Morane Saulnier Model "H"

Vintage looks in a sport-scale R/C monoplane for .049 to .10 mills.

By Don Martin

PHOTOGRAPHY DON MARTIN

Pre-World War I "flying machines" were, at best, fragile, cantankerous, unpredictable crates, but those few pioneer fliers who dared to defy these traits were accomplishing the impossible. One such feat was performed by Roland Garros who in 1913 flew 480 miles from France across the Mediterranean Sea to Africa. His frail Morane Saulnier Monoplane is the subject of this article.

National Aeronautics Quarterly for January-March, 1974 featured the story of Roland Garros and his daring flight, along with three view drawings of his Morane Monoplane. A rather advanced design for its time, the Morane just seemed to have the right proportions for a good R/C model. I decided on a small .049—.10 powered model for Sunday fun flying.

As with most airplanes of this type, some modifications were deemed necessary for a stable flying model, namely enlargement of the tail surfaces, addition of dihedral to the wing and a slight lengthening of the nose. It was then decided to use an undercambered wing for high lift and slow speed, but the thin airfoil of the prototype seemed very impractical, so an old favorite, the NACA 6409 was decided on as a reasonable compromise. Fixed horizontal and vertical fins with hinged elevator and rudder, were used in place of "full flying" surfaces. The final results, in spite of these changes, still makes for a good stand off scale model with excellent flight characteristics.

My Morane came out to a scale of about one and one-third inches equals one foot, with a wing span of 39 inches, which is ideal for small field flying. Anyone wishing to double the plans for a giant size model could build it closer to scale, possibly even using wing warping for roll control as in the full scale Morane.

Construction is fairly conventional and if the following suggestions and sequence are followed no trouble should be encountered in building this "fun flying machine".

Wing

Make a complete front spar of 3/16" × 3/8" spruce and a complete rear spar of 1/8" × 1/4" spruce. Lay them out right over the plan to the correct dihedral angle. Epoxy 3/32" plywood gussets (W5 & W6) to the center of each spar (one side only). Next make a 1/8" plywood template of the rib and use this to cut two ribs from 1/4" balsa (W1) and 18 from 1/16" balsa (W2). Cut two W3's from 1/16" sheet balsa and glue to two of the W2 ribs (make one left and one right). Line these up with the lower edge of the airfoil to form the wing tip supports. Enlarge the spar slots in the two W1 ribs to go over the gussets. Slide the ribs for one half the wing onto the spars, keeping the front spar gusset facing forward and the rear spar gusset facing toward the trailing edge. Make sure the 1/4" rib, W1, is closest to the wing center and the rib with W3 is nearest the tip. In this manner the ribs and spars form their own jig. Cut the 1/4" × 1" trailing edge stock to length and notch for the ribs as shown. Using Saran Wrap or waxed paper to protect the plans, pin the trailing edge for one half of the wing in place with 1/16" "shims" under the forward edge. This will give the correct angle for proper airfoil shape. Slip the ribs into the notches and glue in place lining them up over the proper location and secure with pins as you go. Now glue and pin the leading edge stock in place, after which the spars can be lined up and glued in place.

The wing tips are formed by using two laminations of the 1/16" sheet balsa. R3 and the temporary tip former R4 serve to give proper contour to the tip. Using medium grade 1/16" sheet balsa cut the tip pieces to shape and soak in water to allow easier bending. Fit one lamination at a time and use an aliphatic resin glue to secure in place. Once the glue is dry the laminated tips will be rigid. Complete the other half of the wing in the same manner and add 1/8" sheet balsa gussets to the leading and trailing edges at the center. Sand the tips to shape and glue 3/16" square spruce rigging support blocks in place. When these are dry, drill completely through each one with a number 60 drill. The rigging "wire" will eventually be passed through these holes.

Fuselage

Medium 3/32" sheet balsa is used for the fuselage sides. Cut them to shape and epoxy on the 1/32" plywood doublers making a left and a right side. Set these aside to cure and move on to the firewall and landing gear assembly.

The firewall is made of three laminations of 3/32" plywood (F1, F1A, F1B). The center lamination, F1B, can be notched out to accept the landing gear ends or drilled afterward. If you select the former method be careful not to let the openings fill up with epoxy when assembling the three laminations and keep them lined up properly while clamping.

Bend all landing gear and rigging support parts from 3/32" music wire (except the upper

rigging support which is 1/16" wire) using the patterns shown on the plans. Now take the completed firewall, landing gear struts, axle, maple block and lower rigging support and assemble into one unit. Use epoxy in the firewall and maple block and wrap the three axle joints with wire and solder. You may have to fabricate some sort of jig to hold everything in position, but this completed unit should be a properly aligned rigid assembly.

By this time the fuselage sides should be ready. Carefully cut openings for the wing and the slot for the horizontal stabilizer. Join the sides together using the firewall-landing gear assembly just completed plus F4, F5, F6 and the solid balsa block in the tail. This block is necessary to support the horizontal and vertical fin, but use soft balsa to keep the tail light. Do not put in F2, F3, and F3A at this time as they will be placed after the wing is secured in place. Put the bottom 3/32" sheeting and the floor doubler in next with the grain running crosswise.

At this point the Gold-N-Rod outer sections are put in place bringing the two outer ones out through the sides near the tail for elevation and rudder control. The optional center one ends at the tail block and is used to conceal the antenna. This could be continued through the bottom of the tail block to allow any excess antenna to trail out the rear. However, I found that by routing the antenna lead around the equipment area and then through the Gold-N-Rod there is sufficient room to conceal it entirely.

After epoxying the Gold-N-Rod to the bulkheads the top sheeting and 3/32" plywood rear hatch holddown can be put on. When everything is dry the fuselage can be rough sanded and the slots for the horizontal stabilizer can be extended through the tail block and the slot made in preparation for the vertical fin. The 1/8" balsa hatch supports are set in place next from the firewall to F3A. Don't forget the 1/8" × 1/4" spruce inserts for the upper rigging support mount.

I found the best way to make the removable hatch is right in place. Cut a piece of 1/32" plywood and a piece of 1/16" balsa sheet to fit the hatch opening. Place waxed paper over the opening on the fuselage and put the 1/32" ply in place first and glue the 1/16" balsa on top of it. Wrap some masking tape on both ends and the middle of the hatch (completely around the fuselage) to hold the hatch parts down tight so the curve forms properly. When dry remove from the fuselage and cut the cockpit opening completely through and cover the bottom with 1/16" balsa sheet. Epoxy a small block of hardwood at the front to engage a dowel in the firewall as a front hold down. After the epoxy has cured, slip the hatch in place and drill a 3/16" hole through the firewall and the hardwood block on the hatch. Remove the hatch and epoxy a 3/16" dowel in the firewall flush with the outside and protruding about 1/4" inside. Two holes at the rear corners of the hatch through the rear hold down block and 4-40 blind nuts under the block will complete the hatch assembly.

Now using soft balsa blocks, form the cowl extensions on the hatch and both sides of the fuselage.

Cowl

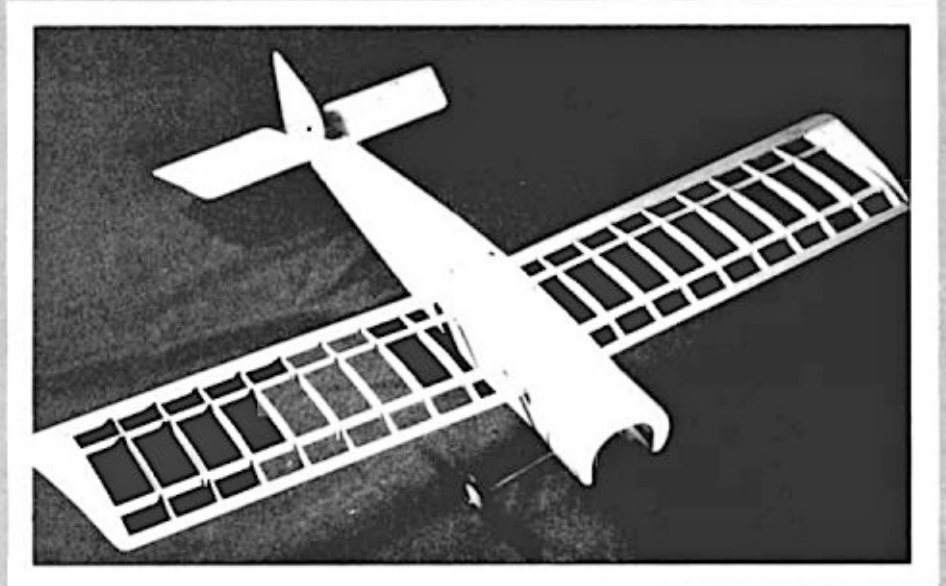
Cut one C1 and two C1A's from 3/32" plywood. Epoxy one of the C1A's to the C1 leaving a 1/16" all around on the circular portion. Then cut the three 1/8" sheet balsa spacers and use these to space this assembly from the other C1A. This leaves a circular frame around which 1/16" sheet balsa is wrapped, grain crosswise. Use rubber bands to hold the sheet balsa in place till the glue dries. Now cover the forward portion (C1A) with 1/4" sheet balsa and sand the cowl to shape. Four holes are drilled through C1 and the firewall and 3-48 blind nuts are used inside to hold the cowl in place. The exact location of these holes will depend on the engine and mount installation chosen. Just make sure they are accessible from the front of the cowl with the engine in place.

Wire landing gear assembly (**above left**). It's much easier to construct than it looks. Heat up your soldering iron and get going. Why are there three control rods here (**above right**)? Because the center rod only serves as a tube for the antenna wire, that's why! Excess antenna wire is allowed to hang out the back.

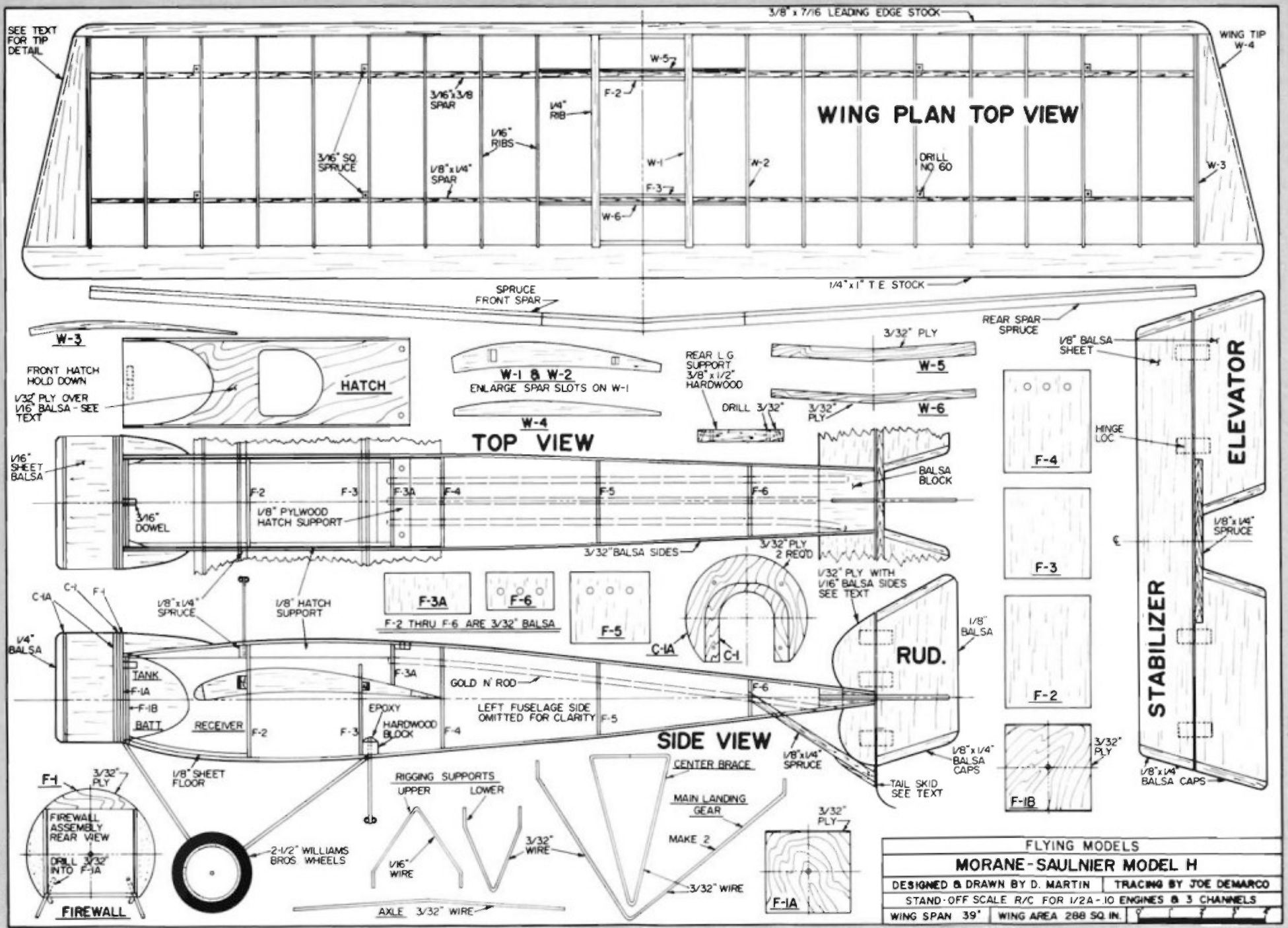
Tail assembly

The horizontal fin is made of 1/8" soft balsa sheet with 1/8" × 1/4" hard balsa tip plates. The elevator is made in the same manner with the left and right halves joined with 1/8" × 1/4" spruce. Slot both the fin and elevator for your favorite hinges and sand to shape. The horizontal fin can now be glued in place taking care to align it properly.

Since the vertical fin takes all the shock of the tail skid and is rather narrow at the fuselage line, it is made of three laminations, the center one being 1/32" plywood. The hinge slots are cut in this piece before assembly. The two outside layers are 1/16" sheet balsa. This will result in a fin 7/32" thick which will have to be carefully sanded down on both sides to 1/8". It will then match up with the rudder which is cut from 1/8" sheet balsa. Glue the fin in place and while waiting for it to dry fashion the tail skid from 1/8" × 1/4" spruce. This will pass through the bottom of the fuselage with one end resting against F6. The other end will rest against the lower fin and extend past it in such a way that the very end is in line with the rudder hingeline.



The Model H framed out and ready for covering. The construction is light, but strong. Add as much detailing as you like, just remember not to add too much excess weight. Use an 049-09 for power. Have fun.



A steerable tail skid is made by removing the hinge pin from the lower rudder hinge and replacing it with a piece of equal diameter steel wire. Bend the top part at a right angle so as to penetrate into the rudder about 1/4" when the hinge is in place. Slip two pieces of brass or aluminum tubing over the wire using the plans as a guide for the length and bend the end of the wire to form a skid. Epoxy the hinge into the rudder and the *upper* piece of tubing to the leading edge of the rudder.

The next step can be done now or after painting. I elected to do it before painting and no problem was encountered in finishing the model with the surfaces all hinged.

Carefully fit all elevator hinges and epoxy into place in both the fin and elevator, being careful to keep epoxy out of the moving parts of the hinges. Next fit the rudder hinges and epoxy into place, but do not let the upper piece of tubing get epoxied to the fin. The lower tubing should rest on the end of the tailskid and it is epoxied in this position. When finished you will have a rugged and reliable steerable tail skid.

Now slip the inner Gold-N-Rods in place and use them to line up the rudder and elevator control horns which can be fastened permanently in place at this time.

Final preparations

All parts except the tail surfaces were covered with silkspan on my model but I would strongly recommend using silk or Coverite instead, at least on the wing for a more durable finish. When covering the wing leave the center section between the two W2 ribs open. Two coats of Aerogloss clear dope was then applied after which the wing was slipped into place. Slide the wing through the fuselage until it is centered. The W2 ribs should protude about 1/8" from each side of the fuselage and be approximately flush with the inside. Glue the W2 ribs to the fuselage and when dry glue formers F2, F3 and F3A in place. F2 and F3 will anchor the wing securely in place and also act as dihedral braces for both spars.

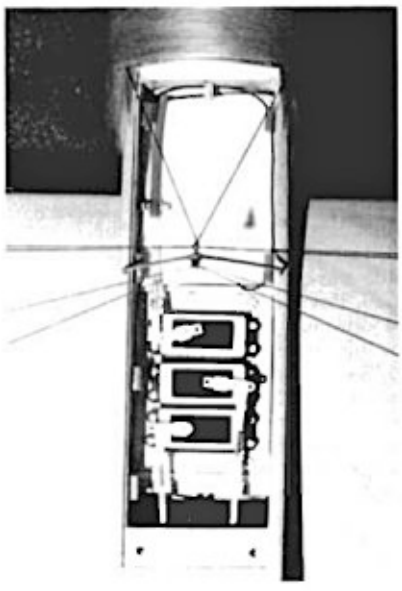
At this point the receiver, batteries, servos and tank should be fitted into place. Only general locations are shown on the plan as they will vary with different equipment. Just keep everything as far forward as possible. Also mount the engines and make any changes in the cowl necessary to accommodate your particular installation.

For 1/2A a Cox TD.049 or .051 is best installed on a tank mount. By removing the center 1/8" spacer used in constructing the cowl, the engine will fit completely within the cowl. To avoid cutting any unnecessary openings in the cowl I ran a wire from the glow plug down the bottom tank mount bolt and use alligator clips on the starting battery, one connecting to the wire and the other to an engine mount bolt.

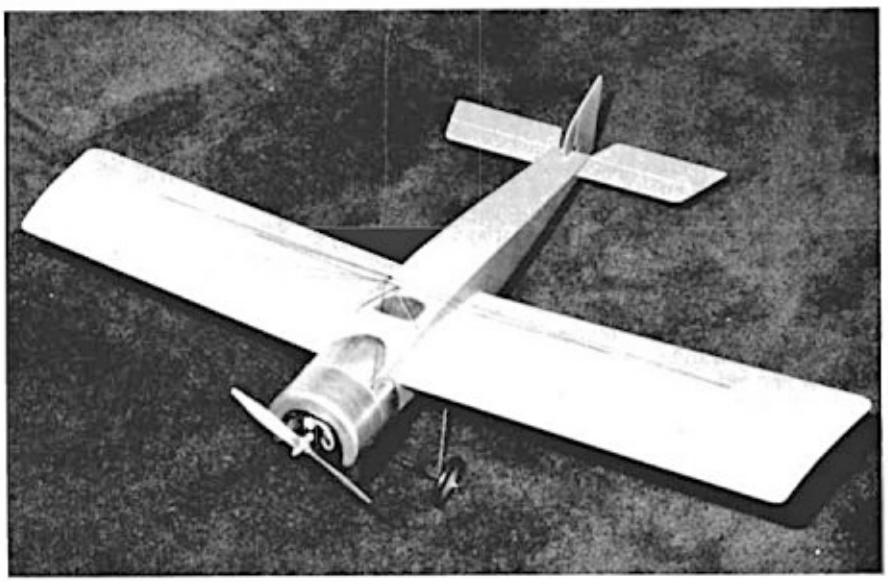
When everything is fitted to your satisfaction remove the engine and all radio equipment and prepare for the final finish.

Finishing

Fill all "dings" and the spaces around the wing where it enters the fuselage with "Dap" and sand smooth when dry. Your favorite primer and paint can now be applied. As to the final finish, the choice is yours. Aircraft of this vintage, as far as I can determine were simply varnished or shellacked over the linen covering and left to age to various shades of brown, yellow or orange. I used RS Perfect paints which were so successful on my Fokker T2 (July '77 FM). For the Morane I used PC 31 tan for the entire model except the cowl, which, of course, is aluminum. If the surface is well primed, two brushed coats will give a very acceptable finish.



Some of the Morane's sub-assemblies before final assembly (**above left**). Construction is not difficult. Don used Ace Bantam Midget servos for throttle, rudder and elevator control (**above right**). Sullivan Gold N' Rods operate control surfaces. Completed model (**below**) is finished in a light tan color to duplicate the linen fabric of original. Rigging adds nice touch.



The upper rigging support can now be epoxied in place and small loops fashioned from soft wire, (straight pins work well for this). Wrap one around each of the rigging supports where the wires pass through and epoxy into place.

Next open up the holes through the covering which were previously drilled through the 3/16" square blocks in the wing for the rigging. Heavy black button thread is then run through these holes and through the wire loops on the upper and lower rigging supports and the axle center to simulate the rigging and wing warp control wires. If you have any slight warps in the wing a little tension on the proper rigging "wire" before epoxying in place will solve the problem.

The original model sports a Cox Td049 equipped with an Ace throttle sleeve in the power department. An Ace seven channel radio with three Bantam servo's provides the guidance. The total weight with this equipment is 32 oz., resulting in a 16 oz. wing loading.

The TD049 may be slightly marginal to some pilots, but providing the airplane is carefully balanced and is hand launched it makes a very docile "schoolyard" type model. My personal preference is for slow almost glider like performance. Although not tried, a David Diesel conversion for the TD049 or 051 would probably be the ideal power for the average sport flyer. For those who want real snappy performance an 09 or 10 would be the way to go. Either way, keep the C.G. no farther aft than the front wing spar. Happy Flying!