Skybolt

BUILDING AND FLYING INSTRUCTIONS

SIG®

Skybolt

BY CLAUDE McCULLOUGH

LaMar Steen's homebuilt Skybolt is not only a great looking airplane but a practical design as well. There are no machined parts and a welding torch and ordinary shop tools are sufficient to construct it. The prototype was built by LaMar's students in the Aerospace program at Manual High School in Denver - a fact which will help clarify the lettering on the decal in this kit.

Full symmetrical wing sections are used to aid aerobatic characteristics and the structure is stressed for 9 G's plus and 8 G's negative. The top wing span is 24 feet and the lower span is 23 feet. One quality that has made it so popular is the reasonable size of the cockpits.

An information pack on the Steen Skybolt with 3-view can be obtained for $2.00 from Steen Aero Lab, Inc., 15623 DeGaulle Circle, Brighton, Colorado 80601.

ABOUT THE MODEL

Our version of the Skybolt was designed with easy building and good model flight characteristics in mind and the exact scale outlines have been modified. It is primarily intended for the NSPA-AMA biplane stunt event and for sport flying. However it can be used for Sport Scale events if desired. In this connection it should be noted that the available 3-view is not quite like the actual airplane in that a different shape and style of cowling is shown so it is recommended that pictures alone be used as a scale presentation for judging. AMA Sport Scale rules do not require a 3-view for competition - photos only may be used if desired.

It's common with homebuilt's for some component shapes to vary from plane to plane depending on how the individual builders happened to bend the tubing. The tail surfaces on Skybolts are an example of this artistic expression. We used the general shape shown on the Steen three-view and if you wish to emphasize the Sport Scale aspect, be sure and check photos of the particular Skybolt example being copied for exact shape. Touch up the curves of the kit tail accordingly with a sanding block.

The color scheme of the model was taken from the markings of LaMar's airplane as it was originally painted. He has since redone it in a more complex pattern with air brushed edges between the colors, while his first version needed only masking tape.

Hale Wallace painted his Skybolt pre-production model like his full-size Skybolt. This is a colorful arrangement but requires more masking to reproduce the checkerboarded under-surfaces. An alternate decal is available with stars, license numbers and the Skybolt name for the cowl to duplicate his airplane.

Hale used a more elaborately shaped cowling on his Skybolt, as have some other home builders of the design. The fairing behind the spinner and the lower scoop can be made from balsa. Glue balsa to the cowling plastic with Sig-Ment. Paint the balsa parts with Sig Sanding Sealer to fill the wood grain.

ABOUT BALSA WOOD:

We do our best to put as good a grade of balsa in our kits as the supply situation permits. The world-wide increase in demand for balsa has made it impossible to obtain as high an average quality as used to be the case.

Every piece of balsa supplied cannot be 100% perfect or kit prices would have to be greatly increased. Mineral stains or small knots do not affect wood strength. Even with the very best grades of balsa, there is a natural tendency for some sticks or sheets to immediately bow upon being cut off from a perfectly square block because of built-in stresses. In most cases, these can be bowed back into alignment during building. True up the edges of bowed sheets by trimming, using a metal straightedge.

Due to the balsa wood supply situation, it is sometimes necessary to supply alternate sizes. In most cases, this will be a larger piece than required and rather than saw it and throw away the excess we put in the larger piece so that you can trim it and use the scrap wood for something else.

SINGLE OR DOUBLE AILERON?

The original model used single ailerons on the lower wing to keep the linkages to the servo simple. The installation was very effective, gave good response and as rapid a roll rate as desired. The complications of hooking up the double ailerons are not worth the trouble for sport fliers – the single ailerons are more than adequate. As a matter of fact, the single aileron set up can give a good account of itself at a contest.

For high level competition and expert fliers the double ailerons will probably be desired. They provide maximum control leverage and a very rapid roll rate for performing complicated free-style maneuvers.

MUFFLER INSTALLATION

Large chamber type mufflers should be located completely outside the cowl on an extension pipe. The Du Bro Muff-L-Aire or similar stack-type mufflers have a neater appearance. These work well if the plates are taken off and varnish and carbon cleaned away occasionally. Use of a 1/2" prop extender such as a K & B or Fox will allow the engine to be moved back on the mounts closer to the firewall providing a little more room below the exhaust outlet within the cowl. This was done on the prototype model and a Tatone EM-SS Special Manifold was fitted. (See Sig Catalog for photo and current prices of the EM-SS.) This has side-mounted tubes, which were exited straight out of the cowling bottom. Rudder extension tubing is provided with the manifold.

NOTE: The Semco Pitts, Jr. muffler will not fit inside and a hole must be cut in the bottom of the cowling.

BEFORE BEGINNING CONSTRUCTION

The isometric drawings and instructions are numbered in a sequence for explanation of techniques. This does not mean that the sequence must be followed exactly, step-by-step. To speed construction it may be desirable, for example, to start building the wing or tail while the preliminary parts of the fuselage are drying. This will work satisfactorily as long as simultaneous construction is not carried past the point where it will interfere with proper completion of some of the interlocked parts. Protect the plan from glue damage by covering it with wax paper or plastic wrap.

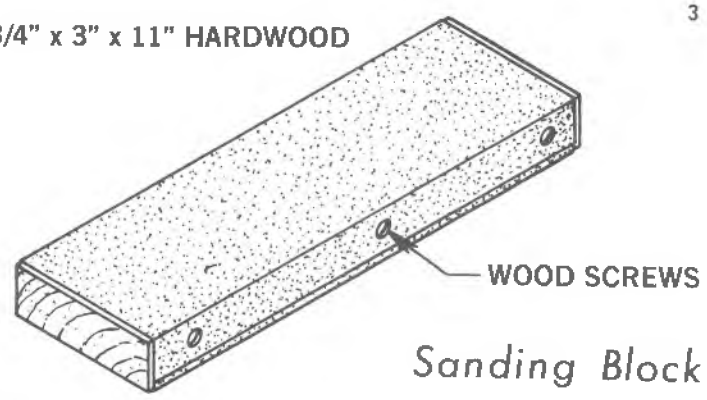
To understand all of the construction requirements, read the complete instructions and study the drawings carefully before beginning. A little time spent in looking at the isometrics will make it clear where construction out of the descriptive sequence is required or can be done.

Cut all long pieces of balsa first, followed by medium lengths, before cutting up any full-length strips into short pieces. Remove die-cut pieces from the sheets carefully. If difficulty is encountered, do not force the part from the sheet. Use a modeling knife to cut it free. Leave parts in the sheets until needed in construction.

The framework may be glued with either Sig-Bond resin type glue or Sig-Ment solvent type cement. In any joint involving plywood or hardwood, Sig-Bond is the best choice. Areas subjected to unusual strain, exposed to fuel or oil, or including metal pieces, should be epoxied with Sig Epoxy Glue or Sig Kwik-Set 5 minute type epoxy.

(1.) SANDING BLOCK

The first requirement is to make a large sanding block to take a full sheet of sandpaper. It is an indispensable tool for many operations. Use several wood screws along one edge to hold the sheet in place.



Sanding Block

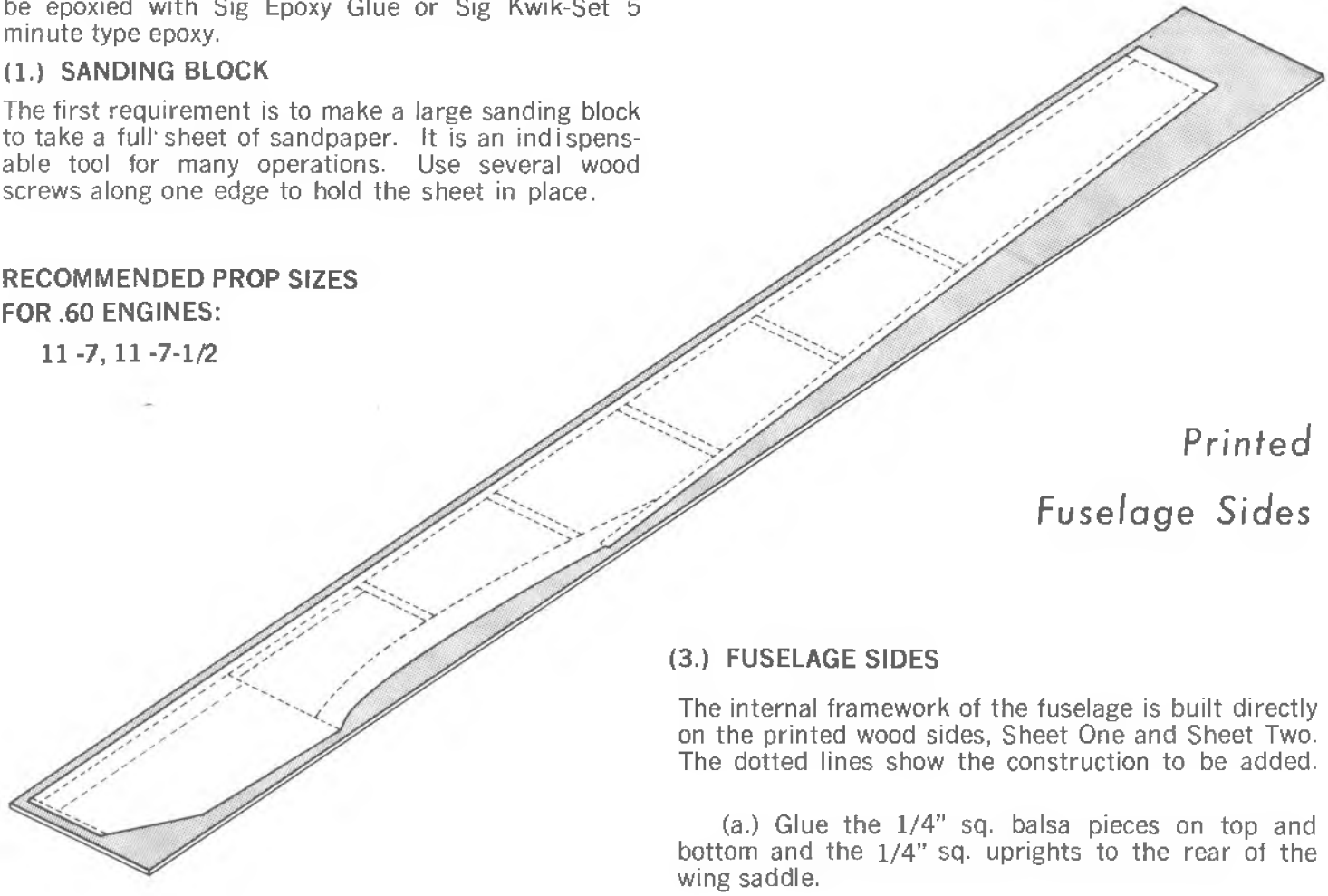
(2.) CUTTING OUT PRINTED PARTS

A jig saw is best for this job. Cut just outside the lines, leaving all of the line on the part. When fitting into place in the structure or joining with an adjacent part, use the sanding block to bring the edges to an exact fit. If an X-Acto knife is used, don't cut too close to the lines but leave enough margin to true up and finish the edge with a sanding block. It is easier to cut at an angle with a knife so more tolerance may be needed for final fitting with the block.

The fuselage sides need not be cut out of the sheets until the internal structure is glued to them. Decide before beginning construction whether you intend to use a wing fillet. If you do not, omit plywood part FZ and use the cut line on the parts for "No Fillet".

RECOMMENDED PROP SIZES FOR .60 ENGINES:

11-7, 11-7-1/2



Printed Fuselage Sides

(3.) FUSELAGE SIDES

The internal framework of the fuselage is built directly on the printed wood sides, Sheet One and Sheet Two. The dotted lines show the construction to be added.

(a.) Glue the 1/4" sq. balsa pieces on top and bottom and the 1/4" sq. uprights to the rear of the wing saddle.

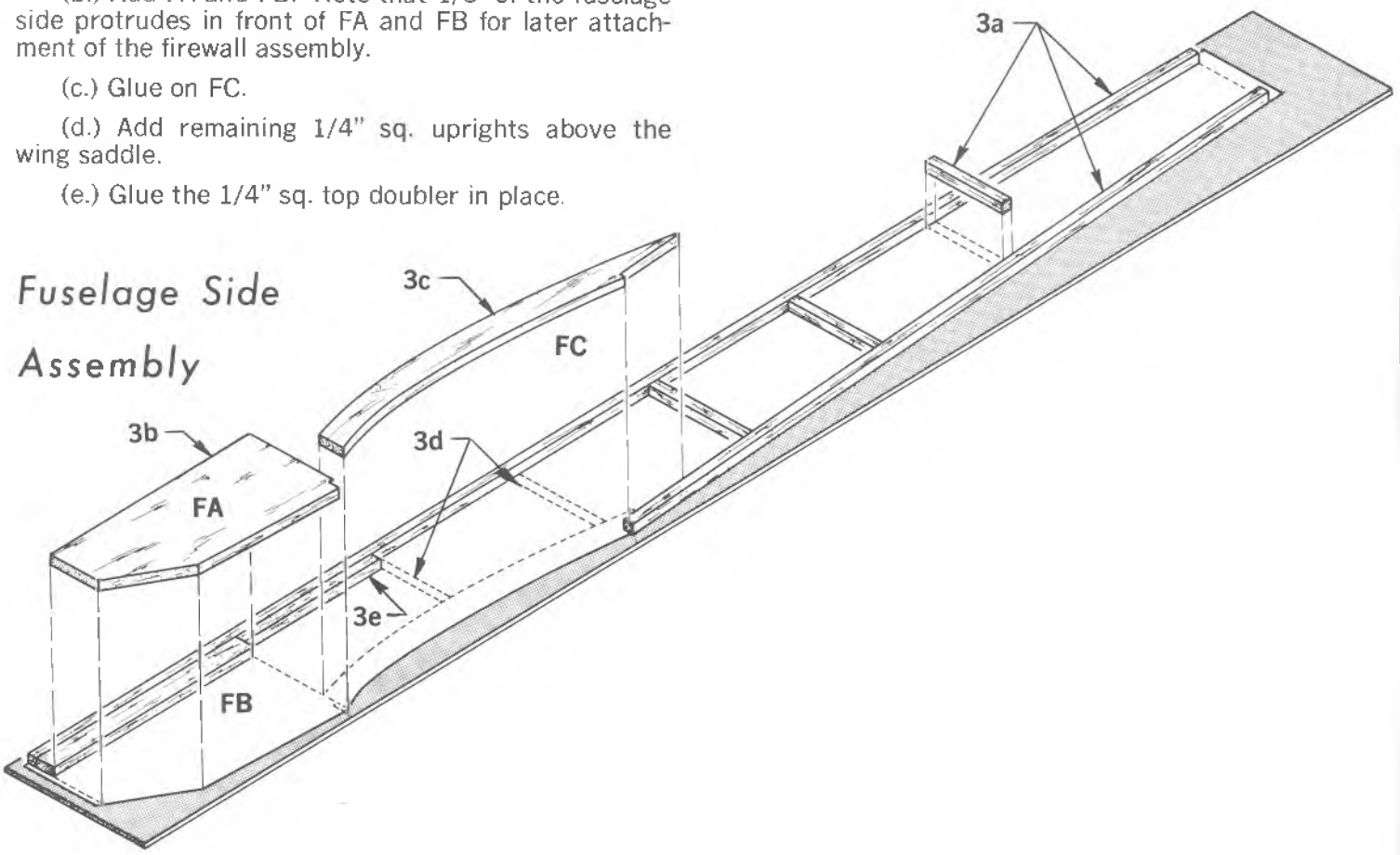
(b.) Add FA and FB. Note that 1/8" of the fuselage side protrudes in front of FA and FB for later attachment of the firewall assembly.

(c.) Glue on FC.

(d.) Add remaining 1/4" sq. uprights above the wing saddle.

(e.) Glue the 1/4" sq. top doubler in place.

Fuselage Side Assembly



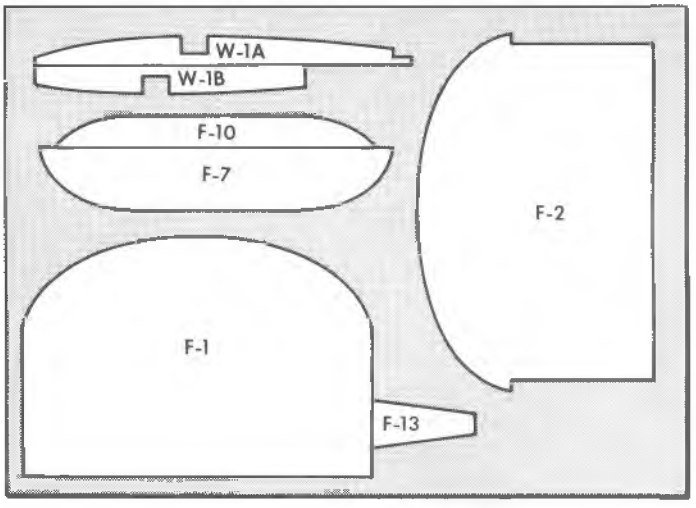
(4.) FIREWALL

(a.) The firewall is made by gluing the two 1/8" plywood die-cut parts F1 and F2 together to form a 1/4" thick piece. Use Sig epoxy glue.

(b.) The recommended engine installation, using side mounting is shown on the plan. If you should use an inverted engine, be sure and lower the tank so it will be the same distance below the hole in the needle valve body that is shown on the plan for the side mounted engine. The original model used no engine offset to the right or down and this gave good results. Some fliers have a personal preference for 2 to 4 degrees of right thrust to help counteract torque effects. This is an aid on takeoff to lessen pull to the left. If you wish to do this, make allowance for the thrust offset in installing the mounts. Make a tapered shim to put behind the mounts. Shift the mounts over from the firewall centerline so the prop spinner will still be in the center of the cowl with the shims installed.

(c.) It is easiest to install the engine mounts before the firewall is attached to the fuselage. Mark the vertical and horizontal center lines on the firewall, using the drawing on the plan as a reference. Determine the spacing between the engine mounts required by your engine. Mark the appropriate mount locations and mounting hole spots. One good way to do this is to tack glue the mounts to the engine with 5-minute epoxy and then mark the mount holes in the firewall.

(d.) Drill the engine mount holes in the firewall. Epoxy 6-32 blind nuts to the back of the firewall to retain the mounts. The holes in the firewall must be large enough to allow the blind nuts to pull into the firewall when the mount bolts are tightened.



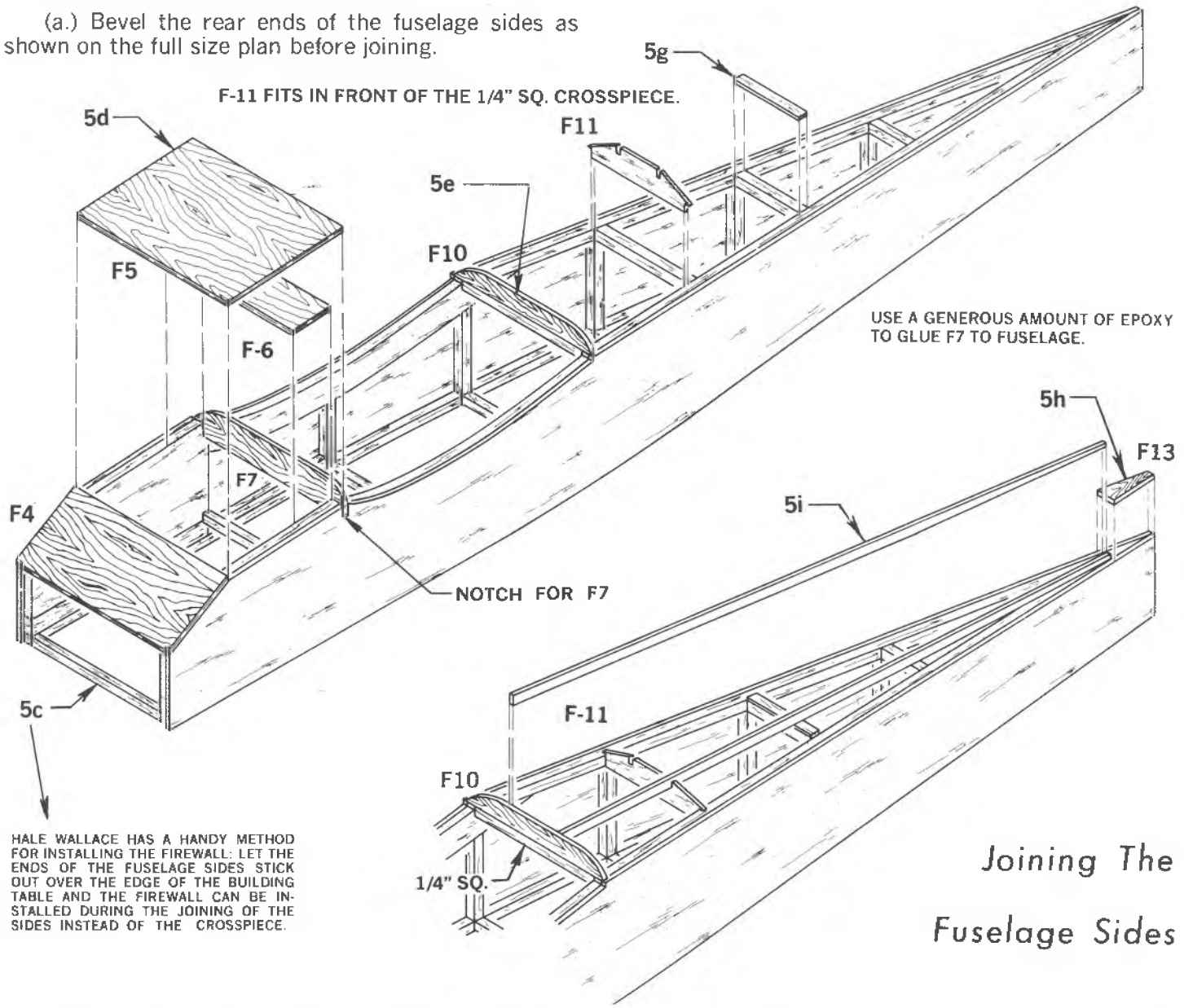
Key To Plywood Parts

1/8" x 4-3/8" x 7-3/8"	F3
1/8" x 2-1/2" x 5-1/8"	F4
1/8" x 5-1/8" x 3-7/8"	F5
1/8" x 1-1/2" x 4-3/8"	F6
1/32" x 10" x 2-1/2"	FZ

1/16" x 2" x 4" AILERON MOUNT, SCABS ON W1

(5.) JOINING THE FUSELAGE SIDES

(a.) Bevel the rear ends of the fuselage sides as shown on the full size plan before joining.



(b.) Gray tone shade on the Fuselage Top View locates the 1/8" sheet fuselage sides. Pin the sides on the plan upside down - flat top of the sides against the building board.

(c.) At the front, use several temporary 1/4" sq. cross pieces. Later, after removing the joined sides from the board and installing the firewall and F-3, the temporary cross pieces can be removed.

(d.) Add ply parts F7, F4, F5 and F6 in this order. Let the front parts dry before pulling the rear together.

(e.) Continue joining the sides toward the rear with ply part F10 and 1/4" sq. balsa crosspieces.

(f.) Carefully mark the centerline of the plan onto each of the 1/4" sq. crosspieces. This is to later provide an accurate lineup for gluing on the tail.

(g.) Glue on the 1/16" x 1/4" crosspiece addition at Section "R".

(h.) Epoxy the ply tail wheel bracket mount F13 in place.

(i.) Install the 1/8" x 1/4" bottom stringers. Note that they must be tapered to fit against the fuselage frame toward the rear. (See full size plan.)

The frame may now be removed from the plan.

(6.) MOUNTING THE LANDING GEAR

(a.) Hold the gear in place against the bottom of F5. Using it for a drill guide, drill holes through the plywood for the mounting bolts.

(b.) Install 4-40 blind nuts on the inside of the fuselage to retain the gear. Glue in the nuts with epoxy.

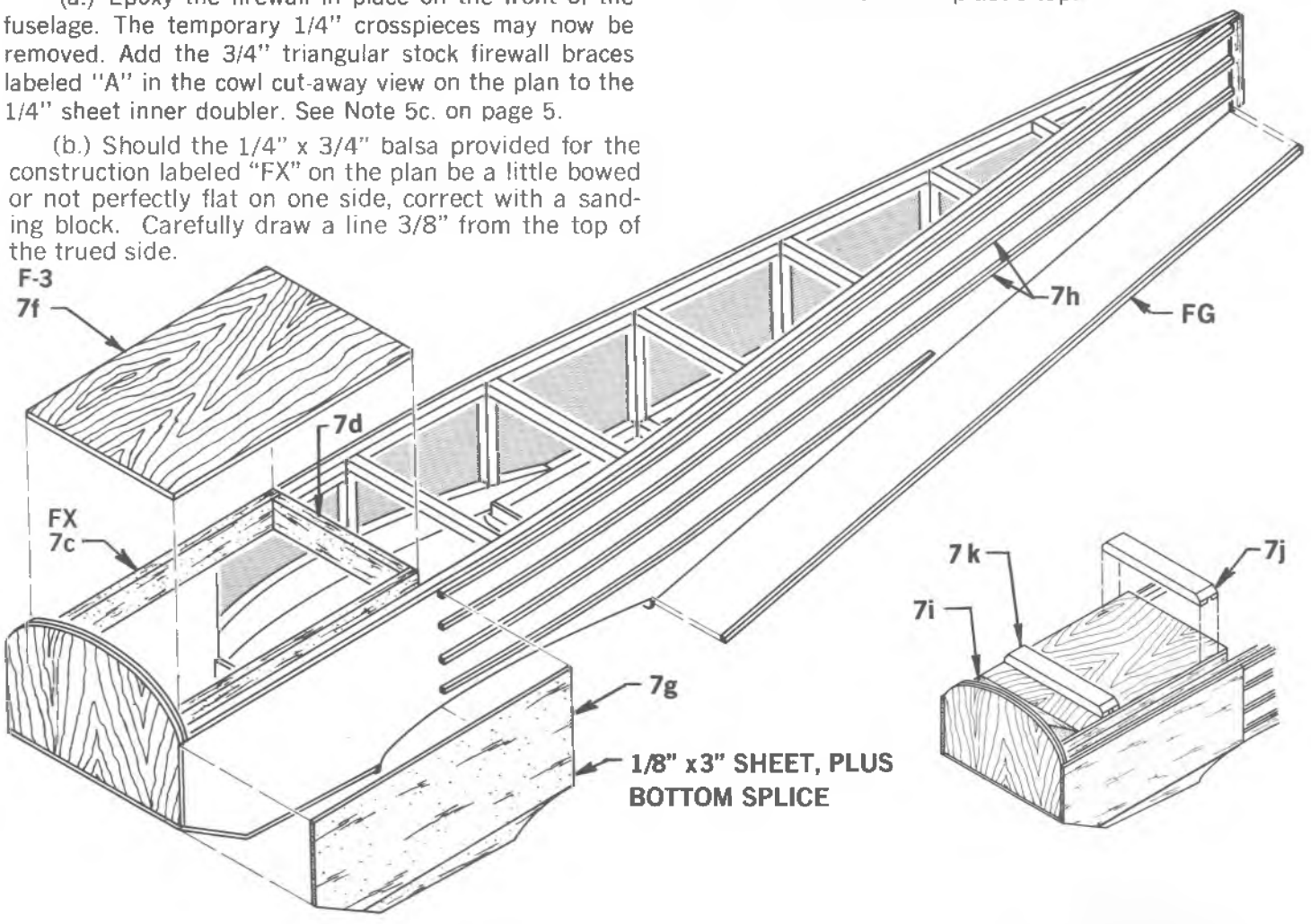
(c.) Glue 3/8" sheet balsa to F5 in front of the landing gear. A separate piece of 3/8" sheet is glued to the landing gear itself. Drill holes through the sheet to pass the landing gear mounting bolts, allowing the landing gear to be removed if desired.

(d.) Carve and sand the fuselage bottom to contour shape.

(7.) COMPLETING THE FUSELAGE

(a.) Epoxy the firewall in place on the front of the fuselage. The temporary 1/4" crosspieces may now be removed. Add the 3/4" triangular stock firewall braces labeled "A" in the cowl cut-away view on the plan to the 1/4" sheet inner doubler. See Note 5c. on page 5.

(b.) Should the 1/4" x 3/4" balsa provided for the construction labeled "FX" on the plan be a little bowed or not perfectly flat on one side, correct with a sanding block. Carefully draw a line 3/8" from the top of the trued side.



Completing The Fuselage

(c.) Glue the FX pieces inside the fuselage frame. Position the line drawn on them exactly on the top of the fuselage sides, with 3/8" of FX protruding above the sides. The top of FX must be parallel to the top of the fuselage sides so that the plywood platform F3 will also be parallel and thus set the wing incidence at 0 degrees.

(d.) Add the 1/4" x 3/4" crosspiece at the back of the FX pieces.

(e.) Glue 3/16" x 3/4" T. E. stock to the inside of the FX pieces. (See "Typical Front Section At F7" on the full size plan.)

(f.) Glue plywood part F3 to the FX frame just completed.

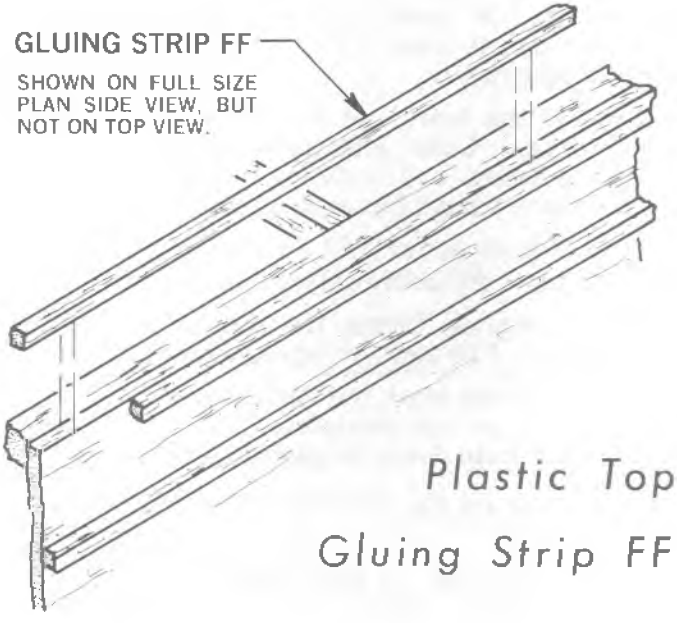
(g.) Glue 1/8" sheet balsa to the side of the nose.

(h.) 1/8" sq. balsa stringers are added to the fuselage sides. Use the full-size plan as a guide in installation.

(i.) Epoxy the 1/4" triangular stock brace to the back of the firewall top and on top of F3. Be sure and keep epoxy out of the blind nuts for the motor mounts by filling them with modeling clay or putting a small square of plastic tape across the hole.

(j.) Bevel the ends of the grooved hardwood blocks to clear the sides of the plastic top.

(k.) Glue the grooved hardwood blocks to F3. Use plenty of epoxy, but be careful not to get the groove plugged with glue. Pass a 1/8" sq. balsa stick through it to insure that this has not happened. Check carefully to see that the space between the grooves is exactly the same on both sides—4-1/4" center to center.

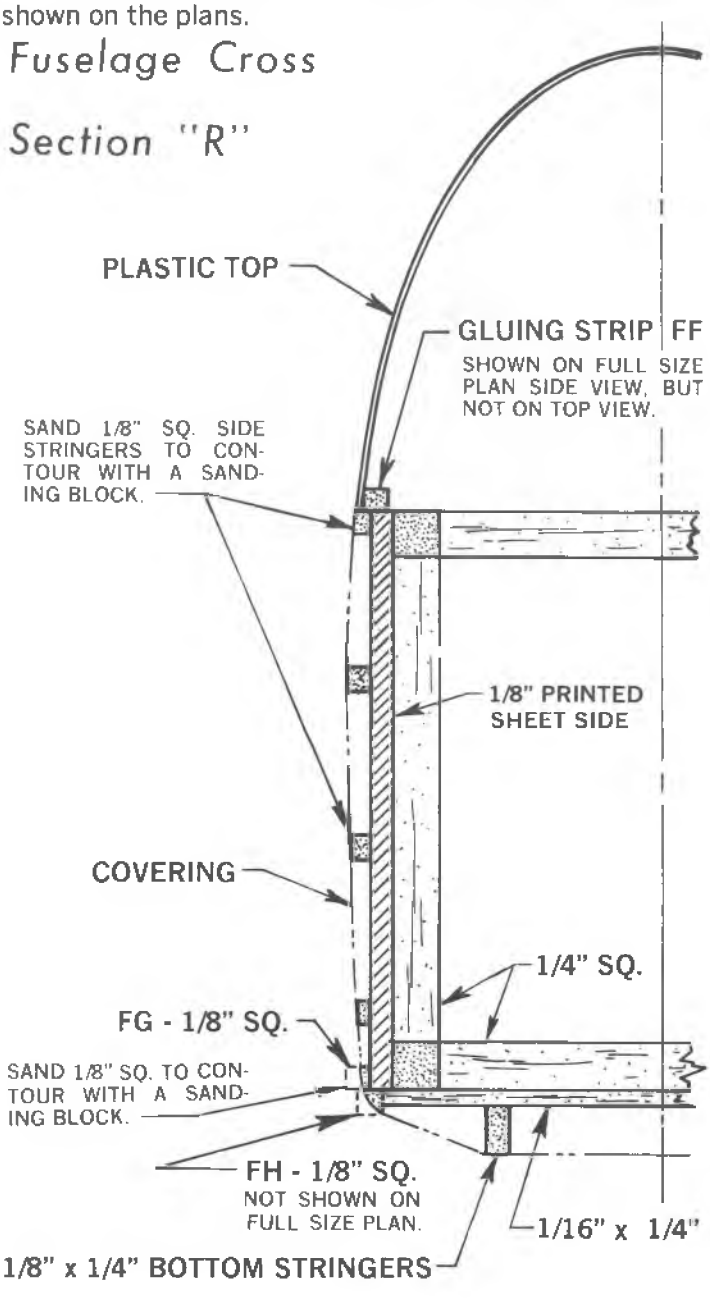


Plastic Top

Gluing Strip FF

(l.) Note on the adjoining cross section view of the fuselage the stringer on the bottom corner labeled "FH". This 1/8" sq. stringer was not shown on the full size plan to avoid the confusion of so many overlapping lines that would result. It is glued to the corner to help form the contour and keep the covering from sticking to the fuselage frame when being doped.

(m.) Glue the F-12 pieces to the fuselage sides as shown on the plans.



(8.) TAIL ASSEMBLY

(a.) Pin down the tail surface parts on a sheet of wax paper and glue them together with Sig-Bond or Sig Epoxy glue. Key letters appear on the patterns to insure proper assembly. Connect matching letters to each other.

(b.) A pattern appears on the centerfold page of this booklet showing the elevator glued to the piece of 1/4" x 1/2" balsa. This pattern also shows the distance between the halves for installing the 3/32" wire connector.

NOTE: The stabilizer, elevator, fin and rudder parts are easiest to cover before they are hinged and attached to the fuselage. Refer to the Finishing Section at this time and prepare the tail parts before hinging and attaching to the fuselage. Be certain to test assemble them on the hinges before covering to insure that a good edge and end match has been obtained in the sanding operation. Do not cover portions of the tail that are glued to another part so that there will be wood-to-wood joints. If it is more convenient, remove a section of the covering to expose the wood. It is also probably best to have the lower wing completed and fit into the wing saddle of the fuselage while the tail is pinned in place so that they can be lined up in conjunction and any difference in alignment corrected. The tail surfaces must be in place before the plastic top is permanently attached.

(c.) Punch a series of angled holes with a l /16" wire in the bottom of the stabilizer every quarter of an inch or so in the places where it will contact the fuselage frame. Do likewise in the fuselage frame. Work these holes full of epoxy glue and this will in effect "nail" the two parts together when the glue sets.

(d.) Use the crosspiece center marks as a guide in correct alignment when gluing the stabilizer onto the fuselage.

(e.) Draw the centerline on the top of the stab, using the previously established cross piece center marks and the back end of the fuselage as guides in getting the line exactly correct. Measure 1/8" on each side of this center line and mark this as the fin position on top of the stab.

(f.) Punch 1/16" holes as previously done in the mounting of the stab on the fuselage. Epoxy the fin in place on the stab, filleting with a bead of glue.

(9.) INSTALLING THE PLASTIC FUSELAGE TOP

(a.) A 1/8" sq. stringer is shown on the side view labeled "FF". This is a gluing strip for the plastic top. It has not been shown on the top view on the plan to avoid too many overlapping lines. A separate view on the center fold of this booklet shows how this strip is located. Run it directly on top of the 1/8" sheet fuselage sides until about the front of the cockpit. At this point it should begin to taper off onto the top 1/8" stringer.

(b.) The gluing strip should be beveled to fit the curve of the sides of the plastic top. Toward the rear, very little bevel will be required but progressively more is needed toward the front. Lay the plastic top in place to determine the amount. Dress the bottom of the top with the large sanding block so that the top will sit exactly level. Also it is possible the top may have flattened somewhat during storage of the kit. The top is flexible and can be held in the installation position with a row of pins just to the outside of the gluing strip. Keep in mind that the fuselage side stringers will be sanded to blend into the contours of the plastic top, as indicated in the cross section views of the fuselage. Trim down the tail fillets on the plastic top as required for a good fit against the tail.

Above: Hazel Sig with both prototype Skybolts, model and full size.

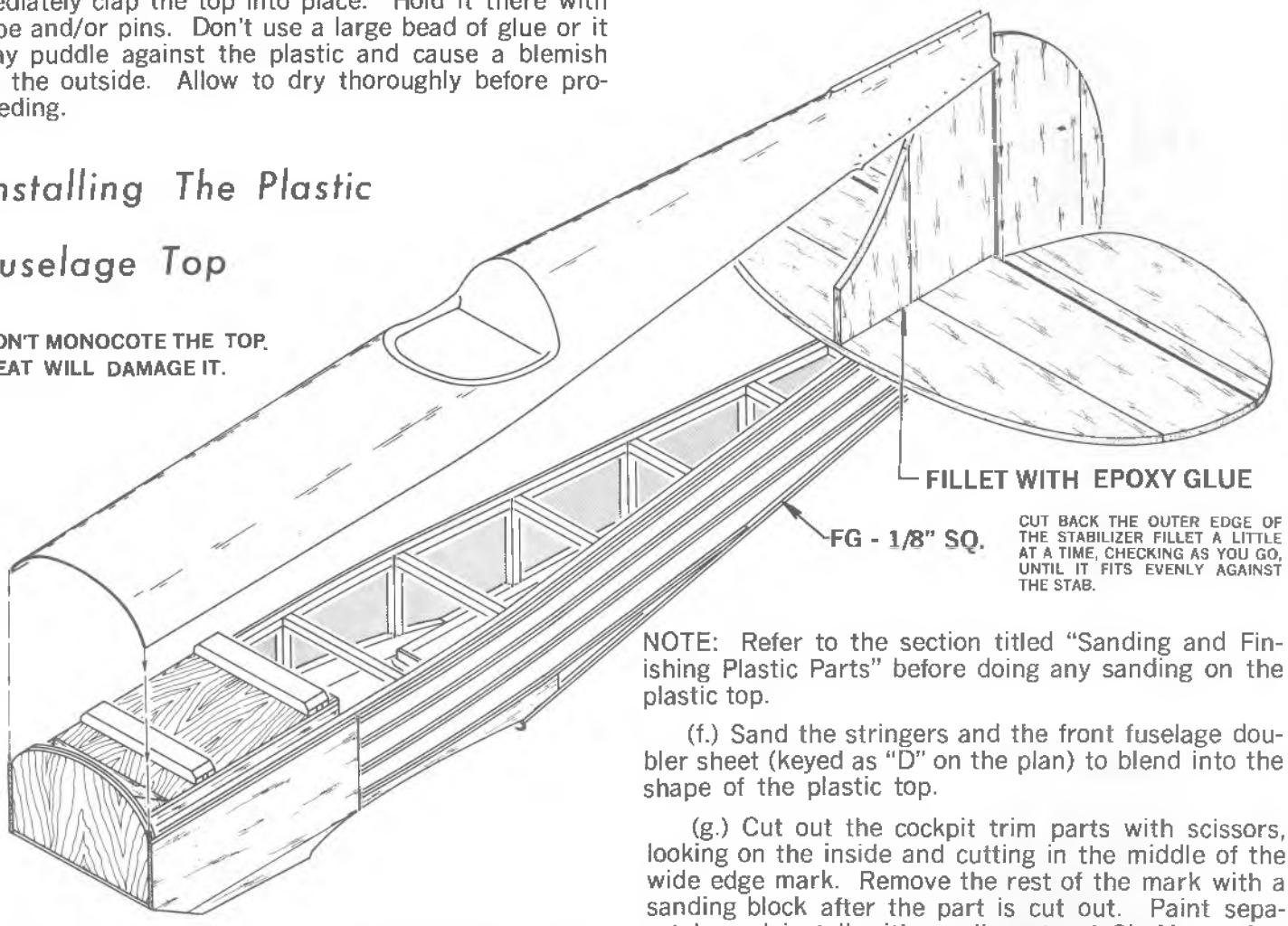
Below: Norm Tobison's Skybolt features a sharp red and white color scheme.

Hale Wallace spent 3 years building this beautiful 12" = 1' scale model. See the Sig Catalog for details of the alternate decal available to help duplicate his fine red, white, blue and black color scheme.

(c.) The plastic top is glued to the fuselage strip FF with Sig-Ment. It is recommended that a large bead of Epoxolite instead of Sig-Ment be put on the firewall to fill any slight irregularities between it and the plastic top. Because Sig-Ment is fast drying, this operation must be accomplished quickly and is best done with a helper. Leave the tail part unglued and work only on the matter of gluing the plastic top to gluing strip FF. Lay down a bead of Sig-Ment and immediately clap the top into place. Hold it there with tape and/or pins. Don't use a large bead of glue or it may puddle against the plastic and cause a blemish on the outside. Allow to dry thoroughly before proceeding.

Installing The Plastic Fuselage Top

DON'T MONOCOTE THE TOP. HEAT WILL DAMAGE IT.



IMPORTANT: GO EASY ON GLUE, FILLER AND PAINT ON THE TAIL. AN EXTRA OUNCE HERE TAKES 5 OR 6 OUNCES OF WEIGHT IN THE NOSE TO COUNTERBALANCE IT.

(10.) COWLING

Use Sig Supercoat Thinner, Acetone (at some drugstores) or MEK (methyl ethyl ketone) to weld the plastic together. The fuselage should be assembled with the plastic top in place before assembling the cowl parts.

(a.) Tape the cowling parts together and try a preliminary fit of the match to the fuselage. If the cowl fits the fuselage loosely, remove a little width by sandlarge sanding block. If it fits tightly, sand down the fuselage.

(b.) Trial fit the cowling front on the taped together halves. If it is slightly oversize, remove some of the back of it or some of the front of the halves, or both, by sanding down to bring the sizes together.

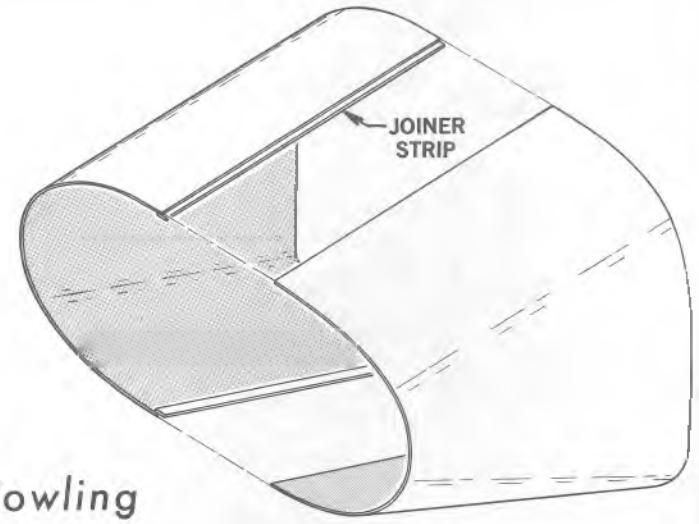
(d.) Continue with the remaining plastic top attachment around the tail. Flow Sig-Ment into the seam between the plastic and the tail and tape and pin it in place.

(e.) Fill any cracks between the plastic top and the fuselage or tail with a putty made as follows: stir talcum powder into Sig-Ment until it is about the consistency of bread dough. Then add butyrate dope thinner until the mix is like soft margarine.

NOTE: Refer to the section titled "Sanding and Finishing Plastic Parts" before doing any sanding on the plastic top.

(f.) Sand the stringers and the front fuselage doubler sheet (keyed as "D" on the plan) to blend into the shape of the plastic top.

(g.) Cut out the cockpit trim parts with scissors, looking on the inside and cutting in the middle of the wide edge mark. Remove the rest of the mark with a sanding block after the part is cut out. Paint separately and install with small spots of Sig-Ment after other painting and finishing is completed.



Cowling

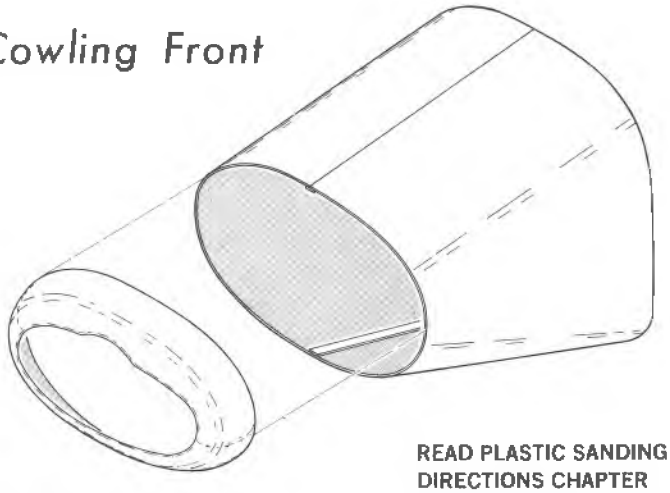
(c.) Untape the cowl when the fit is satisfactory. Hold the plastic joiner strip in place on the inside of one half. Leave half of the width of the joiner strip extending over the edge so as to lap onto the other part half when it is attached.

(d.) Using a small, pointed brush, flow a few drops of thinner under the edge. It will spread along the seam by capillary action. (Don't let the thinner get under your finger, it will leave a finger print.)

(e.) Join the halves on one side with tape. Flow thinner into the opposite seam from the inside. Squeeze and hold together until dry. Remove tape and do the remaining seam.

(f.) A putty may be made from shavings of the waste plastic dissolved in thinner, acetone or MEK to fill any parts of the seam not completely closed. Sig Epoxolite Putty may also be used for this purpose.

Cowling Front



DON'T MONOCOTE THE COWL. THE HEAT MAY DAMAGE IT

READ PLASTIC SANDING DIRECTIONS CHAPTER BEFORE SANDING COWL

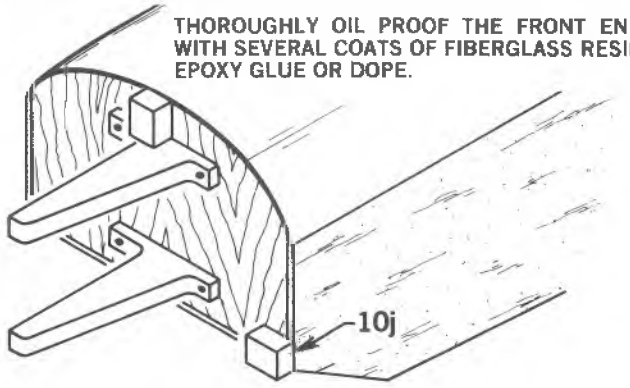
(g.) Attach the cowling front to the body of the cowling using thinner or acetone to bond them together. After attachment, reinforce the seam between the front and the body by applying joiner strip to the inside surface of the seam. Because of the curvature, short pieces of strip should be used. Bend them to the general shape before holding them in and applying thinner. As the thinner welds the plastic together the strip may be pressed down tightly in place.

(h.) The seams may be scraped down and any rough spots or flaws taken out with sandpaper. Do not use coarse sandpaper that will cut deep scratches in the plastic. The deep scratches may later open up wider when dope is applied. Use medium paper and finish carefully with fine paper, sanding down enough to have a smooth, scratch-free surface.

(i.) To make the openings in the front of the cowl nosepiece and in the side of the cowl for the engine head, first drill a series of holes about 1/8" in diameter around the cut out portion. Have the holes almost touching each other. Don't get them too close to the edge of the opening. Once the opening is made the edges can easily be trimmed to exact shape with an X-Acto knife. Cut through the bits of plastic between each of the drilled holes with a knife and break out the part to be removed. Don't get hasty in cutting the opening in the cowling side for the engine head - start undersize and open it up slowly, fitting as you go so that it doesn't end up larger than necessary. Don't have any square cornered openings.

Cowl Mounting Blocks

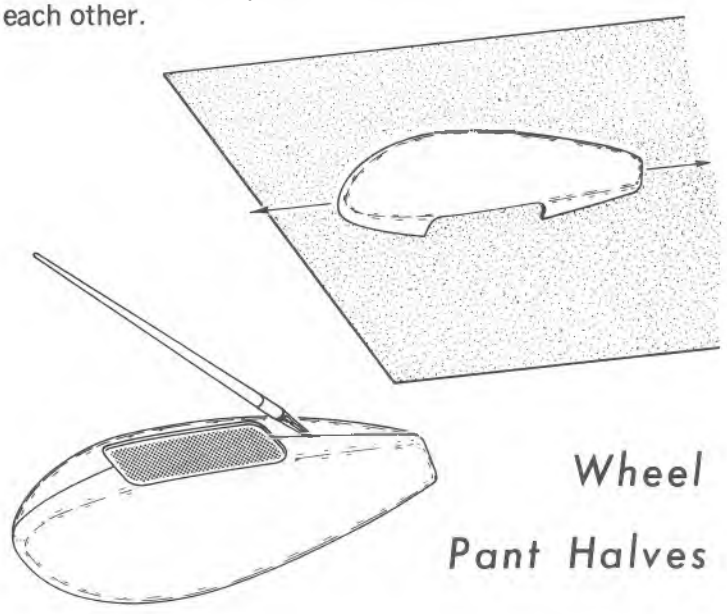
MAKE CERTAIN THE BLOCKS SUPPORT THE COWL. PULLING THE COWL DOWN TO THEM WITH THE MOUNTING SCREWS CAN CAUSE CRACKING.



(j.) Epoxy three hardwood cowl blocks to the front of the firewall. Fit the cowling over them, sanding down the blocks until they seat snugly against the inner surface of the cowl. Drill a pilot hole through the cowl into the blocks far enough to start the cowl screws threading into the blocks. Open up the cowl holes so they are large enough to pass the screws.

(11.) WHEEL PANTS

The wheel pant halves are joined in the same manner as the cowl except that the joiner strips are not necessary. Squeeze the pant halves tightly together after allowing a few seconds for the plastic to soften from the thinner in the joint. This will weld the halves to each other.



Wheel Pant Halves

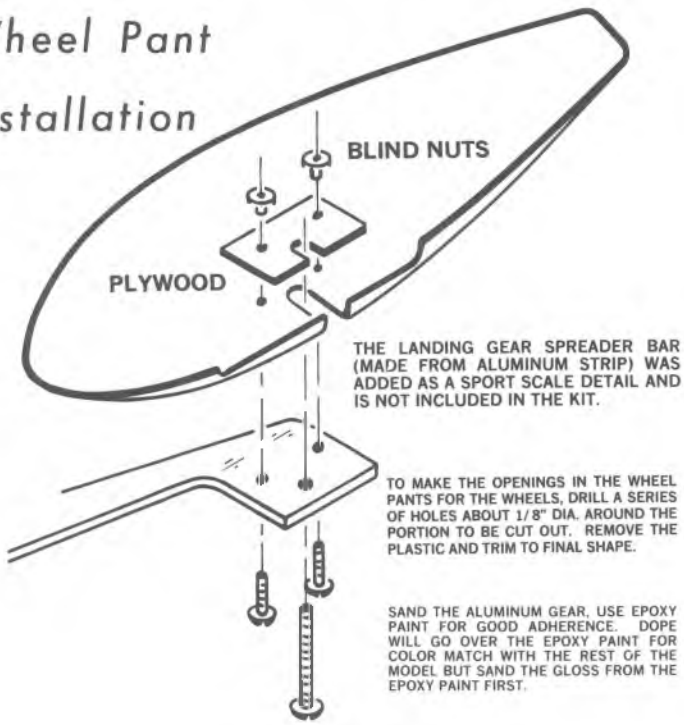
(a.) A heavy duty 8-32 axle bolt is included in the Skybolt so the axle hole in the landing gear must be drilled out to accept the bolt. Use a No. 18 or a 11/64 inch drill.

(b.) A 1/8" scrap plywood plate is cemented to the inside of the pant half with Sig-Ment.

(c.) The slot in the pant and ply plate is made wide enough to clear the axle nut. The pant may be removed without taking off the wheel.

(d.) Blind nuts and 4-40 bolts hold the plywood plate and pant to the landing gear. The best way of fitting is to bolt the pant approximately in place with just one bolt. Then carefully align it to the angle desired, tape it in place and drill the final hole.

Wheel Pant Installation



FILE A NOTCH INTO THE LANDING GEAR TO ALLOW THE WING DOWEL ENOUGH SPACE.

(12.) BRASS PARTS

Several parts must be cut from brass strip. Cut the strip to proper length by clamping in a vise and sawing off with a hack saw. Finish with a file. Use a center punch to mark places for holes before drilling them. The holes wherever the part is glued to something allows the epoxy to fasten firmly and literally nail the brass piece in place. Brass parts to be soldered should be polished clean with sandpaper, as should the wires or other parts to which they will be soldered.

Brass Part Patterns

NOTE: Material supplied in kit for Type B Double Ailerons. Type A is optional.

Wheel Sizes	MAIN - 2-1/2" TAIL - 1-1/4" - 1-1/2"

(13.) CABANE STRUTS

The four 1/8" wire main cabane struts and two 3/32" wire brace struts are prebent but some minor alterations of the bends may be necessary during assembly. The critical matter is to get the front and rear sets of cabane struts made exactly the same. If they are exact, the 0 degrees incidence of the top wing will be set accurately. Use the cabane strut pattern in "Typical Front Section at F7" on the plan for assembly of the struts. Polish all parts clean and bright with sandpaper to insure good soldering.

(a.) Make two top brackets "SS" from the 5/16" brass strip provided in the kit, using the pattern shown here. Drill a 1/8" hole in SS. Clamp the brass in a vise and use a file to notch the bottom portion to 1/4" wide.

(b.) Put a straight board along the bottom of the cabane strut drawing on the plan to provide a lineup edge to work against while pre-assembling the struts.

(c.) Match the cabane strut wires in pairs. In particular make sure that the tops are filed to exactly the same height. This provides a lineup point to check alignment when they are reassembled in the fuselage.

(d.) Fasten a pair of cabane struts and an "SS" piece to the drawing, using pins to keep them aligned. Shim the bottom of the cabane struts with 1/16" shims to level the parts.

(e.) Tack solder only one of the pair of cabane strut wires to the side of brass part "SS". Be careful not to let the solder flow across and fasten SS to the other cabane strut wire, Tack the other wire to SS temporarily with 5-minute epoxy to hold the assembly together for the next operation.

(f.) Take up the first set of wires from the board and turn it over on the drawing. Assemble the 2nd set directly on top of the first, using shims where appropriate to keep the operation level. Slip a small piece of paper between the two SS pieces (which are now touching each other) to keep them from being soldered together. Use a small piece of 1/8" dowel as a pin to hold the two holes in the SS pieces exactly aligned with each other.

(g.) Now repeat the steps previously done on the first assembly in paragraph (e.) above.

(h.) Remove from the board, separate the matching pairs and clean off the 5 minute epoxy used to temporarily join the first set.

(i.) Insert a set of matched wires into the grooved hardwood block holes on each side of the fuselage. Don't glue them in the holes. Make certain that the tops of the wires are once again flush and matched as they were when pre-assembled. Bind the top tightly together with copper wire. Solder permanently, of place while the solder is soft. Protect the plastic fuselage top during the soldering operations with a wet cloth so that dripping solder or the heat of the iron will not blemish it.

(j.) Repeat the process described in paragraph (i.) for the second set of cabane struts.

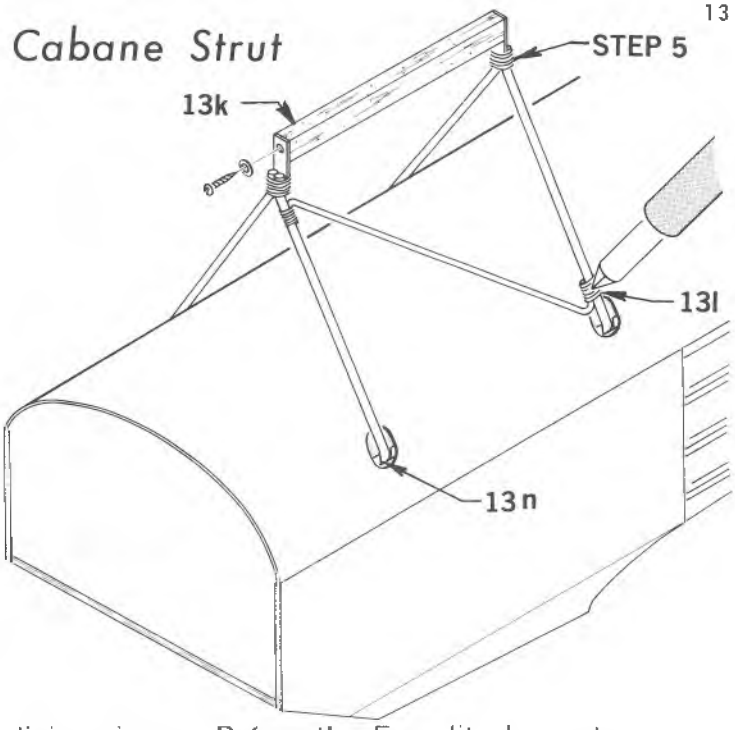
(k.) Make a spacing block from scrap wood as shown in the accompanying isometric drawing. This should be 4-1/16" long to maintain the spacing between the struts. Use a screw at each end to hold it temporarily in place. If the front and rear sets of cabane struts are parallel, 0 degrees incidence will be maintained automatically.

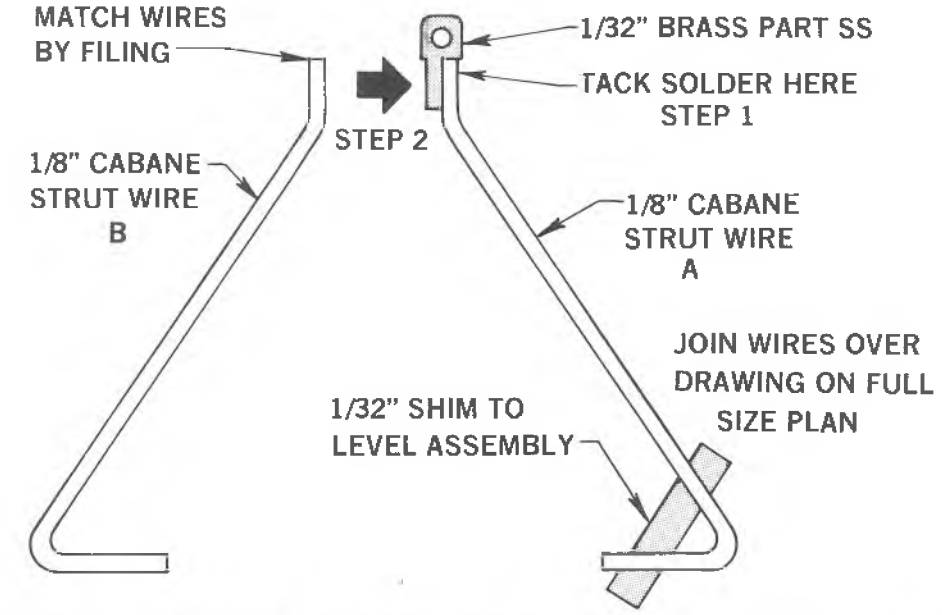
(l.) Fit the 3/32" brace wire between the front and rear cabane struts and bind on the fine copper wire. Solder permanently together. The spacing block can now be removed.

(m.) Cut the 1/8" x 1/4" balsa strip to fit on the cabane struts as shown on the plan and epoxy the pieces in place on the wires. Sand a small rounded depression in the balsa to make it fit tightly against the wire. Allow the epoxy glue to squeeze out around the wire and when the glue starts to set up it can be trimmed off flush and later sanded smooth.

(n.) Put a scab of epoxy glue over the ends of the grooved hardwood blocks where the cabane strut wires enter.

(o.) Plug the holes in the plastic fuselage top around the cabane struts with Sig Epoxolite Putty. Fillet the putty against the wires and balsa streamlining pieces. Before the Epoxolite has set up completely, carve it flush with the plastic fuselage top.





STEP 1 - TACK SOLDER PART SS TO ONE CABANE STRUT WIRE (A).

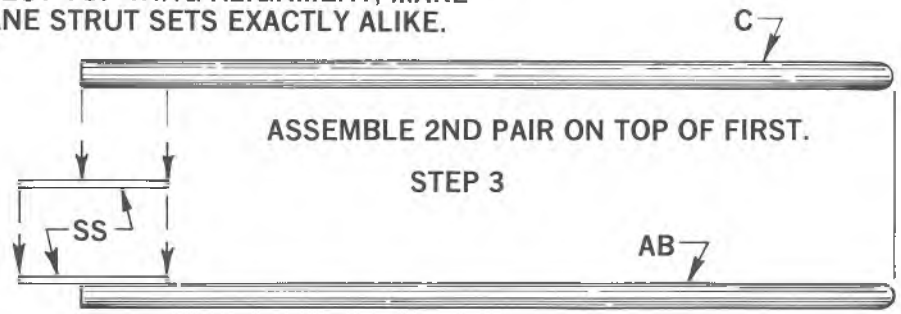
STEP 2 - TEMPORARILY FASTEN THE SECOND CABANE STRUT WIRE (B) TO THE FIRST WITH 5-MINUTE EPOXY GLUE.

STEP 3 - TURN FIRST PAIR (AB) OVER AND REPEAT THE PROCESS WITH THE OTHER SET OF CABANE STRUTS WIRES (CD).

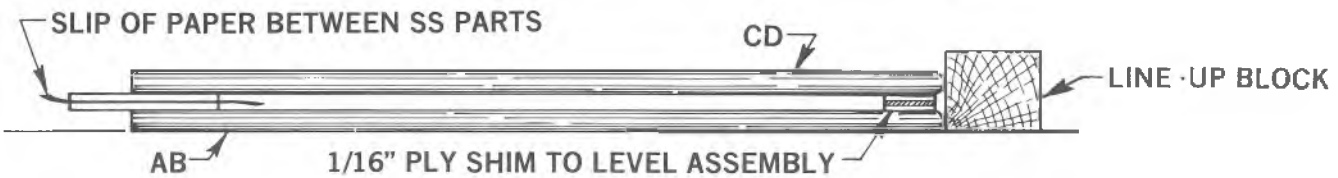
STEP 4 - CUT OFF THE EPOXIED WIRES, CLEAN METAL WITH SANDPAPER AND REASSEMBLE IN THE FUSELAGE GROOVED HARDWOOD BLOCKS.

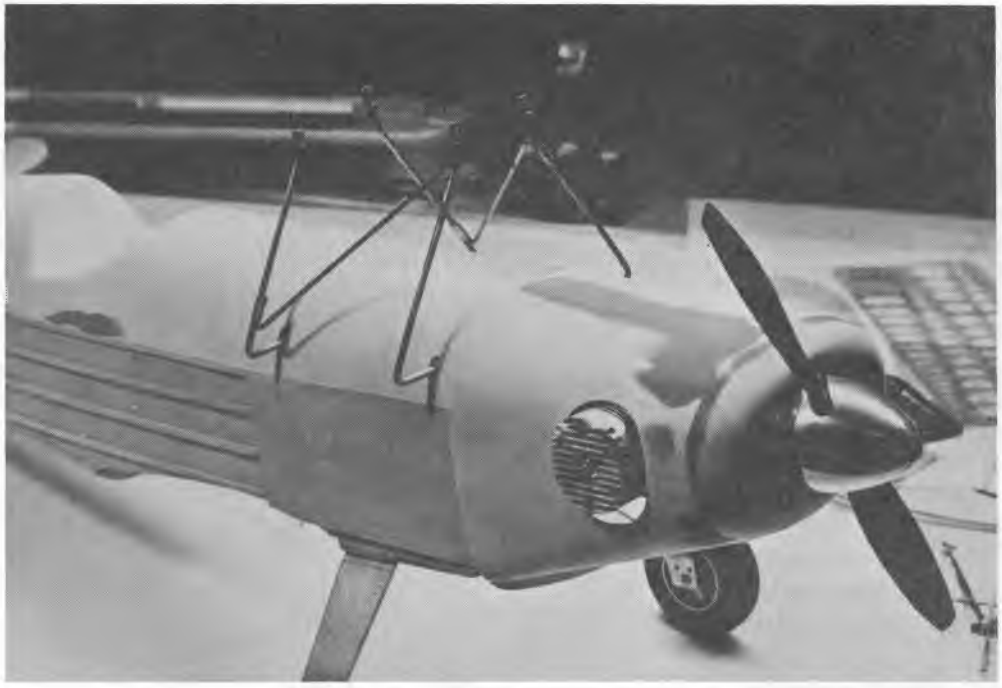
STEP 5 - BIND TIGHTLY WITH COPPER WIRE AND SOLDER PERMANENTLY.

FOR PERFECT TOP WING ALIGNMENT, MAKE THE CABANE STRUT SETS EXACTLY ALIKE.



Making The Cabane Struts

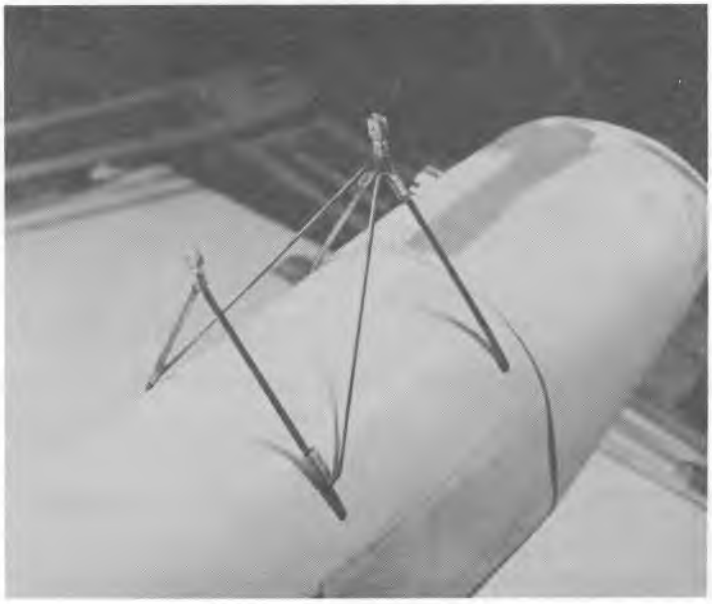




OPTIONAL CABANE STRUT

This ingenious method of making the cabane struts for the Skybolt was developed by Jerry Smith and was featured in his "Here's How" column in the March 1976 issue of R/C Modeler magazine. It has the advantage of doubling the wearing surface of the brass parts as well as aiding in assembly of the model.

If you prefer a metal top wing attachment rod rather than a dowel, use a piece of brass tubing instead of a music wire or steel rod. Prolonged use of a steel rod causes the hole in part SS to wear. This applies whether you use the kit or Smith's method. Some fliers have used a nylon rod.



HERE'S HOW

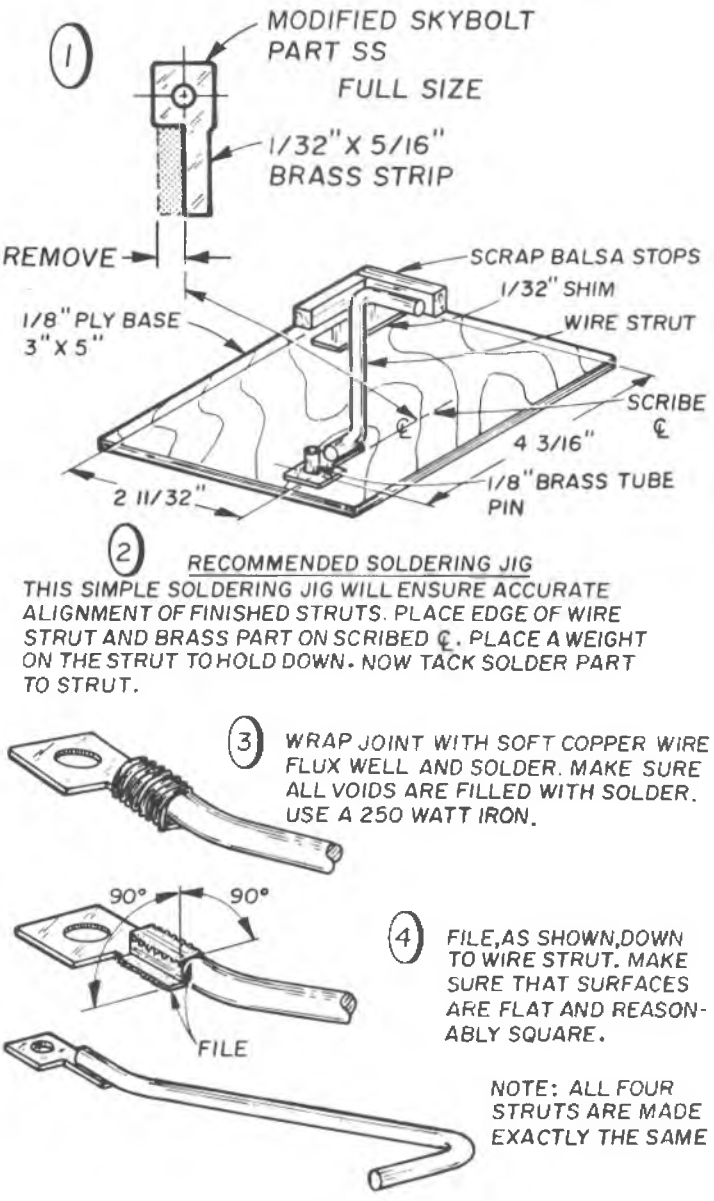
REPRINTED FROM R/C MODELER MAGAZINE, MARCH, 1976.

BY JERRY SMITH

Having at least three R/C Biplanes in the hanger would indicate that I fall into the category of a Bipe addict. Everytime I see a new Bipe I have to fight off the urge to build it. And, so it was that day I sat in the Hobby Shop reading thru "The Building And Flying Manual" on Sig's Skybolt Bipe. Not having built a Sig kit for a number of years, I decided, on the basis of what this excellent kit had to offer, to renew my acquaintance.

Claude McCullough's efforts are certainly evident throughout the kit. The building and flying instructions manual (Most complete and informative that I have seen in sometime) supplemented by a good set of plans, easily lead you thru the building phase. In a recent note to me, Claude explained. "We put a lot of sweat into it, trying to make it a good kit that would sell for a reasonable price. Now, since balsa and other things are still going up, I suppose we will have to increase the price in time. The Skybolt is selling very well and we get lots of good comment on the way it builds and flys."

Building the Skybolt, my constructive discontent began to show up again. This time it was the method of building the cabane struts. I have always found it difficult to finish the fuselage while working around these struts. A real headache! So-why not make them removable! The result? A nice clean fuselage to finish with the added convenience of building and finishing the struts off the airplane. Why not!! The following information and sketches will make clear my modification for removable cabane struts on Sig's Skybolt. This method may also be used on other aircraft with cabane struts of similar arrangement. If you are thinking Bipe, you will be extra pleased with Sig's Skybolt kit. I was!!



ABOUT THE FUEL TANK INSTALLATION

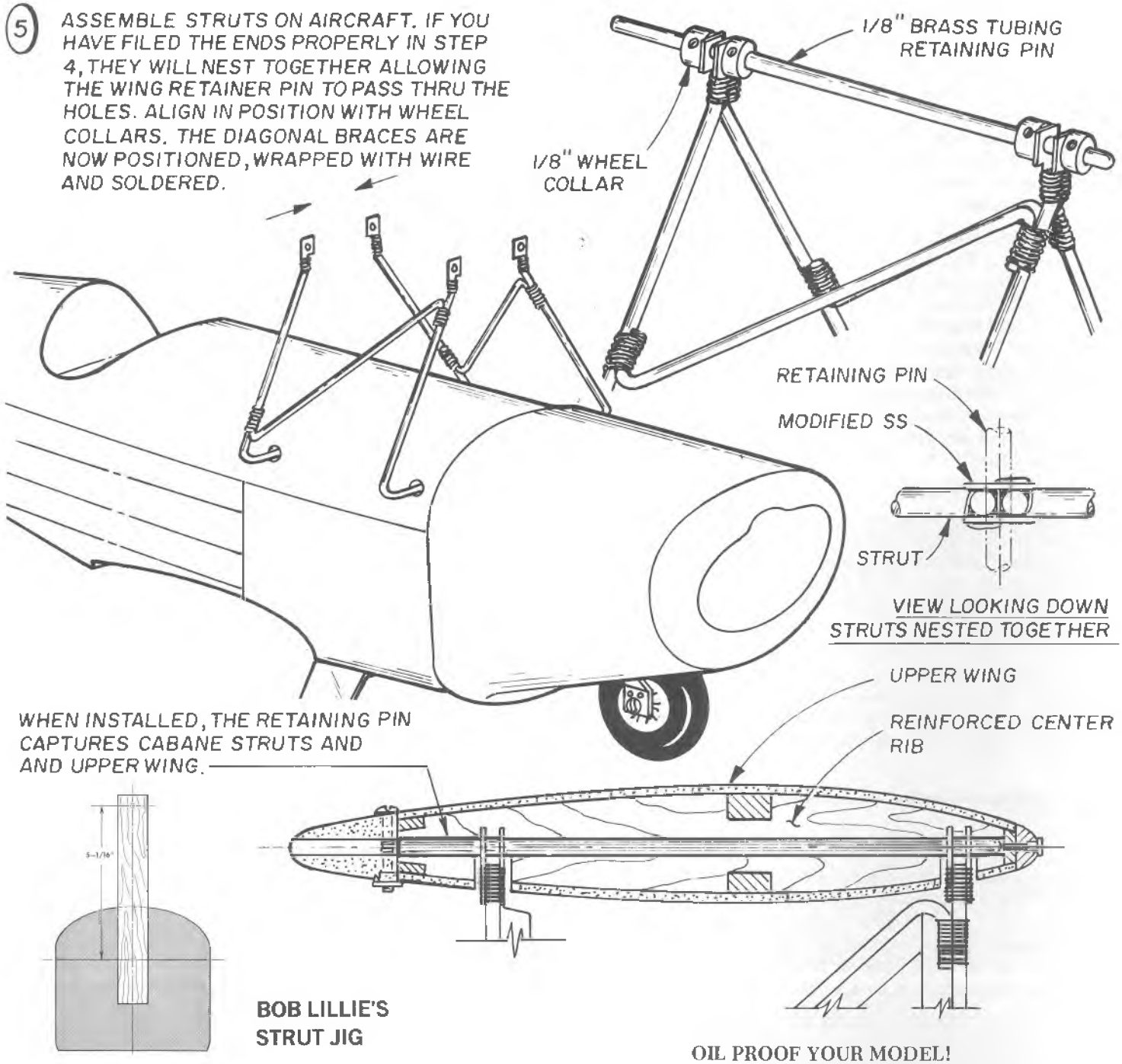
We occasionally receive suggestions from builders that a removable hatch be designed into a model for access to the gas tank. Our opinion is this is not the best method. The hatch opening makes the nose weaker and there is no good way to keep oil from leaking in around the hatch. Fasteners must be built in to hold a hatch in place.

Modern plastic tanks are virtually indestructable under normal use and bursting or cracking is almost unknown. If you use Sig Heat Proof Silicone tubing (which will not harden or deteriorate in fuel) in the plastic tank, the tank will seldom have to be removed. We have models in which the tank has been installed for three or four years without ever needing removal. So it is quite practical to put the tank in semi permanently. Put scrap wood supports under and at the back of the tank. The front is supported by the 7/8" hole in the firewall. Seal the tank cap in the hole with G.E. Silicone Bathtub Seal (hardware stores) or Devcon Seal-It (available from Sig.) You can stuff paper toweling on each side to keep it wedged in place. Some builders, after putting their receiver battery in a plastic sack, taping it shut, wrapping it in a foam rubber package and stuffing it into the nose under the tank, then stuff more paper toweling or foam rubber in to fill the nose. Others prefer to put in scrap balsa side supports to hold the tank in position.

Check the models at a contest-you'll find that the majority of them have sealed noses, as does this kit. Should you ever need to remove the tank, it is a simple matter to break out the scrap supports and push out the silicone rubber seal around the front cap. Reach into the fuselage and guide the tank outside.

SPECIAL TIP: Test install the tank and check for ease of placement and replacement before closing up access to the interior of the nose of the model. The vent tubes, for example, must not be too long.

After installation of the tank, put fuel tubing on the vent tubes and run it to the outside of the cowling for easy tank filling. The best way to fill the tank is to take off the fuel line to the needle valve and pump the fuel in there until it runs out the vent. Or, if access to the needle valve is not convenient, a third line may be added in the extra hole provided in the rubber tank top of Sig and most plastic tanks. It is a good idea to run the overflow vent out the bottom of the cowl so any fuel leakage is not sprayed on the canopy.



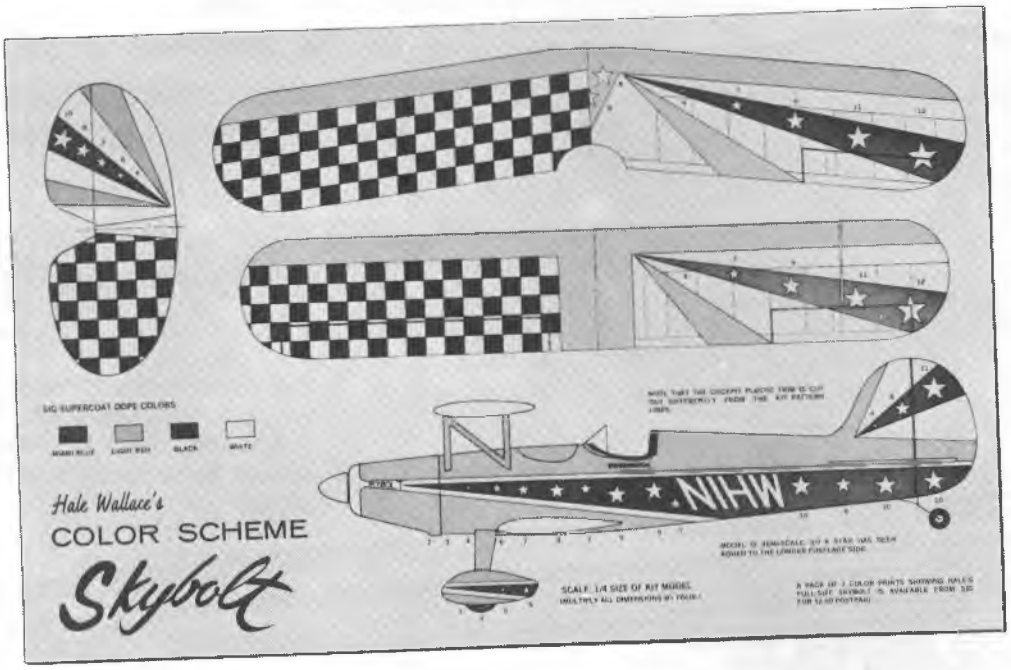
BOB LILLIE'S STRUT JIG

Bob Lillie (Milwaukee, WI) used a simple method of alignment for the cabane strut assembly. He tack glued a ply piece to the firewall with a hole exactly 5-1/16" on center from the thrust line mark on the cowl. The same spot is located on the leading edge of the fin. (This would be 5-1/16" above the thrust line, but for easier measurement, use 4-7/16" above the stabilizer top or 4-1/16" above the fuselage top if the stabilizer is not yet in place. A small scrap wood support is tack glued here to hold the end of a 36" piece of music wire. The music wire rod is run through the front ply piece, the cabane strut brass parts and on to the fin during checkout and assembly of the strut. This procedure will assure exact O-O alignment with the thrust line. Before permanent assembly, be sure and check out the wing alignment as shown by the drawing on the full size plan.

OIL PROOF YOUR MODEL!

One of the most destructive things that can happen to a model is allowing engine oil to soak into bare, untreated balsa or plywood, It will cause glue joints to loosen and results in a steady increase in weight. An oil soaked model cannot be properly repaired or re-painted after a crackup, since glue and finish will not hold. Cover all wood parts of the model and put on enough coats of finish so that oil cannot soak in. Don't leave any exposed wood on the outside. Around the nose and engine compartment, apply extra effort at oil proofing. Coating the firewall and front joints with epoxy glue is best, but several extra coats of dope or paint will also do the job. Take special care during building to use plenty of epoxy glue to attach the firewall and coat the back of the firewall and the firewall braces with the glue. Fill any cracks with epoxy.

Skybolt Alternate Color Scheme



Paint your model like Hale Wallace's spectacular version. A color photo of his EAA prize winning Skybolt appears in the Sig catalog.

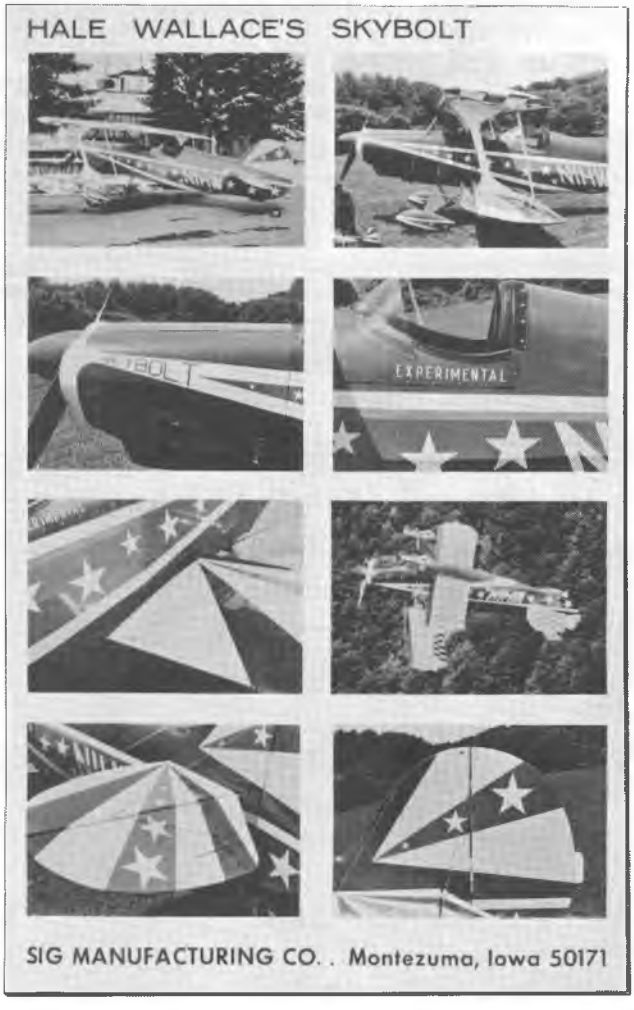
Decal Set consists of:

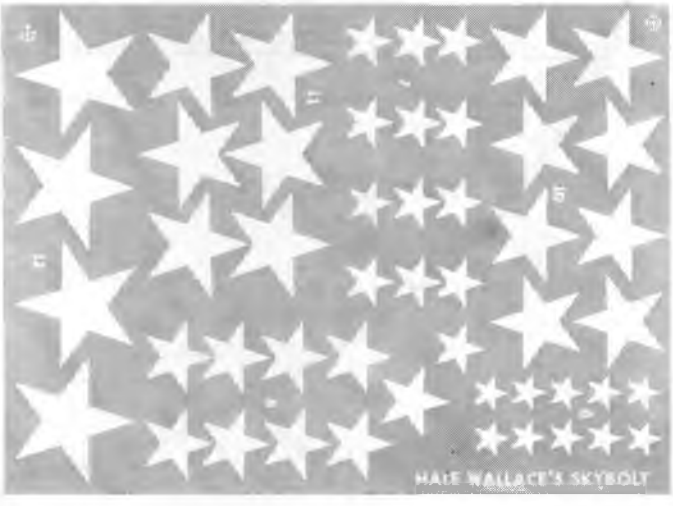
- 2 - 8-1/2" x 11-1/2" Decal sheets
- 1 - 10-3/4" x 17" Quarter size color layout plan of the kit model.

On the reverse side of the plan are 8 black and white photos of Hale's airplane.

Order DK-200

A Pack of Seven Color Prints Showing Hale's Full-Size Skybolt Is Available From Sig - PP-400

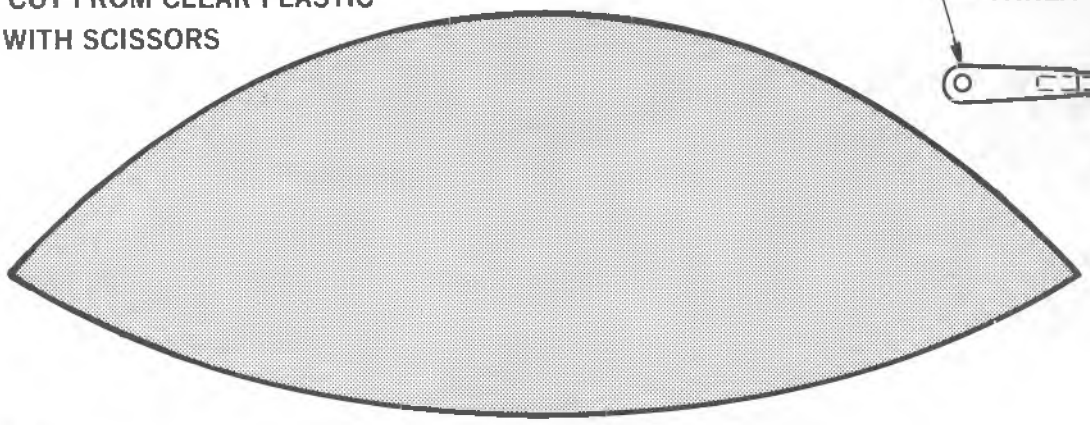


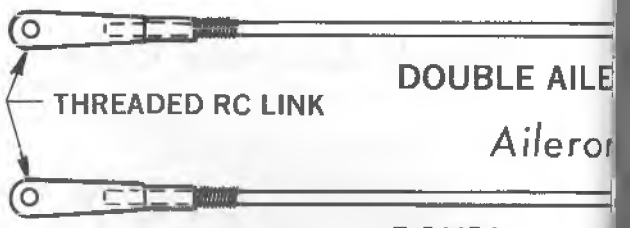


SIG MANUFACTURING CO. . . Montezuma, Iowa 50171

Windshield Pattern

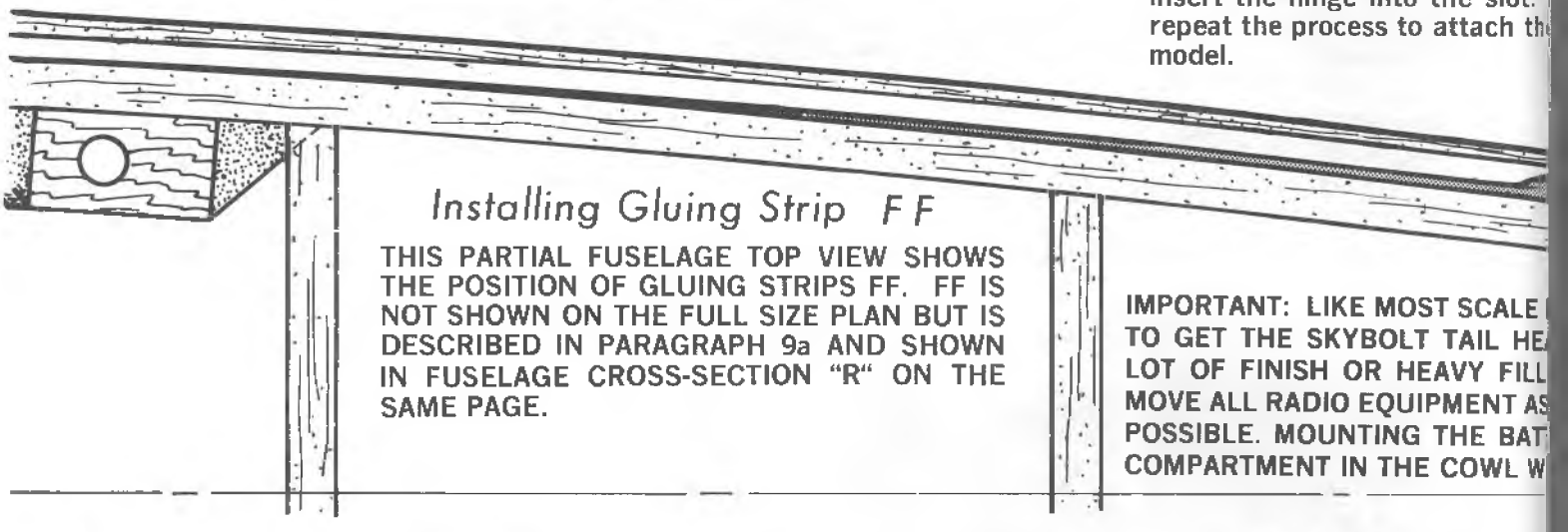
CUT FROM CLEAR PLASTIC
WITH SCISSORS





Hinging

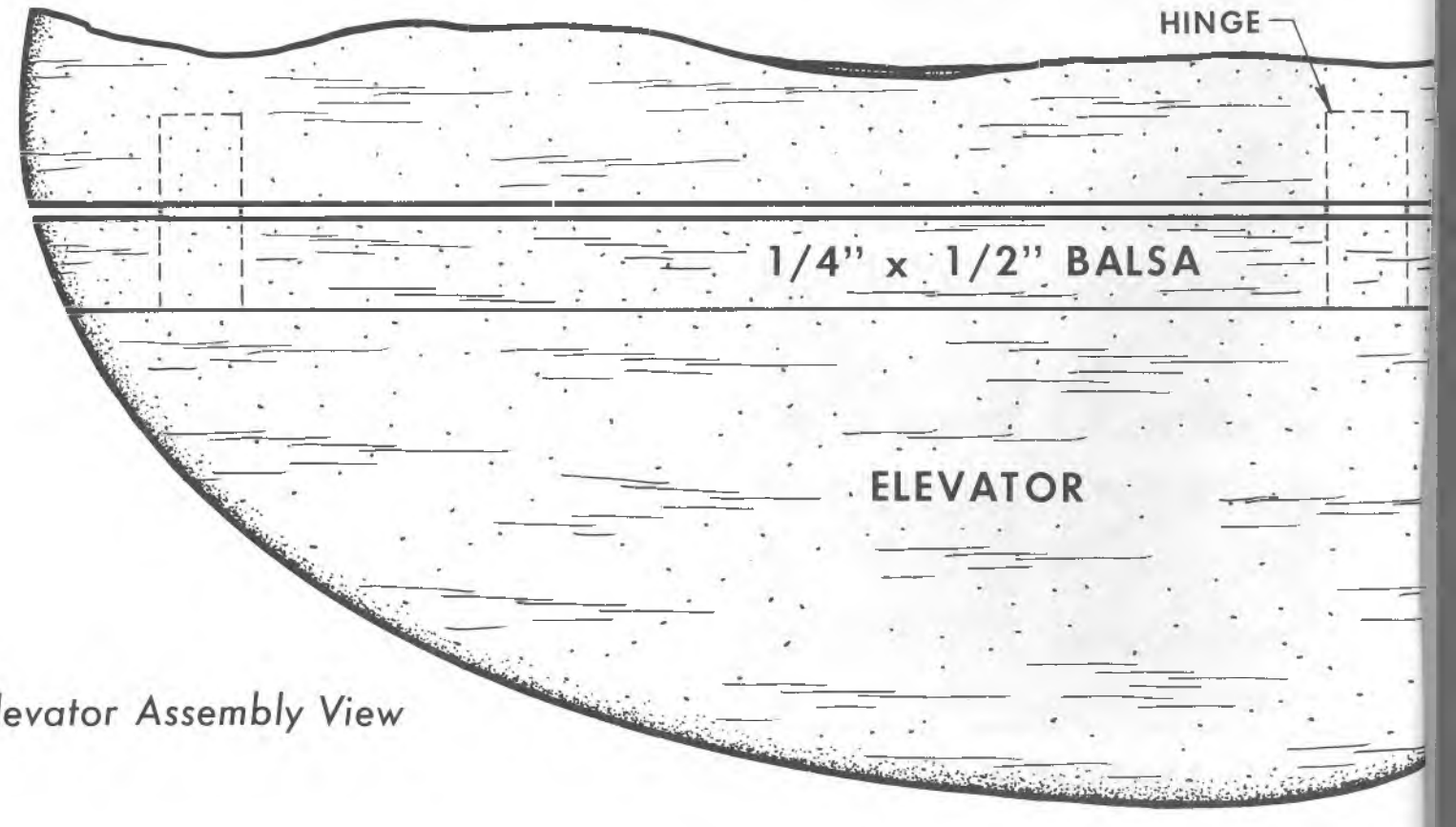
Cut slots in the control surface
hinges. Fill the slots with Sig K
insert the hinge into the slot.
repeat the process to attach th
model.



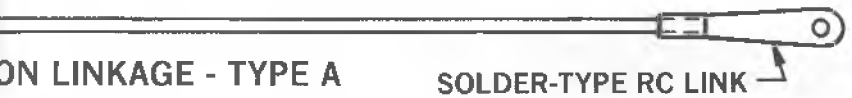
Installing Gluing Strip FF

THIS PARTIAL FUSELAGE TOP VIEW SHOWS THE POSITION OF GLUING STRIPS FF. FF IS NOT SHOWN ON THE FULL SIZE PLAN BUT IS DESCRIBED IN PARAGRAPH 9a AND SHOWN IN FUSELAGE CROSS-SECTION "R" ON THE SAME PAGE.

IMPORTANT: LIKE MOST SCALE
TO GET THE SKYBOLT TAIL HE
LOT OF FINISH OR HEAVY FILL
MOVE ALL RADIO EQUIPMENT AS
POSSIBLE. MOUNTING THE BAT
COMPARTMENT IN THE COWL W

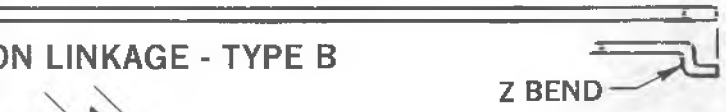


Elevator Assembly View

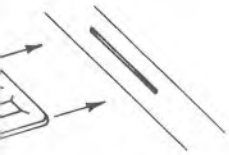


ON LINKAGE - TYPE A

Inter-Connecting Rods



ON LINKAGE - TYPE B



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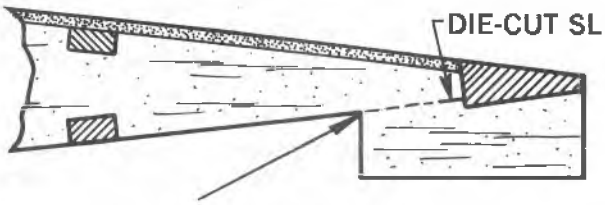
Removing The Jigs



CUT FROM FRONT EDGE OF JIG TAB TOWARD DIE-CUT SLIT IN THE BACK.

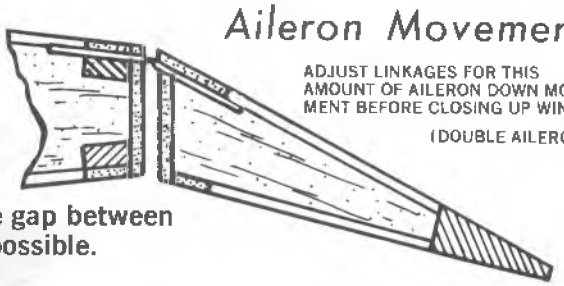
CONTROL MOVEMENTS USED ON ORIGINAL MODEL

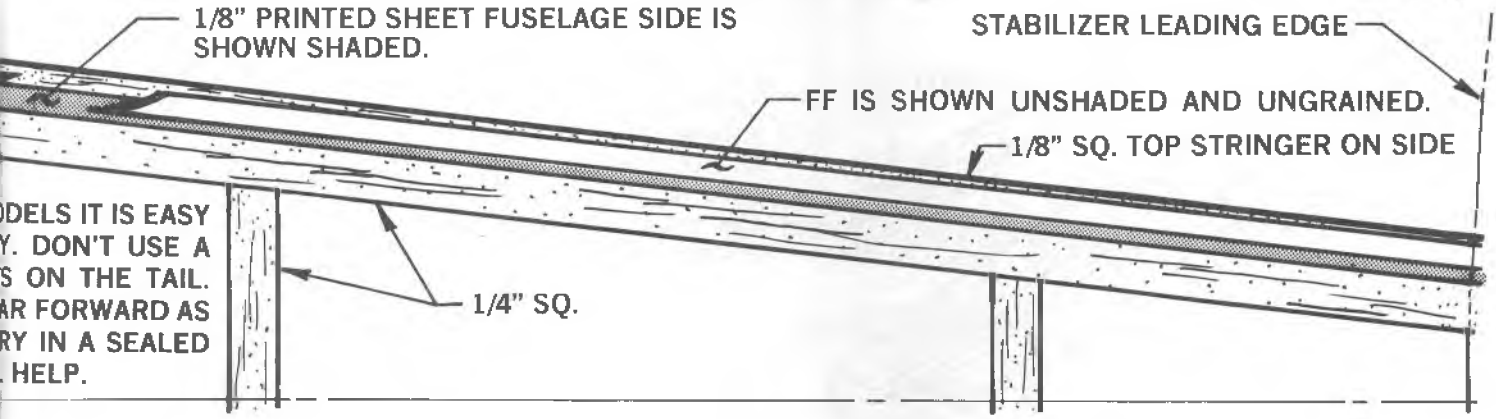
RUDDER - 1" EACH WAY

ELEVATOR - 7/8" DOWN, 1" UP

Note: For best control response, keep the gap between the surface and the model as narrow as possible.

Aileron Movement





DELS IT IS EASY
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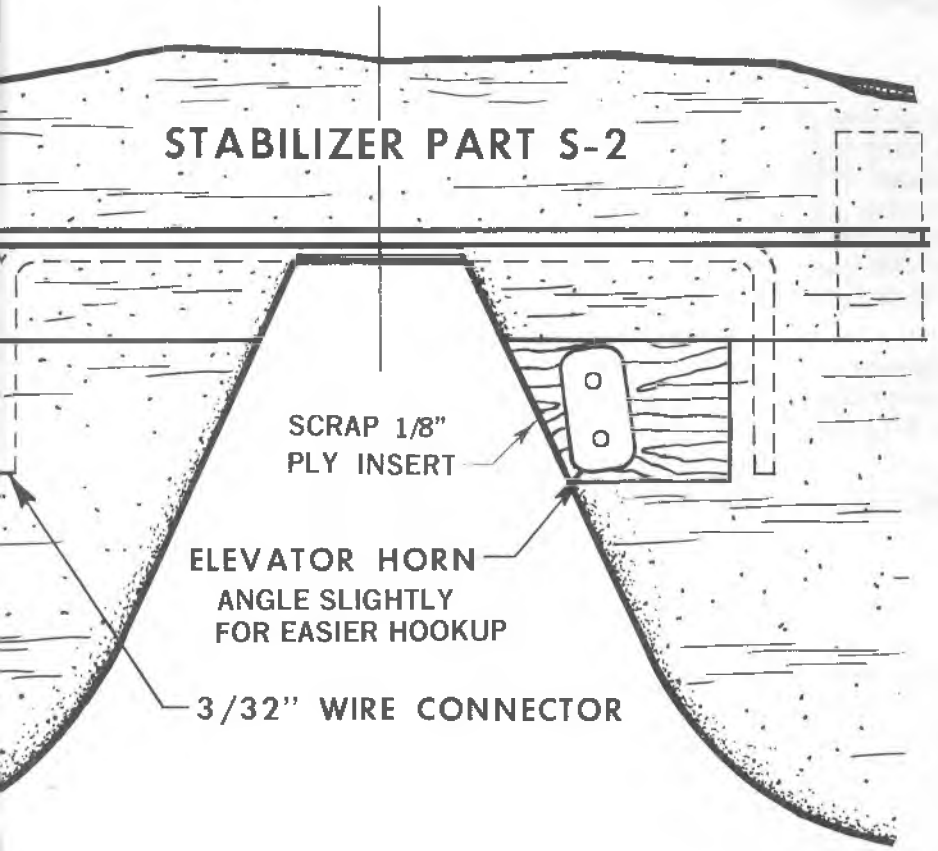
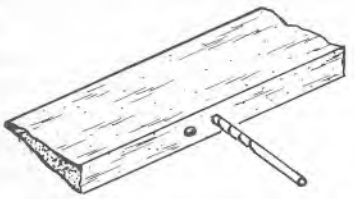
HELP.

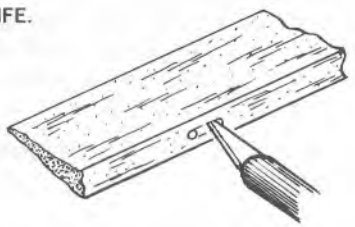


MAKING A HINGE SLOT

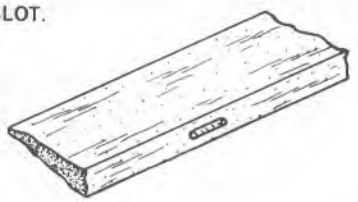
1.) DRILL TWO 1/16" DIA. HOLES INTO THE WOOD.



2.) CUT BETWEEN THE HOLES WITH A MODELING KNIFE.



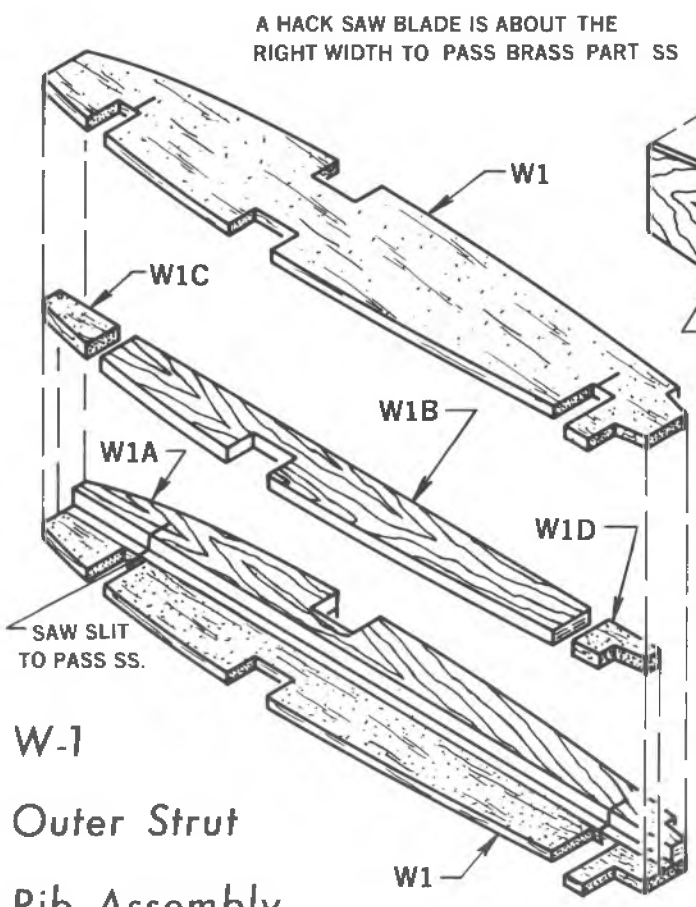
3.) USE EPOXY GLUE TO FASTEN THE HINGE IN THE SLOT.



NOTE: AN X-ACTO KEYHOLE SAW BLADE NO. 15 IS ALSO HANDY FOR CUTTING HINGE SLOTS.

(14.) W1 RIB ASSEMBLY

The cabane struts must be completed on the fuselage before the parts for the top wing center rib W1 are glued together so that the match between them can be checked.



W-1 Outer Strut Rib Assembly

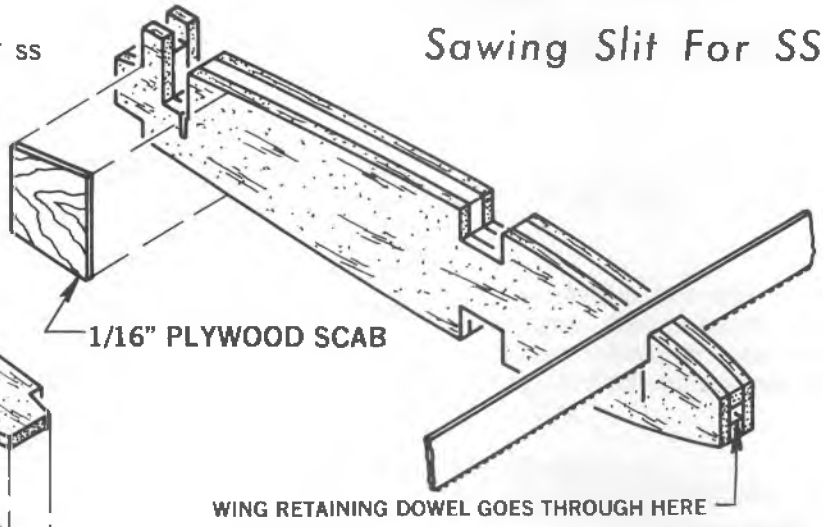
(a.) Using the pattern in this book, draw on one of the W1 balsa ribs the center line and the lines indicating the edge of the plywood center pieces W1A and W1B. Lay W1A and W1B in place. Put the 1/8" dowel that will be used as a wing attachment pin in place between W1A and W1B to check that the spacing is correct. It is best that the dowel not fit so tightly that it will be difficult to remove.

(b.) When satisfied with the position (ignore any edges of W1A and W1B that stick out and concentrate on getting the center dowel correct), glue W1A and W1B in place on the W1 rib.

(c.) Notch into W-1 as required to pass the top of the cabane struts.

(d.) Trial fit the W1 assembly to the cabane struts and mark where the brass part SS on top of the cabane struts needs to go into W1A.

(e.) Use a hack saw blade to saw slots into W1A to pass the tops of brass parts SS on the struts.



(f.) Check the fit of the W1 assembly on top of the cabane struts, using the dowel to hold it in place. It is probable that minor alterations in the notches will have to be made to clear the solder on part SS, etc. Cut away to fit, but don't make the openings any larger than absolutely necessary to make the assembly fit.

(g.) Add balsa pieces W1C and W1D.

(h.) Once you are certain that the assembly is fitted properly to the cabane struts and that the dowel can be inserted and removed easily, the second W1 balsa rib can be glued on top of the rest of the assembly. Keep the assembly true by lining up the rear key tab and the bottom of the first rib W1 with the second W1 rib.

(i.) Complete the saw cut made previously for SS through the second rib W1 just added.

(j.) If the plywood parts W1A and W1B protrude anywhere around the edges of the assembly, trim them down flush with the balsa W1 ribs.

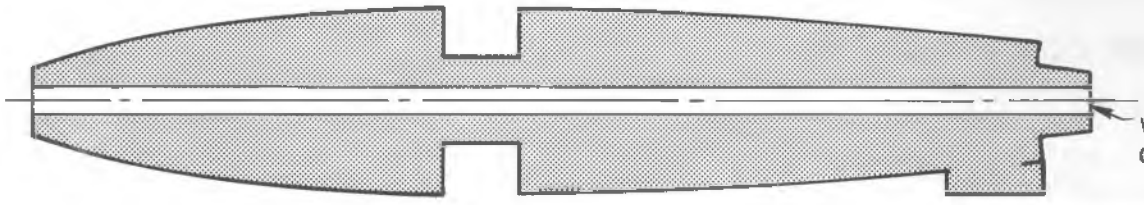
(k.) Check the assembly again for ease of mounting on the cabane struts with the dowel.

(l.) Glue plywood scabs of 1/16" plywood on each side of the openings in the W-1 assembly. Make them full depth so that the planking will glue to them as well as to the rest of the W1 assembly.

(m.) The assembly can now be built into the wing in the same manner as the rest of the ribs.

Pattern For W1 Assembly

PATTERN FOR W1 CENTERLINES. USE FOR ACCURATE POSITIONING OF W1A & W1B.



(15.) OUTER STRUT RIBS

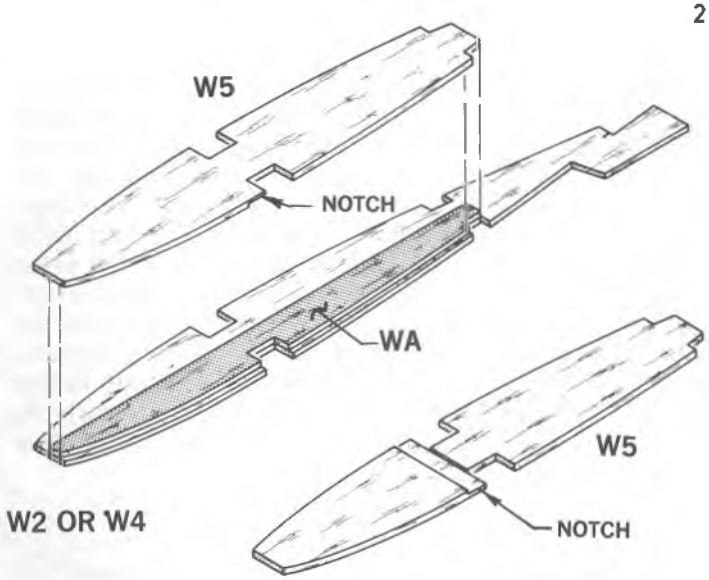
Before beginning construction of the wings, glue together the W4, WA, and W5 sandwiched ribs as shown in the accompanying drawing. This forms a recess in the wing surface in which to mount the outer struts.

(a.) Glue a WA part onto each of four standard W4 ribs. IMPORTANT NOTE: All four of the assemblies are different. There is an upper right, lower right, upper left and lower left. Check with the plan to insure that you assemble the parts in correct sequence. WA is on the upper part of the bottom wing ribs and on the lower part of the top wing ribs.

(b.) Cut a slot into W5 with a new, sharp knife or razor blade to pass brass part ST. Be careful not to cut too deeply. Follow the construction layout shown below and put the notch in toward WA. Don't get glue into the notch. Leave ST out until the wing is completely assembled and ready for covering.

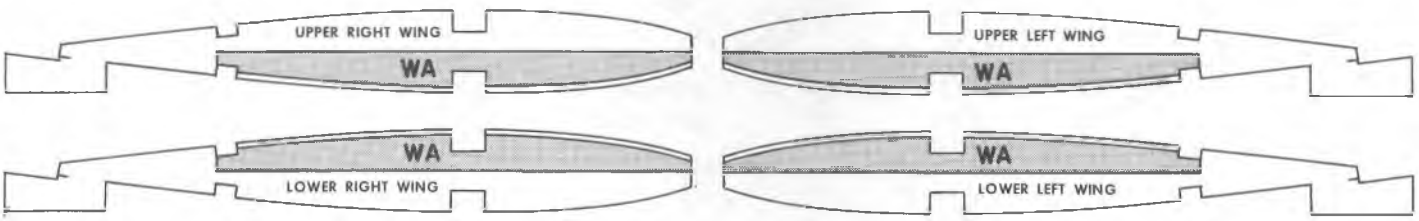
(c.) Glue W5 on WA, lining it up exactly with the W4 rib or W2 rib.

USE W2 OR W4 BASE RIB TO GLUE WA TO, DEPENDING ON AILERON CONFIGURATION USED.



GLUE NOTCHED SIDE OF W5 RIBS IN, TOWARD WA. DON'T GET GLUE INTO NOTCH.

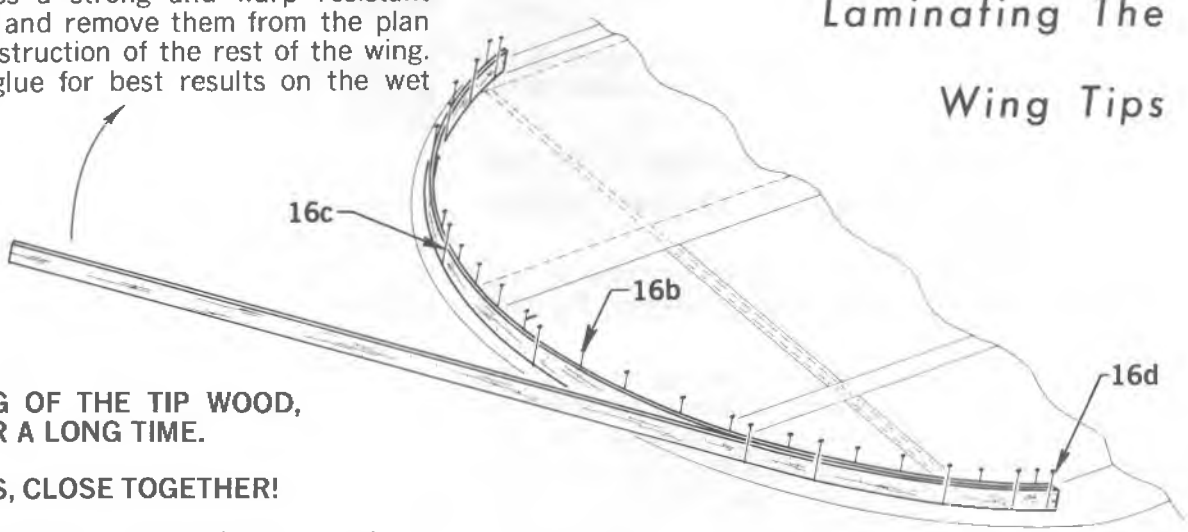
Outer Strut Rib Assembly



(16.) WING TIPS

The laminated outline used on the wing tips is not difficult and produces a strong and warp resistant unit. Make the tips and remove them from the plan before beginning construction of the rest of the wing. Use only Sig Bond glue for best results on the wet wood.

Laminating The Wing Tips



FOR EASY BENDING OF THE TIP WOOD, SOAK IN WATER FOR A LONG TIME.

USE PLENTY OF PINS, CLOSE TOGETHER!

(a.) Soak 1/16" x 1/4" balsa strips for at least an hour to soften them.

(b.) Place pins along the inside of the tip outline on the plan.

(c.) Pin a strip of 1/16" x 1/4" balsa against the first line of pins, holding it in place with a second line of pins.

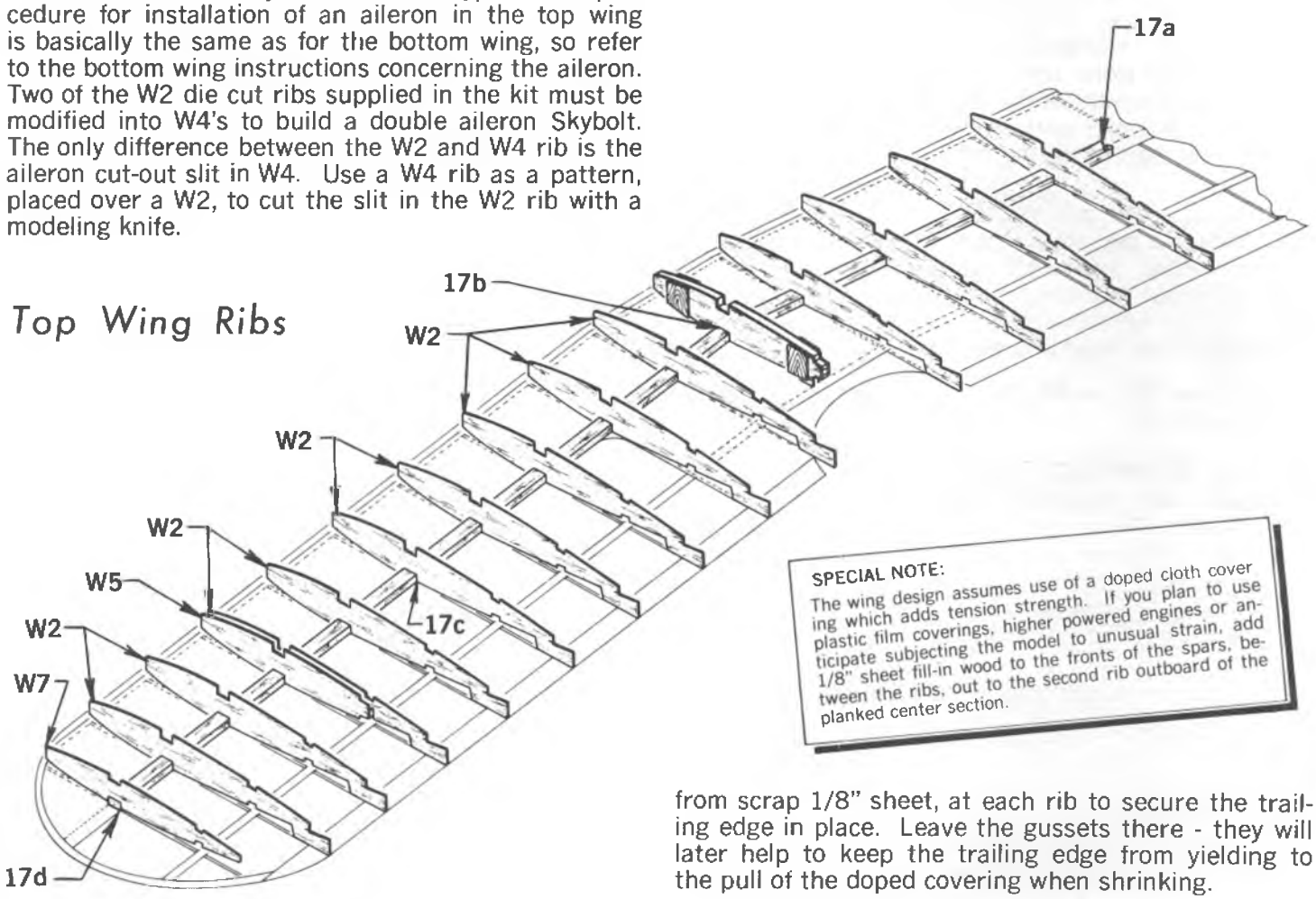
(d.) As the second strip is laminated against the first, remove the second line of pins one by one as you proceed along the tip and move them over to secure the second strip against the first.

(e.) Continue the process described in (d.) above until all four strips are joined. Allow to dry thoroughly before removing from the board.

(17.) TOP WING ASSEMBLY

The following sequence describes the construction of the top wing without ailerons. If you want to build the double aileron version with ailerons in the top wing, refer to the full size plan which shows the different construction layouts for each type. The procedure for installation of an aileron in the top wing is basically the same as for the bottom wing, so refer to the bottom wing instructions concerning the aileron. Two of the W2 die cut ribs supplied in the kit must be modified into W4's to build a double aileron Skybolt. The only difference between the W2 and W4 rib is the aileron cut-out slit in W4. Use a W4 rib as a pattern, placed over a W2, to cut the slit in the W2 rib with a modeling knife.

Before beginning construction of the wing frames, the laminated wing tips should be made and removed from the board. Also complete the W1 and W5 rib assemblies for installation in the wing structure.



SPECIAL NOTE:
The wing design assumes use of a doped cloth covering which adds tension strength. If you plan to use plastic film coverings, higher powered engines or anticipate subjecting the model to unusual strain, add 1/8" sheet fill-in wood to the fronts of the spars, between the ribs, out to the second rib outboard of the planked center section.

(a.) Pin the 1/4" x 3/8" bottom main spars to the plan. Use epoxy to join the spars in the center of the wing.

(b.) Epoxy glue the W1 rib assembly to the spar.

(c.) Glue the remaining ribs to the spar. Sig Bond is recommended.

(d.) Put rib W7 in place, but do not glue it until later when adding the wing tips and aligning the parts together.

(e.) Fit the trailing edge into the jig ledge on the back of the ribs. Trim parts wherever necessary to make the trailing edge fit snugly against the ribs. Note that the 90 degree angled front corner of the trailing edge is placed down. (See the rib cross-section drawings on the full size plan.) Check the position of the 1/16" x 3/16" cap strips and center section planking on the ribs in relation to the trailing edge to be certain the trailing edge is positioned correctly on the ribs.

(f.) Since there will be minimum gluing contact between the ribs and the trailing edge until the cap strips are installed, add some small gussets, made from scrap 1/8" sheet, at each rib to secure the trailing edge in place. Leave the gussets there - they will later help to keep the trailing edge from yielding to the pull of the doped covering when shrinking.

(g.) Add the top 1/4" x 3/8" main spar. Use epoxy glue for the center joint and to attach the spar to the W1 rib assembly.

(h.) Glue on the top rear spars.

(i.) True up the fronts of the ribs by sanding lightly with a long sanding block, preferably at least 24" long. This also angles the rib fronts so the leading edge will fit snugly against them.

(j.) Glue the leading edge to the front of the ribs.

(k.) Punch or drill a 1/16" hole through the middle of the center section leading edge into the inner channel of the W1 rib assembly. This is to pass a wire to punch the dowel out when removing the top wing from the cabane struts.

(l.) Fit the laminated wing tip and glue the rib onto the wing. Hold it in place with pins and scrap scabs of wood underneath. Glue to the leading and trailing edge first.

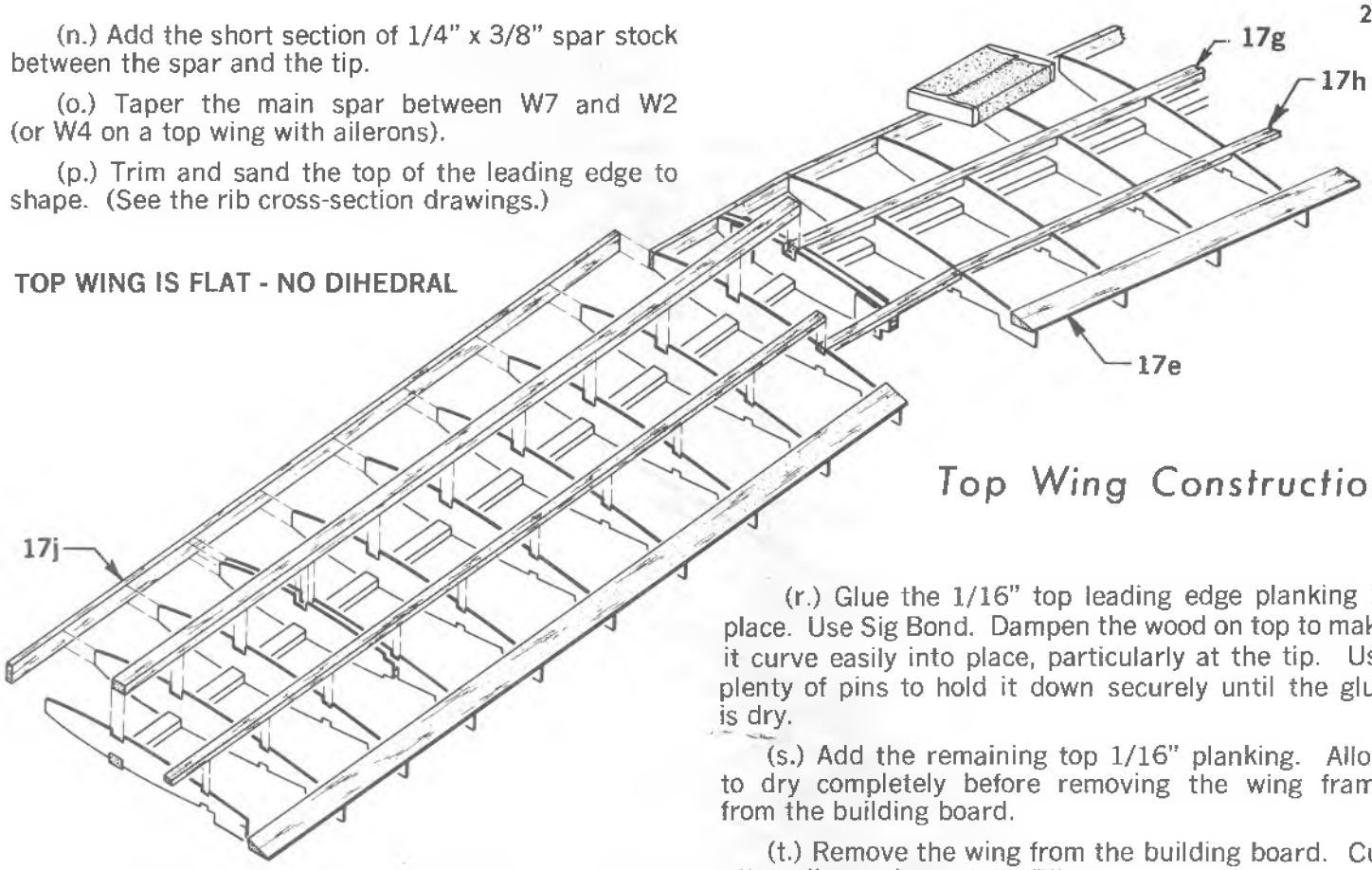
(m.) Fit rib W7 against the tip and glue the rib to the tip and to the spars. The rear spar must be bent down to the tip. Wetting it will help it bow into place.

(n.) Add the short section of 1/4" x 3/8" spar stock between the spar and the tip.

(o.) Taper the main spar between W7 and W2 (or W4 on a top wing with ailerons).

(p.) Trim and sand the top of the leading edge to shape. (See the rib cross-section drawings.)

TOP WING IS FLAT - NO DIHEDRAL



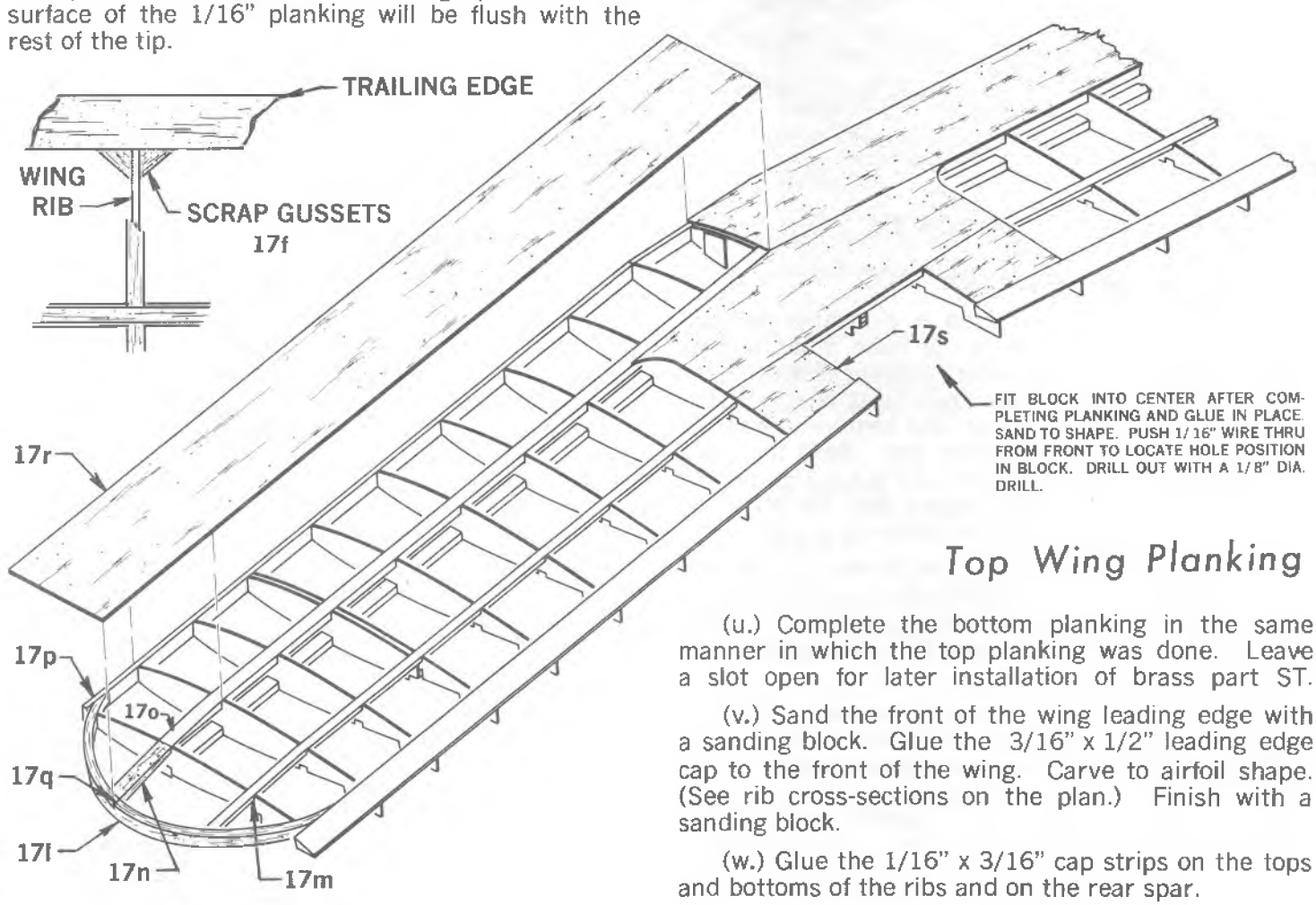
Top Wing Construction

(q.) Notch into the laminated wing tips so that the surface of the 1/16" planking will be flush with the rest of the tip.

(r.) Glue the 1/16" top leading edge planking in place. Use Sig Bond. Dampen the wood on top to make it curve easily into place, particularly at the tip. Use plenty of pins to hold it down securely until the glue is dry.

(s.) Add the remaining top 1/16" planking. Allow to dry completely before removing the wing frame from the building board.

(t.) Remove the wing from the building board. Cut off the jig portions of the Ribs.



Top Wing Planking

(u.) Complete the bottom planking in the same manner in which the top planking was done. Leave a slot open for later installation of brass part ST.

(v.) Sand the front of the wing leading edge with a sanding block. Glue the 3/16" x 1/2" leading edge cap to the front of the wing. Carve to airfoil shape. (See rib cross-sections on the plan.) Finish with a sanding block.

(w.) Glue the 1/16" x 3/16" cap strips on the tops and bottoms of the ribs and on the rear spar.

(x) Round the wing tips with a sanding block and sand the entire wing smooth in preparation for covering.

(y) Epoxy the brass parts ST into the slots in the W5 rib assemblies. Be certain that plenty of glue is worked into the slot and onto the adjacent spar areas.

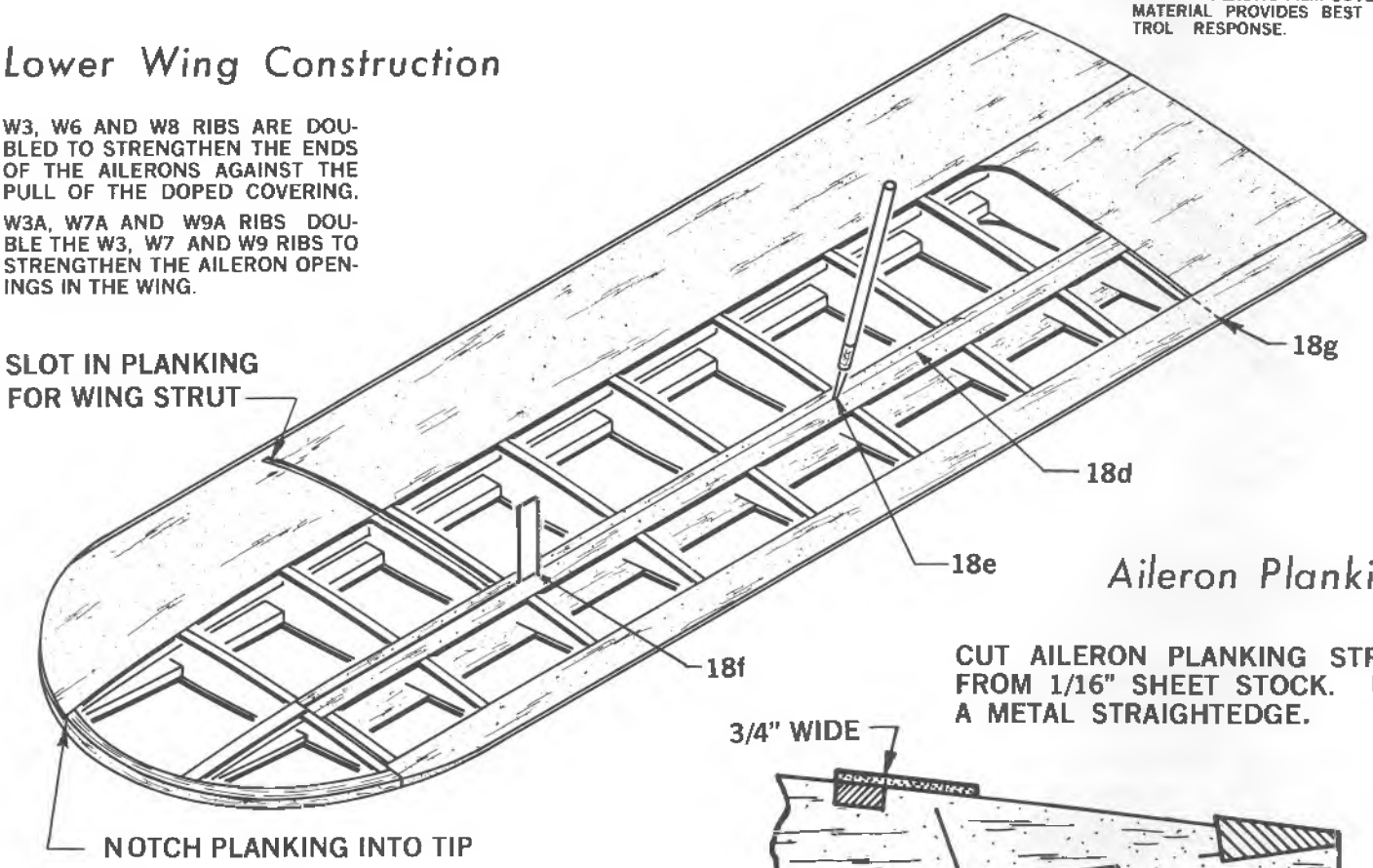
(z.) Epoxy the 1/16" I.D. Eyelet in the center leading edge hole.

Lower Wing Construction

W3, W6 AND W8 RIBS ARE DOUBLED TO STRENGTHEN THE ENDS OF THE AILERONS AGAINST THE PULL OF THE DOPED COVERING.

W3A, W7A AND W9A RIBS DOUBLE THE W3, W7 AND W9 RIBS TO STRENGTHEN THE AILERON OPENINGS IN THE WING.

SEALING CONTROL GAPS WITH TAPE OR PLASTIC FILM COVERING MATERIAL PROVIDES BEST CONTROL RESPONSE.



Aileron Planking

CUT AILERON PLANKING STRIPS FROM 1/16" SHEET STOCK. USE A METAL STRAIGHTEDGE.

(18.) LOWER WING ASSEMBLY

The lower wing is constructed in a manner nearly identical to the top wing so the basic steps will not be repeated here. The major differences are the ailerons and the fact that the lower wing is constructed in two halves. Make one half and remove it from the board before building the other half. Read the upper wing steps (17.) (a.) through (17.) (s.), which are the same for the bottom wing, except that rib W7 is W9 on the lower wing and step (k.) does not apply.

A small gauge pattern is provided in this book for setting the angle of the end of W2 rib in each half of the lower wing. Paste it to a piece of cardboard and use this to set the angle of the end ribs when gluing them to the spar.

When you read step (s.), refer to the lower wing cross sections to understand the additional 1/16" planking required for the aileron on the bottom wing (or for the aileron on the top wing, if you are building a double aileron version). For a single aileron version, leave off the center section top planking over the aileron torque rod for coordination with the torque rod installation as is explained further on in this section.

Having completed the 2nd bottom wing half through step (s.) proceed with the lower wings as follows:

(a.) Leave the second bottom wing half on the board and match the other half to it with the tip blocked up as indicated in the accompanying dihedral diagram. If the halves do not fit snugly together, touch up with a sanding block until they do.

(b.) Punch some 1/16" diameter holes at a slight angle into the ends of the spars, leading and trailing edges. Carefully spread epoxy glue into these, working out any air lock. Also glue the rib faces and join the two halves together. The glue in the punched holes will "nail" the parts together and make the joints stronger than the wood itself. When the glue cures, remove the wing from the board. Cut off the jig portions of the ribs.

NOTE: In the case of use of a minature size aileron servo and single ailerons, the hardwood piece on which the servo is mounted (see full size plan) will serve as a very adequate joint splice. If you use a larger servo (which will be screwed to a plywood scab epoxied on top of the spars) or if you build a double aileron version (with the servo mounted horizontally behind the main spars), epoxy some scrap plywood across the spar joints before closing in the bottom of the wing. Also epoxy a strip of aircraft tape or fiberglass cloth (not furnished) across the top center seam of the bottom wing and coat it generously with epoxy.

(c.) Complete the bottom planking. This ends on the second rib from the middle joint and does not go all the way to the center line. The gap will be filled later when the fairing is added to the bottom of the center section.

(d.) Locate the back edges of the rear spars on the surface of the planking and draw guide lines on both top and bottom about 1/32" behind this so there is no danger of cutting into the spars in the next step.

(e.) Cut through the planking on the guide lines with a sharp knife.

(f.) Remove the blade from an X-acto razor saw by prying apart the crimped metal backing with a screw driver. Insert the blade into the slits just cut in the planking and saw through each of the ribs.

(g.) Saw through the trailing edge and remove the ailerons.

(h.) Trim and sand the back of the wing with a sanding block so the planking is flush with the back of the rear spars.

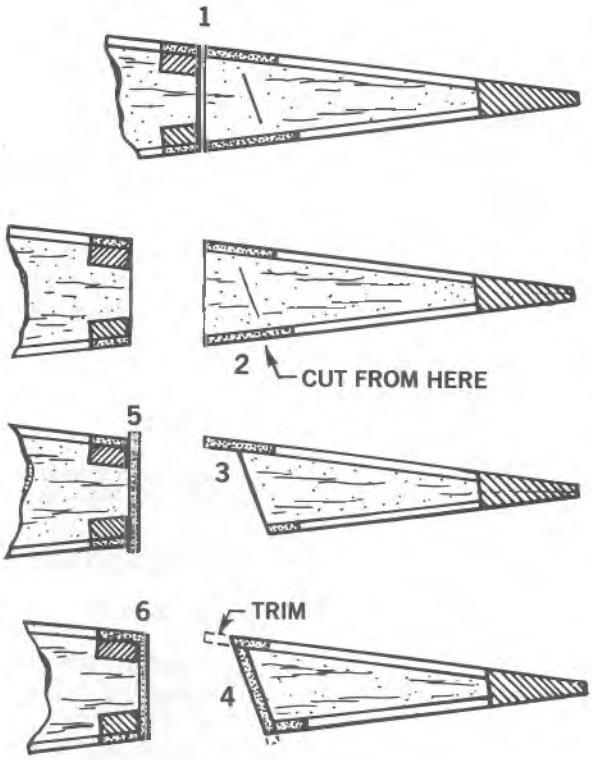
(i.) Cover the open back of the wing with 1/16" sheet wood.

(j.) Cut through the ailerons from the bottom in line with the die-cut slits. Be careful not to damage the top planking which must be left protruding in front of the aileron ribs.

(k.) Fit a piece of 1/16" sheet to the face of the aileron. Bevel the edge of the piece of sheet to fit against the top planking that protrudes in front of the aileron ribs.

(l.) Complete the construction and sanding of the lower wing in the same manner previously described for the upper wing in steps (u.) through (y.).

Cutting Off The Ailerons



STEP 1 - SAW AILERON OFF AT BACK OF REAR SPAR.

STEP 2 - CUT THROUGH BOTTOM PLANKING AND RIBS IN LINE WITH DIE CUT SLIT

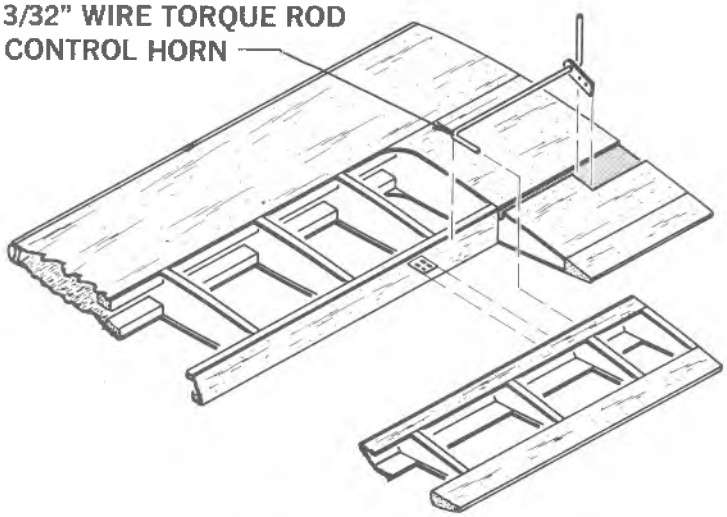
STEP 3 - LEAVE TOP PLANKING PROTRUDING UNCUT IN FRONT OF RIB.

STEP 4 - FACE FRONT OF AILERON WITH 1/16" SHEET STOCK AND TRIM AILERON TO CONTOUR.

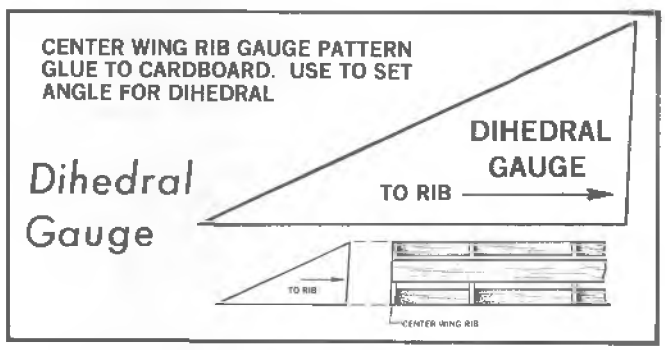
STEP 5 - COVER BACK OF WING WITH 1/16" SHEET STOCK.

STEP 6 - TRIM WING TO CONTOUR.

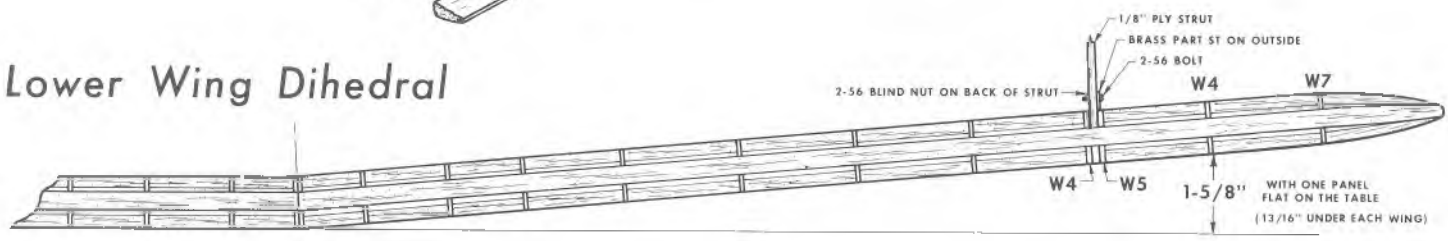
Single Aileron Hinging



Dihedral Gauge



Lower Wing Dihedral

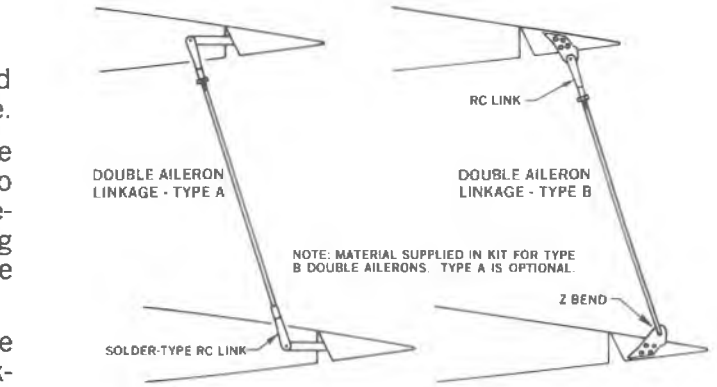


(19.) SINGLE AILERON HINGING

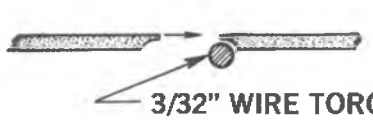
(a.) Cut a slot into the aileron in which to imbed the torque rods. Have them slightly below the surface.

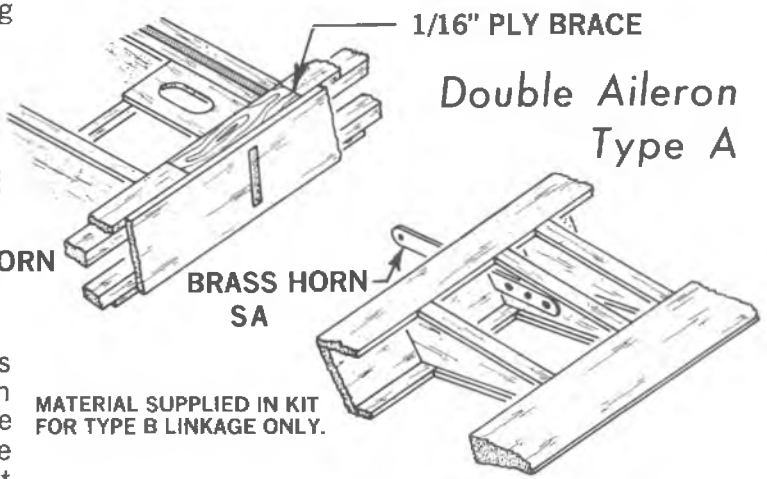
(b.) Epoxy the hinges into the ailerons. Check the operation of the ailerons with them attached dry to the wing to make sure there is no binding before epoxying in the torque rods, the hinges into the wing and the nylon bearing that supports the ends of the torque rods in the center section.

(c.) The torque rod will be just below the surface of the wing. Carefullly shape the edges of the planking to close the gap over the rod. This allows silking and doping over it without sticking problems.



Planking Over Control Horn





Double Aileron Type A

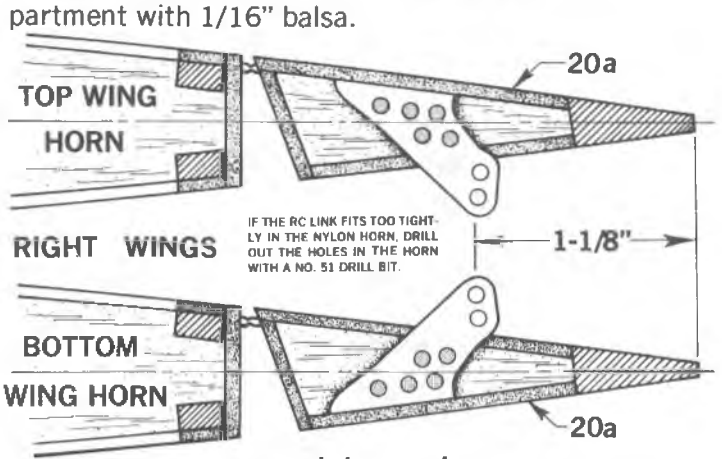
(20.) NOTES ON DOUBLE AILERONS

For double aileron pushrod hookup, refer to the plans and mount the bellcrank on 1/8" plywood between the wing ribs. The exact location of the 1/16" wire will be determined by the type of servo you will be using and the position of the output arms. In most cases the servo board will be mounted as low in the wing as possible, usually sitting directly on the 1/16" bottom planking of the center section. (See center section Bottom Fairing section.) Mark the spots on the ribs through which the pushrod will pass. Put a small 1/16" scrap bearing on a rib midway between the servo and the bellcrank. Check out the aileron movement before closing up the wing covering to make certain the correct amount of movement with your brand of servo is achieved. The lower gap in the aileron should almost completely close in one extreme servo position. If not, move the pushrods to the other holes in the bellcrank to attain the desired amount of movement. This also can be regulated to a certain extent by choice of holes in the nylon aileron horn but it is best to be certain that the internal hookup is in the ballpark before covering the wing.

There are two ways recommended for interconnecting the ailerons. The method (A) shown in this book is better balanced and transfers less load on the servos. However, to disconnect the linkages when removing the wings, it is necessary to use the radio to drive the servo to one extreme or the other so as to bring the RC links near the surface of the wing where they are easily reached. This is also the case when installing the wings. The spars must be cut away to clear the movement of the brass horn SA. Replace the wing planking over these cutouts with 1/16" plywood to retain wing strength. So while this method gives a technically ideal installation, the advantages must be balanced against the building intricacies involved.

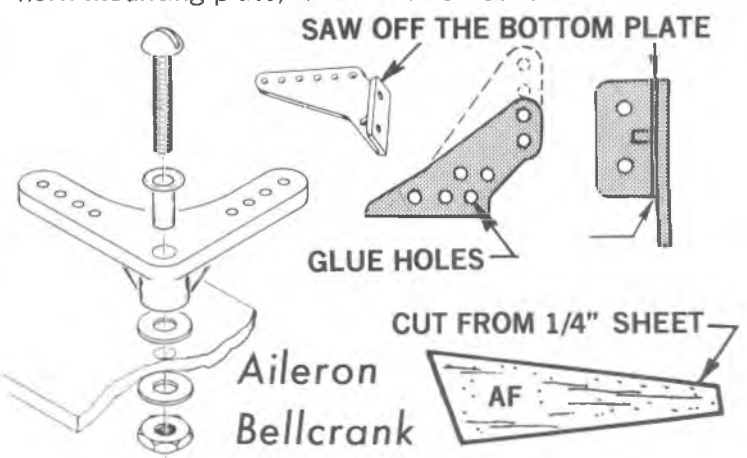
Shown here and on the plan is another method (B) that is more practical, since the linkages can be removed without the use of radio. It does not appear to produce an undue load on the servos.

(a.) Sheet the bottom of the aileron horn compartment with 1/16" balsa.



Double Aileron Type B

(b.) Cut off the four small nylon horns as shown by the accompanying pattern. Discard the attached horn mounting plate, it will not be needed.

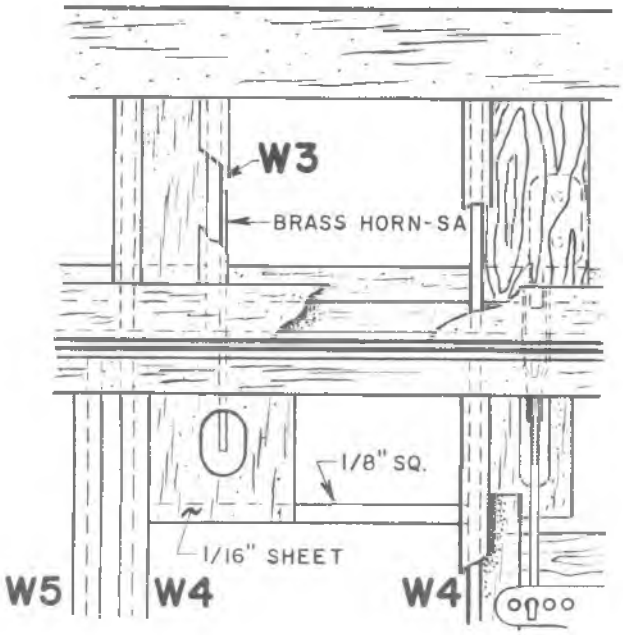


Aileron Bellcrank

(c.) Epoxy the horns to the bottom planking and to the rib. The epoxy will fill the holes and "nail" the horn to the wood.

(d.) Plank the top of the horn section with 1/16" sheet balsa.

Type A Aileron Construction



(e.) Use the aileron connecting rod pattern to make up the linkage to hook the top to the lower.

(21.) WING SADDLE

The next fuselage construction steps require the comleted and planked bottom wing. For best finished fit, the wing should be covered and the first coats of dope applied.

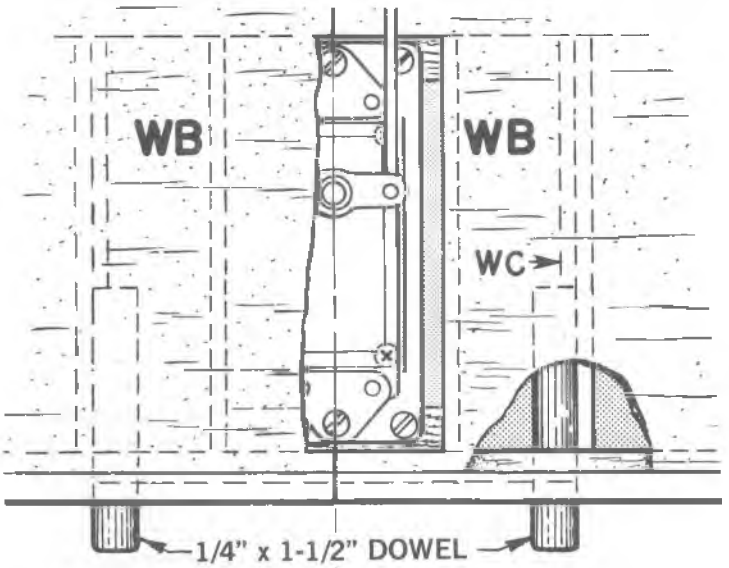
(a.) Sand the fuselage to match exactly the contour of the bottom wing. If you are using a fillet, allow for the fact that the 1/32" plywood wing saddle FZ will be added to the opening between the wing and fuselage. Tack glue some small scraps of 1/32" in the opening to hold the wing in the same relationship to the fuselage it will be when the 1/32" wing saddle is finally installed.

(b.) Check the position of the wing leading edge when it is in place on the fuselage against F7 and mark and drill a hole in the center of the wing leading edge so that the dowel installed in it will hit the approximate hole location in F7 shown on the cross-section on the plan.

NOTE: Some fliers prefer the extra rigidity and strength provided by two dowels in the leading edge. Follow the same procedure, but glue the dowels to the first two ribs on each side of the center.

(c.) Push a 1/4" x 1-1/2" dowel into this hole until only about 1/16" protrudes. (Note that this is a temporary dimension for checking purposes only. When finally glued in the dowel should stick out 1/4" to 3/8") Hold the wing up against the wing opening in the fuselage and mark the spot where the end of the dowel hits F7.

Suggested Two Dowel Installation



BRACE DOWELS WITH 1/4" SCRAP

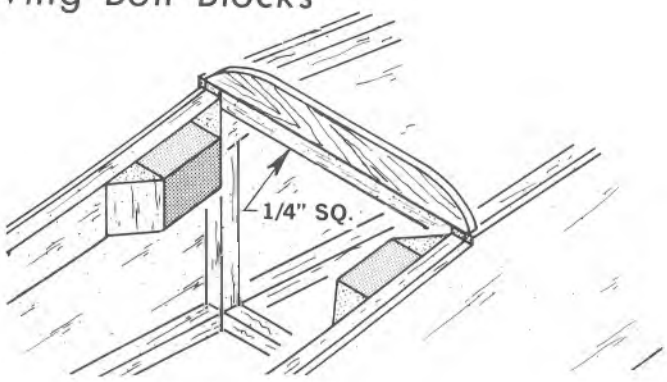
(d.) Remove the wing and drill a 1/4" hole in the marked spot of F7.

(e.) Put the wing back on to check the position of the dowel hole. It is probable that the alignment is not yet perfect. Enlarge the wing dowel hole as required to shift the dowel so that the wing will fit snugly against the fuselage. Plug the enlargement with scrap slivers. Pull the dowel out with about 1/4" to 3/8" protruding from the leading edge. Glue the dowel into the wing with Sig Kwik-Set 5-minute type epoxy glue and hold the wing in place on the fuselage until it sets up. Be careful not to let the glue ooze out of the dowel hole into F7. Use only a minimum amount since it can be glued additionally once the alignment is set. When the epoxy sets up remove the wing and surround the dowel inside the wing with pieces of scrap balsa, bracing it against the bottom planking and to the top. If the dowel is being inserted into a hardwood servo mount block, as on a single aileron version (see photo in Radio Equipment Section), no further bracing will be required, just fill the hole with epoxy.

(f.) Hold the wing in position and by pushing a long pin through it, locate the proper spots on the bottom of the wing to drill through to hit the hardwood wing bolt anchor blocks in the desired location. (Or do this before installing the plastic top and the block positions can be marked on the top of the wing by reaching through the open fuselage.) Drill through the wing and anchor block with a No. 7 drill. Tap the hardwood blocks with a 1/4-20 tap. Enlarge the holes in the wing to pass the nylon wing bolts by drilling through them with a 1/4" diameter bit.

(g.) On models using the optional fillet remove the tack-glued scraps of 1/32" that have been holding the wing at the correct location. Protect the top of the wing from epoxy leakage by taping plastic wrap to it. Turn the fuselage upside down and put the plywood wing saddles F Z in place on each side using Sig

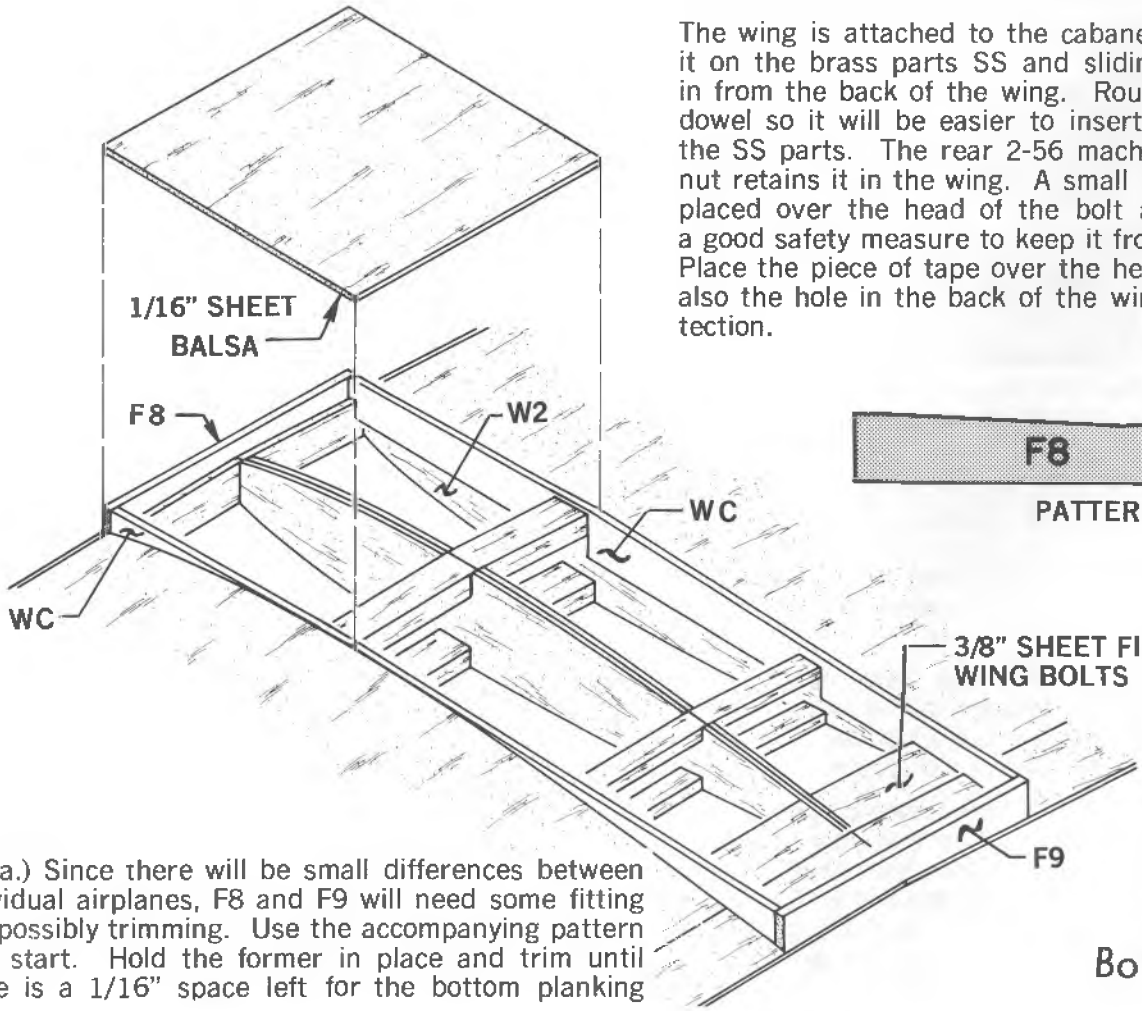
Wing Bolt Blocks



Epoxy Glue. (Not Kwik-Set, as more time than 5 minutes will probably be needed). Replace the wing and bolt it in position with the nylon wing bolts. This will force the FZ plywood saddles up tightly against the fuselage. If FZ does not seat down against the wing surface in some spots, drive a sliver of wood between the saddle and the fuselage to force FZ against the wing while the epoxy is setting up.

(22.) BOTTOM FAIRING

Don't install the bottom fairing on the lower wing center section until the wing is fitted to the fuselage and in place on it. Put a piece of plastic wrap over the leading and trailing edge when mounting the wing to protect F7 and F10 from glue when adding F8 and F9.



Lower Wing Bottom Fairing

PATTERN

(a.) Since there will be small differences between individual airplanes, F8 and F9 will need some fitting and possibly trimming. Use the accompanying pattern as a start. Hold the former in place and trim until there is a 1/16" space left for the bottom planking on top of F8 and F9 when held in place against F7 and F10.

(b.) Add the WC side parts, trimming and insetting where necessary to be flush with F8 and F9. Glue WC to the W2 rib.

(c.) Do any remaining chores, such as mounting the servo and strengthening the wing dowels with scrap or Epoxolite putty before closing up the bottom.

(d.) Plank the fairing frame with 1/16" sheet balsa.

(e.) Add pieces of sheet balsa to each side to provide carving wood to complete the shape of the bottom and match F7 and F10. The thicker wood at each end will need some sanding to contour to fit the block against the curve of the wing. The outline of the outer edge of the bottom fairing is shown on the full size plan of the bottom wing.

(f.) Carve and sand to shape, blending into the contours of the front and rear parts of the fuselage bottom.

(g.) The wing bolt heads are inset into the fairing blocks and rest on the planking. Since the planking is backed up by a solid block fill-in, this proved sufficient support on the original model. If you wish to really beef this up, inset a small square of 1/16" plywood into the planking for the nylon wing bolt head to seat against.

(23.) MOUNTING THE TOP WING

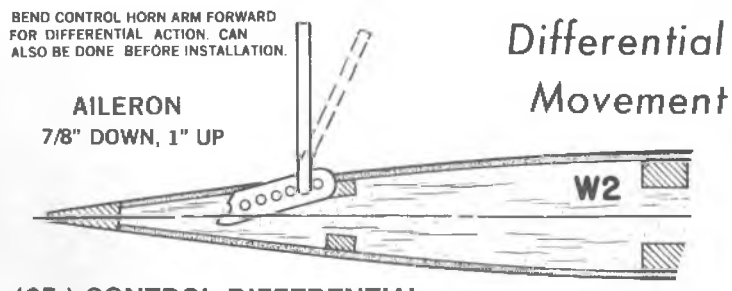
The wing is attached to the cabane struts by setting it on the brass parts SS and sliding the 1/8" dowel in from the back of the wing. Round the end of the dowel so it will be easier to insert into the holes in the SS parts. The rear 2-56 machine bolt and blind nut retains it in the wing. A small piece of vinyl tape placed over the head of the bolt after tightening is a good safety measure to keep it from vibrating loose. Place the piece of tape over the head of the bolt and also the hole in the back of the wing for double protection.

To remove the dowel, push it out from the front by inserting a wire through the eyelet in the leading edge.

Replace the dowel when it shows signs of wear. Reversing it will change the wear spots. If you do a lot of flying you may want to replace it with a piece of 1/8" wire or brass tubing (fill the ends with a small piece of dowel and epoxy so it can be pushed out). It is advisable however, to use the dowel on test flights since it has a break-away capability that will reduce damage in a crackup.

(24.) OUTER STRUTS

Sand the front and back edges of the die-cut struts to a rounded section. They are slightly over length to accommodate any small individual differences between models. Mount the wings on the fuselage and use pieces of masking tape from tip to tip to hold the top wing level. Measure from tip to tip at each end to check alignment. Make cardboard patterns by tracing around the die-cut struts with a pencil. Cut these out and fit them into the strut slots in the wings, trimming the patterns with scissors as necessary to get a good fit. A small notch must be made in the struts at each spar location to clear the spar. Trim the plywood struts according to the cardboard patterns. Mark the holes in brass parts ST onto the struts and drill them to take 2-56 blind nuts. Put the blind nuts on the inside of the struts, facing toward the fuselage. The struts can then be mounted by placing them in the slots in the wings and inserting a 2-56 X 3/8" bolt through each brass part ST and into the strut and blind nut.



Differential Movement

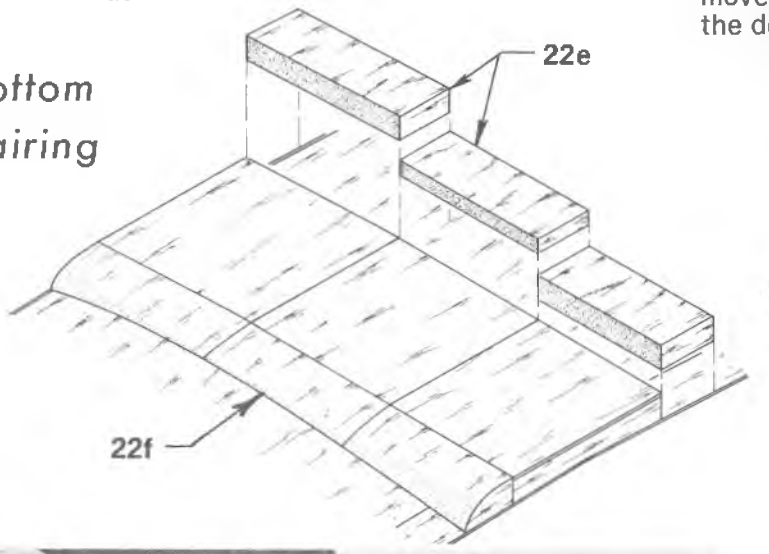
(25.) CONTROL DIFFERENTIAL

Many fliers have a personal preference for variations in amount of control movement from one side of the servo to the other. On the original Skybolt it was found that better balance in outside and inside maneuvers was obtained by having more up movement of the elevators than down. This is obtained by moving the nylon control horn back from the hinge line. The farther back it is moved, the greater the difference will be between up and down. The plan shows position used but individual fliers may want more or less after test flying.

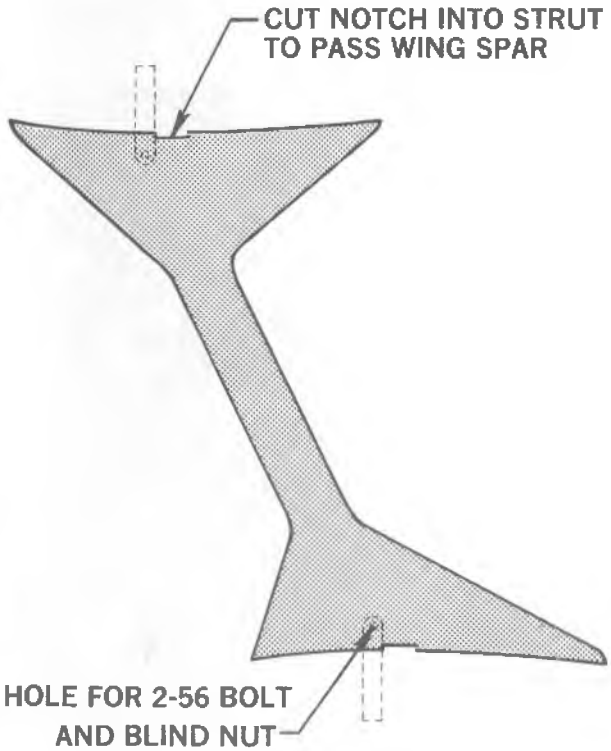
In aileron movement, it is held that better results are obtained when less down movement is used compared to up. In the double aileron version this is obtained automatically by the location of the nylon aileron horn behind the hinge line. To have differential movement in the single aileron setup, bend the 3/32" wire control horn arms forward as shown here.

Servos with rotary output wheels and a variety of pushrod hole locations can be set up for differential movement by selection of the proper hole to obtain the desired effect.

Bottom Fairing



Fitting The Outer Struts



Skybolt Cockpit

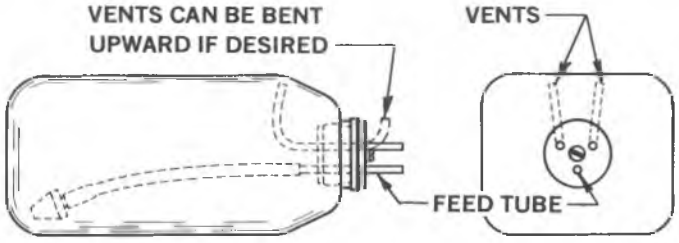
Shown here and on page 27 is the pilot's cockpit and instrument panel. The legend "Aerobatics by Dick Rutt" was added at the time the airplane was repainted with the airbrushed striping. The model uses the original sharp edge color scheme and the covered front cockpit and no bubble canopy as shown on the cover of Private Pilot for August 1973.

Most Skybolts do not have wing fillets.

LaMar Steen

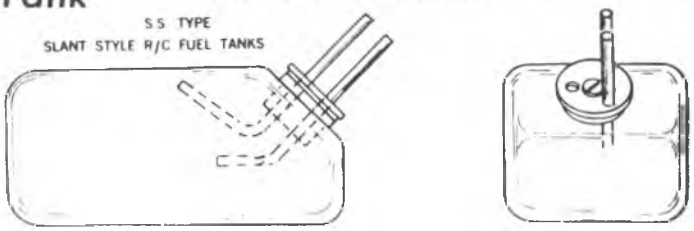
(26.) TANK INSTALLATION

Use a Sullivan RST-12 rectangular plastic tank. (see Sig Catalog.) A side mounted engine is recommended for use in the Skybolt. The plan shows the correct location of the tank for proper fuel draw and idle.



Fuel Tank

WHEN USING A PROP EXTENDER (WHICH MOVES THE ENGINE BACK FARTHER ON THE MOUNTS), A SULLIVAN SS-12 TANK COULD BE USED. THIS REQUIRES LESS ROOM FOR FUEL OUTLETS BETWEEN ENGINE AND FIREWALL.



(a.) Drill a 7/8" hole in the firewall for the neck of the fuel tank. If you prefer, the outlet tubes can be run through individual holes, though this makes it more difficult to install and remove the tank. In either case, the holes are plugged and sealed against leakage of exhaust oil into the fuselage with G. E. Silicone bathtub sealant - obtainable at hardware stores.

(b.) If the tank is equipped with an internal fuel line cut from Sig Heat Proof tubing it can easily be left in the fuselage for a full season of flying since this line will not harden when immersed in fuel. So install the tank semi-permanently with cross pieces of plywood or balsa to hold it in place. Should the need arise to remove it, break away the scrap supports and bathtub seal and pull the tank out through the lower wing opening. In this connection, be sure and leave enough room in front of the servo installation.

(27.) SANDING AND FINISHING PLASTIC PARTS

All of the plastic parts should be sanded to remove the gloss on the surface of the plastic before they are painted. Don't sand the plastic fuselage top with coarse sandpaper, which can cut deep scratches. These scratches may open up during doping and become more noticeable. Instead use something like 220 grit 3-M Tri-M-Ite no load silicon paper. (See Sig Catalog.) Polish down the first sanding with 360 grit Tri-M-Ite or 400 wet paper before color doping.

The same sanding caution applies to other parts, however in fitting halves of the cowling or pants together there are often relatively large bumps to be worked down on the seams. In this case it is permissable to use a coarser paper or block as long as time is taken to take out any scratches made thereby by polishing down with finer grades of paper.

The plastic parts may be sprayed or brushed with Sig Supercoat Dope. Care should be taken not to apply heavy, wet coats of dope. Put on very light coats and allow them to dry thoroughly before applying a second coat. Spraying is the best method of getting a good finish with a minimum amount of dope - preferably with a spray gun and using as little retarder mixed with the thinner as the humidity will allow. Spray only extremely light, dustlike coats with adequate drying time allowed between them. Be especially careful with spray cans not to get the plastic too wet.

Seal the edge of the masking tape with clear dope before using colored dope. Be careful when removing masking tape from plastic not to start a peeling action on the film of color dope when getting to a corner or going around a curve. Pull the tape back over itself slowly and watch the edge. Use a new sharp modeling knife to cut the paint film if necessary to make the tape peel easily without pulling up the color dope film.

The plastic parts may also be painted with SIG Plastinamel, K & B Super Poxy, Hobbypoxy or DuPont Dulux enamel. Do not use other paints, dopes or finishes without first testing on scrap plastic to make certain they are compatible with the plastic.

(28.) COVERING AND PAINTING

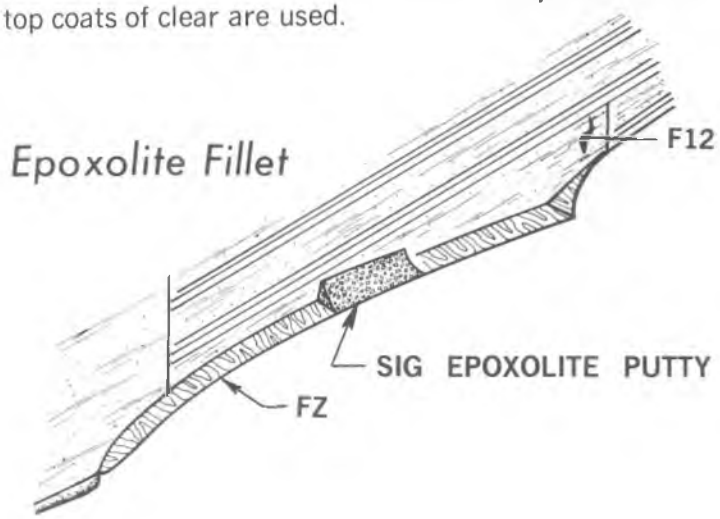
The model should be covered with silk, or other cloth material, rather than Silkspan, due to the large unplanked area. After final sanding of the finished framework give it two coats of dope wherever you want the silk to adhere to the framework. Give these areas another final, light sanding, Remember that covering and paint won't cover up poor workmanship. Be sure all surfaces are smooth. Apply the silk wet but do not stretch too tightly, as it will only encourage warping later on. Pull the silk up just enough to get out all the slack and wrinkles. Paint dope around the edges This will soak through and adhere to the pre-doped framework. Let dry before trimming with a sharp double-edge (for thinness) razor blade. Check for any spots that are not stuck down and apply more dope.

In covering the fuselage sides, lap about 1/2" of the silk up onto the plastic top and dope it to the plastic. Use a 1" wide scrap of silk to tape over the seam between the firewall and the plastic fuselage top.

Next, give the entire airplane two or three brushed coats of SIG Supercoat Clear Dope to shrink the silk and remove any wrinkles. Apply the first coat lightly so that the dope will not flow through the silk and run down on the inside. If these two or three coats of regular Clear Dope take out the slackness andy any wrinkles from the silk, switch to Sig Lite-Coat Low Shrink Clear dope for about one to three more coats to complete filling the grain of the silk. Lite-Coat doesn't shrink much and use of it helps keep down the chance of warps developing.

The entire airplane should now be given two coats of white dope. We recommend spraying the color dope. Reduce the dope at least fifty-fifty with Supercoat Thinner for spraying. If you brush, add enough so that it flows out easily without brush marks. Better have the dope a little thin with an extra coat required than trying to spray or brush it on too thickly. When the white is completely dry, mask off the first trim color

areas. Brush around the edges of the masking tape with clear dope. This seals the tape, preventing leakage of colors underneath the edge. Use a good grade of paper to cover the areas not to be painted as much of the outline masking tape as possible, using another layer of masking tape to hold the masking paper in place. The paper and double layer of tape will prevent the dope from soaking through and staining the white with residue from the tape. Don't leave the masking tape on any longer than necessary--the longer it is on, the tighter it sticks to the finish. Repeat the above process for the second trim color. After all trim color dope is applied (but not the decals), spray two to four coats of Lite-Coat Low Shrink Clear dope over the entire model. If the plastic parts have been trimmed with color dope, they should also be sprayed with top coats of Clear. The model will be easier to keep clean when top coats of clear are used.



(29.) WING FILLET (OPTIONAL)

(Full size Skybolts do not have wing fillets, but the fillet used on the prototype model made a good wing seat for the lower wing.)

The fuselage should be covered before the wing fillet is applied. Tape the outline of the wing fillet off with masking tape to avoid getting Epoxolite smears on the fuselage. Mix the putty according to the directions on the cans. Smooth into the fillet area with a paddle. As the putty begins to set ip it can be smoothed with a wetted finger tip. Allow to set for 24 hours before sanding. Use fairly coarse garnet paper wrapped around a round object for initial sanding, and shaping. Finish with fine garnet or no-fill silicon paper. Allow the Epoxolite to cure for at least 48 hours before painting. Use very light coats of dope and allow them to dry thoroughly before applying another coat.

(30.) WINDSHIELD

Cut the windshield from clear plastic sheet, using the pattern in this booklet. Fasten it to the model with Sig-Ment used sparingly. The "super" type, cyanocrylate glues are also handy for attaching the windshield since they take hold almost instantly. Cover the glue seam with a strip of Stripe-Rite colored plastic tape or a strip of ABS plastic to simulate the windshield attachment strip of the full size airplane.

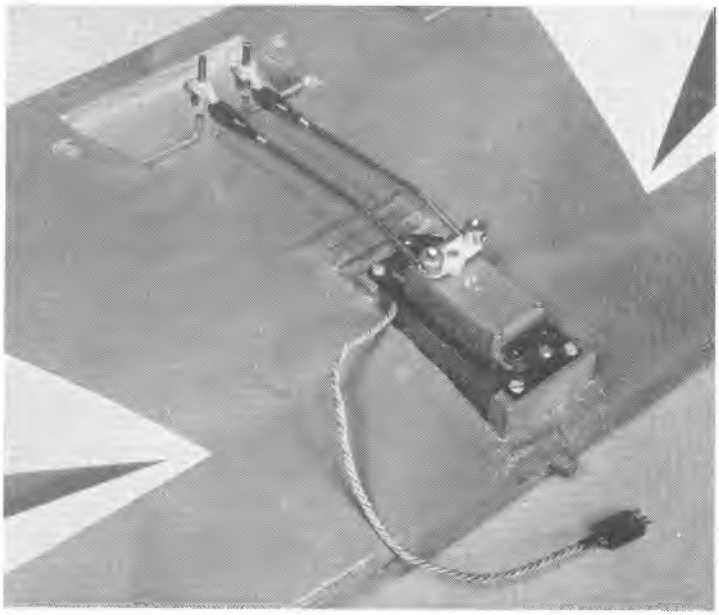
(31.) DECALS

Model fuels are hard on decals. Even if you are using no nitromethane, the oil will get to and loosen them. So try to direct all fuel overflow and exhaust spray out to an area without decals. Keep a coat of auto paste wax over the decals and replace it at regular re-applications.

"DKM" STIK-TITE PRESSURE SENSITIVE DECALS

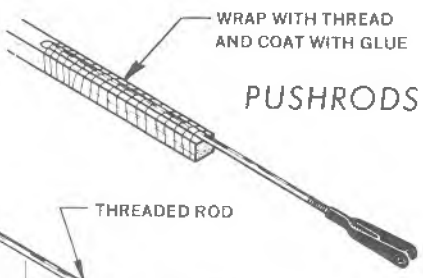
Cut out the decals with a pair of sharp scissors. Leave about 1/32" to 1/16" of clear edge around the decal. Round the corners as you are cutting. Wet the surface on which the decal will be placed with soapy water (use dishwater detergent). Place the decal on the model and squeegee the water from underneath with a balsa paddle. Allow to dry. This procedure will prevent air from being trapped underneath as is possible when the decals are applied dry.

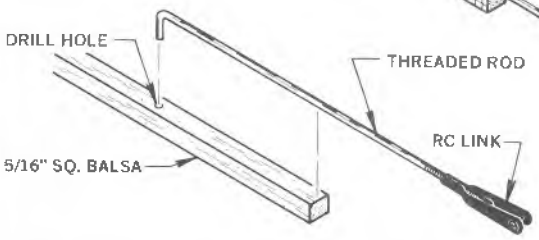
Bottom Color Scheme



The original model first used an EK-MM aileron servo on an AM-3 plastic mount with the rear end screwed to a 1/8" ply scab glued on top of the planking over the spars. Later the shorter EK-SM mounted on an AM-4 plastic mount shown in the photo was installed on a piece of hardwood glued to the front face of the spars.

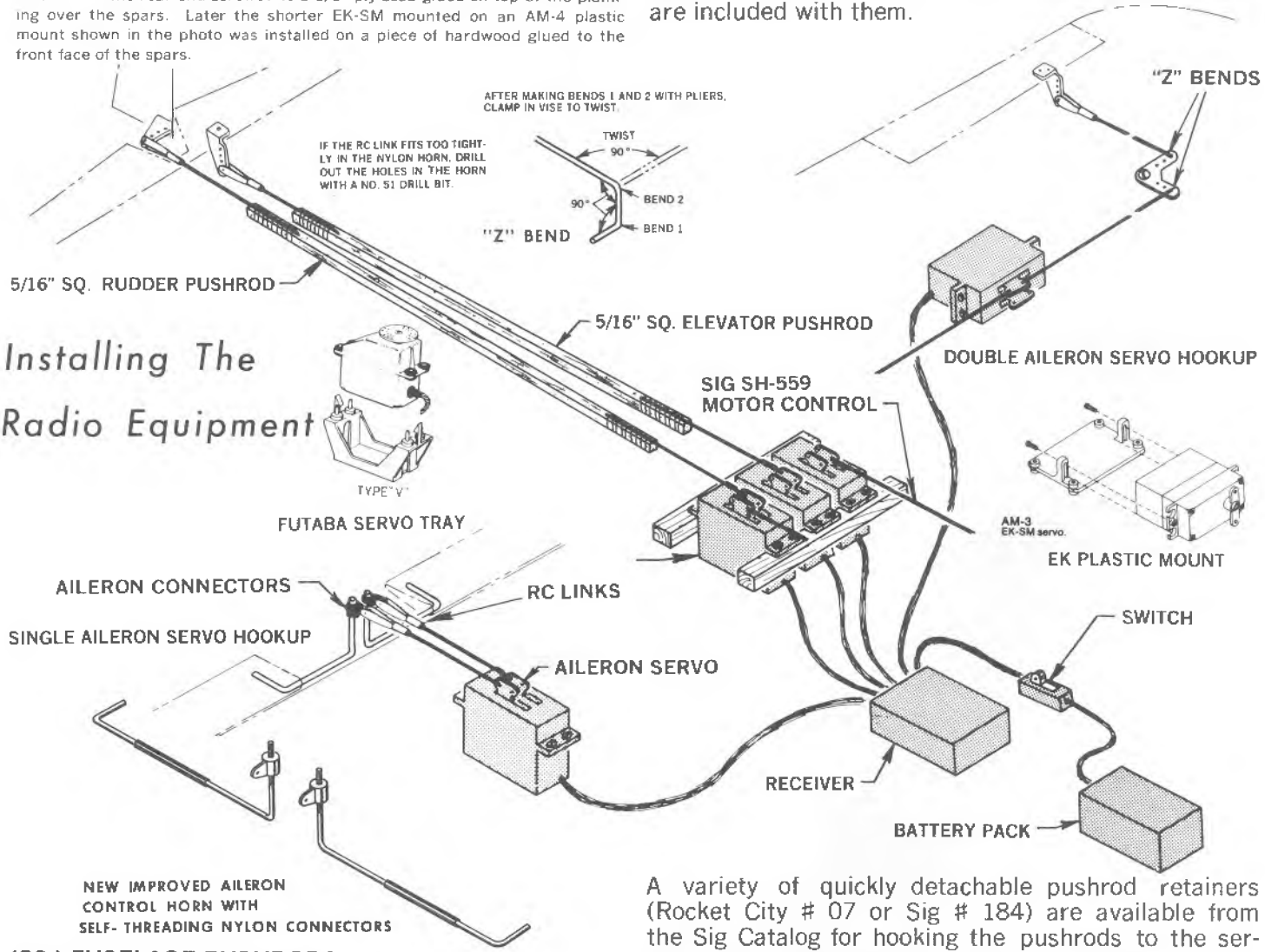
MAKE CONTROL SURFACE ENDS OF PUSHROD FIRST, FEED THROUGH FUSELAGE, HOOK RC LINK TO SURFACE, CUT SERVO END OF BALSA TO EXACT LENGTH NEEDED, MEASURE AND INSTALL SERVO CONNECTING WIRE END.





(33.) RADIO EQUIPMENT INSTALLATION

The most convenient method of installing servos is on the plastic mounts which most of the radio equipment makers offer with their outfits or as an accessory. These are screwed to hardwood mounting rails for fuselage servos or to hardwood blocks for mounting in the wing. Instructions for the use of these mounts are included with them.



Installing The Radio Equipment

(32.) FUSELAGE PUSHRODS

5/16" square balsa is provided to make the fuselage pushrods that run to the elevator and rudder. Bind the fittings to each end with heavy carpet thread and epoxy glue. Use the R/C links at the tail end so that trimming adjustments can be quickly made.

A variety of quickly detachable pushrod retainers (Rocket City # 07 or Sig # 184) are available from the Sig Catalog for hooking the pushrods to the servos. Avoid metal-to-metal contact in linkages because this may produce harmful radio interference.

A flexible steel cable pushrod with nylon outer tubing (not furnished) such as the Sig SH-559, or Du Bro FC-149 is recommended for hookup of the throttle to the motor control servo.

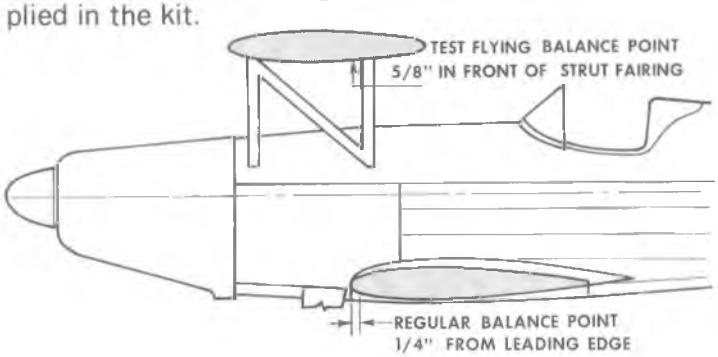
For the single aileron version, Du Bro AH-79 or Rocket City # 05 strip aileron horn wire connectors are suggested to hook the servo to the wire aileron horns.

The receiver battery pack should be wrapped in foam rubber sheet, held on with rubber bands. Place it as far forward as possible, under the tank. It is a good idea to put the package in a small plastic bag, taped shut around the battery cable to protect the battery from accidental fuel leakage.

The receiver should be similarly wrapped up in foam rubber to protect it from engine vibration. Cover it with a plastic bag also. Stow this completed package in front of the servos. Make certain that the receiver will stay in place during aerobatic maneuvers.

"Brick" type receiver and servo combinations will have to be mounted on rails as specified by the manufacturer of the radio equipment.

Note: No servo mounting material or hardware is supplied in the kit.



(34.) PRE-FLIGHT

Be certain to carefully range check your radio equipment and see how it operates with the engine running before attempting test flights. A lot of problems can be avoided if the engine has been well broken-in and the idle adjustment perfected on a test block or in another airplane before installation in the model. A properly balanced and aligned model with a reliable engine and radio is assured of successful flights.

(35.) FLYING THE SKYBOLT

If you are a newcomer to model flying it is suggested that you not attempt flying without the assistance of a modeler with experience. Contact your local club or ask your hobby dealer for the names of good fliers in the vicinity and a suitable location for flying. Many hours of work are involved in the construction of a model and it can all be lost in a moment of beginner's indecision. A skilled flier can help you get past the first critical test and trimming flights without damage to the model and give instruction in proper control.

Balance the model at the C.G. point indicated on this page. If it balances farther back, add lead to the nose as required. For test flights add some extra lead to the nose to move it 3/8" further ahead.

Trying to fly with the C.G. too far back is much more dangerous than the slight increase in wing loading caused by adding lead to the nose. Balance with an empty fuel tank. When slightly nose heavy the model is much more stable and less likely to snap roll or stall. The reaction to control movements is less sensitive so it's not as easy to over control. Some aerobatic ability may be sacrificed with a forward C.G. so you may wish, after test and familiarization flights, to move it farther back to get more aerobatic ability. Do this slowly and check results and control response in the air at a good altitude.

Hold a small amount of up elevator during the first part of the takeoff to keep the tailwheel steering effective until air speed is high enough for the rudder to take over. The model will drift to the left from torque during takeoff. Feed in some right rudder as soon as the tail wheel clears the ground, earlier if required. The model is not difficult to manage in the air and can be flown by anyone who is capable of handling a multi-channel model.

BOOKLET ILLUSTRATIONS BY MIKE STOTT

SKYBOLT PHOTOS

SPORTS PLANES, APRIL - MAY 1973. COLOR COVER & BLACK AND WHITE PHOTOS. BACK ISSUE.

PRIVATE PILOT, AUGUST, 1973. COLOR COVER AND BLACK & WHITE PHOTOS.

SPORT AVIATION, FEBRUARY 1978. EXCELLENT COLOR SCHEME, MANY COLOR PHOTOS. EAA, Box 229, HALES CORNERS, WISC. 53130

TWO 3-1/2" x 5" COLOR PRINTS OF STEEN'S SKYBOLT IN MARKINGS USED ON MODEL ARE AVAILABLE FROM SIG - ORDER PP-234

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