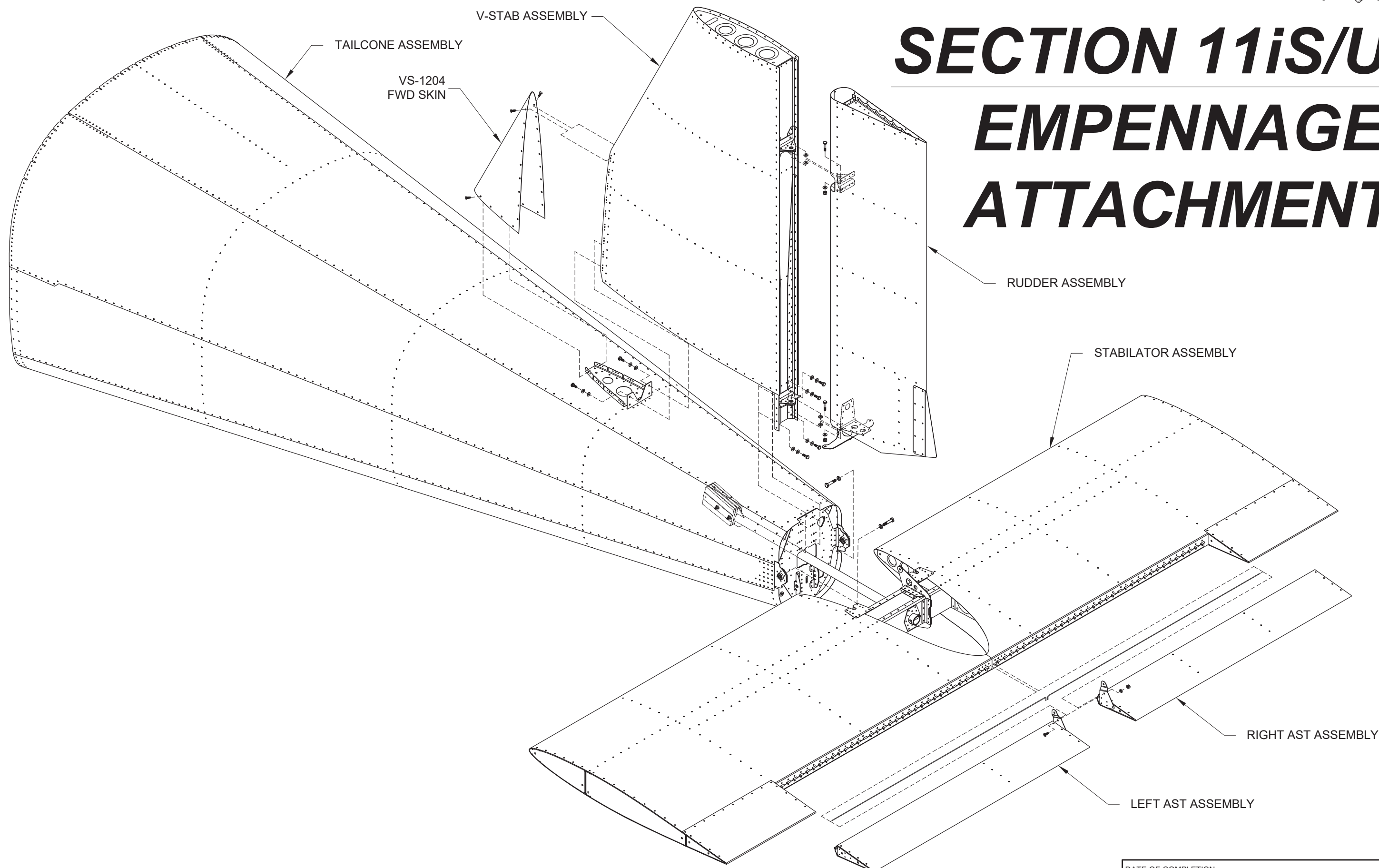


# SECTION 11iS/U: EMPENNAGE ATTACHMENT



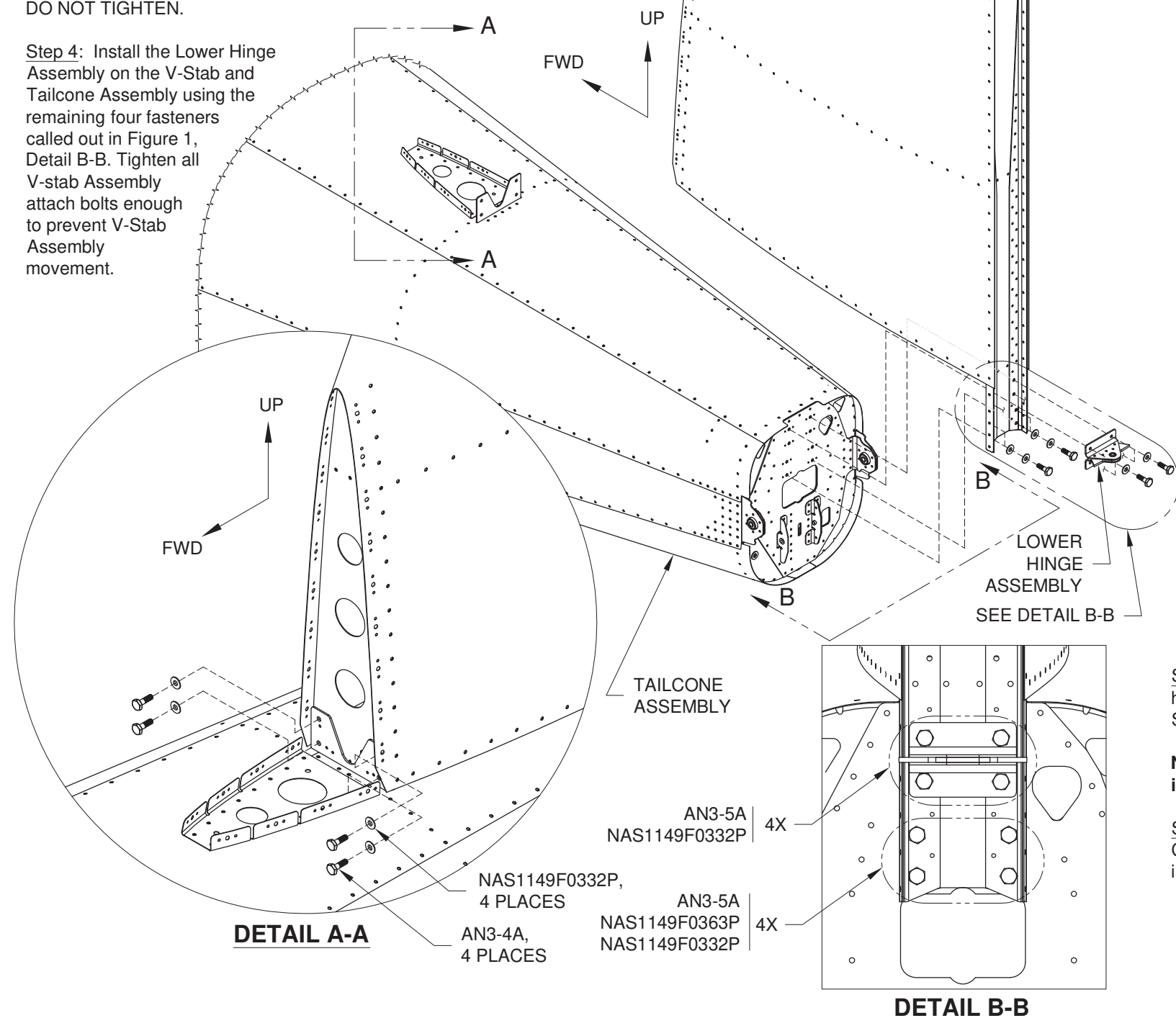


**Step 1:** Remove the VS-1204 Fwd Skin shown on Page 11iS-01, the Lower Hinge Assembly and the hinge hardware from the V-Stab Assembly.

**Step 2:** Place a piece of paper on top of the aft end of the Tailcone Assembly to prevent the V-Stab Assembly from scratching the top skin. Check that the bottom edge of the V-Stab Assembly has been deburred well.

**Step 3:** Attach the rear spar of the V-Stab Assembly to the Tailcone Assembly using the lower four fasteners called out in Figure 1, Detail B-B, DO NOT TIGHTEN. Remove the protective paper. Attach the front spar of the V-Stab Assembly to the Tailcone Assembly using the hardware called out in Figure 1, Detail A-A, but DO NOT TIGHTEN.

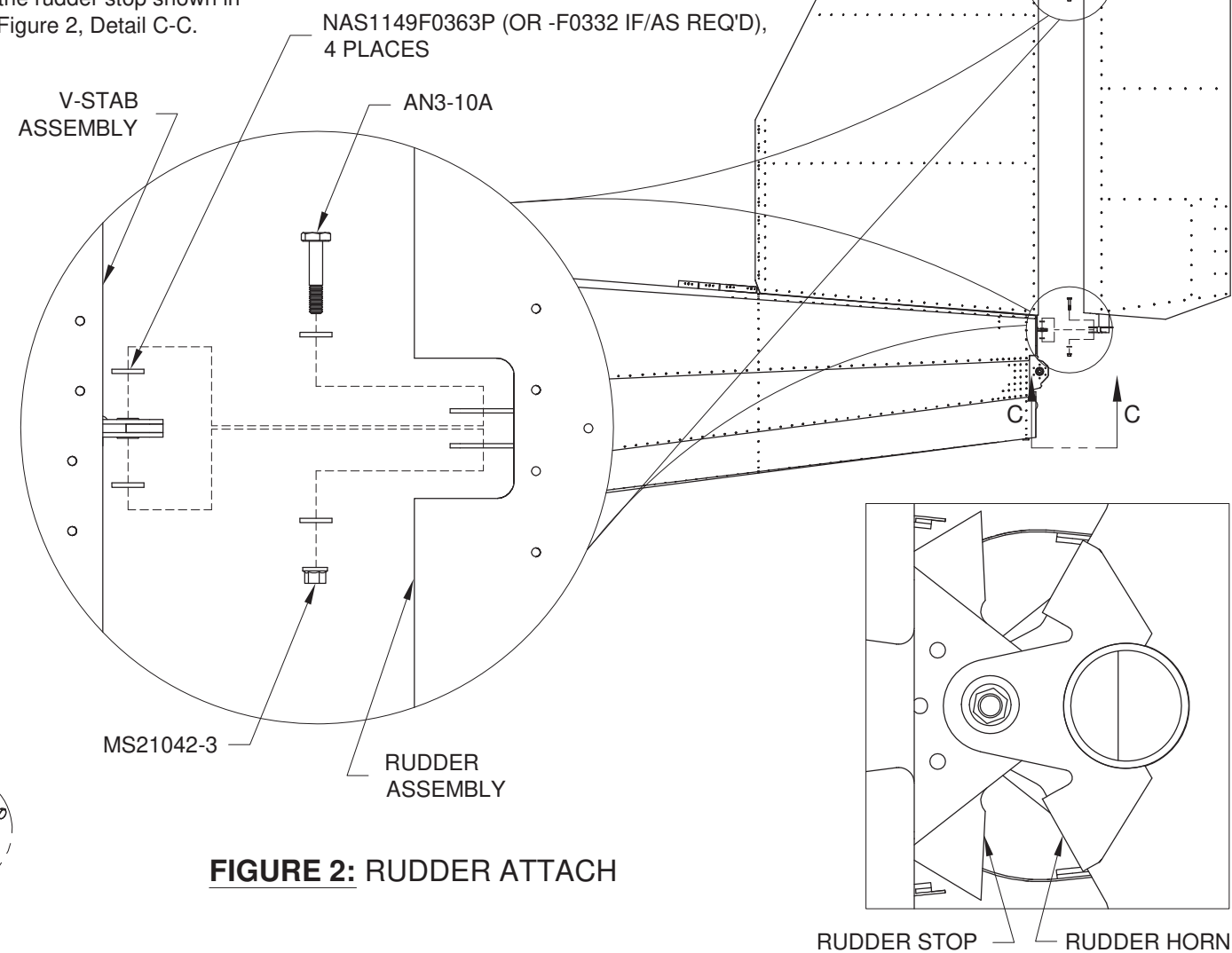
**Step 4:** Install the Lower Hinge Assembly on the V-Stab and Tailcone Assembly using the remaining four fasteners called out in Figure 1, Detail B-B. Tighten all V-stab Assembly attach bolts enough to prevent V-Stab Assembly movement.



**FIGURE 1: V-STAB ASSEMBLY ATTACH**

**Step 5:** Temporarily install the Rudder Assembly to the V-Stab Assembly using the hardware called out in Figure 2. Refer to Page 7-03.

**Step 6:** Check the Rudder Assembly to make sure it swings freely. Rudder travel in both directions should only be limited by the rudder horn contacting the rudder stop shown in Figure 2, Detail C-C.

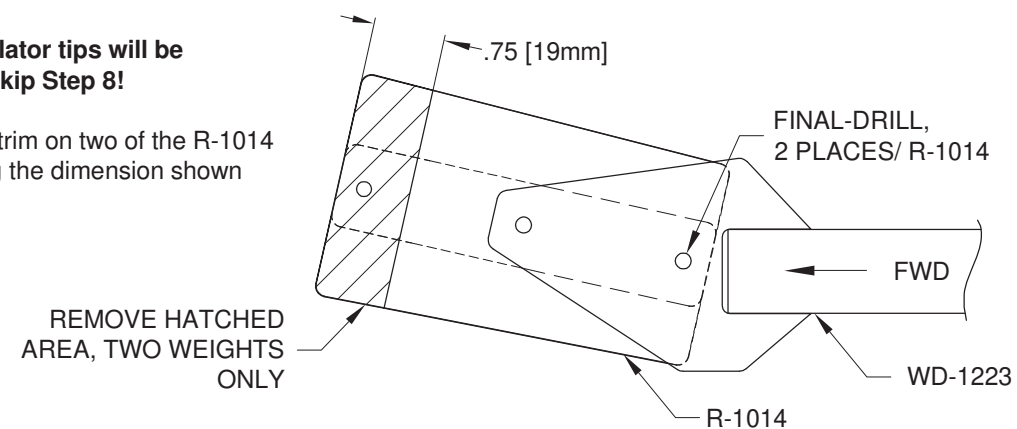


**FIGURE 2: RUDDER ATTACH**

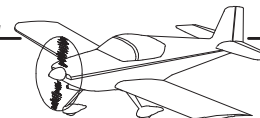
**Step 7:** Final-Drill #12 the attach holes in all of the R-1014 Counterbalance Weights. Final-Drill the aft hole, pin the aft hole to the WD-1223 Counterbalance Arm with a bolt, then final-drill using the forward hole in the arm as a drill guide. See Figure 3.

**NOTE:** If the fiberglass stabilator tips will be installed (see Section 12A) skip Step 8!

**Step 8:** Perform a preliminary trim on two of the R-1014 Counterbalance Weights using the dimension shown in Figure 3.



**FIGURE 3:  
COUNTERBALANCE WEIGHT MODIFICATION**



Step 1: Remove the AN4 bolt, used to locate the glued washers, from each of the stabilator hinge brackets, refer to Figure 2.

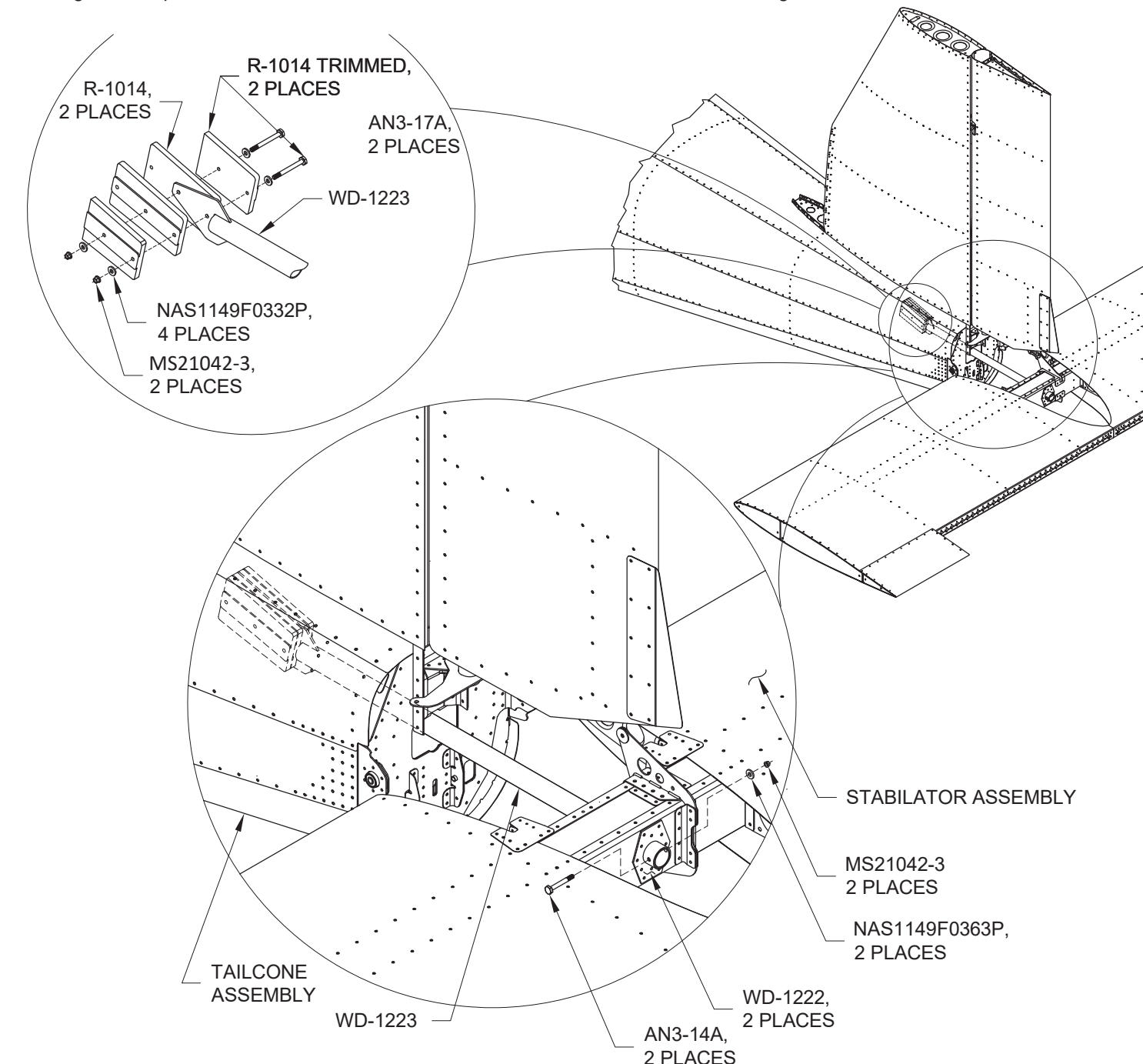
Mark "top" on the WD-1223 Counterbalance Arm near the spar attachment end.

Coat the bare steel part of the counterbalance arm with grease before installation.

Step 2: Attach the R-1014 Counterbalance Weights to the arm with the hardware called out in the Figure 1 detail.

**Note: Use sawhorses or patient friends to position the Stabilator Assembly relative to the aft fuselage for the next few steps. Precise positioning will greatly simplify installation of the stabilator hardware.**

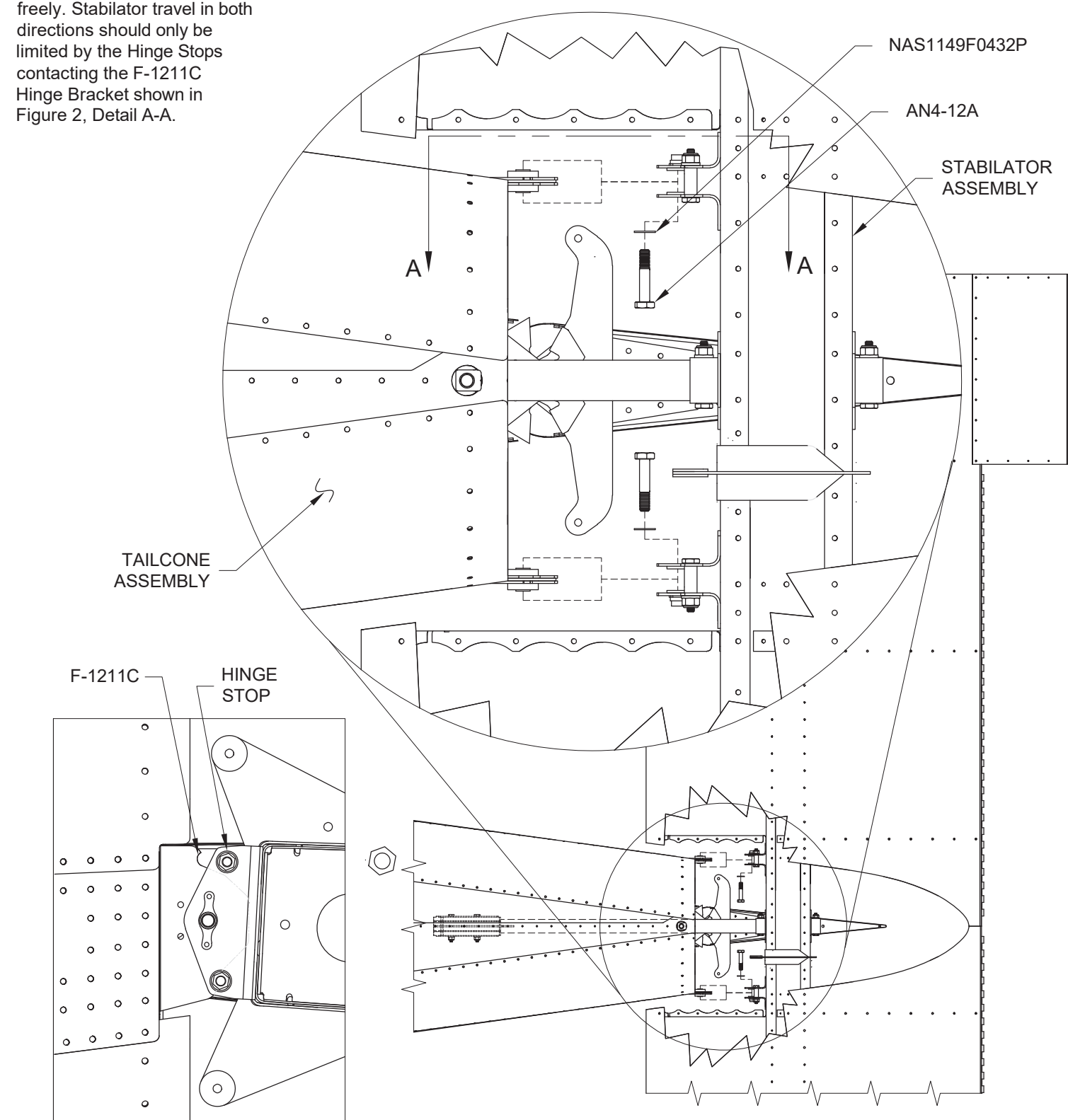
Step 3: Insert the WD-1223 Counterbalance Arm into the Stabilator Assembly rotated 90° from the installed position. Keep the counterbalance arm within both WD-1222 Counterbalance Brackets. Insert the counterbalance weights through the hole in the aft bulkhead of the Tailcone Assembly. Turn the counterbalance arm back to the installed position as indicated by "top" marking from Step 1. Install the counterbalance arm with the attach hardware shown in Figure 1.



**FIGURE 1:**  
STABILATOR COUNTERBALANCE

Step 4: Install the Stabilator Assembly to the Tailcone Assembly using the hardware called out in Figure 2.

Step 5: Check the Stabilator Assembly movement to make sure it swings freely. Stabilator travel in both directions should only be limited by the Hinge Stops contacting the F-1211C Hinge Bracket shown in Figure 2, Detail A-A.

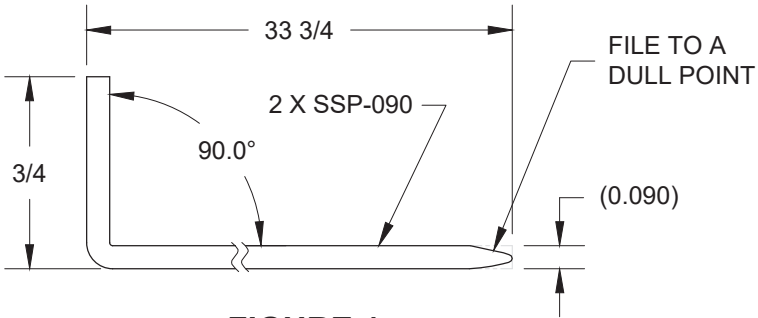


**DETAIL A-A**  
STABILATOR SHOWN ATTACHED

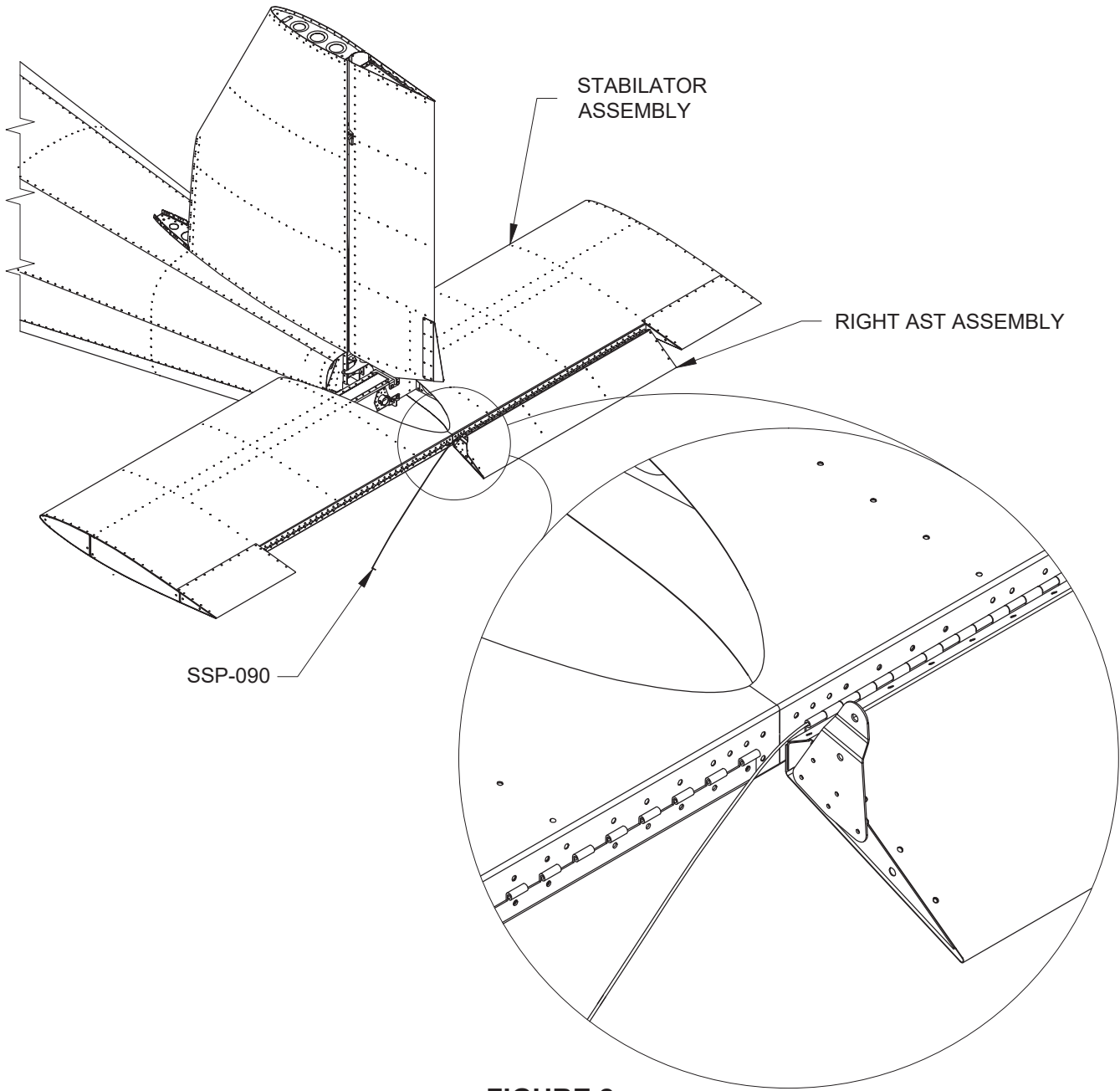
**FIGURE 2:**  
STABILATOR ATTACH  
BOTTOM VIEW

**Step 1:** Retrieve the hinge pin that was set aside on Page 8-3, Step 5. Fabricate two hinge pins per the dimensions given in Figure 1. File a dull point at one end and bend the other.

**Step 2:** Install the Left and Right AST Assemblies to the Stabilator Assembly using the hinge pins fabricated in Step 1 as shown in Figure 2.



**FIGURE 1:**  
HINGE PIN FABRICATION

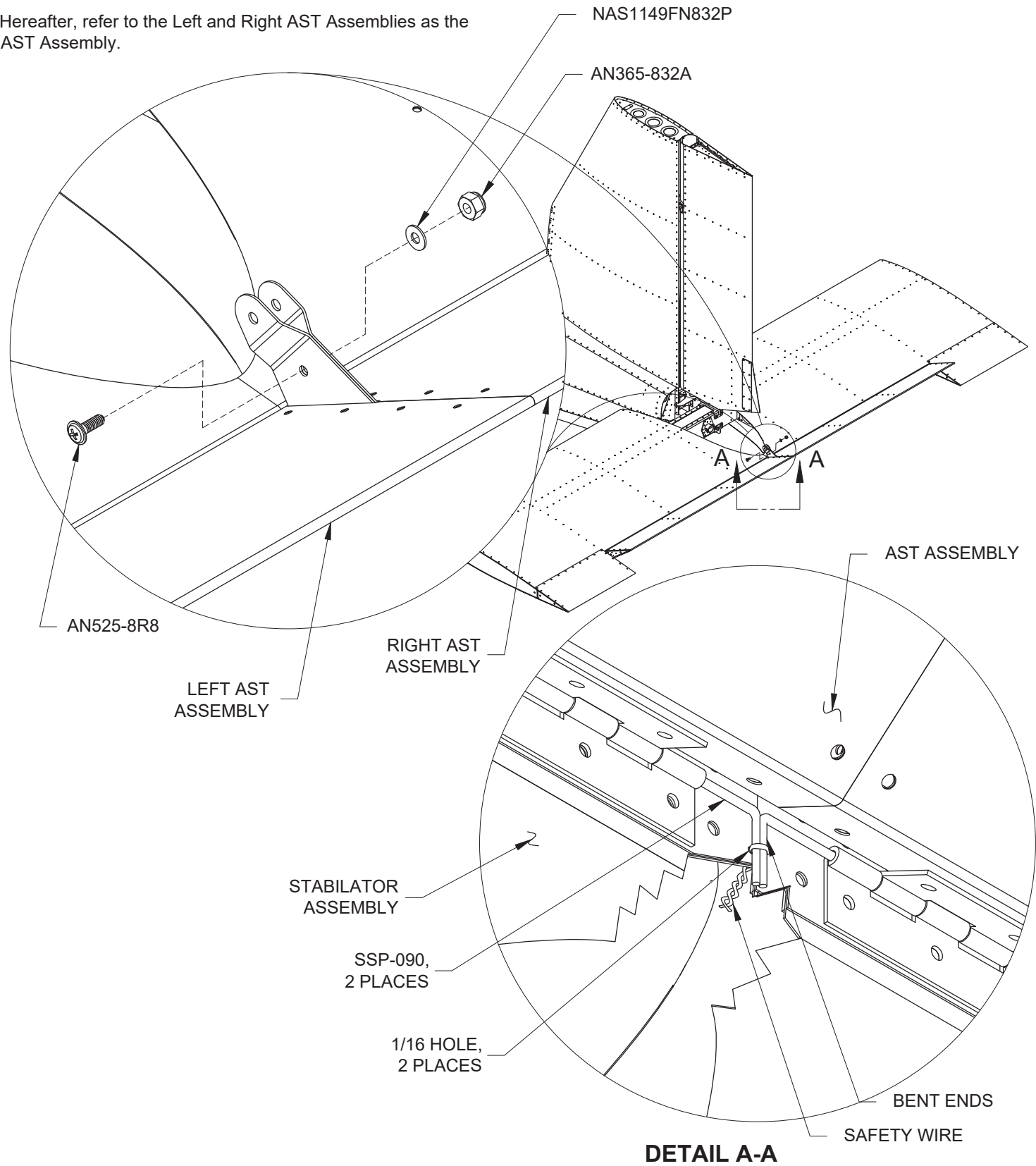


**FIGURE 2:**  
AST ASSEMBLY ATTACH

**Step 3:** Attach the Left and Right AST Assemblies together using the hardware called out in Figure 3.

**Step 4:** Rotate the hinge pins so the bent ends lay against the Stabilator Assembly. Fasten the bent ends of both hinge pins with safety wire through the holes called out in Figure 3, Detail A-A. Twist the safety wire on the inboard side of the Stabilator Assembly as shown.

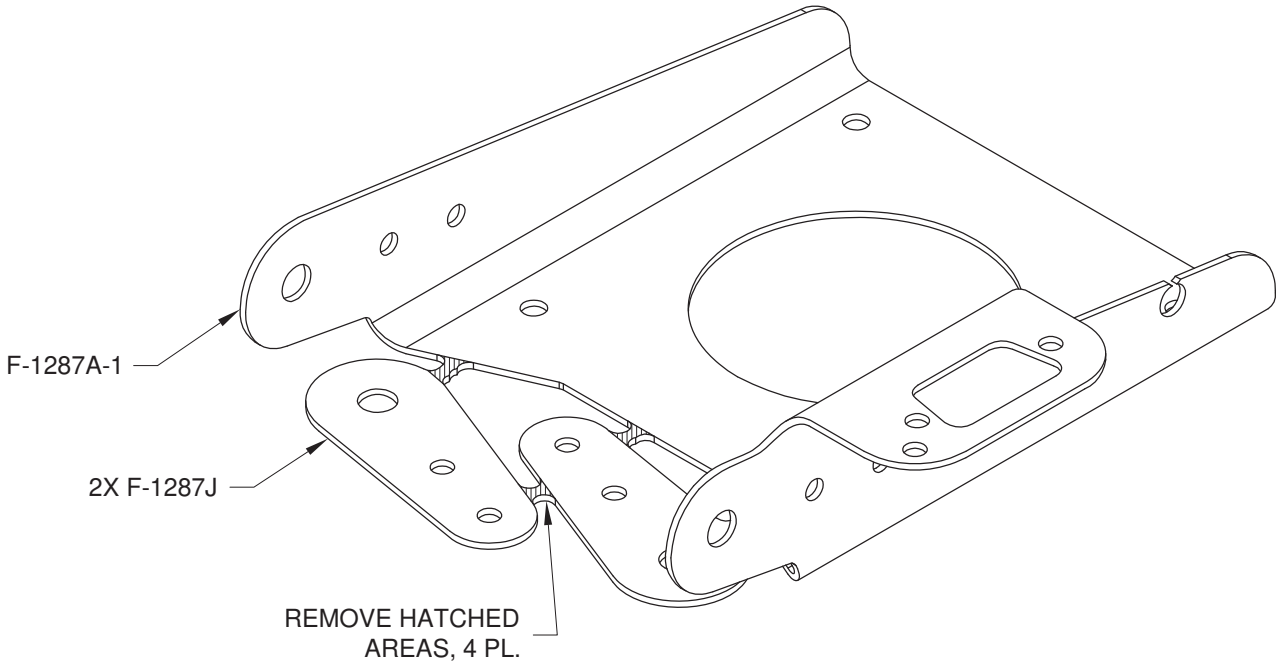
Hereafter, refer to the Left and Right AST Assemblies as the AST Assembly.



**FIGURE 3:**  
AST ASSEMBLY SAFETY WIRE

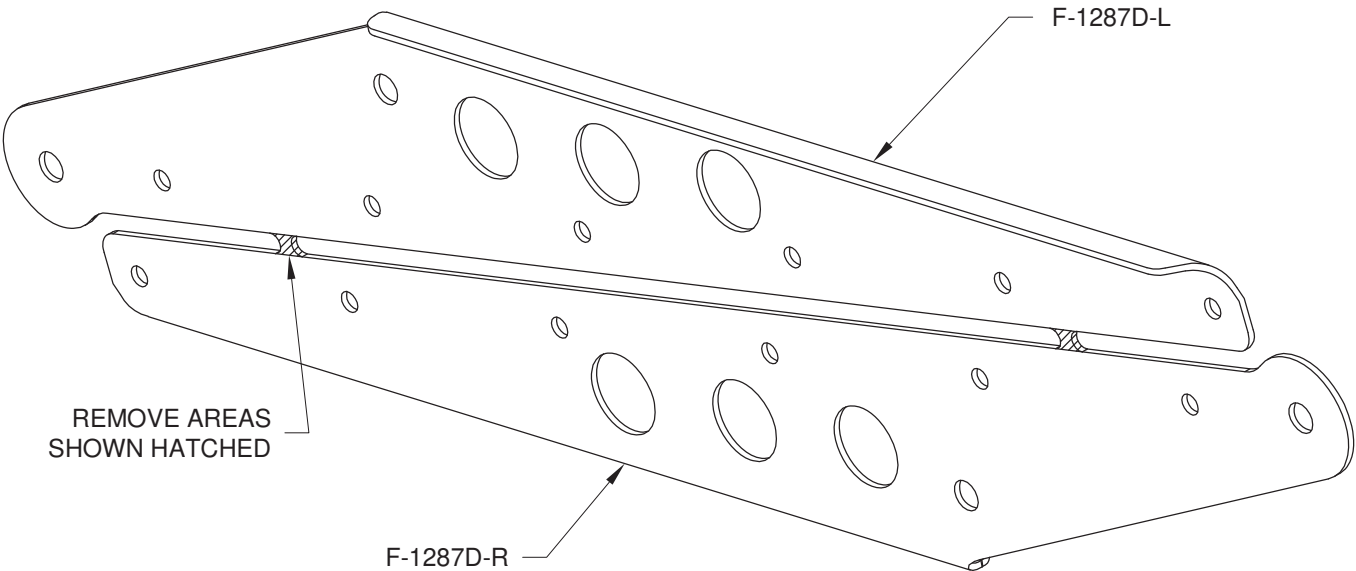
Step 1: Separate the F-1287J Doublers from the F-1287A-1 Servo Tray by removing the material called out in Figure 1.

Deburr the parts.



**FIGURE 1:**  
SEPARATING DOUBLERS FROM SERVO TRAY

Step 2: Mark then separate the F-1287D-L & -R Clevis Plates by removing the material called out in Figure 2.

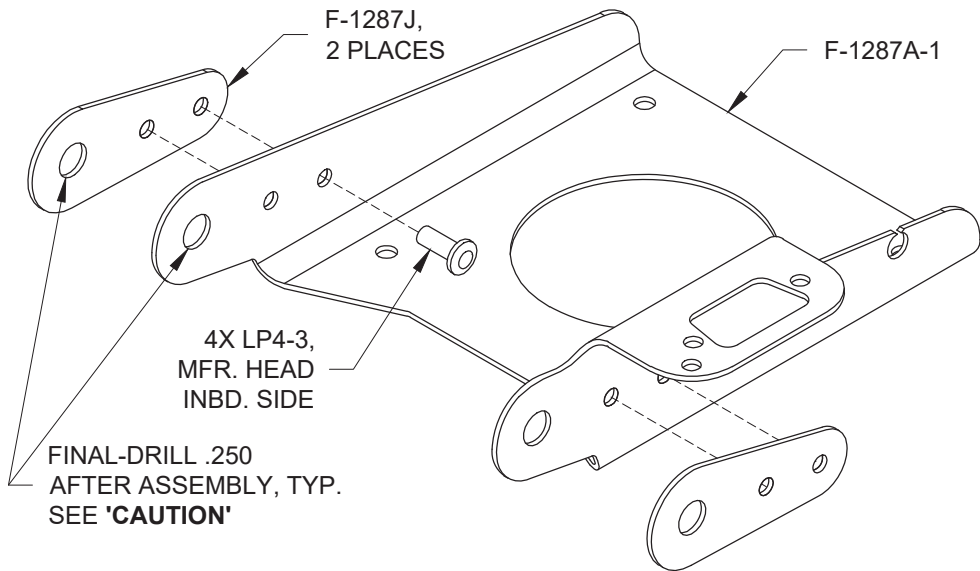


**FIGURE 2:**  
F-1287D CLEVIS PLATE SEPARATION

Step 1: Rivet the F-1287J Doublers to the F-1287A-1 Servo Tray. Orient and use rivets as called out in Figure 1.

**CAUTION:** After drilling, carefully deburr the 1/4 in. hole to remove only the burr without creating a chamfer.

Step 2: Final-Drill .250 and deburr the pivot holes in the Servo Tray and in the F-1287C Link per the call-outs in Figures 1 and 3.

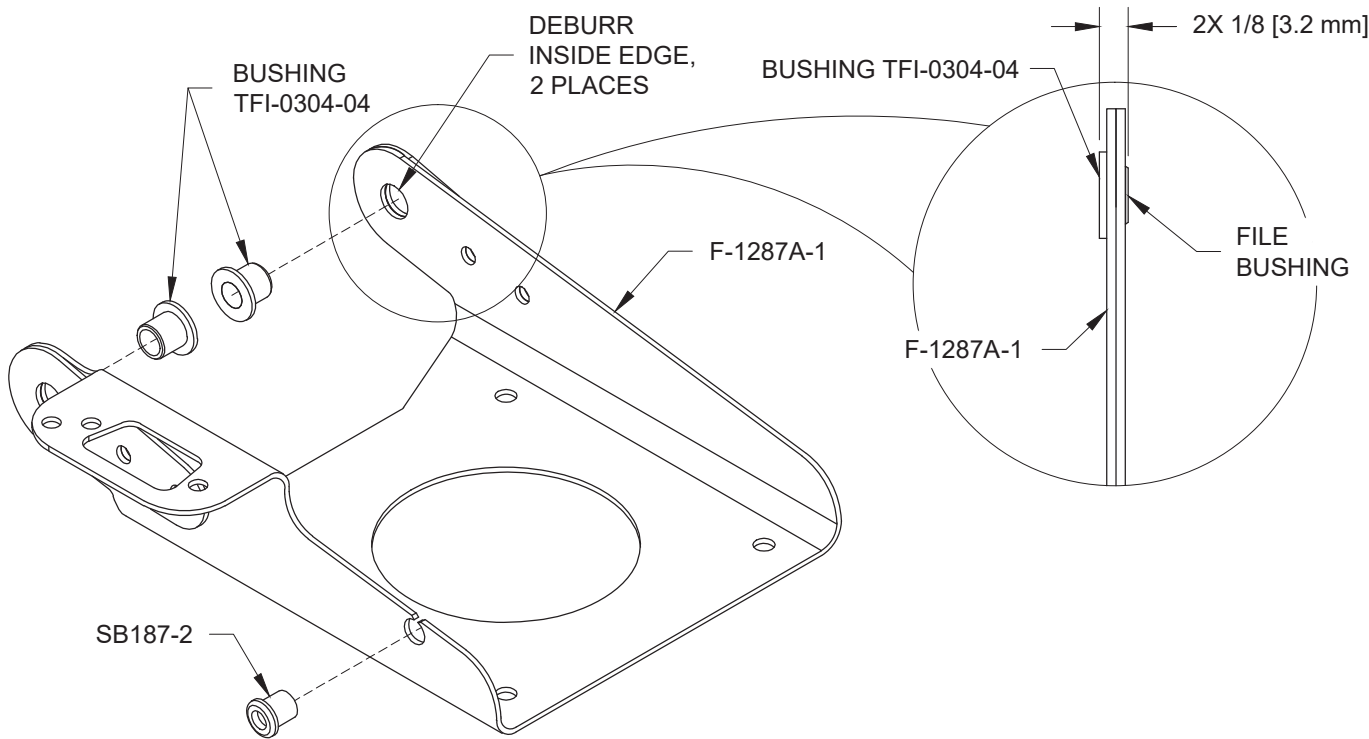


**FIGURE 1: INSTALL DOUBLERS**

Step 3: Insert the small plastic snap bushing into the opening in F-1287A-1 as shown in Figure 2.

Step 4: Insert the polymer bushings into the F-1287A-1 Servo Tray as shown in Figure 2.

Step 5: File the polymer bushings inserted in the previous step. The bushings must be **greater than** the thickness of the part and **less than or equal to** the dimension given in the detail.

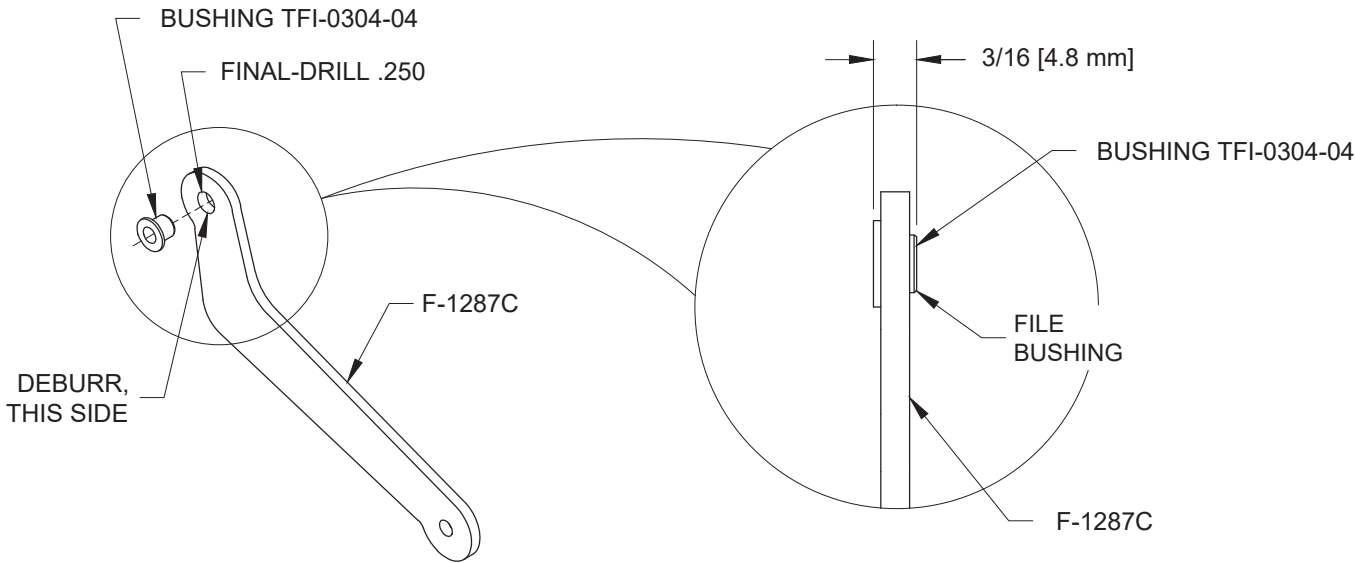


**FIGURE 2: INSTALL BUSHINGS**

Step 6: Deburr and flatten as required the F-1287C Link called out in Figure 3.

Step 7: Insert the polymer bushing into the F-1287C Link as shown in Figure 3.

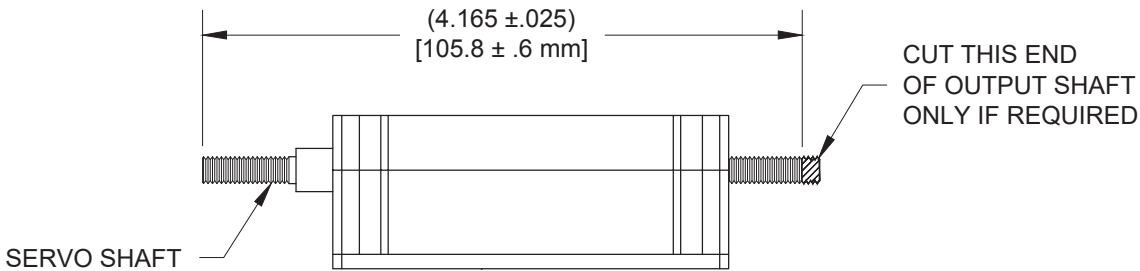
Step 8: File the polymer bushings inserted in the previous step. The bushings must be **greater than** the thickness of the part and **less than or equal to** the dimension given in the detail.



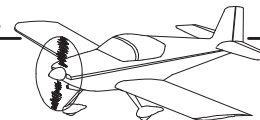
**FIGURE 3: INSTALL BUSHING**

**NOTE:** The servo may be labeled B6-7T.

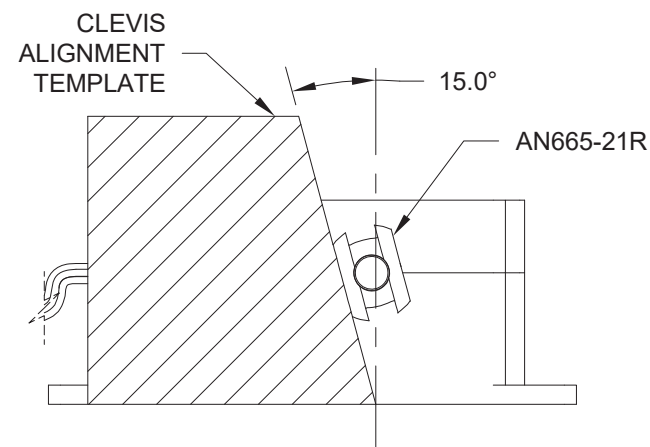
Step 9: Verify the length of the ES MSTs-B6-7T-165 servo shaft per the dimension shown in Figure 4. If the shaft exceeds this dimension, cut off the excess from the end marked "CUT THIS END" using a hacksaw and deburr. Since nothing will be connected to the cut end 'clean' threads are not required.



**FIGURE 4: SERVO SHAFT LENGTH VERIFICATION**



Step 1: Fabricate the Clevis Rod End Alignment Template shown in Figure 1 below from any thin, stiff material such as cardstock.



**FIGURE 1: CLEVIS ALIGNMENT TEMPLATE**

Step 2: Install the BUSH-BS.188X.313X.222 and AN665-21R clevis rod end onto the ES MSTS-B6-7T-165 Pitch Trim Servo shaft as shown in Figure 2 with the clevis rod end just in contact and snug with the bushing.

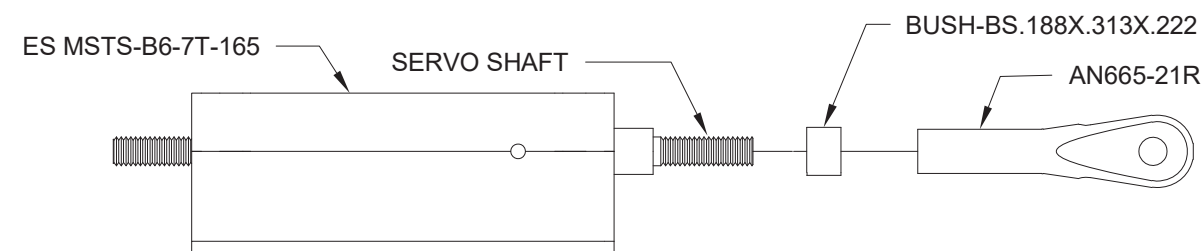
Using the Clevis Alignment Template shown in Figure 1, check that the angle of misalignment between the clevis and the final installed position of the clevis is less than 15°. If the clevis rotates past the ideal position or has more than 15° of misalignment before reaching the correct final position, the bushing will need to be modified using the instructions in Step 3.

**CAUTION: If the clevis rod end is tightened through more than 15°, the shaft may be damaged.**

Step 3: Complete the following step if the clevis has more than 15° of misalignment before reaching the correct final position or the clevis rotates past the ideal position. Tighten the bushing into the chuck of a drill press. The bushing must be square to the table of the drill press. Lower the bushing to the drill press table and check that the bushing is flat against the drill press table. Hold a piece of sandpaper on the drill press table. Set the drill press to low speed then slowly lower the bushing against the sandpaper. Only a couple thousandths removed will make a 10° difference.

The finished surface must be square. If you attempt this by hand the surface will become angled allowing contact at only one point on the perimeter between the bushing and the clevis or rod shoulder. This will allow the rod to flex and possibly fatigue. Check that the bushing makes contact around the entire perimeter against both the shoulder in the rod and the clevis fitting.

The final bushing should place the slot in the clevis perpendicular to the lower face of the trim motor housing.



**FIGURE 2: INSTALLING CLEVIS AND BUSHING**

Step 4: Install two AN315-3R nuts onto the opposite end of the trim motor shaft from the clevis. See Figure 3. Jam the nuts together.

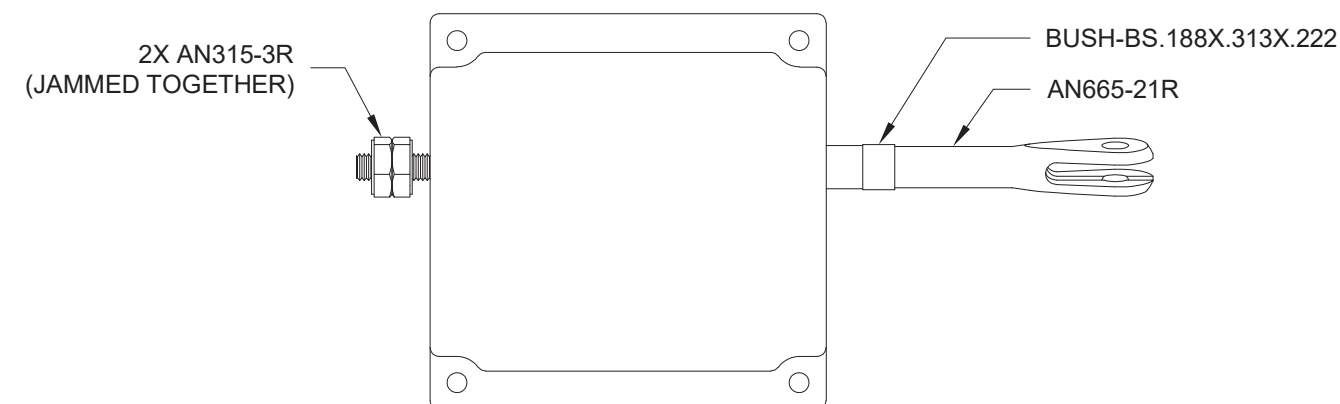
**WARNING: Ensure that the threadlocker is only applied to the threaded portion of the servo shaft where the bushing and clevis are installed. Any threadlocker present outside of this area can affect the operation of the trim motor.**

Step 5: Hold the jam nuts installed in the previous step with a wrench to prevent torque on the shaft from being transmitted to the internal components of the trim motor.

Install the bushing and clevis onto the shaft of the trim motor with Loctite 271 (or equivalent permanent strength threadlocker) as shown in Figure 2. Align the slot in the clevis perpendicular to the bottom surface of the trim motor housing. Allow the threadlocker time to cure as prescribed in the product instructions and clean up any excess threadlocker.

Remove and discard both AN315-3R nuts.

Step 6: After the threadlocker has cured, run the trim motor fully in both directions.



**FIGURE 3: CLEVIS FINAL TIGHTENING**

**Step 1:** String the wires of the ES MSTS-B6-7T-165 through the snap bushing as shown in Figure 1.

**Step 2:** Install the Pitch Trim Servo to the F-1287A-1 Servo Tray using the hardware called out in Figure 1.

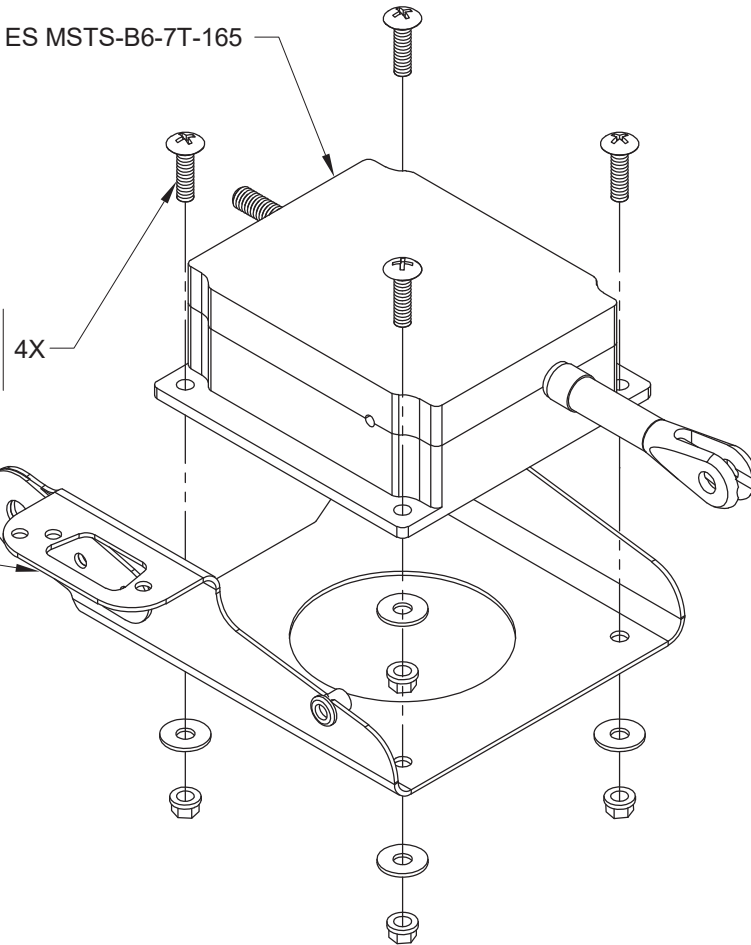
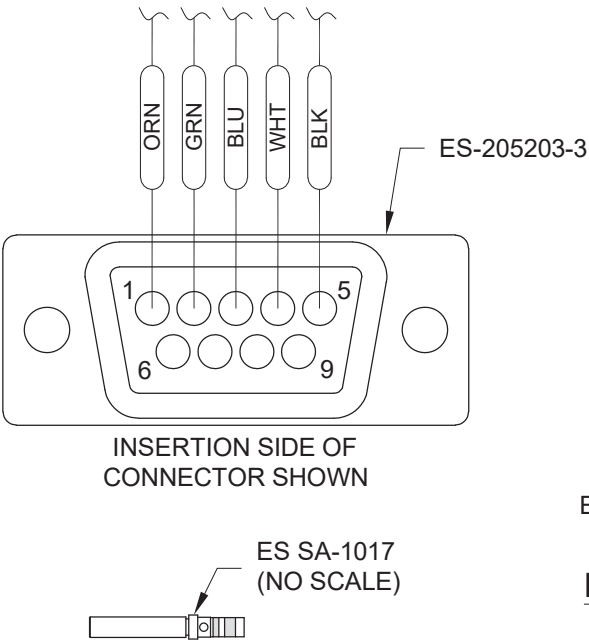
**NOTE:** When installing wire pins into D-Sub connectors, gently pull test each wire after insertion to verify it has hooked into the connector body. If a pin is inserted into the wrong location remove it using the **TOOL ICM INSRT/EXTRCT D-sub Tool** available through Van's Aircraft.

**NOTE:** See Section 5.21 for more information on crimping D-Sub terminals.

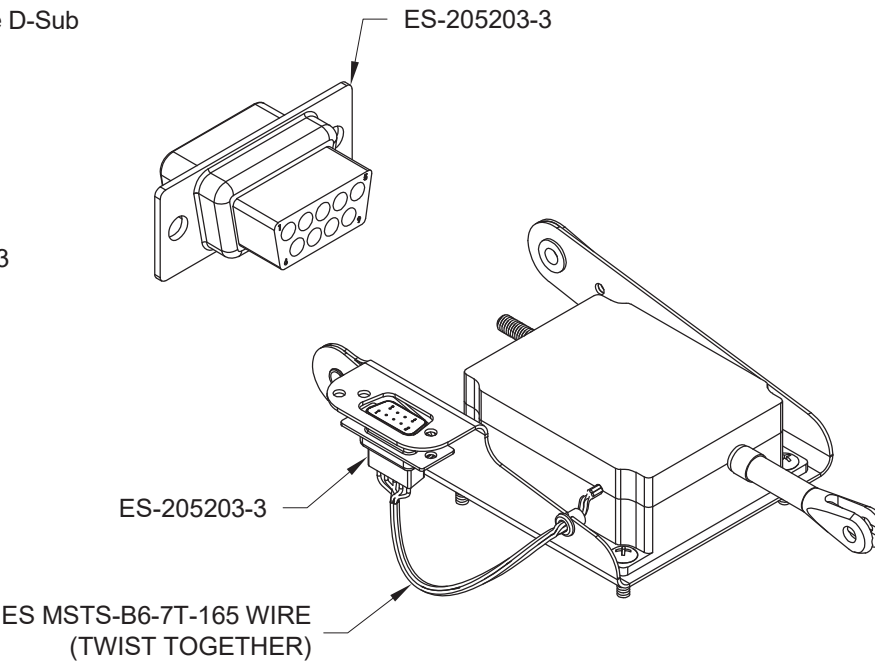
**Step 3:** Crimp ES SA-1017 Socket Pins (20-24) onto the ends of the wires coming out of the ES MSTS-B6-7T-165 Pitch Trim Servo.

Twist all the wires together coming from the servo.

Insert the sockets pins into an ES-205203-3 Female D-Sub 9 pin connector per the locations shown in Figure 2.



**FIGURE 1: INSTALL SERVO**



**FIGURE 2: INSERTING CONNECTORS**

**CAUTION:** Install castle nuts in this section finger tight, to eliminate lateral play but allow freedom of movement, then install the cotter pins.

**NOTE:** The Pitch Trim Servo is not shown in Figure 3 for clarity.

**Step 4:** Attach the F-1287D-L & -R Clevis Plates together using the parts and hardware called out in Figure 3. Pay attention to the orientation of the clevis plates in relation to the F-1287C Link. Cleco the clevis plates to the F-1287E Pushrod. Pay attention to the orientation of the pushrod in relation to the clevis plates.

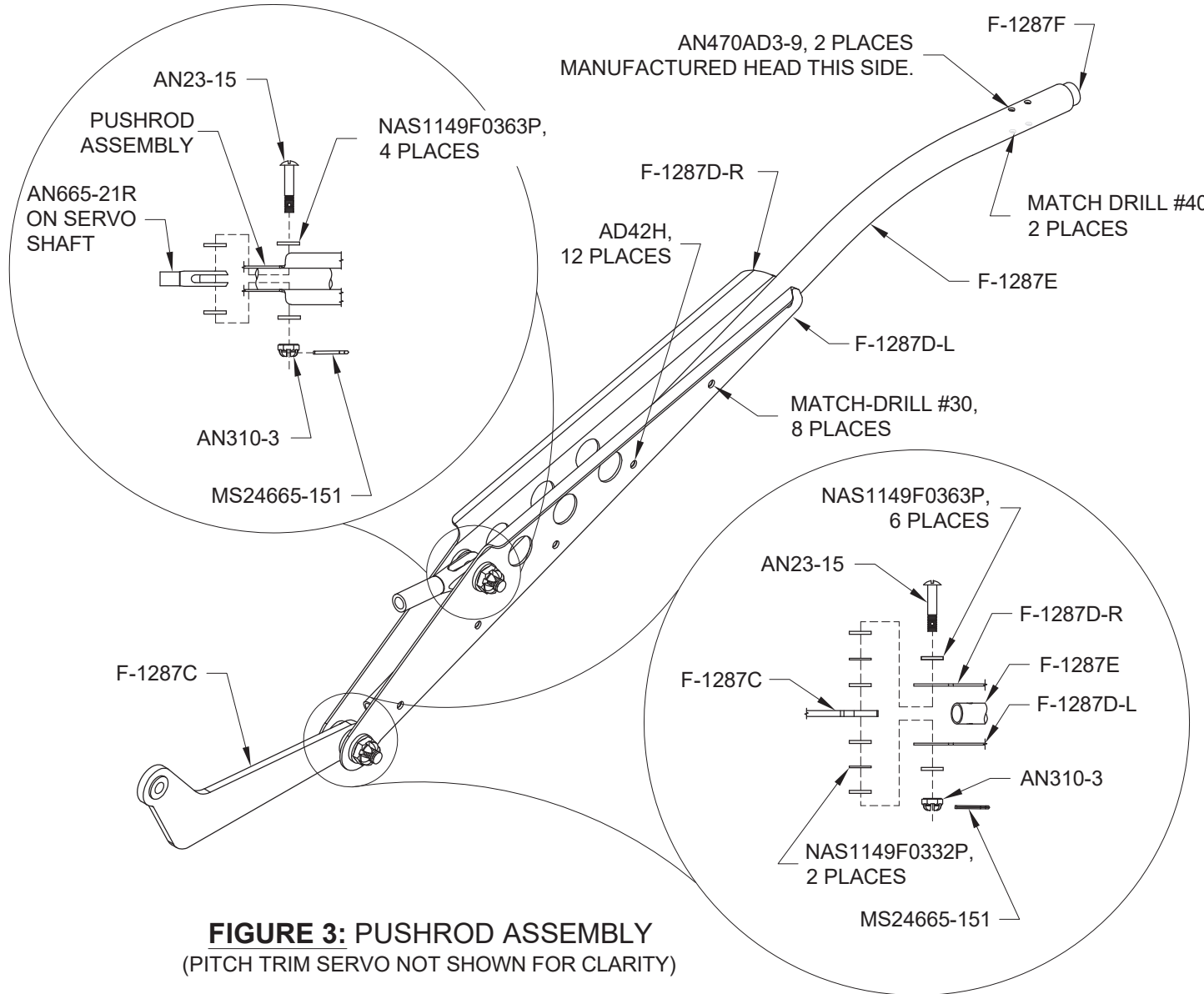
**Step 5:** Match-Drill the holes in each of the F-1287D-L & -R Clevis Plates into the F-1287E Pushrod as called out in Figure 3. Remove the clevis plates with the hardware still attached. Clear away chips.

**Step 6:** Clamp the F-1287F Threaded Insert into the curved end of the F-1287E Pushrod as shown in Figure 3. Use a rivet or similar to align the holes in the threaded insert with the holes in the pushrod.

**Step 7:** Match-Drill the holes from the F-1287E Pushrod and the F-1287F Threaded Insert through the pushrod as called out in Figure 3.

**Step 8:** Rivet the F-1287D-L & -R Clevis Plates to the F-1287E Pushrod using the hardware called out in Figure 3. Apply pressure toward the clevis plate while setting each rivet. Rivet the F-1287F Threaded Insert to the pushrod using rivets called out in Figure 3.

Hereafter refer to the pushrod, clevis plates and threaded insert as the Pushrod Assembly.



**FIGURE 3: PUSHROD ASSEMBLY**  
(PITCH TRIM SERVO NOT SHOWN FOR CLARITY)

Step 1: Install the called out rod end bearing and jam nut into the F-1287F Threaded Insert per dimensions in Figure 1. Achieve the dimension given then rotate the bearing body to align with the centerline of the Pushrod Assembly as shown in Figure 1.

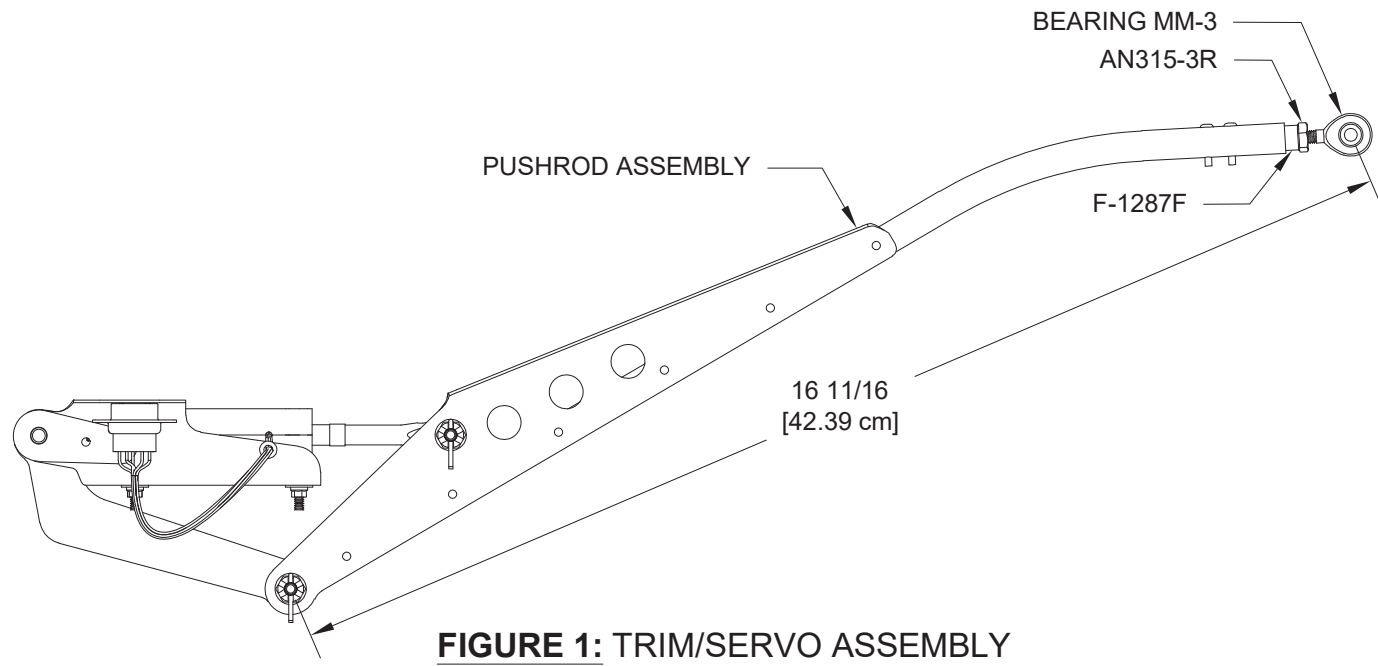


FIGURE 1: TRIM/SERVO ASSEMBLY

**NOTE: The Rudder, V-Stab, and Stabilator Assemblies are not shown for clarity in Figure 2.**

Step 2: From below the Stabilator Assembly, guide the rod end bearing of the Trim/Servo Assembly up between the stabilator main skins to the AST Assembly control horns as shown in Figure 2.

Step 3: Install the F-1287A-1 Servo Tray to the F-1211D Attach Brackets using the hardware called out in Figure 2. Prior to Section 38iS/U Airframe Assembly, separate the legs of the cotter pin only enough to hold it in the hole until final installation. Fully install this cotter pin after the tailcone is attached to the fuselage.

**NOTE: The rod end bearing will need to be disconnected from the AST for balancing the Stabilator Assembly.**

Step 4: Temporarily install the rod end bearing to the AST Assemblies using the hardware called out in Figure 2.

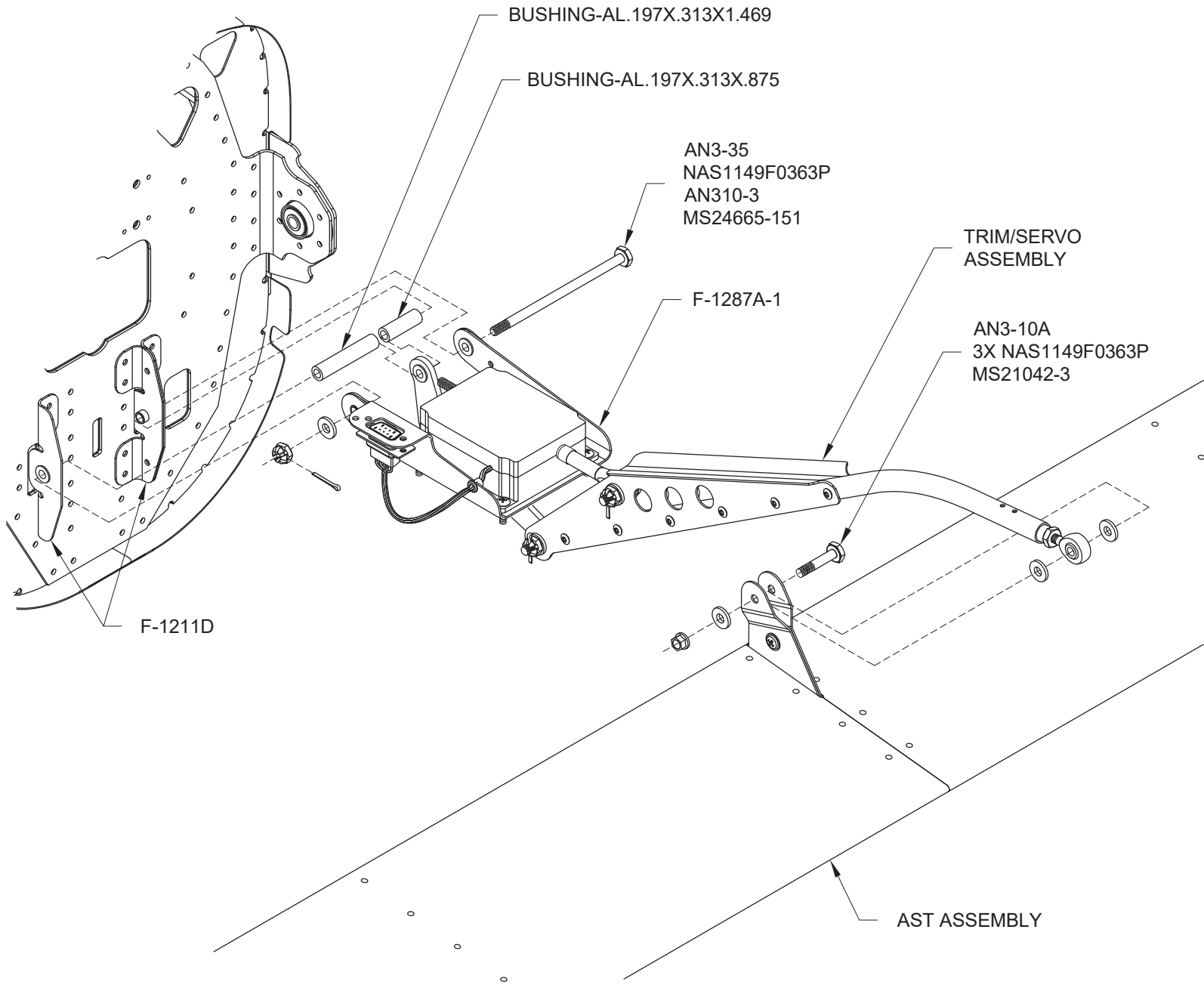


FIGURE 2: TRIM/SERVO ASSEMBLY INSTALLATION



## VAN'S AIRCRAFT, INC.

**Step 1:** Temporarily connect  $\approx 12$  V+ to the black wire, white wire V-, to fully extend the servo shaft, then disconnect the battery. (A 12-14V tool battery pack or 9 volt battery may be used for this purpose.)

Check the Stabilator Assembly movement to make sure it swings freely. Stabilator travel in both directions should be limited only by the stabilator hinge stops contacting the F-1211C tailcone hinge bracket. (Refer to Page 11-3, Figure 2, Detail A-A.)

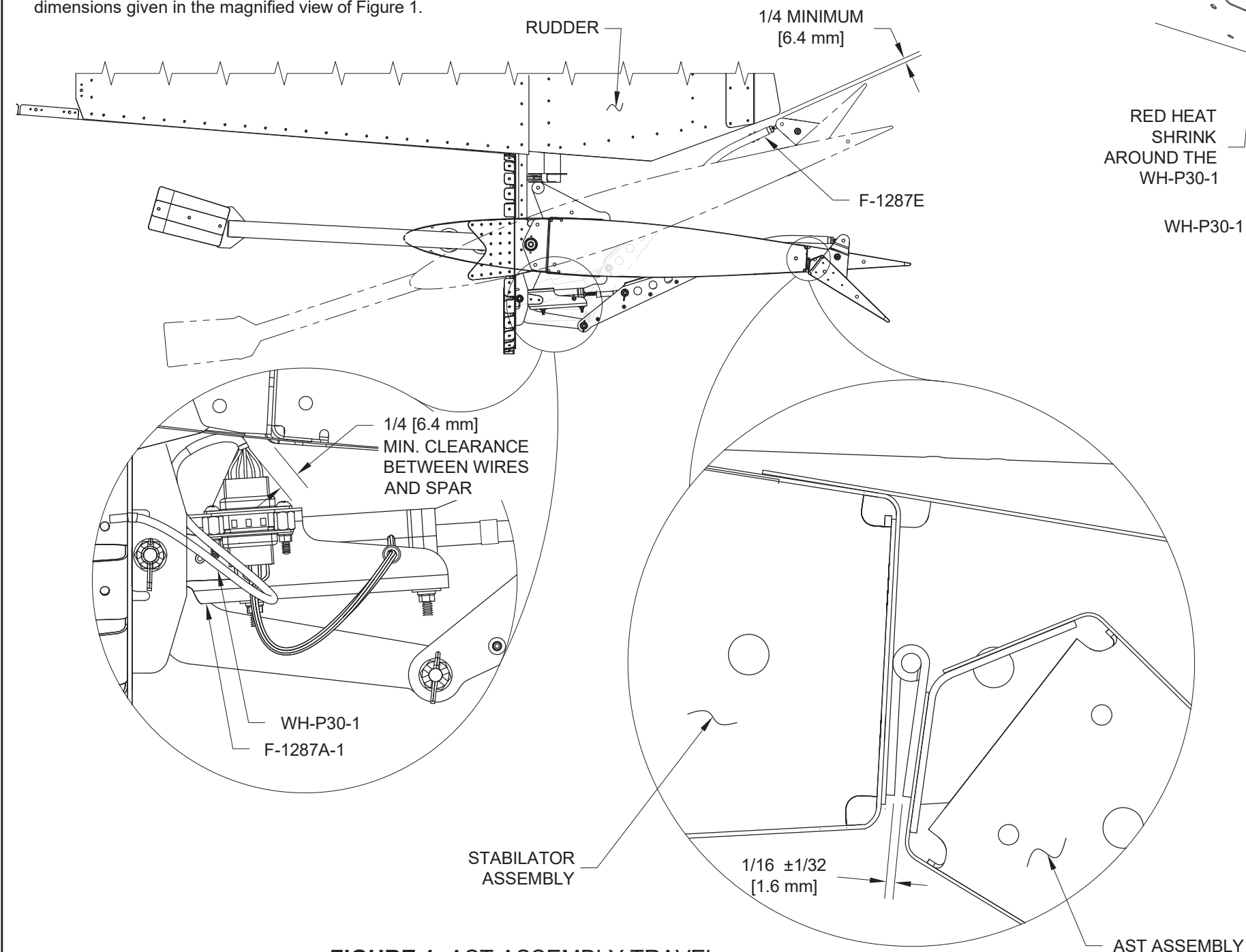
If necessary, adjust the rod end bearing to achieve clearance between the AST and Stabilator Assembly hinge halves per dimensions given in the magnified view of Figure 1.

**Step 2:** Temporarily connect  $\approx 12$  V+ to the white wire, black V-, to fully retract the servo shaft, then disconnect the battery.

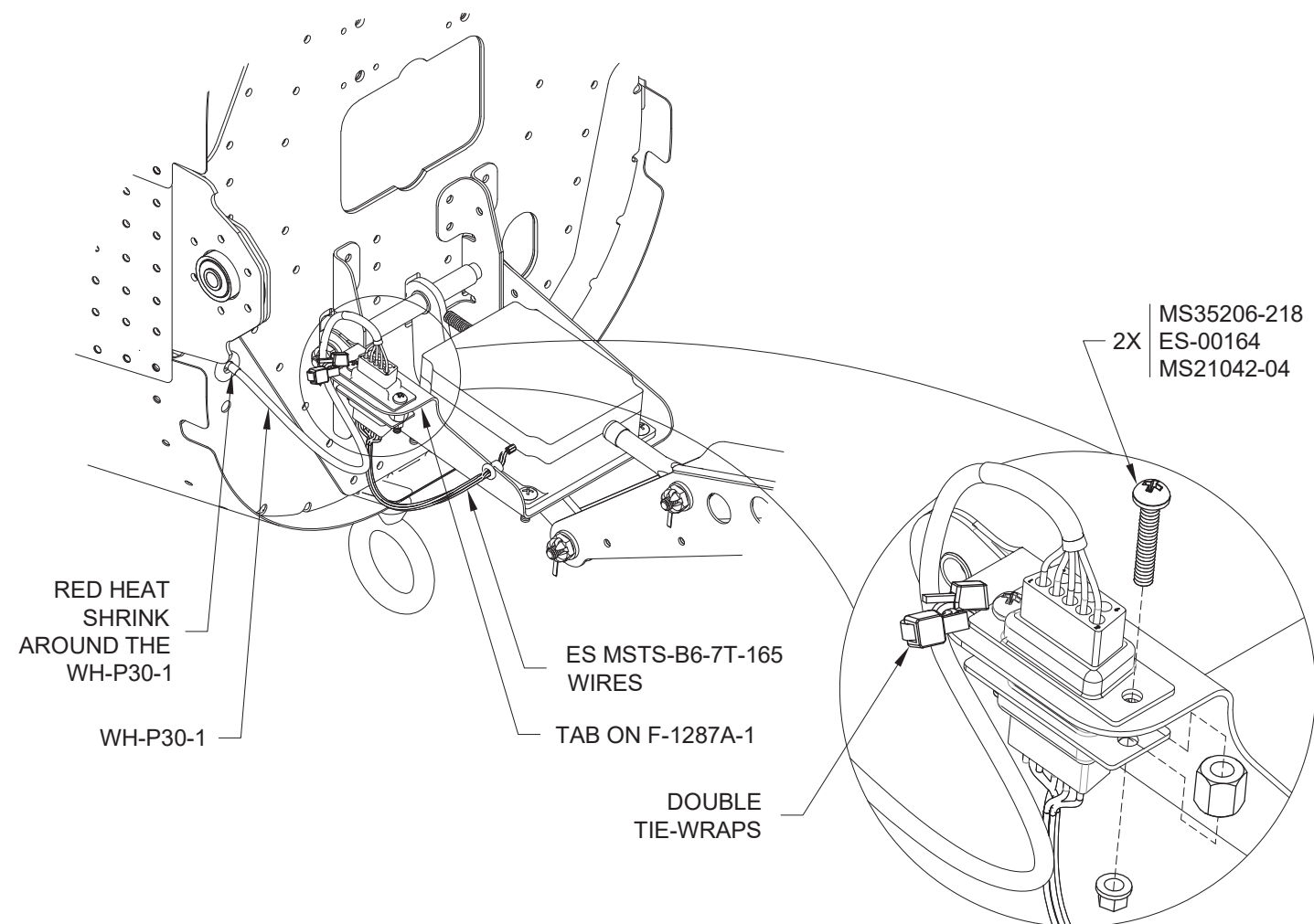
Check the Stabilator Assembly movement to make sure it swings freely as in the previous step. Also make sure there is at least 1/4 in. [6.4 mm] between the F-1287E Pushrod and the rudder bottom in any servo position as shown in Figure 1.

**Step 3:** Seal all openings on the wire insertion side of the servo's D-Sub using RTV.

**Step 4:** Plug the connector on the end of the WH-P30-1 Trim Wires into the connector on the wires coming from the ES MSTS-B6-7T-165 Pitch Trim Servo. Install the called out hardware including the two wire tie-wraps as shown in Figure 2.



**FIGURE 1: AST ASSEMBLY TRAVEL**



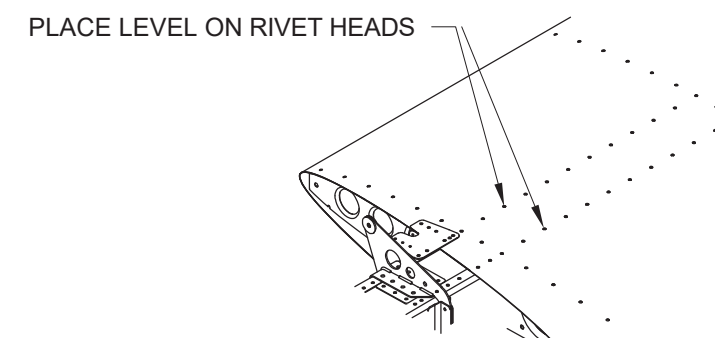
**FIGURE 2: WH-P30-1 ATTACH DETAIL**

**Step 5:** Check stabilator travel. Place a digital level or smart phone with a level application onto the top of the two rivets indicated in Figure 3.

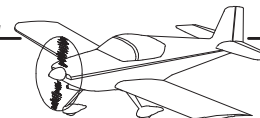
The total amount of travel should be  $20 \pm 0.5^\circ$ .

An alternative method is to compare vertical dimensions taken from the trailing edge to the floor at max and min travel. The difference between these measurements should be  $8 \pm 1/4$  in. [ $20.3 \pm 5$  cm].

If this measurement is not achieved the installation must be checked for error.



**FIGURE 3: LEVEL RIVET LOCATIONS**



**NOTE:** The following description of balancing the Stabilator Assembly is optional. Balancing should only be accomplished after all painting/decal application has been completed and the tips are finished to final configuration (stock tip ribs or optional fiberglass tip fairings) to prevent under-balance of the stabilator. The goal is to reduce weight as much as possible and achieve a neutrally balanced stabilator. This procedure may be completed off of the aircraft if the AST Pushrod Assembly weight can be accurately replicated on the bench.

Step 1: With the Stabilator Assembly, AST Assembly, and pitch trim system installed as detailed in the previous pages, disconnect the AST Pushrod from the AST horn, and ensure that the control cables are NOT connected to the stabilator horns.

Tape the AST Assembly into the "trail" position at one of the outboard corners and rest the pushrod on top of the pushrod attach bolt as shown in Figure 1.

Step 2: Verify that the stabilator swings freely on its hinges with very little friction. If notable friction is felt, determine the cause and repair. If a small amount of friction is present, err on the side of too much counterbalance i.e. the stabilator should just start to creep leading edge down if disturbed.

**NOTE:** When the Stabilator is neutrally balanced it will remain in any position it is placed in.

Step 3: Remove weight from the fwd end of one or both outboard R-1014 Counterbalance Weights until neutral balance is obtained. If too much weight is removed, new R-1014 weights, or for small changes AN970-3 large area washers, are available from Van's. Each AN970-3 weigh .155 oz [4.4 grams], and two will fit onto each bolt without having to substitute a longer bolt.

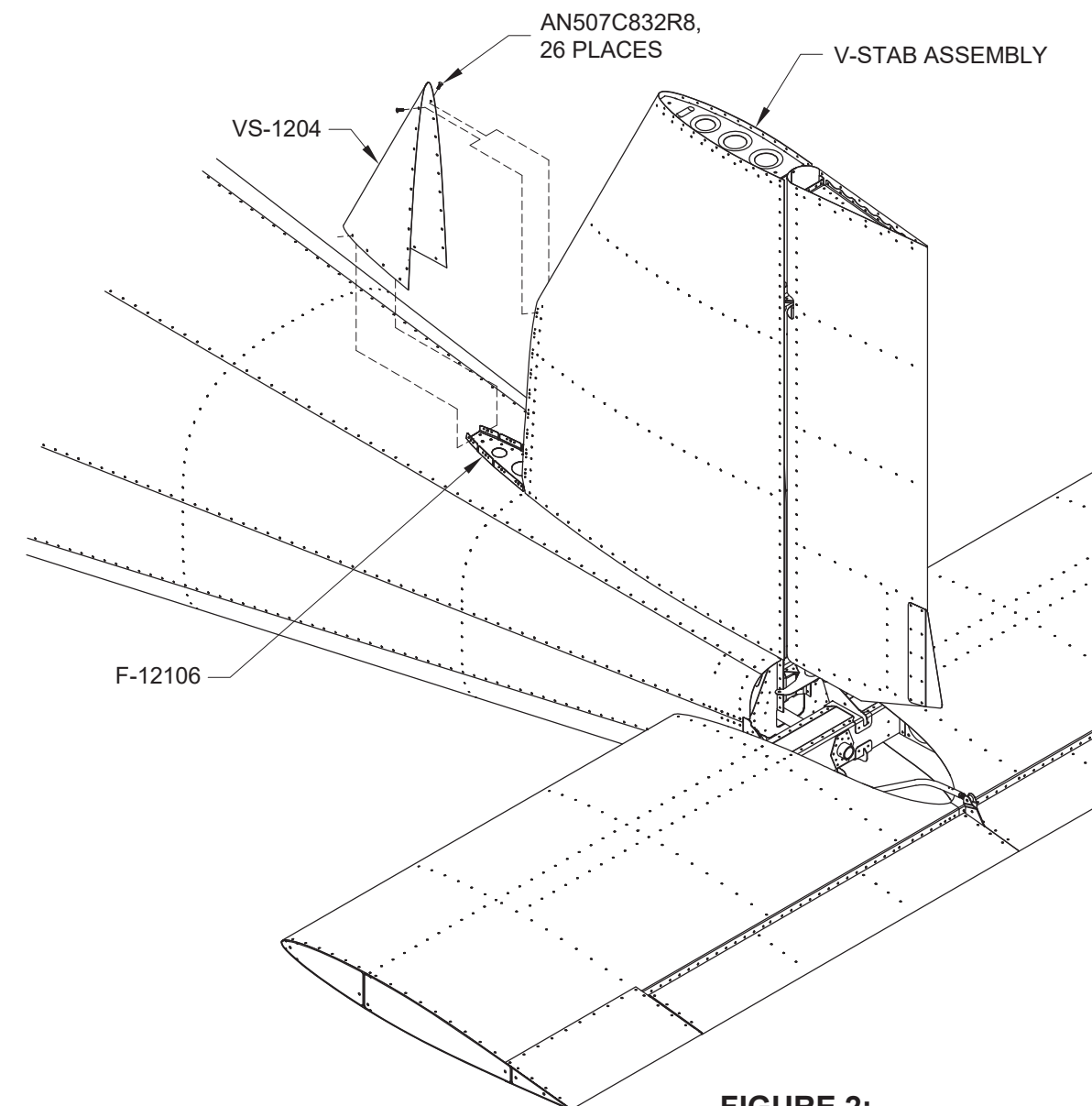
To estimate the required counterweight reduction, weight can be placed on top of the stabilator at the position shown in Figure 1 until neutral balance is obtained. Remove half that amount of weight from the counterbalance for an equivalent balance change.

A 0.1 in. [2.5 mm] trim from one balance weight removes approximately .032 lbs or .51 oz. [14.5 grams].

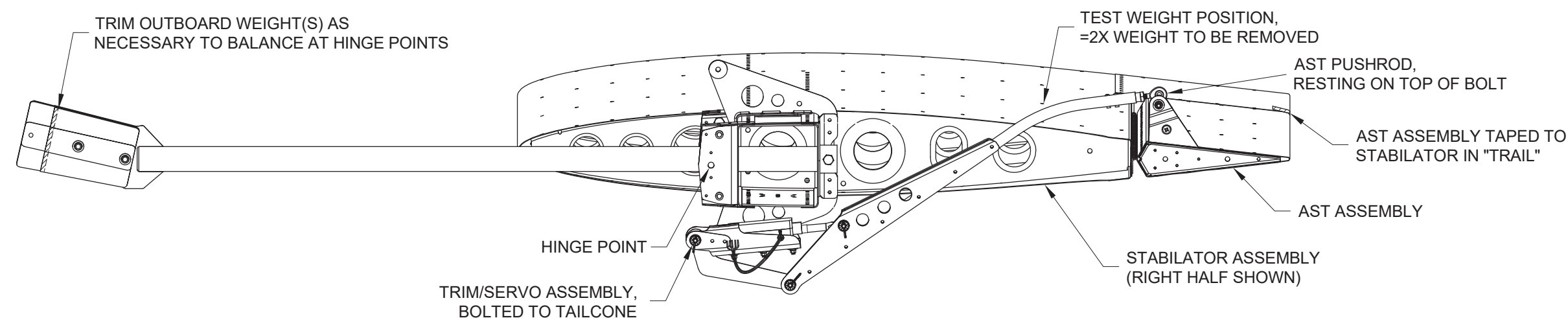
**WARNING:** Any weight added to the counterbalance must be fastened rigidly and securely so that there is no way for it to work loose.

Step 4: Install the VS-1204 Fwd Skin to the V-Stab Assembly and the F-12106 using the hardware called out in Figure 2.

END OF SECTION



**FIGURE 2:**  
FORWARD SKIN ATTACH



**FIGURE 1:**  
COUNTERBALANCE WEIGHT CHECK



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