LIBERTY SPORT

BUILDING AND FLYING INSTRUCTIONS

SIG
CRAFTMAN'S KIT

LIBERTY SPORT

BY DICK GRAHAM

. . ."What's in a name?" . . . In our case, an attractive two-winger with ideal proportions for modeling.

Orval Lloyd, designer and builder, and his brother Liberty (hence the name Liberty Sport) flew their ship to Olathe where it was exhibited during the 1968 NATS.

Having given this airplane the "long look" when it appeared on the cover of the July 1966 issue of SPORT AVIATION magazine, we were very happy to take a few snapshots of the ship and chat with the Lloyd brothers. Orval, incidentally, is no slouch when it comes to model building. The brothers gave us a very complete and accurate 3-view while at the NATS. Later they furnished the pictures and information necessary to fully detail the model.

BEFORE BEGINNING CONSTRUCTION

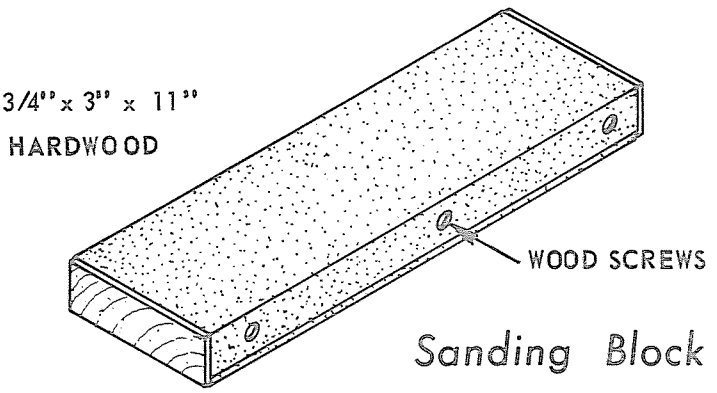
The isometric drawings and instructions are numbered in a sequence for explanation of techniques. This does not mean that the sequence must be followed exactly, step-by-step. To speed construction it may be desirable, for example, to start building the wing or tail while the preliminary parts of the 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.

Photographer Nyle Leatham in the Sport rear cockpit.

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.



Make a large sanding block that will take a full sheet of sandpaper. Use several wood screws on one edge to hold the sheet in place and be easily removable when required for replacing the sandpaper. This will be found a valuable tool during construction of your Sport.

Material for very fine super detailing, which we assume will be used by a minority of Sport builders, is not included in the kit. The instructions and plans, make mention of several of these areas for those who do wish to super detail the model and photos and 3-views of the full-size airplane are included for reference.

(1.) FUSELAGE MAIN FRAME

(a.) Cut FC, FN and FW from the 1/4" printed sheet. It is best to use a jig saw but if one is not available, cut out the parts slightly oversize with a modeling knife and dress down the edges with a large sanding block so they are square and even.

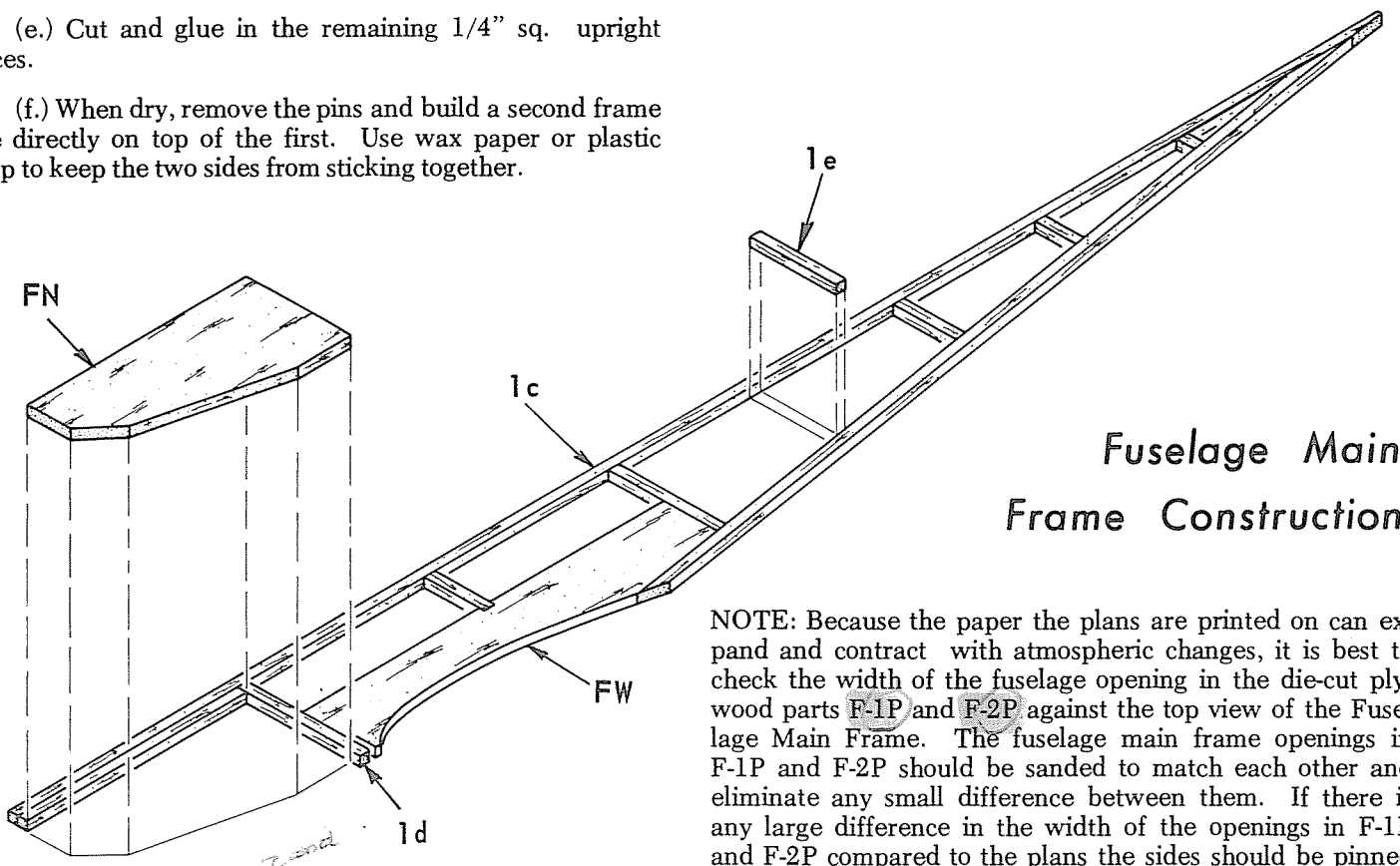
(b.) Protect the Fuselage Main Frame drawing on the plan (Plate One) with wax paper if Sig-Bond is used or cover it with plastic wrap if Sig-Ment is preferred. (Wax paper may inhibit drying of Sig-Ment).

(c.) Pin the top and bottom 1/4" sq. balsa pieces down to the plan.

(d.) Add FW, then the 1/4" sq. upright between FW and FN, next the 1/4" sq. piece above FN and finally glue on FN. Do not glue on FC until after the main frame sides are joined.

(e.) Cut and glue in the remaining 1/4" sq. upright pieces.

(f.) When dry, remove the pins and build a second frame side directly on top of the first. Use wax paper or plastic wrap to keep the two sides from sticking together.

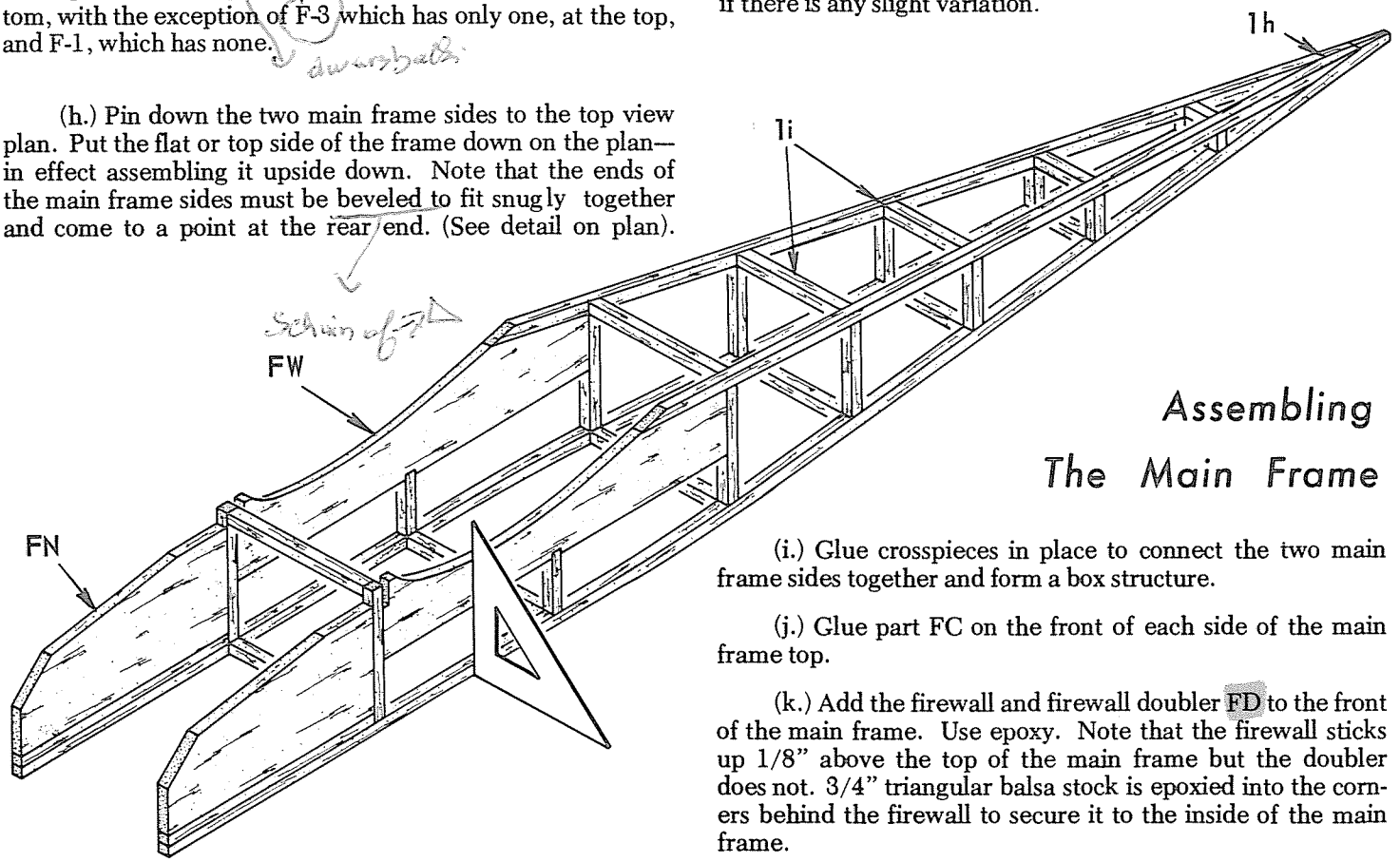


Fuselage Main Frame Construction

NOTE: Because the paper the plans are printed on can expand and contract with atmospheric changes, it is best to check the width of the fuselage opening in the die-cut plywood parts F-1P and F-2P against the top view of the Fuselage Main Frame. The fuselage main frame openings in F-1P and F-2P should be sanded to match each other and eliminate any small difference between them. If there is any large difference in the width of the openings in F-1P and F-2P compared to the plans the sides should be pinned to the top view so that the parallel part at the front where F-1P and F-2P are installed is exactly that width that will allow the plywood parts to fit snugly over the finished frame. The fit of the balsa wood formers following is not so critical and they can be trued with a sanding block after assembly if there is any slight variation.

(g) Gray tone shading on the Fuselage Top View indicates the outline of the Fuselage Main Frame top view. Cut 1/4" sq. crosspieces of the correct width at each section. All require two crosspieces, one at the top and one at the bottom, with the exception of F-3 which has only one, at the top, and F-1, which has none.

(h.) Pin down the two main frame sides to the top view plan. Put the flat or top side of the frame down on the plan—in effect assembling it upside down. Note that the ends of the main frame sides must be beveled to fit snugly together and come to a point at the rear end. (See detail on plan).



Assembling The Main Frame

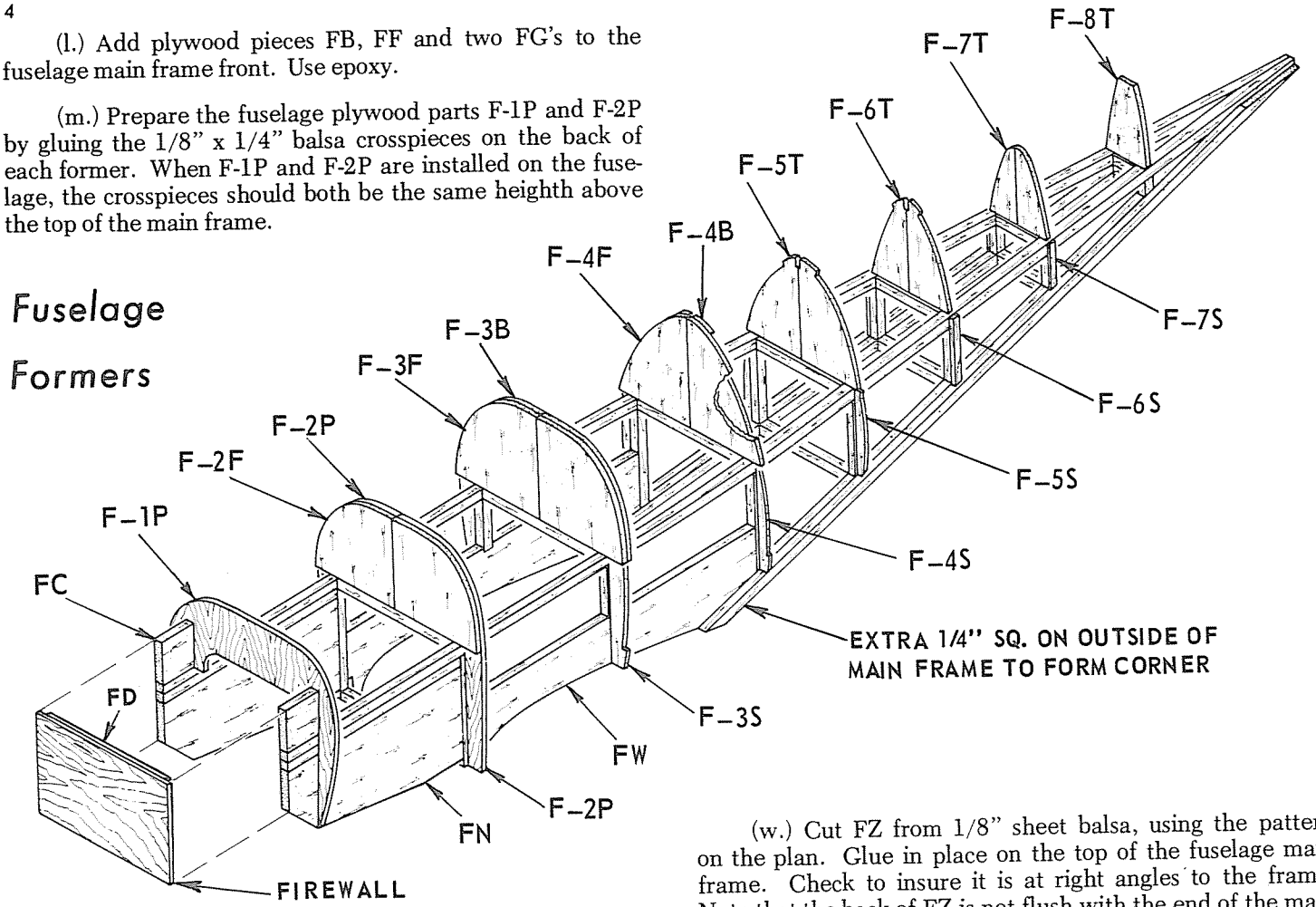
(i.) Glue crosspieces in place to connect the two main frame sides together and form a box structure.

(j.) Glue part FC on the front of each side of the main frame top.

(k.) Add the firewall and firewall doubler FD to the front of the main frame. Use epoxy. Note that the firewall sticks up 1/8" above the top of the main frame but the doubler does not. 3/4" triangular balsa stock is epoxied into the corners behind the firewall to secure it to the inside of the main frame.

(l.) Add plywood pieces FB, FF and two FG's to the fuselage main frame front. Use epoxy.

(m.) Prepare the fuselage plywood parts F-1P and F-2P by gluing the 1/8" x 1/4" balsa crosspieces on the back of each former. When F-1P and F-2P are installed on the fuselage, the crosspieces should both be the same heighth above the top of the main frame.



(n.) Epoxy the 1/8" I.D. brass tubing cabane strut mounts in place on top of the 1/8" x 1/4" crosspieces. Use enough glue to securely fasten the tubing.

(o.) A J-bolt is added at each end to anchor the tubing mounts. Put the 1/8" wire strut into the tubing when tightening down the J-bolts to prevent the tubing from being distorted. Do not overtighten. Coat the J-bolt in front and back with epoxy glue so that it will not later vibrate loose.

(p.) Glue F-1P and F-2P to the fuselage main frame.

(q.) Epoxy F-2X to the bottom of F-2P.

(r.) Add plywood piece FA between the back of the firewall and the front of F-1P.

(s.) The fuselage top formers, with the exception of F-8T, are in halves on the die cut sheets. Prepare them for assembly by gluing the halves together on a sheet of wax paper or plastic wrap.

(t.) Glue Formers F-3F and F-3B together and F-4F and F-4B together. When dry, glue these assemblies and also F-5T, F-6T, F-7T and F-8T to the top of the main frame.

(u.) Glue balsa former F-2F to the front of F-2P.

(v.) Glue side formers F-3S, F-4S, F-5S in place on each side of the main frame. (See cross-section on the plan). F-6S is a piece of 1/8" x 1/4" scrap balsa and F-7S is a piece of 1/16" x 1/4" scrap balsa, simply glued onto the outside of the main frame uprights at F-6 and F-7 to bring the side stringers out to the required position.

(w.) Cut FZ from 1/8" sheet balsa, using the pattern on the plan. Glue in place on the top of the fuselage main frame. Check to insure it is at right angles to the frame. Note that the back of FZ is not flush with the end of the main frame but is 1/4" forward to leave room for the 1/4" sq. fin post when attaching the fin to the fuselage.

(x.) Add the tail platform FY from the die cut sheet. It is glued to F-8T at the front and to FZ at the back. Check to insure that FY is exactly parallel to the top of the fuselage main frame since this will set the 0 degree stabilizer position. If it is not parallel, modify the top of F-8T or FZ accordingly with a sanding block before gluing FY in place.

(2.) FUSELAGE STRINGERS AND PLANKING

For proper scale appearance and ease of alignment, most of the stringers are not installed in notches.

(a.) The 1/8" x 1/4" balsa stringers between sections F-1 and F-2 are glued between the back of F-1P and the front of F-2F and, lower down, the back of F-1P and the front of F-2P. These are installed flush with the surface of the formers so that the planking may be glued to them later.

(b.) The top stringers between sections F-2 and F-4 under the planking just below the edge of the cockpit openings are fitted in two sections from the back of F-2P to the back of F-3F and from the back of F-3B to the front of F-4F and are also flush with the surface of the formers. Hold the cockpit patterns in place to see where the openings will be so that the stringer is positioned so as not to interfere with cutting out of these openings in the planking later.

(c.) The next stringer down, at the bottom of the cockpit planking, is installed from the back of F-2P through the notch in F-3F and F-3B and to the front of F-4F flush with the surface of the formers.

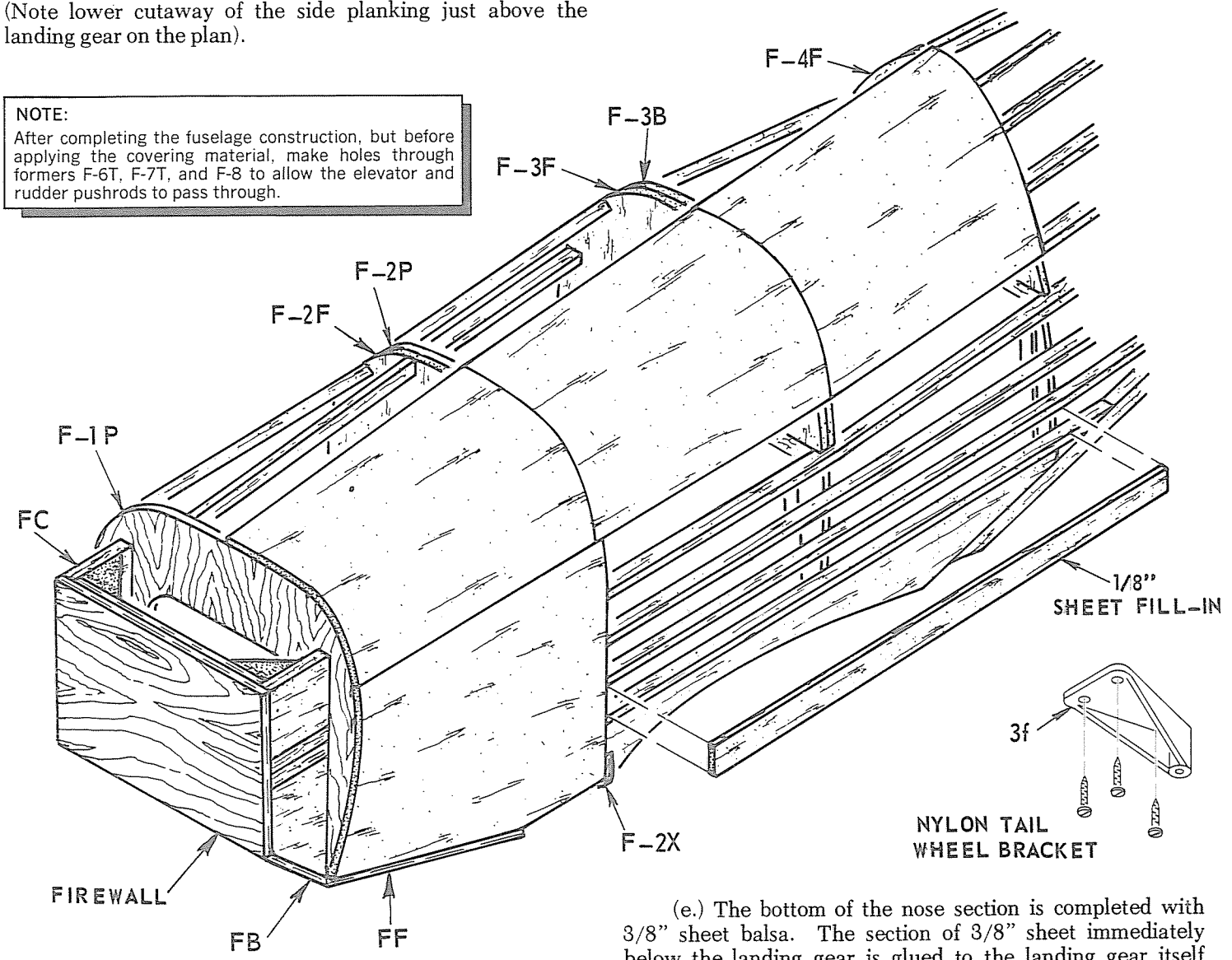
(d.) Before proceeding with the rest of the stringers, install the 1/8" sheet front fuselage planking. Wet the sheets to aid in bending and plank in sections as follows:

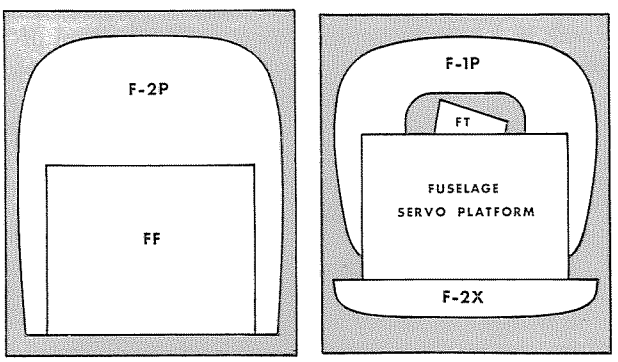
From F-1P to F-2P. Start at the top center stringer and work down. Use the 4" wide sheets at the top for the first section of planking. Use the 3" sheets below the 4" sheet to complete the planking on down to the bottom of the fuselage. End at the seam between F-2F and F-2P until the stringer seen just above the tank on the plan is reached. From this point on down the planking ends at the back side of F-2. (Note lower cutaway of the side planking just above the landing gear on the plan).

Next plank from the seam between F-2F and F-2P to the seam between F-3F and F-3B. Do not attempt to cut the cockpit opening out of the 1/8" sheeting until later. The lower edge of this planking ends on top of the 2nd stringer that goes through the notch in F-3F and F-3B.

The section from the seam between F3F and F3B to the seam between F-4F and F-4B and down to the 2nd stringer that goes through the notch in F-3F and F-3B is planked last.

NOTE:
After completing the fuselage construction, but before applying the covering material, make holes through formers F-6T, F-7T, and F-8 to allow the elevator and rudder pushrods to pass through.



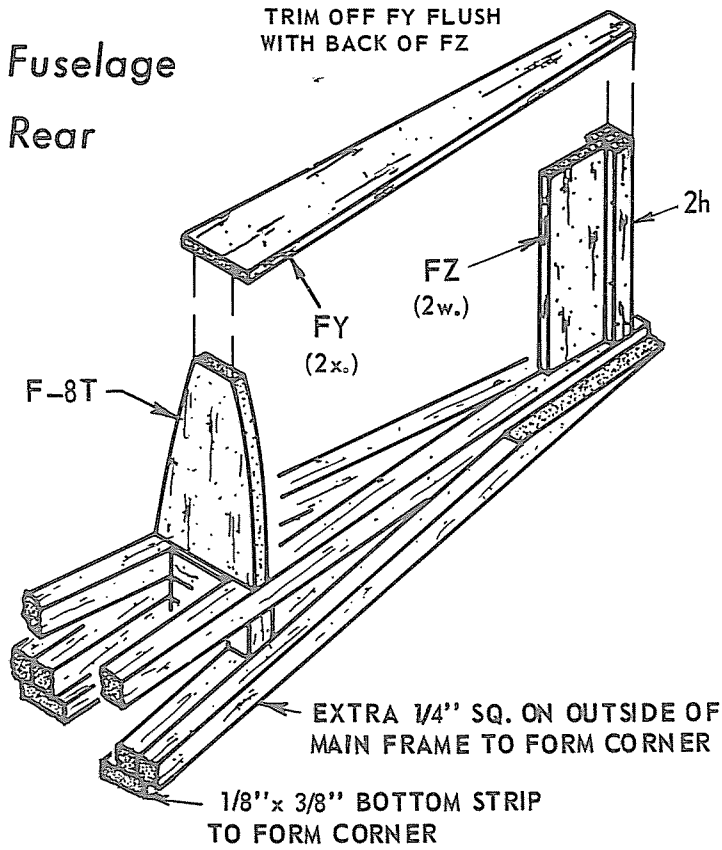


KEY TO PLYWOOD PARTS

(e.) The bottom of the nose section is completed with 3/8" sheet balsa. The section of 3/8" sheet immediately below the landing gear is glued to the landing gear itself and removed with it when the 4-40 mounting bolts are unscrewed from the blind nuts on the inside of the plywood landing gear mount FG. Leave holes in the wood on the bottom of the landing gear to pass the screws that retain the gear. Shape the 3/8" sheet bottom to the contour of F-2X. Shape the front portion as shown on the plan in Section F-1 so as to fit snugly into the back of the plastic cowling. This will require sanding into the edges of the plywood nose floor FF.

(f.) Glue the plywood tailwheel bracket platform FT to the bottom of the fuselage main frame. Trim and sand the edges of FT to match the contours of the fuselage corners when this operation is being performed later. The nylon tailwheel bracket is fastened to FT with sheet metal screws.

(g.) The corners of the fuselage main frame, from the wing opening to the tail end are built up by adding a 1/4" sq. piece to each side and a 1/8" x 3/8" strip to the bottom. (See Fuselage Cross Sections on the plan). Don't carve these to shape until the stringers are all in place so that the contours can be blended together.



(h.) Add the vertical 1/8" x 1/4" strips at the back on both sides of FZ.

(i.) Run the remaining 1/8" x 1/4" top and side stringers, using pins to hold them in place until dry.

(j.) There are several areas requiring fill-in planking between the stringers. These are:

Under the headrest area.

Just in front of the stabilizer position under the fin L.E.

At the fuselage rear below the stabilizer.

Just above the wing opening in the bottom of the fuselage to provide a base for the fillet.

These can be seen on the plans of the fuselage and on the cross-sections. Cut the planking to fit snugly in between the stringers with the exception of the wing opening planking which is allowed to protrude down slightly at the bottom so that it may be sanded to match FW and fit against the plywood wing saddle FX when it is being installed.

(k.) Using a large sanding block, sand the fuselage to the contours shown on the cross-sections, blending the stringers into the shape as required and tapering them to the tail post at the fuselage rear end.

(l.) Trace the cockpit patterns on the planking and cut out the openings.

(m.) Glue the hardwood wing bolt anchor blocks to the inside of FW. Brace them with 1/2" triangular balsa stock.

(3.) WING SADDLE

The next fuselage construction steps require the completed and planked bottom wing.

(a.) Sand the fuselage to match exactly the contour of the bottom wing. 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 F-2X 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 F-2X shown on Section F-2 on the plan. Remove the wing planking just above this spot, about 1/2" wide and back to the front spar, so that easy access may be had to the dowel area. Save the piece removed so that it can be glued back on after installation of the dowel.

(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 F-2X.

(d.) Remove the wing and drill a 1/4" hole in the marked spot of F-2X.

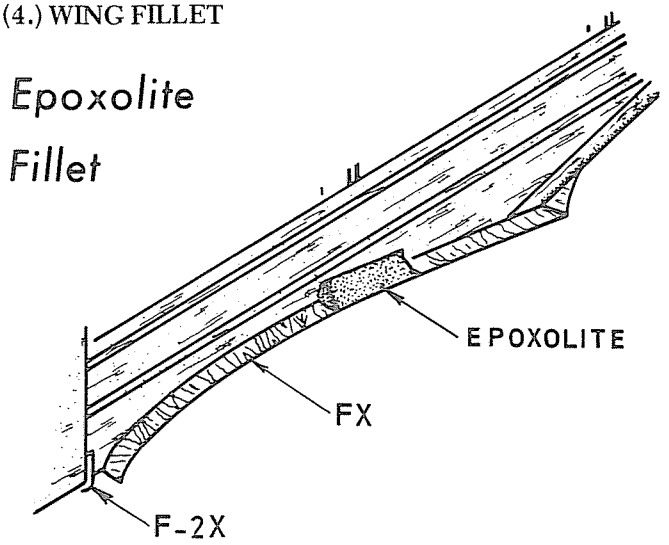
(e.) Put the wing back on to check the position of the dowel and dowel hole. It is probable that the alignment is not yet perfect. Enlarge the wing dowel hole as required to shift the dowel so that the wing will fit snugly against the fuselage. Plug the enlargement with scrap slivers. Pull the dowel 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 F-2X. 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. Replace the top planking that was removed to make the access hole to the dowel area.

(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. 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" dia. bit.

(g.) 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 FX in place on each side using Sig 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 FX plywood saddles up tightly against the fuselage. If FX does not seat down against the wing surface in some spots, drive a sliver of wood between the saddle and the fuselage to force FX against the wing while the epoxy is setting up.

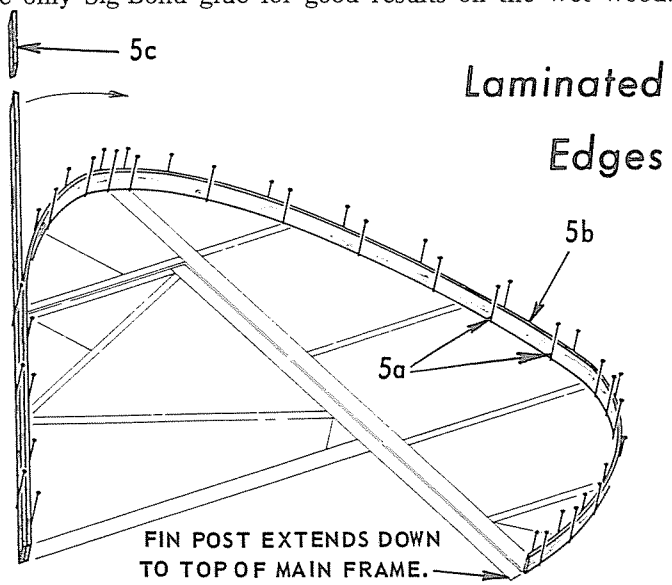
(4.) WING FILLET



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 up it can be smoothed with a wetted finger tip. Allow to set for 48 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. The Epoxolite can be coated with sanding sealer and/or dopes at the same time as the rest of the fuselage. 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.

(5.) FIN AND RUDDER

The laminated outline used on the tail and wing tips is not difficult and produces a strong and warp resistant unit. It enables close reproduction of the scale shape since in the full scale aircraft these outlines are formed by steel tubing. Use only Sig-Bond glue for good results on the wet wood.



(a.) Place pins along the inside of the outline.

(b.) Soak 1/16" x 1/4" balsa strips in water for an hour to soften them. Pin a strip against the first line of pins, holding in place with a second line of pins.

(c.) As the second strip is laminated against the first, remove the second line of pins one by one as you proceed along the outline and move them over to secure the 2nd strip against the first.

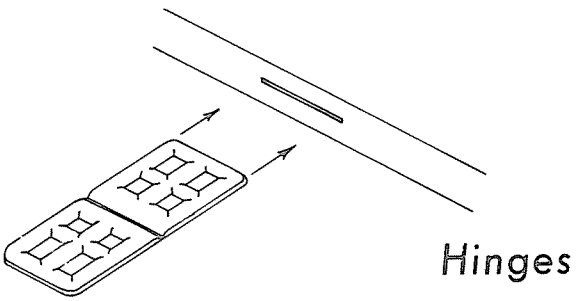
(d.) Continue the process described in (c.) above until all four strips are joined. Allow to dry thoroughly before removing from the board.

(e.) With a pencil, mark the rib ends that are notched into the fin outlines. Also mark the angle of the ribs as a guide in notching. Saw 1/16" deep notches in the outline.

(f.) The rudder outline is constructed in the same manner as that described above for the fin.

(g.) Assemble the tail by adding the 1/8" x 1/4" balsa strip ribs, the 1/4" fin post and 1/4" sq. rudder spar and last the 1/8" and 1/4" gussets. Note that the fin post goes down to the top of the main frame along the back of part FZ.

(h.) Sand the outside edges to a rounded shape. Don't install the nylon control horns until after covering and doping.



(i.) Cut slots in the control surface to receive the molded hinges. Fill the slots with Sig Kwick-Set epoxy glue and insert the hinge into the slot. After the glue has set, repeat the process to attach the control surface to the model.

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

(6.) STABILIZER AND ELEVATOR

Prepare for assembly of the stab and elevator by laminating the tips in the same manner as the outlines for the fin and rudder were constructed in the preceeding section. Pin the parts to the plan, gluing them to each other in the following order:

(a.) The stabilizer leading edge and elevator trailing edges of 1/4" sq. balsa.

(b.) Part S-1 from the printed sheet.

(c.) The stabilizer trailing edge and elevator leading edge of 1/4" x 1/2" balsa.

(d.) The 1/8" x 1/4" strip balsa ribs.

(e.) The 1/4" gussets EG in the elevator.

(f.) The laminated tips.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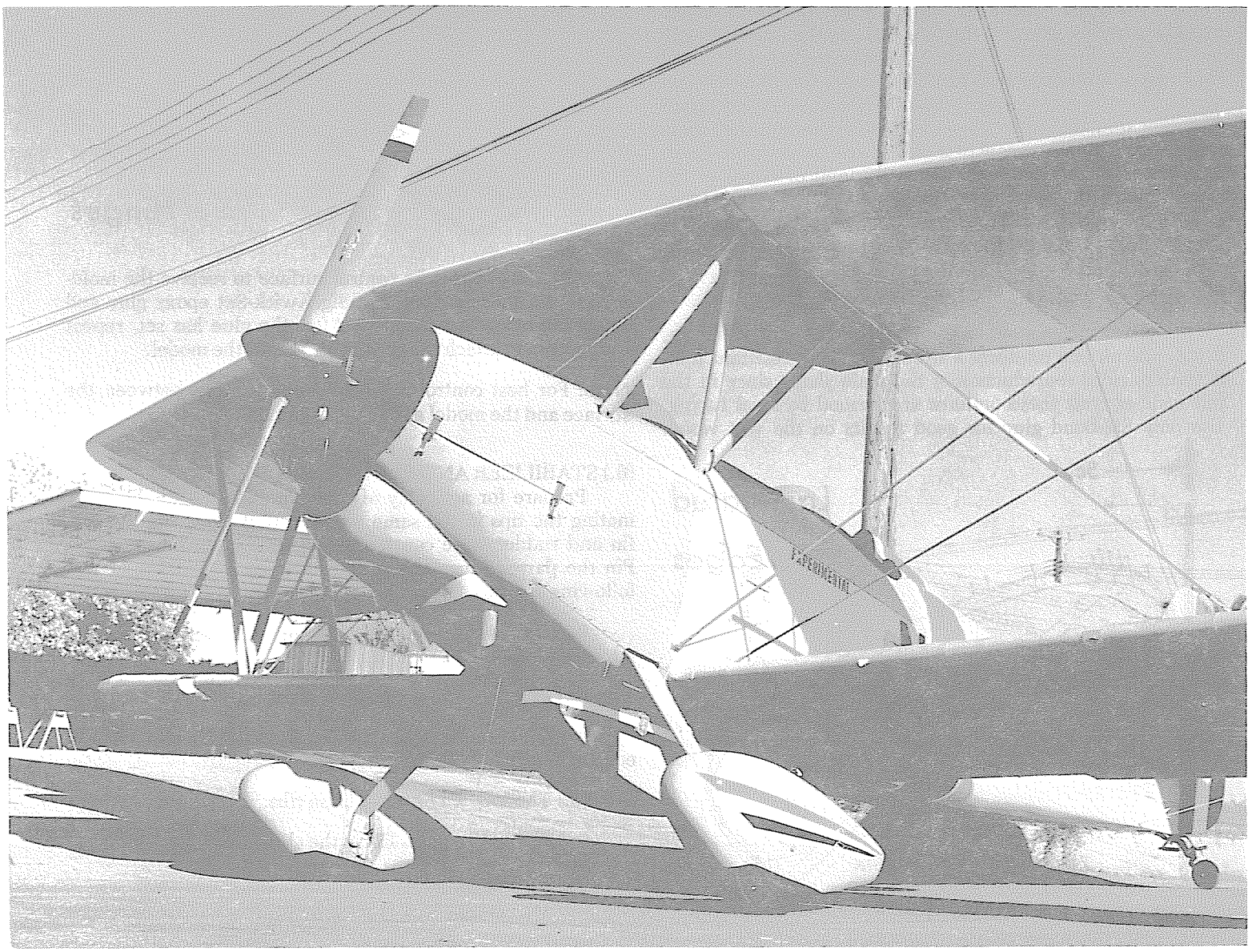
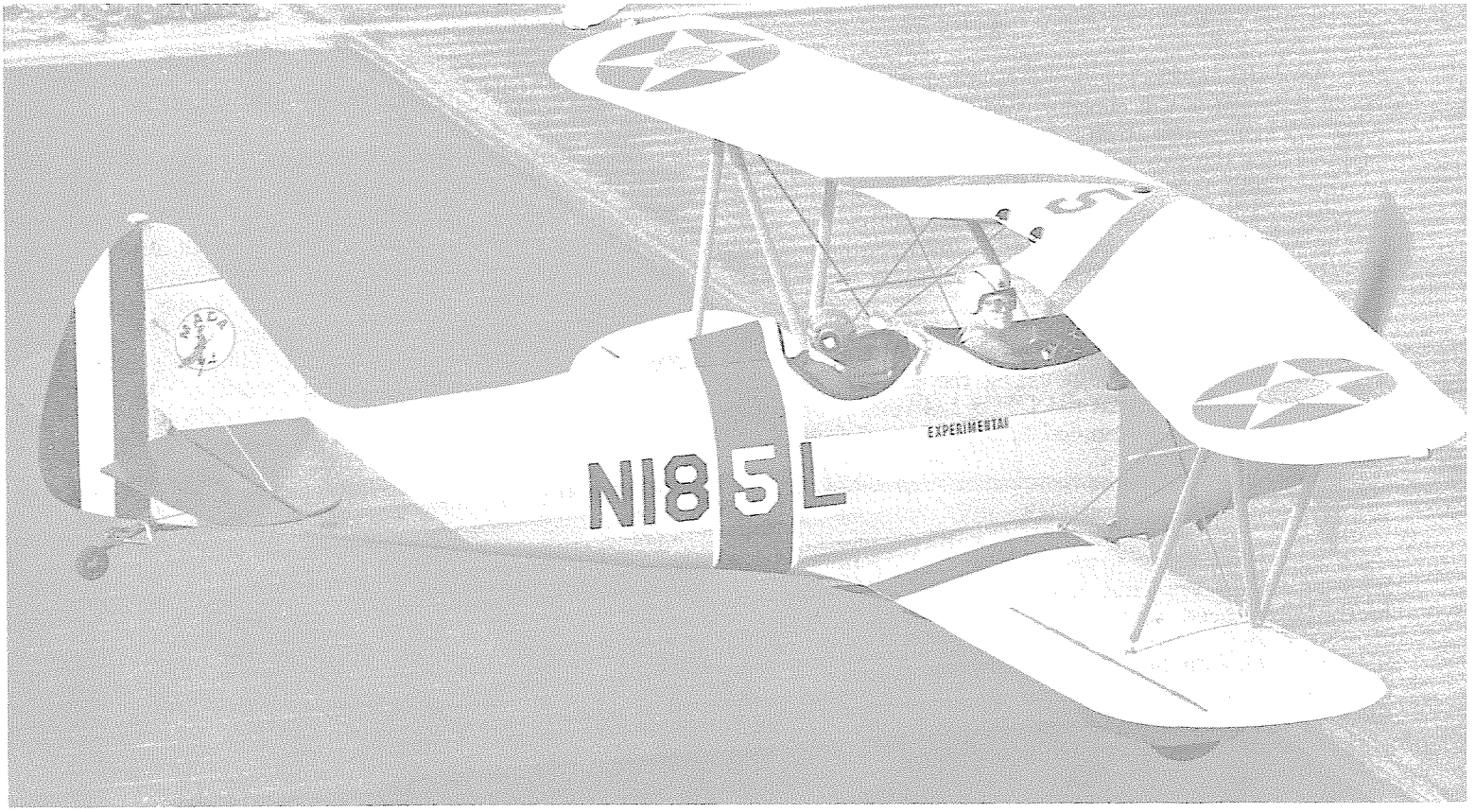




Photos By Nyle Leatham, Mesa, Arizona

Sand the outside edges to a rounded shape. Cut a recess in the front of the elevator leading edge to receive the 3/32" wire connector. Drill holes for the arms of the connector and epoxy the two halves of the elevator to the connector wire. Check to insure that the halves are true, not twisted in relationship to each other and in line before the epoxy sets up. Install the nylon control horn after covering and doping. Hinging directions are given previously in this booklet.

(NOTE: The tail surfaces are most conveniently covered before attaching to the fuselage. Should you wish to cover the fuselage before mounting the tail surfaces, first pin the tail in place so that the 1/8" x 1/4" pieces on either side of part FZ can be sanded to blend into the fin post.)

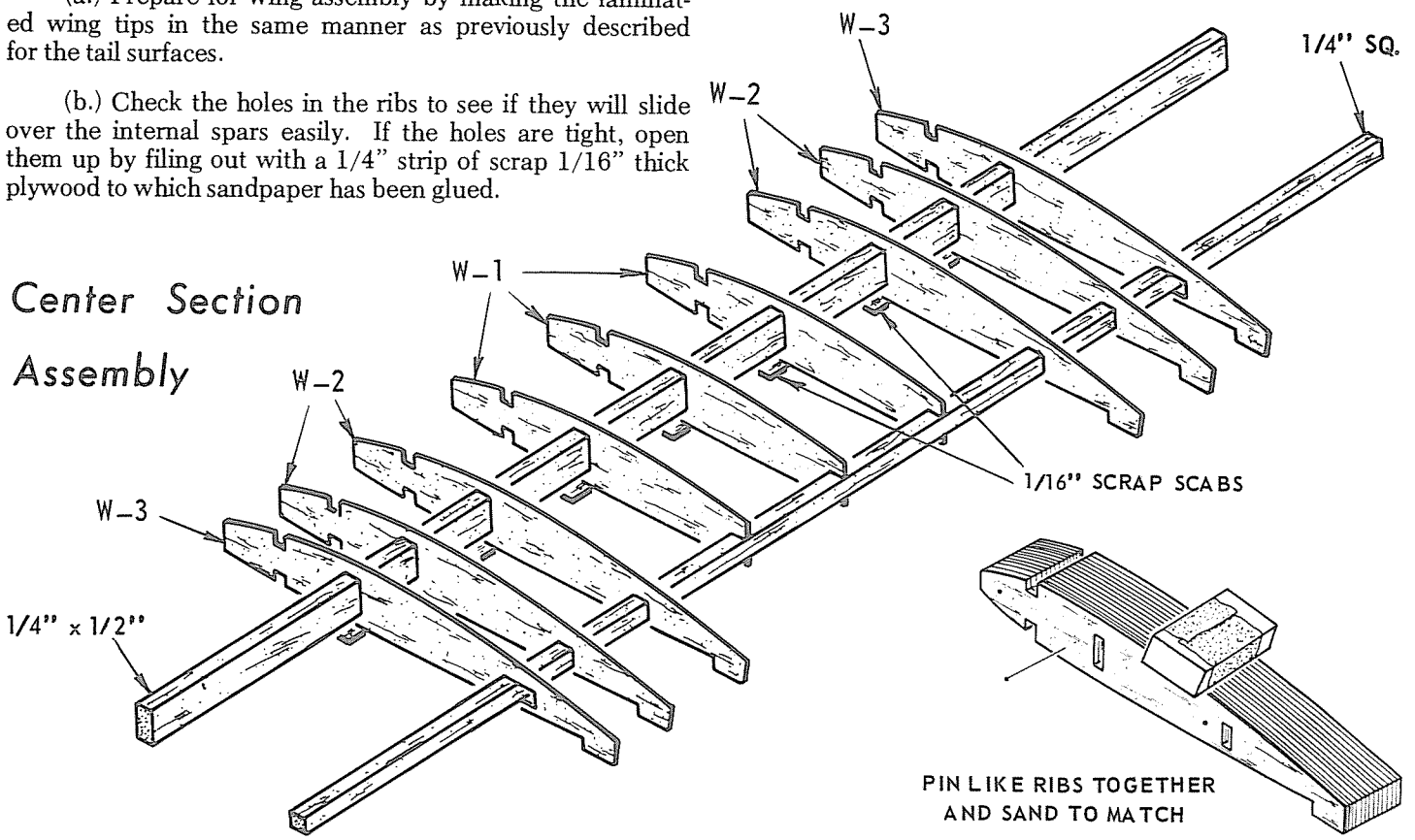
(7.) TAIL BRACING

For those building a fully detailed scale model, the plan shows 1/32" wire bracing (not supplied) on the tail surfaces. One of the prototype models was flown without this bracing without any difficulty so it is not absolutely required. It does result in increased strength as well as being a good scale detail. After covering and doping, drill 1/16" mounting holes through the tail surfaces and fuselage. Fit four individual pieces of brace wire. The end portions that are in the tail surface and fuselage should be nicked with a file to help the glue adhere. Epoxy the wires into the holes and fill the holes completely with the glue.

(8.) TOP WING ASSEMBLY

(a.) Prepare for wing assembly by making the laminated wing tips in the same manner as previously described for the tail surfaces.

(b.) Check the holes in the ribs to see if they will slide over the internal spars easily. If the holes are tight, open them up by filing out with a 1/4" strip of scrap 1/16" thick plywood to which sandpaper has been glued.



(c.) Attach the right wing panel from Plate One to the center section drawing on Plate Two. Connect X-Z to X-Z. Protect the plan with wax paper or plastic wrap.

(d.) Start with the center section. Slide the ribs over the 1/4" x 1/2" main spar and the 1/4" sq. rear spar. Note that the ends of these spars extend out into the outer swept wing panels. Put scabs of 1/16 scrap balsa under each center section rib just below the main spar to allow for the 1/16" planking that will later be installed. Pin down the ribs to the building board as they are lined up. Glue the spars to the ribs.

(e.) Add the 3/16" sq. top front spar.

(f.) Note that the notched trailing edges are supplied in left and right pieces for both top and bottom wing. Look at the rib cross-section on the plan and it will be seen that the right angled corner of the notched trailing edge is up. Check carefully before trimming the ends of the notched strips to insure that you have the correct piece of stock, not only for the top or bottom wing but also for the proper right and left relationship. The small center section pieces of the top wing must be cut off from the main trailing edge and an angle cut in at the splice between the center section and the outer swept panel. Because of the production procedure in the notching operation, there will be an extra center section piece for the lower wing. Discard the extra piece and use only one of the center section portions of the notched strip. Clean out the notches in the trailing edge stock so they will fit easily onto the ends of the ribs. Pin and glue them in place on the ends of the ribs. Note that in the center section and the first two rib areas of the outer swept panel that 1/16" planking will later be glued to the tops of these particular ribs to bring the surface flush with the top of the trailing edge stock. (See rib cross-sections on the plan).

Photo By Nyle Leatham, Mesa, Arizona

Photos By Nyle Leatham, Mesa, Arizona

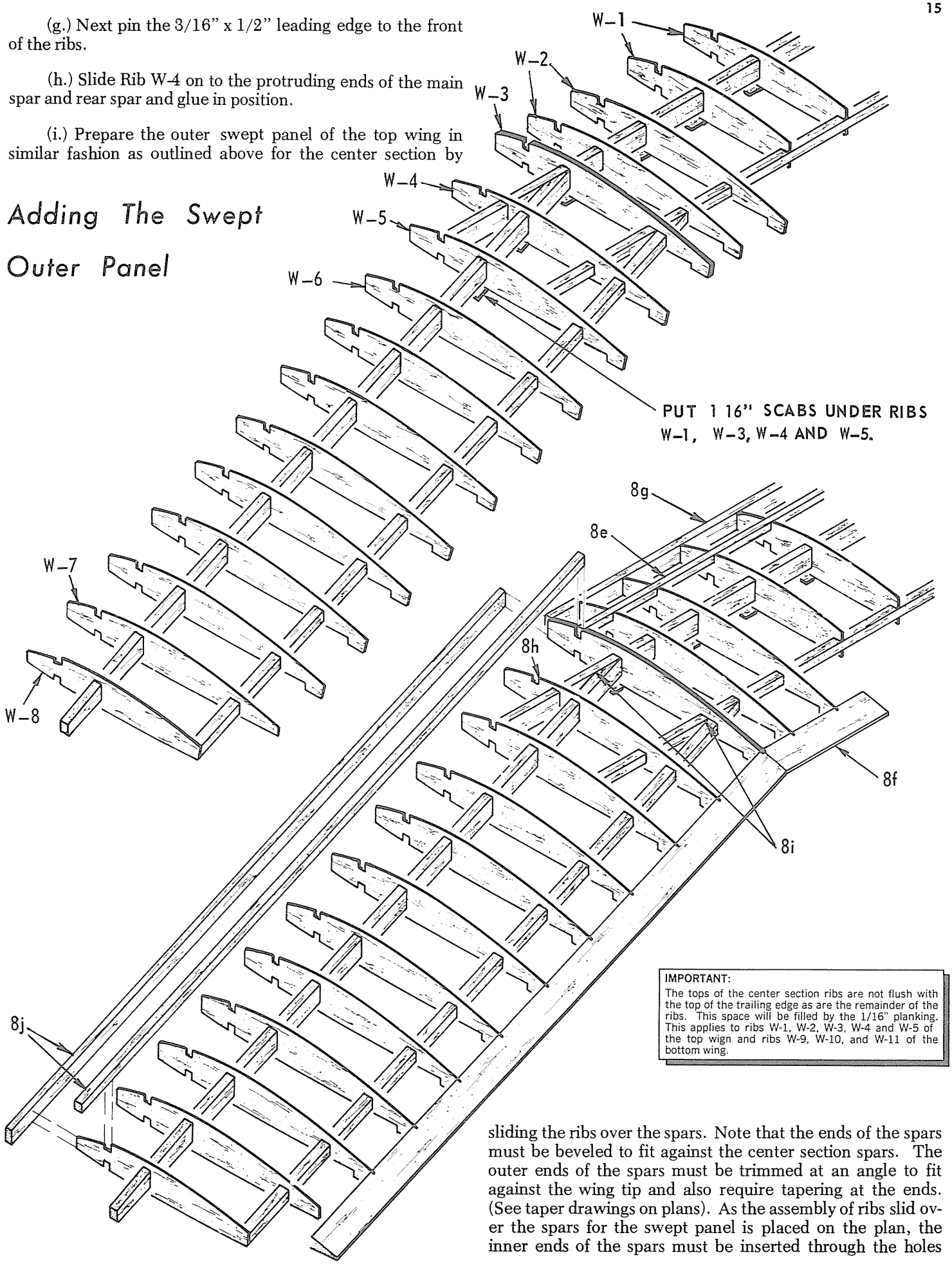
Photo By Nyle Leatham, Mesa, Arizona

(g.) Next pin the 3/16" x 1/2" leading edge to the front of the ribs.

(h.) Slide Rib W-4 on to the protruding ends of the main spar and rear spar and glue in position.

(i.) Prepare the outer swept panel of the top wing in similar fashion as outlined above for the center section by sliding the ribs over the spars. Note that the ends of the spars must be beveled to fit against the center section spars. The outer ends of the spars must be trimmed at an angle to fit against the wing tip and also require tapering at the ends. (See taper drawings on plans). As the assembly of ribs slid over the spars for the swept panel is placed on the plan, the inner ends of the spars must be inserted through the holes

Adding The Swept Outer Panel

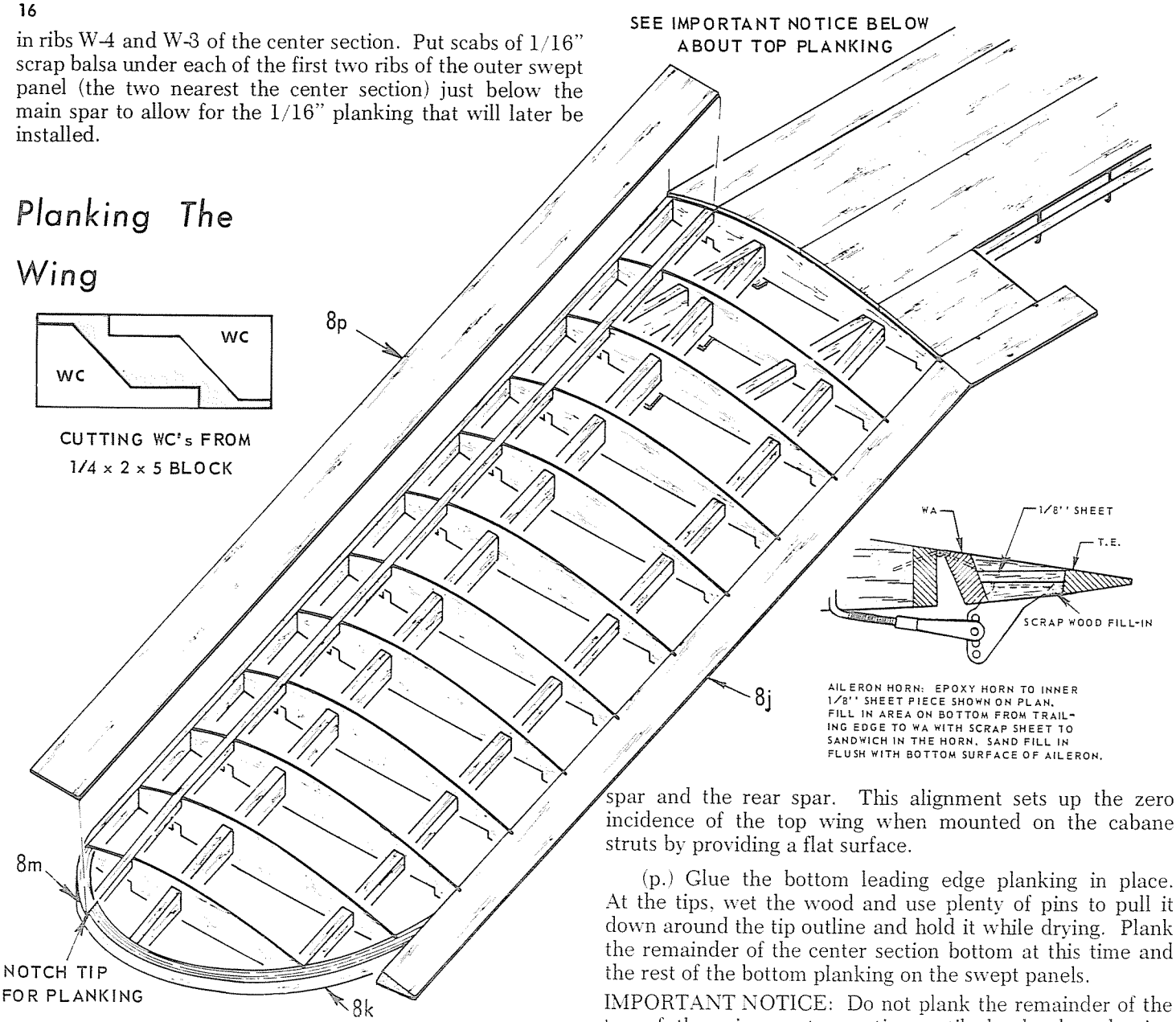


IMPORTANT:
The tops of the center section ribs are not flush with the top of the trailing edge as are the remainder of the ribs. This space will be filled by the 1/16" planking. This applies to ribs W-1, W-2, W-3, W-4 and W-5 of the top wign and ribs W-9, W-10, and W-11 of the bottom wing.

in ribs W-4 and W-3 of the center section. Put scabs of 1/16" scrap balsa under each of the first two ribs of the outer swept panel (the two nearest the center section) just below the main spar to allow for the 1/16" planking that will later be installed.

Planking The Wing

CUTTING WC's FROM
1/4 x 2 x 5 BLOCK



AILERON HORN: EPOXY HORN TO INNER 1/8" SHEET PIECE SHOWN ON PLAN. FILL IN AREA ON BOTTOM FROM TRAILING EDGE TO WA WITH SCRAP SHEET TO SANDWICH IN THE HORN. SAND FILL IN FLUSH WITH BOTTOM SURFACE OF AILERON.

(j.) Add the 3/16" sq. front spar, trailing edge and 3/16" x 1/2" leading edge as above in the center section construction steps. Because of the swept wing, the notches in the trailing edge must be opened up at an angle with a modeling knife to accommodate the ends of the ribs.

(k.) Fit the previously assembled wing tip in place on the wing.

(l.) Remove the wing from the plan. Add the 3/16" lower front spar.

(m.) Notch into the laminated tip where the planking will be installed and taper the bottom front 3/16" sq. spar at the tip so that when the 1/16" leading edge planking is glued in place the surface of the planking will be flush with the laminated tip.

(n.) Glue in the 1/8" plywood strut plates. The front plate is located just under the planking. The rear plate is flush with the bottom wing surface.

(o.) Glue in the 1/4" hardwood wing screw anchors WH and WD between W-2 and W-3. Note the cross section view of this area on the Fuselage Side View. The bottoms of these anchor blocks are flush with the bottoms of the main spar and the rear spar. This alignment sets up the zero incidence of the top wing when mounted on the cabane struts by providing a flat surface.

(p.) Glue the bottom leading edge planking in place. At the tips, wet the wood and use plenty of pins to pull it down around the tip outline and hold it while drying. Plank the remainder of the center section bottom at this time and the rest of the bottom planking on the swept panels.

IMPORTANT NOTICE: Do not plank the remainder of the top of the wing center section until the hardwood wing screw anchors WH and WD are threaded and the top wing installed on the cabane struts. (Refer to the CABANE STRUT section). After this is done the planking on the top of the wing may be completed.

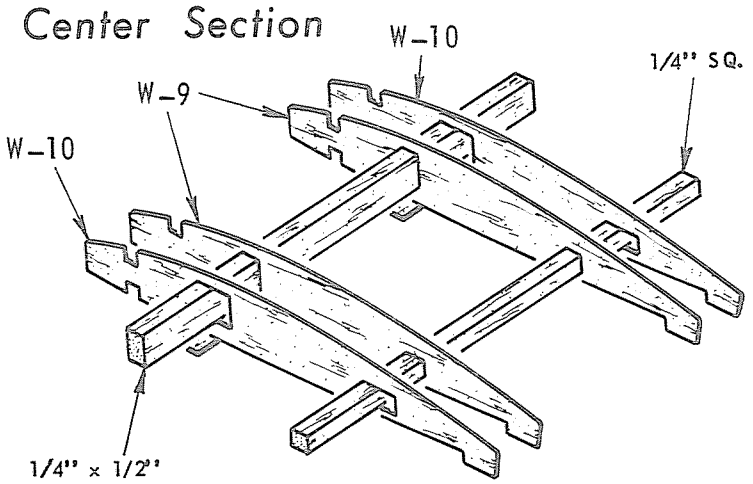
(q.) Trim the leading edge sheeting flush with the 3/16" x 1/2" leading edge. Then glue the 1/4" x 5/8" leading edge cap in place. When dry, carve and sand the cap to blend into the wing contour.

(9.) LOWER WING ASSEMBLY

The aileron size shown on the plan is the scale size. This was used on the kit prototype models. It delivers good, scale-like response and is large enough to perform reasonably good roll maneuvers. This is the size that should be used when it is important that the model be exact scale such as for entry in the AMA RC Scale event. For use as a Sport Scale model or in biplane stunt events or for quicker response and more aerobatic ability during Sunday flying it is suggested that the size be increased to the length indicated by the dotted line extensions on the lower wing plan. To do this all that is necessary is to modify Ribs W-12 so that they are the same as the W-13 ribs except that the 1/4" sq. rear spar is retained on W-12. The W-13 ribs have die-cut slits so that

the aileron may be cut loose from the wing at the proper angle after initial assembly is completed. The basic method of assembling the bottom wing is the same as for the top wing. Follow the same general procedure.

(a.) Build up the lower wing center section as the upper wing center section was constructed in paragraph 8d.



(b.) Build up the outer lower wing panels as the upper swept outer wing panels were built in paragraph 8g and 8i. Don't glue the overlapped center section spars and outer panel spars together until incorporating the dihedral. Leave out parts WW and WA at this time. They will be glued in later, after the ailerons are cut out of the assembled wing.

(c.) Add the trailing edge, leading edge and front spar.

(d.) Glue on the laminated wing tips.

(e.) Put scrap balsa scabs under the aileron ribs just behind the die-cut rear slit. Pin the ribs and scabs to the board so that when the die-cut slits are completed and the aileron cut loose from the rest of the wing, the ailerons will remain in the same location relative to the rest of the wing that they were before being cut loose.

(f.) Do the same just in front of the front die-cut slit.

(g.) Cut through the slits and remove the wood between them.

(h.) Add part WW, 1/4" x 3/4" to the back of the ribs.

(i.) Bevel the edges of the 1/4" x 3/4" balsa used for part WA as shown in the cross section view. Glue part WA to the aileron ribs.

(j.) Leave the center section pinned down. Unpin the outer panels from the plan and bevel the joint on the leading and trailing edges between the center section and outer panels so as to obtain a good match with the required 3/4" dihedral incorporated. Replace the wing panels and use epoxy to glue in the dihedral. Block up until the glue is dry.

(k.) Add remaining wing structure such as the gussets, lower front spar and fill-in for the wing bolt holes.

(l.) The 1/8" x 5/8" strut mounting plates are glued flush with the upper surface of the ribs. The front plate is under the leading edge planking and will not require any bracing but the rear plate should be supported from underneath with the addition of some scrap balsa glued to the rib and the planking to the rear.

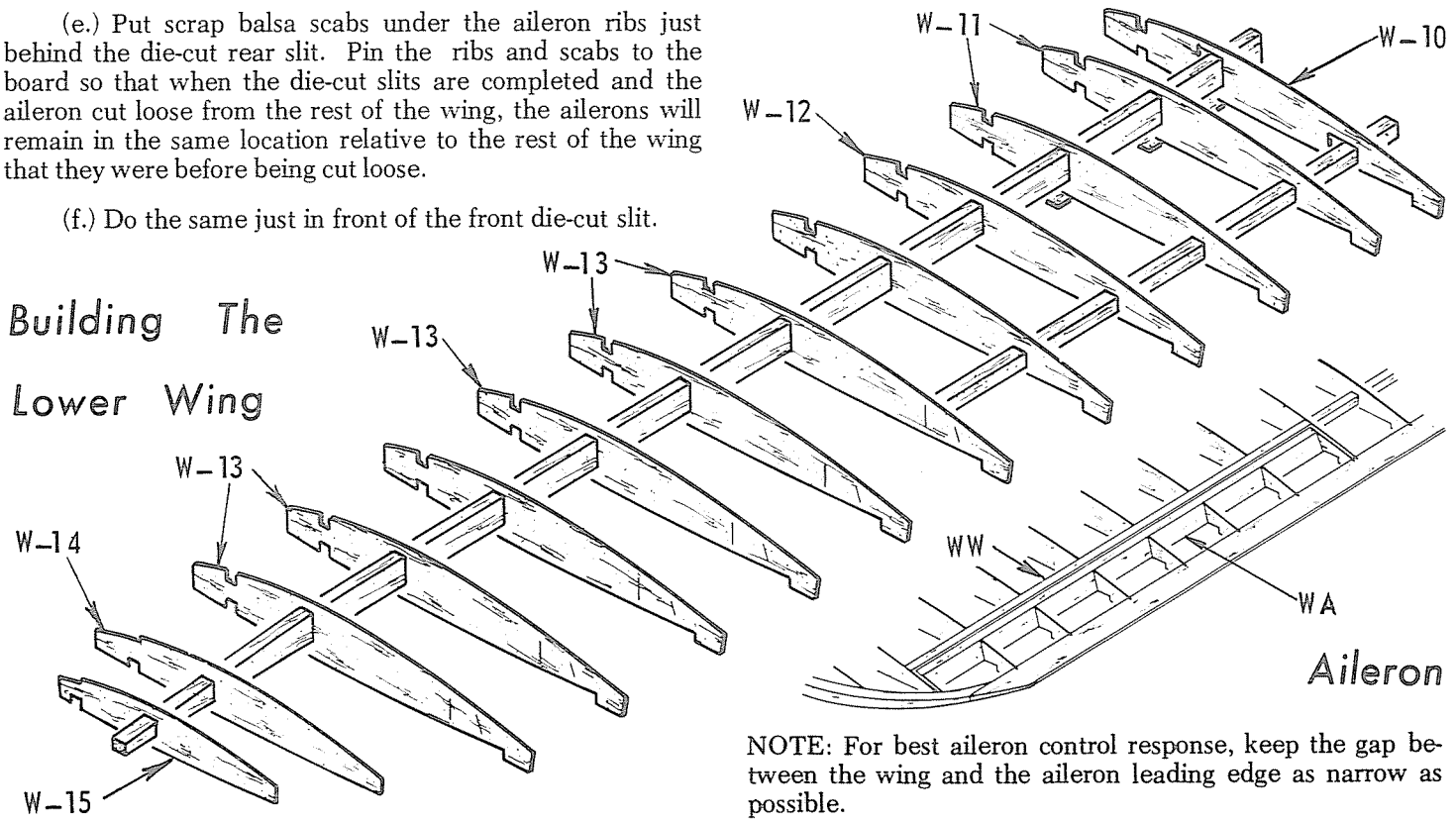
(m.) Install the servo mounting plate, servo, push rod, bellcrank mounting plates and bellcranks.

(n.) Add the 1/16" planking in the same manner as the planking was applied to the top wing.

(o.) Sand the entire lower wing with a sanding block.

(p.) Cut through the trailing edge to separate the ailerons from the rest of the wing.

(q.) Replace the ailerons on the wing with nylon control hinges in the same manner as the tail surfaces were hinged.

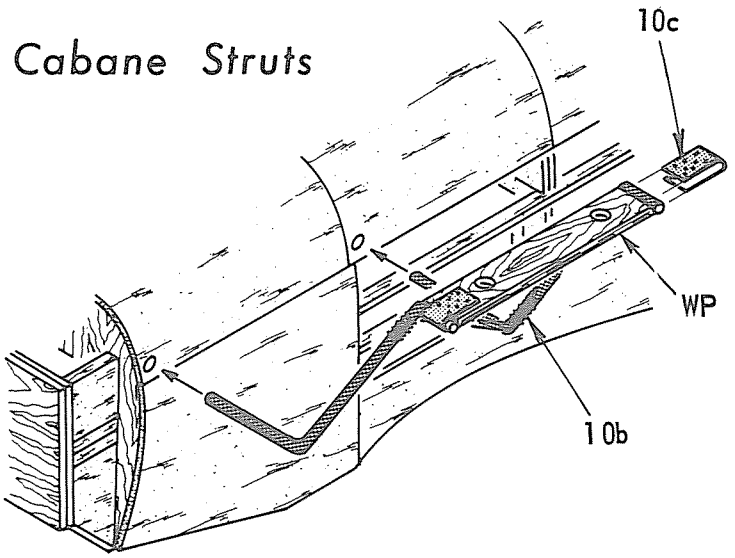


NOTE: For best aileron control response, keep the gap between the wing and the aileron leading edge as narrow as possible.

(10.) CABANE STRUTS

The four 1/8" wire main cabane struts and 3/32" wire brace struts are pre-bent but some minor alterations of the bends may be necessary during assembly. The only critical dimension is the width at the top so that the plywood parts WP, when installed, will fit into the top wing against the hardwood wing bolt anchor inserts WH & WD. The 0 degree wing incidence is set automatically, since the main struts are identical but if some bending is necessary to make the width at the top come out right be sure that the bends are made the same on all of the main struts.

(a.) Insert the four main cabane struts into the brass tubing mounts in the fuselage.



(b.) Fasten the 3/32" wire brace struts in place by binding them to the main struts with copper wire. After checking to see that the wing will fit onto the top of the cabane strut assembly, solder the brace struts in place, using a hot iron and non-corrosive soldering paste.

(c.) The 1/8" plywood strip WP is held to the arms at the top of the main cabane strut by a brass strap. Drill some random glue holes in the strap. Bend the strap around the arm at the top of the 1/8" wire main strut. Solder the strap to the arm. Glue WP to the strap with epoxy. Use a liberal amount of glue so that there is a good coating under and on top of the strap. Lash the ends of the strap tightly to WP with thread. Wind the thread on in an even single layer so that it will not so that it will not be unnecessarily thick.

(d.) Epoxy pieces of 1/8" x 1/4" balsa to the struts as indicated on the Fuselage Side View. Sand them to streamline shape.

(e.) Place the wing on the cabane struts and hold in exact alignment. Drill through WP and the hardwood wing bolt anchor inserts WH & WD in the wing with a number 7 drill. Remove the wing and tap the holes in WH and WD with a 1/4-20 tap. Enlarge the holes in WP to 1/4" with a 1/4" diameter drill so as to pass the nylon wing screws.

(f.) Cut off the 1" nylon wing screws to about 1/2" to 9/16" in length so they will not hit the top planking when the wing is attached.

(g.) To permanently install the cabane struts in the brass tubing, nick the wire at intervals with a file and glue them into the tubing with epoxy.

(h.) The remaining 1/16" top center section sheeting may now be installed.

(i.) Complete the center section by gluing the 3/4" balsa block T.E. fill-in to the structure and carving it to shape. Add the 1/8" diameter dowels to simulate hand holds.

(11.) WING STRUTS

The prototype model has been extensively flown and violently stunted with a .60 engine to test the strength of the wings. They have proven to be strong enough without functional use of the outer wing struts. Therefore the struts are shown as plug-in accessories for scale appearance purposes only. They need not be used for test, practice or sport flying. This suggestion assumes that the wings are well built and have been covered with a doped cloth covering. Plastic film coverings are not as strong since they lack the tension strength of a doped covering. Builders who intend to use plastic film or expect to place unusual loads on the wings should make the wing struts functional by epoxying small brackets at the ends of each strut leg. Fasten these to the wing strut plates with small screws.

The rigging wires on the wings are a super-detailing feature and are not supplied. There are several ways these may be added. For Sport Scale the elastic thread obtainable at department stores may be fastened to small hooks on the wings and quickly detached when disassembling the model. Fishing leader lines with small springs added to maintain tension are also practical to use. For more detailed installations, as on the original model, 1/32" music wire can be bolted on to scale-like brackets with 00-90 bolts and nuts. (See Sig Solder 3/8" pieces of 1/16" I.D. brass tubing, one end of which has been flattened and drilled to accept 00-90 bolts (or wood screws), to the ends of the wires.

(12.) LANDING GEAR

The landing gear supplied is over scale width to provide a rugged and practical unit for sport flying. For a super-detailed model a cut-down, slimmer gear may be installed for competition flights. The pants on a thinned down gear may be installed with an accessory device such as the Fox Flanged Collar or the Williams Bros. Wheel Pants Flange. As was previously noted earlier in the instructions, the landing gear can quickly be removed by unbolting from the blind nuts with access to the bolt heads through holes in the balsa block fuselage bottom.

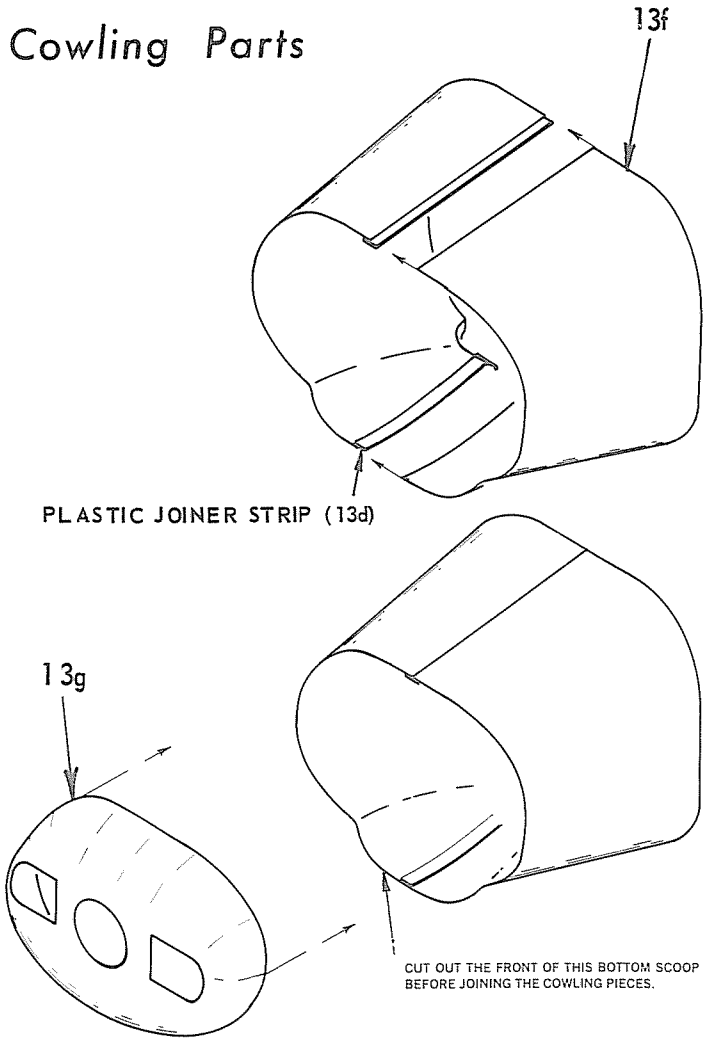
(13.) COWLING

The cowling should be assembled and fitted to the fuselage before the fuselage is covered or doped.

(a.) Match the two cowling halves by truing the edges with a large sanding block.

(b.) Test assemble the halves with masking tape. Check the fit over the fuselage. It may be that the seams must be worked down more to narrow the cowl slightly for a good fit on the fuselage. Or if the cowl is undersize, the front of the fuselage can be sanded down slightly for a good match.

Joining The Plastic Cowling Parts



(c.) 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 carefully sanding down to bring the sizes together.

(d.) 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.

(e.) 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).

(f.) Join the halves with several strips of masking tape. Flow butyrate thinner or acetone into the seam from the inside. Scrape and sand the seam. A putty may be made from shavings of the waste plastic dissolved in acetone to fill any parts of the seam that have not completely closed.

(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. Cold form 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 sanded 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.) Epoxy the 3/8" x 3/4" x 1" 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.

(14.) 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.

The full-size plans show a sample installation with servos installed on horizontal plastic mounts and screwed to 1/8" plywood plates in the wing and the fuselage. The elevator and rudder servos are installed on the bottom of the fuselage plate, the motor servo on the top side.

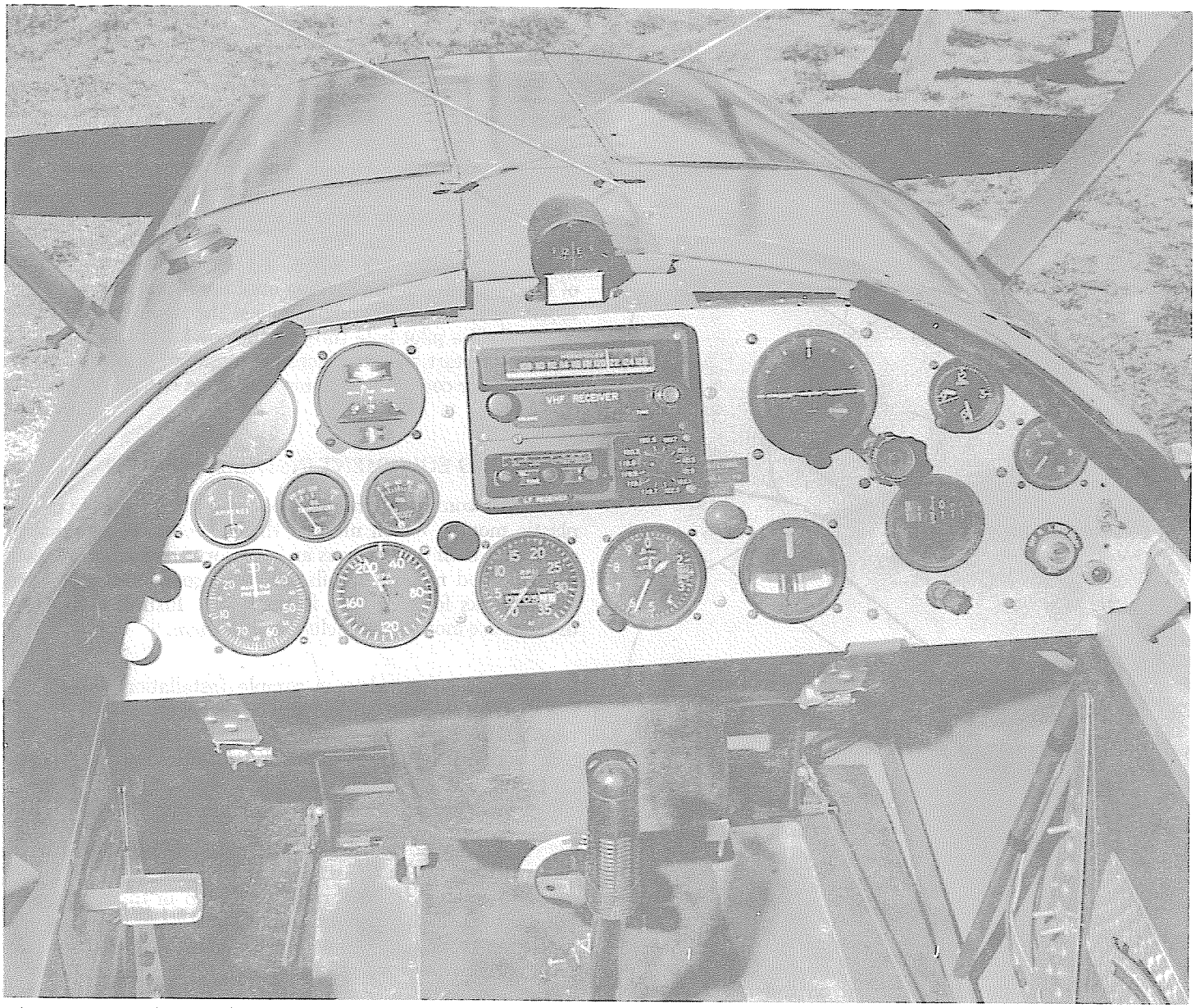
Servos for which plastic mounts are not available can be screwed directly to at least 3/8" square hardwood rails placed across the cabin, three abreast, as shown in the accompanying drawing. With rubber grommets installed in the servo mounting holes, mark the spots for drilling the pilot holes for screws. Space the servos at least 1/8" apart and do not have them contacting the hardwood mounting rails except on the grommets. Using a washer on the wood screws, mount the servos to the rails. Do not tighten the screws down against the grommets since this will cause vibration to be transferred to the servos. The washer should just rest against the grommet without compressing it.

The pushrods for the fuselage are pieces of firm 5/16" sq. balsa. The 1/16" wire ends are wrapped with thread and coated with epoxy glue. Use the R/C links at the tail end so that trimming adjustments can be quickly made.

A flexible steel cable pushrod with nylon outer tubing (not furnished) is recommended for hookup of the throttle to the motor control servo.

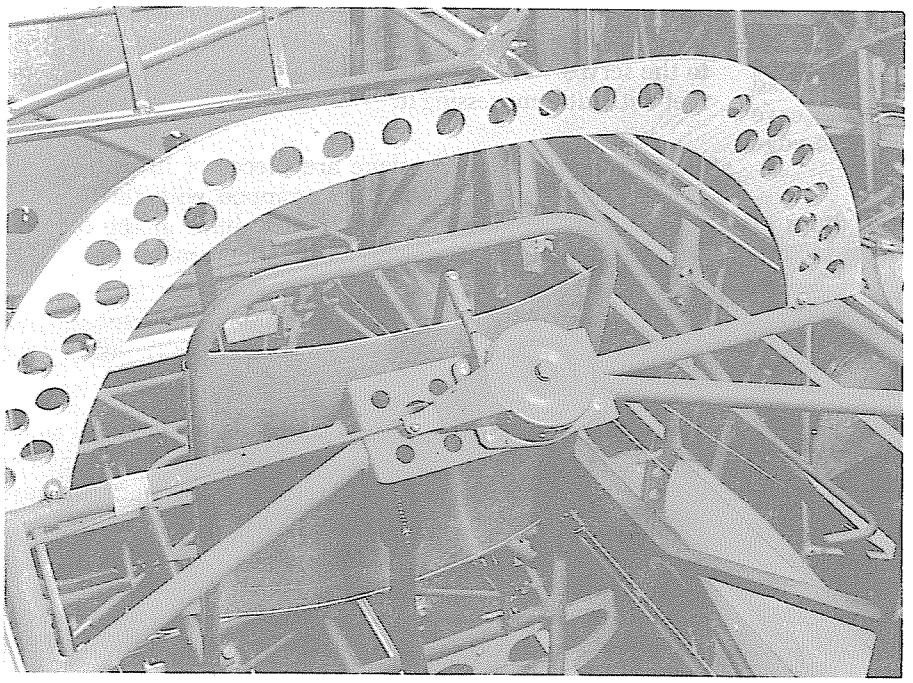
A variety of quickly detachable pushrod retainers are available from the Sig Catalog for hooking the pushrods to the servos. Avoid metal-to-metal contact in linkages because this may produce harmful radio interference.

The switch may be mounted wherever it is convenient on the side of the model, preferably the side away from the engine oil. Another good spot is inside of the cockpit where it may be reached easily.



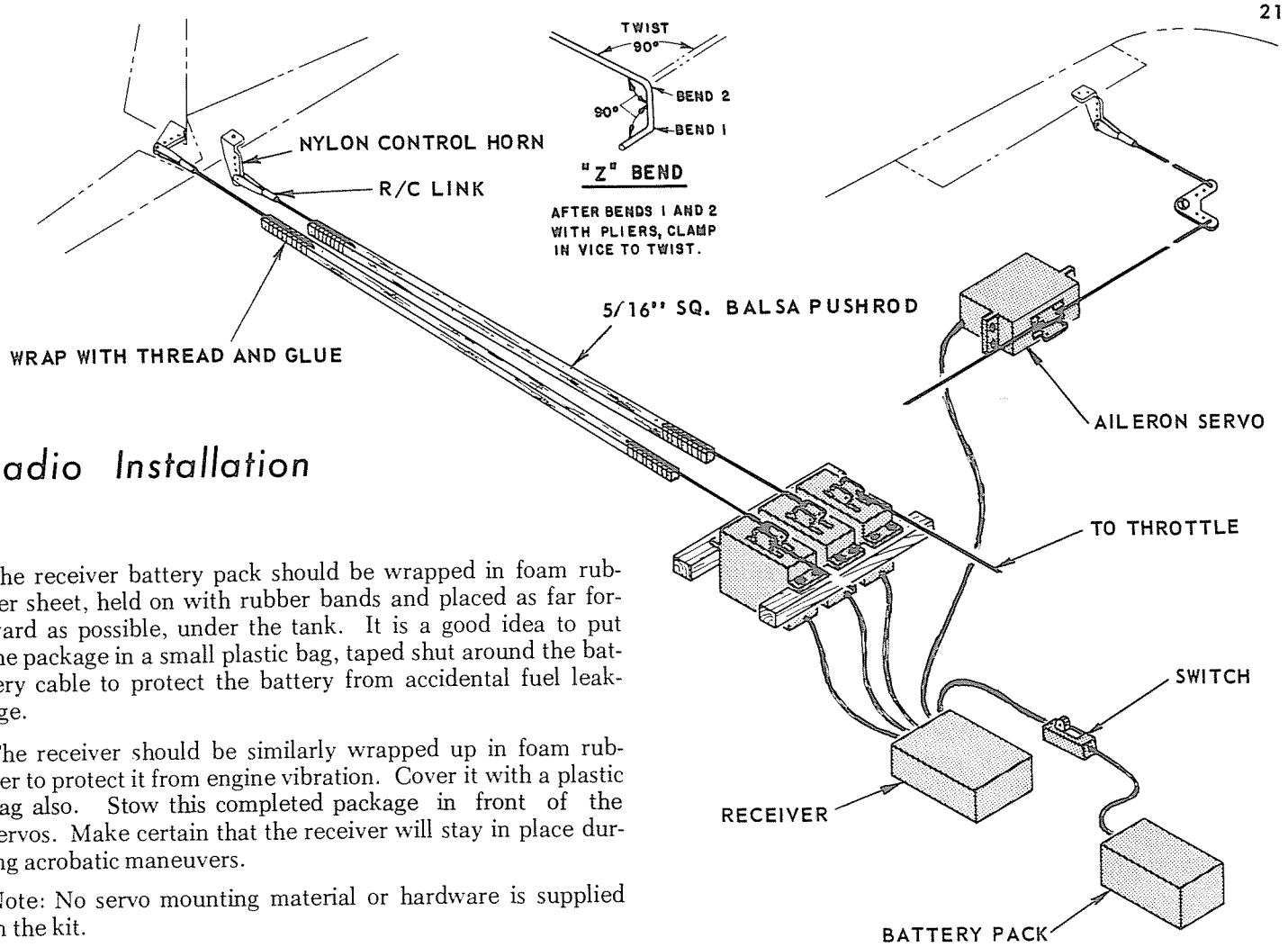
Photos By Nyle Leatham, Mesa, Arizona

Instrument Panel



LIBERTY SPORT

Back Of Front Seat
(No panel in rear cockpit.)



Radio Installation

The receiver battery pack should be wrapped in foam rubber sheet, held on with rubber bands and placed 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 acrobatic maneuvers.

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

(15.) COVERING AND FINISHING

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-edged (for thinness) razor blade. Check for any spots that are not stuck down and apply more dope.

Next give the entire airplane three coats of Supercoat Clear Dope or Sig Lite-Coat Low Shrink Clear Dope. We recommend spraying if you have a spray gun. If you spray, reduce the dope at least fifty-fifty with Supercoat Thinner. If you brush, reduce the clear until it brushes easily and flows out nicely.

The first coat of clear dope over the entire silk surface must be brushed on sparingly. As the brush rubs across the ribs on the open sections, dope is rubbed off the brush and through the silk and will run down the ribs on the inside. An excessive amount will run completely through the framework and puddle against the covering surface on the other side. When these puddles dry, the large amounts of dope solids in them causes more shrinkage than in the rest of the covering and a scarred area results. So apply dope very lightly the first time over. A second coat will seal most of the pores of the silk and from this point, running through will not be a problem.

After the third coat of clear you may commence color doping or, if a super finish is desired, several coats of Sig Sanding Sealer applied first. Thin to spraying consistency and apply an even coat to all silk-covered parts of the model, including the open framework. Sand with no-fill sandpaper, such as 3-M Tri-M-Ite (See Sig catalog), about 220 grit. Don't bear down on the edges of the ribs or the silk fibers will be cut through. Spray a second coat and sand again. A third or fourth coat may be necessary, depending on how heavy a coat is applied, to completely fill the silk grain. The ideal is a completely smooth and even base. Keep in mind that weight can build up fast in finishing and restraint must be used in applying, as well as a lot of sealer removed during the sanding.

The sanding sealer may be brushed on but more sanding may be required to remove the brush marks. Go easy on edges of ribs and stringers - don't cut down into the silk.

The color scheme is shown on the three-view. After spraying on the base colors, add the wing chevron and fuselage stripes by masking off the areas with masking tape. The base color for the rudder should be white with red and blue stripes added as trim. The area of the fuselage just behind the cockpit should be given a base coat of white for the white stripes

on either side of the red stripe though it is not necessary on the entire fuselage. Brush around the edges of the masking tape with thin clear dope and allow to dry. This seals the tape, preventing leakage of the colors underneath the edge. Don't leave masking tape on longer than necessary -- the longer it is on the tighter it sticks to the finish.

Spray two coats of clear over the completed color scheme.

(16.) WINDSHIELD

Cut the windshields from the clear plastic sheet. Fasten to the model with Sig-Ment used sparingly. Cover the seam between the fuselage and windshields with a strip of scrap plastic to simulate the bottom metal strip on the full size airplane.

(17.) 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.

FUEL TANK NOTES:

Temporary cross pieces of scrap plywood or balsa may be glued across the inside of the fuselage to support the tank, or it may be kept in place by stuffing foam rubber under and around it. Silicone rubber sealer, such as G.E. or Devcon, available at most hardware stores, should be used to fill the seam between the tank vents and the firewall to prevent fuel from seeping into the fuselage. Should it be necessary to remove the tank, the silicone seal can be broken loose and then replaced when the tank is put back in. Sig Heat Proof Fuel Line will not harden in glow fuel like most other types of fuel tubing. So if it is used for the pickup line inside of the tank, the tank will seldom have to be removed.

(18.) 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.

(19.) FLYING

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 model club or ask your hobby dealer for the names of good fliers in your 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 the plan. If it balances further back, add lead to the nose as necessary. For test flights add some extra lead to the nose to move it 3/8" to 1/2" 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 its not so easy to overcontrol. Some aerbatic ability may be sacrificed with a forward C.G. so you may wish, after test and familiarization flights, to move it tarther 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 run 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 take-off. Feed in some right rudder as soon as the tail wheel clears the ground, earlier if required. The Sport is not difficult to manage in the air and can be flown by anyone who is capable of handling a multi-channel model.

SCALE PRESENTATION DATA SOURCES

AIR PROGRESS HOMEBUILT AIRCRAFT, Spring-Summer 1966. *
Story, B & W Photos

AIR PROGRESS, April 1970 *
Story, B & W Photos, 2 Page Color Photo

AIR BRITAIN DIGEST, May 1967
Story, B & W Photos, Three-Views

SPORT AVIATION, July 1966.
Color Cover Photo

* The publisher of "Air Progress" has informed us that these back issues are no longer available from them.

BOOKLET ILLUSTRATIONS BY MIKE STOTT

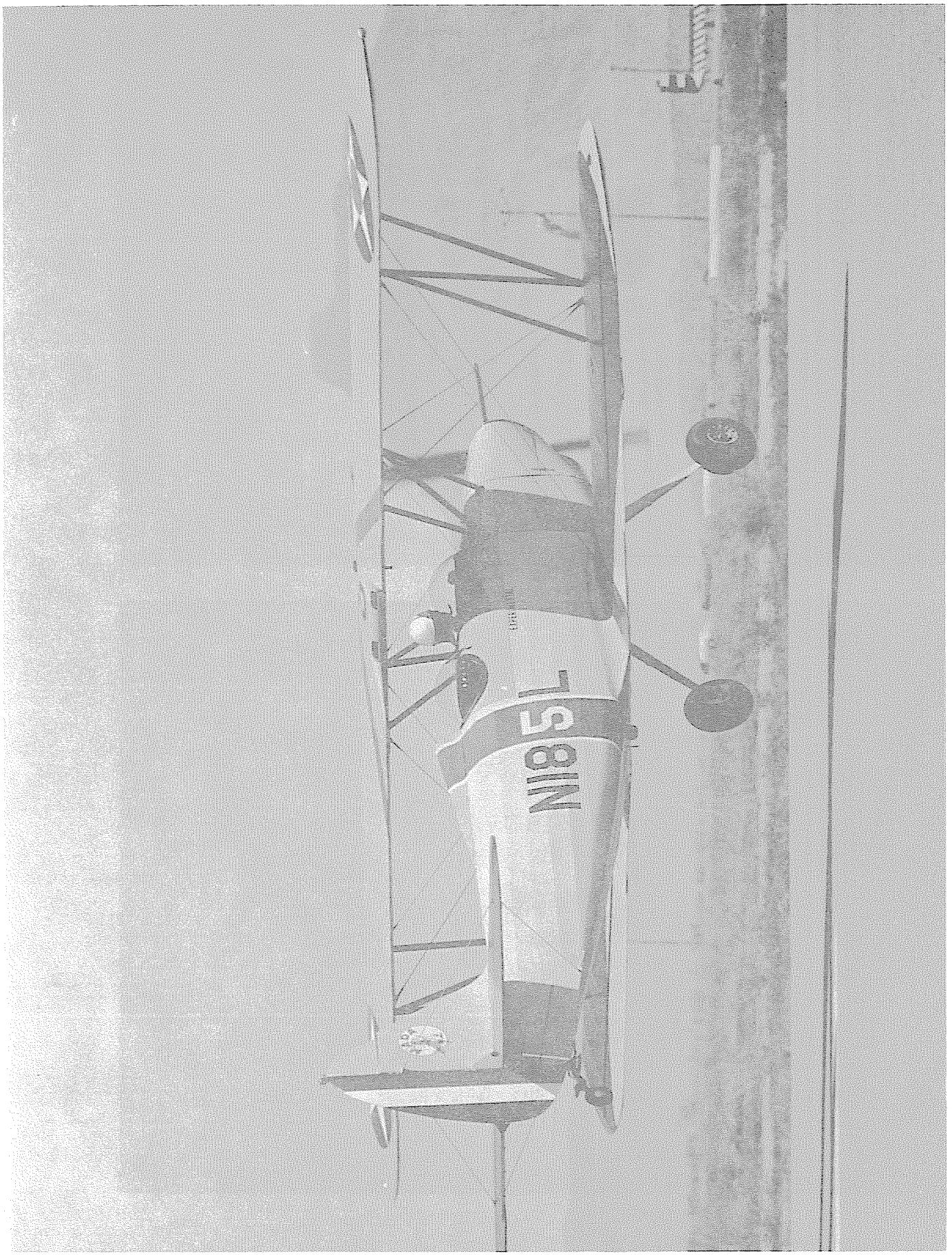
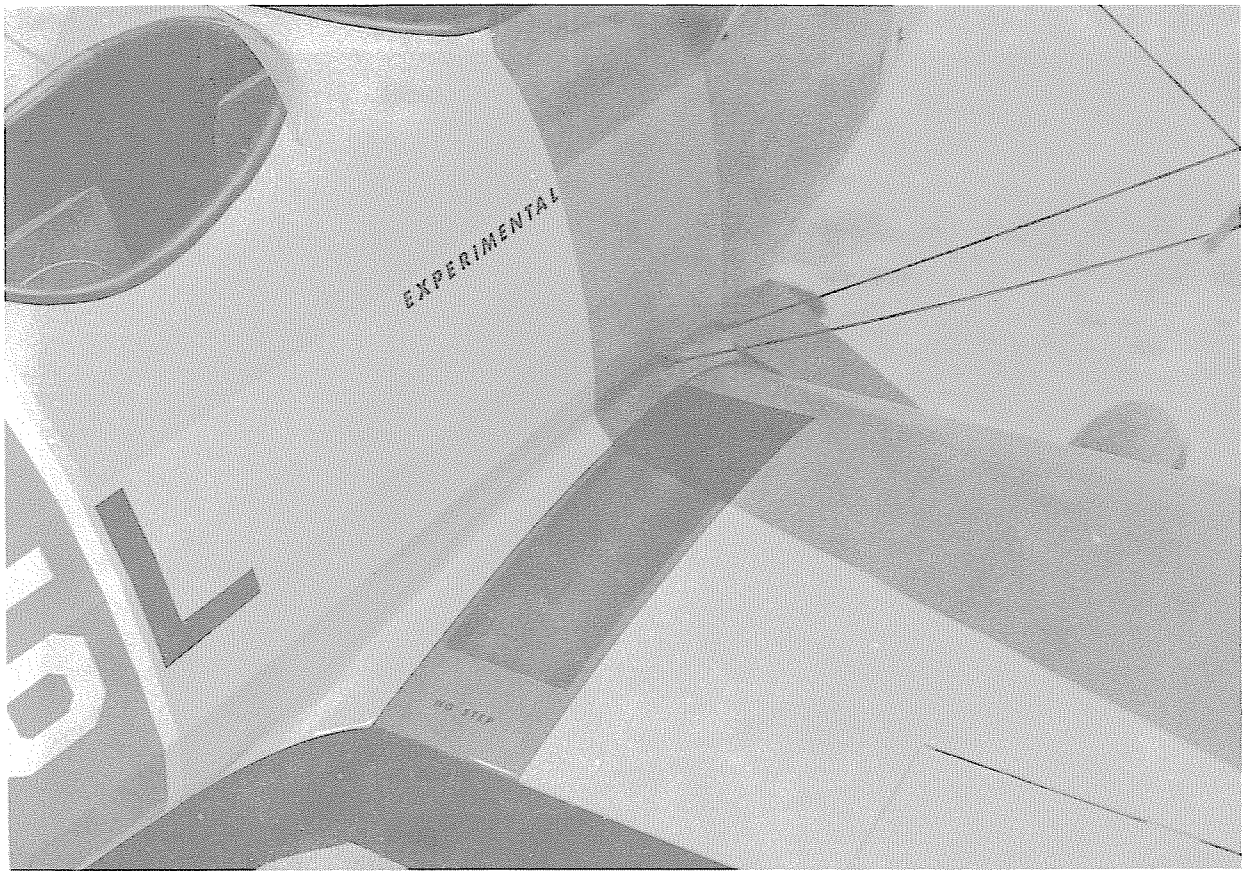
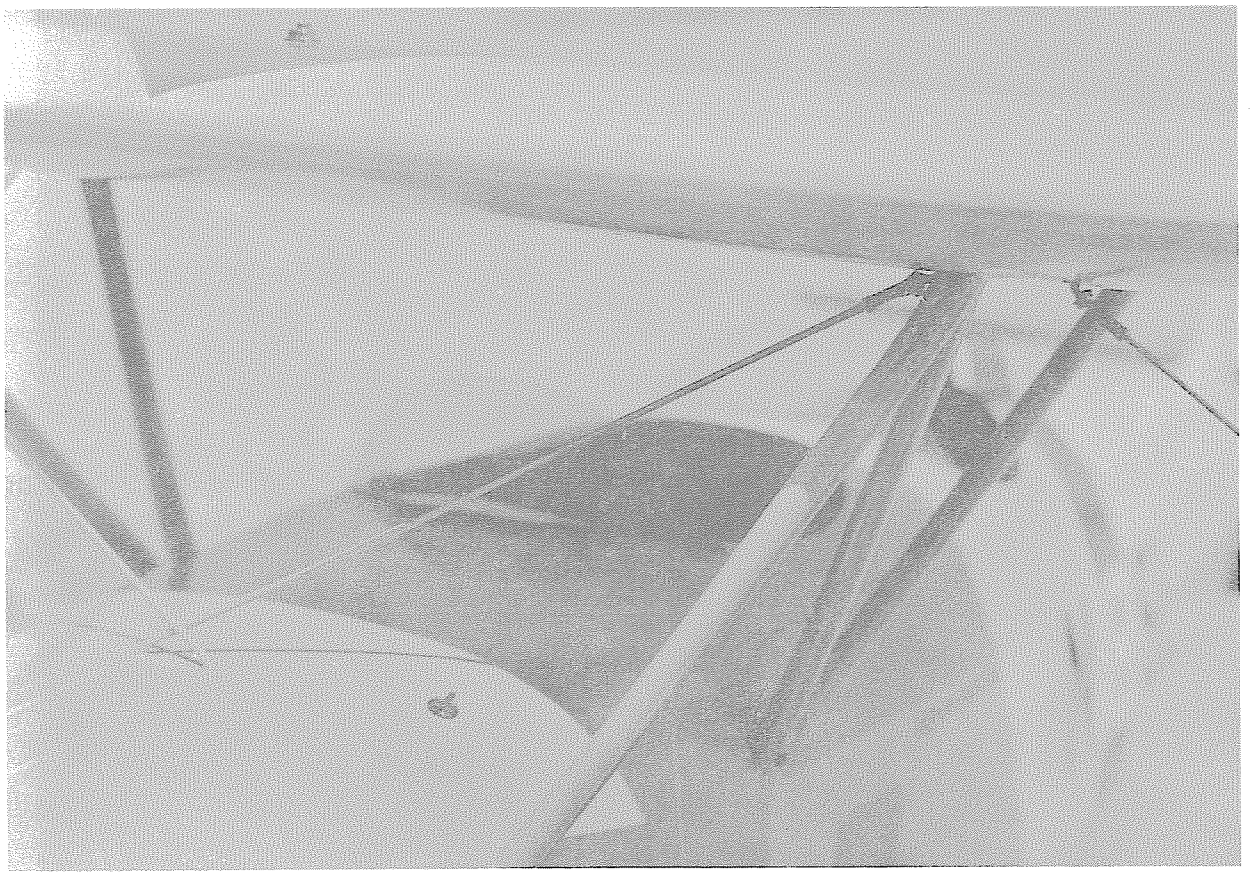


Photo By Nyle Leatham, Mesa, Arizona





Sig Mfg. Co., Montezuma, Iowa 50171