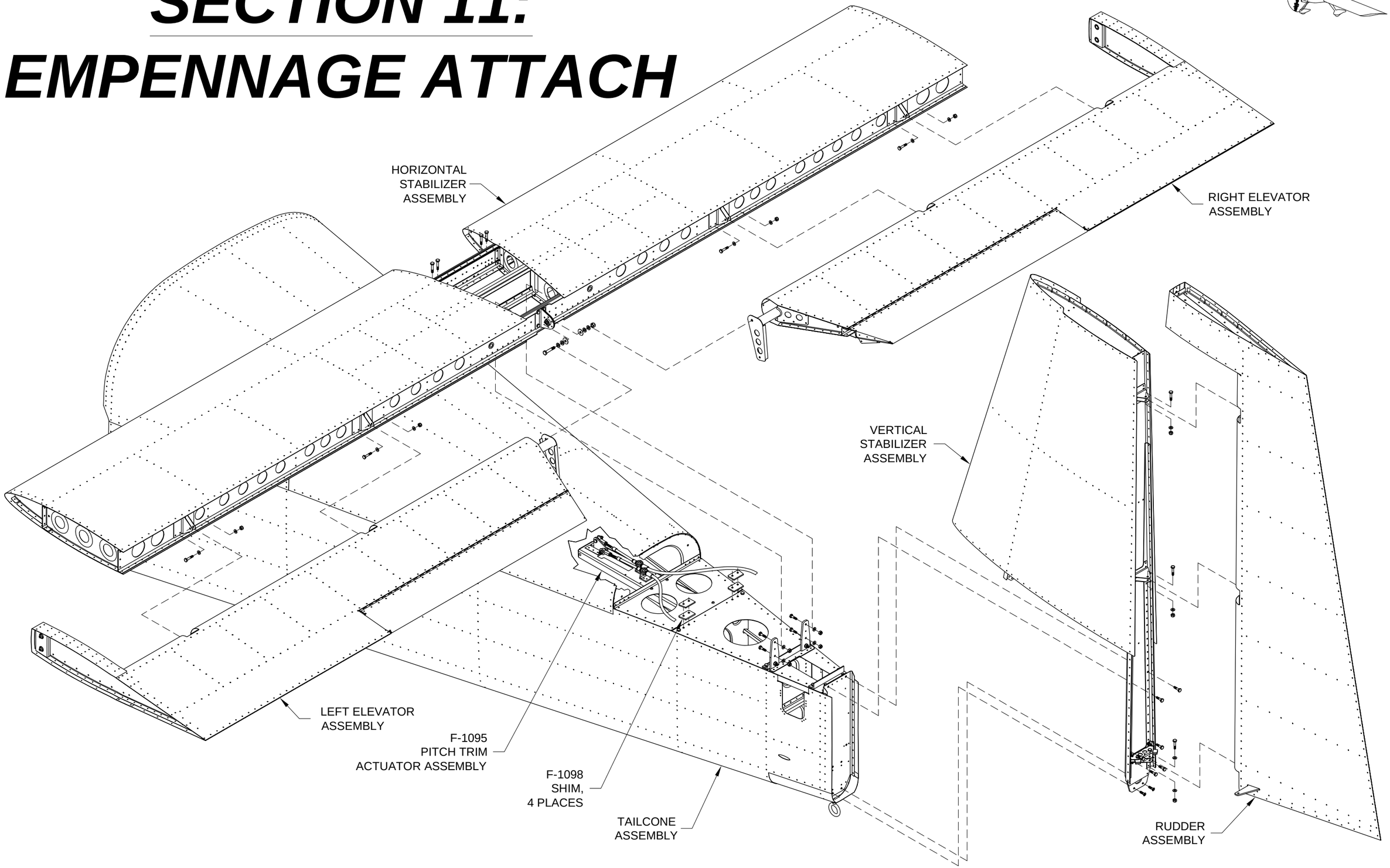
SECTION 11:
EMPENNAGE ATTACH



Step 1: Install MD3614M Rod End Bearings and AN316-6 Jam Nuts into both elevators as shown in Figure 1. Tighten jam nuts after achieving the rod end bearing engagement called for in Figure 1, Detail A.

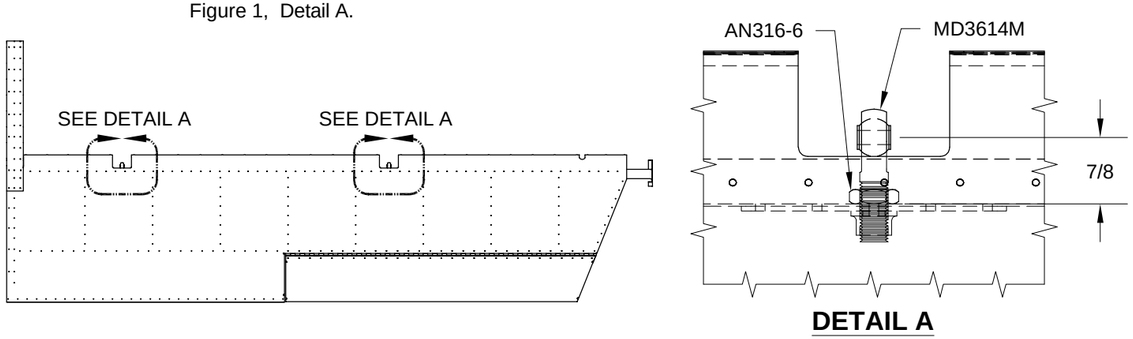


FIGURE 1: ROD END BEARING ATTACH

Step 2: Attach the horizontal stabilizer to the workbench using four "drywall" type screws as shown in Figure 2. Position the stabilizer on the workbench such that the tips hang over the edges of the workbench. The overhang is necessary so that the elevator counterbalance arms will clear. See Figure 4. The screws are installed through the holes in the HS-1008 Horizontal Stabilizer Front Spar Attachment Brackets into the surface of the workbench. Rest the rear spar of the horizontal stabilizer on a spacer block as shown in Figure 2 to hold the horizontal stabilizer in it's correct orientation.

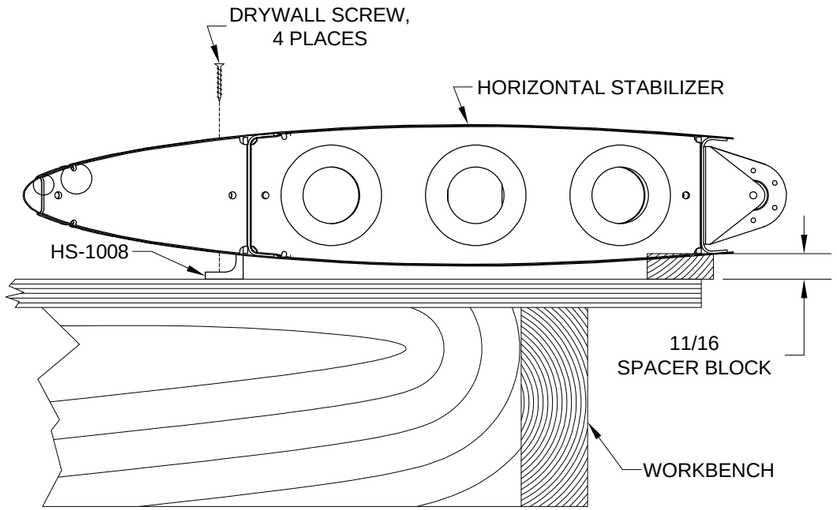


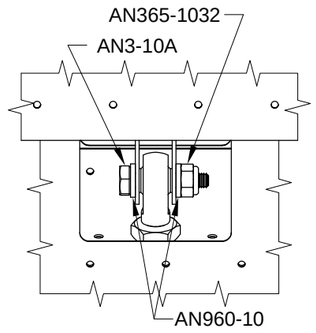
FIGURE 2: HORIZONTAL STABILIZER SETUP

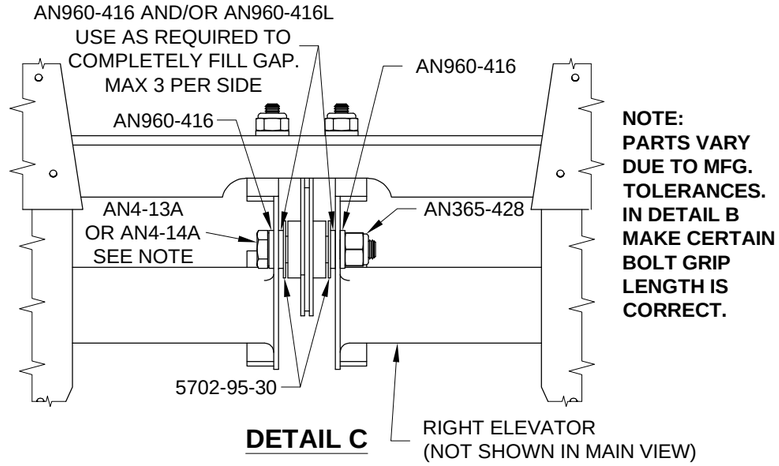
Step 3: Temporarily install the left elevator to the horizontal stabilizer as shown in Figure 3. Elevator attach hardware is shown in Figure 3, Detail B. Not completely filling the gap between the elevator horn and the VA-146 with washers and then tightening the bolt to remove the gap will cause slight binding in the rod end bearings.

Perform an initial check to see that the elevator rotates freely and with no interference. The elevator should not come in contact with the upper or lower flanges of the horizontal stabilizer. There should be 1/8 inch gap between the outboard edge of the horizontal stabilizer and the inboard edge of the elevator counterbalance arm. Tighten the jam nuts after completing the adjustments.

Step 3: (continued) Final check for 30° "UP" (+0°/-5°) elevator travel and 25° "DOWN" (+0°/-5°) elevator travel as shown in Figure 4. Elevator travel is best measured using a protractor or an electronic "smart level".

Step 4: Secure the elevator in the "trail" position by placing strips of duct tape over the gap between the elevator counterbalance arm and the horizontal stabilizer.





NOTE: PARTS VARY DUE TO MFG. TOLERANCES. IN DETAIL B MAKE CERTAIN BOLT GRIP LENGTH IS CORRECT.

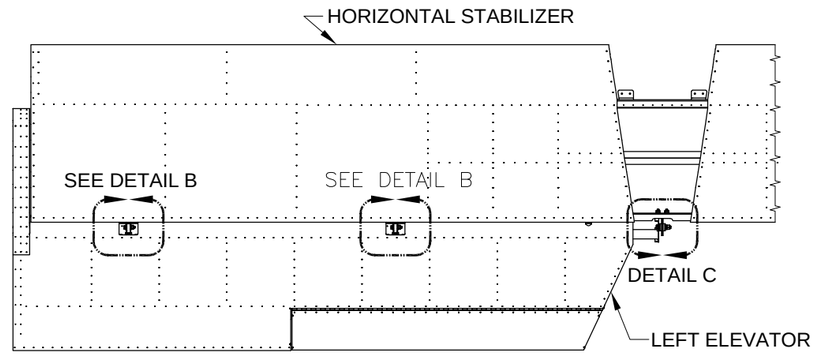


FIGURE 3: ELEVATOR INSTALLATION

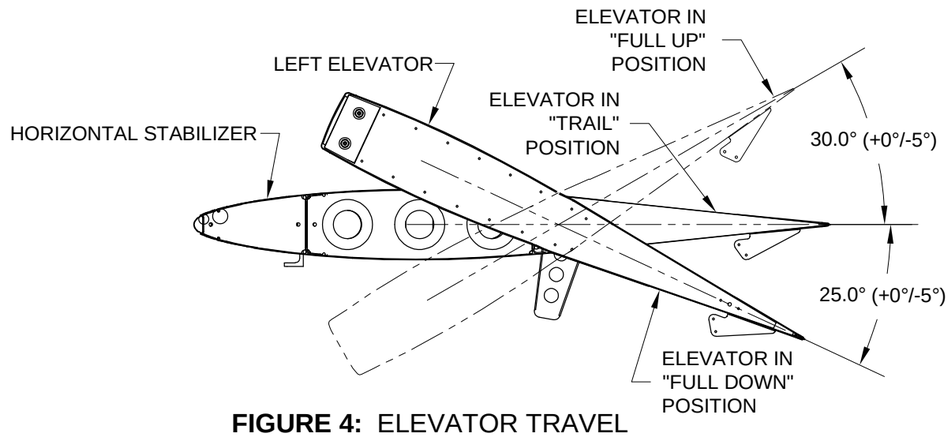


FIGURE 4: ELEVATOR TRAVEL

Step 1: Locate the steel E-Drill Bushing provided in the kit and shown in Figure 1 below. The drill bushing will be used to protect the hinge bearing from the drill bit when match-drilling the elevator horns to the inboard elevator hinge point. It may be necessary to reduce the diameter of the tube to get it to fit inside the bearing. Mount the tube in a drill press then hold a file to it until the diameter measures 1/4 [6.4 mm].

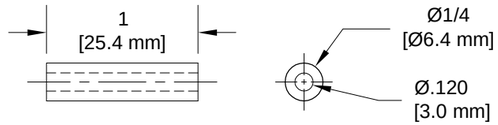


FIGURE 1: E-DRILL BUSHING

Step 2: Insert the E-Drill Bushing into the VA-146 Elevator Center Bearing as shown in Figure 2. Match-Drill #30 the WD-605-L-1 Left Elevator Horn using the E-Drill Bushing as a drill guide.

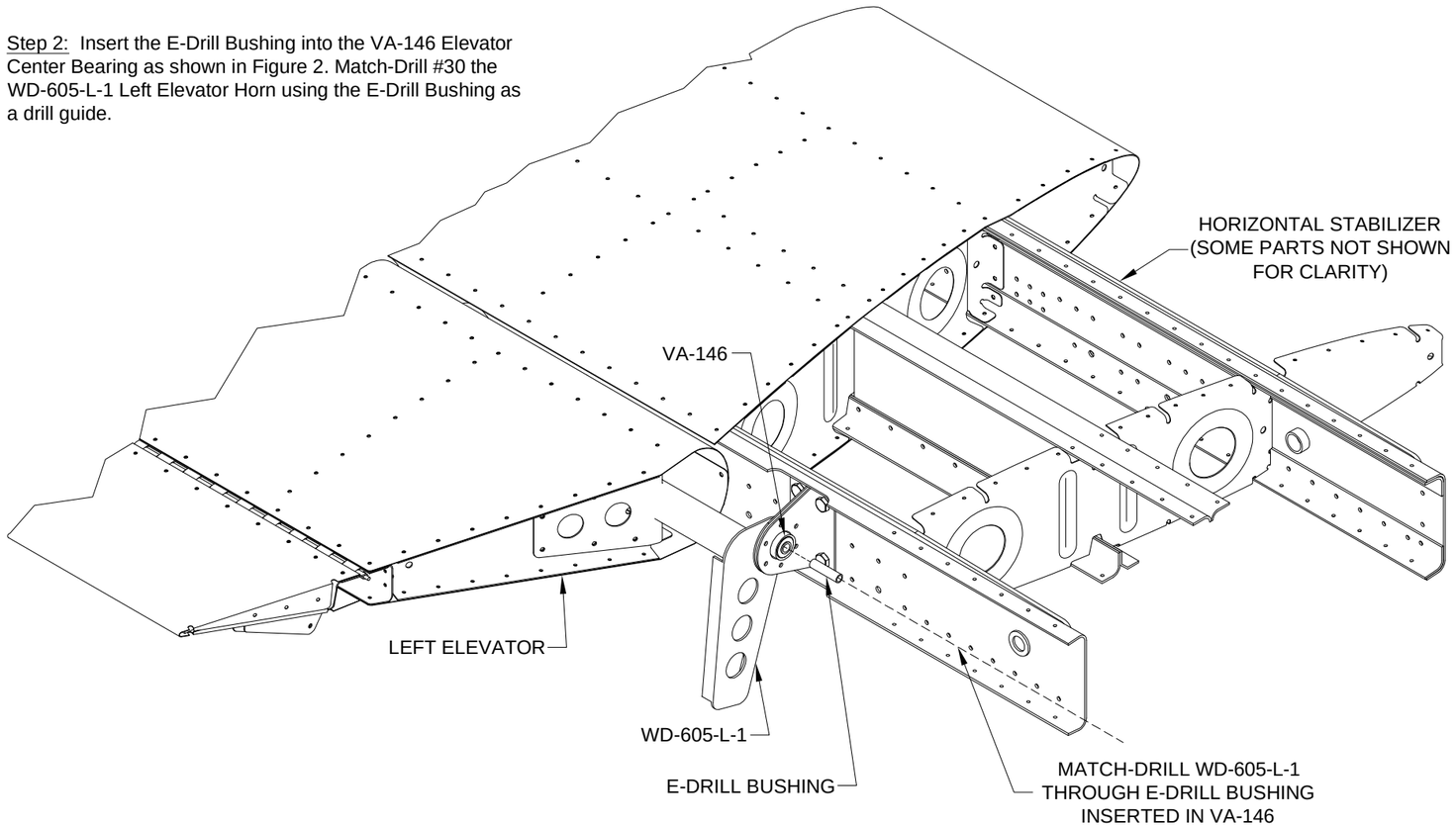


FIGURE 2: MATCH-DRILL ELEVATOR HORN

Step 3: Remove the left elevator from the horizontal stabilizer. Final-Drill the hole in the WD-605-L-1 Elevator Horn to 1/4 inch and deburr the hole.

Step 4: Repeat Page 11-2, Steps 3 and 4 and Steps 1 through 3 for the right elevator.

Step 5: Install both right and left elevators to the horizontal stabilizer. See Page 11-2, Figure 3 for hardware call-out. Secure both elevators in the "trail" position by placing strips of duct tape over the gap between the elevator counterbalance arm and the horizontal stabilizer.

Step 6: With both elevators in the "trail" position there will most likely be a mismatch in position between the bottom end of the WD-605-L-1 Elevator Horn and the bottom end of the WD-605-R-1 Elevator Horn. Identify which of the two elevator horns is the most aft.

Step 7: In the most aft WD-605-1 Elevator horn, locate and drill a 3/16 inch hole as shown in Figure 3.

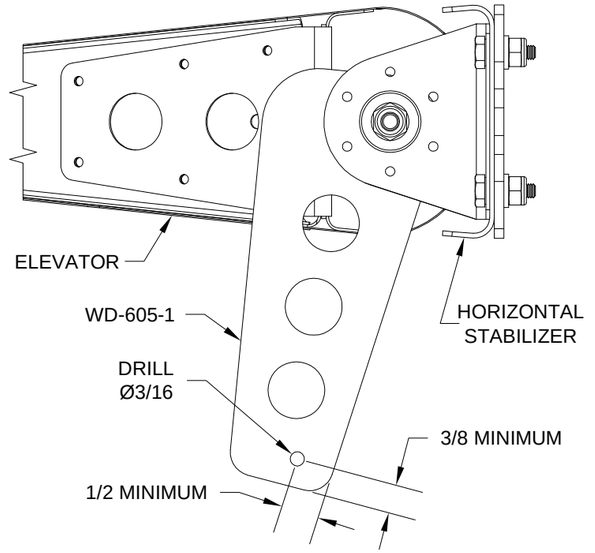


FIGURE 3: ELEVATOR PUSHROD BOLT HOLE

Step 8: Measure the spanwise distance between the WD-605-L-1 and WD-605-R-1 Elevator Horns.

Step 9: Make or find or otherwise acquire a block of wood/plastic/metal that is the same thickness or up to 1/32 inch less than the distance measured in Step 8. The block should be 3/4 to 1 1/4 inch wide and 2 to 3 inches long. This Drill Guide Block will be used to keep the bit perpendicular when drilling from one elevator horn to the other. A stack up of blocks is acceptable if a single block the correct thickness is not available. Use a drill press to drill a 3/16 inch diameter hole in the block(s) 1/2 inch from one end. The hole must be perpendicular to the drill guide block.

Step 10: Insert a 3/16 bolt through the hole drilled per Step 7 in the WD-605-1 Elevator Horn. Place the Drill Guide Block against the elevator horn with the bolt passing through the hole drilled per Step 9. Clamp both elevator horns together with the drill guide block between them then double-check that both elevators are aligned in trail.

Step 11: Remove the 3/16 bolt from the WD-605-1 Elevator Horn and Drill Guide Block. Match-Drill #12 a hole in the elevator horn using the elevator horn and drill guide block to aid alignment. Drill the hole as straight and as square as humanly possible.

Step 12: Remove the clamp and Drill Guide Block from the WD-605-1 Elevator Horns and then remove the elevators from the horizontal stabilizer. Reinstall the elevator attach hardware finger tight in the horizontal stabilizer hinge brackets so that it won't get lost. Deburr the holes in the elevator horns and set the elevators safely aside.

Step 1: Final-drill 1/4" the vertical stabilizer attach hole in the VS-1016 Vertical Stabilizer Front Spar Attach Bracket as shown in Figure 1. Final-Drill #12 the four holes common to the vertical stabilizer front spar attach bracket and the HS-1002 Front Spar. Deburr the holes and set the bracket aside for now.

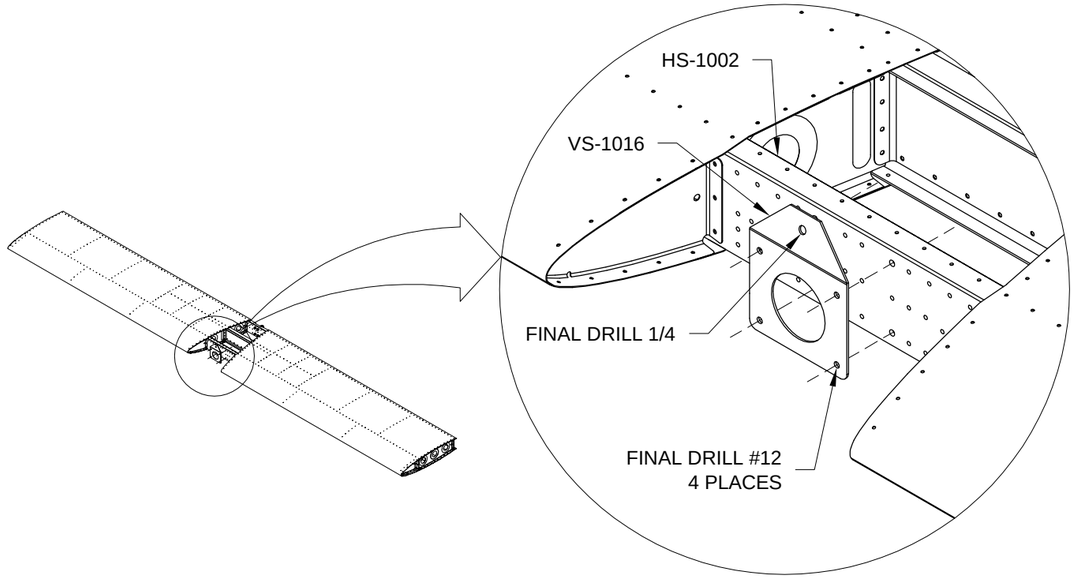


FIGURE 1: DRILLING VERTICAL STABILIZER FRONT SPAR ATTACH BRACKET WITH SPAR

Step 2: Fabricate four F-1098 Shims as shown in Figure 2 from AB4-125X1 1/2 aluminum bar.

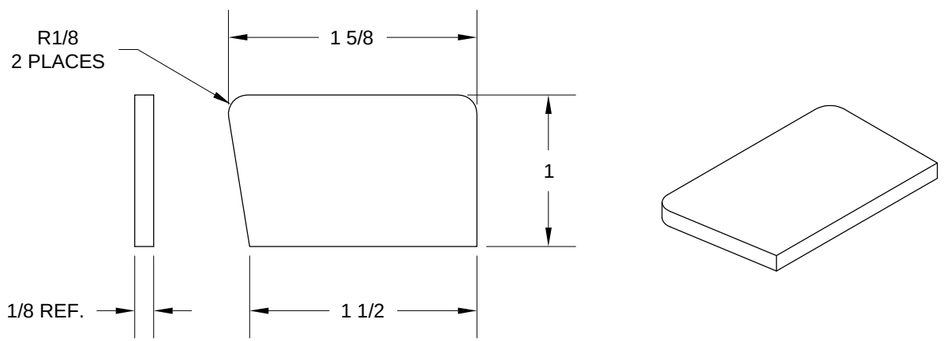


FIGURE 2: FABRICATE SHIMS

Step 3: Attach the F-1098 Shims to the underside of the HS-1008 Horizontal Stabilizer Front Spar Attach Brackets with double sided tape as shown in Figure 3. Carpet tape provides good results. The tape will hold the shims in position while being drilled in assembly with the tailcone.

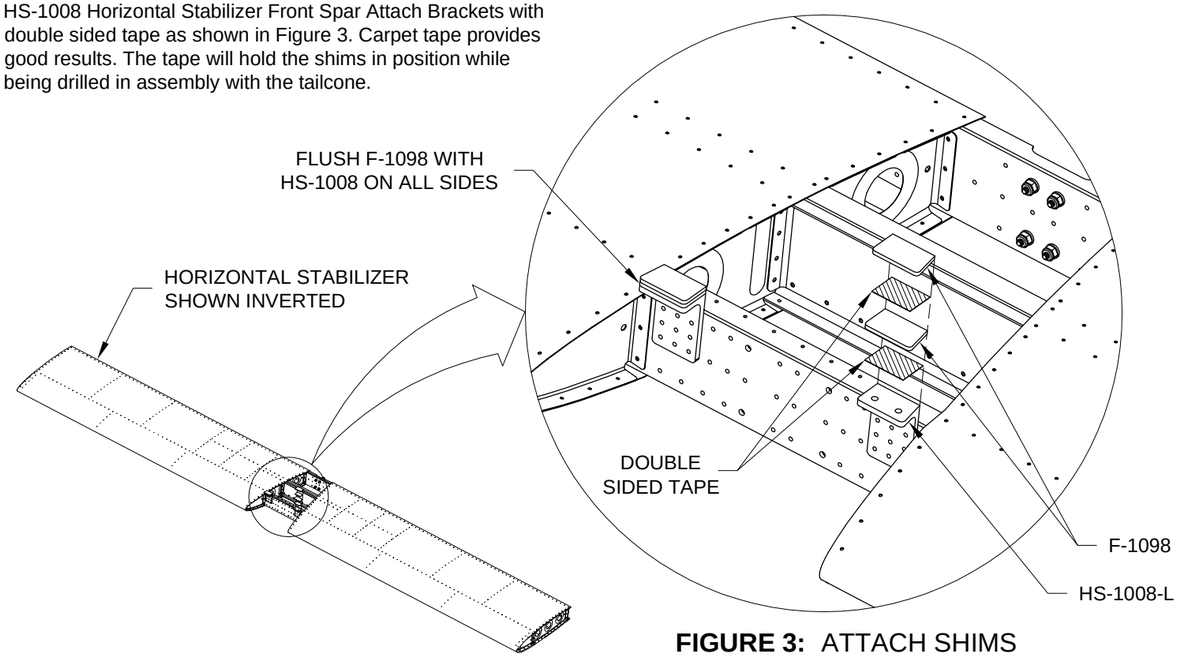


FIGURE 3: ATTACH SHIMS

Step 4: Lower the horizontal stabilizer onto the tailcone so that the HS-1003 Rear Spar is aft of the F-1011C Horizontal Stabilizer Attach Bars protruding from the aft fuselage as shown in Figure 4. Cleco the horizontal stabilizer to the horizontal stabilizer attach bars using the two #30 alignment holes in the horizontal stab and the two 1/8 inch holes in the bars.

Match-Drill #12 four holes in the horizontal stabilizer attach bars using the rear spar web as a drill guide. After each hole is drilled insert the hardware shown in Figure 4.

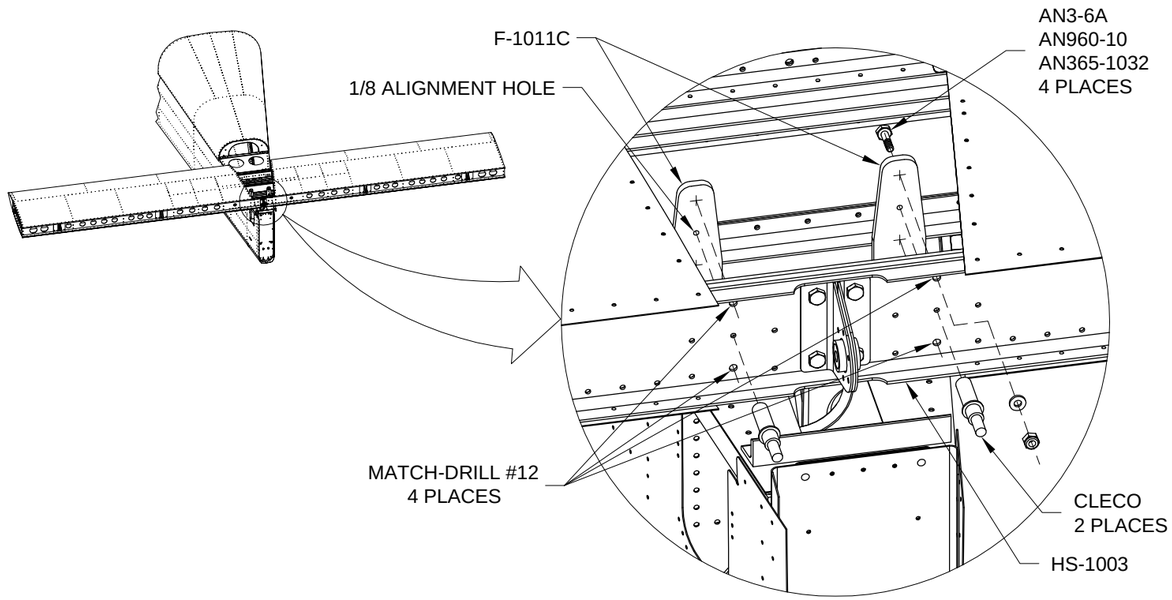


FIGURE 4: CLECO AND DRILL ATTACH BARS

Step 1: Cut a 2x4 wood block to length so it nests snug between the HS-1008 Horizontal Stabilizer Front Spar Attach Brackets as shown in Figure 1. Since the block doesn't sit flat, clamp it near it's forward edge so that it does not damage the F-1014 Aft Deck. This will hold the horizontal stabilizer in a fixed position.

Add reference marks adjacent to one another on the wood block and aft deck.

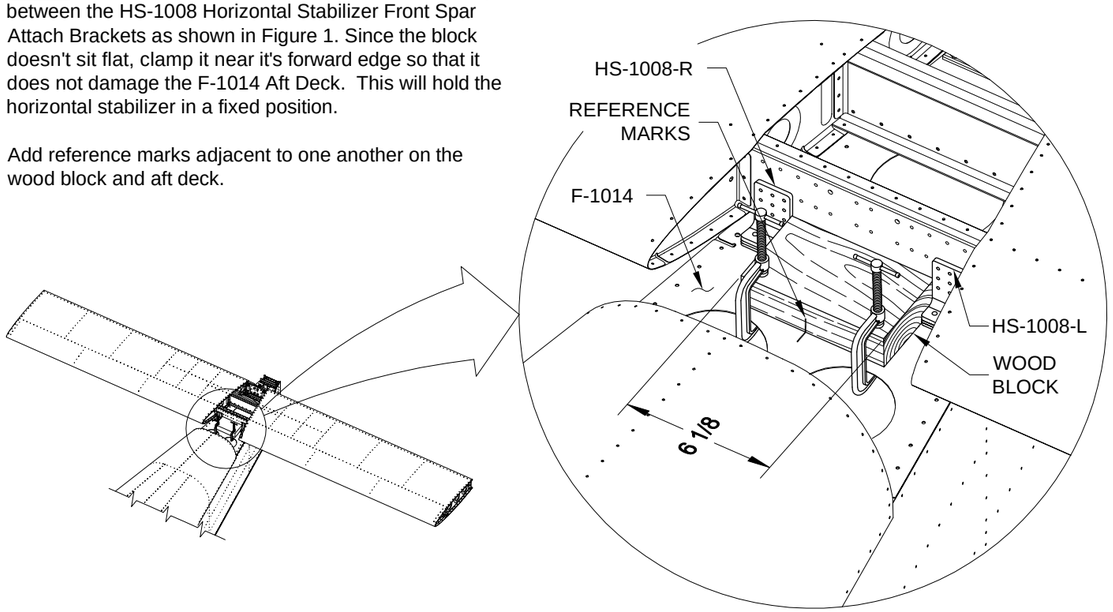


FIGURE 1: CLAMP BLOCK TO AFT DECK

Step 2: Measure from the aft outboard corners of the HS-1001 Skins to a common rivet hole on the centerline of the F-1075 Tailcone Aft Top Skin as shown in Figure 2 to check that the horizontal stabilizer is square to the tailcone. If the two measurements are equal the stabilizer is properly positioned. Proceed to the next step. If the measurements differ loosen the clamps holding the block of wood, slightly rotate the stabilizer, tighten the clamps and recheck the measurements. Repeat this until the lengths are equal.

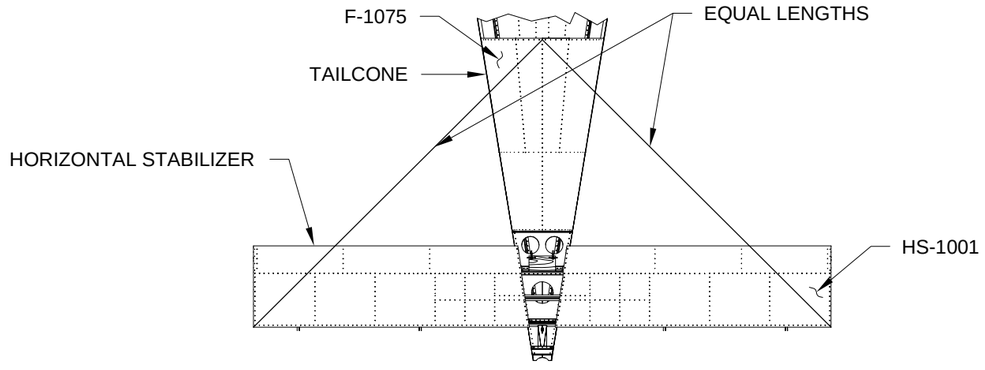


FIGURE 2: SQUARE HORIZONTAL STABILIZER WITH TAILCONE

Step 3: Match-Drill #12 the F-1098 Shims, F-1014 Aft Deck, F-1010B Spacer and F-1010A Angle using the four holes in the HS-1008 Horizontal Stabilizer Front Spar Attach Brackets as drill guides as shown in Figure 3. It may be necessary to use at least a 6 inch long extended drill bit. The F-1010B Spacer and F-1010A Angle are not shown. Remove the horizontal stabilizer. Deburr and prime if/as desired. Bolt the horizontal stabilizer to the tailcone using the hardware shown in Figure 3 and Page 4, Figure 4.

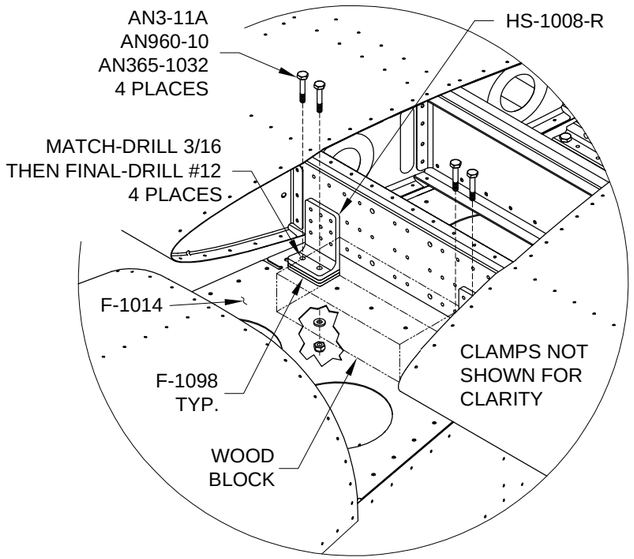


FIGURE 3: MATCH-DRILL SPACERS AND TAILCONE

Step 4: Bolt the VS-1016 Vertical Stabilizer Attach Bracket to the HS-1002 Front Spar as shown in Figure 4.

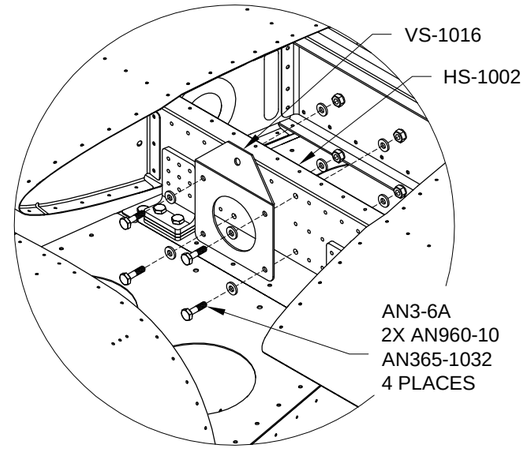


FIGURE 4: ATTACH VS-1016

Step 5: Final-Drill #12 the top two 3/16 holes in the rear spar doubler as shown in Figure 5. Bolt the vertical stabilizer to the F-1012 Aft Fuselage Bulkhead Assembly using the upper two AN3 bolts called out in Figure 6. Final-Drill #12 the four remaining 3/16 holes as shown in Figure 5, then machine countersink the two bottom holes. Install the hardware shown in Figure 6. Match-Drill #30 and final-drill #12 where called out in Figure 5, then install the corresponding hardware called out in Figure 6.

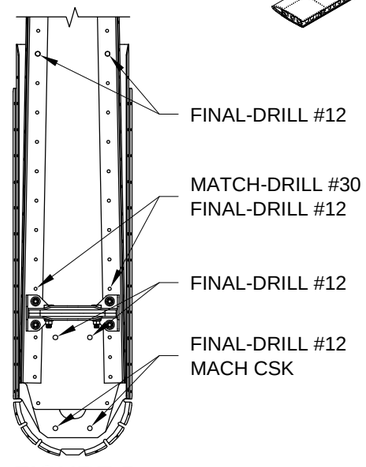


FIGURE 5

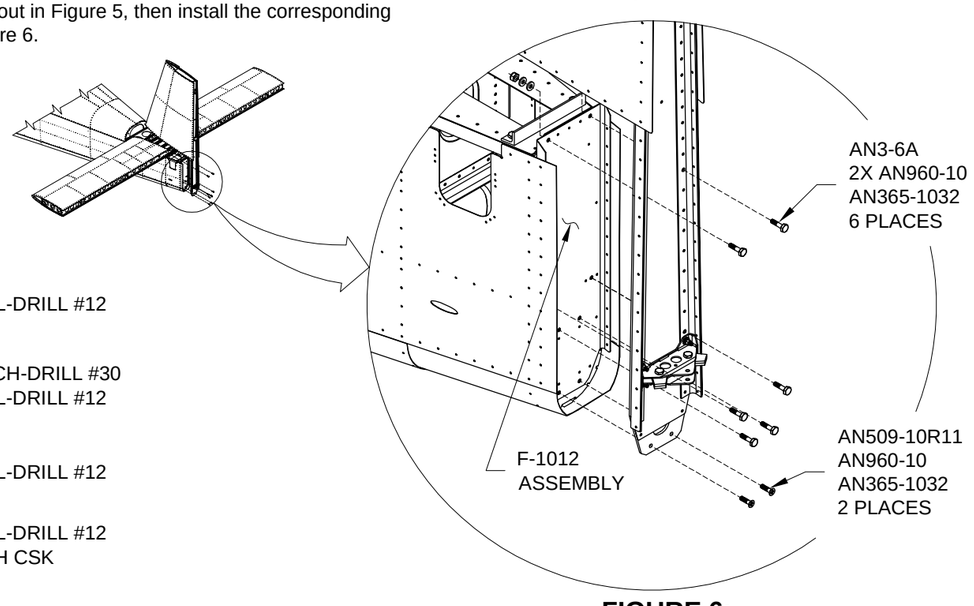


FIGURE 6: VERTICAL STABILIZER INSTALLATION

Step 1: Apply a thin coating of Anti-Seize paste to the contact area of the Vertical Stabilizer Front Spar and VS-1016 Vertical Stabilizer Front Spar Attach Bracket.

Bolt the vertical stabilizer to the VS-1016 Vertical Stabilizer Front Spar Attach Bracket with the hardware shown in Figure 1.

AN4-5
2X AN960-416
AN310-4
MS24665-208 (NOT SHOWN)

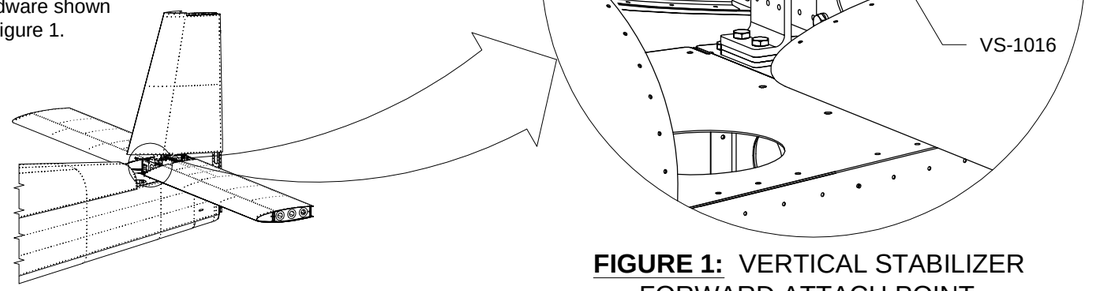


FIGURE 1: VERTICAL STABILIZER FORWARD ATTACH POINT

Step 2: Bolt the elevators to the horizontal stabilizer. They should swing freely with no resistance. See Page 11-2, Figure 3.

Step 3: Cut the F-1091 Pushrod to length from AT6-035 X 1 1/2 aluminum tube as shown in Figure 2.

Step 4: Install the VA-101 Threaded Insert into the F-1091 Elevator Pushrod. In order to accurately mark the locations of the threaded insert attach holes onto the pushrod make a simple template from a strip of stiff paper. Wrap the 1/2 X 2 in. strip around the outside of the pushrod, trim it until the ends just meet, then flatten it out and mark the pattern of six evenly spaced holes. Wrap it around the pushrod again and transfer the spacing to the pushrod. Drill # 30. Disassemble, deburr and prime the pushrod ends.

Because the pushrod effectively becomes an enclosed unit with no practical possibility of internal inspection we recommend priming the inside of the pushrod. Pour liquid primer into one end and swirl it toward the other, coating the entire inside of the pushrod. An alternative method is to spray primer into one end of the pushrod, then turn the pushrod around and spray into the other end. Let the primer cure thoroughly before continuing. The primer must be dry before installing the rod end bearings. We have seen wet primer migrate into the rod end bearing and freeze the bearing.

Reinstall the threaded insert and rivet as called out in Figure 2. Thread the jam nuts onto the rod end bearing shanks then thread the rod end bearings into both ends of the pushrod. Leave the jam nuts finger tight for now.

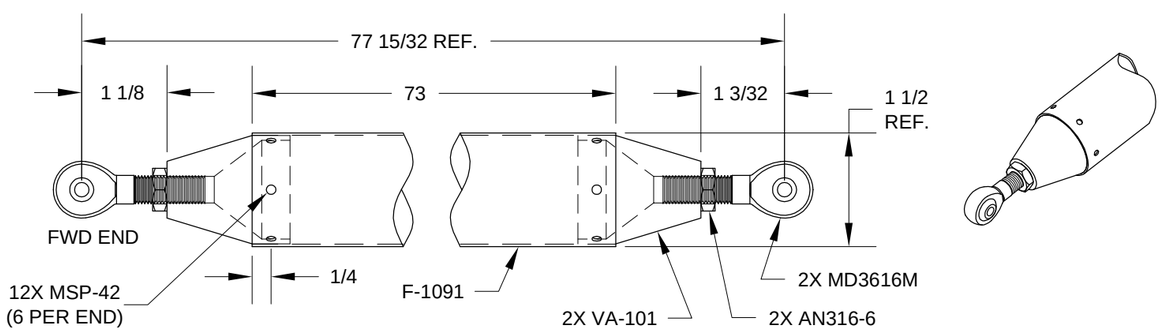


FIGURE 2: PUSHROD ASSEMBLY

Step 5: Install the F-1091 Elevator Pushrod bolting it to the WD-605-L-1 and WD-605-R-1 Elevator Horns and to the F-635 Bellcrank Assembly using the hardware shown in Figure 3, Details A and B.

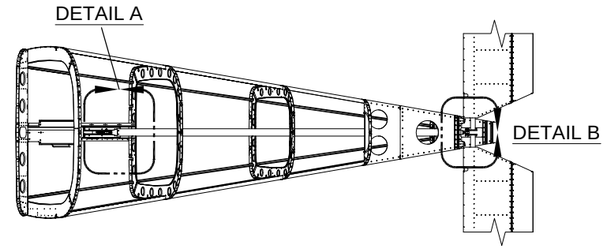
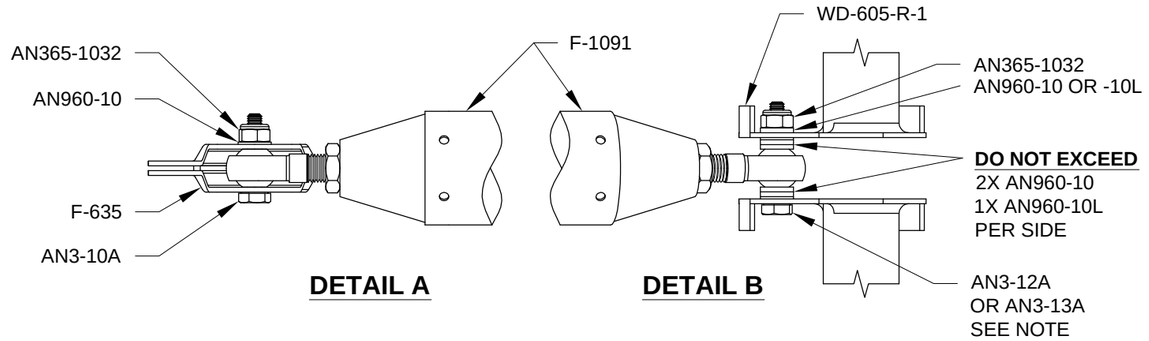


FIGURE 3: PUSHROD INSTALLATION

NOTE: Parts vary due to manufacturing tolerances. In Detail B make certain bolt grip length is correct. If gap exists after using maximum number of washers, tighten nut and bolt to eliminate gap.

WARNING: Do not exceed the maximum number of washers shown in Detail B.



Step 6: Check for the proper amount of elevator travel. See Page 11-2, Figure 4 for the degrees of travel. File if/as required the F-1011B Stop/Doubler and/or the F-1012D Up Elevator Stop as shown in Figure 4.

Since it is common for one horn to be farther forward than the other it is acceptable for only the forward horn to make contact with the stop/doubler. This also applies to the up elevator stop and the most aft horn.

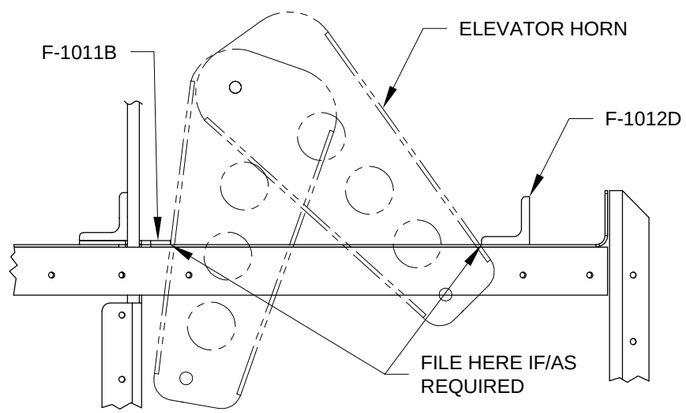


FIGURE 4: ELEVATOR STOP ADJUSTMENT

Step 1: Secure the elevator in the "trail" position by placing strips of duct tape over the gap between the elevator counterbalance arm and the horizontal stabilizer.

Step 2: Transfer the template shown in Figure 1 to a piece of stiff cardboard or wood. (To avoid cutting up your plans centerpunch through the paper just at the 3 corners.) Adjust the rod end bearings on the F-1091 Elevator Pushrod until the angle of the F-635 Bellcrank Assembly matches that of the template as shown in Figure 2.

Step 3: Tighten the jam nuts against the threaded inserts.

WARNING: **In the final installation both rod ends must have over half the thread engaged making it impossible for a bearing to back off the pushrod if both ends are pinned.**

Step 4: Remove the duct tape added from Step 1. Deflect the elevator to the stops and check for any interference or resistance in the system.

Remove and store the pushrod.

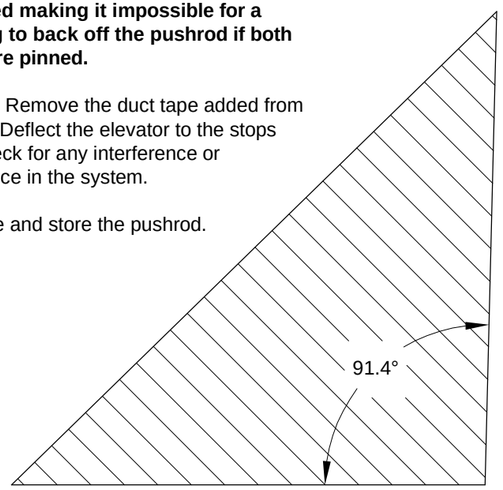


FIGURE 1: TEMPLATE

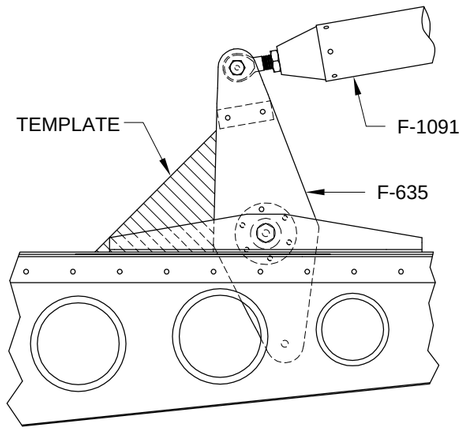


FIGURE 2: TEMPLATE PLACEMENT

Step 5: Thread the AN316-6 jam nuts onto the MD3614M rod end bearings and thread the rod end bearings into the R-1002 Rudder Spar as shown in Figure 3, Detail A. Measure from the center of the pivot bolt hole to the forward face of the rudder spar. As a starting point use the dimension shown in Figure 3, Detail A.

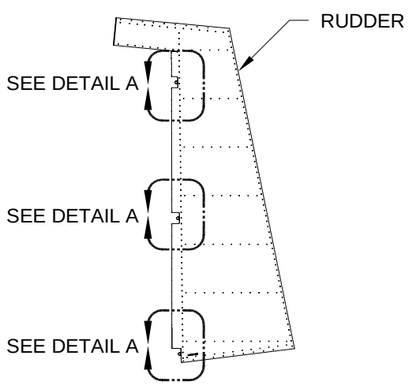
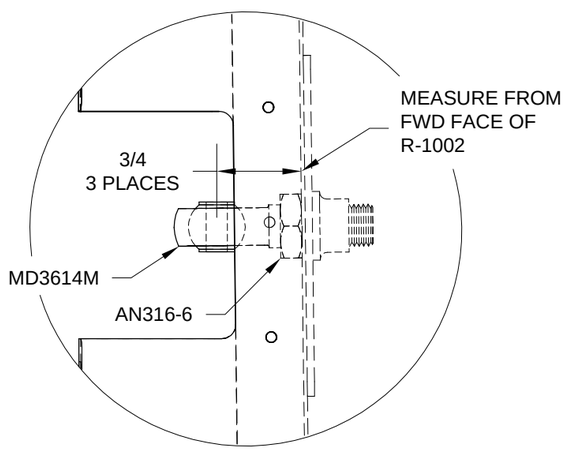


FIGURE 3: ATTACH ROD END BEARINGS TO RUDDER



DETAIL A

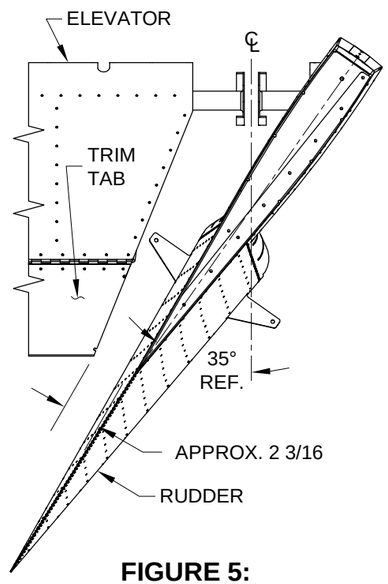


FIGURE 5: RUDDER TRAVEL

Step 6: Bolt the rudder to the vertical stabilizer as shown in Figure 4 using only the top and bottom hinge hardware. Check for travel and adjust as required. Finally, adjust the center rod end until a bolt can be slipped into place. The rudder should swing freely.

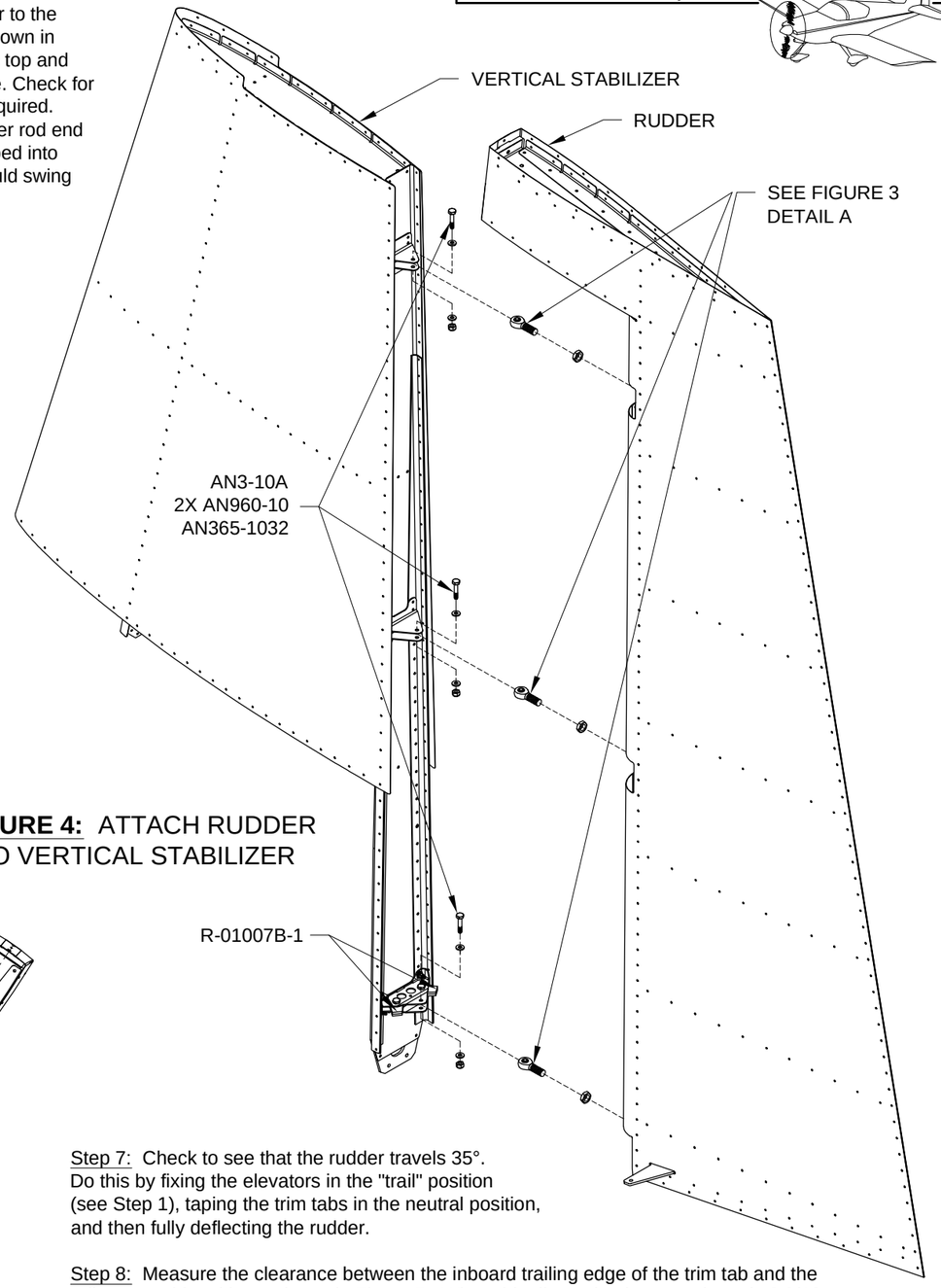


FIGURE 4: ATTACH RUDDER TO VERTICAL STABILIZER

Step 7: Check to see that the rudder travels 35°. Do this by fixing the elevators in the "trail" position (see Step 1), taping the trim tabs in the neutral position, and then fully deflecting the rudder.

Step 8: Measure the clearance between the inboard trailing edge of the trim tab and the adjacent rudder skin as shown in Figure 5. When this dimension is approximately 2 3/16 inches the rudder travel is 35° and the R-01007B-1 Rudder Stop is properly adjusted. The rudder stops were designed to allow 35° of travel so a very small if any adjustment should be necessary. If more travel is needed file the rudder stops (see Figure 4) if/as required. If there is too much travel shorten the bottom rod end. Tighten the jam nuts when the adjustments are complete.

Step 9: Remove and store the rudder and vertical stabilizer.

Step 1: Fabricate two F-1095C Trim Bellcrank Brackets from AA6-063X3/4X3/4 Aluminum Angle as shown in Figure 1.

It is critical that the 1/4 inch diameter hole and the 1/8 inch diameter hole are exactly in line with each other.

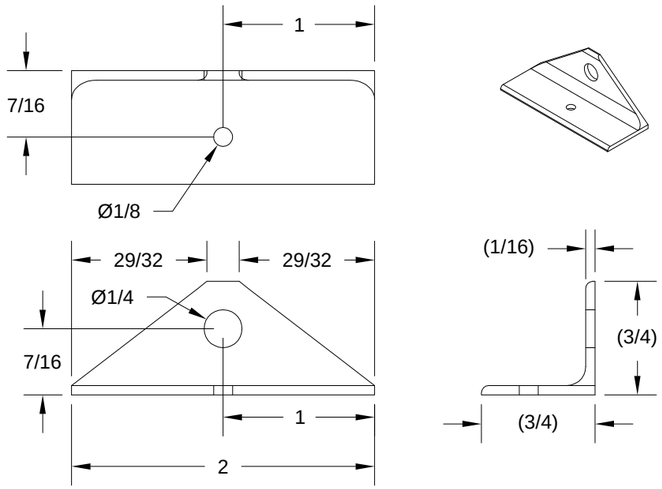


FIGURE 1:
TRIM BELLCRANK BRACKET

Step 2: Fabricate two F-1095G Trim Cable Anchor Brackets from AA6-125X1X1 1/4 Aluminum Angle as shown in Figure 2.

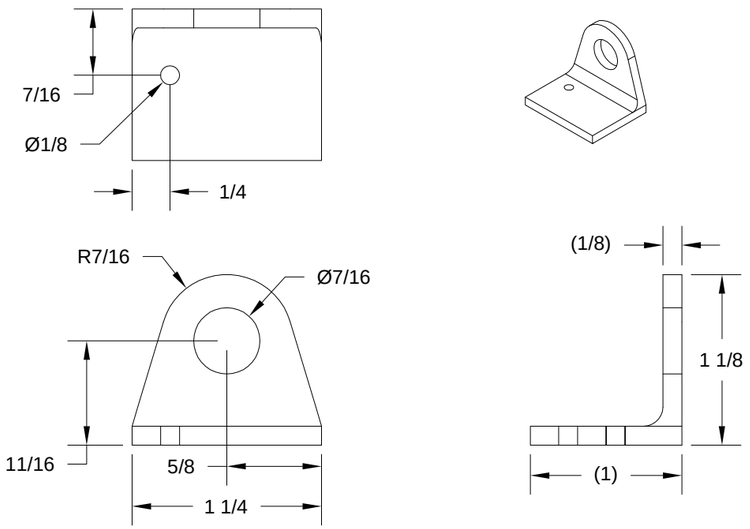


FIGURE 2:
TRIM CABLE ANCHOR BRACKET

Step 3: Fit the F-1095F Trim Servo Spacer to the underside of F-1095A Trim Mount Bracket as shown in Figure 3.

The upper forward edges of the trim servo spacer must be rounded to nest inside the bend radius of the trim mount bracket. The upper surface of the trim servo spacer must fully contact the lower surface of the trim mount bracket.

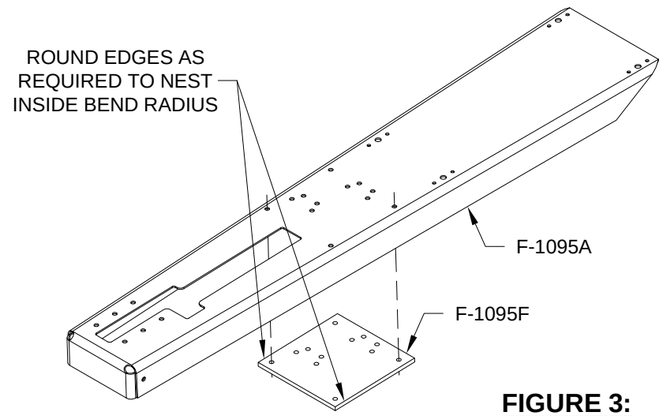


FIGURE 3:
FITTING TRIM SERVO SPACER
TO TRIM MOUNT BRACKET

Step 4: Cleco the F-1095F Trim Servo Spacer to the F-1095A Trim Mount Bracket as shown in Figure 3. Cleco through the four corner holes in the trim servo spacer.

Cleco the F-1095C Trim Bellcrank Brackets and F-1095G Trim Cable Anchor Brackets to the trim mount bracket as shown in Figure 4.

Match-Drill #30 the trim bellcrank brackets and trim cable anchor brackets using the holes in the trim mount bracket and trim servo spacer as drill guides. Double-check that the pairs of brackets are parallel to each other and to the edges of the cut-out in the trim mount bracket when match-drilling.

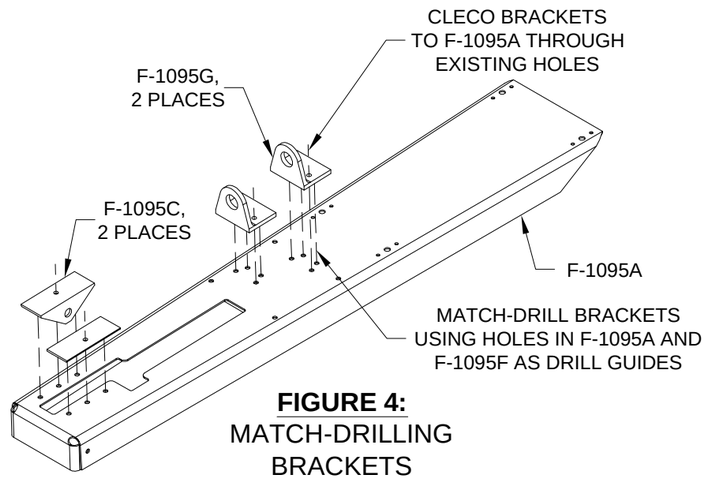


FIGURE 4:
MATCH-DRILLING
BRACKETS

Step 5: Cleco the F-1095F Trim Servo Spacer to the F-1095A Trim Mount Bracket as shown in Figure 3. Cleco through F-1095G Trim Cable Anchor Bracket attach holes leaving open the four corner holes in the trim servo spacer.

Final-Drill #28 the four corner holes in the trim servo spacer.

Remove the trim servo spacer from the trim mount bracket.

Machine countersink the eight #30 holes in the trim servo spacer for AN426AD4 rivets. Countersink the LOWER SURFACE of the trim servo spacer. See Figure 3.

Step 6: Run a #40 drill through the eight 3/32 inch diameter nutplate attach holes in the F-1095A Trim Mount Bracket.

Machine countersink the eight #40 holes in the trim mount bracket for AN426AD3 rivets. Countersink the UPPER SURFACE of the trim mount bracket. See Figure 3.

Run a #30 drill through the 1/8 inch diameter holes in the close-out flanges in the trim mount bracket.

Step 7: Deburr all holes and edges of the F-1095A Trim Mount Bracket, F-1095C Trim Bellcrank Brackets, F-1095F Trim Servo Spacer, and F-1095G Trim Cable Anchor Brackets.

Prime the trim bellcrank brackets and trim cable anchor brackets. All other F-1095 Assembly parts are made from alclad material and may be primed if/as desired.

Step 8: Rivet the F-1095C Trim Bellcrank Brackets, F-1095F Trim Servo Spacer, F-1095G Trim Cable Anchor Brackets, and K1000-08 Nutplates to the F-1095A Trim Mount Bracket as shown in Figure 5.

Install rivets through the holes in the close-out flanges in the trim mount bracket as shown in Figure 5.

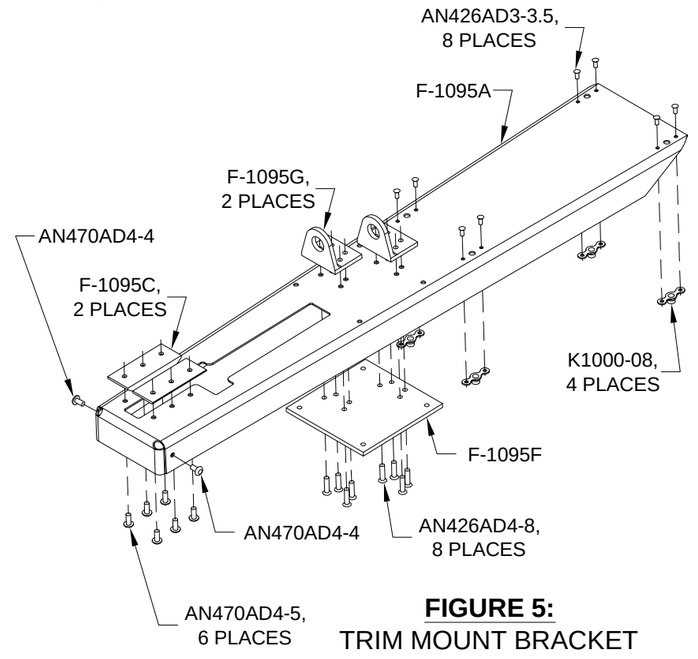


FIGURE 5:
TRIM MOUNT BRACKET
ASSEMBLY DETAIL

Step 1: Run a #30 drill through all holes in the two F-1095D Trim Servo Links and the F-1095E Trim Servo Link Spacer.

Deburr all holes and edges of the trim servo links and trim servo link spacer. Prime parts if/as desired.

Assemble the trim servo links and trim servo link spacer as shown in Figure 1.

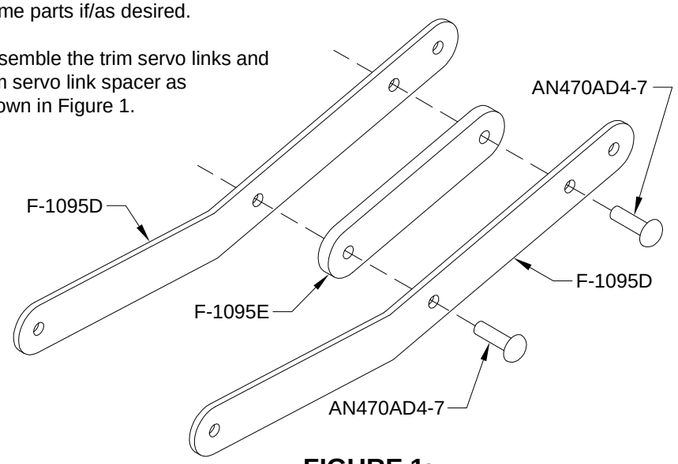


FIGURE 1:
TRIM SERVO LINK AND TRIM SERVO LINK SPACER ASSEMBLY

Step 2: Study Figure 2 until you understand the proper installation of the F-1095B Trim Bellcrank between the F-1095C Trim Bellcrank Brackets. Pay particular attention to the orientation of the trim bellcrank. Note that two thin washers are used as spacers between the trim bellcrank and the trim bellcrank brackets.

The holes in the trim bellcrank are slightly undersize; run #30, #12, and 1/4" drills through the appropriate holes to bring them to full size. Deburr the holes.

Temporarily install the trim bellcrank between the trim bellcrank brackets. Check for free rotation of the trim bellcrank with minimum side-play. The spacer washers may be reduced in thickness if there is rotational binding. The spacer washers may be replaced with thicker washers if there is excessive side-play.

Permanently install the trim bellcrank as shown in Figure 2.

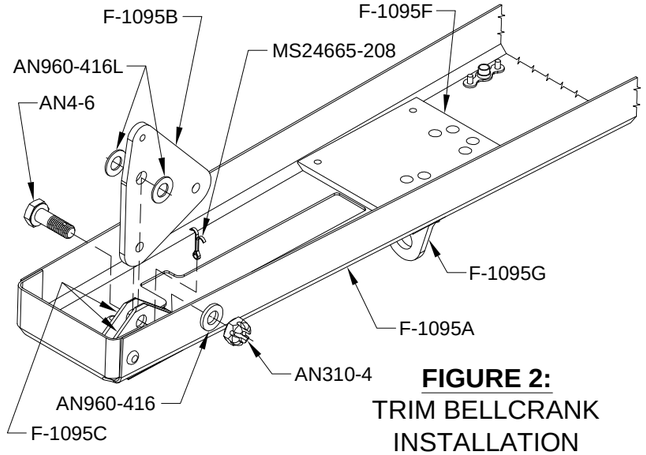


FIGURE 2:
TRIM BELLCRANK INSTALLATION

Step 3: Enlarge the four mounting holes in the Trim Servo by drilling #28. See Figure 3.

Using a file, reduce the thickness of the actuating lug on the trim servo until it fits the gap of the F-1095D/E Trim Servo Link Subassembly. See Figure 3.

Attach the F-1095D/E Trim Servo Link Sub-Assembly to the trim servo as shown in Figure 3.

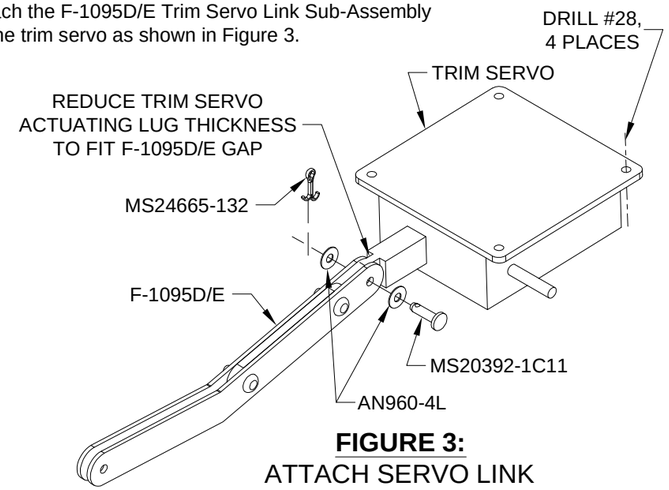


FIGURE 3:
ATTACH SERVO LINK TO SERVO

Step 4: Install the Trim Servo to the F-1095A Trim Mount Bracket and F-1095F Trim Servo Spacer as shown in Figure 4.

Attach the F-1095D/E Trim Servo Link Sub-Assembly to the F-1095B Trim Bellcrank as shown in Figure 4.

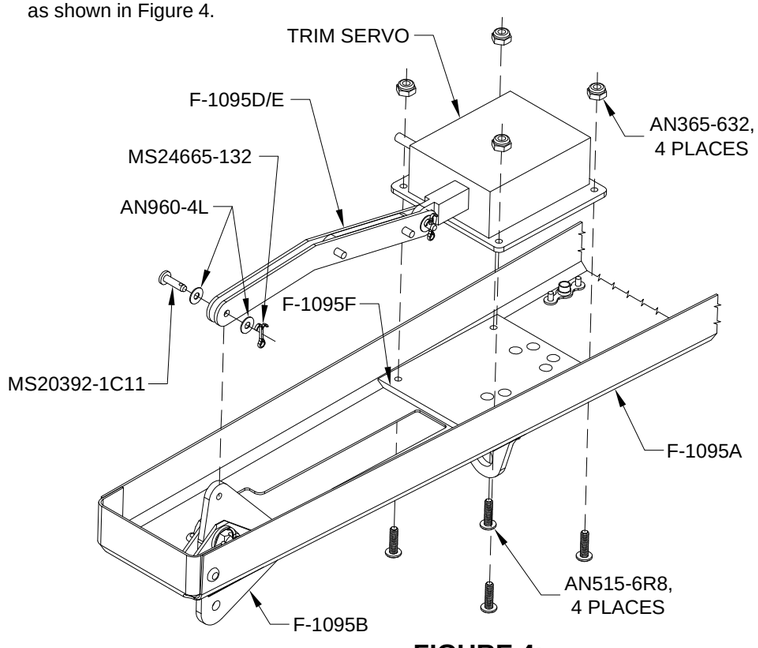


FIGURE 4:
TRIM SERVO INSTALLATION

Step 5: Install the two CT Q-43 Elevator Trim Cables through the F-1095G Trim Cable Anchor Brackets as shown in Figure 5.

Adjust the trim cable jam nuts so as to center the threaded portion of the trim cable on the trim cable anchor brackets.

Step 6: Study Figure 5 until you understand the attachment of the threaded ends of the two CT Q-43 Elevator Trim Cables to the F-1095B Trim Bellcrank. Pay particular attention to the orientation of the bolts and the placement of the various washers.

Attach the threaded ends of the two CT Q-43 Elevator Trim Cables to the F-1095B Trim Bellcrank using the hardware called-out in Figure 5. Leave the trim cable jam nuts finger tight.

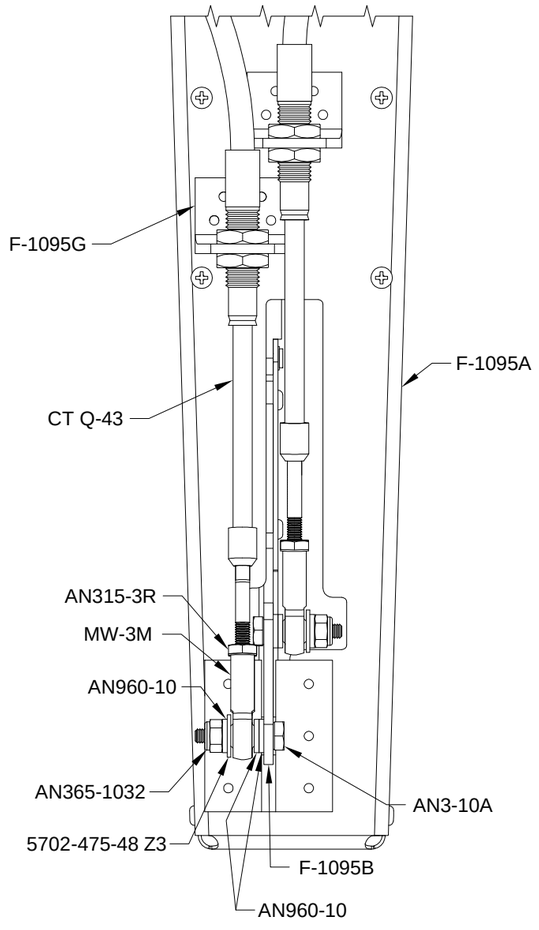


FIGURE 5:
ELEVATOR TRIM CABLE ATTACH DETAIL

Step 1: Run the Trim servo to its full retracted position. Adjust the engagement of the rod end bearings and the elevator trim cable position on the F-1095G Trim Cable Anchor Brackets so that both cables are fully extended. Tighten the trim cable jam nuts.

Run the trim servo through its full range of motion and verify that the F-1095B Trim Bellcrank motion matches that shown in Figure 1. There must be no binding or interference of parts as the trim servo runs through its full range of motion.

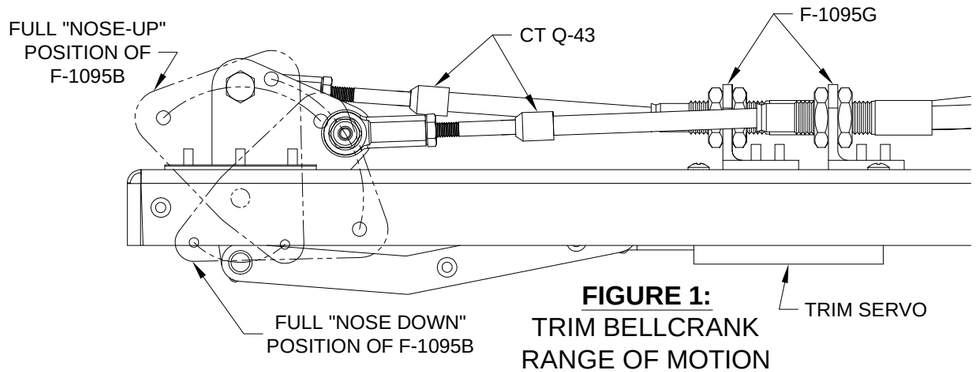


FIGURE 1:
TRIM BELLCRANK
RANGE OF MOTION

Step 2: Remove the E-616PP Cover Plate - Elevator Trim/WD-415 Elevator Trim Cable Anchor Bracket Sub-Assemblies from the bottoms of both Elevator Assemblies.

Loosely place the F-1095 Elevator Trim Actuator Sub-Assembly in the aft fuselage.

Route the CT Q-43 Elevator Trim Cables through the holes in the Horizontal Stablizer Inboard Nose Ribs, then through the snap bushings installed in the Horizontal Stablizer Front Spar and Horizontal Stablizer Rear Spar, through the Elevator Leading Edges, then through the snap bushings installed in the Elevator Front Spars, and finally through the openings in the bottoms of the elevators. See Figure 2.

Progressively move the elevator trim actuator sub-assembly into final position while routing the elevator trim cables.

After the elevator trim cables have been routed, attach the elevator trim actuator sub-assembly to the underside of the F-1014 Fuselage Aft Deck through holes pre-punched in the fuselage aft deck using the screws called-out in Figure 2.

Step 3: Thread the E-616PP Cover Plate - Elevator Trim/WD-415 Elevator Trim Cable Anchor Bracket Sub-Assemblies on to the CT Q-43 Elevator Trim Cables. Adjust so that the elevator trim cable anchor brackets are centered on the 7/16 threaded portion of the elevator trim cable anchor points. Attach the cover plates to the bottoms of the elevators.

Run the Trim Servo to the "FULL NOSE UP" position.

Enlarge the hole in each trim tab horn by drilling #12. Temporarily attach the elevator trim cables to the elevator trim tab horns using the hardware called-out in Figures 2 and 3. Of the three washers called-out in Figure 2, one is to be installed between the cotter pin and the outer surface of the clevis while the other two washers are to be installed between the E-917/E-918 (left side) and E-1017/E-1018 (right side) Elevator Trim Tab Horn and the inner surface of the clevis; one washer on the outboard side of the elevator trim tab horn and one washer on the inboard side of the elevator trim tab horn.

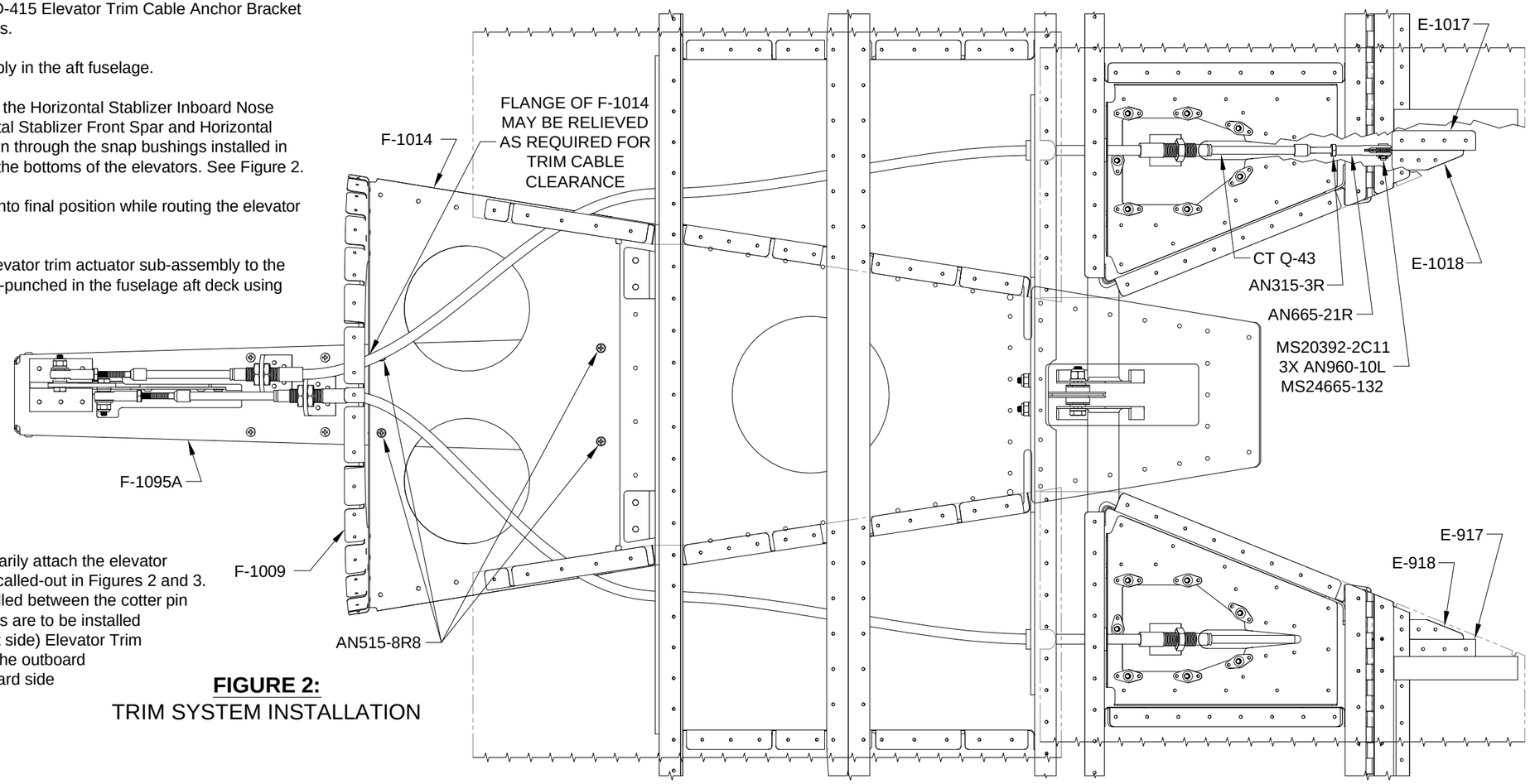


FIGURE 2:
TRIM SYSTEM INSTALLATION

Step 3: (continued) Adjust the engagement of the jam nut and clevis onto the trim cable so that the tabs are in the 35 degrees TAB DOWN position as shown in Figure 3.

Permanently attach the clevis to the trim tab horn using the hardware called-out in Figures 2 and 3. (This step may be delayed until final assembly.)

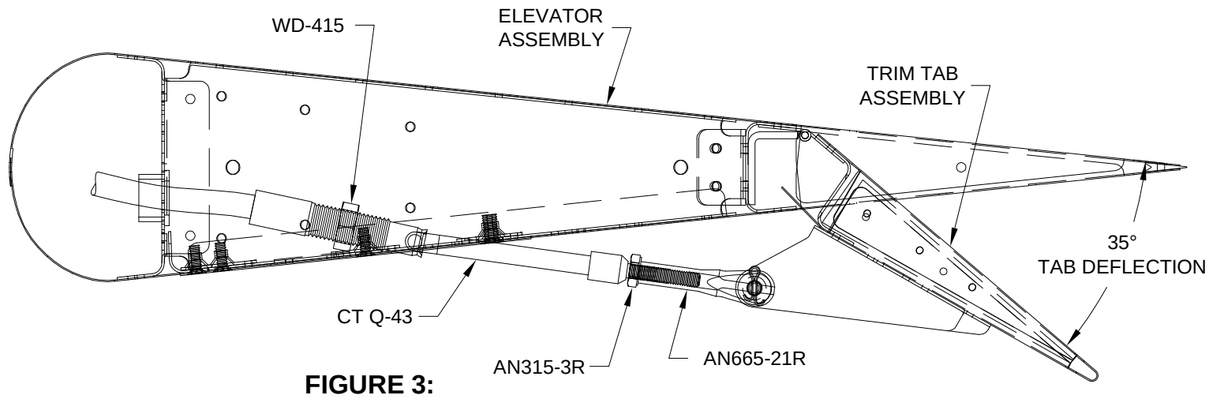


FIGURE 3:
TRIM TAB DEFLECTION