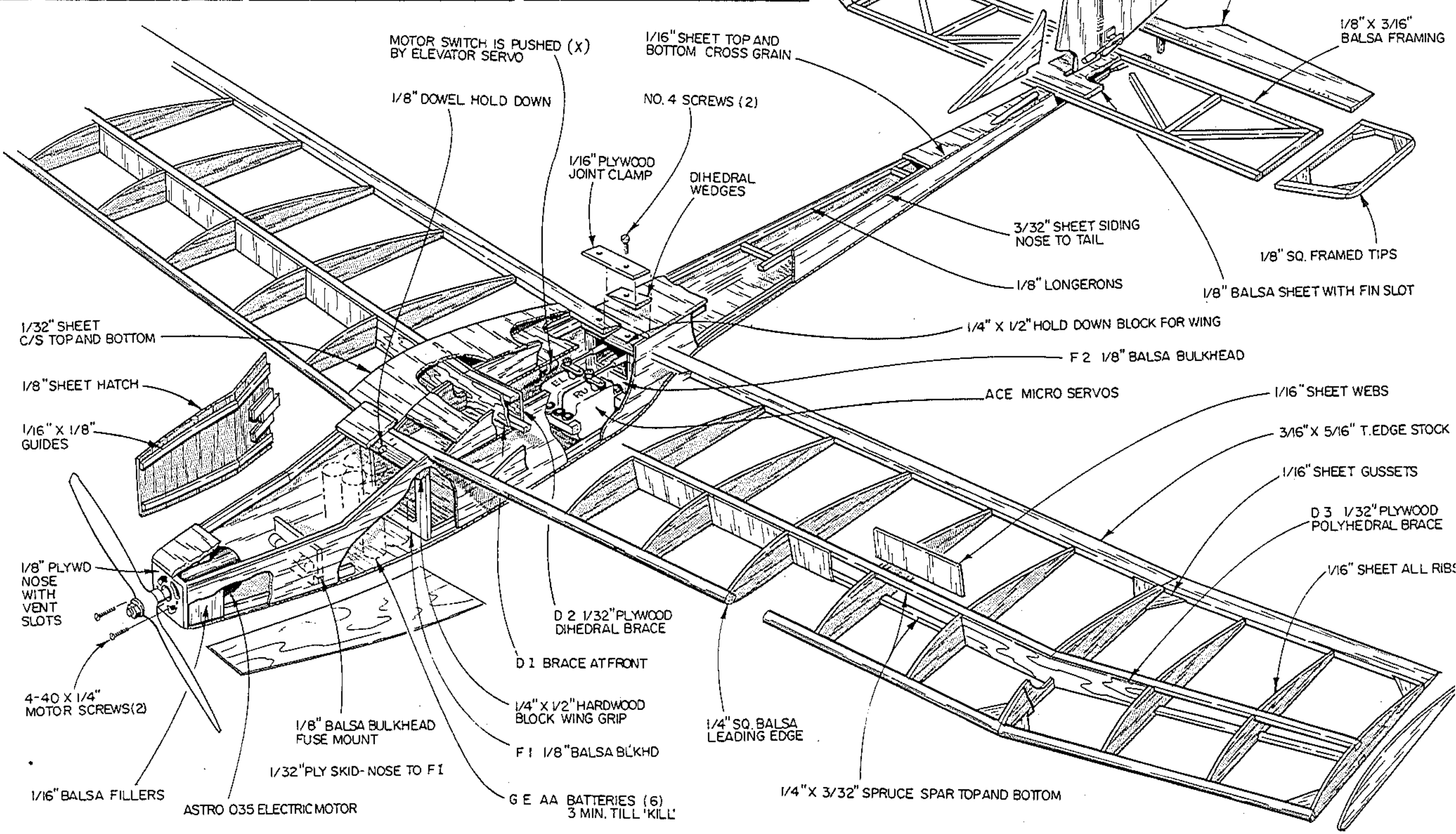
The outer panels are made in the same manner as the main section, except the spar is 1/4 × 3/32 balsa. Do not glue in W-1 or the end caps just yet.

A critical part of building a wing is making sure that the panels are aligned properly when they are joined with dihedral. An easy way to achieve this is to have two building boards, such as described in a February 1983

**CHUCK WOOD** by Hank Clark    "DON'T AGE YOUR ACT"



*MA* article. Accurately hinge them in the middle, and they will always be flat and not twist at any angle.

Prop up the boards so that the center panel spar bottoms are 1¾ in. from the table surface. Bevel the L.E., spars, and the T.E. so that they fit well when joined at this angle. Apply white glue to the edges, join the panels, and pin in place. Glue in the top spar.

Cut the front dihedral brace from 1/32 ply, and install it with white glue. Clamp it with clothespins. While this is setting up, cut the rear brace. Note that it is 1/16 in. narrower than the spar depth to allow for the top and bottom sheeting. When installing it, place a spacer of 1/32-in. scrap under the brace and check to see that another 1/32-in. scrap will come out flush with the top of the spar. Trim if needed, then glue and clamp in place. Trim 1/32 from the top and bottom of ribs W-A and B to allow for the sheeting; cut these ribs in two at the spar notches, and install them, using shims. Glue W-A ribs to each other as well as to wing parts.

The 1/32-in. top sheeting and 1/16-in. vertical grain shear webs are installed next.

With panels still pinned to board, prop up the tips of the outer panels so that the bottom of the spar is 1⅝ in. high. Bevel the ends, and glue them in place. Next, add the 1/16-in. corner gussets and 1/32 ply to the T.E. for the wing hold-down screws. Sheet the bottom center section with 1/32 balsa.

Shape and sand the L.E. and wing tips. Add the end caps. The finished wing should weigh about 2.5 oz.

**Fuselage.** Cut the two sides from lightweight, straight-grained 3/32 balsa of similar density so that they will curve evenly. Clamp the halves together with clothespins, using cardboard scraps to proctect the balsa from denting, and sand them to identical shape. With a triangle, mark thie positions of formers F1 and F2 on the inside walls.

Cut F1 and F2 from 1/8-in. stiff balsa, and mark their vertical centers. Cut the hardwood wing hold-down blocks, and bevel the L.E. block as per the plan.

A brace can be fashioned from scrap 3/16 or ¼ balsa to hold the tail while lining things up. The base is made about 3-in. sq. and notched for a vertical post 4 or 5 in. high and 1 in. wide.

Put three rubberbands loosely around the fuselage halves, and clip the tail to the temporary support with a clothespin. Line up the fuselage over the top view of the plan, and pin the support to the board. Spread the sides, and slide the formers into place. Test-fit the hardwood pieces. The forward hold-down should be flush with the top, and the rear one should be 1/16 in. from the top.

When the formers are lined up over the plan—vertical and parallel to each other—and a triangle shows that the fuselage sides are square to the building board, CyA-glue the formers in place. Glue in the hardwood blocks with white glue.

Cut out the firewall. It's much easier to drill all the holes before cutting it from a large sheet of 1/8 plywood.

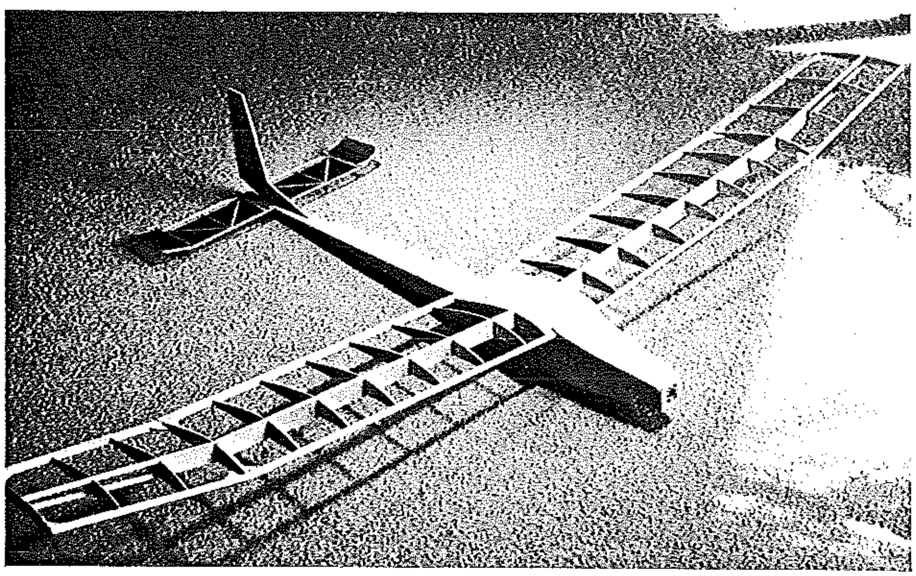
Drill a center 7/16-in.-dia. hole and 1/8-in.-dia. motor mounting holes; check that the motor fits properly. The air inlet holes are formed by drilling two 1/8-in.-dia. holes side-by-side and connecting and enlarging them with a rat-tail file. Draw a vertical line on the center of the firewall. Pull in the sides at the nose with a padded C-clamp. Apply white glue to the firewall edges; install between the sides, then tighten the clamp. Make sure that the centerline matches with the plan and that the firewall has no side-thrust and about 2° of downthrust. Let it dry thoroughly.

Remove from the board and install the longerons throughout. If CyA glue is used, no clamping is needed. Add 1/16 balsa fillers in the nose.

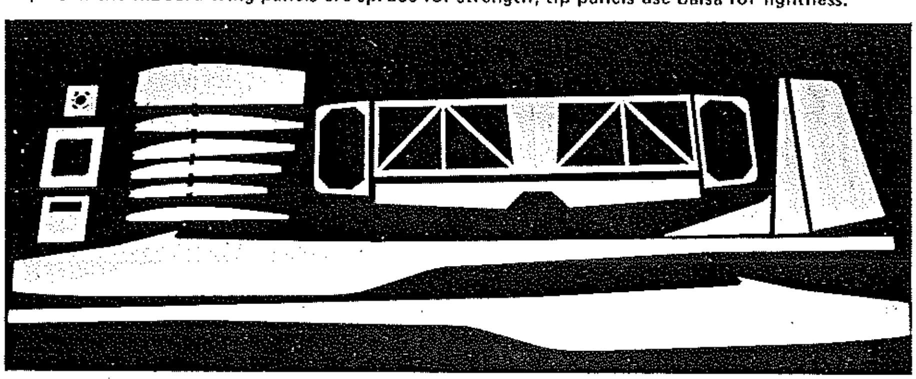
Put the fuselage back over the top view. Place a book on each side of the fuselage, and rest a straightedge on each; the fuselage should be perfectly straight from F-1 to the tail. Apply CyA glue at the tail joint. Install the cross braces. Then apply the 1/16-in., cross-grain top sheeting with white glue, stopping at the beginning of the stab location.

Install the pushrod outer sleeves. Then apply all the 1/16-in., cross-grain bottom sheeting. Finish the top sheeting and hatch with 1/8 balsa. Note that the hatch front and the rear of the nose sheeting are beveled to hold the front of the hatch in place. The catch is made from strips of hardwood and a bent pin.

Add a 1/32 ply skid. Round off all the corners to minimize the square box look and sand the fuselage smooth.



Before covering, the complete structure weighs 5.5 oz. The covering adds about 1.5 oz. more. Spars in the inboard wing panels are spruce for strength; tip panels use balsa for lightness.



Assembled stabilizer and all the other major parts laid out prior to assembly. The plywood motor mount and the stack of ribs are the most time-consuming pieces to cut out.

**Tail section.** The stabilizer is built in three pieces over the plan, but the tips are attached later.

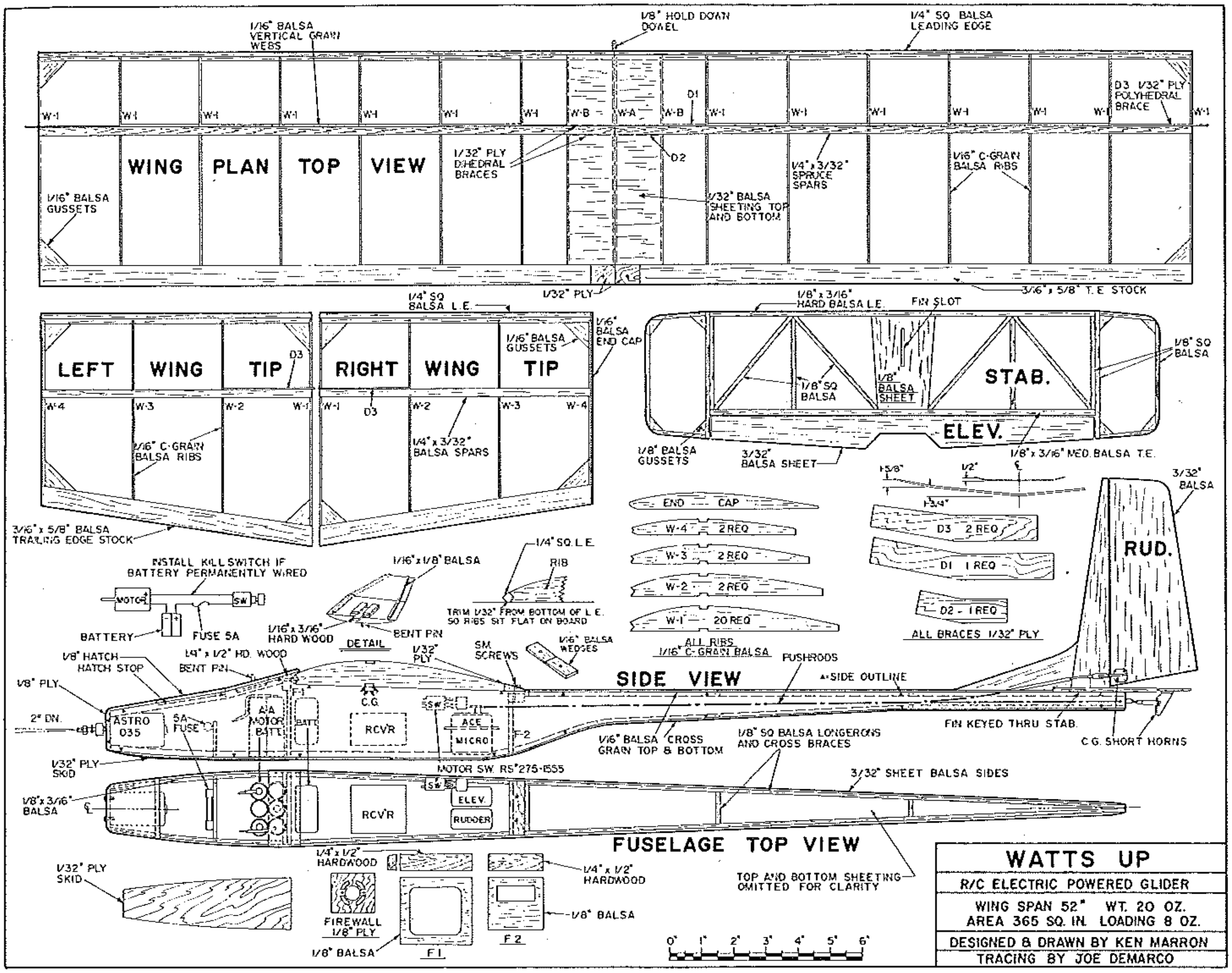
The L.E. and T.E. of the center section are 1/8 × 3/16 balsa. Pick a hard piece for the L.E. and a piece soft enough to push a needle through for sewing on elevator hinges for the T.E. The rest of the stab is made with 1/8 sq. lightweight balsa. The L.E. and T.E. of the tips are trimmed and rounded after the gussets are added.

When dry, prop up the tips ½-in. at the bottom. Bevel the mating edges, and glue in position.

The fin, rudder, and elevator are cut from medium weight, straight-grained 3/32 balsa. Cut a slot in the stabilizer for the fin; glue the fin in position after checking for squareness with the stab.

The tail assembly is attached to the fuselage with white glue. Take time to assure trueness from all angles.

**Wing mounting.** Check the wing fit in the saddle, and mark its center. Drill a hole in the wing L.E. dihedral joint to accommodate a 1/8-in. hole for the peg. Then slide the wing in place; if it does not sit flush with the



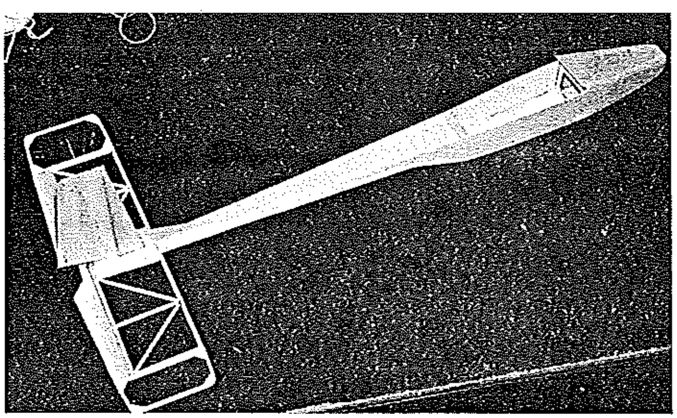

saddle, elongate the hole with a rat-tail file. Do not overdo the filing, as a snug fit is desired. Align the wing perfectly, and then drill two holes for the #4 self-tapping sheet-metal hold-down screws through the rear hardwood hold-down block.

**Covering.** Pick a lightweight material. The model presented here was covered with transparent yellow Solarfilm on the wing and the stab and opaque orange on the fuselage and tail. Midnight blue was used for the windows and logo. D&J striping finished it off.

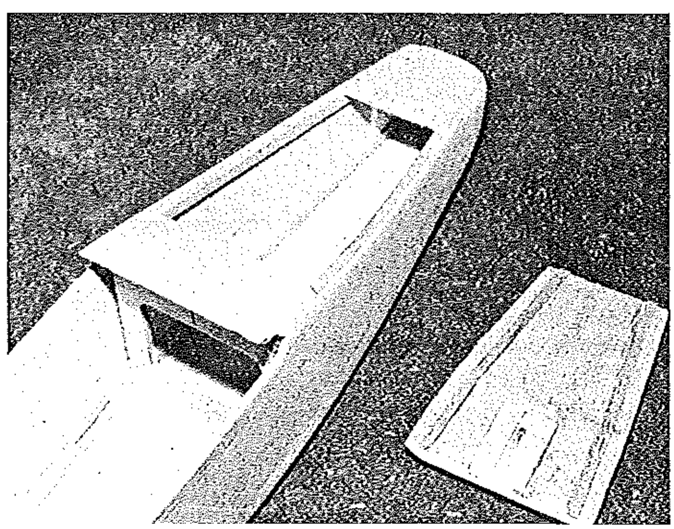
The control horns (cut down Carl Goldberg short horns) are attached with CyA. After sanding the bottom and removing the covering material from the horn location, flood the area with CyA to harden the wood. Press the horn in place, and hold for a few moments. When it's dry, run a bead of CyA around the sides, and make "rivets" in the mounting holes with some CyA and baking soda.

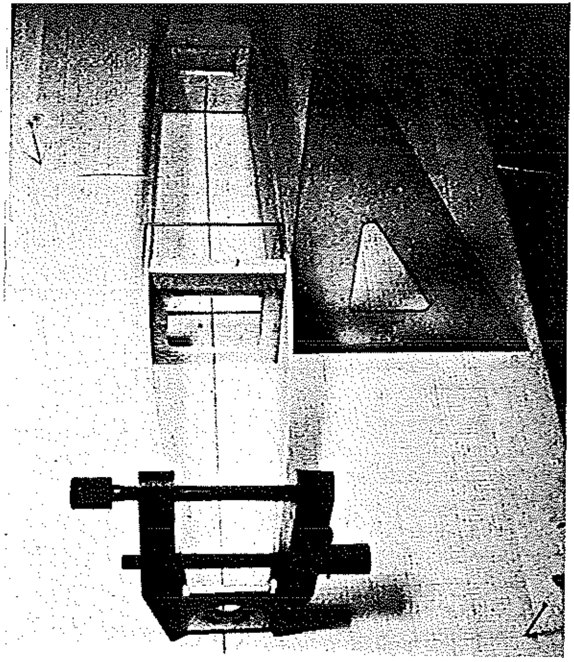
After covering, the rudder and elevator are attached using thread doubled over and applied in a Figure 8 pattern as shown (or use Solarfilm hinges as described in the January 1983 *MA*, page 49).

Check the balance point (CG) with all components temporarily in place, including the pushrods. When the CG is in the correct position, mount the servos on the rails.

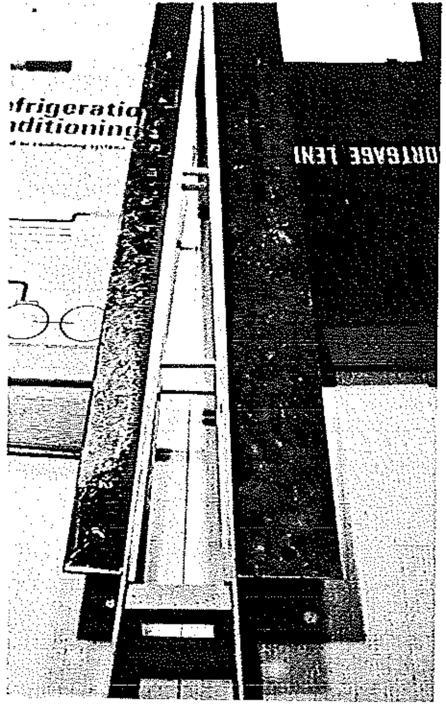


Above: The complete fuselage, sanded and ready for covering and radio installation, shouldn't weigh more than 2.5 oz. Select wood carefully to minimize weight. Right: Motor and battery compartment must be quite strong to handle the mass concentrated there. Balsa longerons and 1/16 balsa doublers in the nose stiffen the sides considerably.

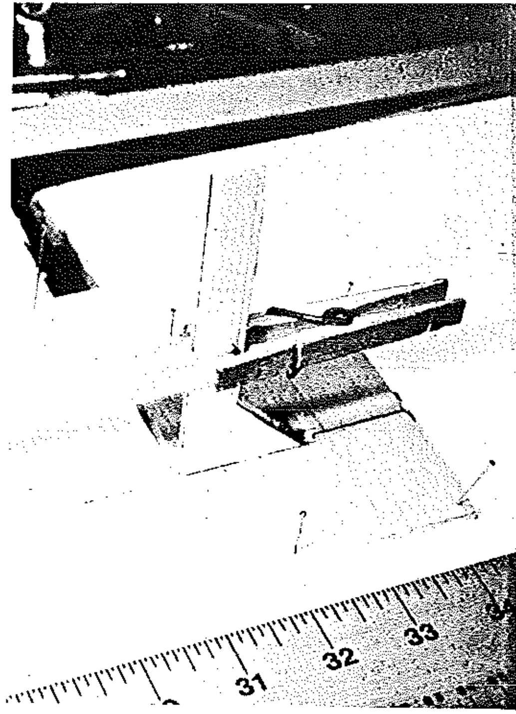




Fuselage alignment and symmetry is made easier by using graph paper with a line drawn down the center and centerlines marked on the formers and firewall. Rubberbands and modeling clamps help to hold things tight for gluing.



A couple of straightedges assure straight fuselage sides from F-2 to the tail post. Books hold sides in place while adding crosspieces.




This brace, further described in the text, holds the fuelage rear on the centerline while aligning the formers and firewall.

The motor is actuated by a push-ON, push-OFF switch (Radio Shack #275-1555) when full-down elevator is applied. Remove the switch mounting nut, and discard. Sand the side of the switch that will face the fuselage wall, and begin to position it. Make sure it turns on and off with the servo centered at neutral. Adjust the switch, not the trim on the transmitter, until full-down elevator turns on the switch every time. Attach with CyA glue on all four sides. Do the wiring before installing the radio.

Run the antenna wire back through the fuselage and out through a small hole made near the rear.

**Motor batteries.** G.E. AA cells were used because they are high quality and cost less than two dollars each. G.E. ½ sub-C cells are another good choice. The motor can also be purchased complete with the batteries.

As shown, the motor-to-battery connection is made with mini-alligator clips (Radio Shack #270-378) rather than the servo-type plugs. In this way the plane can be held with one hand while unclipping and removing the power pack with the other hand.

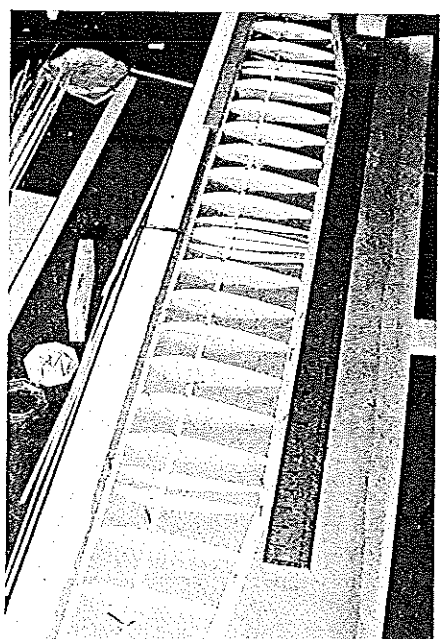
If only one pack is used it can be wired permanently and a charging jack added externally.

**Miscellaneous comments.** Although made to operate on six cells, the motor works well with only four cells; when conditions are calm, the plane is usually flown that way. With four cells the weight goes down about 1¾ oz., and a flatter glide results; total powered altitude is about the same (it just takes longer to get there). Since less current is consumed, the run is a minute or so longer.

When charged from a 12-volt source, six cells should have a resistor in series with it (two Radio Shack #271-311 1-ohm, 10-watt resistors in series work well). Four cells should never be charged from 12 volts even with a dropping resistor in series. Current never tapers off enough to avoid damaging the cells. Instead, connect two four-cell packs in series for 12-volt charging.

Don't overlook slow-charging at 50 mA from a radio charging system or equivalent. Six cells charge well from an eight-cell transmitter output. This method has the advantage of allowing you to arrive at the flying field with several pre-charged packs.

Don't overlook the condition of your charging battery. If you are getting poor performance from your system, suspect a weak charging battery first.



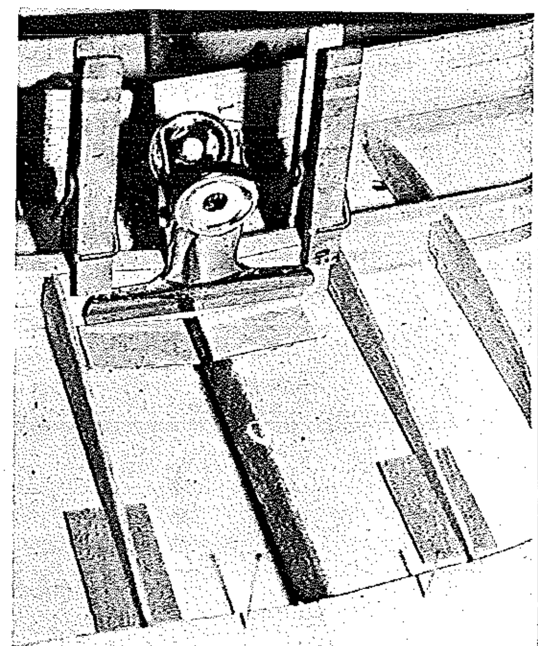
Author's prototype wing under construction. The trailing edge and bottom spar are pinned in place. Ribs are added, then the L.E.

Finally, no cooling exhaust slots are used or needed with this setup. Since current draw is low, the little heat generated is dissipated without them.

**Trimming and flying.** If new to RC flying, please seek out help—even if you have to travel far to visit a club. A one-time lesson of several hours will greatly improve your chances of success.

Install a 6-3 prop and the motor power pack. Stuff foam padding around the pack, but do not hook it up yet. As a safety precaution, get in the habit of range-checking an electric-powered plane before installing

*Continued on page 130*



A paper clamp and clothespins hold the center dihedral braces while the glue dries. Shims of 1/32 ply provide the correct spacing of ribs and dihedral braces for the center sheeting.

## Watts Up/Marron

*Continued from page 36*

the motor power pack. This is to avoid having the motor switch accidentally turned on when not expected, perhaps causing an accident. If the pack is permanently wired, a kill switch should be installed.

The CG should be just forward of the spar for first flights.

Range-check the radio. Assuming it checks okay, hand glide the model, pushing it away from you with the wing level and the nose down slightly. The flight path should be long and flat, needing little control input. If elevator adjustment is required, it is important to note that the servo arm must be centered at neutral for the ON/OFF switch to work properly. Therefore, make adjustments at the pushrod ends, not with elevator trim.

When satisfied with the glide and switch action, connect the motor power pack. Caution, please, at this point; make sure you are clear of the prop.

Turn on the motor with a blip of full-down elevator, and firmly throw the plane with its nose pointed slightly downward. The ship will pick up speed and start to climb at a respectable rate. In 1½ min. or so it should be as high as a hi-start Sailplane launch and still be climbing, although more slowly. After about 3 min. the battery will be fairly well used up; another quick blip of down is used to shut off the motor, ending the free ride. Now you will have to find a thermal if you want to keep it up there in the wild blue.

Watts Up thermals beautifully. On those long, lazy summer afternoons, the trims can be adjusted for wide circling flight as you lie on the grass and watch the show.

As with most gliders, this plane lands itself fairly well. When perhaps 20 ft. or so high, just turn into the wind, keeping the wing level. It will settle in, needing just a little down elevator (if it is breezy) to keep the nose down until a foot or so from the ground. Go to neutral or a little up, and it will slide right in.

After becoming acquainted with the ship, a slightly more rearward CG position will flatten the glide somewhat. Do try out different props.

*Continued on page 132*

## For Fun/Winter

*Continued from page 127*

More cells probably means more cost, more complex charging, and the need to balance cells by trickle charging. Nice to know, but I don't expect I'm ever going to get that far into it.

My new airplane (on paper) is predicted by that formula to do 8 min.-plus on six cells with a direct-drive 05 Cobalt, between 9 and 10 min. on seven cells and a 7-4 prop (I wonder about that 7-5 wood prop). The Super Ferrite 05 turning its 8-6 at a surprisingly-reasonable drain may be interesting. I went down from LeCrate's 460 squares to 405 squares for a Heinkel look-alike low-winger with a flat center section, Contender-type flap (for approach and landing), and ailerons (no rudder). A hot pilot could fly with a 10 or 15-size motor and direct drive. If the test ship is OK, the plans can be blown up (or reduced) to any size for several ranges of motors, in large sizes with either direct or reduction drive. Things can be further juggled by size choice for anything from a bomb to near-sailplane performance. Doug Pratt will build one size, Bill Kaluf another, and I will make a third. Motor cells are under the wing for a low C.G.—mounted in radiator-like detachable tunnels. It's as thin as a paper dart, but in larger sizes the cells could be internal. Also a rudder versions—two different dihedrals, for rudder or ailerons. More news next spring.

Always the Gas modeler, I think my proposed Electric would make a tremendous sport Gassie—aggressive looking and simple. Now, I feel like building that, too. There are never easy answers. Wanna trade?

*Bill Winter, 4426 Altura Ct., Fairfax, VA 22030.*

**When writing advertisers, mention that you read about them in Model Aviation**

## Watts Up/Marron

*Continued from page 130*

Electric flight is a challenge to the sport flier and competitor alike. With the Watts Up, your introduction should be gratifying. Happy landings.

## Radio Technique/Myers

*Continued from page 39*

ing microscopic whiskers through the insulating paper. You can blow out the whiskers with a high-voltage charge, but do you really trust the cells afterward? I don't. So, if you are away from the workbench a lot, Chargemaster may prove to be a fine tool for you. Ace RC, Inc., Box 511E, Higginsville, MO 64037.

*George M. Myers, 70 Froehlich Farm Rd., Hicksville, NY 11801.*



## Electrics/Kopski

*Continued from page 44*

My J-3 has proven over the years to be a real crowd pleaser—probably because it's a good old J-3, a fact which "touches" many observers.

This plane was built in the winter of 1978-79, and it was first flown on March 3 of the latter year. I didn't know it till later, but Bob Boucher of Astro Flight was designing his Porterfield at the same time. The two planes are very similar.

To date, the J-3 has accumulated 334 flights (not one drop of oil has soaked in!), and 150 of these are depicted in Fig. 4. Prior to 1980 I was not keeping record of flight time, only date and number of flights, and that's the reason only about half are plotted.

From Fig. 4 it is obvious that this is a "five-min. airplane," and you can see from the "vital statistics" what the details are. Here's some more information about the plane.

The J-3 was scratch-built using Sig plans as a guideline. Since this was to be electric-powered, I knew the plane itself had to be lightweight, and the more rugged kit version for a glow engine would not do. I set about redrawing the plans and choosing construction techniques and wood sizes consistent with the application. I also changed the airfoil to a 12½% flat-bottom section. Dihedral was added in lieu of ailerons. Result: a real charmer!

Admittedly, the J-3 is a fair-weather flier. It does not handle wind well, and it is definitely more fun to fly in calm air. A typical flight starts with a small amount of ground handling followed by taxi and takeoff. Following climb-out, I back off the proportional "throttle" and cruise around. Flybys are a snap—beautiful to experience. The plane is a pussycat in handling, and several times I've nearly hypnotized myself into flying it into myself.

Usually I'll do some touch-and-goes and one or two inside loops, playing the "throttle" control as needed to do this. While the plane glides nicely (note some of the longer lift-assisted flight times in Fig. 4), I generally keep the power on the whole flight, only varying the amount for the desired effect. About a third of the time I have enough power left after landing to taxi back to the pit area. Otherwise, I power it out and have to bring it back dead-stick.

This J-3 is a good example of inadequate battery cooling. I'm on my fourth battery, and heat is the reason. At the time of design and construction, what looked like a good installation for cooling has proved to be inadequate. (Whatever knowledge I may have in Electrics has not come cheaply!)

The 15-size motor used in this plane was a new version when the plane was new, the so-called "black back 15." The current model of the Astro 15 is a rather different motor (the Ferrite 15), and it uses 12 cells of 1.2 Ah. I may install one of these someday and get longer flights. The overall weight will increase by about 9 oz., but I estimate the flight time should increase to about 8-9 min.

Look over the vitals and get the general idea. There are many candidate designs around that would perform comparably but that would require some modeling effort to make suitable for electric power. My J-3 is but one example. The Astro Porterfield is an