

ELECTRO-GLIDE "HAVING IT ALL"

Aerobatics or sailplane . . . why not have the best of both worlds . . . build this sailplane wing for your Electro Streak and you can!

By Don Sobbe

About three years ago I backed into electric flying because of my involvement with a kit manufacturer. I needed a model to evaluate the performance of several electric motors for a kit that I was to engineer for them. Well, at the time I thought, "Won't this be fun. I'm going to fly models that stagger around the sky imitating home sick man hole covers!" Then, I had the good fortune to meet Tom Stryker, designer of what was to later become the Great Planes Electro Streak. I was impressed with the model's aerobatic capabilities and built one from his plans. I've had a lot of fun with that model and another one of Tom's designs, the Electric Hots, for which I did the kit engineering. These models really perform! And, obviously, I've changed my mind about electric airplanes.

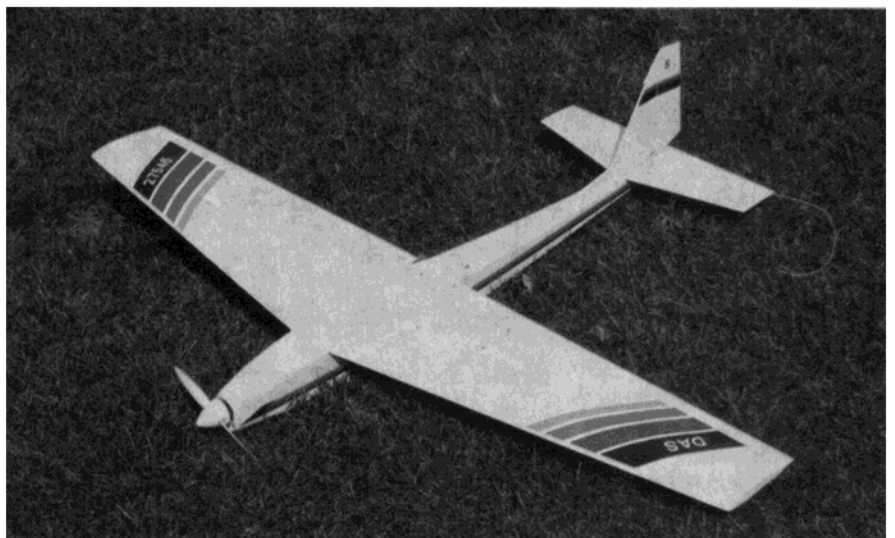
We all have certain types of models and flying activities that appeal to us more than others. I enjoy the discipline and precision of aerobatic and scale flying. But for pure fun, I also like the challenge of thermal soaring. At times, I've even speculated about how to combine these radically different flight envelopes into one model. But, alas, just a dream.

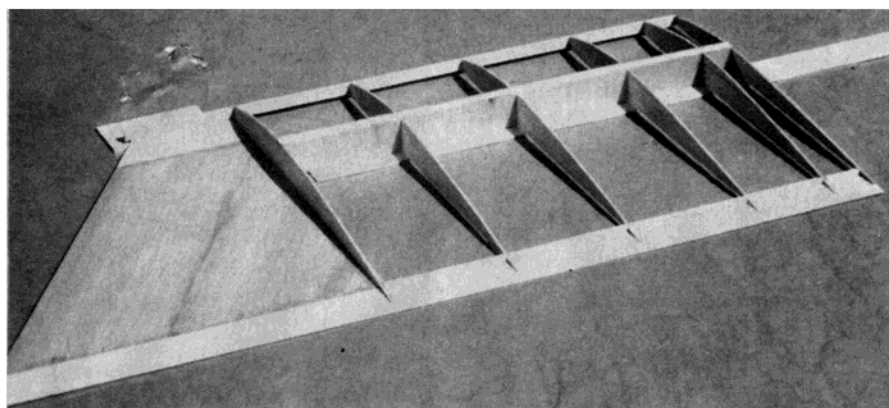
Then, one day, while I was sitting in the pit area waiting for my battery charger to

pump up the flight pack for my Electro Streak. I noticed a long line of puffy clouds marching over the flying field. I kicked myself for not having brought a glider along. Just for the heck of it, I launched my Electro Streak. It climbed up into thermal country and shut off the motor. Since my Electro Streak has an extended wing, 48" instead of the standard 44", I wanted to see if it would at least stay up in what looked to

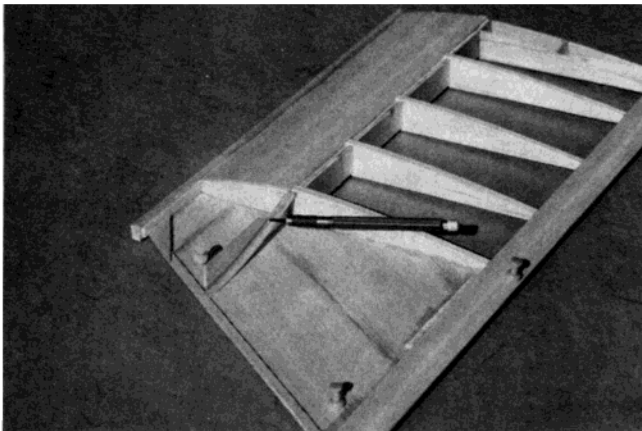
be strong lift. Thirty-five minutes later my Electro Streak touched down with enough power left in the flight pack for another three minutes of flying. I took a long hard look at that model. Hmm . . . the fuselage and tail looked like a two meter glider. What if I were to design a wing . . .

Photo #1 shows my Electro Streak with a two meter wing mounted on it. I call it the Electro-Glide (sorry Harley-Davidson).





Basic wing framework. Note the false rib is being fitted, but not glued in at this point in construction. Vertical grain shear webs on both sides of the balsa spars make for a strong, light box spar.



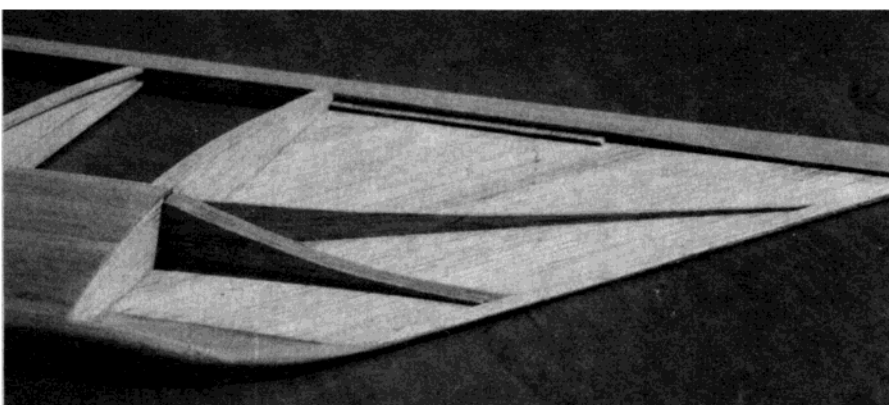
Wing tip box spar sheet being trimmed after installation.

The Electro Streak wing is lying in front. With this combination you can convert from a fast aerobatic model to a real thermal machine in seconds, just by swapping wings; almost two models in one. The best part is that you get great performance from both configurations without changing any of the equipment. Not even the prop!

This wing handles extremely well. Rate of climb, penetration, stall recovery, and rudder authority are very good. Sensitivity to lift is excellent. Recently, I had an opportunity to fly my Electro-Glide in the same thermal with one of the new Graupner electric gliders. I was able to stay up in weak lift, and even gain some altitude, while the other model slowly returned to the ground.

That surprised me, as Graupner designs a pretty good glider! The only negative comment I have about this combination is that, after establishing a banked turn, you can release the controls and the model will continue to turn until opposite rudder is applied. It's nothing serious, and the wing has proven to be stable even in rough air.

The wingtip shape may seem a little unusual. But, if you really want to study energy management and drag reduction, fly electric models! The wing tip is a very low drag design that incorporates washout. The wing breaks into three pieces for transport and uses a locking mechanism that is easy to build, self-aligns and allows assembly and disassembly without any tools. It also



The finished wing tip, showing the shaped leading edge. Note the fishplates in the trailing edge. The wing tip box spar and stiffener are scalloped to avoid lumps in the covering. Clean and efficient.

releases the outboard panels in the event of a rough landing, which minimizes possible damage. So, if you have an Electro Streak, or are about to get one, here's an opportunity to get two models for almost the price of one.

CONSTRUCTION

If you can build a straight Electro Streak wing, this one will be a snap, so I'll just hit the high spots. We'll start with the center panel. Use a plane and sanding block to make a 3/8" wide bevel in the bottom trailing edge sheet. It doesn't have to be a feather edge. Its purpose is just to reduce the trailing edge thickness. Pin it in place. Elevate the bottom spar with a strip of 1/16" balsa before pinning it to the plan. Add the

HAVING IT ALL

SPECIFICATIONS:

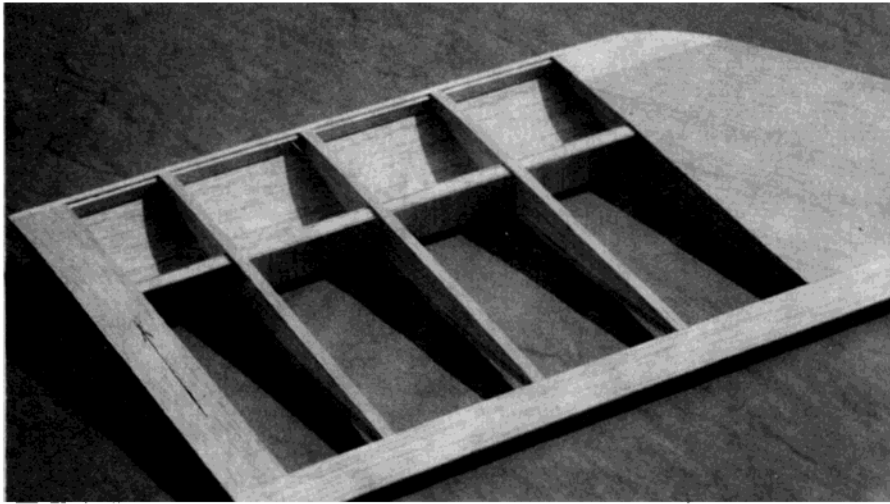
Airfoil	Modified Clark Y
Span	76 3/4 Inches
Chord	9-25/32"
Wing Area	635.78 Sq. In. (4.41 sq. ft.)
Wing Weight	11 to 12 Oz.
Wing Loading	* 9 to 11 Oz./Sq. Ft.

* Assuming the total model weight at 40-43 Oz.

ribs. **Do not** install the false ribs at the ends at this time. Glue in the 1/8" square trailing edge fillers. Don't forget to leave a slot for the false ribs. Glue the top trailing edge in place. Add the top spar and all shear webs. Be sure that the shear webs have vertical grain and do not extend above or below the spars. Add the 1/16" x 5/16" edge to match the contour of the ribs. Then, add the leading edge sheet, cap strips, and center section sheeting. We'll add the end rib center sheets later.

Remove the wing from the plan. Add the 1/4" x 3/8" leading edge cap. Make sure it overlaps the lower part of the leading edge by 1/16". Turn the wing over and add the false ribs, the center sheeting over the end ribs (note the grain direction), center section sheeting and the cap strips, which are to lay over the leading edge and butt against the leading edge cap. Glue in the stiffeners between the false ribs and end ribs. Then, shape the leading edge cap to a round section, as shown on the plan. Don't install the upper end rib center sheets yet.

The outer wing panels are built in the same sequence and manner as the center wing panel, except that the 1/16" wingtip sheets are to be edge glued to the lower trailing edge sheet before the ribs are installed. Be sure to observe the grain directions of the wingtip parts. This is important for construction, strength, and for later adding washout to the tips. Note that the wingtip sheets will not contact the



The underside of a completed outer wing panel. Note the wood grain direction on the end rib center sheet.

forward portion of the last rib because of the curve on the bottom of the rib. For now, just glue that rib to the tip sheets between the trailing edge and spar.

After completing the outer wing panel (omit the upper end rib center sheet), finish building the wingtip. Bend the forward wingtip sheet into contact with the forward portion of the end rib and the leading edge. Glue it in place. Then, pin the outer wing panel and wingtip sheets flat on your building board. Glue the 3/32" filler piece and the 1/16" x 1/4" strip to the outer edges of the wingtip. Bend and glue a 1/16" x 1/4" strip into contact with the tip sheets and the upper spar, as shown in section "BB" on the plan, to create the top of the wingtip box spar. Glue 1/16" balsa sheeting to each side of the bent strip so that they contact the tip sheets and end rib. Trim them flush with the top of the bent strip.

Note: Do not substitute a piece of 1/4" balsa for the built-up wingtip box spar, as it will not be rigid enough to hold the tip shape when the wingtip is washed out later in construction.

Add the 1/16" wingtip stiffener. Then add the fishplates between the trailing edge sheets. Nothing fancy here. Just observe the grain direction of the fishplates and be sure they overlap the lower trailing edge/wingtip joint. These fishplates are necessary to strengthen this joint. Glue the last 1/2" of the two trailing edge sheets together, in the area shown by the diagonal lines on the plan. Remove the outer wing panel from the plan and sand the wingtip edges to a round section. Section "AA" on the plan shows the correct shape of the wingtip as it curves into the leading edge cap.

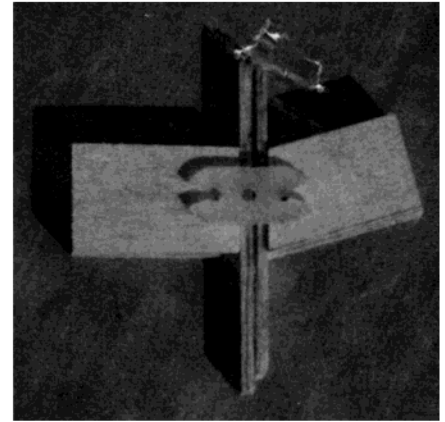
Make the dihedral braces from 1/4" plywood. Cut the wood from between the spars on the facing ribs of each panel. Sand the dihedral braces to fit loosely between the spars in each panel without allowing any vertical play.

The nylon wing locks are made from a Du-Bro 90° nylon bellcrank (catalog number 167). I chose this bellcrank because: (1) its hole spacing is right for the

application, which means, (2) replacement parts will be easy to make if they are lost or broken. Cut the wing locks out with a cut-off wheel turned at slow speed in your Dremel tool. Cut the slots in the ends with a new, sharp, X-Acto blade. Be careful not to scratch these parts with the knife blade, as this would cause a fatigue crack to start. The slots should be sized to snap over a piece of 1/16" piano wire fairly easily, but positively.

Make the wing block assemblies from the three sizes of plywood shown on the plan. Be sure to make a right and left set. One of the photos shows how to locate the locking pin holes by using two pieces of scrap 1/16" balsa as a spacer between each block half. Position a nylon wing lock on the two halves of the plywood blocks so that the center hole in the nylon wing lock is centered over the two pieces of scrap balsa. Then, mark the location of the outer holes on the blocks. Drill the blocks and press a 1/16" piano wire pin into each hole.

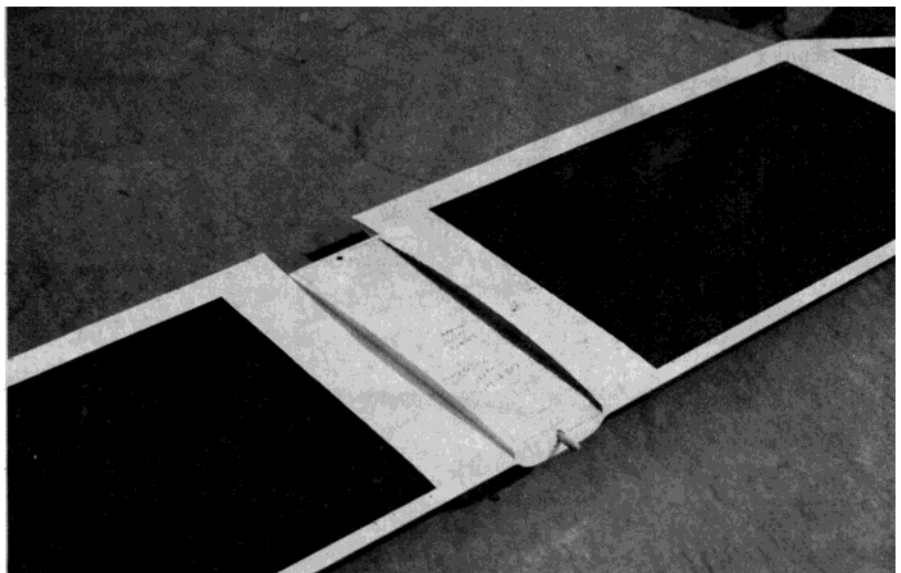
Locate and cut the slots for the wing locks



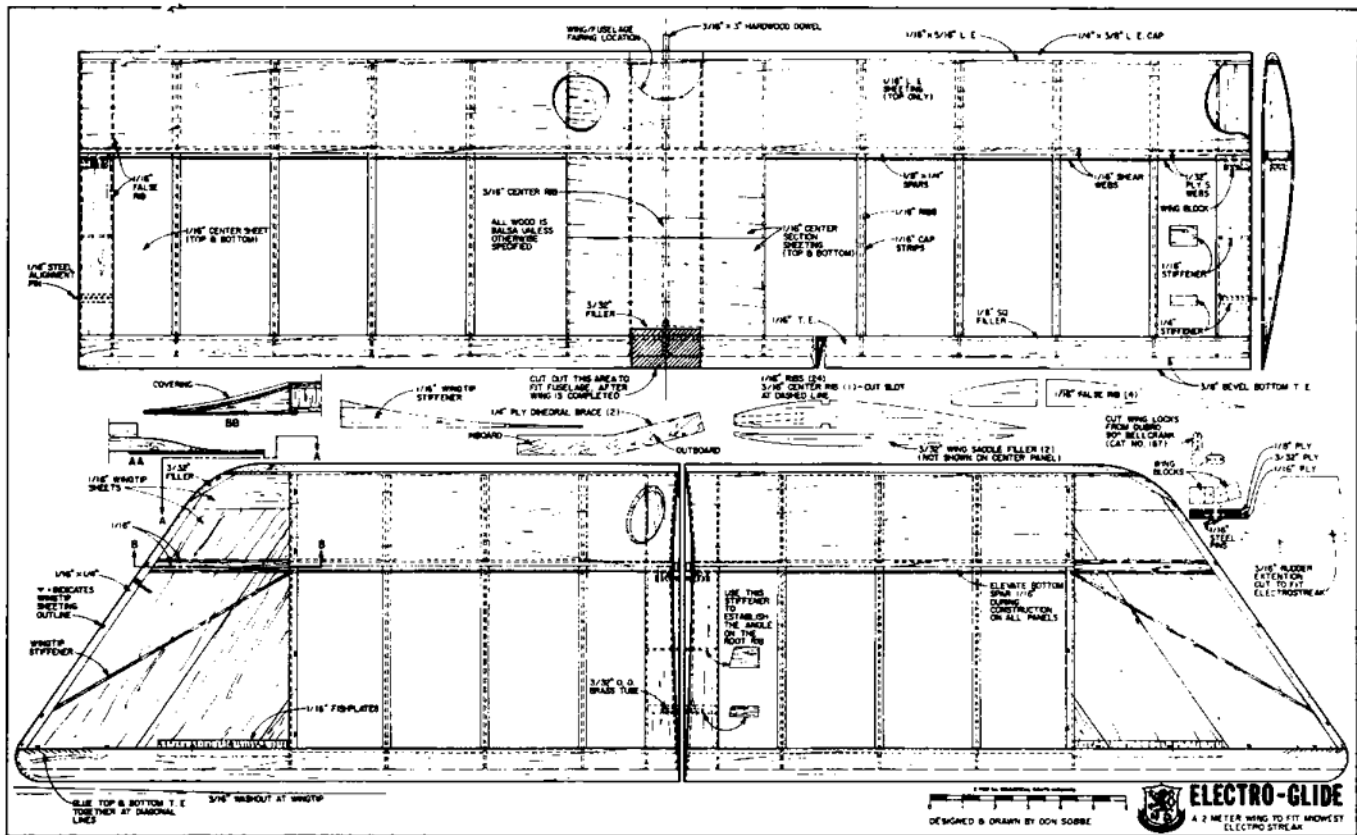
The method of locating the holes for the wing locking assembly is shown here. The nylon wing lock is made from a nylon bellcrank.

in the end ribs. Doing one at a time, mate each outer wing panel to the center panel with the dihedral brace in place. If necessary, block up the outer wing panel so that the mating edges of the two panels are flush and tight. Assemble the wing blocks in place against the plywood shear webs in both panels and glue them in place. After assembly, separate the two panels by holding the center panel and gently tapping on the outer wing panel, at the leading edge. (Believe it or not, it's easier to separate the wing panels after they're covered!) Then, locate and install the 1/16" alignment pins and brass tubes in the wing panels. The pins are to be parallel to the center panel spars and should stick out of the end ribs 5/32". That's enough length to engage the outer panels, and yet release cleanly if the wing locks let go on a bad landing. Now, add the upper end rib center sheets.

Insert the 3/16" wing dowel into the center rib and place the wing on the wing saddle. Align the wing with the fuselage and cut out the trailing edge to fit the fuselage. Use 3/32" balsa to fill in between the upper and lower center section sheeting. Use a



Finished wing showing the cut-out and wing saddle filler pieces that allow this flat bottom wing to fit the cambered wing saddle of the Electro Streak.



piece of scrap 3/16" dowel as a wedge between the wing saddle and the wing, near the leading edge, to raise the leading edge into position on the wing saddle. Then, locate and drill the wing bolt hole. Hold the wing in place with the wing bolt and mark the location of the fuselage sides on the underside of the wing with a pencil. Glue the wing saddle filler pieces to the wing on these pencil lines. Place the wing in the wing saddle and use sandpaper to sand the wing saddle filler pieces so that the underside of the wing is at the same incidence as the stabilizer. Glue the wing in place after covering the wing.

Only the wing/fuselage fairing location is shown on the plan. Build it up in the same manner as this same fairing on the Electro Streak's own wing.

The rudder extension is necessary to insure adequate rudder authority at low airspeeds. It also greatly improves the Electro Streak's ability to perform clean snap-rolls with its own wing! Glue it in place on top of the existing rudder.

Covering:

Cover the wing with Super MonoKote. The wingtips have been engineered to wash out when the covering is shrunk. To do this properly, apply the MonoKote to the top and bottom of all of the panels "before" shrinking it. Then, shrink the bottom first, then the top. The wingtips will gradually wash out about 3/16", between the last rib and the end of the trailing edge. Use your heat gun to adjust the washout so it is the same at both wingtips.

Flying:

The C.G. is located at the same point for both wings. Pay attention now! You're going to have a mental problem on the first flight with this wing. So far, you've been used to rocketing around using the ailerons to turn and bank. When you swap wings, the ailerons and aileron servo leave with the standard wing! Rudder is now the primary turn and bank control. I had a big problem with this for a while on the first flight. When I moved the aileron control stick, nothing happened! I thought I'd lost it! Keep mumbling to yourself, "Use the rudder, use the rudder." It helps if you simply move the aileron and rudder control sticks in unison, until your mind and fingers get things sorted out.

As I said earlier, this is a stable wing and control is no problem. You will need a little down trim when flying with the motor running. The wing has a wide speed range, even while gliding. It can cover a lot of ground quickly when you want to penetrate, or get to a thermal. The best L/D (thermaling) speed can be set by trimming the elevator so the model is gliding slowly, but without porpoising. When it comes time to land, roll in a little down trim to keep the airspeed up. Don't forget that you're carrying a lot of ballast in the form of battery. If you try to raise the nose too much on a slow approach, you'll stall out.

Oh! I almost forgot. If you have an Electro Streak that has downthrust in the motor, take it out. The model will climb and roll a lot better with its own wing if the thrust

line is 0 degrees. Also, inverted flight will not require as much down elevator to hold the model level. This also improves pitch trim with the glider wing.

Well, there it is. Now you can take one airplane to the flying field and fly two. And, you'll have something to do while your other battery is charging!

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