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THIS BULLETIN IS FAA APPROVED FOR ENGINEERING DESIGN

SERVICE BULLETIN M20-285

Date: January 19, 2005

- SUBJECT:** STABILIZER TRIM TORQUE TUBE SCORING
- MODELS/ S/N** MOONEY M20K, S/N 25-0002 thru 25-2032
- AFFECTED:** MOONEY M20L, S/N 26-0001 thru 26-0041
MOONEY M20M, S/N 27-0002 thru 27-0328
MOONEY M20R, S/N 29-0001 thru 29-0332, 29-0334 and 29-0338
MOONEY M20S, S/N 30-0001 30-0065
- TIME OF COMPLIANCE:** **ONE TIME VISUAL INSPECTION** AT NEXT SCHEDULED ANNUAL INSPECTION, BUT WITHIN NEXT 100 FLIGHT HOURS; **ANNUAL/100 HOUR FOLLOW ON INSPECTIONS** PER S & M MANUAL.
- INTRODUCTION:** There has been a report that the attaching hardware (bolt, washers (4), nut and cotter pin), attaching the Down Spring Control Cable Assembly (710081-501) to the Bellcrank Assembly (710076-501) in the aft tailcone, may have been installed in reverse direction of engineering design.
The threaded end of the bolt should be inserted from aircraft left side to aircraft right side; threaded end pointing in the outboard direction away from the Stabilizer Trim Torque Tube (aircraft centerline).
An incorrect hardware installation orientation may cause scoring of the Stabilizer Trim Torque Tube as a result of the bolt thread contacting the Stabilizer Trim Torque Tube surface during Horizontal Stabilizer trimming movement. Scoring of the Stabilizer Trim Torque Tube could result if attaching hardware is installed incorrectly by maintenance personnel.
- INSTRUCTIONS:** Read entire procedure before beginning work.
1. Obtain access to Bellcrank Assembly through left or right side Inspection Cover under Horizontal Stabilizer.
 2. Locate Bellcrank and verify orientation of mounting hardware at Down Spring Control Cable Assembly attaching point (ref. Figure SB M20-285-1).
 3. If hardware is installed in the proper orientation, reinstall removed Inspection Cover.
 4. Complete logbook entry.
 5. Return aircraft to service.
- If hardware has been installed in opposite direction of intended engineering design then:**
6. Temporarily secure Control Cable Assembly to prevent it from falling into Tailcone cavity. Remove existing cotter pin, nut, washers and bolt and discard. Reattach Control Cable Assembly with new hardware (Kit M20-285-1) in correct orientation. Insert bolt with washer from inboard to outboard side of the aircraft. Install washer, castellated nut and cotter. Remove temporary material used to secure Control Cable during procedure. Apply Torque Seal to attaching hardware.
- NOTE: If Stabilizer Trim Torque Tube, 740192-007, has been damaged by incorrectly installed bolt, nut, washer, & cotter pin the following Steps must be followed:**
7. Obtain access to entire length of Stabilizer Trim Torque Tube, 740192-007 (or alternate tube) by removal of access panel on RH side of Tailcone (M20L, M20M, M20R, M20S) or LH side of Tailcone (M20K).
 8. Locate and inspect existing Stabilizer Trim Torque Tube for scoring damage created by interference with the Down Spring Bellcrank/Cable attach bolt's threaded end. If scoring has occurred, the Stabilizer Trim Torque Tube (ref. Figure SB M20-285-2) will require replacement.
 9. Prior to removing any Stabilizer Trim Torque Tube attaching hardware:
 - 9A. Adjust trim control to full nose down position to aid in preventing inadvertent rotational movement during procedure.

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(CON'T.)

- 9B. Placard cabin controls in clear view to indicate work being performed on flight control system and not to move or otherwise disturb flight controls.
- 9C. Mark original orientation of mating component assemblies (both ends of components that will not be removed) with tape or a temporary, non-destructive, mark.

NOTE: Make sure the entire length of the Stabilizer Trim Torque Tube is secured from any rotational movement prior to any attaching hardware/Universal Joints being disconnected during these R & R procedures.

10. Remove mounting hardware (Cotter Pins, Washers, Clevis Pins) from the forward end of the Stabilizer Trim Torque Tube, 915026-021 or 740192-007 so that the entire Universal Joint, MS20270B8 is left attached to the basic tube. If the tube, as an assembly, cannot be removed with the square Slip Joint, 740029-000, (aft end of assembly) still in place, it may be necessary to remove the hardware attaching this Slip Joint from the Universal Joint, 740009-007, prior to removal. Remove damaged Stabilizer Trim Torque Tube and components from mating assemblies.

NOTE: If this tube/components cannot be removed by sliding various components forward or aft, it may be necessary to cut the tube to remove. However, it may be difficult to install the new configuration tube when its build up is complete.

Exercise caution to avoid rotating the Stabilizer Trim Torque Tube mating component assemblies during Stabilizer Trim Torque Tube removal. Rotation of these components will cause Stabilizer Trim System to be out of rig.

11. Place removed Stabilizer Trim Torque Tube on workbench and disassemble Tube from both forward and aft Universal Joints and Bushings.

NOTE: Do not reverse the ends of the Universal Joints when installing into new tube or slip joint.

The Universal Joints will be reinstalled into their mating components and the existing holes will need to line up. The Universal Joints may only fit their old components in one orientation position. At reinstallation of tube assembly, rotate forward U-Joint 180 degrees within the mating tube if holes do not align at first attempt. Do not rotate mating tubes. When reinstalling into the aft Slip Joint, the same situation may exist. Rotate Slip Joint 180 degrees if it will not fit at first attempt. Do not rotate Slip Joint while attached to Jack Screw. Remove slip joint to bench for attachment to the Tube assembly.

Tube P/N 915026-021 will have bushings at both ends. Discard the damaged Tube, P/N 740192-007 or 915026-021, and the Bushing, 915026-019, from aft end of 915026-021 Tube

12. Position new forward Bushing, 915026-017, existing forward Universal Joint, MS20270B8, onto non-swaged end, of new Tube, P/N 740192-007,

NOTE: At this point in assembly of the forward end of the new replacement tube assembly and its components, the configuration of the tube components will vary from model to model and year to year depending upon the Autopilot System installed and/or the absence of an Auto Pilot. Different methods and components will be used to locate the old, already drilled, Universal Joints into the new tube 740192-007.

13. Use appropriate method(s) to locate the lateral, center line of the new tube, so both ends will be oriented the same as build up is accomplished.
14. Insert Bushing, 915026-017, into non-swaged end of new Tube, 740192-007. Locate and drill a 0.125 - 0.131 inch diameter hole, 0.438 inches back from the end of the non-swaged end of new tube, 740192-007 and on the center line mark located in Step 13 above. Drill through only one wall of tube and bushing (Refer to Hole "A" Figure SB M20-285-3).

This will be the **starting hole** for the alignment and orientation of the reassembly of the components to complete the new Stabilizer Trim Torque Tube.

- 15A. If the tube assembly **does not have an Auto Pilot/Electric Trim system installed**, insert the correct end [see NOTE: in Step 11] of the old, forward, Universal Joint, MS20270B8, into Bushing, 915026-017, to align Universal Joint with the starting hole (A) drilled in Step 14. Use the old Universal Joint as a drill fixture and drill a 0.125 – 0.131 inch hole through the bottom wall of the bushing

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(CON'T.)

and tube. Assemble the tube, bushing and Universal Joint by installing Clevis Pin, AN392-25, Washer, AN960-4L, Cotter Pin, AN380-2-2, to secure tube, bushing and Universal Joint assembly using the one drilled hole.

- 15B. If this tube assembly **has an Auto Pilot/Electric Trim System sprocket installed**, the Auto Pilot supplied sprocket should be positioned onto Tube, 740192-007, to align with the starting hole drilled in Step 14. Use the Auto Pilot Sprocket as a drill fixture and drill a 0.125 – 0.131 inch hole through the bottom wall of the bushing and tube. Assemble this sprocket to new tube, bushing and Universal Joint with type of hardware as originally used on the damaged tube assembly using the one drilled hole.

Since this area of the Stabilizer Trim Torque Tube may vary with each aircraft being inspected, the mechanic/technician must use their best judgment to rebuild the replacement tube assembly to provide a positive attachment with the existing mating component tube.

- 16A. On the tube assembly forward end **without an Auto Pilot/Electric Trim system** the 2nd hole 90 degrees from the 1st hole (Refer to Hole "B" Figure SB M20-285-3) will be more difficult to locate so the holes already drilled in the Universal Joint will match with the new hole to be drilled in the tube and bushing. The 2nd hole (B) will be a 0.125 – 0.131 inch diameter hole, 0.188 inches back from the end of the non-swaged end of new tube, 740192-007, and 90 degrees from 1st hole (A).

However, since the holes drilled into the original tube/bushing/Universal Joint may not have been 100% jig drilled, the following procedures are suggested:

- a. Remove the clevis pin, washer and cotter pin holding this forward end assembly together.
 - b. Carefully mark Universal Joint/tube junction and pull Universal Joint out from tube end; visually and dimensionally obtain the proper location of the 2nd hole (B) (use a machinist square & measurements to obtain location), 90 degrees from 1st hole (A) at the correct dimension from end of tube, as detailed in paragraph 16A above.
 - c. Drill a 0.0625 (1/16th) or smaller pilot hole at this location through one wall of the tube and bushing.
 - d. Slide Universal Joint back into bushing and secure with clevis pin, washer and cotter pin in the 1st hole (A).
 - e. Verify that pilot hole is over the 2nd hole (B) in the Universal Joint to allow mechanic/technician to carefully ream the pilot hole to align completely with the 2nd hole in the Universal Joint.
 - f. Complete the drilling of the other wall of both the bushing and the tube using the Universal Joint as drill guide.
 - g. Install another clevis pin, washer, and cotter pin into the 2nd hole (B) to fully secure components.
- 16B. On the tube assembly forward end **with an Auto Pilot/Electric Trim system** the 2nd hole (B) should be easier to locate and drill. The Auto Pilot sprocket can be used as the drill guide from the outside of the tube and bushing to be drilled. Since the one hole is already drilled and pinned, the sprocket can be used as the drill fixture for the 2nd hole (B). Make sure the sprocket is secure and square on the tube for proper electric trim movement. Drill 0.125 – 0.131 inch hole through the other hole in sprocket and through the walls of the tube and bushing.

After the forward end of the tube assembly is completed and pinned securely, the aft end of the tube can be built up.

17. This end of tube, 740192-007, is swaged and the aft Universal Joint, 740009-000, is to be inserted into this swaged end of the tube. Locate and drill a 0.125 – 0.131 inch hole, 0.438 inches back from end of swaged end of tube on the lateral center line of tube as marked in Step 13 above (Refer to Hole "C" Figure SB M20-285-3).
18. Insert the correct end (see NOTE: in Step 11) of aft Universal Joint, 740009-000, into the swaged end and line the drilled hole nearest the end of the Universal Joint with the newly drilled hole in the swaged end of the tube. Verify alignment. Use Universal Joint as drill guide and carefully drill (0.125 – 0.131 inch hole) through the other side of swaged tube wall.
19. Insert existing Clevis Pin, AN392-25, through tube and Universal Joint to secure tube and aft Universal Joint.

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(CON'T.)

20. Locate position for 2nd hole (D) in tube. This 2nd hole (90 degrees from the 1st hole (C)) will be more difficult to locate so the holes already drilled in the Universal Joint will match with the new hole to be drilled in the tube. The 2nd hole (D) will be a 0.125 – 0.131 inch diameter hole, 0.188 inches back from the end of the swaged end of new tube, 740192-007, and 90 degrees from 1st hole (C).
21. Repeat the “suggested pilot hole and reaming” procedures of Step 16A above to locate and drill this 2nd hole (D) except apply them to this aft hole position.
22. Insert square Slip Joint, 740029-000, over the exposed end of the aft Universal Joint, 740009-007. Verify all four holes align properly. If they do not rotate the Slip Joint 180 degrees to verify all four holes are aligned in this position. The slip joint was originally installed at this location so the holes must fit in one of the two positions. Do not rotate Slip Joint while attached to Jack Screw. Remove slip joint to bench for attachment to the Tube assembly.
23. Verify all clevis pins, washers, and cotter pins are installed in each hole position in the new built up Stabilizer Trim Torque Tube assembly at both forward and aft end of the tube assembly. Verify sprocket (if installed) rotates on same plane as the tube assembly is rotated through a complete 360 degree rotation. This should have already been checked in Step 16B above.
24. The new Stabilizer Trim Torque Tube assembly, 740192-007 is now ready for installation with its mating components in the tailcone area of the aircraft.

NOTE: If the mechanic/technician had difficulty in the removal of the original damaged tube assembly, the new tube assembly may have similar difficulty in being installed.

25. To obtain sufficient clearance to slide the forward Universal Joint of the new tube assembly back into its mating tube just forward of Fuse. Sta. 142 bulkhead, the Universal Joint, connected to the Stabilizer Trim Control Wheel Assembly between the Pilot & Co-Pilot seats may have to be disconnected to provide sufficient sliding movement to insert and attach this connection (Refer to Figure SB M20-285-4).

NOTE: Make sure the entire length of the Stabilizer Trim Torque Tube is secured from any rotational movement prior to any attaching hardware/Universal Joints being disconnected during these R & R procedures.

26. Install new Stabilizer Trim Torque Tube being careful not to rotate mating components from original orientation.
27. Re-install connecting hardware. Remove temporary orientation tape or markings from mating component assemblies.
28. Verify proper rigging of the Stabilizer Trim System per Maintenance Manual, SECTION 27-40-00.
29. Recheck all control tube clearances and travel limits.
30. Complete logbook entry.
31. Return aircraft to service.

WARRANTY:

Mooney Airplane Company, Inc. will warrant replacement parts (ref. Kits below) and labor for inspection (up to 1.0 hours) and replacement (if required, up to 8.0 hours) to comply with this Service Bulletin for aircraft currently covered under the Mooney Airplane Company, Inc. factory warranty program.

REFERENCE

MAC Service & Maintenance Manuals (applicable. A/C) as revised to include Annual/100 Hour inspections of this Elevator Down Spring System. (SECTION 27)

DATA:

PARTS LIST:

Mooney Airplane Company, Inc., Parts Kit: M20-285-1

<u>Item</u>	<u>P/N</u>	<u>Description</u>	<u>Qty</u>
1.	AN3-6	Bolt, Cable attach	1
2.	AN960-10L	Washer, Cable attach	2
3.	AN960-10	Washer, Cable attach	2
4.	AN320-3	Nut, Castellated, Cable attach	1
5.	MS24665-132	Pin, Cotter, Cable attach	1

Mooney Airplane Company, Inc., Parts Kit: M20-285-2

<u>Item</u>	<u>P/N</u>	<u>Description</u>	<u>Qty</u>
1.	740192-007	Tube, Trim Torque	1
2.	915026-017	Bushing	1
3.	MS24665-132	Pin, Cotter, [new for each clevis pin]	10

FIGURE/TABLES: SEE FIGURES ON FOLLOWING PAGES

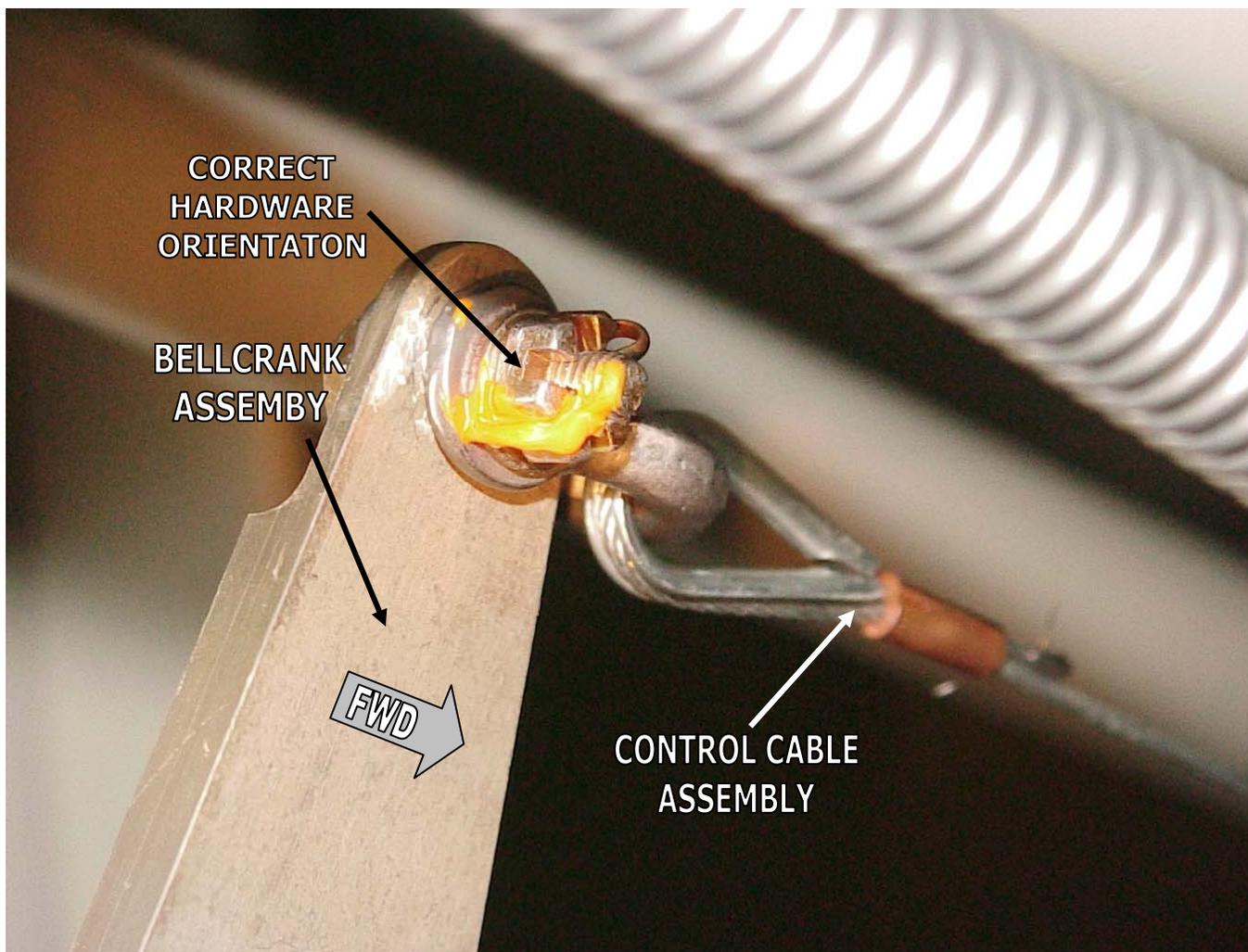


Figure SB M20-285-1

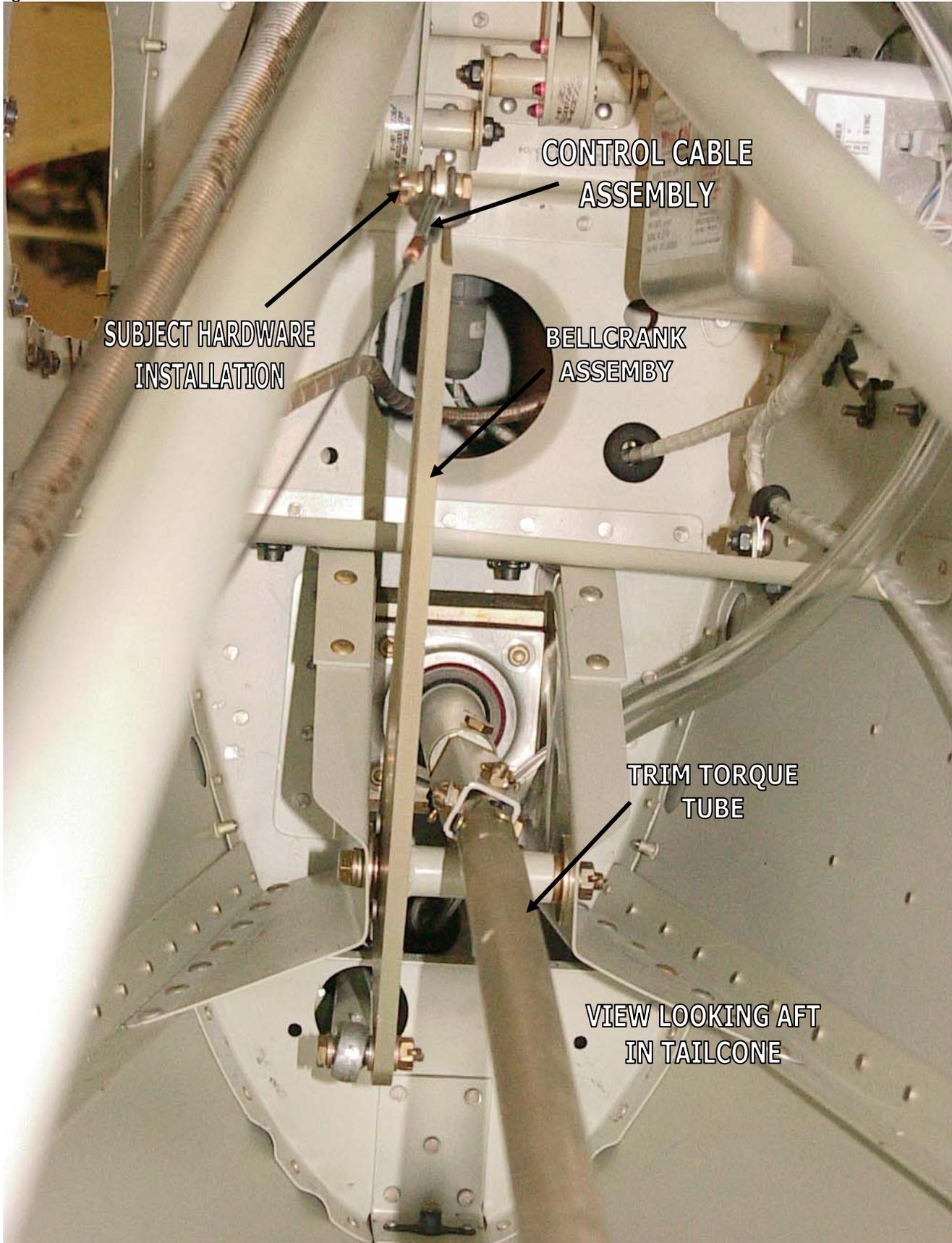


Figure SB M20-285-2

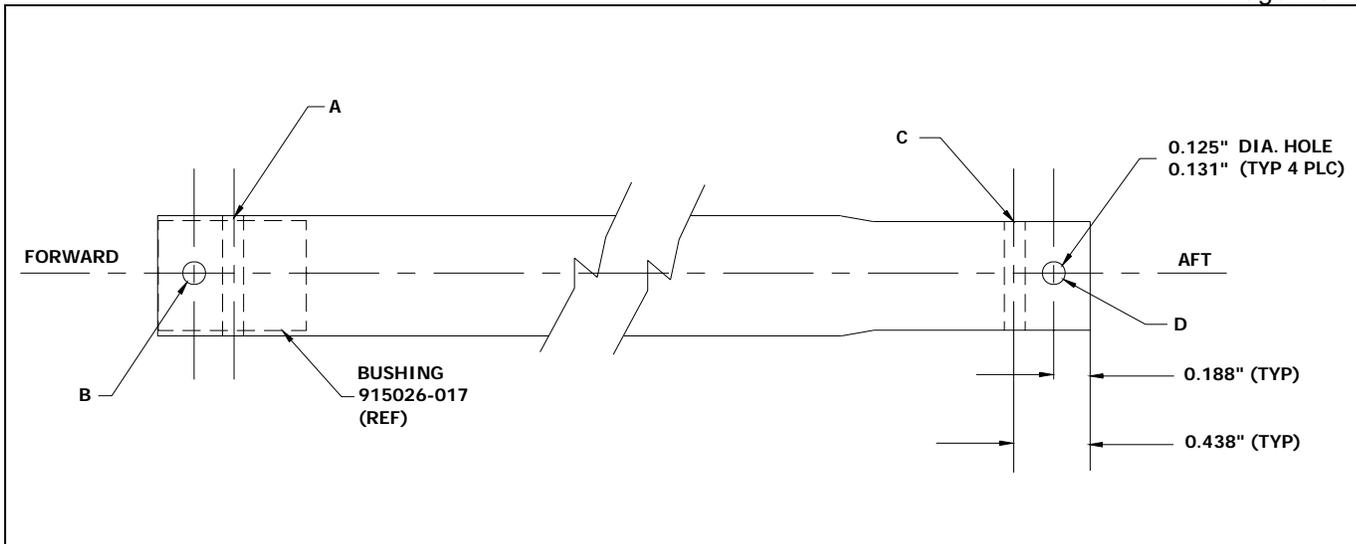


Figure SB M20-285-3

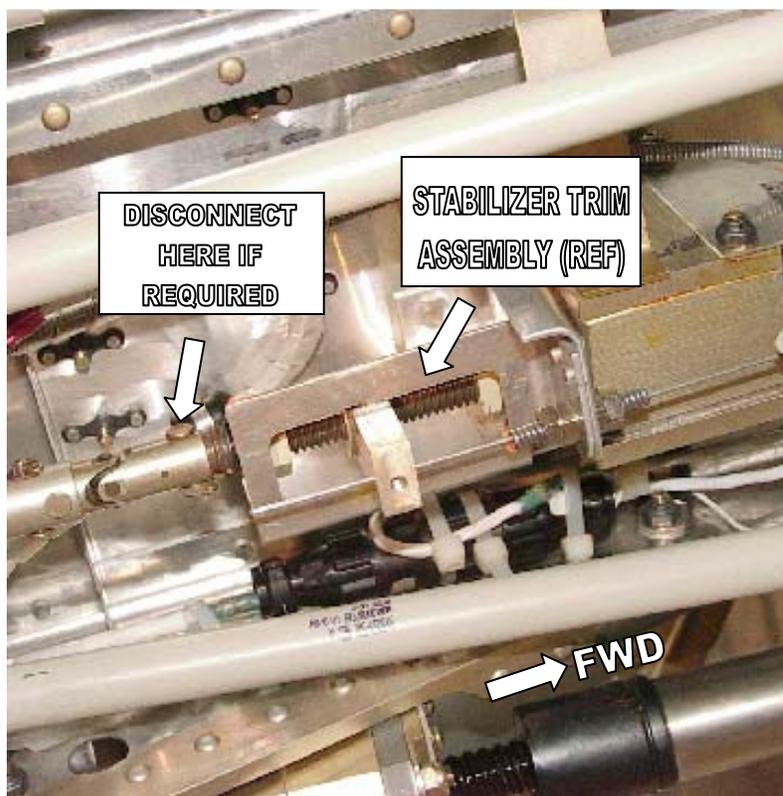


Figure SB M20-285-4