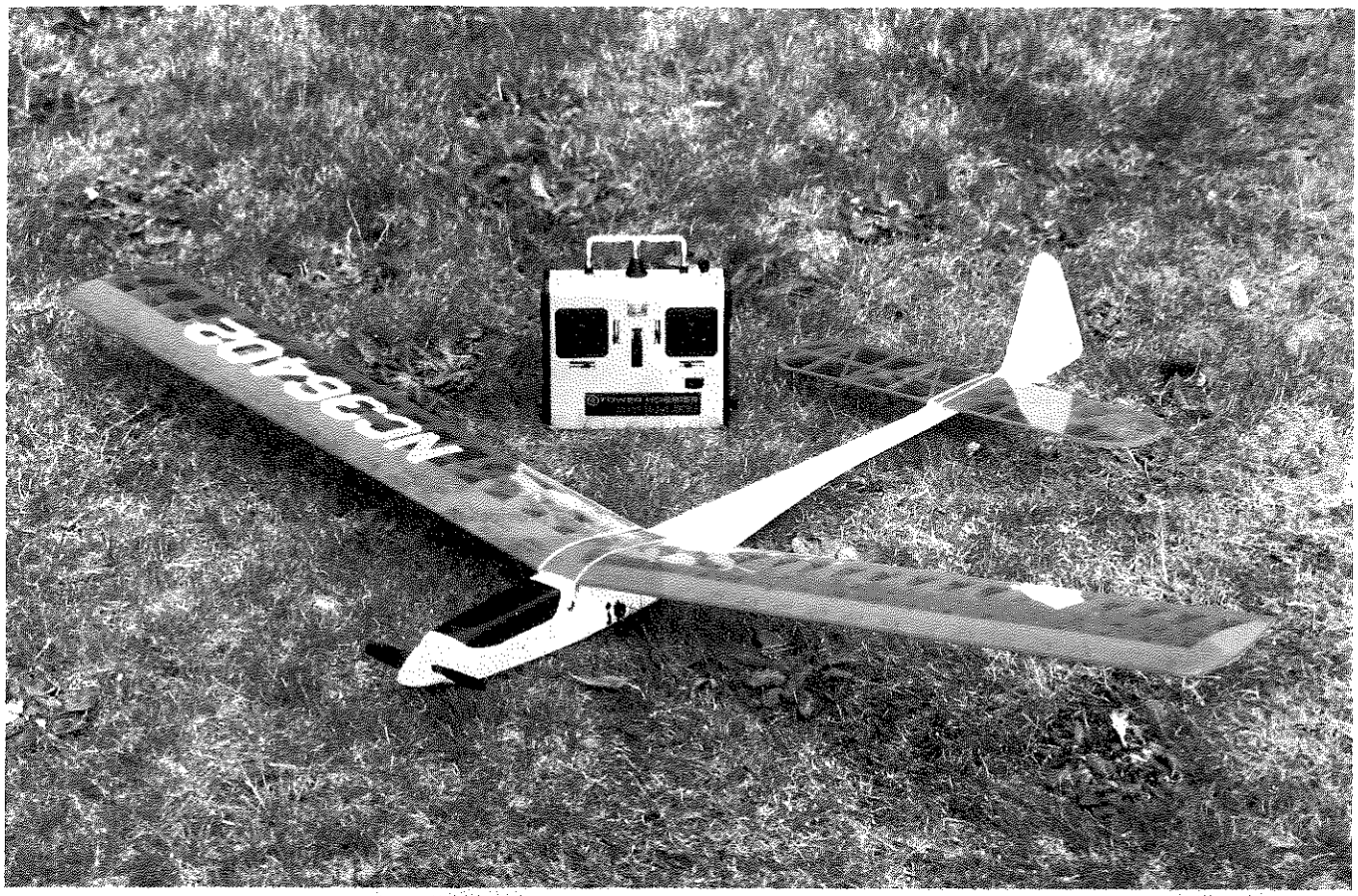
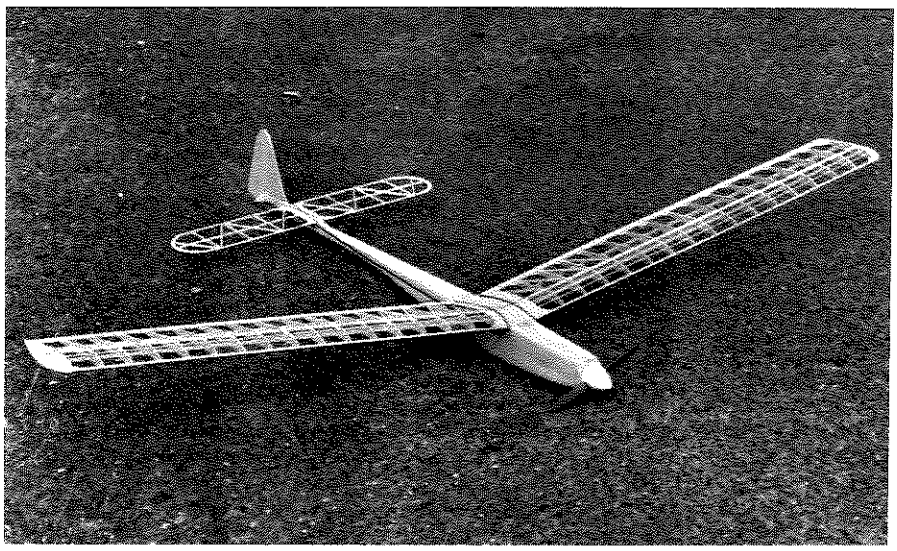


SWEETY

By BRUCE GRAY. . .A sweet-flying, inexpensive single-channel electric sailplane that is guaranteed to put some fun back into your flying without taking much from your wallet. Power is an Astro 035 electric motor.

• More and more people are becoming interested in electric-powered flight because of its numerous advantages. Electrics are quiet, clean, simple, and very adaptable. Electric planes can do just about anything. They can fly 100 miles per hour, climb 2,000 feet in 60 seconds, or fly slowly for about half an hour inside buildings.

Many people want an electric-powered, radio-controlled plane that is inexpensive, easy to build, rugged, and slow and docile in flight. Such a plane isn't easy to find. You may look at the prebuilt models, but they cost $100 without the radio control, and they tend to be overweight. Or you may try modifying a gas-powered, R/C model, but they tend to be heavy too, so performance suffers. Even some purposefully built electric-powered 'trainers' have wing loadings of a pound per square foot, that produces a flight faster than many would like.



A view of the Sweety prior to covering. Sheet balsa fuselage and rudder make for easy building.

Sweety uses an inexpensive power system and about $25 worth of materials for the airframe and covering. The plane is easily built and can take less than graceful landings without damage. And with a wing loading of about eight-and-a-half ounces per square foot, flight speed is about 15 miles per hour. Additionally, Sweety flies herself without control input. If you like relaxing flying, this is it.

Sweety uses the Astro Flight 035 motor and a free flight battery pack. The plane is designed to accept both the 020 and 035 motors and flies well with either. I understand, however, that the 020 motor is being discontinued. Flight speed is slower with the 020 system, but the climb is better with the 035. Since the 035 system is quite a bit more powerful and weighs only a few ounces more, I recommend it.

For those of you who like to experiment, Sweety can carry different flight battery packs.

The standard freeflight pack is 275mAhr which gives about two minutes of power and a good climb. You can use 450 or

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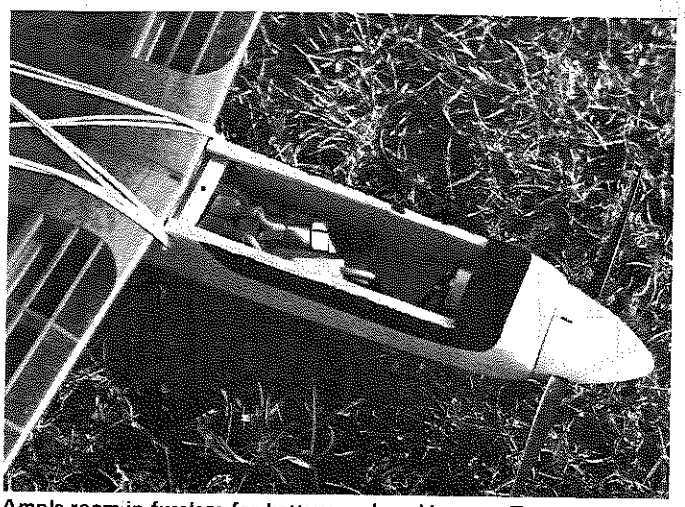
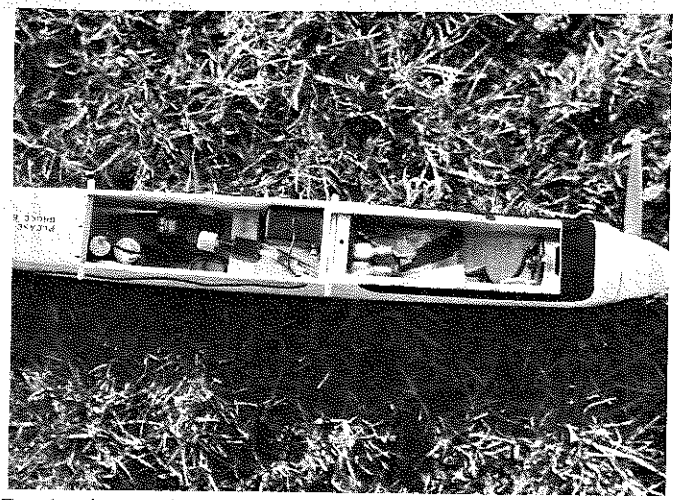


Ample room in fuselage for battery pack and harness. To save some weight, make your own harness; at least, add a fuse!



Rear hatch opened to show servo setup. An independent on/off servo greatly simplifies linkage adjustment and flying.

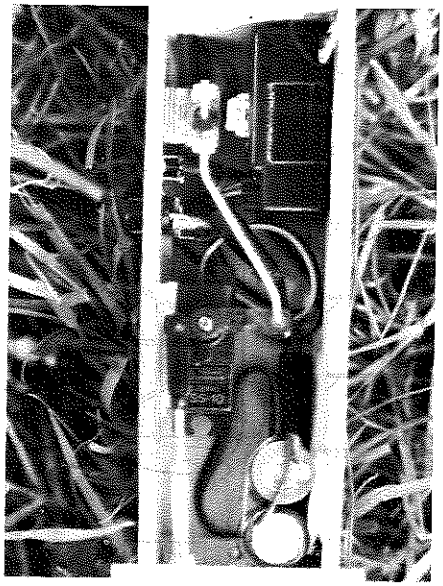
550mAhr batteries, but space becomes cramped and components may have to be rearranged. The 550mAhr pack produces flights of about five minutes. If you want really long flights, don't be shy about flying with less than the recommended number of cells.

As with any small, electric-powered plane, lightweight radio gear is needed. If you have some, you're set. If not, and if you're on a really tight budget, you can get a single-channel pulse proportional system for about $20. Going this route you lose the option of having motor on/off control. If you plan to build more complicated models, I would recommend a four-channel mini-system. Suitable equipment is available from Ace, Cannon, Futaba, World Engines, and Tower Hobbies. The total weight for the radio equipment should be about two-and-a-half to three ounces.

This plane has a narrow fuselage; a mini-system is a must.

CONSTRUCTION

This model may seem complicated at first glance, but it is really quite simple. If you take one piece at a time you won't be overwhelmed. It took me about 40 hours to build the model from scratch, and I am very slow and meticulous. Only basic modeling tools are required; no drill press, jigsaw, or other expensive tools. Although not necessary, one real timesaver is the power Dremel tool.



A closer view of servo, linkage, and receiver. You can follow the layout on the plan, or make your own placement of flying system.

With a model of this size, much weight can be saved by choosing adhesives and wood properly. You will need several adhesives. Almost all the model can be built with a small bottle of cyanoacrylate adhesive. Get a gap-filling formula. Be careful with this stuff since it is an extremely powerful bonder. It sticks your fingers to things just as permanently as it does wood.

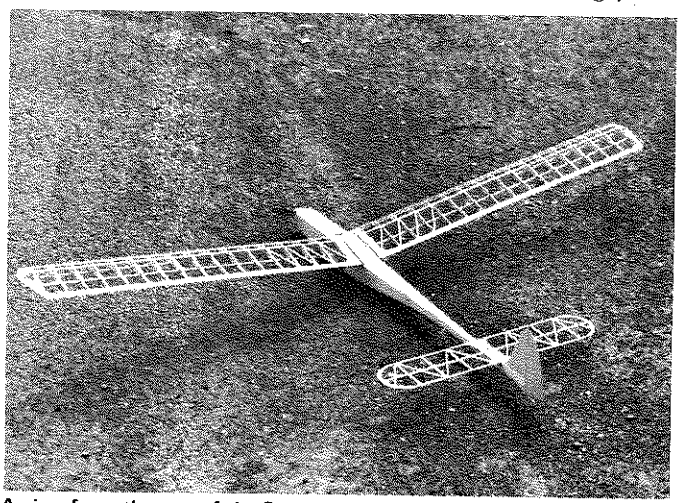
A tiny jar of contact cement like Weldwood and some 5-minute epoxy are also needed.

Selecting wood is like selecting wine, it depends upon the situation and your preference. Balsa is amazingly variable both in density (4-18 oz./ft.3) and type of cut, so visit your local hobby or lumber store that stocks balsa and test the wood by hand. The wood should be straight, with fairly uniform density and have only minor blemishes. Select medium-light wood for the fuselage nose, top and bottom sheeting, wing center sheeting and tips, and stabilizer center sheeting and tips. Pick medium-hard for fuselage sides, and wing spars (make sure these pieces are matched for left and right sides). All other wood can be medium density.

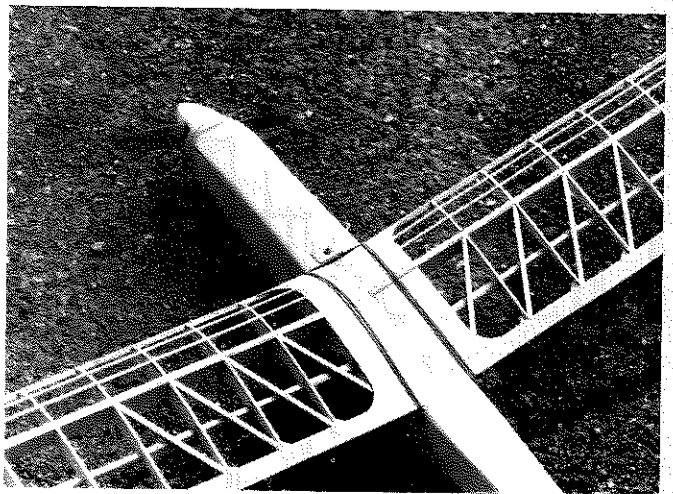
TAIL SURFACES

The rudder and fin are as simple as they get. Cut out the two pieces, making sure you include the one-inch wide tab on the fin that extends down into the fuselage.

The stabilizer is easily built by placing the parts over the plans. The plans should be covered with wax paper to protect them. Pin down the three spars, selecting the dense spar for the center. Cut the center sheets from a one-inch wide strip, and glue



A view from the rear of the Sweety without its covering reveals a simple, no nonsense beauty and grace. It just looks like a good flyer!



Close-up look at the wing attachment and hatch covers. Use epoxy to bond the wing panels together to ensure strength at stress points.

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them in place. Cut the tips from the same balsa strip, and glue them on, making sure the center spar is notched into the tip. Glue the crosspieces in, then add the fillets and two gussets on the leading edge. Finally, cut and glue the diagonals in place. Sand the leading edge, trailing edge, and tips to a round section. Now you've got a strong, light stabilizer that's begging for a plane.

WING

There are quite a number of pieces in the wing but very few different ones. Most of the parts can be made several at a time. Cut two ply templates of the W3 rib, and drill 1/16-inch holes in them as shown. Cut two, 5-inch long pieces of 1/16-inch music wire, blunting one end and pointing the other. Cut the required blanks and drill 1/16-inch holes in them. Sandwich the stack together between the templates, and secure it with the wire rods. Shape the stack, being careful not to take off too much wood at a time. Cut the notches with a fine saw, and clean them up with a model file. Text-fit pieces of wood in the notches before unpinning the stack. Trim the W1 and W2 ribs as shown.

Take all the stringers, spars, leading and trailing edges and balance them at their centers to find the heavy end. Mark this end and place it toward the inboard side during assembly.

Build one wing panel at a time. Cut the spars and trailing edge slightly over length. Pin the trailing edge down, and place the bottom spars in place. Lay down the 1/16 sheet for the center bottom, allowing room for the 1/16 ply wing braces (W4, W5). Cut sixteen shear webs and use one to space all the ribs, except W1, evenly over the spars. Make sure all is square, then glue together.

Add the top spar, wing tip and leading edge, gussets and shear webs. Repeat this procedure to make the second panel.

Block each wing panel up as indicated in the dihedral diagram on the plans, and carefully sand the root of each panel so they fit tightly and the wing is true. Now place the panels together and block them up so the wing is accurate. Using epoxy, bond the panels together and add W4 and W5. Epoxy W1 in place and add the top sheeting. Don't worry if it takes you a few tries to get the sheeting cut just right. There are a lot of compound curves there. You may find it necessary to wet the sheeting with water to prevent it from cracking when bent over the ribs. Glue the stringers and 1/8-inch square diagonals in place. Sand the leading edge to meet the ribs. Round the tips, and sand smoothly overall. Now you can't help but build the fuselage.

FUSELAGE

Balance your matched sheet sides to find their heavy end. Use this end toward the nose. Cut out the side and ply doublers. Now you have to start thinking about left and right sides. Place the forward and stabilizer support doublers on the sheet sides. Mark the balsa sides for location and remove the doublers. Apply contact cement to mating surfaces and let sit till glossy. Ever so carefully, place the doublers on the sides. Once the pieces touch, that's it, you have no time to maneuver them. Glue on the 3/16 square pieces and 1/8 sheet doubler at the nose. Add the longerons. Start at one end and bend them in place, tacking down as you go. Place the sides together, and drill the holes for the wing and stabilizer hold-down dowels.

The covered, finished, ready-to-fly Sweety, charged up and set to take to the skies. Total cost of materials is quite low; radio system is equally inexpensive.

Make all formers. Place one side on a flat surface and glue F2, F3, and F4 in place aligning them carefully. Add the 3/32-inch dowels and the 1/8-x 1/4-inch spruce cross pieces that receive the bolts.

Note that the lower spruce piece on the hatch is glued to the fuselage, the upper one to the hatch. Drill the spruce pieces slightly undersize, and thread them with a bolt. Cut the ply floor, skid plate, and tail skid; and drill the holes through which to pass the bolts. Glue the bottom sheeting between formers F2 and the forward edge of the spruce cross piece at F3. Bolt on the ply floor and skid plate. Glue the piece of 3/32 sheet on the top at the nose. Cut the hatch and its associated ply and spruce parts, and glue them together. Build the motor compartment floor, cutting the pieces to fit. Attach the hatch.

Carefully align the fin and glue it in place along with the back tip of the fuselage. Add the stabilizer dowels. Sheet the bottom of the fuselage behind the wing and sand the rear bottom section of the fuselage rounding the edges. Epoxy the tail skid in place. Round all edges of the fin and rudder. Drill holes in the fin to receive the hinges. Use white glue or epoxy to mount the hinges in the fin, then add the rudder. Epoxy the control horn in place.

Install the pushrod linkage to suit your particular equipment. Sheet the top of the fuselage behind the wing. Place the wing and stabilizer on the fuselage to help shape the remaining fillets.

The nose may need to be modified. If you live in a warm climate and plan on using the

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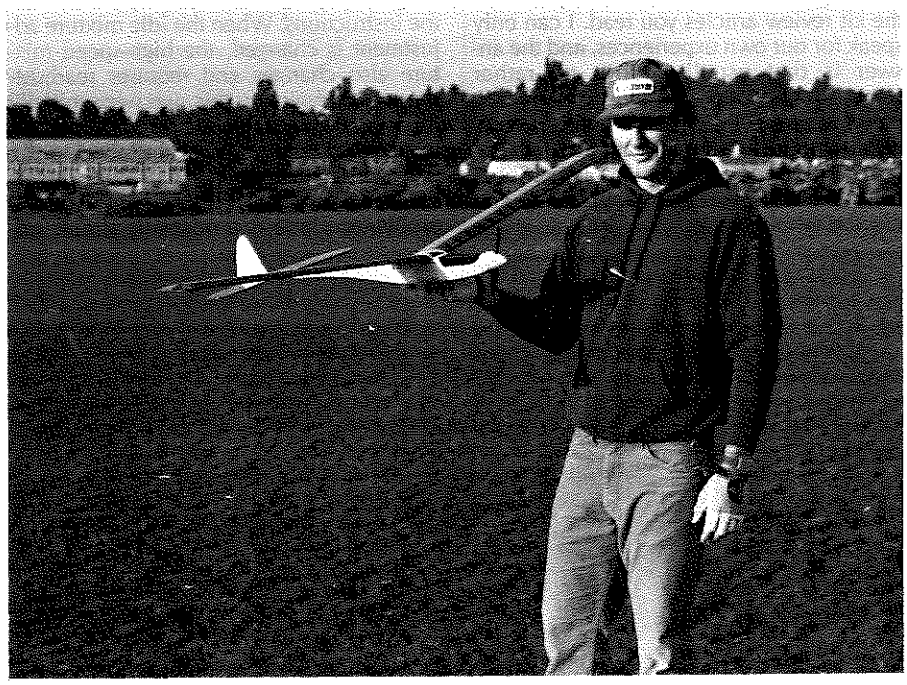

The author with his Sweety at a prime flying area. Single-channel control will keep your Sweety under control and within sight, providing just under a half-hour of flying fun per charge.

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larger battery packs, you will probably want to provide cooling for the motor. Also, if you use a spinner other than Carl Goldberg, the thickness of F1 may need to be different to provide proper clearance. Use contact cement to bond F1 to F2. Mount the motor and spinner, and sand the entire fuselage to a smooth-rounded section, barely cutting into the longerons and blending the nose into the spinner. Use contact cement to mount the 3/4-inch wide velcro strips, if you plan to use this attachment method for the batteries.

FINISHING

You probably have a preferred method of finishing your airplanes. With this model the important thing to remember is keep the covering light. I used red transparent Solarfilm for the wing and stabilizer, painted the fuselage and rubber with five coats of thinned white dope, and the canopy with black enamel. If you prefer a heavy tissue paper or light silkspan for the entire model, you will end up with a strong, light structure. But application of these materials is more time consuming and the covering is susceptible to high humidity and punctures more easily.

MOTOR AND RADIO INSTALLATION

Bolt the motor in place with 1/4-inch long 1/8 N.F. bolts and washers. Pull the motor shaft forward and turn it to check that the bolts clear the armature. If not, add thicker washers. The motor comes with a wiring harness, but if you want to make some improvements and save some weight, make your own.

The least you must do to the harness is add a 10 amp fuse between the motor and battery. An automotive blade-type attached to female, solderless connectors works well. Although you may have installed an on/off switch, a fuse is a must. It's cheap, light protection for your motor, batteries, and your fingers! The plans show one possibility for the arrangement of the radio and on/off switch. Yours may be different to suit your equipment and preferences. I found that an independent on/off servo greatly simplifies both linkage adjustment and flying. If you plan to remove the flight battery frequently, I suggest you replace the Astro Flight connectors with 4-pin Deans connectors. The Astro Flight connectors are very difficult to work in confined spaces. For a detailed explanation of the building of electric planes, Mitch Poling's book, *Building and Flying Electric-Powered Model Aircraft*, is the best one I know of.

FLYING

I hope you have the same experience I did. On the first flight without any adjustments, my model flew perfectly.

Attach the wing with #30 rubberbands (2 x 8 inches) and the stabilizer with #10s (1-1/4 x 1/16 inch). Balance the model as marked on the plans by shifting the two battery packs. It's safer to be a little nose heavy rather than tail heavy. Check for proper alignment of all parts, and that the surfaces are perfectly true. Put about 1/16- to 3/32-inch washout in each wing tip. Cycle all the Ni-Cds: transmitter, receiver, and flight pack. Draw the discharge graph for the 100mAhr receiver pack and mark the voltage at which it is time to stop and charge up or change packs. The capacity of these cells is so small that you will probably only get about 25 minutes of safe flight. I install a charge jack on the side of my planes so I can quickly check the voltage and charge the pack in the field.

An expanded scale volt meter that places a load on the cells is what you'll need. Also, if you wish to quick-charge them in the field, you will need a charger that has current adjustment. There are many good quality ones on the market now; shop around before you buy.

Choose a day with no wind. By far the best time to test fly is early in the morning. The field should be large with mowed grass. Have someone who has flown R/C before help you. If you can't find anyone, familiarize yourself with the procedures and you'll probably do fine.

Once at the field make a last check with the voltmeter, a range check, and confirm that the model is aligned and that the controls are correct. Flip the motor on and run into whatever breeze there is. Let Sweety lift out of your hand. It doesn't require much of a throw. Do not throw with the nose pointed up! Throw level or slightly down. She should climb out gently and gain about 200 feet of altitude with a full motor run.

Only small rudder commands are needed to keep her in range and to land. With only one control and a slow, stable plane, the fun is back in flying. Welcome to the relaxing side of electric flight.