

MODIFICATION INSTRUCTIONS



Middle Fork Mods. LLC

TAIL TIE-DOWN REPLACEMENT

APPROVED MODEL LIST STC

Document No: 16-020-AE3302
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LOG OF REVISIONS

Revision	Date	Description of Change	Prepared	Approved
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1. INTRODUCTION

Middle Fork Mods. LLC prepared these modification instructions in support of the installation of a tail tie-down replacement on aircraft listed in Table 1-3.

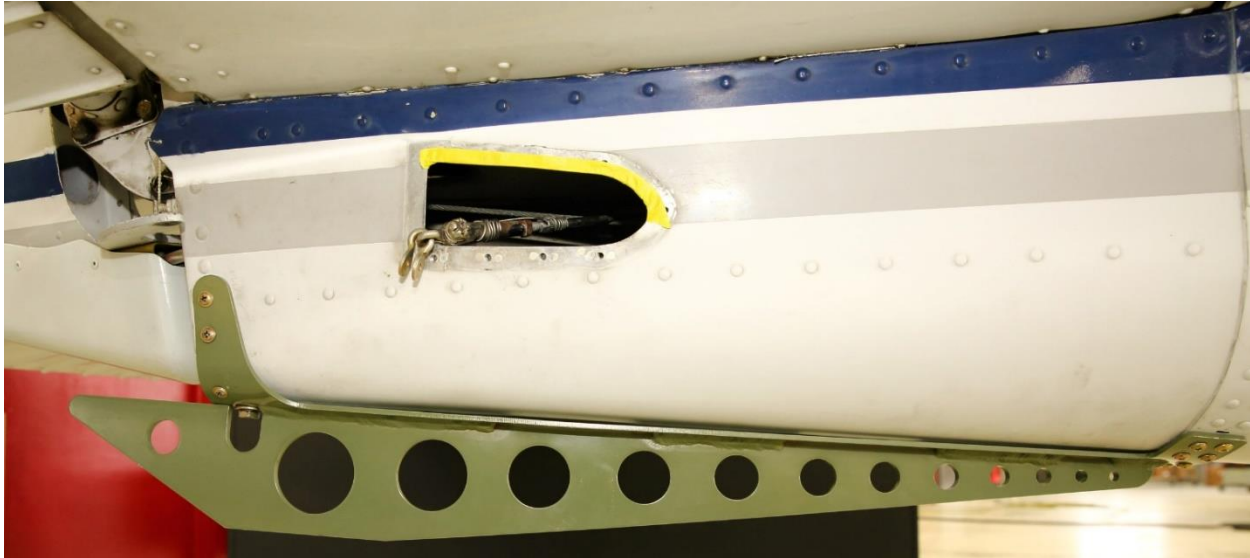


Figure 1-1, Replacement Tail Tie-down Installation

This tail tie-down installation removes the factory tail tie-down ring and replaces it with a tie-down structure that eliminates the single point attachment. The replacement tail tie-down utilizes multiple attachment points at the two most rearward fuselage bulkheads.

1.1 References

- 1.1.1 Middle Fork Mods. Document 16-020-MT2901, Instructions for Continued Airworthiness
- 1.1.2 FAA Advisory Circular, 43.13-1B, Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair
- 1.1.3 Cessna Illustrated Parts Catalog P257-12, Model 172 & 175, 1962 and Prior
- 1.1.4 Cessna Illustrated Parts Catalog P529-12, Model 172, P172, F172, FP172, 1963-1974
- 1.1.5 Cessna Illustrated Parts Catalog P534-12, Model FR172, 1968-1976
- 1.1.6 Cessna Illustrated Parts Catalog P696-12, Model 172, 1975-1986
- 1.1.7 Cessna Illustrated Parts Catalog P693-12, Model 172RG, 1980-1985
- 1.1.8 Cessna Illustrated Parts Catalog P968-12, Model R172, 1977-1973
- 1.1.9 Cessna Maintenance Manual 172RMM17, Model 172 Series, 1996 & On
- 1.1.10 Cessna Service Manual D138-13, Cessna 100 Series, 1962 and prior
- 1.1.11 Cessna Service Manual D637-1-13, Cessna 100 Series, 1963 Thru 1968
- 1.1.12 Cessna Service Manual D972-4-13, Model 172 Skyhawk Series, 1969 Thru 1976
- 1.1.13 Cessna Service Manual D2065-3-13, Model 172 Series, 1977 Thru 1986
- 1.1.14 Textron Aviation Illustrated Parts Catalog 172RPC26, Model 172, 1996 and On

1.2 Definitions

AC	Advisory Circular	FAA	Federal Aviation Administration
AML	Approved Model List	ICA	Instructions for Continued
AN	Army-Navy	Airworthiness	
A/R	As Required	STC	Supplemental Type Certificate
CFR	Code of Federal Regulations	TCDS	Type Certificate Data Sheet
CG	Center of Gravity		

1.3 Tools Required

- Basic hand tools

1.4 Materials Required

Table 1-1, Required Modification Materials

Item	Quantity	Part No.	Description	Supplier
1	1	16-020-534530	Tail Tie-Down Assembly	Middle Fork Mods LLC.
2	10	AN525-832R10	Screw	--
3	4	AN525-832R12	Screw	--
4	2	AN525-832R14	Screw	--
5	A/R	AN960-8	Washer	--
6	16	AN365-832A	Nut	--
7	1	AN5-7A	Bolt	--
8	1	MS27183-11	Steel Washer	--
9	2	AN426AD4-8	Rivet	--
10	2	AN426AD4-6	Rivet	--
11	9	MS21069L06	Nutplate	--
12	18	AN426AD3-3	Rivet	--
13	9	AN526632R8	Screw	--

1.5 Optional Materials

Table 1-2, Optional Modification Materials

Item	Quantity	Part No.	Description	Supplier	Notes
1	1	16-020-534545	Plate, Tie-Down Reinforce Assy Optional	Middle Fork Mods LLC.	
2	A/R	748	RTV Sealant	Dow Corning	Or Equivalent
3	A/R	P/S 890 Class B	Pro-Seal	PPG	

1.6 Aircraft Component Compatibility

Table 1-3, Textron Aircraft Model Applicability

Model	TCDS	Approved
172	3A12_84	November 4, 1955
172A	3A12_84	July 16, 1959
172B	3A12_84	June 14, 1960
172C	3A12_84	July 18, 1961
172D	3A12_84	June 19, 1962
172E	3A12_84	June 27, 1963
172F (USAF T-41A)	3A12_84	April 21, 1964
172G	3A12_84	June 15, 1965
172H (USAF T-41A)	3A12_84	June 7, 1966
172I	3A12_84	December 15, 1967
172K	3A12_84	May 9, 1968
172L	3A12_84	May 13, 1970
172M	3A12_84	May 12, 1972
172N	3A12_84	May 17, 1976
172P	3A12_84	May 13, 1980
172Q	3A12_84	October 15, 1982
172R	3A12_84	June 21, 1996
172S	3A12_84	May 1, 1998
175	3A17_47	January 14, 1958
175A	3A17_47	August 28, 1959
175B	3A17_47	June 14, 1960
175C	3A17_47	September 18, 1961
P172D	3A17_47	June 25, 1962
R172E (USAF T-41B) (USAF T-41C or D)	3A17_47	April 21, 1964
R172F (USAF T-41D)	3A17_47	May 14, 1968
R172G (USAF T-41C or D)	3A17_47	July 18, 1969
R172H (USAF T-41D)	3A17_47	July 2, 1970
R172J	3A17_47	September 19, 1972
R172K	3A17_47	May 28, 1976
172RG	3A17_47	June 1, 1979
F172D	A4EU	June 4, 1993
F172E	A4EU	June 4, 1993
F172F	A4EU	November 9, 1965
F172G	A4EU	December 21, 1965
F172H	A4EU	October 20, 1996
F172K	A4EU	January 25, 1971
F172L	A4EU	February 10, 1972
F172M	A4EU	December 1, 1972
F172N	A4EU	December 1, 1976
F172P	A4EU	August 27, 1980
FP172D	A4EU	June 25, 1962
FR172E	A18EU	December 20, 1967
FR172F	A18EU	November 27, 1968
FR172G	A18EU	October 23, 1969
FR172H	A18EU	December 17, 1970
FR172J	A18EU	December 1972
FR172K	A18EU	December 1, 1976

2. STANDARD PRACTICES

The following suggestions should be applied wherever they are applicable when working on the aircraft.

- To ensure proper reinstallation and/or assembly, tag and mark all parts, clips, clamps, brackets, etc. as to their location prior to removal and/or disassembly.
- During removal of various parts, inspect them for indications of scoring, burning or other undesirable wear conditions. To facilitate reinstallation, observe the location of each part during removal. Tag any unserviceable part and/or units for investigation and possible repair before reinstallation.
- Ensure that all parts are thoroughly cleaned before assembling.
- Never reuse lockwire, lockwashers, tablocks, tabwashers or cotter pins. All lockwire and cotter pins must fit snugly in holes drilled in studs and bolts for locking purposes. Cotter pins should be installed so the head fits into the castellation of the nut, and unless otherwise specified, bend one end of the pin back over the stud or bolt and the other end down flat against the nut. Use only corrosion resistant steel lockwire and/or cotter pins. Bushing plugs shall be lockwired to the assembly base or case. Do not lockwire the plug to the bushing.
- All workmanship is to be performed to the standards set forth in FAA Advisory Circular 43.13-1B (reference 1.1.2)

3. MODIFICATION

NOTE: “Forward” and “aft” are used throughout these modification instructions in reference to the two most rearward bulkheads of the applicable aircraft. These bulkhead locations are defined by Table 3-1 and depicted in Figure 3-2 and Section 5.

Table 3-1, Bulkhead Identification

Make	Year	Forward Bulkhead Station	Aft Bulkhead Station
Textron	ALL	205.81	228.68



Figure 3-1, Aircraft Tail Section, Unmodified

3.1 Tail Tie-Down Ring Removal

The aircraft's tail tie-down ring (Figure 3-2, item 19) is a threaded eye-bolt that attaches to the underside of the aircraft tail through a hole in the bottom of the aft fuselage bulkhead and into a riveted nutplate. The tie-down ring is often interchangeably referred to as a "mooring ring," "eyelet," or "eye-bolt" in various publications.

The tie-down ring must be completely removed from the aircraft following these instructions:

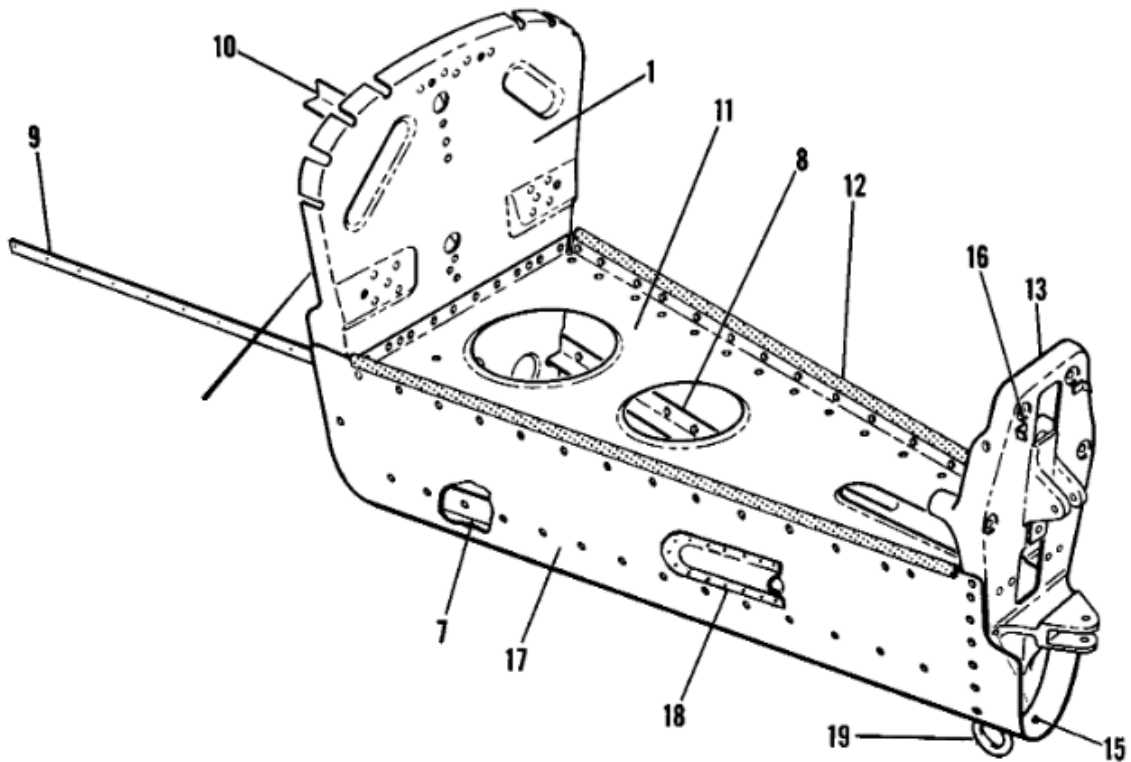


Figure 3-2, Aft Tail Section Cutaway

- 3.1.1 Remove the aircraft's tail tie-down ring (Figure 3-2, item 19) from the aft fuselage bulkhead (Figure 3-2, item 13) by unscrewing it from the bulkhead. See Figure 3-3.

NOTE: Do not destroy or discard the removed tie-down ring. The removed tie-down ring and hardware weight must be measured and used in the weight and balance calculations of Section 4.1.

- 3.1.2 Inspect the tie-down ring attachment hole, nutplate, and surrounding aft bulkhead structure for any damage and perform any necessary repairs before continuing this installation.



Figure 3-3, Tail Section, Tie-Down Ring Removed

3.2 Tail Tie-Down Installation Preparation

In preparation for installation of the replacement tail tie-down, four universal head rivets will need to be removed from the tail section at the forward and aft bulkheads. Four of the removed rivets will be replaced with flush head rivets to facilitate flush mounting of the tail tie-down. The remaining removed rivets will be replaced with machine screws and nuts used to attach the replacement tie-down to the aircraft.

NOTE: Be sure not to oversize or damage rivet holes during the rivet removal process. Inspect and deburr all rivet holes as necessary prior to reinstalling rivets or adding fasteners.

3.2.1 Disconnect the aircraft rudder cable rigging at the rudder (Figure 3-4, item 1)(Figure 3-5).

NOTE: It is only necessary to remove rudder cable rigging on the side which the tailcone faring will be removed.

3.2.2 Remove one or both of the aircraft's tailcone farings and rub strips (Figure 3-4, item 2) by removing rivets to gain access to the aft fuselage bulkhead (Figure 3-5).

NOTE: It is only required to remove the tailcone faring on one side of the aircraft, however, if desired, both tailcone farings can be removed for improved tail access. If both sides are removed, double the quantity of items 11-13 in Table 1-1.

NOTE: Either side may be removed, but it is recommended for a right-handed person to remove at least the right side faring and a left-handed person to remove at least the left side faring.



Figure 3-4, Tailcone Faring Removed and Rudder Cable



Figure 3-5, Tailcone Faring Removed and Rudder Cable Disconnected

3.2.3 Remove the two rivets which secure the tie-down ring nutplate (Figure 3-6).

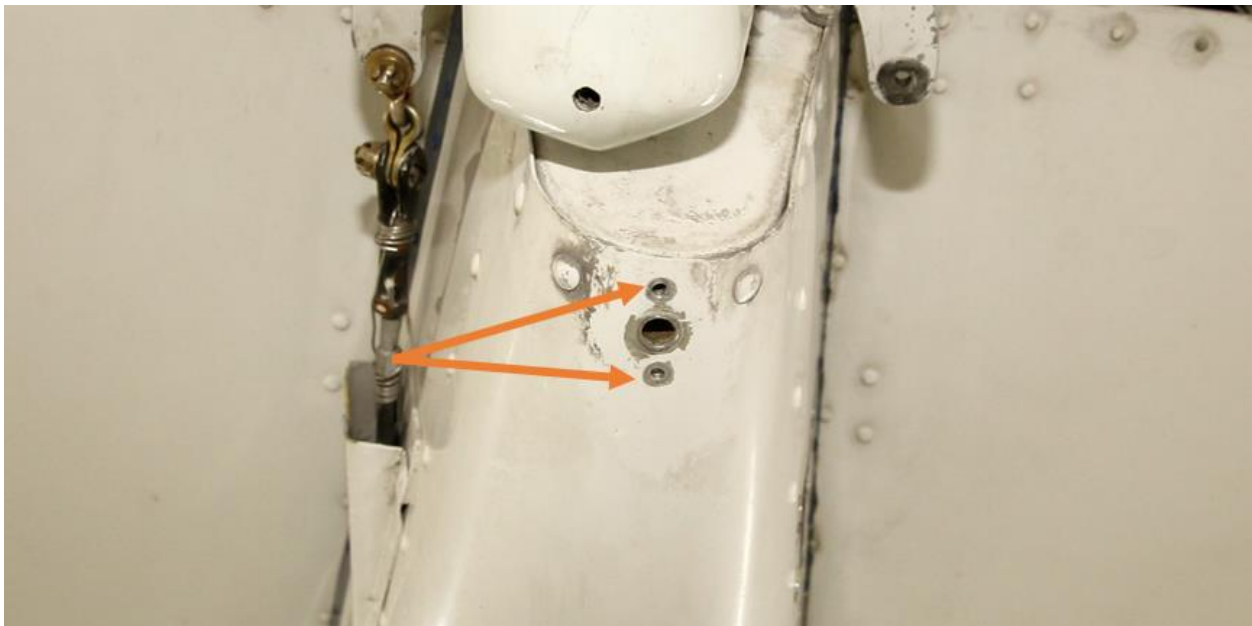


Figure 3-6, Tie-Down Nutplate, Rivets Removed

- 3.2.4 Remove six rivets which secure the aircraft skin to the aft bulkhead as shown in Figure 3-7 and Figure 3-8.

NOTE: The original tail tie-down ring hole marks the bottom center of the rivets to be removed with three rivets on either side of the hole.

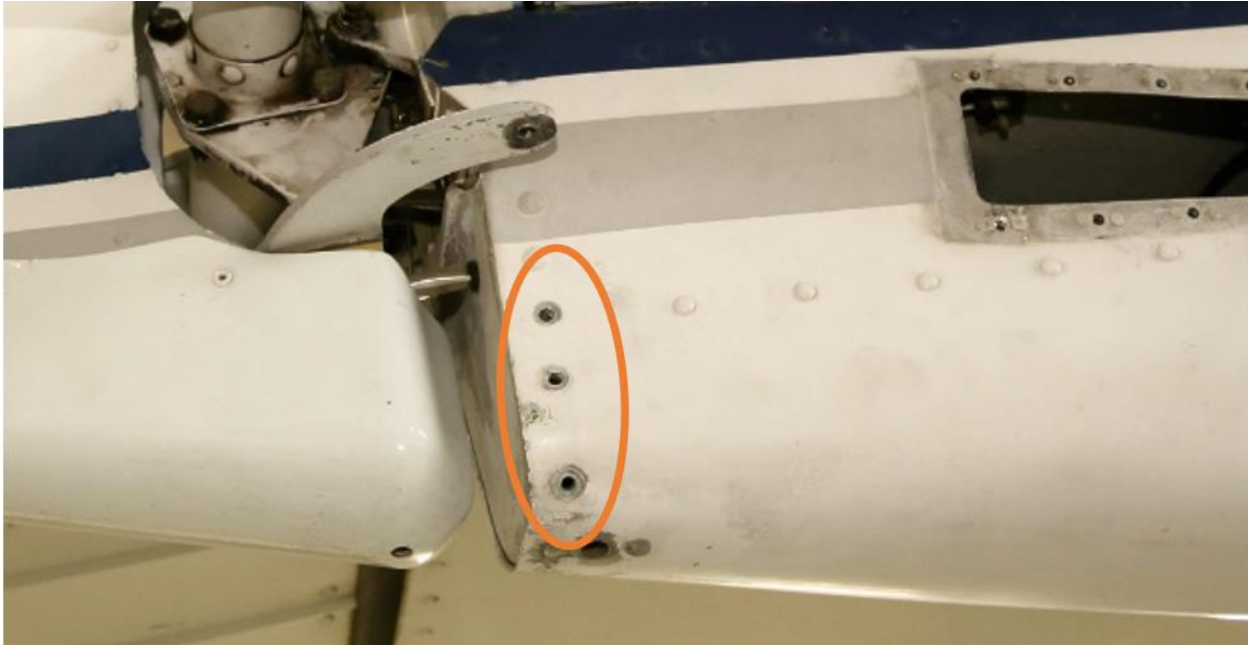


Figure 3-7, Aft Bulkhead RH Rivets, Removed



Figure 3-8, Aft Bulkhead LH Rivets, Removed

- 3.2.5 Remove the 12 rivets which secure the aircraft skin to the forward bulkhead as shown in Figure 3-9.

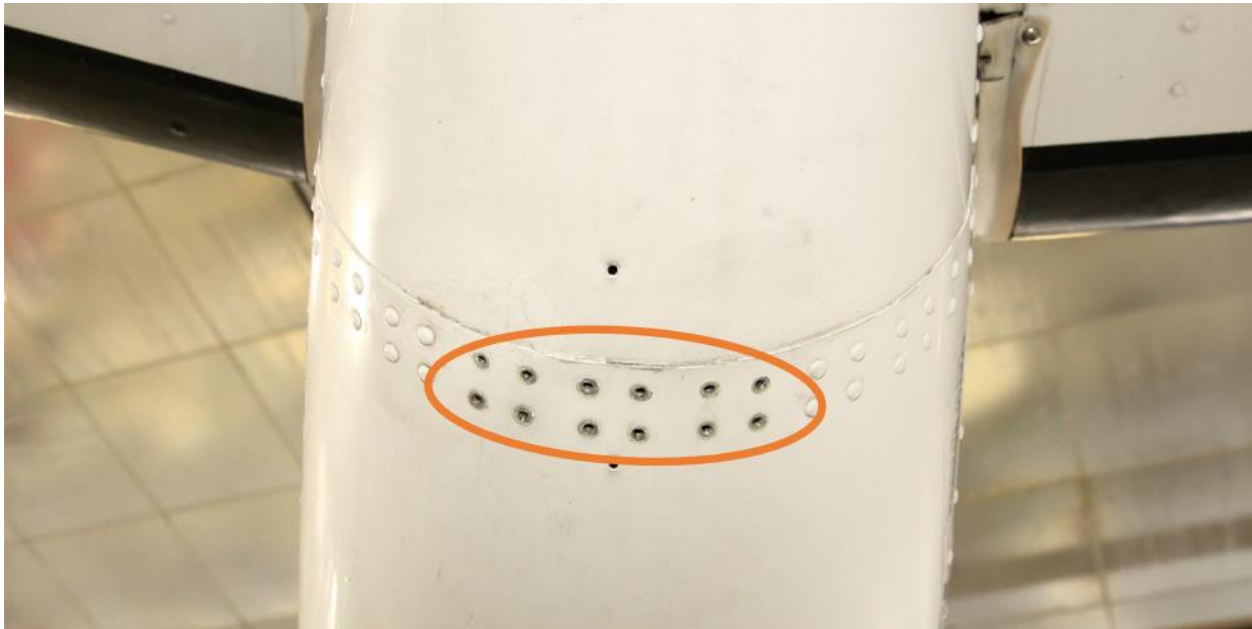


Figure 3-9, Forward Bulkhead Rivets, Removed

- 3.2.6 Locate the two holes which will be replaced by flush head rivets which previously secured the tie-down nutplate (Figure 3-10).

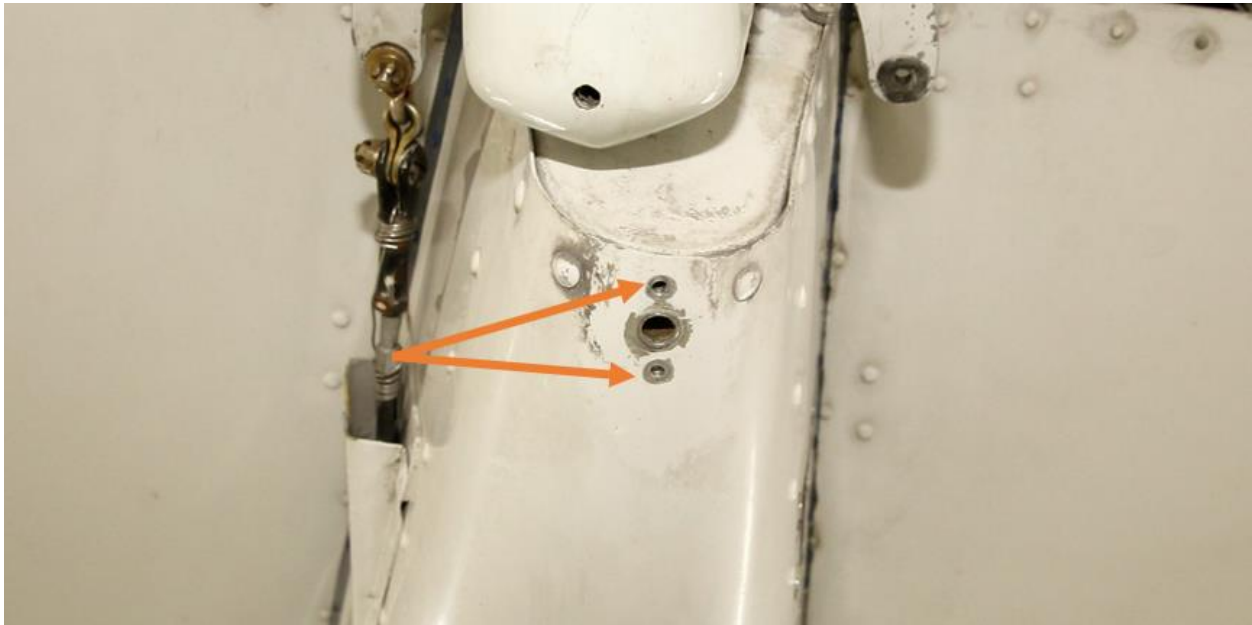


Figure 3-10, Tie-Down Nutplate Rivet Location

- 3.2.7 Prepare the two rivet holes by dimpling or countersinking skins prior to installing countersunk rivets.
- 3.2.8 Replace the two universal head rivets removed in step 3.2.3 (Figure 3-10) which previously secured the tie-down ring with AN426AD4-8 countersunk rivets to secure the tie-down nutplate into the aircraft. All riveting workmanship is to be performed in accordance with AC 43.13-1B Chapter 4, Section 4, Paragraph 4-57.

- 3.2.9 Locate the two holes in the forward bulkhead which will be replaced by flush head rivets (Figure 3-11).



Figure 3-11, Forward Bulkhead Flush Head Rivets

- 3.2.10 Prepare the rivet holes by dimpling all skins prior to installing countersunk rivets.

NOTE: Countersinking these rivet holes by countersink drilling is NOT acceptable for this installation. Aircraft skins must be dimpled.

- 3.2.11 Replace two universal head rivets removed from the forward bulkhead in 3.2.5 with AN426AD4-6 countersunk rivets (Figure 3-11). All riveting workmanship is to be performed in accordance with AC 43.13-1B Chapter 4, Section 4, Paragraph 4-57.

3.3 Tail Tie-Down Installation

Installation of the replacement tail tie-down is achieved by properly fitting the tie-down to the airframe, match drilling the weldment to the preexisting airframe rivet holes, and attaching the tie-down to the airframe using an assortment of AN hardware. The installed tie-down can be seen in Figure 3-13, below.

NOTE: Prior to installation, inspect the aircraft skin and tail tie-down to ensure that the mating surfaces are painted. If either surface has exposed metal, repair by conversion coating per MIL-C-5541 or alodine 1132, prime with zinc chromate, epoxy primer or equivalent, and apply topcoat (optional) before continuing the installation.

NOTE: If the “◀ TIE DOWN HERE” placard (Figure 3-12) is damaged or covered by additional topcoat, repair the placard in accordance with Section 8 of the ICA (reference 1.1.1) before returning the aircraft to service.

NOTE: Prior to installation, weigh the replacement tail tie-down and record the weight in the appropriate tables of Section 4.1.

NOTE: Maintain 2D minimum edge distance for all fasteners.



Figure 3-12, Example TIE DOWN HERE Placard

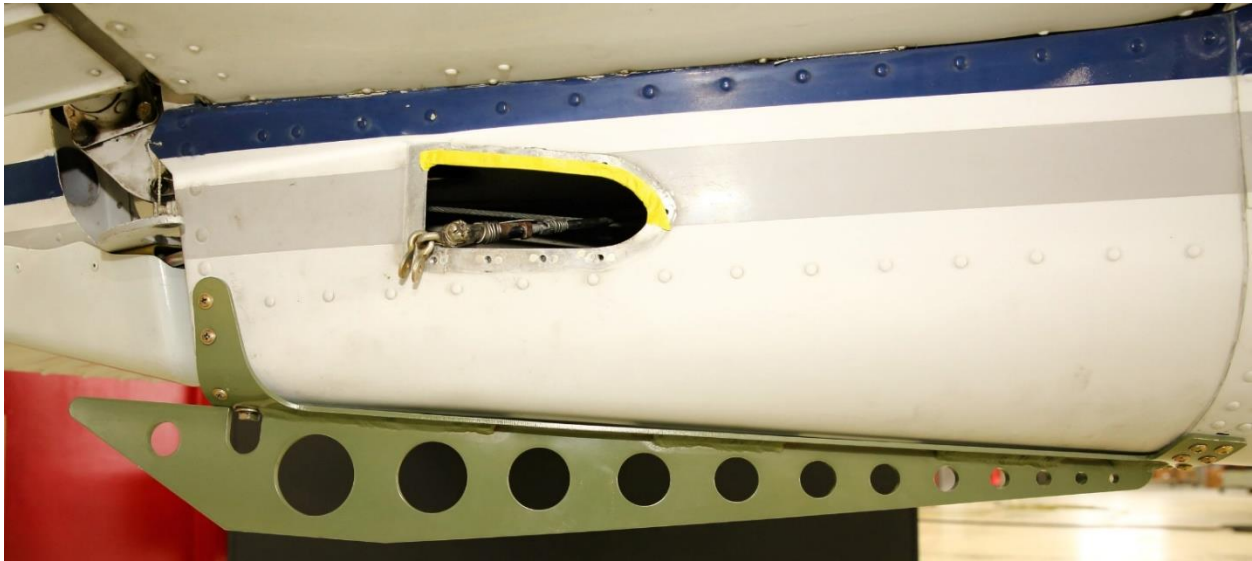


Figure 3-13, Installed Replacement Tail Tie-Down

- 3.3.1 Weigh the replacement tail tie-down and record the weight in the appropriate tables of Section 4.1.
- 3.3.2 Test fit and adjust the replacement tie-down to fit flush to the airframe as shown in Figure 3-13.

NOTE: The replacement tail tie-down is manufactured to match the curvature of the tail section at the forward and aft bulkhead attachment points. However, due to imperfections and repairs that many aircraft contain, slight manual reforming of the mounting flanges may be necessary for a precise fitment. If the tail tie-down appears to be significantly out of shape for your aircraft, stop the installation and contact the supplier for additional installation instructions.

- 3.3.3 Install an AN5-7A bolt with MS27183-11 steel washer through the new tail tie-down bolt hole and the bolt hole located in the aft bulkhead (Figure 3-14, items 1 and 2). Secure the tie-down bolt into the nutplate which originally held the factory tail tie-down ring. Final bolt torque will be accomplished in a later step.

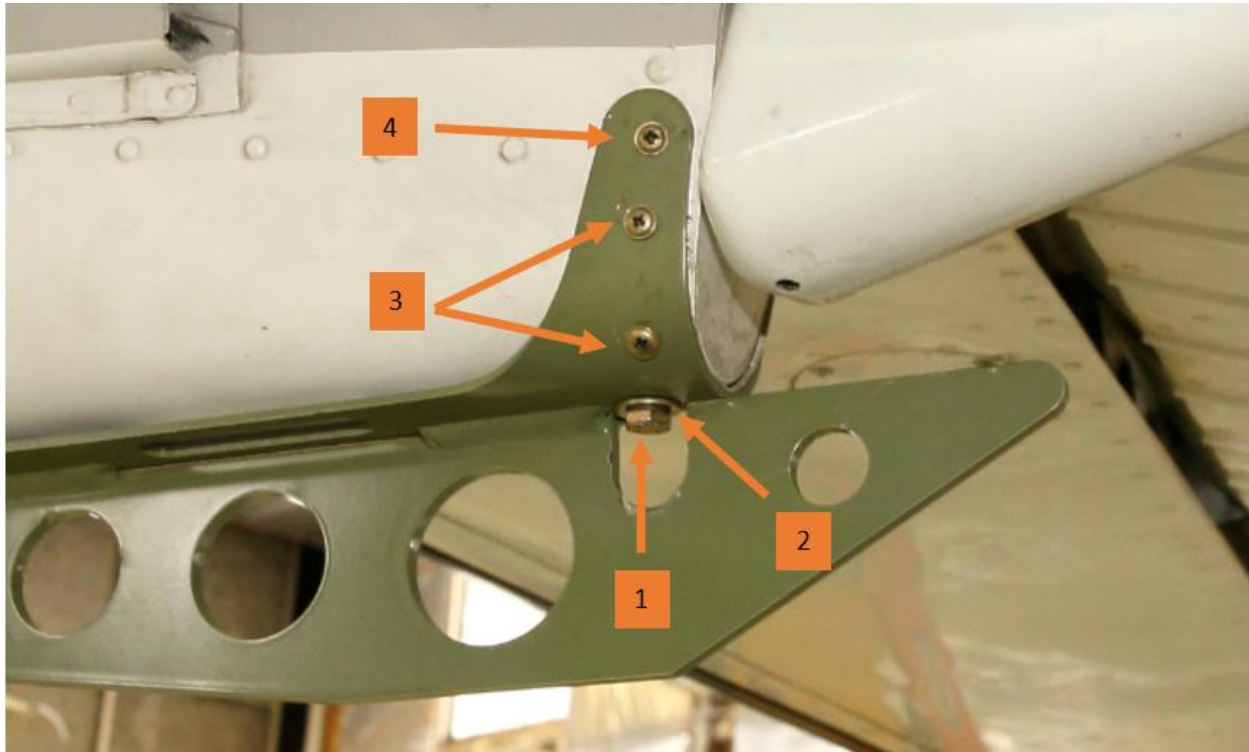


Figure 3-14, Aft Bulkhead Attachment, LH

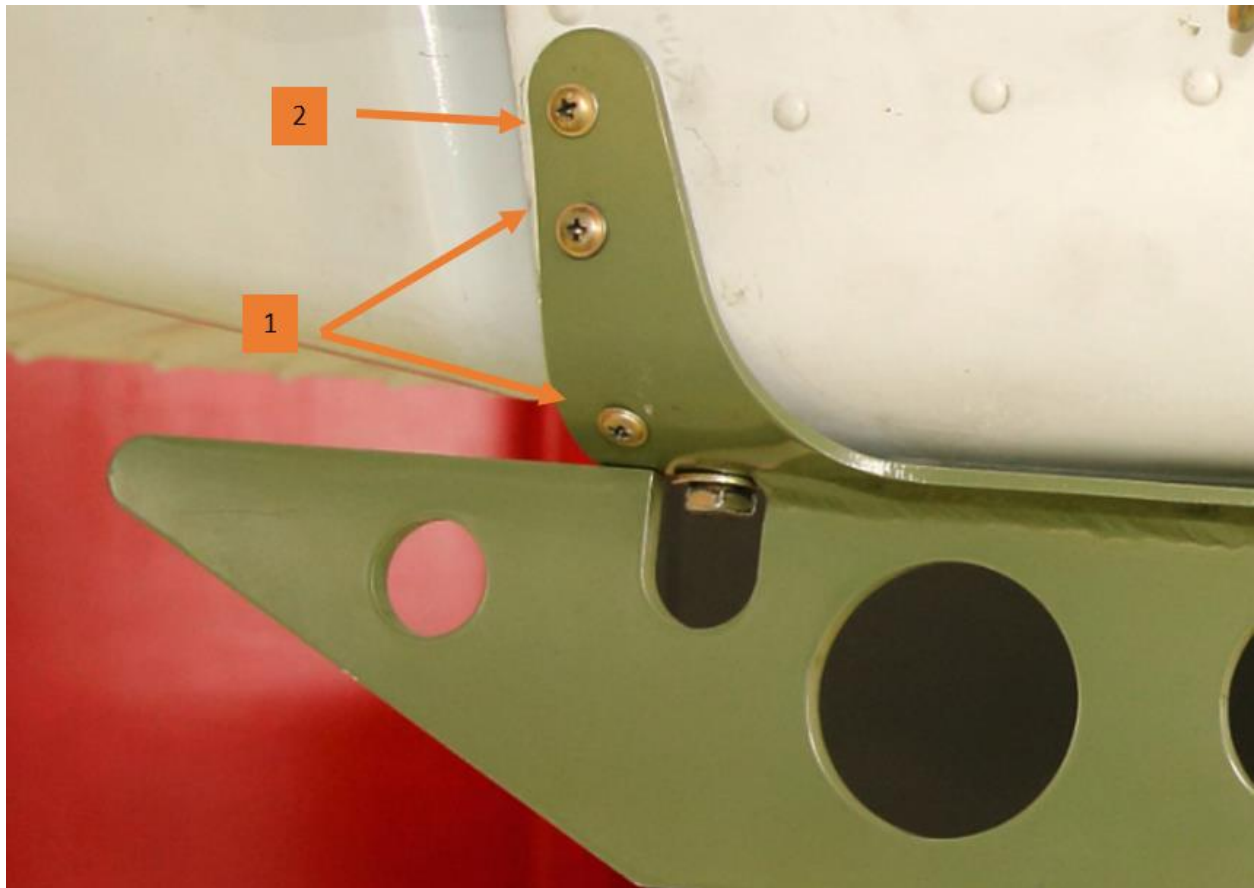


Figure 3-15, Aft Bulkhead Attachment, RH

- 3.3.4 Align the tie-down along the centerline of the aircraft by ensuring the center of the forward bulkhead mounting flange is centered with the centerline of the aircraft's tail, reference Figure 3-16, below.



Figure 3-16, Fwd Bulkhead Attachment

- 3.3.5 Match drill the tie-down forward mounting flange and the forward bulkhead station using the existing rivet locations and a #20 drill bit.

NOTE: It may be necessary or helpful to use a hole finder to match-drill the tie-down to the bulkhead.

NOTE: The new attachment hardware is slightly larger than the removed rivets and will require match drilling to resize the existing rivet holes. Ensure all drilled holes are deburred and free of debris before installing new fasteners.

HOLE TOLERANCE: 0.164 +0.000/-0.002

- 3.3.6 Attach the tie-down forward mounting flange to the airframe using ten AN525-832R10 machine screws through the tie-down with an AN960-8 washers and AN365-832A nuts on the backside of the forward bulkhead (Figure 3-16).

NOTE: Additional AN960-8 washers may be required on the backside for the aft bulkhead to account for variable bulkhead thicknesses. Use washers as needed for your installation.

- 3.3.7 Match drill the tie-down aft mounting flange to the aft bulkhead station using the existing rivet locations and a #20 drill bit, reference notes and hole tolerance in step 3.3.5.

- 3.3.8 Partially attach the tie-down aft mounting flange to the airframe using four AN525-832R12 machine screws through the tie-down with an AN960-8 washer and AN365-832A nut on the backside of the aft bulkhead (Figure 3-14, item 3)(Figure 3-15, item 1).

NOTE: Additional AN960-8 washers may be required on the backside for the aft bulkhead to account for variable bulkhead thicknesses. Use washers as needed for your installation.

NOTE: For best fitment it is recommended that the AN525-832R12 machine screws be installed and tightened starting at the bottom of the tie-down (closest to the AN5-7A bolt) and working upwards along the aft mounting flange.

- 3.3.9 Attach the tie-down aft mounting flange to the airframe at the remaining locations using two AN525-832R14 machine screws through the tie-down with an AN960-8 washer and AN365-832A nut on the backside of the aft bulkhead (Figure 3-14, item 4)(Figure 3-15, item 2).

NOTE: Additional AN960-8 washers may be required on the backside for the aft bulkhead to account for variable bulkhead thicknesses. Use washers as needed for your installation.

- 3.3.10 Torque all tie-down attachment hardware in accordance with Table 3-2.

Table 3-2, Hardware Torque Specification

Hardware	Hardware Size	Torque (inch-pounds)
AN525-832R1X	8-32	12-15
AN365-524A	5/16-24	60-85

NOTE: Tighten hardware starting at the bottom of the tie-down (closest to the AN5-7A bolt, and at the lowest point of the aircraft) and working upwards along the mounting flanges.

3.4 Optional Item: Tie-Down Reinforcement Assembly

Installation of the Reinforcement Assembly (Table 1-2, item 1) is not required for function of the tail tie-down. If desired, the optional reinforcement assembly may be installed as follows:

- 3.4.1 Mate and align the reinforcement plate onto the tie-down plate outer periphery and tie-down hole profile within 0.030" as shown in Figure 3-17.

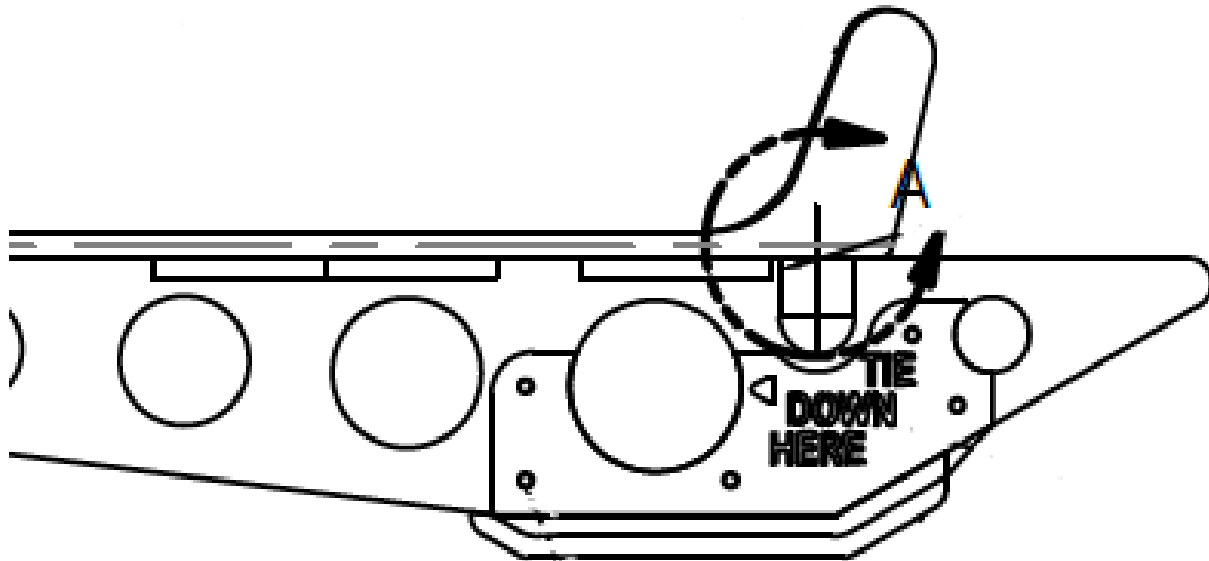


Figure 3-17, Reinforcement Assembly Location

- 3.4.2 Match-drill (5) holes to $0.190 +0.010/-0.000$ diameter.
- 3.4.3 Attach the reinforcement plate using (5) AN525-832 R12 screws, (5) AN365-832A nuts, and (5) or more AN960-8 washers under nuts as needed. Torque according to Table 3-2.

NOTE: If the “◀ TIE DOWN HERE” placard (Figure 3-17) is damaged or covered by additional topcoat, repair the placard in accordance with Section 8 of the ICA (reference 1.1.1) before returning the aircraft to service. “◀ TIE DOWN HERE” must be visible over the installed reinforcement assembly.

3.5 Optional Item: Sealant

3.5.1 After the tail tie-down is installed, it is allowable to seal the tie-down to the aircraft tail using materials listed in Table 1-2, items 2 and 3 to help prevent dirt and debris from becoming trapped in between the tie-down and the aircraft tail. If desired, run a bead of sealant around the entire perimeter of the tie-down.

NOTE: Ensure that the tie-down is completely sealed. No gaps in the sealant between the aircraft and tie-down are acceptable.

3.6 Tailcone Faring Reinstallation

Complete the following steps for each tailcone faring removed.

3.6.1 Install nine MS21069L06 nutplates where aircraft the tailcone faring rivets were removed in step 3.2.2 using 18 AN426AD3-3 rivets. (Figure 3-18). All riveting workmanship is to be performed in accordance with AC 43.13-1B Chapter 4, Section 4, Paragraph 4-57.

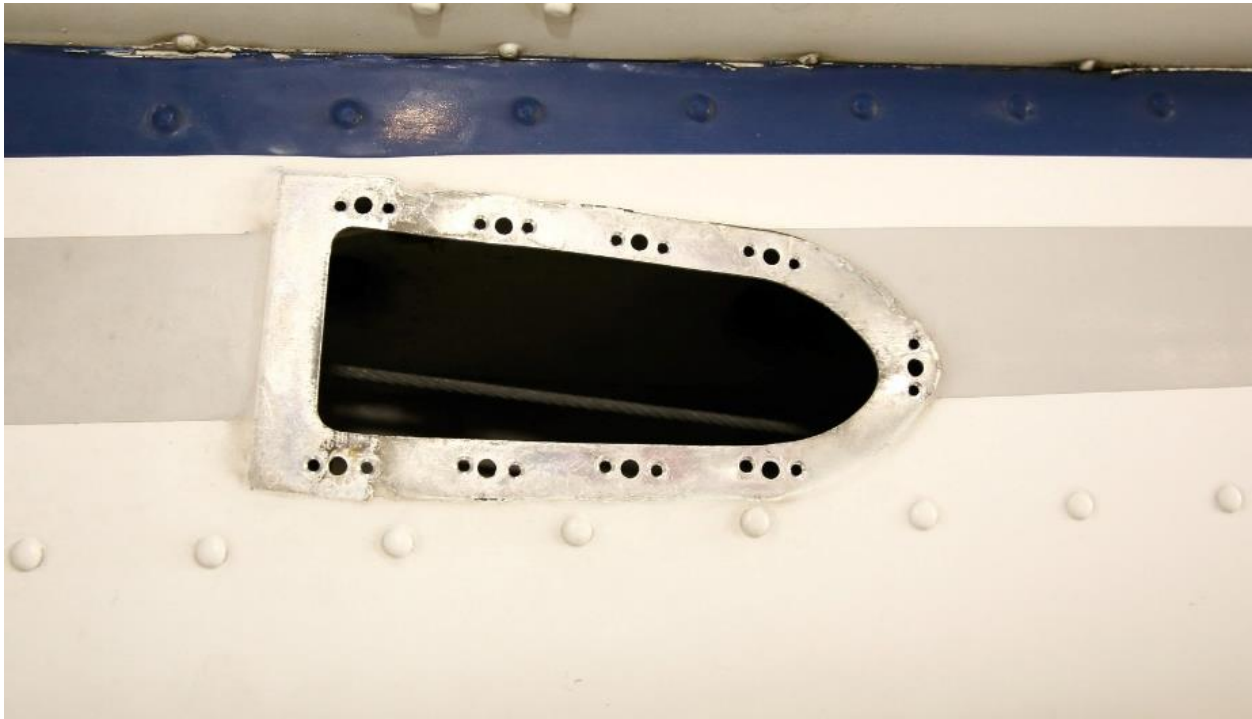


Figure 3-18, Tailcone Faring Nutplates

3.6.2 Reinstall the tailcone faring and rub strip using nine AN526632R8 screws (Figure 3-19).

NOTE: Pass the aircraft rudder cable through the tailcone faring before installation.



Figure 3-19, Tailcone Faring, Installed

3.6.3 Reattach the aircraft rudder cables to the rudder (Figure 3-19) using retained hardware. Tighten castellated nut and install a new cotter pin. Ensure rigging routing and tension is correct in accordance with the aircraft's maintenance manual.

4. POST INSTALLATION

4.1 Weight and Balance

Determine the new empty weight of the aircraft and corresponding center of gravity.

- 4.1.1 Weigh the replacement tail tie-down before installation. Record the weight in Table 4-2.
- 4.1.2 Weigh the factory tie-down that was removed from the airframe after cleaning and removing all debris. Record the measured weights in Table 4-2.
- 4.1.3 Obtain the baseline aircraft's weight and balance records and verify the information is up to date and accurate. Record the required information in Table 4-2 and Table 4-3.
- 4.1.4 Perform the calculations in Table 4-2, Table 4-3, and Table 4-4 to determine the modified aircraft CG location.
- 4.1.5 Update aircraft weight and balance records accordingly.

Table 4-1, Replacement Tie-Down Center of Gravity

Make	Series	Configuration	Installed Center of Gravity (in.)
Textron	ALL	Without Reinforcement Assembly	219.8
Textron	ALL	With Reinforcement Assembly	221.7

4.1.6 Aircraft Weight Calculation

Table 4-2, Modified Aircraft Empty Weight Calculation

Baseline Aircraft Empty Weight (lb)	-	Removed Tie-Down Weight	+	Installed Tail Tie-Down Weight	=	Modified Aircraft Empty Weight (lb)

4.1.7 Moment Calculations

Table 4-3, Modified Aircraft Moment Calculation

Article	Net Weight (lb)	x	Arm/CG (in)	=	Moment (in-lb)
Baseline Aircraft Empty					
					-
Article	Net Weight (lb)	x	Arm/CG (in)	=	Moment (in-lb)
Removed Tie-Down			228.7		
					+
Article	Net Weight (lb)	x	Arm/CG (in)	=	Moment (in-lb)
Replacement Tie-Down					
					=
Total Moment (in-lb)					CG Location (in)

4.1.8 CG Calculation

Table 4-4, Modified Aircraft CG Calculation

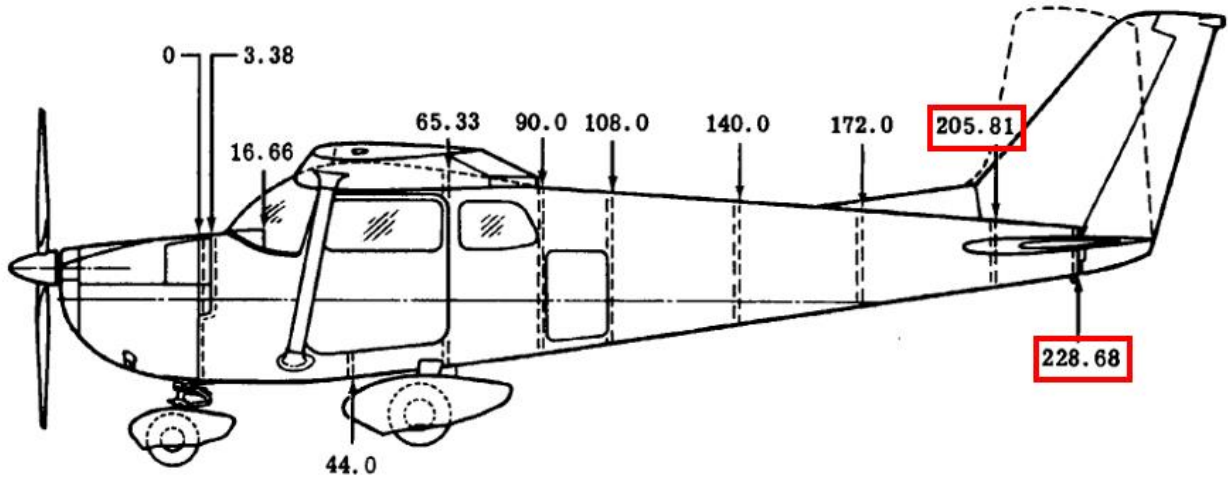
Total Moment (in-lb)	/	Modified Aircraft Empty Weight (lb)	=	CG Location (in)

4.2 Return to Service

- 4.2.1 Complete FAA form 337 stating that the tail tie-down replacement has been installed in accordance with this STC.
- 4.2.2 Update all aircraft logbooks accordingly.

5. APPENDIX A

5.1 Cessna 172 and 175 Series





Middle Fork Mods. LLC