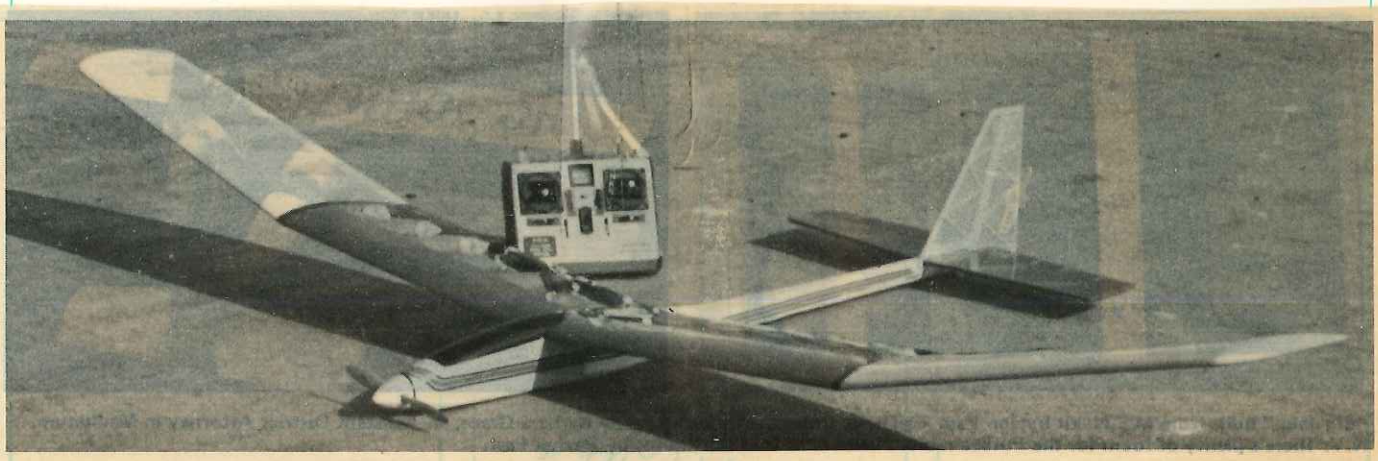


# ELECTRICUS

**By LARRY JOLLY . . . Here's a really super 2-meter, direct drive, 05 electric sailplane that climbs like the proverbial "homesick angel" and handles aerobatic maneuvers like a champ. Perfect as a first electric model.**

• As I promised in my last article, this month we are going to build an electric sailplane. Whether you are a novice electric flier or a veteran power jockey, pay attention and you can have a most satisfying model that you can fly literally anywhere, anytime, and you won't get caught, because the Electricus 205 flies very high, very easily, and of course very quietly.

How did the Electricus 205 come about? Well, it's a long story that started back in January of 1982. I had just flamed out of the Leisure Grand Championships with an overloaded micro-switch. Mike Charles went on to win with his two-meter design, Ultra II (featured in January '83 **MB**). I liked the looks and characteristics of Mike's airplane . . . and the fact that it won didn't hurt, either. Anyway, like any experienced modeler, I went home and slept on it.

As I fell into a deeper sleep, I started to dream. I found myself in a tunnel of darkness. I looked left, then right. To the right I saw a glimmer of light at the end of the tunnel. I started walking, then running, until I got to the end of that tunnel. As I peered out I saw that this was a strange land, not unlike a desert . . . with rocks, and cactus, and all that good stuff. A little ways out I saw a man standing on a ladder, working on what appeared to be an adobe house.

I walked over to the man and greeted him. Upon asking his name, he replied that he was, "The Bearded One, Guru of Sandia Crest, Keeper of all Knowledge pertaining to model airplanes." I thought to myself, "What a break. This guy can tell me everything I need to know about my next electric project."

I told the Bearded One of my dilemma. He knew a lot about free flight power models, and suggested I steer my thoughts in that direction. He reminded me of the basic rule: More wing more glide, less wing more climb. Like any truly great Guru, he preferred for me to think out my design rather than have him draw the picture for me. I thought to myself, if I could get my model high enough, theoretically it wouldn't need to glide at all. If it started from enough height, it couldn't fall fast enough to touch down before the max time had elapsed. What I needed was something in between a balloon and a Saturn V.

As the parameters were laid down, the Electricus 205 started to take shape. Light weight was a key factor, for as you physics majors know, mass has a lot to do with acceleration. If I could build a model to 35 ounces all up, I could shorten the span and still have a reasonable wing loading. I asked the Guru about airfoils. I told him I was thinking about an under-cambered section to improve the glide. Looking at me like I was nuts, he replied, "Any good free flighter knows thin, flat bottoms climb faster than under-cambered sections. Didn't you ever hear of Carl, "The Wizard of the Chicago Armory," and his 8% flats that set the world on its ear in the late '30s?" You know, he was right.

Author/designer, Larry Jolly poses with the electricus at a local school yard field.

Now, I was ready to build. I chose the Eppler 205 airfoil because of its excellent handling characteristics, flat bottom, and its ability to cover ground. The Guru informed me that a place called Dukes was out of Jet, so I would have to go back where I came from to complete my model. Bidding me farewell, the Guru went back to finish his house. (You figure it out? Yes, the Guru in this case is Dave Thornburg!)

So this is how the Electricus was born. It has an exceptional climb and a wide speed range. If your idea of fun is contest flying, this is the model that is going to be hard to beat. The Electricus 205 is designed to take full advantage of a hot 6-cell, 05 motor and a small 2-3 channel radio.

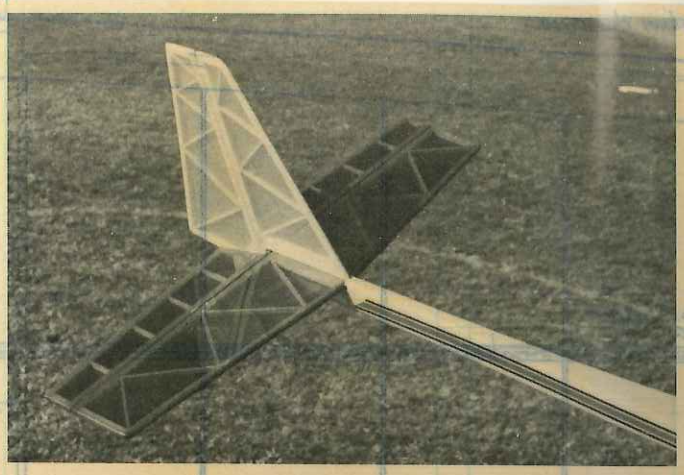
For S.E.A.M. 2-meter rules, I would recommend a Leisure 05 racing or an Astro 05XL. Use a Rev-Up 7x4 prop for this class. For F3E or 7-cell contests, use the Astro-Cobalt Challenger and a 7x6 Rev-Up. But before you fly, contact NASA, otherwise they'll think one of theirs got away!

If you want to fly an Electricus 205 you have to build it, so Let's Go!!!

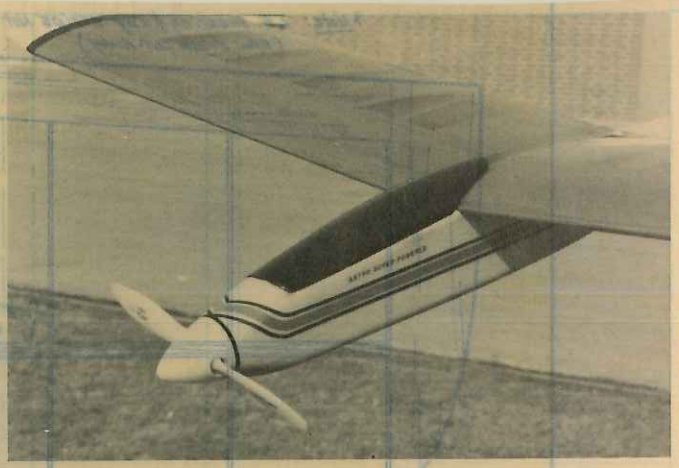
**PREPARATION**

I have found it much easier to scratch build if you start out by cutting yourself a kit. Check the plans over to see what you'll have to buy, in addition to what you now have. All wood should be "contest wood" for the best possible performance.

Cut the fuselage sides from two pieces of 3/32x3x36 matched C-grain, if you have it. The ribs are made by the sandwich-and-sand method. If you have



Light tail structures are a must for decent wing loadings on electric sailplanes. Electricus weighs 34.5 oz; 8.5 oz./sq. ft.



The nose of the Electricus fairs into the prop spinner beautifully. You won't find ugly rubberbands over this wing!

trouble making your ribs, check the back issues of **Model Builder**. Dave Thornburg proved he knows more about making ribs than your local barbecue house ever thought of. If you have a table saw at your disposal, make the leading edge by splitting a piece of 1/4x 5/8 with a 30-degree cut. Follow this with a 10-degree cut on the bottom. If you don't have a saw, rough sand a piece of 1/4x1/4 to shape.

When you have everything prefabricated, set it out on a table and see if it looks as good as those photos the guys send in for their "before" pictures in their kit review articles. Now you're all ready, right? You have a straight, true building board at least 36 inches long, T-pins, knives, sandpaper, plus thick and thin instant glue. Let's do it . . . if we start now, we can chase the thermals Sunday morning!

**BUILDING THE ELECTRICUS 205**

The wing is the most time consuming construction to build, so let's start on it first. Let's begin with the left center panel, so we don't cover the internal construction detail.

1. Pin down the following: the bottom leading edge 1/16x3x18 sheet, the 1/8x 1/4x18 bottom spruce spar, the 1/4x1x 1/8 shaped T.E., and the 1/16x1/4 cap strips that go between the bottom sheeting and the trailing edge. Don't forget the center sheeting. When everything is straight, glue it in place.

2. Place ribs 3-6 in position and glue in place.

3. Add the top spar.

4. Now carefully fit and glue in place the 1/16 vertical grain shear webs. (Note: shear webs go in all bays, except the one at the tip dihedral break.) Also note this wing is bulletproof, but is only as strong as its weakest shear web.

5. Now is the time to glue the leading edge in position.

6. If you used instant glue to assemble the center panel, it is now dry, so you can raise it up to the 3-1/4 inch dihedral and build the tip right on to it, using the same sequence that you just used to build the center panel.

7. The dihedral braces are cross-over braces made from hard 1/8 inch balsa. Check the detail on the plans for their construction method. I like to cut a strip the full height of the brace, the full length. I then cut the proper angle to match the bottom spar and have found that the excess fits between the top of the brace and the bottom of the top spar.

8. Add the top sheet and the cap strips to the tip.

9. Sand the end of the wing tip flush and glue the tip block in place. I like to rough sand the tip block before I glue it in place.

10. Now build the right wing panel to the exact same point as you now have the left panel.

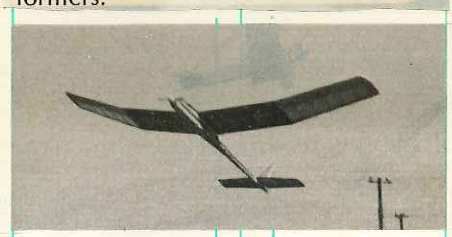
11. When both panels are complete, line them up on the board. Raise one wing 3-1/4 inches off the table while the other remains flat. See how they fit. If the match isn't perfect, rectify with a sanding block. Now glue the panels together. Add the two center plywood braces, and the two center ribs in each panel.

12. Now add the top sheet and cap strips to the panel that is flat on the board. When complete, pin the other panel to the board and sheet it. The wing is now complete except for final sanding. Put the wing some place where the cat won't get it, and we'll build the fuselage.

**BUILDING THE FUSELAGE**

This is the easiest box you'll ever build, if it takes you more than an hour, you paid too much attention to those Charlie's Angels reruns.

1. Pin the fuselage sides to the board, bottom facing bottom. This ensures that you build a left and right fuselage side. Now mark the locations of the two formers.



2. Glue all the longerons in place. When dry, sand the longerons at the tail so they come together as shown in the top view.

3. Notch both formers to accept the pushrods and whatever clearance for wires you might require.

4. Place the fuselage sides right side up on the board, longeron side in. Place both formers in location and pin the tail together. Check to see that all is square. If everything lines up hit it with the "instant sticker."

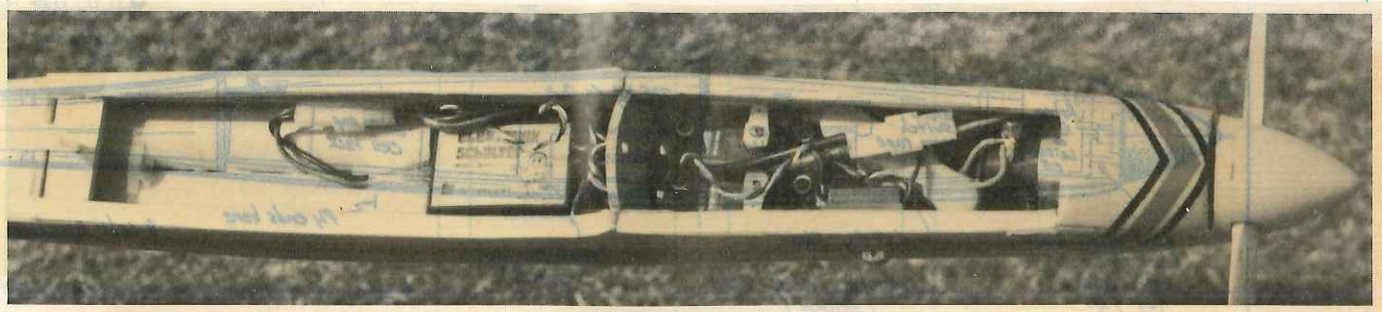
5. Note the fuselage sides overlap the outside of the nose block approximately one inch. Not mentioned earlier, but important, is the fact that final shaping of the inside of the block must be done after the block is glued in place. If you attempt to fit your motor before the block is glued in place, you'll find that it splits easily. Glue the nose block in place. Before shaping the fuselage, fit the motor and motor tube to the block. Make sure there is no up or side thrust. Two degrees down thrust is okay. It's a good idea to add 1/16 inch balsa scrap to the front of the fuselage sides, as it aids shaping later.

6. Glue the pushrods in place.

7. Add the 1/16 plywood floor and the 1/16 balsa top and bottom sheet.

8. The fuselage is now complete except for sanding to shape. If you have a broken motor, put in position with a 1-1/2 Goldberg spinner mounted in place. If you are using the motor you intend to fly the plane with, put tape over all entrances to the inside of the motor. Now sand the daylights out of the fuselage. The object is to blend the box fuselage shape into the spinner, and round the corners.

Let's build the tail surfaces. As the Electricus is not a flying wing, we have to have something stuck on the back to control pitch and yaw. Build the tail surfaces flat on the plan out of 3/16 thick materials. Note the photos show the built-up elevators I originally used. However, I substituted sheet for the elevators on the plans because the built-up ones are so much fun to sand, cover, and try to keep from warping. When the



This photo shows the equipment layout in the prototype Electricus. Under the canopy are: rudder and elevator servos; 225 ma airborne battery pack; switch harness; 05 motor. Behind F-1 former are the Futaba 7G receiver, Geist speed controller, and six-cell power pack.

structures are dry, sand them to something resembling an aerodynamic shape, and put them aside. Don't sand the surfaces too thin, you don't want them to flutter.

**FINAL ASSEMBLY**

Make sure the entire model is finish sanded. Now glue the 1/8 plywood wing screw mount in place inside the fuselage. Place the wing on the fuselage and check the fit between the wing and the fuselage. If the fit is not good add wood, or subtract wood with a sanding block. Be careful that you don't change the incidence. Holding the wing carefully in position, drill through the front former into the wing with a long 3/16 drill. Glue the 3/16 dowel in place. Add the plywood reinforcement on the top of the wing. Now carefully line up the wing and drill through the wing and wing mount with a 1/8 drill. If everything looked good, open up the hole in the wing to clear an 8-32 nylon bolt and tap the plywood plate for the same.

Now build the canopy frame out of 3/16 scrap stock. If you want to, you can form your own canopy out of plastic, find one that fits, or order one from me. Instructions for ordering will appear at the end of the article. Anyway, trim the canopy to shape and glue to the balsa frame. Check that the tail surfaces mount square on the fuselage in relation to the wing. If everything looks good, cover the entire airframe with Super Monokote. Make the wings and tail a bright color for visibility. Now hinge the tail surfaces. Note you'll have to join the elevators with a piece of wire first. I like to use Rocket City Nylon Hinge Strip for my hinges. It's very simple to cut to shape and use. Don't use pin-type hinges on built-up surfaces under 1/4 inch thick. You have to remove so much material for hinge clearance that a shear point is formed, allowing damage that is very difficult to repair. Place the wing on the fuselage again and bolt in place. Now pin the tail surfaces in place, make sure the tail and wing are in line and square, and then glue in place. Add the control horns to the elevator and rudder and make up the tail end of your pushrods.

**EQUIPMENT PLACEMENT**

The following is my method for proper placement of the balance point without the necessity of adding ballast. It is applicable to any electric model, and for that matter, any conventional model that is not already too tail-heavy for the equipment to make any difference. As already stated, the Electricus 205 was designed for maximum performance from an 05, six-cell system. Because the airframe is small and light weight, to meet the performance criteria, you must also use a radio that has a small airborne system. If you are trying to stick a Heathkit GD47 in this thing, I feel for you, because it ain't gonna work! However, any modern equipment should at least shoe horn in place. If you don't have small equipment, and cannot afford a miniature airborne, make wider formers while building the fuselage to accommodate the bulky equipment. Note some performance will be lost.

Now back to the task at hand. Mark the balance point location shown on the plans, onto the fuselage. Put the prop and spinner on your motor and place in position in the motor tube. Place the motor battery pack in the back of the cabin area, as shown on the plan. Now place the servos and receiver, and battery pack in place, and check the balance. Rearrange your equipment until the Electricus balances properly. Now check that the servos move the right direction for their usage and mount your equipment in place. I use one inch rudder throw each way, and 3/8 inch elevator throw, each way. Set up your controls like this and adjust to suit your flying style.

I recommend that you set up your aircraft so that the motor battery is easily removed. This allows you to pull the pack out of the aircraft for charging. I have included a sketch of the S.E.A.M. approved switch harness for your electric system. Look at it and set yours up accordingly. Always mount your switch harness so that it is easily removed in an emergency.

Did I hear someone say "Fire"?! I personally use a 30 amp electronic on-off switch manufactured by Geist and sold through Wilshire Model Center. It's not necessary, but certainly a nice touch. By the way, in case you haven't noticed, all we have left to do is figure out how we're going to hold the canopy down, charge the radio, and cycle the motor battery. We're gonna fly this thing in the morning. I use a pin in the front of the canopy and two wire hooks on the sides at the back that loop under the front longerons holding the canopy in place. Figure out what will work best for your situation. I'm sure some of you will come up with such exotic systems as tape or a rubber band looped around the fuselage!

**FLYING THE ELECTRICUS 205**

Forget the proverbial tall grass for test gliding. The kid next door already smoked it all. Assemble your model without the propeller in place. Check the balance, that the controls move the right direction, and everything is stuck on good and tight. Have an experienced friend hand launch the model while you're ready on the controls. If everything is straight, your Electricus should glide out straight and flat. If necessary, adjust your trim and toss again. Now bolt a Rev-Up 7x4 wood prop on the nose of your airplane. Top off the motor battery and you're ready for powered flight.

Again have a friend hold the model. Have him stand clear while you turn the motor on. Does the prop turn the right direction, does your radio still range check with the motor on? If the answer is yes, then have your helper launch your Electricus straight ahead into the wind. The Electricus should accelerate and start to nose up into a steep climb. With practice, you will find the so-called step or maximum climb angle for your particular airplane. Don't ever try to climb straight up on elevator. Because our thrust-to-weight ratio is less than 1 to 1, we must use the wing to help our model climb. This means the wing must be working, and for the wing to work it has to have airspeed.

You will soon find that the Electricus can climb to amazing, sometimes uncomfortable heights under power. Be careful that you don't fly the model out of your vision. I have, and can tell you it is alarming to say the least. The Electricus 205 is a very nice handling airplane. She is very smooth and gentle, and yet with exaggerated control throws, is capable of basic aerobatics. The Electricus covers ground and thermals well, she is just the ticket for the new S.E.A.M. two-meter Sportsman class, or lazy summer evenings at the local school yard.

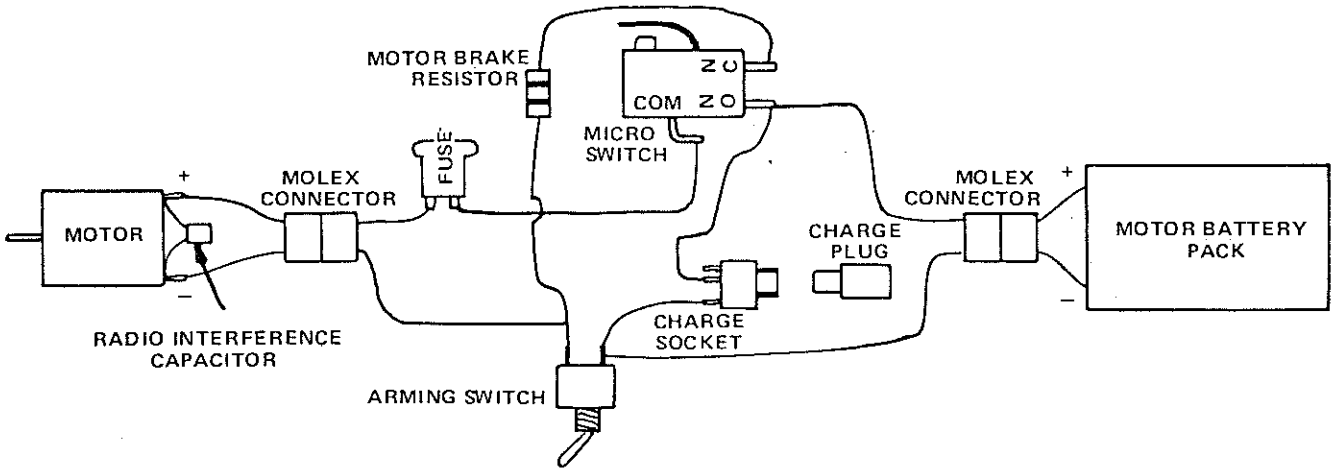
I hope you enjoy your Electricus 205 as much as I have enjoyed writing this article.

**CANOPY ORDERING INFORMATION**

Send $5.00 for your formed, plastic canopy to Larry Jolly Model Products, 5501 W. Como, Santa Ana, CA 92703. Shipping and handling are included. •

TYPICAL ELECTRIC MOTOR-BATTERY WIRING DIAGRAM

SUITABLE FOR MOTORS TO "15" SIZE & BATTERY PACKS
OF UP TO 12-1.2 AMP hr. CELLS




## PARTS LIST

WIRE: 16 or 18 GA stranded copper.
RADIO INTERFERENCE CAPACITOR: ..01 mfd (Micro Farad) to reduce interference. Note: If low frequency interference occurs, add to motor a 47 mfd electrolytic. Be sure to observe polarity on this part.
MOTOR BRAKE RESISTOR: .25 ohm (.24 - .27 OK), 1 watt.
FUSE: ATC 20 amp. Adaptor .187 flag connectors.
MICRO SWITCH: 15 amp, 250 vac (Unimax 3 TMT 15-4 or equivalent).

CHARGE SOCKET: Switchcraft No. 712A or equivalent.
CHARGE PLUG: Switchcraft No. 760 or equivalent.
ARMING SWITCH: Subminiature single pole, single throw (SPST) 10 amp, 125 vac (Radio Shack No. 275-324 or equivalent).
CONNECTORS (MOTOR & BATTERY): Molex 2 pin, size as recommended by motor manufacturer.
CONNECTORS (MICRO SWITCH & FUSE): .187 flag type, Waldom or equivalent.