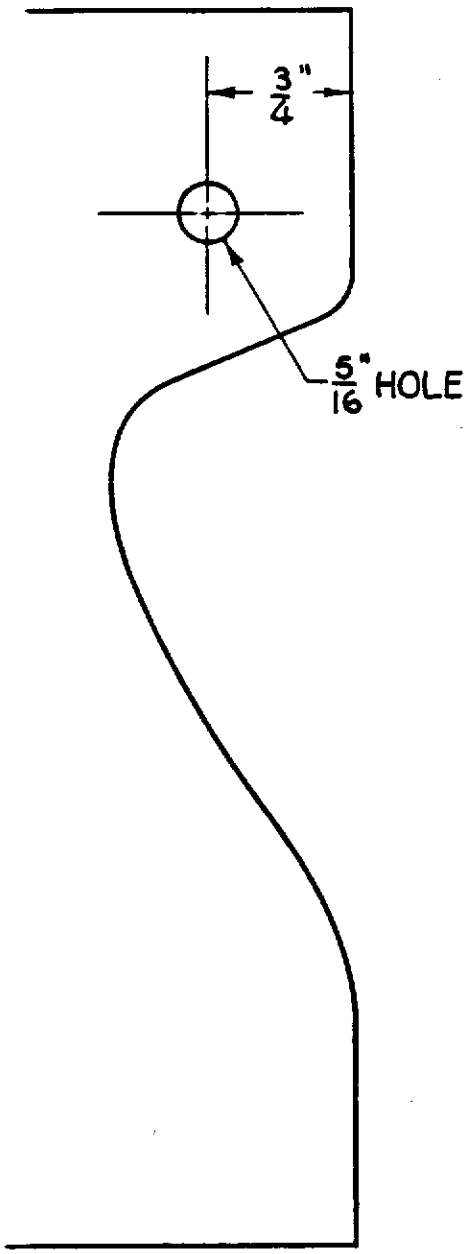
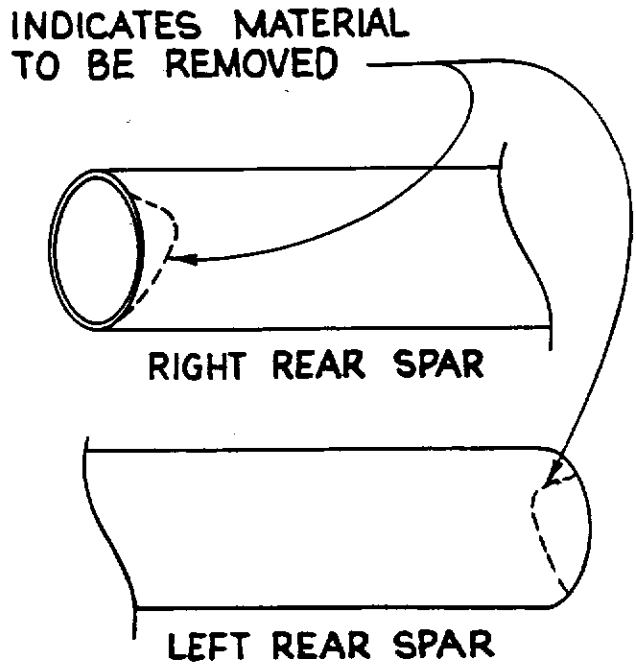
Sub-Section "B" Alignment

Objective:
Notch the rear spars so the wings can be folded. Attach the Lift Strut Brackets to the spars, attach the lift struts to the wings and install the wings on the fuselage. Align the wings in relation to tailpost, establish the correct dihedral and washout, and properly locate the spar reinforcement attach fittings. Align and install the jury struts. Correctly position the butt ribs on the fuselage. Permanently install the jury strut brackets, spar doublers, and #1 ribs.

STEP (1): Now that you have completed the initial layup of both wings and have painted the lift strut attach brackets you can fit the wings to the fuselage. Lay a wing right side up on your sawhorses and drag your straight edge across the top of both spars from the 1st rib to the inboard tip, to mark the exact top of the spars. Drill a 5/16" hole on the top centerline 3/4" from the root end of the top only of the rear spar only.

STEP (2): Cut out the template below and use it to mark the back side of each rear spar at the root end. Remove the spar material with a hand nibbler, file, tin snips, or other appropriate tool. This notch allows clearance of the spar and the rear spar carry-through tube when the wing is folded.





Rear Spar Cut-Out Details and Template
Fig. W-B-1

STEP (3): Attach the Lift Strut Attach Brackets to the spars. Set each wing upside down on your sawhorses and drag your straightedge along the bottoms of the spars between ribs #6 and #7 to find the centerline of the rear spar.

STEP (4): Slip the appropriate rear Strut Attach Bracket over the rear spar. (The lock-back brace tang should fit toward the trailing edge.) There is a small hole between the ears of the bracket. Center it on the centerline mark on the spar, with the center of the bolt hole in the bracket exactly 96 3/4" from the root end of the spar.

STEP (5): Clamp the rear Strut Attach Bracket to the spar with hose clamps and drill the #30 rivet holes in the spar Refer to Plate W-4. Start at the center of the bracket. Install a cleco in each new hole as you work toward the ends. Remove the clamps so you can drill all the rivet holes. Be careful not to drill into the web of the spar insert. Use a drill stop to prevent drill from penetrating too far into spar.

STEP (6): Slip the front spar attach bracket onto the front spar with the center of the bolt hole 96 3/4" from the end of the front spar and the ears of the bracket tilted about 26° toward the trailing edge.

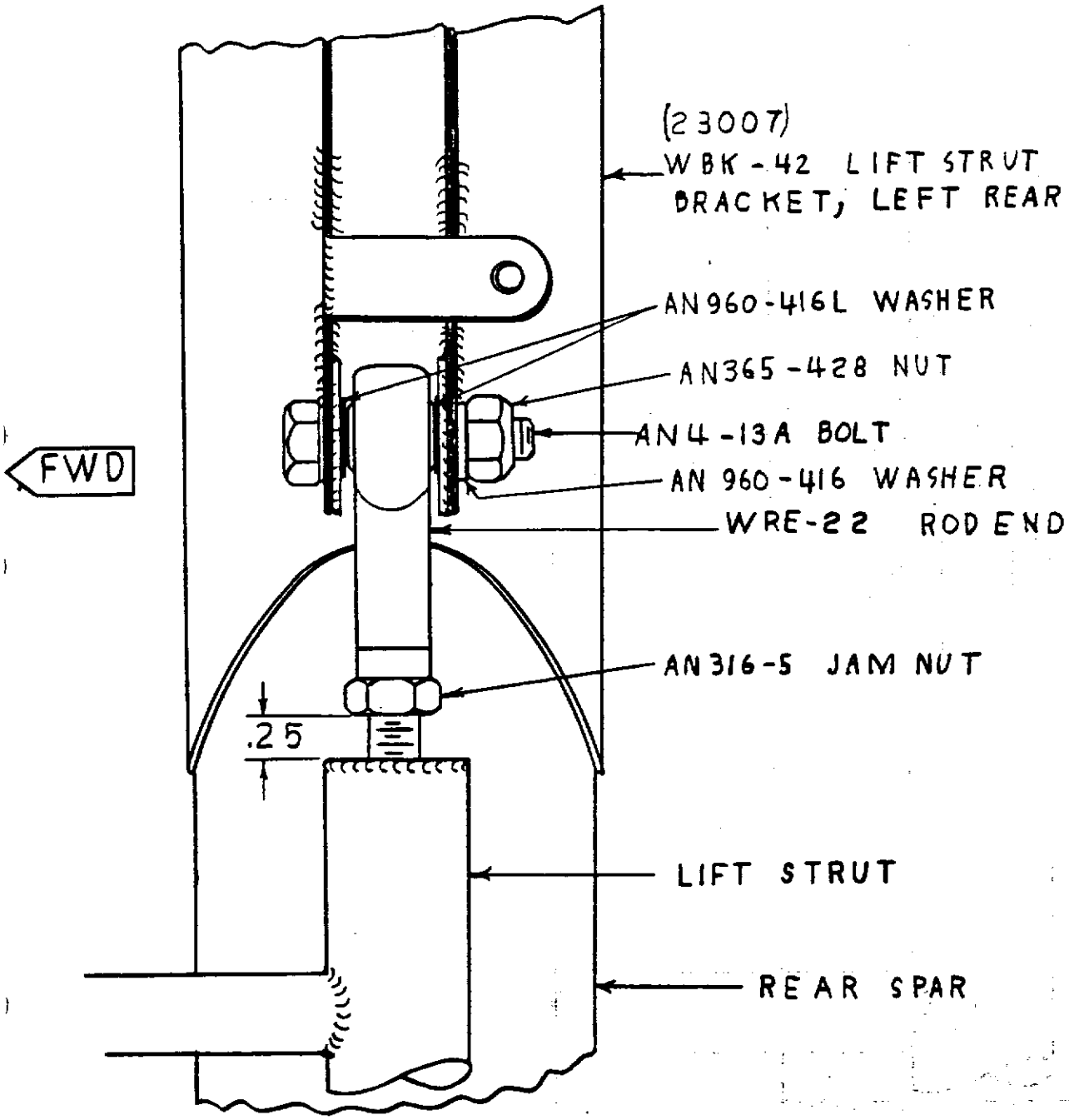
STEP (7): Thread an AN316-5 Check Nut and #23012 (WRE-22) Rod End onto each appropriate Lift Strut. Adjust the Rod Ends so 0.25" of bolt appears inboard of the Check Nut as shown in fig. W-B-2.

STEP (8): Fashion a brace 36 1/2" long that you can tape in place between the inboard end of the Lift Strut and the rear Spar. This will hold the Lift Strut up in place while you bolt the Lift Strut onto the rear Attach Bracket (acting as a tempory jury strut).

STEP (9): Rotate the front Strut Attach Bracket if necessary for a perfect fit on the front rod end. slip an AN960-416L Spacer onto the AN4-13A Bolt, on each side of each #23012 Rod End bearing, to take up any slack if needed.

STEP (10): Check that the distance from the root end of the front spar to the center of the Attach Bracket bolt is 96 3/4". Clamp the Bracket, drill and cleco the rivet holes as you did those in the rear Bracket.

STEP (11): Repeat the procedure to locate the Brackets on the other wing. Be careful not to let the Lift Strut swing up or down while it is bolted in the brackets or one of the rod ends may be damaged.



Lift Strut To Spar Attach Assembly
Fig. W-B-2

STEP (12): Remove the Lift Struts and Brackets from the spars and deburr all rivet holes in the Brackets and spars.

STEP (13): Mix enough Structural Adhesive to coat the inner surfaces of the Strut Attach Brackets. The primary purpose of the epoxy here is to add to the barrier between the aluminum spars and the steel brackets, preventing dissimilar metal corrosion. If the Attach Brackets are not Powder Coated they should be painted.

STEP (14): Coat the inner surfaces of the Brackets with epoxy and rivet them in place on the spars with the 1/8"x1/8" S. S. Rivets. Use 1/8"x1/4" S. S. Rivets through the Brackets and the "I" Insert.

STEP (15): Attach the Lift Strut to the Bracket again and tape the 36 1/2" prop in place to hold the inboard endup.

STEP (16): Slip the #1 Rib into place and tape it into position as securely as you can. You will now need to install the wing, accurately locate the #22002 and #22003 Spar Attach Reinforcement Fittings, and rivet them in place on the spar before you glue on the #1 Rib.

NOTE: There are two ways to accurately locate the butt ribs on the fuselage. One way requires mounting the wings to the fuselage twice. The first time, locate the Spar Attach Reinforcement Fittings on the spars, remove the wings, rivet the Fittings to the spars, and glue the #1 Rib in place. Then install the wings again on the fuselage and fit the Butt Ribs up to the #1 Ribs. The following steps describe the procedure to locate the Butt Ribs and fittings during one set-up.

STEP (17): Slide the #15058 Brackets onto the welded bushings of the headrack. Tape the #27003 and #27004 Butt Ribs onto the Brackets with the flanges to the inside.

STEP (18): Set the fuselage on a low sawhorse (for ease of handling) or on jackstands placed under the front landing gear fittings and a taller stand under the tail. Level the fuselage fore and aft. The underside of the cockpit is the datum. Tape equal shims to each end of your 48" level to clear the sawhorse and hold one end up against the lift strut carry-through tube and the other end against the fuselage crosstube just behind the rudder pedals. Level the fuselage side-to-side also. When you have the fuselage level, weight it down with sandbags so it will not tip when you install one wing.

STEP (19): Mark the top center of the front spar carry-through tube (1" x .035" wall tube across the fuselage above the windshield). Note the distance from this center mark to the center of the bolt hole of each spar attach lug. It should be approximately 18". Measure from the center of the bolt holes in the rear spar carry-through lugs, forward to the centers of the front spar carry-through lugs. (Approximately 27 1/2"). Record these measurements, you will need them later.

STEP (20): For this step you will need help. Have someone hold the tip end of the wing up while you position the rear spar root end over the rear spar carry-through mounting lug. (At this point an adjustable stand can ease the burden on your helper.) Drop in a AN395-85 Clevis Pin to secure the rear spar. Position the front spar over the front carry-through lug. Attach the lift strut lower end fitting to the fuselage attach bracket with an AN6-11 Bolt (these holes have been reamed by the factory). Be careful while the wing is being held without the bolts. Tape or clamp the front spar to the fuselage to prevent the wing from swinging back. Install the other wing.

STEP (21): Adjust the "twist" of both wings so they are identical. Place a level against the bottom of the spars just outboard of the root rib. Make a mark on the bottom of each rear spar 159" from the root end. Clamp a straight edge or steel ruler perpendicular to the level so it will contact the rear spar at its center (see Fig. W-B-3). With the level resting against the bottom of the front spar, adjust the ruler until the level reads level. Move the level to the 159" mark, and with the level resting against the front spar, insert the washout block between the rear spar and the ruler. The level should again read level. If it does not, adjust the front rod end so that it does.

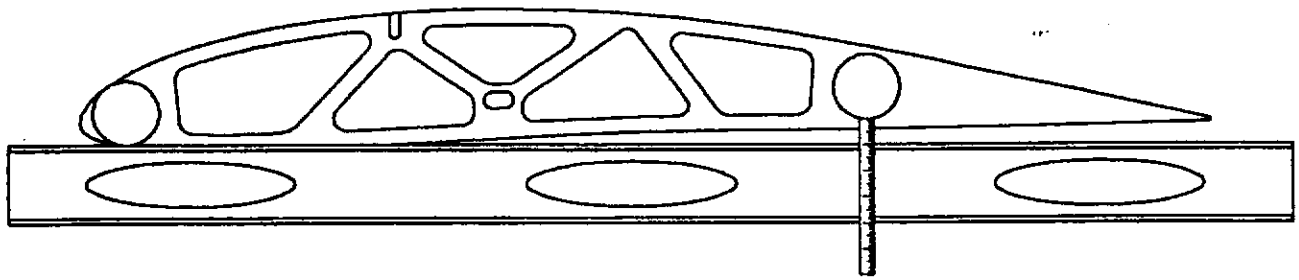


Fig. W-B-3
Setting Wing Twist

STEP (22): Release the front spar from the carry-through lug and carefully swing the wings back one at a time. If the fuselage is level, the wing tips should be the same distance from the floor. If one wing tip is higher than the other, turn both rod ends on the low wing to raise the tip.

STEP (23): Swing the wings out again and secure the front spars to the fuselage. Attach plumb lines to the in board and outboard ends of each spar leading edge. Secure them with masking tape. Stretch a fifth line, under the fuselage, parallel to the floor and just in front of the four lines hanging from the wings. Fasten each end of this line to a solid object. Move the wings until the gaps between the four lines hanging from the wing and the fifth line are all equal.

STEP (24): Measure from the 159-inch mark on the bottom of each rear spar to the second rudder hinge from the bottom of the tailpost, to ensure that both wings are equidistant from the tailpost. If they are not, you may have to sweep one wing slightly forward and one slightly rearward (check the gaps between your strings). A very small movement at the root end of the spar will translate into a much larger movement at the tip of the wing. Clamp the front spars. A small "C" clamp between the 1" x .035" spar carry-through tube and the spar where they connect will work nicely.

STEP (25): In STEP (19) you logged some measurements from the center of the front spar carry-through tube to the mounting lug hole centers and from the rear lug holes to the front. Duplicate these now, ending up with a mark on top of the front spar centered directly over the bushing. Refer to Plate W-13. When you are satisfied the mark is in the right place, drill through with a 3/16" drill. If the hole appears to be centered on the lug, drill to 1/4", then use a small rat-tail file to take the hole out to 5/16" in order to match the lug hole. Insert an AN395-85 Clevis Pin.

STEP (26): Remove the clevis pin from the rear spar and use the spar attach lug as a guide. Drill down through the hole in the top of the rear spar and through the bottom of the spar. Use a drill with 2 1/4" flutes or less to prevent the top spar hole from being reamed out larger while drilling the bottom hole. Drill the bottom holes in the front spars the same way.

STEP (27): Insert an AN5-30 Bolt to secure the rear spar and an AN395-85 Pin for the front. Ream if necessary.

STEP (28): Bolt the #22002 and #22003 Spar Attach Reinforcement Fittings above and below each spar with AN5 or 5/16" bolts. Align the centerline of these doublers with the centerline of the spars. Install the #22002 Front Spar Attach Fittings (long doublers) on the front spars. Drill the rivet holes and cleco the fittings to the spars. Turn the wing over and do the same on the bottom side. Mark each fitting for reassembly and remove.

STEP (29): De-burr all the rivet the holes and rough sand the convex surfaces of all the fittings and sand the matching surfaces on the inside of the spar tubes. Paint structural adhesive onto the convex surfaces of the fittings and on the inside of the spar tubes. Replace the fittings in their respective positions inside the spars and rivet them in place with 1/8" x 3/16" S.S. Rivets.

STEP (30): Ream the four holes in each #25014 (WJS-44) Jury Strut to 3/16 inch. Bolt two #23011 (WJS-4's) to the spar ends of each Jury Strut (see Fig. W-B-4). Position the top ends of the jury struts about 53" from the spar root ends. Use the large hose clamps to clamp the Jury Strut Attach Brackets to the spars. Slip the #23010 (WJC-46) Clamps around the lift struts.

STEP (31): Adjust the Jury Struts so they are parallel with the fuselage and vertical. The lift struts should be perfectly straight with the Jury Struts attached. "Eyeball", or better yet, string-line them from end to end. The lift struts should be straight to provide maximum strength, especially against negative "G" loads. It may be necessary to slide the Jury Struts, Clamps and Brackets one way or the other to straighten the lift struts. When they are straight, drill #30 holes in the spars for the Jury Strut Attach Brackets and cleco in place.

STEP (32): Carefully measure and record the location of the Jury Strut Clamps on the lift struts for easier reassembly. You will also need this measurement if you are installing tube speed fairings on the lift struts, because the wood will have to be notched to allow for the clamps. Refer to Plate W-26.

STEP (33): Adjust the #1 Rib at the root end of each wing so it is exactly where it belongs according to Fig. W-A-14 and tape it securely in place. Refer to Plate W-17.

STEP (34): With the wings in place on the fuselage adjust the Butt Rib on the Brackets so the top edge of the Butt Rib is flush with the top edge of the #1 Rib. See Fig. W-B-4.

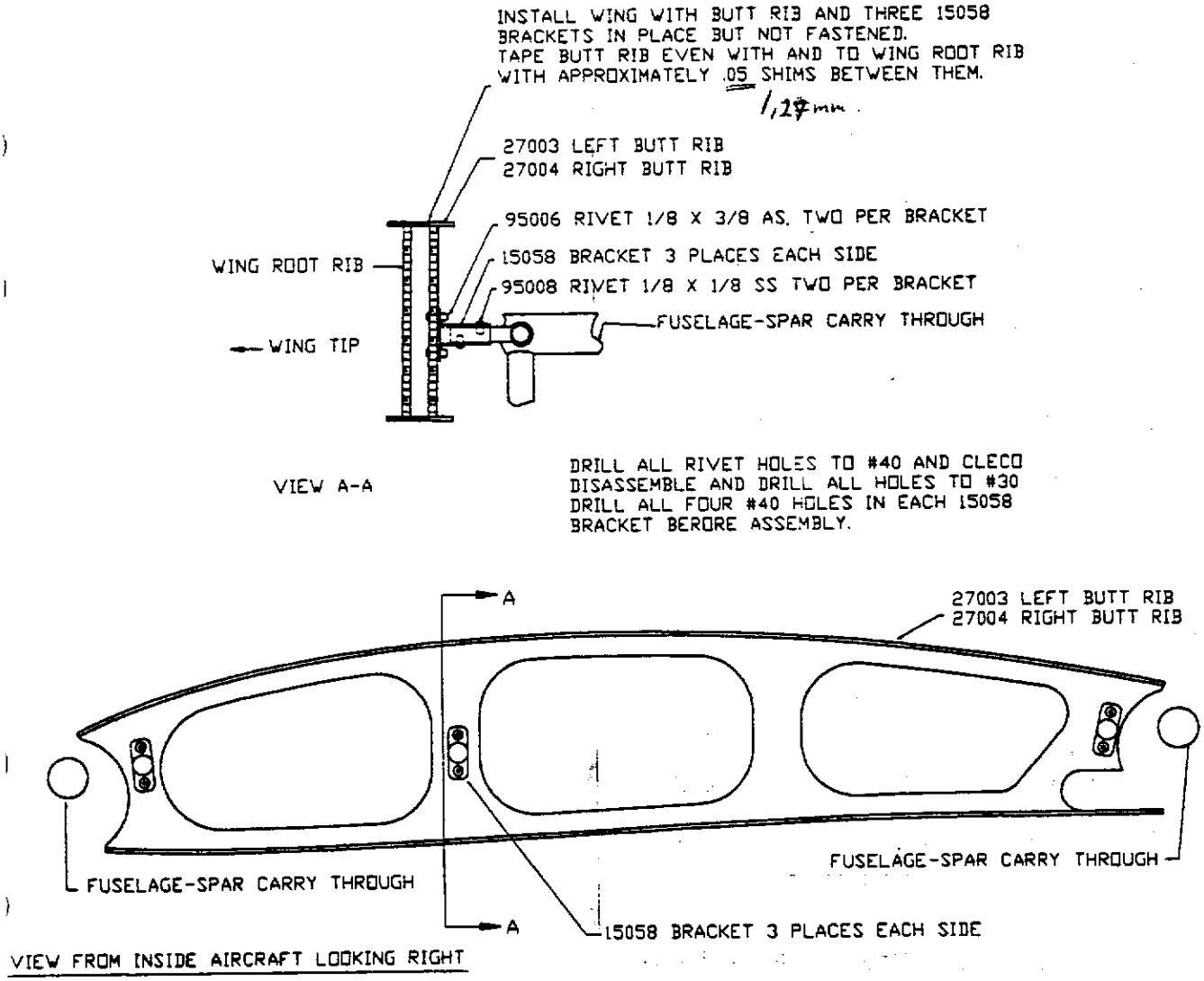


Fig. W-B-4
Butt Rib Installation

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STEP (35): Drill through the holes in the Brackets and through the Butt Ribs. Cleco the Butt Ribs in place.

STEP (36): Tape the Butt Ribs securely to the #1 Rib, mark the sleeves of the Butt Rib Brackets and drill two #30 holes through the sleeves and bushings. Refer to Plate W-17. Drill two holes on opposite sides of each bracket but stagger them slightly so one rivet will not interfere with the other. Cleco.

STEP (37): Remove the Jury Struts and de-burr the rivet holes in the spars and Jury Strut Brackets. Sand with 80 grit sandpaper and clean both surfaces where the Brackets mate with the spars. Apply a thin coat of structural adhesive to the mating surfaces of each bracket. Rivet the Jury Strut Brackets to the spars with 1/8"x1/8" stainless steel rivets.

STEP (38): Notch the #1 Ribs so they will slip over the rivets in the Spar Attach Reinforcement Fittings. Rough sand and clean the spars where the #1 Ribs fit. Slide the ribs into place and apply structural adhesive. Measure carefully to fit them exactly as they were earlier and tape them securely in place while the adhesive sets. Pay particular attention that the tail of each #1 Rib is the correct distance from the #3 Rib so the flaperon hinges will fit properly.