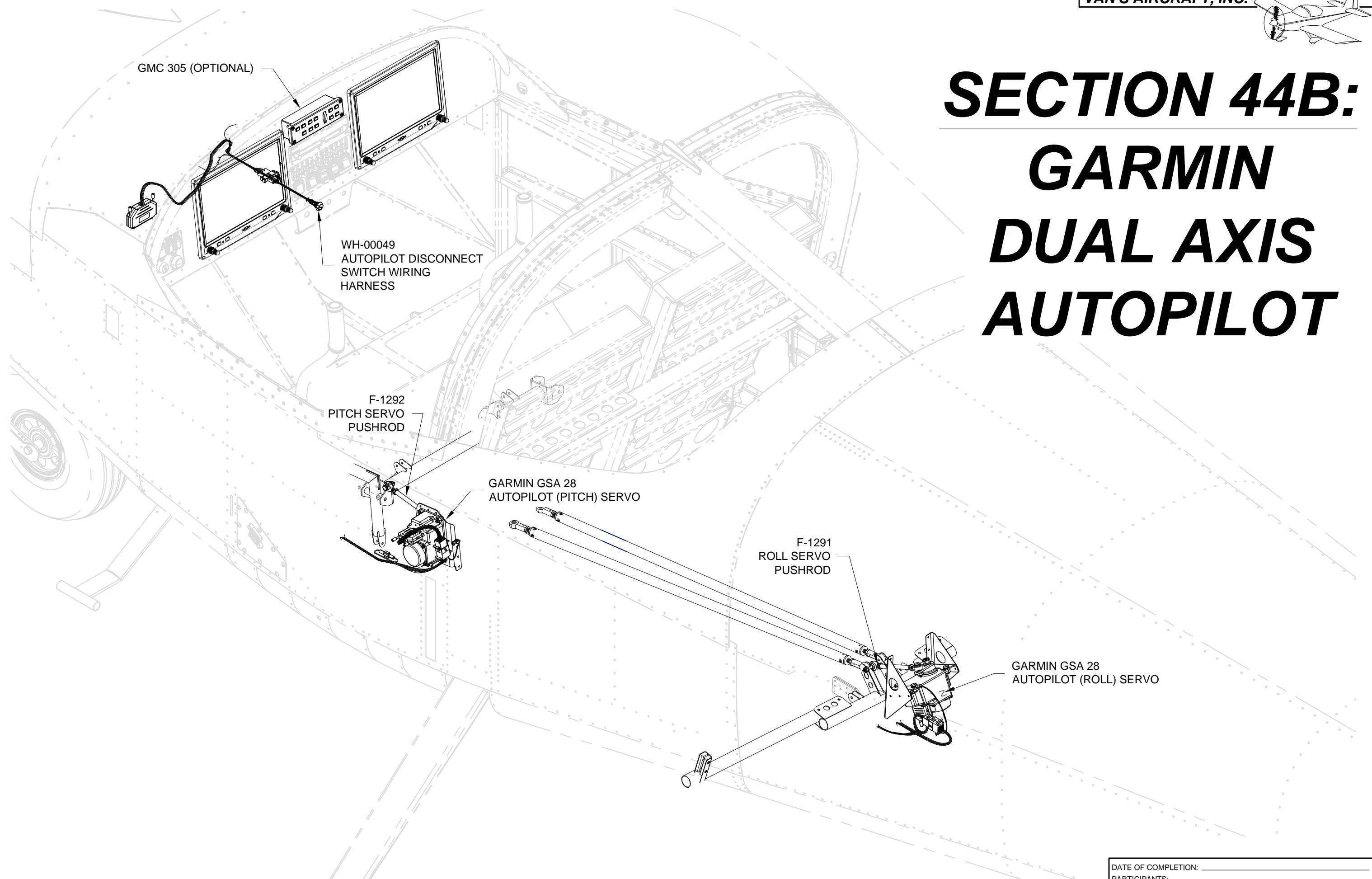


# SECTION 44B: GARMIN DUAL AXIS AUTOPILOT



GMC 305 (OPTIONAL)

WH-00049  
AUTOPILOT DISCONNECT  
SWITCH WIRING  
HARNESS

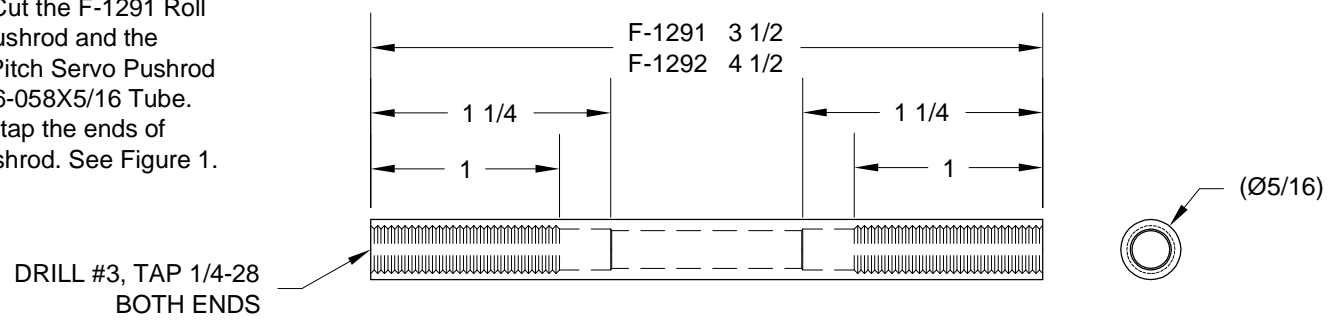
F-1292  
PITCH SERVO  
PUSHROD

GARMIN GSA 28  
AUTOPILOT (PITCH) SERVO

F-1291  
ROLL SERVO  
PUSHROD

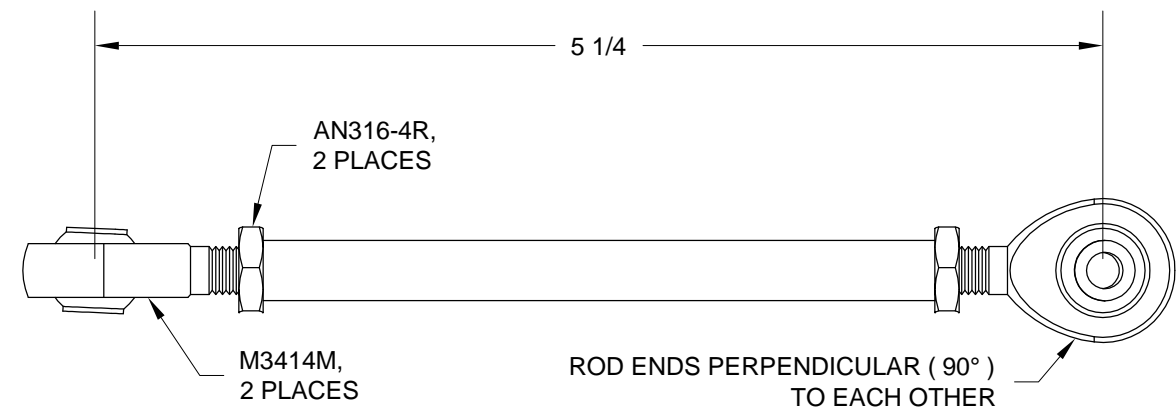
GARMIN GSA 28  
AUTOPILOT (ROLL) SERVO

Step 1: Cut the F-1291 Roll Servo Pushrod and the F-1292 Pitch Servo Pushrod from AT6-058X5/16 Tube. Drill and tap the ends of each pushrod. See Figure 1.



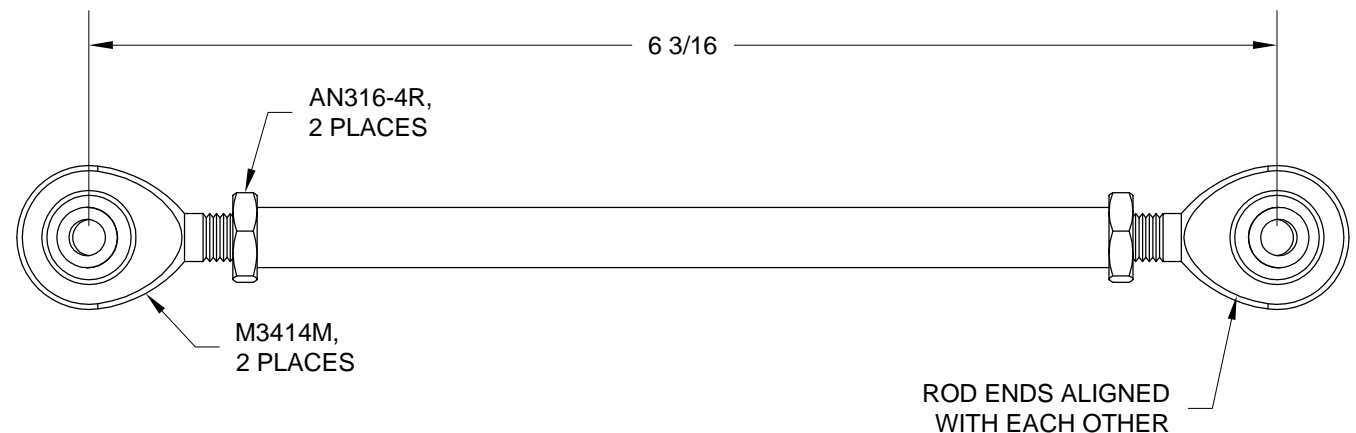
**FIGURE 1: MAKING THE PUSHROD TUBES**

Step 2: Assemble the F-1291 Roll Servo Pushrod and hardware as shown in Figure 2 to make the Roll Servo Pushrod Assembly.



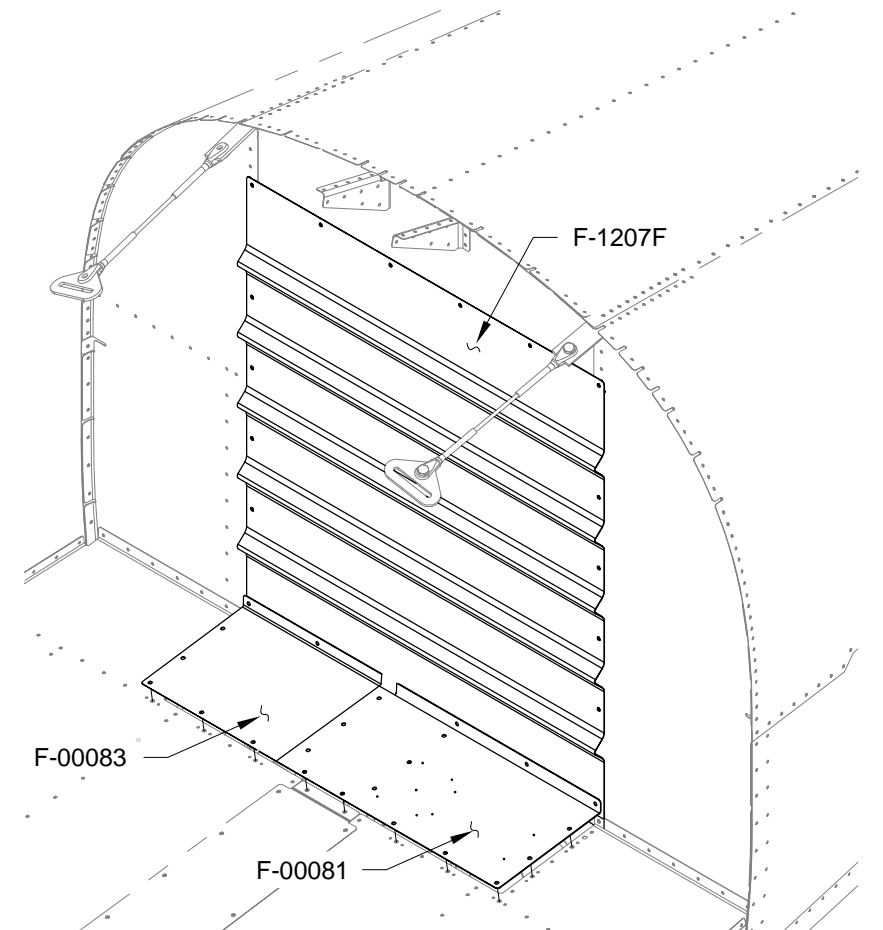
**FIGURE 2: ROLL SERVO PUSHROD ASSEMBLY**

Step 3: Assemble the F-1292 Pitch Servo Pushrod and hardware as shown in Figure 3 to make the Pitch Servo Pushrod Assembly.



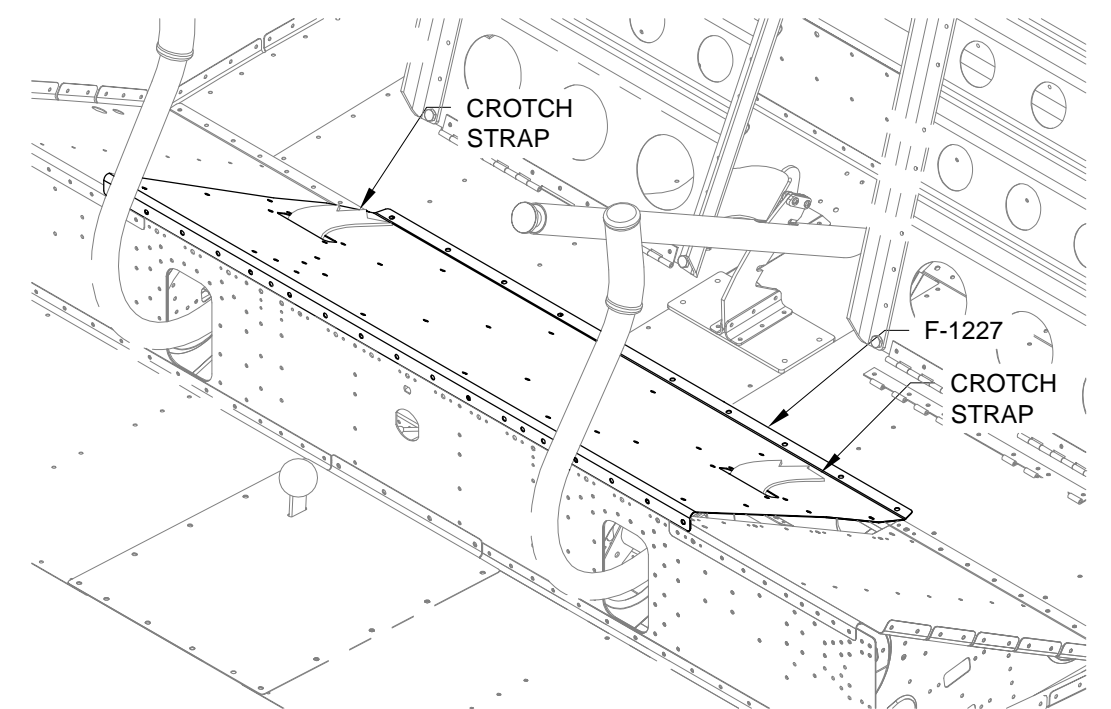
**FIGURE 3: PITCH SERVO PUSHROD ASSEMBLY**

Step 4: Remove the F-00081 ADAHRS Baggage Floor, the F-00083 Baggage Cover, and the F-1207F Baggage Bulkhead Corrugation. See Figure 4.

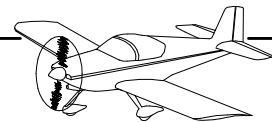


**FIGURE 4: REMOVING ACCESS COVERS**

Step 5: Remove the F-1227 Seat Ramp Cover. See Figure 5.



**FIGURE 5: REMOVING THE SEAT RAMP COVER**



**NOTE:** Some kits may include a pre-trimmed F-1269 Servo Doubler. If so, Step 1 through Step 3 does not apply. Set the F-00072 Trim Guide aside and proceed to Step 4.

**Step 1:** Attach the F-00072 Trim Guide to the previously installed F-1269 Servo Doubler using the hardware called out in Figure 1.

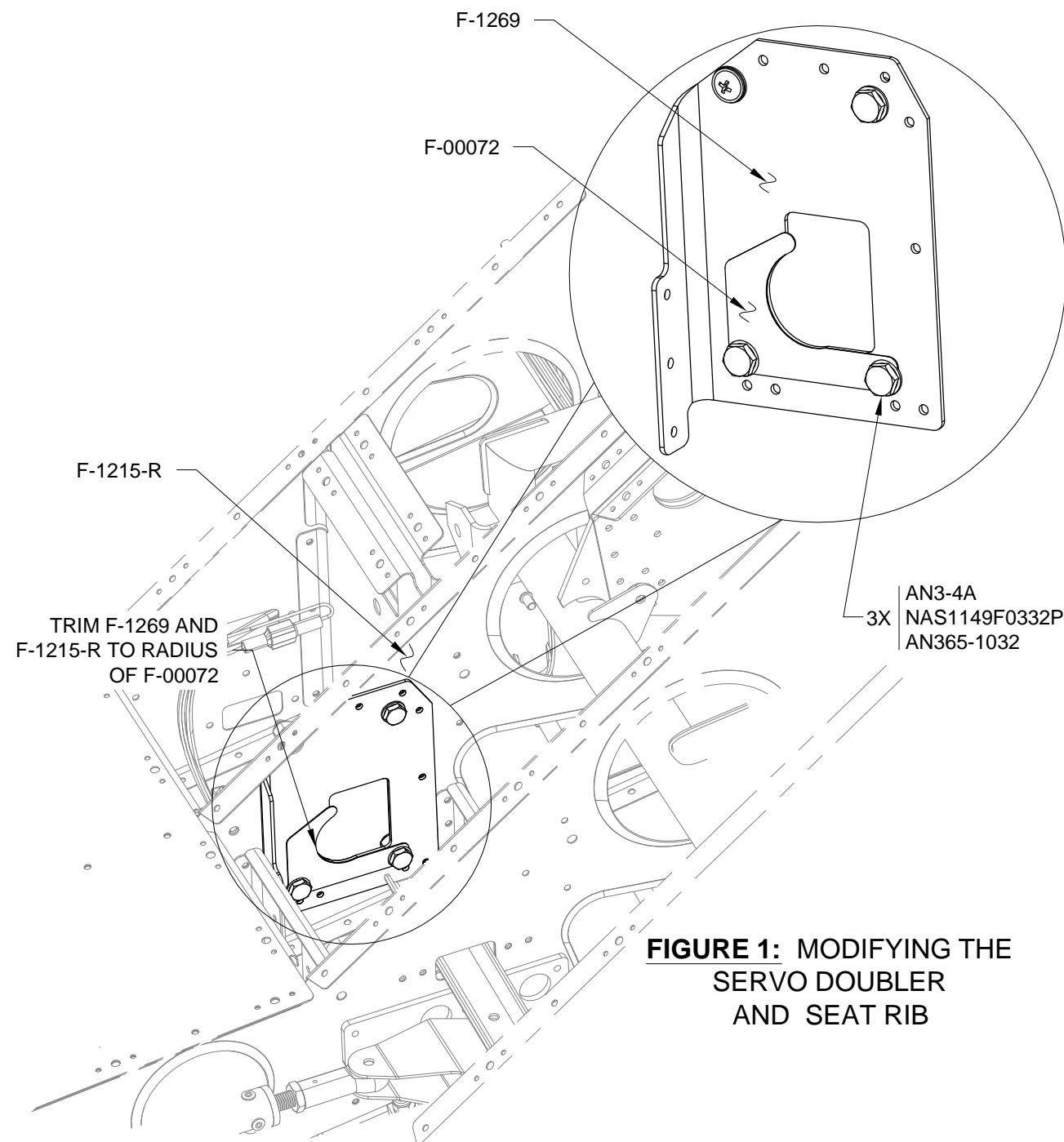
**Step 2:** Remove the excess material from the servo doubler and the F-1215-R Seat Rib to match the radius of the trim guide using a small die grinder.

**Step 3:** Remove and discard the trim guide. Deburr any sharp edges resultant from grinding.

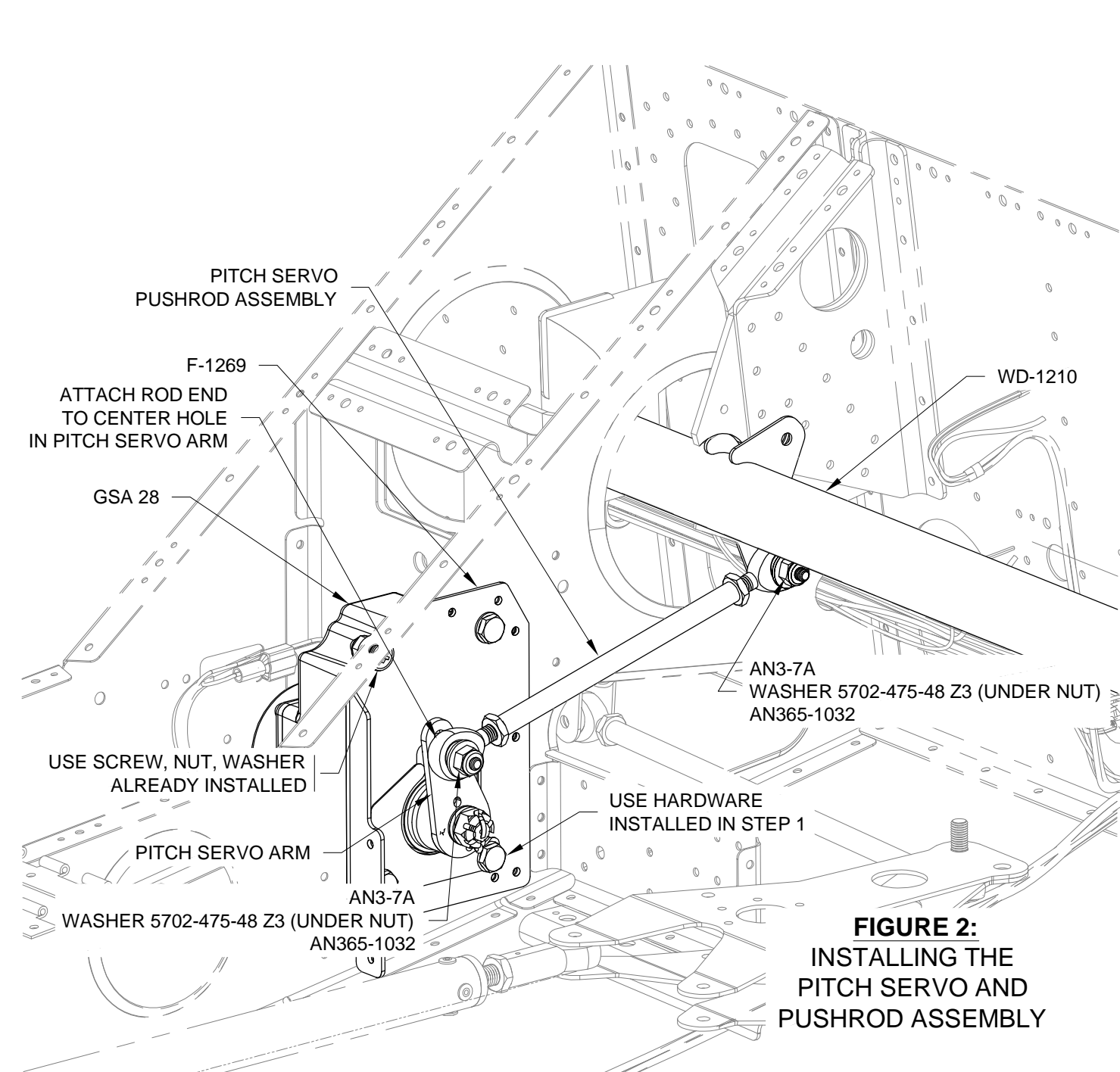
**Step 4:** Install a Garmin GSA 28 Autopilot Servo to the F-1269 Servo Doubler. See Figure 2.

**Step 5:** Attach the Pitch Servo Pushrod Assembly to the Pitch Servo Arm as shown in Figure 2. Make certain the Pushrod Assembly is bolted to the center hole in the Pitch Servo Arm.

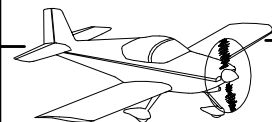
**Step 6:** Attach the other end of the Pitch Servo Pushrod Assembly to the tab on the lower surface of the WD-1210 Control Column. See Figure 2.



**FIGURE 1:** MODIFYING THE SERVO DOUBLER AND SEAT RIB



**FIGURE 2:** INSTALLING THE PITCH SERVO AND PUSHROD ASSEMBLY



**NOTE:** If your aircraft does not have a Molex connector on the autopilot servo wires coming from the WH-00045 Options Harness and WH-00046 Fuselage Harness, go to Page 44B-11, Step 4 for instructions on reconfiguring your harness to mate to the servo Molex connector.

**Step 1:** Mate the spade connector coming from the ES-00010 9-pin female Molex connector to the spade connector coming from the WH-00045 Options Harness. See Figure 1.

Use a tie-wrap to secure the mated spade connectors to the nearby wires from the WH-00046 Fuselage Harness and the WH-00045 Options Harness.

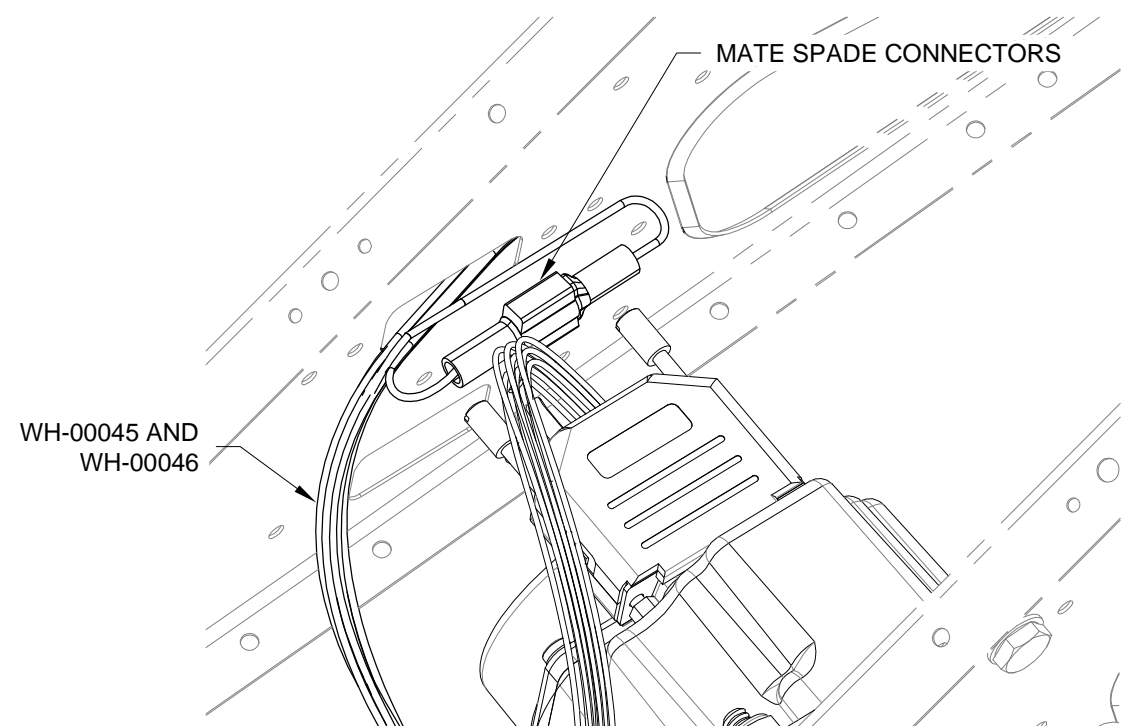
**Step 2:** Locate the WH-00082 Pitch Servo Harness with an 15-pin female D-Sub connector and an ES-00009 9-pin male Molex connector.

Attach the 15-pin female D-Sub connector labeled "P-SERVO" to the 15-pin male D-Sub receptacle on the GSA 28 Autopilot Servo.

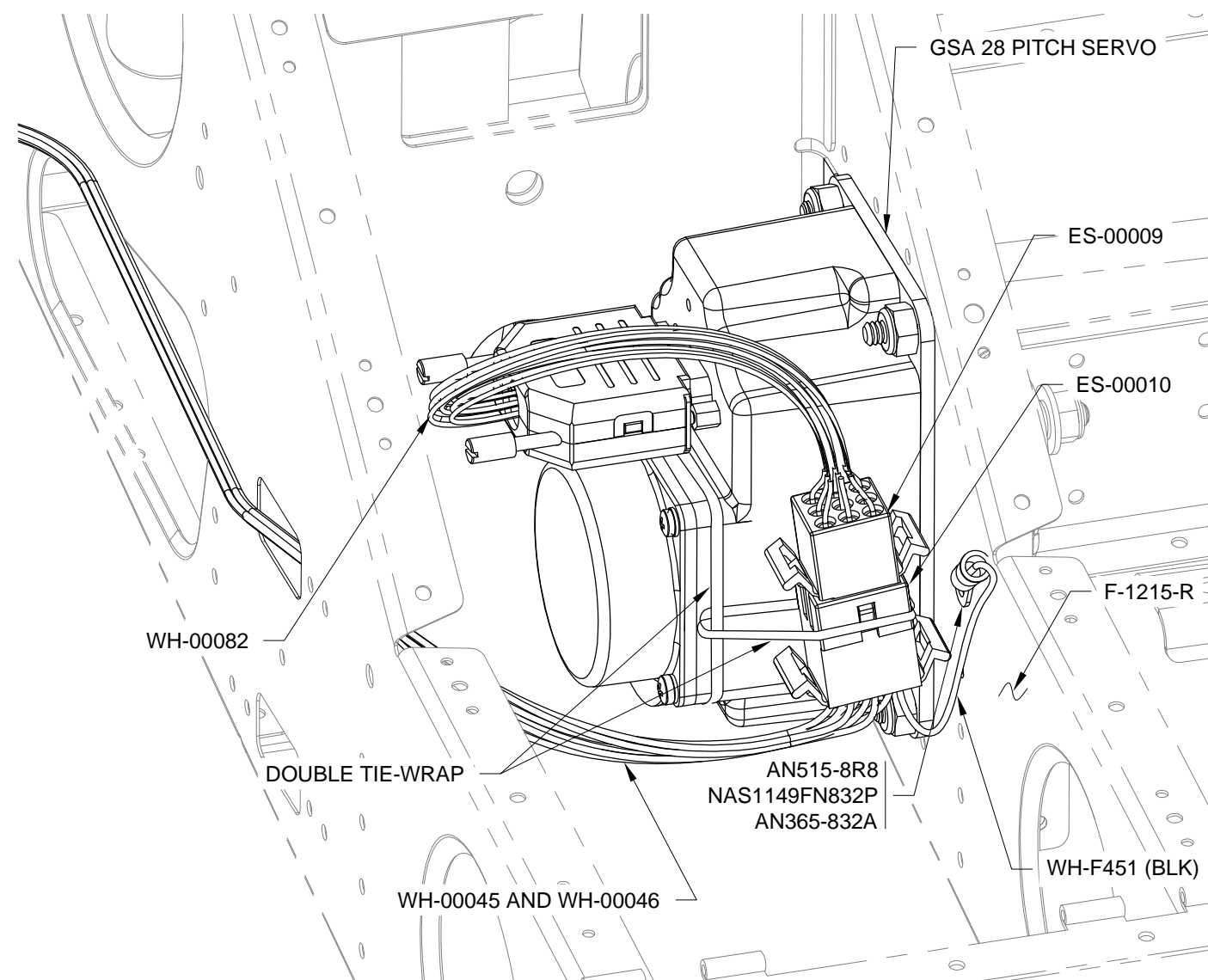
Connect the 9-pin male Molex connector to the 9 pin female Molex connector on the WH-00045 Options Harness.

**Step 3:** Secure the mated Molex connectors to the body of the pitch servo using two tie-wraps. See Figure 2.

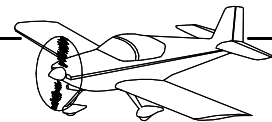
**Step 4:** Locate the WH-F451 (BLK) wire coming from the ES-00010 9-pin Molex connector. Attach the ring terminal to the F-1215-R seat rib. See Figure 2.



**FIGURE 1: INSTALLING THE SPADE CONNECTORS**



**FIGURE 2: PITCH SERVO WIRING**



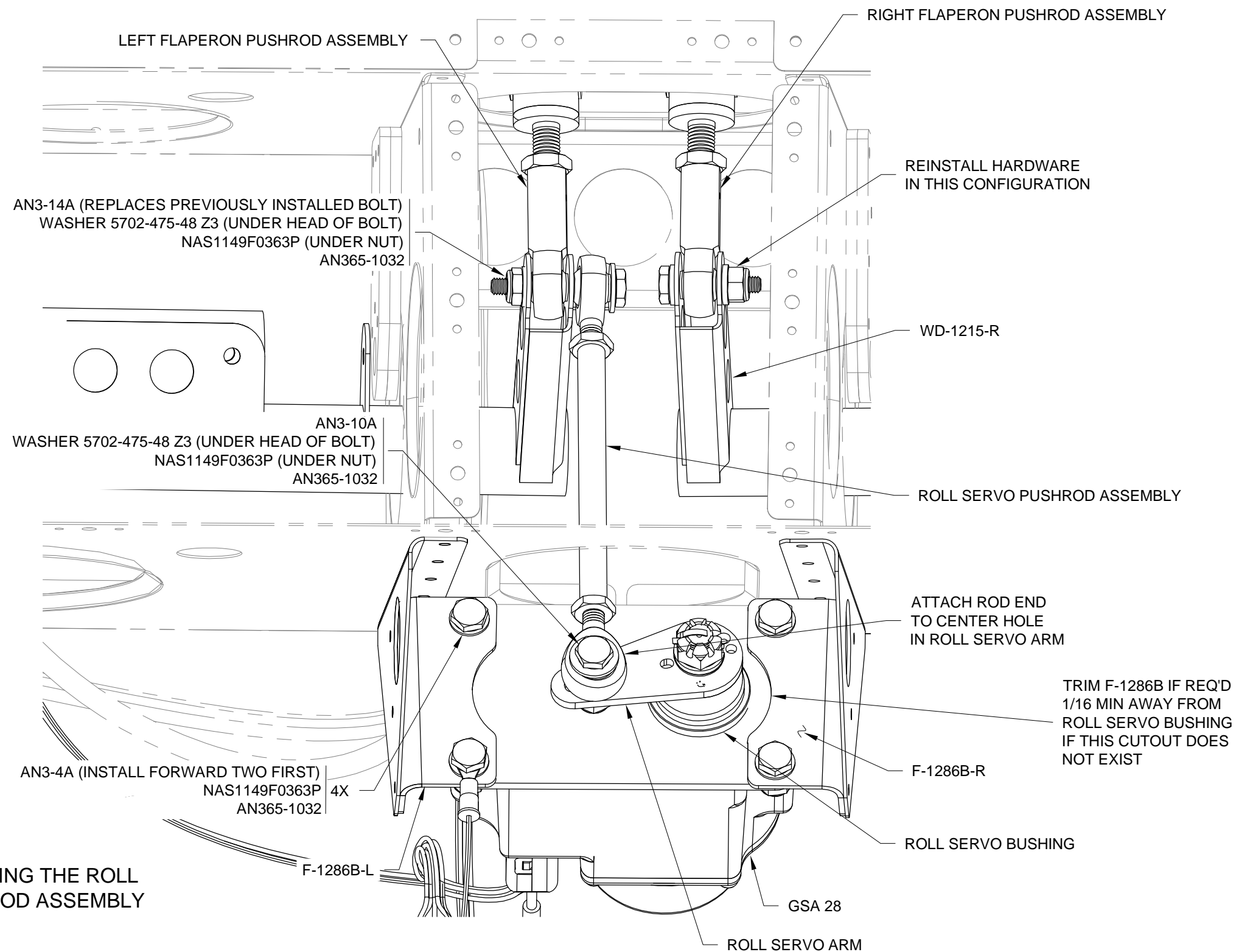
**Step 1:** Older F-1286B Roll Servo Angles may not have a cutout for the bushing protruding from the top of the Garmin GSA 28 Autopilot Servo. Trim the angles if/as req'd. See Figure 1.

**Step 2:** Attach the Garmin GSA 28 Autopilot Servo to the F-1286B Roll Servo Angles. See Figure 1. Install the forward two bolts and hardware first.

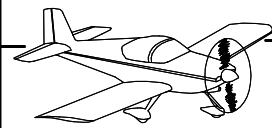
**Step 3:** Locate and install the Roll Servo Pushrod Assembly to the Roll Servo Arm. See Figure 1. Make certain the Pushrod Assembly is bolted to the center hole in the Roll Servo Arm.

**Step 4:** Remove and reinstall the bolt and nut connecting the Right Flaperon Pushrod Assembly to the WD-1215-R Flaperon Torque Arm. Reinstall per the orientation shown in Figure 1. Maintain previous washer positions.

**Step 5:** Attach the free end of the Roll Servo Pushrod Assembly to the WD-1215-L Flaperon Torque Arm and Left Flaperon Pushrod Assembly. See Figure 1.



**FIGURE 1: INSTALLING THE ROLL SERVO AND PUSHROD ASSEMBLY**



**NOTE: If your aircraft does not have a molex connector on the autopilot servo wires coming from the WH-00045 Options Harness, go to Page 44B-09, Step 1 for instructions on reconfiguring your harness to mate to the servo Molex connector.**

**Step 1:** Locate the WH-F450 (BLK) wire coming from the WH-00010 9-pin Molex connector attached to the WH-00045 Options Harness.

Secure the ring terminal under the head of the bolt shown in Figure 1.

**Step 2:** Locate the WH-00107 Roll Servo Harness.

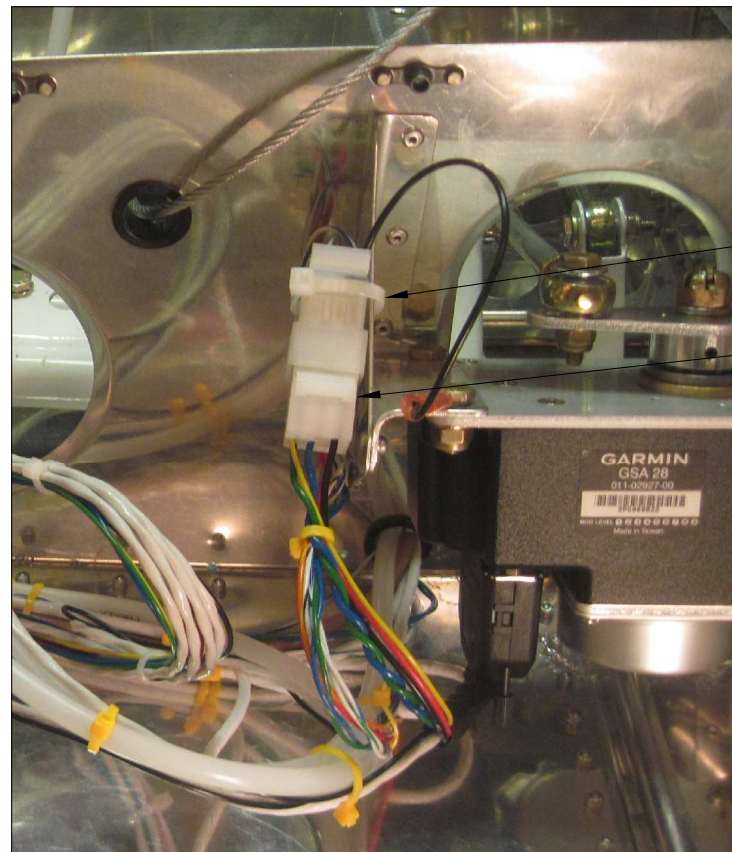
Install the 15-pin D-Sub connector labeled "R-SERVO" to the 15-pin D-sub receptacle on the Roll Servo.

Mate the ES-00009 9-pin Molex connector to the ES-00010 9-pin Molex connector on the WH-00045 Options Harness.

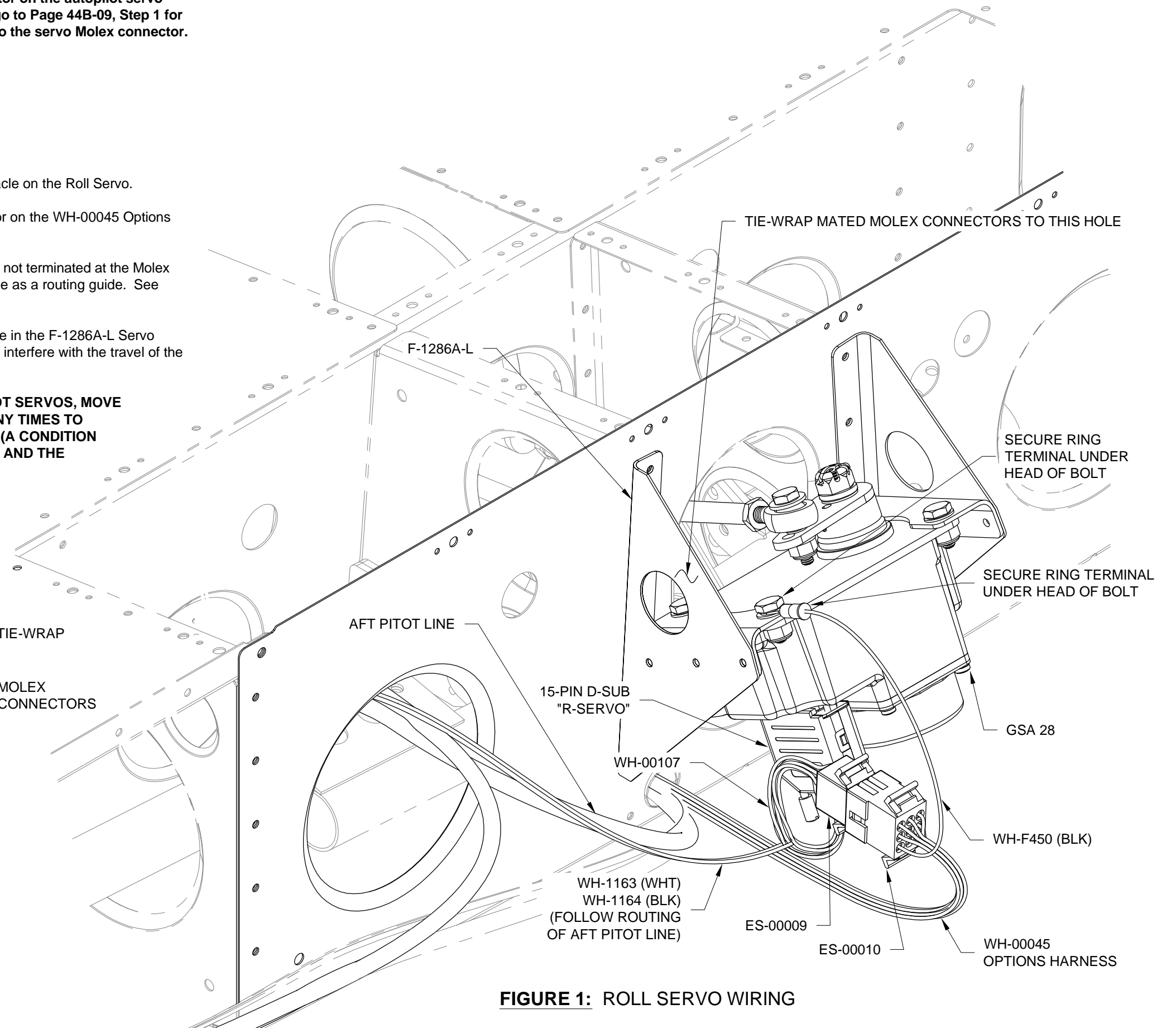
**Step 3:** Route the WH-F1163 (WHT) and WH-F1164 (BLK) wires (the long wires not terminated at the Molex connector) through the lightning hole in the F-1207B shown. Use the Aft Pitot Line as a routing guide. See Section 42N for instructions on installing these two wires.

**Step 4:** Use a tie-wrap to secure the mated Molex connectors to the lightning hole in the F-1286A-L Servo Bracket as shown in Figure 2. Make certain that the WH-F540 (BLK) wire will not interfere with the travel of the Roll Servo Arm.

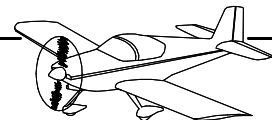
**WARNING: WHEN FINISHED INSTALLING THE GARMIN GSA 28 AUTOPILOT SERVOS, MOVE THE CONTROL STICK THROUGHOUT ITS ENTIRE RANGE OF TRAVEL MANY TIMES TO CHECK FOR AN OVER-CENTER CONDITION OF THE AUTOPILOT SERVOS (A CONDITION WHERE THE SERVO ARM AND PUSHROD BECOME CLOSE TO PARALLEL AND THE CONTROL SYSTEM LOCKS).**



**FIGURE 1: TIE-WRAPPING THE MOLEX CONNECTOR**



**FIGURE 1: ROLL SERVO WIRING**



**NOTE: The GMC 305 is an optional installation. If not installing the GMC 305 at this time proceed to page 44B-09 Step 1.**

**NOTE: If installing the GMC 305, the F-00044G-1 Cntr Inst Pnl GTR 200 GMC 305 is available with the opening already cut for order from Van's Aircraft upon request. If using this center panel, proceed to Step 7.**

**Step 1:** Attach the F-00085 GMC 305 Trim Template to the F-00044-1 GTR 200 Center Panel with two of the panel attach screws. Confirm that the bottom edge is parallel to the opening for the GTR200. See Figure 1.

**Step 2:** Match-Drill the center panel using the trim template as a drill guide. See Figure 1. Place a cleco in each hole after it is drilled.

**Step 3:** Use a scribe or a fine tipped marker to mark trim lines on the center panel using the trim template as a guide. See Figure 1.

**Step 4:** Remove the trim template from the center panel and replace the two panel attach screws.

**Step 5:** Use a straight edge to connect the trim lines marked on the center panel in Step 3. See Figure 2.

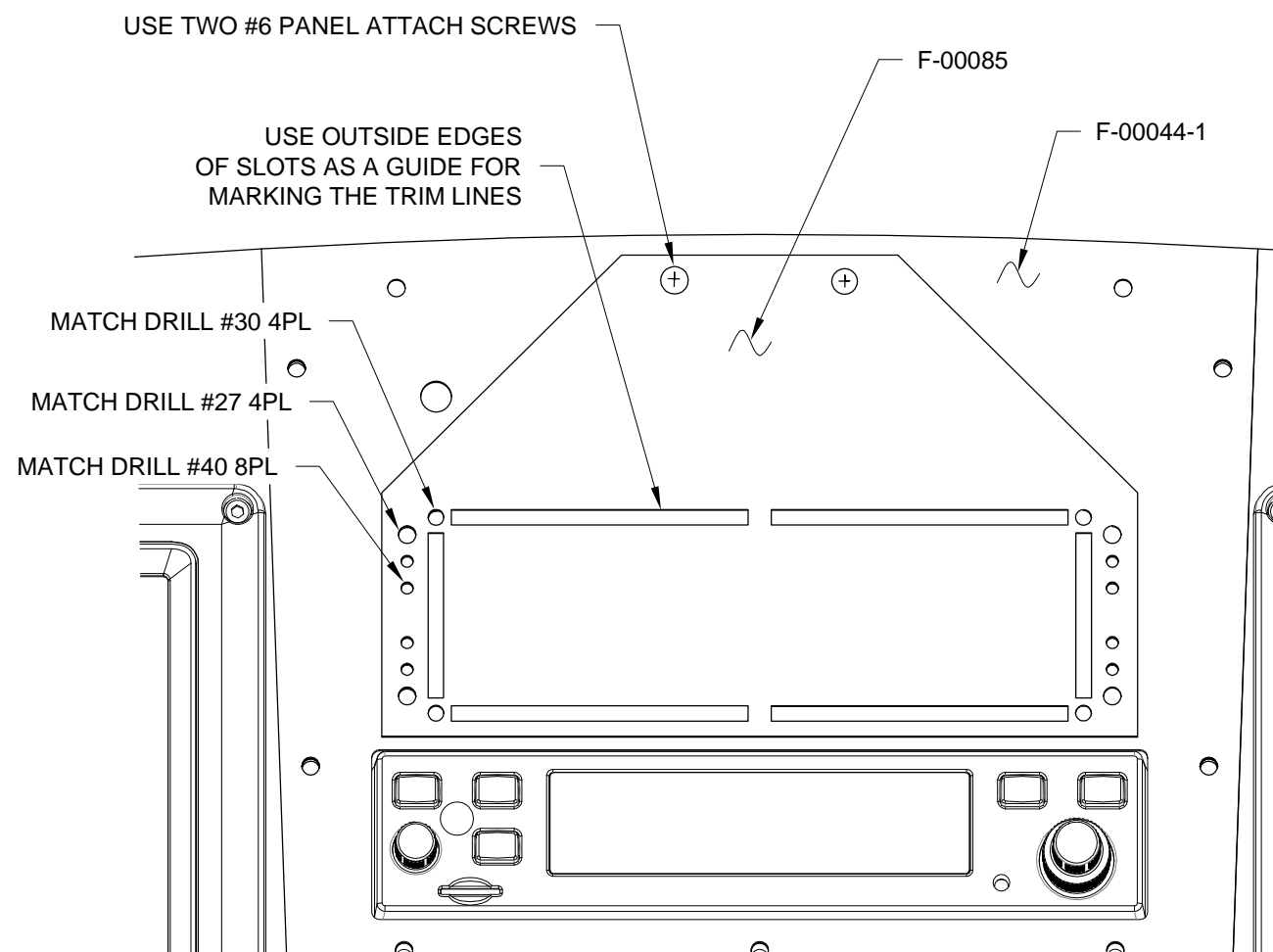
**Step 6:** Remove the material between the trim lines on the center panel. See Figure 2. Use a rotary cutting tool to remove the material just up to the lines. Use a file to remove any left over material and to deburr the cut edges.

**Step 7:** Test fit the GMC 305 to the new cut-out in the center panel.

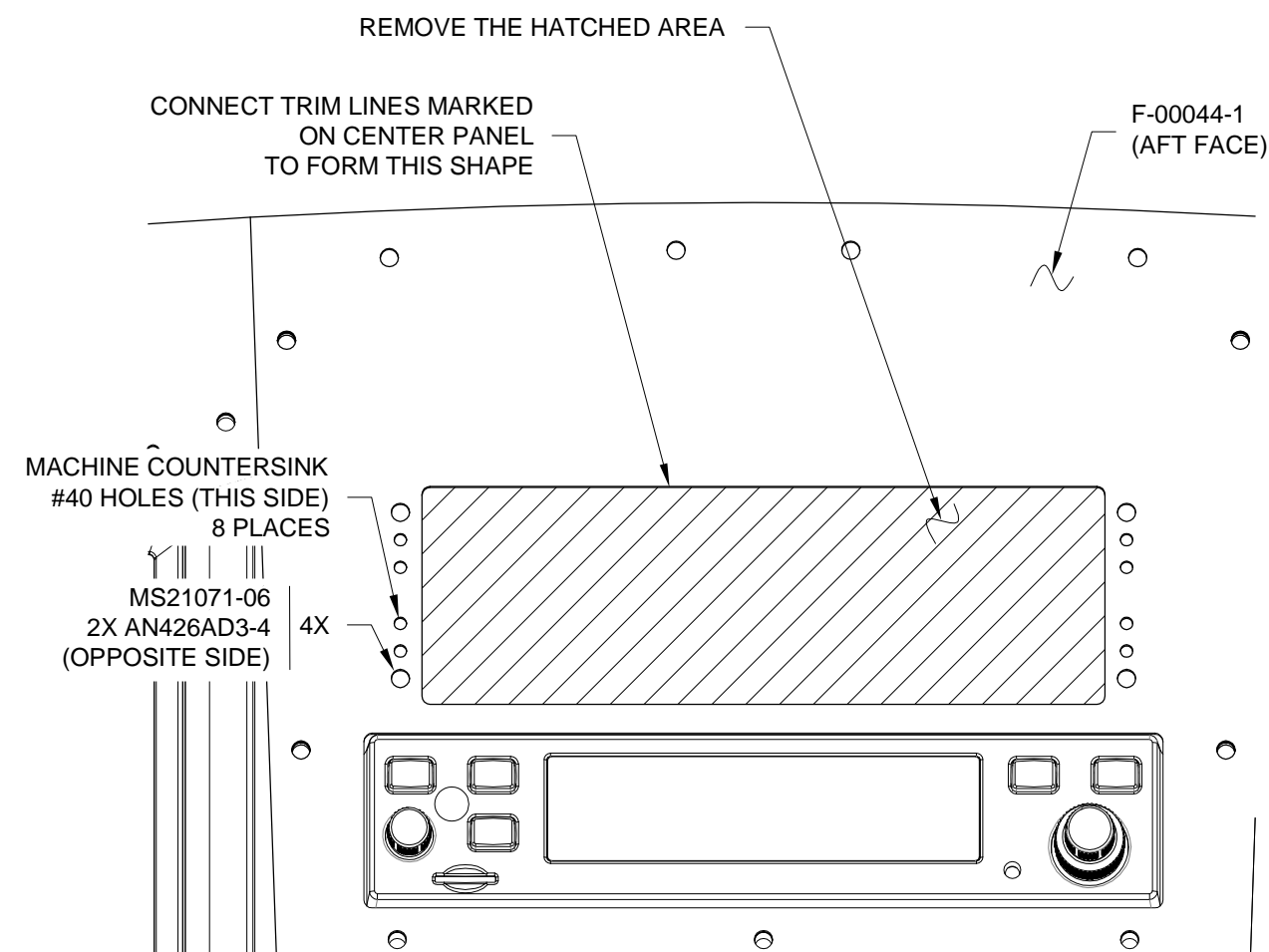
Use a file to remove material from the cut-out in the center panel if/as necessary.

**Step 8:** Machine countersink the eight #40 nutplate attach holes on the center panel to fit the head of an AN426AD3 rivet. See Figure 2.

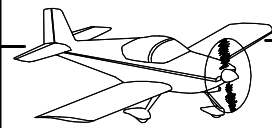
**Step 9:** Rivet four nutplates to the forward face of the center panel. See Figure 2.



**FIGURE 1: MARKING THE GTR 200 CENTER PANEL WITH THE GMC 305 TRIM TEMPLATE**

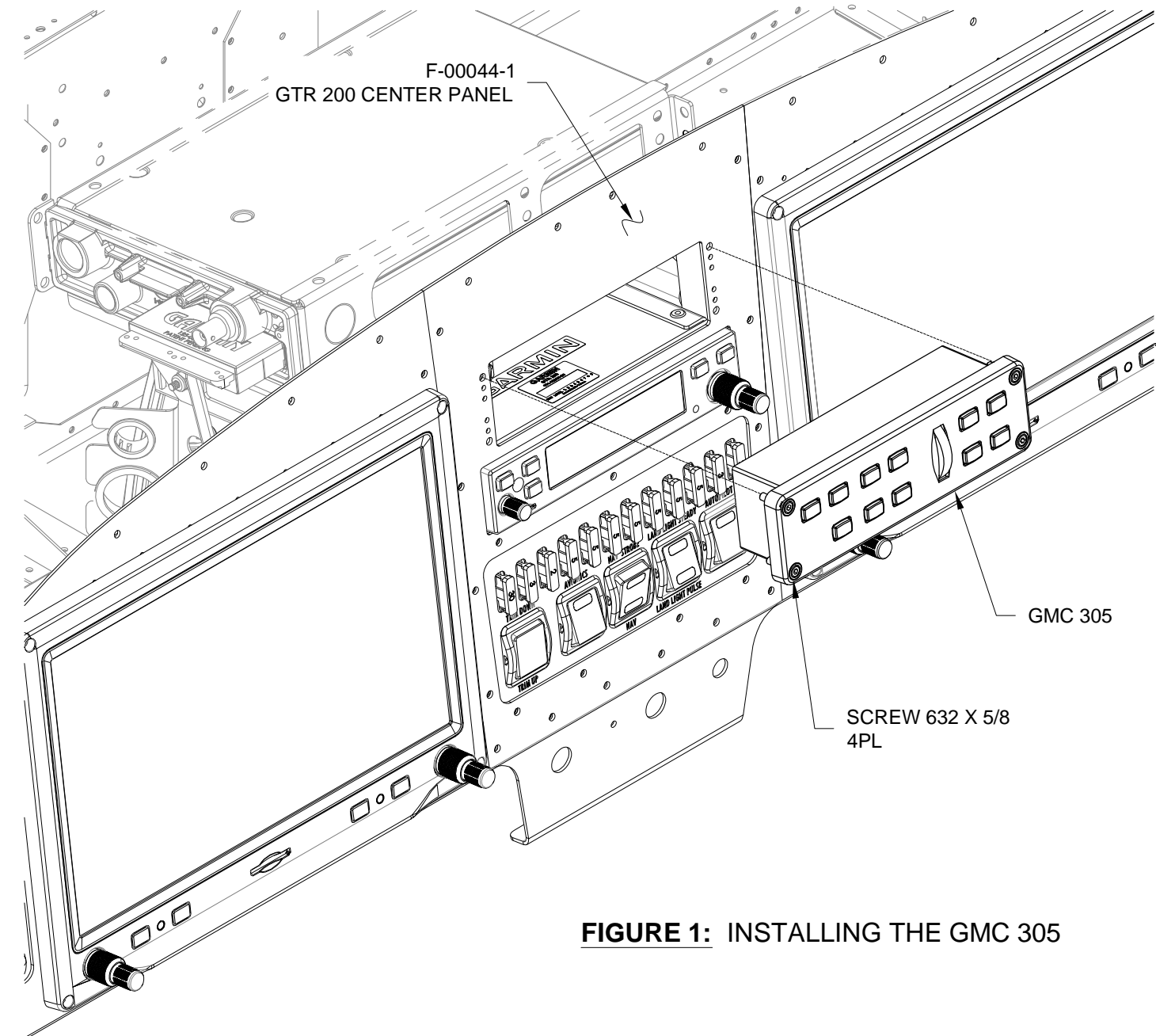


**FIGURE 2: MAKING THE CUT-OUT FOR THE GMC 305**



**Step 1:** Insert the GMC 305 into its cut-out in the F-00044-1 GTR 200 Center Panel. See Figure 1.

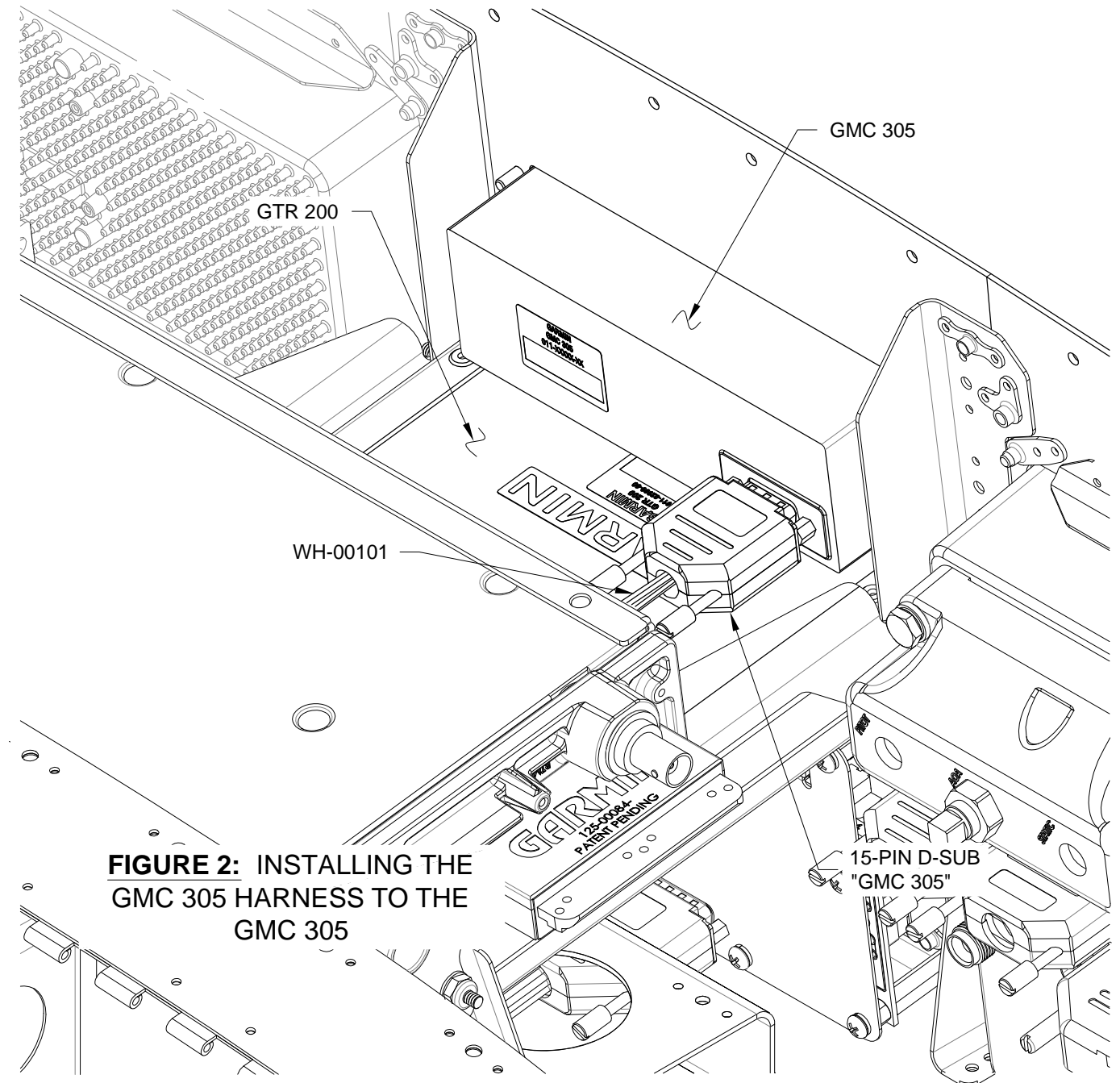
**Step 2:** Install the GMC 305 to the center panel using the attach hardware called out in Figure 1.



**FIGURE 1:** INSTALLING THE GMC 305

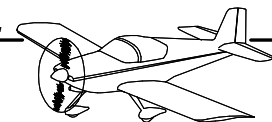
**Step 3:** Locate the previously installed WH-00101 G3X Harness and find the attached 15-pin high density D-Sub connector labeled "GMC 305". Mate it to the 15-pin female D-Sub receptacle on the forward side of the GMC 305. See Figure 2.

Note the routing of the GMC 305 harness over the GTR 200.



**FIGURE 2:** INSTALLING THE GMC 305 HARNESS TO THE GMC 305





**Step 1:** Re-install the F-1227 Seat Ramp Cover, F-00081 ADAHRS Baggage Floor, F-00083 Baggage Floor, and F-1207F Baggage Bulkhead Corrugation.

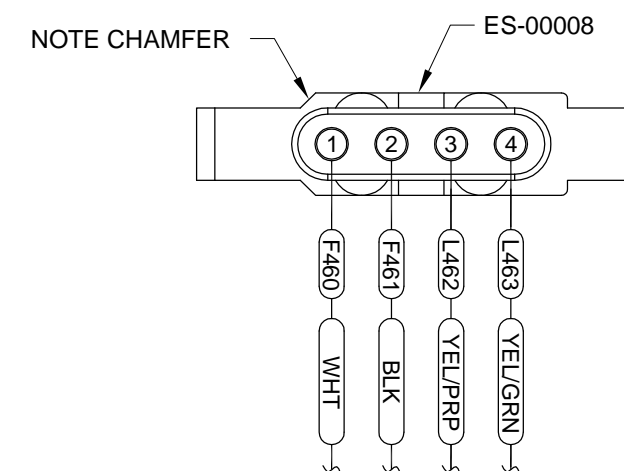
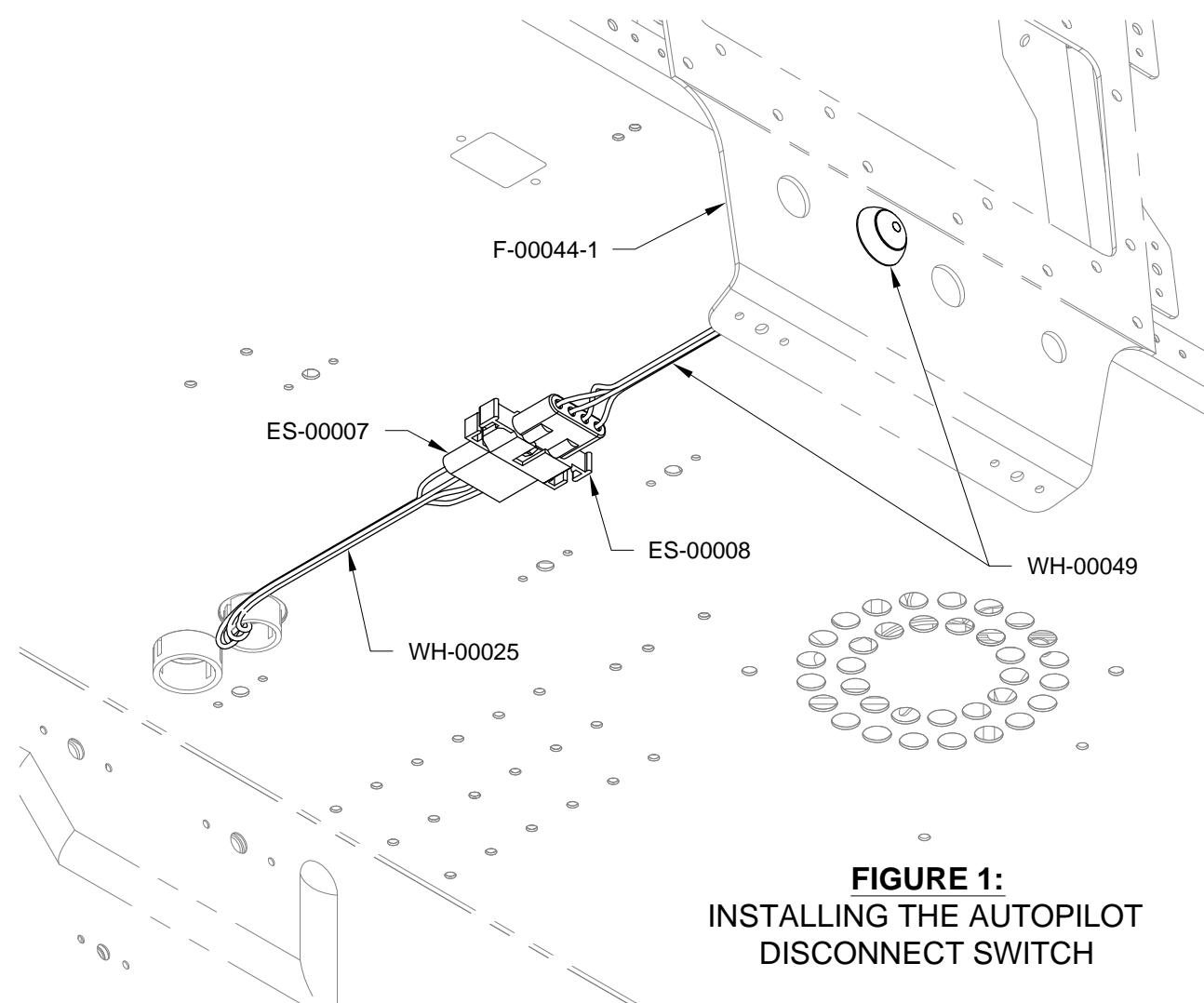
**Step 2:** Use a step-drill to enlarge the existing pilot hole in the F-00044-1 RV-12 GTR 200 Center Panel to 1/2 inch diameter. See Figure 1.

Deburr the hole.

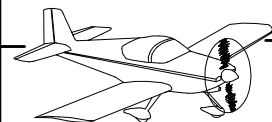
**Step 3:** Install the WH-00049 Autopilot Disconnect Switch into the F-00044 RV-12 GTR 200 Center Panel as shown in Figure 1.

Insert the pins on the end of the autopilot disconnect switch wiring harness into a ES-00008 Molex Plug as shown in Figure 2.

Insert the ES-00007 Molex Receptacle into the Molex plug as shown in Figure 1.



**FIGURE 2: AUTOPILOT DISCONNECT DIAGRAM**  
(VIEW FROM WIRE INSERTION SIDE)



**NOTE: If installing the GMC 305 with the Autopilot Servos, skip Step 5 through Step 10 and proceed to Step 11.**

Step 1: Navigate to the Van's Aircraft web site downloads page.

Download and read the READ ME.doc document pertaining to performing a firmware update to the Garmin G3X Touch. Follow the instructions in this document to successfully install the .gca files.

Download and install the latest "RV-12 G3XT Base Configuration Rev X.gca" file.

Download and install from the same location the latest "RV-12 G3XT Autopilot Option.gca" file.

Finish the installation per the instructions in the Garmin installation guide. See the Garmin web site.

Step 2: Download the latest RV-12 overall Electrical Schematic from the Van's Aircraft web site.

Step 3: On Page 4-2 SkyView and 4-4 of the RV-12 Pilot Operating Handbook:

Enter the text "AUTOPILOT SERVOS" onto a blank line under the "ITEM" column in both tables.

Enter 3.1 lb for "Weight" , 101.6 in for "Location/Arm" and 315 in-lb "Moment" onto the same line as "AUTOPILOT SERVOS" in both tables.

Recalculate and enter new values for the Empty Weight, Empty Moment and Empty Arm on Page 4-4 of the POH.

Step 4: Make an entry on page W&B-2 of the RV-12 Production Acceptance Procedures as follows:

As of this date: \_\_\_/\_\_\_/\_\_\_ the following values represent current Weight and Balance calculations resulting from the installation of the AUTOPILOT SERVOS.  
Revised Empty Weight: \_\_\_\_\_ lbs  
Revised Empty Moment: \_\_\_\_\_ in-lbs  
Revised Empty Arm: \_\_\_\_\_ in  
Signed: \_\_\_\_\_

Step 5 (ELSA): Make an appropriate entry in the airframe logbook. See example below:

Installed the AUTOPILOT SERVOS option in accordance with Van's Aircraft KAI Section 44A and confirmed proper operation.

Signature \_\_\_\_\_ Certificate # \_\_\_\_\_

Step 5 (SLSA): Complete the notification N 14-11-10 (available from the Van's Aircraft web site) corresponding to Garmin Autopilot installation.

**NOTE: Step 6 through Step 8 are applicable only if installing the GMC 305 with the Autopilot Servos.**

Step 6: On Page 4-2 SkyView and 4-4 of the RV-12 Pilot Operating Handbook:

Enter the text "AUTOPILOT SERVOS AND GMC 305" onto a blank line under the "ITEM" column in both tables.

Enter 3.6 lb for "Weight" , 95.3 in for "Location/Arm" and 343 in-lb "Moment" onto the same line as "AUTOPILOT SERVOS AND GMC 305" in both tables.

Recalculate and enter new values for the Empty Weight, Empty Moment and Empty Arm on Page 4-4 of the POH.

Step 7: Make an entry on page W&B-2 of the RV-12 Production Acceptance Procedures as follows:

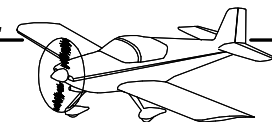
As of this date: \_\_\_/\_\_\_/\_\_\_ the following values represent current Weight and Balance calculations resulting from the installation of the AUTOPILOT SERVOS AND GMC 305.  
Revised Empty Weight: \_\_\_\_\_ lbs  
Revised Empty Moment: \_\_\_\_\_ in-lbs  
Revised Empty Arm: \_\_\_\_\_ in  
Signed: \_\_\_\_\_

Step 8 (ELSA): Make an appropriate entry in the airframe logbook. See example below:

Installed the AUTOPILOT SERVOS AND GMC 305 option in accordance with Van's Aircraft KAI Section 44A and confirmed proper operation.

Signature \_\_\_\_\_ Certificate # \_\_\_\_\_

Step 8 (SLSA): Complete the notification N 14-11-10 (available from the Van's Aircraft web site) corresponding to Garmin Autopilot installation.



**NOTE:** This page applies to kits with a date of purchase of the empennage, wing, fuselage or finish kit prior to September 2011.

**NOTE:** Step 1 through Step 3 applies to wire ends near the Roll Servo. Step 4 through Step 9 applies to wire ends near the Pitch Servo.

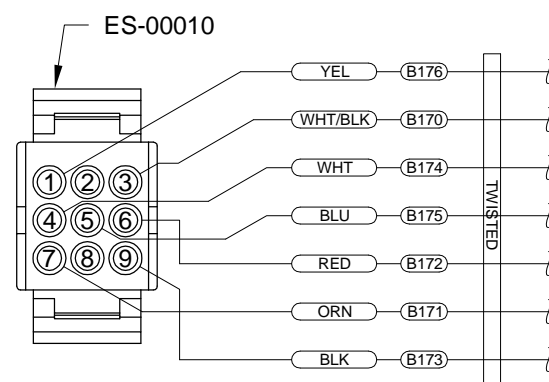
Step 1: Cut the spade connectors off the ends of the seven WH-B170 Autopilot Harness wires. (These spade connectors were installed per Page 31-09, Step 11.)

**NOTE:** See chapter 5W Open Barrel Crimp.

Step 2: Strip the ends of the seven WH-B170 Autopilot Harness wires and crimp an ES-00005 Molex Pin, .093" (18-22) onto the end of each wire.

Step 3: Insert the seven WH-B170 Autopilot Harness wires into an ES-00010 Molex Plug, 9 Position as shown in Figure 1. Numbers identifying the wire positions are molded into the back of the connector.

Continue the installation process by returning to Page 44B-06, Step 1.



**FIGURE 1:** WH-B170 CONNECTION TO ROLL SERVO  
(VIEW FROM WIRE INSERTION SIDE)

**NOTE:** DO NOT cut the male spade connector off the red WH-RV12-OPTIONAL harness and WH-B170 Autopilot Harness wires. Do not cut the female spade connectors off the ends of the BLU and YEL WH-RV12-OPTIONAL harness wires and WH-B170 Autopilot Harness wires.

Step 4: Cut the female spade connectors off the ends of the WHT and BLK WH-RV12-OPTIONAL harness wires and WH-B170 Autopilot Harness wires. (Each spade connector is crimped onto two wires. These spade connectors were installed per Page 31-09, Step 8.)

Cut the male spade connector off the ORN WH-RV12-OPTIONAL harness and WH-B170 Autopilot Harness wires.

Cut the male spade connector off the WHT/BLK WH-RV12-OPTIONAL harness and WH-B170 Autopilot Harness wires.

**NOTE:** See chapter 5W Open Barrel Crimp.

Step 5: Strip the ends of the twelve WH-RV12-OPTIONAL/WH-B170 Autopilot Harness wires. Twist together the stripped ends of each pair of like colored wire and crimp an ES-00003 Molex Pin, .093" (14-20) onto the end of each wire pair.

Step 6: Insert the six WH-RV12-OPTIONAL/WH-B170 Autopilot Harness wire pairs into an ES-00010 Molex Plug, 9 Position as shown in Figure 2. Numbers identifying the wire positions are molded into the back of the connector.

Step 7: Cut a piece of 22 gauge wire 3 1/2 inches long.

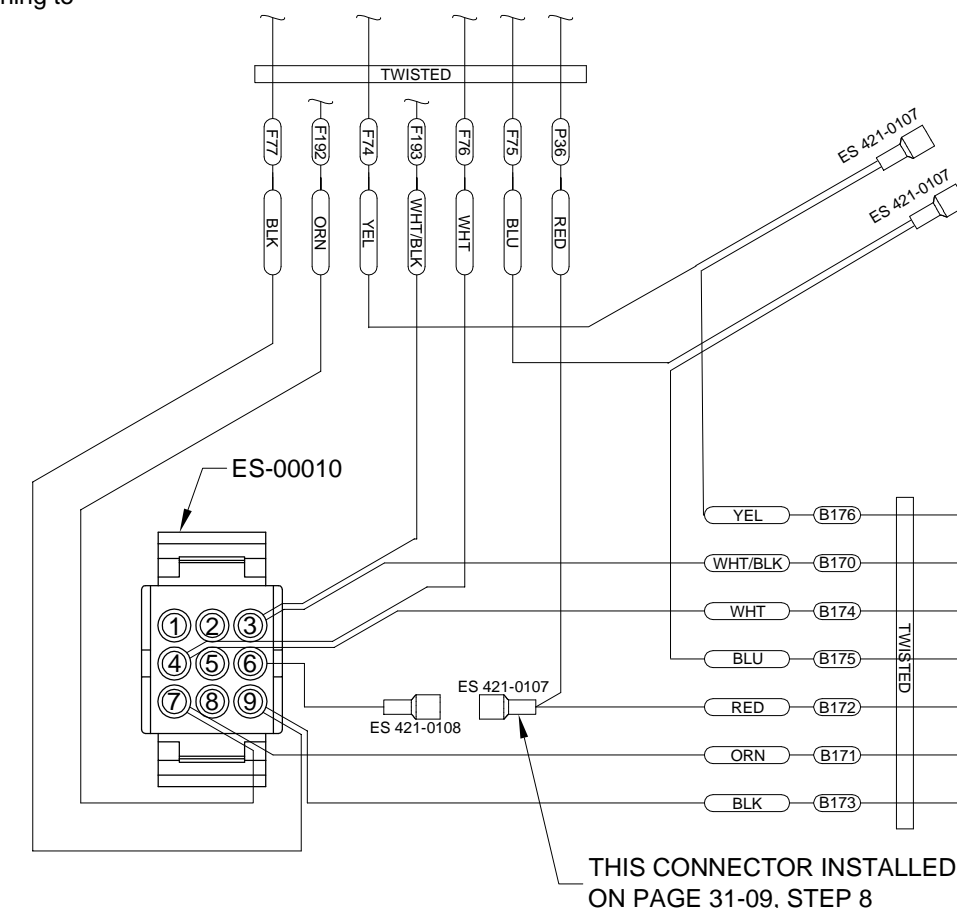
Strip one end and crimp on an ES-00005 Molex Pin, .093" (18-22).

Strip the other end and crimp on an ES 421-108 Female Spade Connector.

Insert the Molex pin end of the wire into position 6 of the ES-00010 Molex Plug, 9 Position as shown in Figure 2.

Step 8: Use a tie-wrap to secure the BLU and YEL wires (with spade connectors still attached) to the WH-RV12-OPTIONAL harness and WH-B170 Autopilot harness wires.

Continue the installation process by returning to Page 44B-04, Step 1.



**FIGURE 2:** WH-RV12-OPTIONAL & WH-B170 CONNECTION TO PITCH SERVO  
(VIEW FROM WIRE INSERTION SIDE)



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