Tail Cone Reinforcement Kit: Installation Instructions for Cessna 180, Early 182, and 185 Aircraft

Document Number: ST02171AK-A INSTALL
Revision: E
4/3/2024

FAA Project Number: SA02522AK

McFarlane Aviation, LLC.
696 E. 1700 Road
Baldwin City, Kansas 66006

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

Tail Cone Reinforcement Splice Installation Instructions

1. Background

Reports have shown that cracks can and have formed in the tail cone reinforcement angles on some Cessna 180, 182, and 185 aircraft. Cessna Service Letter SEL-55-01 "Stabilizers -- Tail-cone and Horizontal Stabilizer Inspection" has identified potential cracks in the tail cone reinforcement angles P/N 0712207-1, &-2 for the following aircraft models: 180, 180A, 180B, 180C, 180D, 180E, 180F, 180G, 180H, 180J, 180K, 182, 182A, 182B, 182C, 182D, 185, 185A, 185B, 185C, 185D, 185E, and 185F. All of the above aircraft utilize the same part numbers. This STC modifies the affected tail cone reinforcement angles by replacing the cracked or damaged sections of the reinforcement angle with a new stronger section. This modification can be installed while inspecting the aircraft according to Cessna Service Letter SEL-55-01. Figure 1 shows the area where the tail cone reinforcement angles are located.

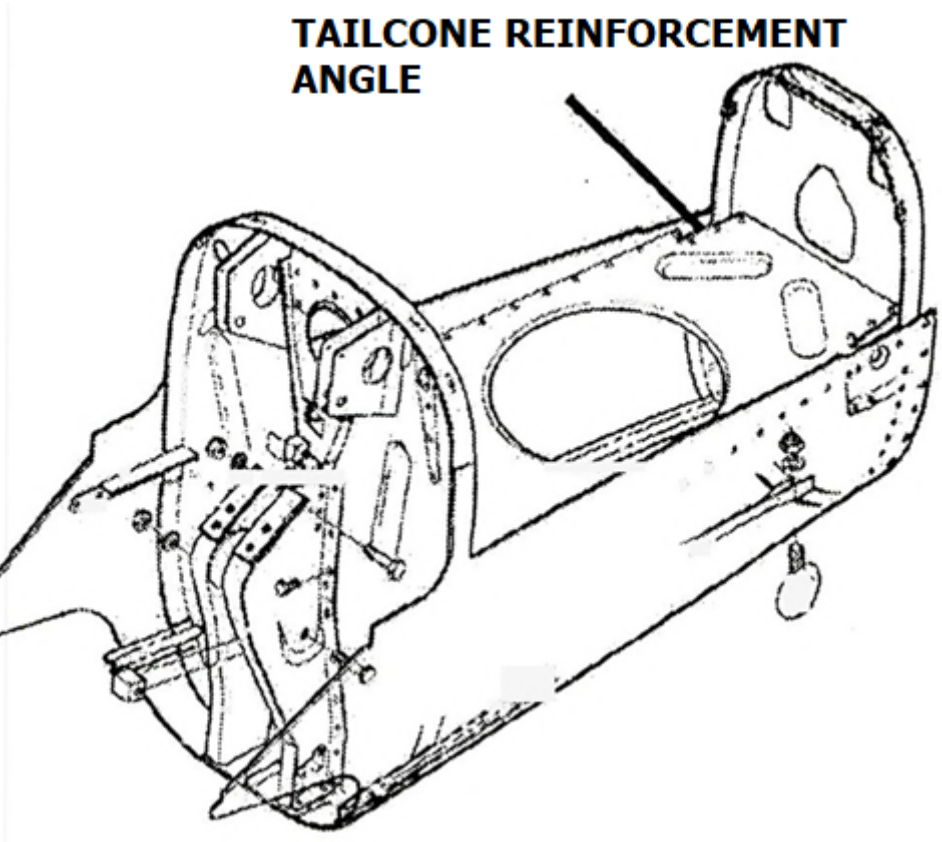

Figure 1: Tail Cone Area

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

Tail Cone Reinforcement Splice Installation Instructions

The tail-cone reinforcement angles (P/N 0712207-1 and -2) tend to crack at the rear stabilizer attach pivot. Figure 2 and Figure 3 show the area of concern, and an example of where cracks have been found in service. It is understood that all the cracks form at the same spot with very similar propagation.

Figure 2: Tail Cone Reinforcement Angle (LH shown, RH opposite)

Figure 3: Typical crack in the Tail Cone Reinforcement Angle (LH shown)

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

2. STC Overview

This STC involves cutting out the suspect portion of the tail-cone reinforcement angle(s) and attaching a new part onto the angle to provide reinforcement and replace the aft stabilizer attach pivot hole. This greatly reduces the labor involved compared to removing and replacing the entire tail cone reinforcement angle. See Figure 4 and Figure 5

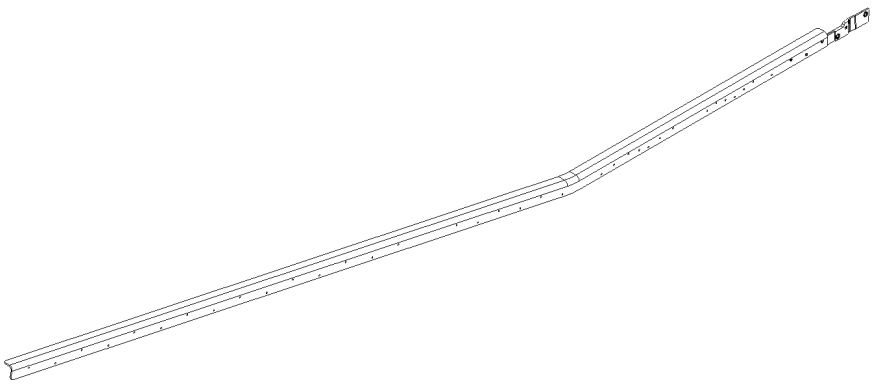

Figure 4: STC design showing the Reinforcement Angle crack area replaced with STC reinforcement angle splice installed

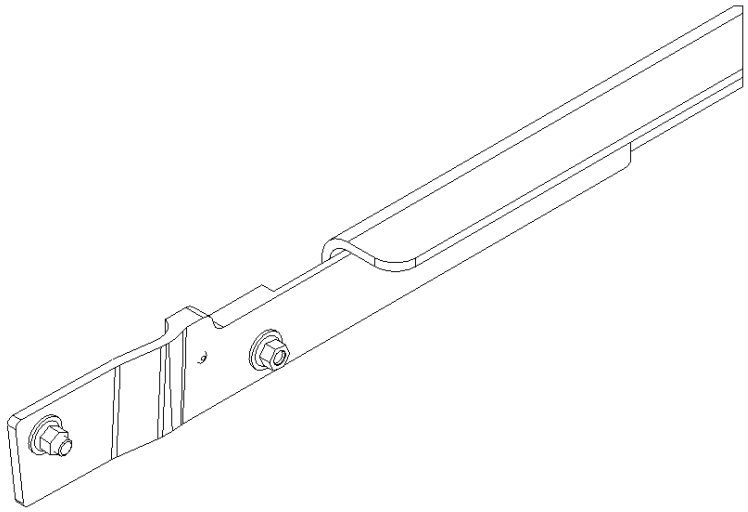

Figure 5: Close up view of STC reinforcement angle splice part

3. Installation Instructions

3.1 Parts and Tools

Ensure that you have received all the necessary parts and tools. Table 1 is a list of all the parts and tools you should have received with this STC. If you are missing any of the above parts or tools contact McFarlane Aviation immediately.

Table 1: STC Package Parts and Tools

Description	Part Number	QTY.
RH tail cone reinforcement angle splice	QMI-0712048-6R	1
LH tail cone reinforcement angle splice	QMI-0712048-7R	1
Rivet *(Use as needed)*	MS20426AD4-6	7
Rivet *(Use as needed)*	MS20426AD4-7	7
Rivet *(Use as needed)*	MS20426AD4-8	7
Rivet *(Use as needed)*	MS20470AD5-7	3
Rivet *(Use as needed)*	MS20470AD5-8	3
Bolt	AN525-832R8	4
Bolt	AN525-832R10	4
Washer	AN960-8 or NAS1149FN832P	4
Nut	MS21043-08	4
Drill Bit #40	DB-40	1
Drill Bit #30	DB-30	1
Drill Bit #21	DB-21	1
Drill Bit #19	DB-19	1
Drill Bit 15/64	DB-15/64" Dia.	1
Reamer	¼" Dia.	1
Guard	QMI-004	1
Hack Saw Handle & Blade	HACK SAW	1
Drill Guide Assembly	QMI-002	1
1/8” Hex Key	1/8-HK	1
7/32” Box Wrench	7/32-BW	1

3.2 Aircraft Preparation

1. Prepare the aircraft for maintenance. Make sure the aircraft is electrically grounded. Make sure that all the switches are in the OFF position. Disconnect electrical power from the aircraft.
2. Remove the tail cone and all fin and horizontal stabilizer tail fairings as needed.
3. Disconnect the rudder control cables at the rudder bell crank.
4. Disconnect the elevator bell crank tube from the elevator pylon.
5. Remove attaching hardware for the vertical stabilizer and rudder. Remove the vertical stabilizer and rudder.
6. Disconnect attaching hardware for the horizontal stabilizer and elevators. Remove the horizontal stabilizer and elevators. The aircraft tail should now look like Figure 6.

Note: Figure 6 shows the tailwheel and stinger removed. Removal of the tailwheel and stinger are not required for installation of the tail cone reinforcement angle splice

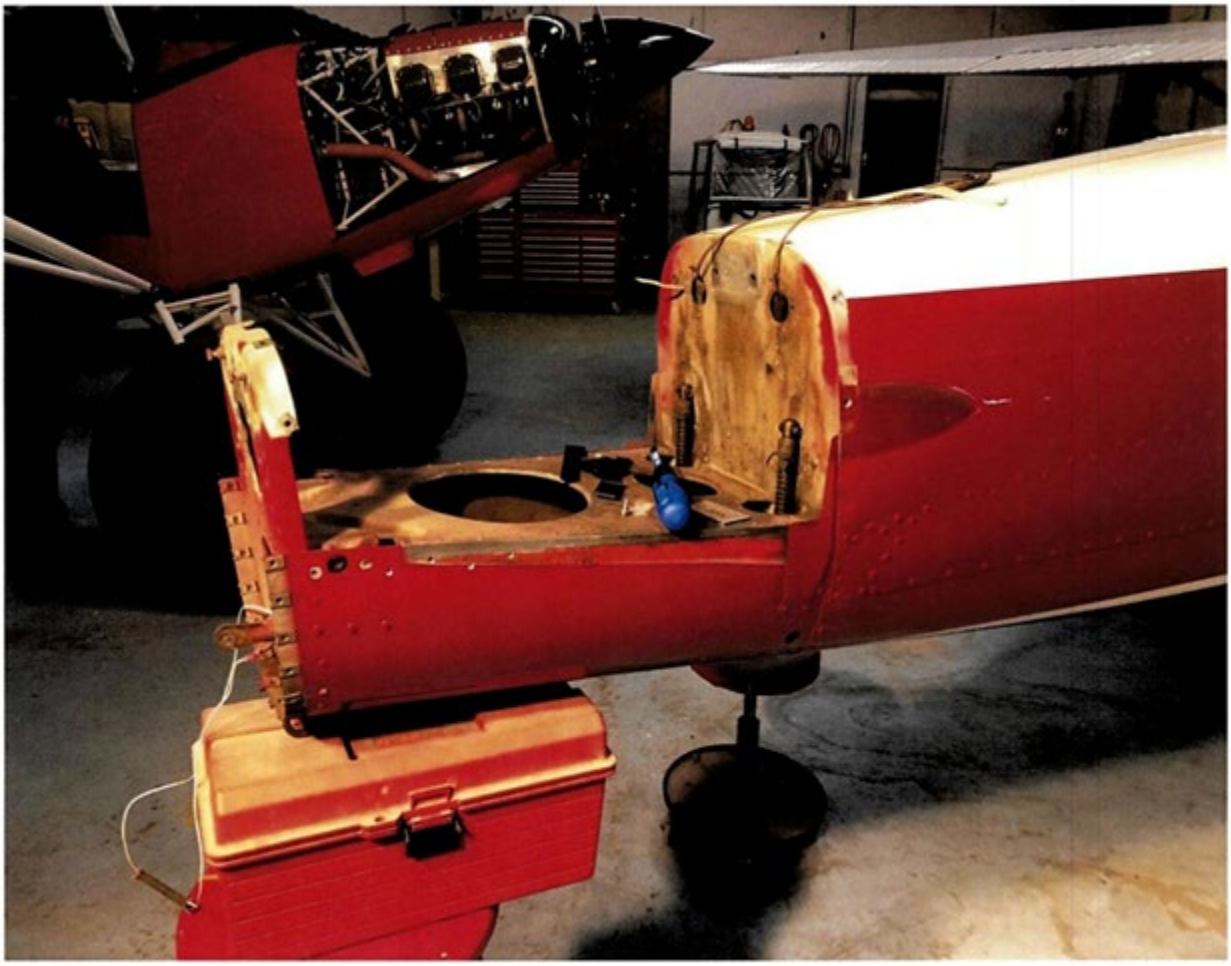

Figure 6: Prepared Aircraft

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

3.3 Tail Cone Reinforcement Angle Cutting and Removal

1. Using the supplied ¼" diameter reamer, ream both the outer and inner LH horizontal rear pivot holes as shown in Figure 7.

Figure 7: Reaming Rear Pivot Holes

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

2. Starting on the left-hand side of the aircraft, drill out the far aft (4) AN426AD-4 (small flush) rivets of the tail cone reinforcement angle with a #30 drill bit. Be careful not to oblong the rivet holes. You may want to start out with a smaller #40 drill bit and then work your way up to a #30 drill bit. The aircraft should now look like Figure 8.

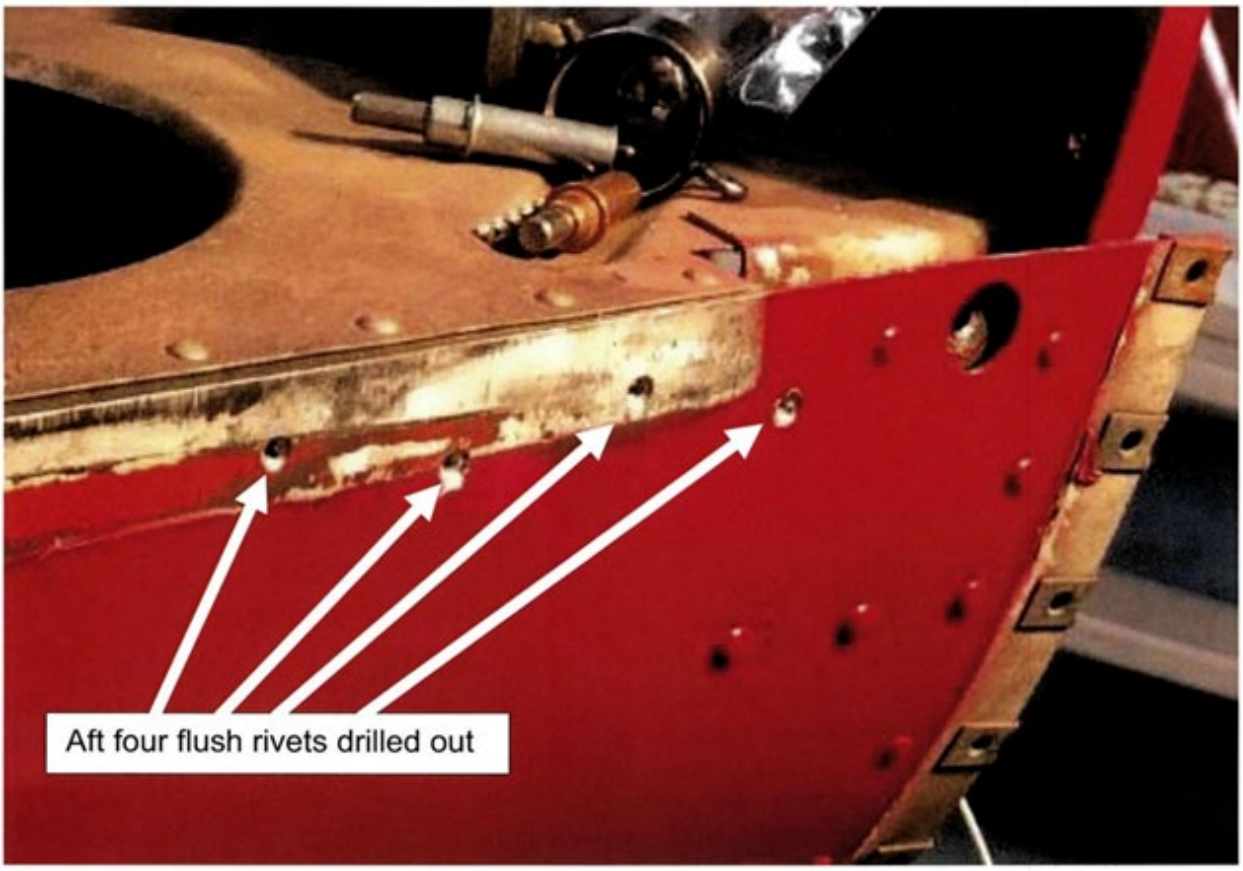

Figure 8: Aft four AN426AD-4 rivets drilled out

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

3. Drill out the far aft (2) AN470AD-4 (large universal head) rivets of the tail cone reinforcement angle with a #30 drill bit. Again, be careful not to oblong the rivet holes. You may want to start out with a smaller #40 drill bit and then work your way up to a #30 drill bit. See Figure 9.

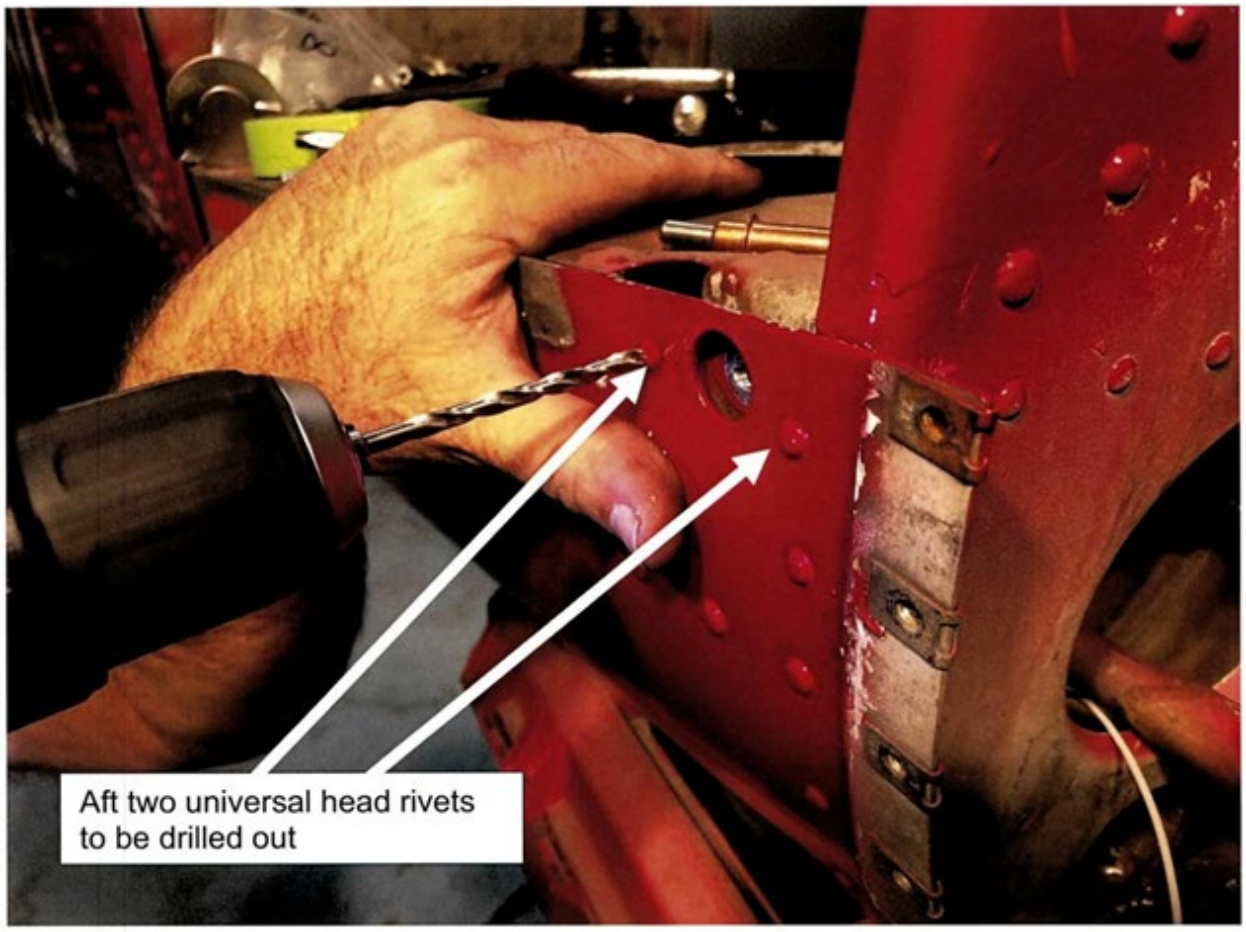

Figure 9: Drill out aft two AN470AD-4 rivets

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

4. Slip the supplied guard between the fuselage outer skin and the tail cone reinforcement angle as shown below so as to prevent cutting the outer fuselage skin. See Figure 10.

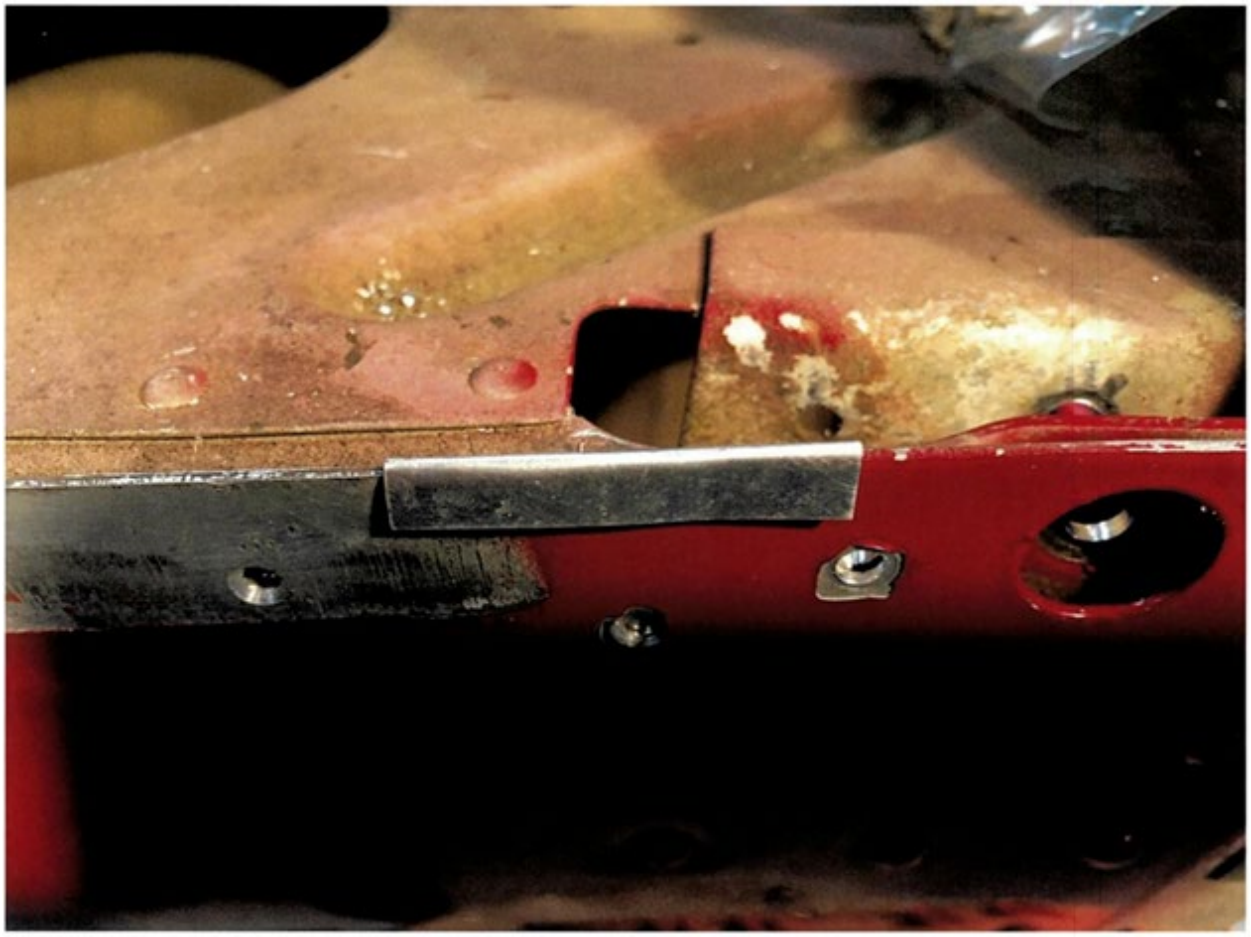

Figure 10: Insert Guard between fuselage skin and reinforcement angle

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

5. Using the hacksaw blade that is inserted in to the hacksaw handle, cut the aft portion of the tail cone reinforcement angle off. Make the cut flush with the forward opening in the top plate as shown in Figure 11.

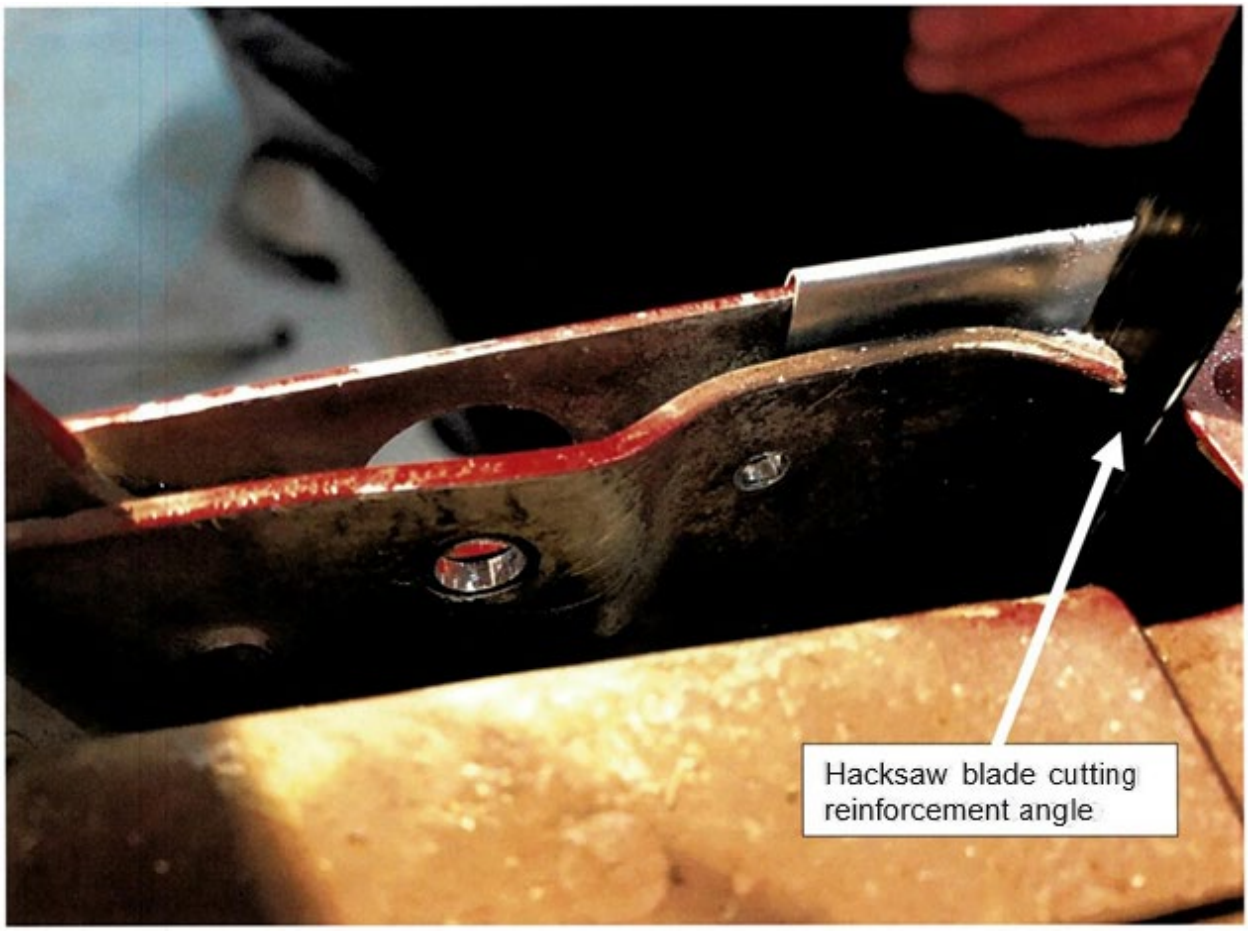

Figure 11: Cutting Reinforcement Angle

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

6. Remove the cut portion of the tail cone reinforcement angle as shown in Figure 12.

Figure 12: Remove cut off portion of reinforcement angle

7. After you complete the cut, your aircraft should look like Figure 13.

Figure 13: After removing reinforcement angle cutoff

3.4 Reinforcement Angle Splice Installation

1. Remove the guard and insert the LH tail cone reinforcement splice (P/N QMI-0712048-7R).

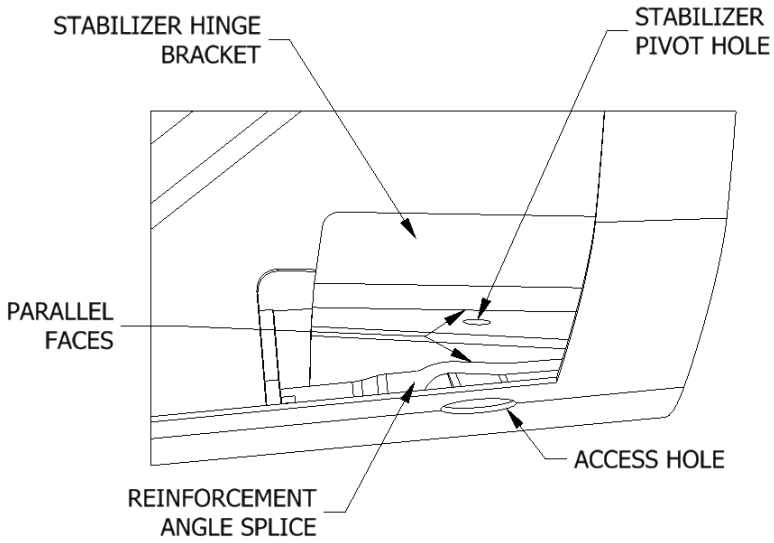

Figure 14: Reinforcement Splice Placement Diagram

2. Install drill guide assembly over the pivot hole and insert a drill bit or pin as shown in Figure 15 to mark the center of the hole. Check the mark to ensure the hole is centered over the flat section of the offset face of the splice. Slide the splice forward or aft as needed to ensure hole is center to the face.

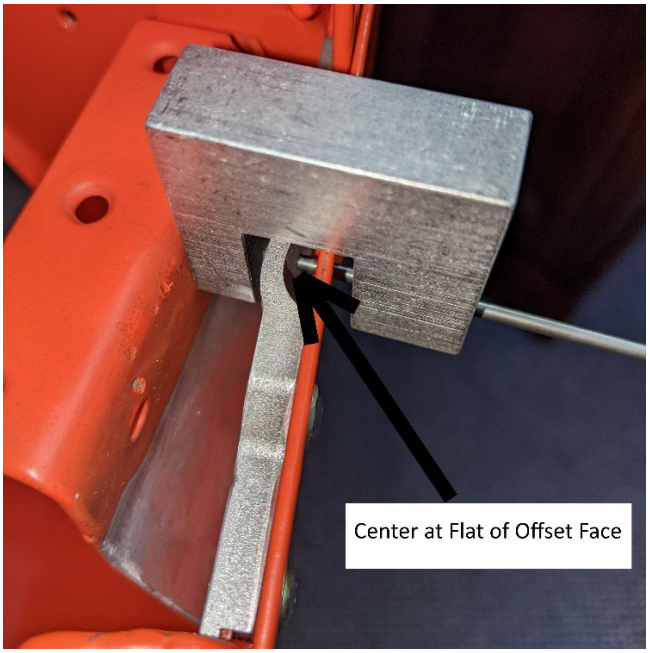

Figure 15: Drill Guide Assembly w/ Marking Pin

3. Clamp the bracket in locations shown in Figure 16 and mark all the hole locations.

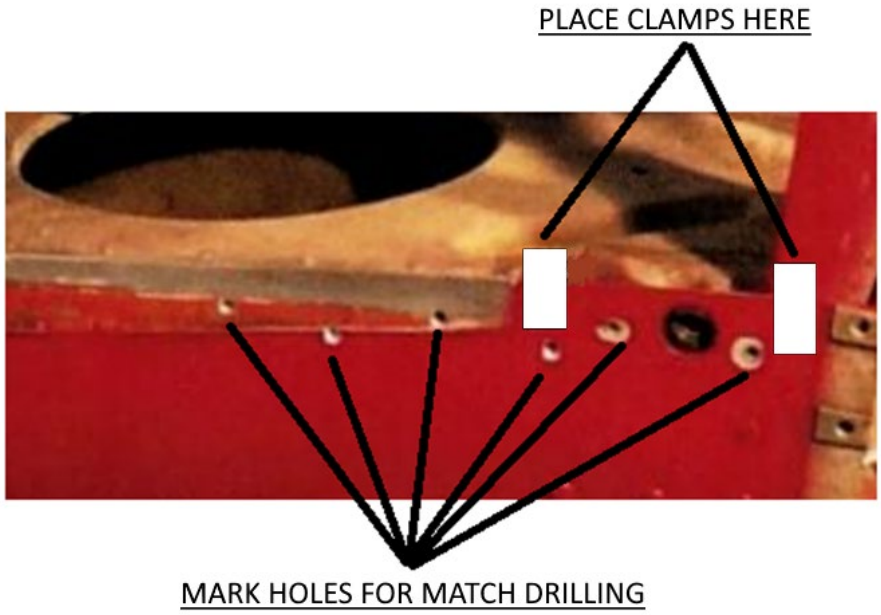

Figure 16: Hole Marking Diagram

4. Remove the clamps and bracket from the aircraft. Ensure the marks are clear and will give adequate edge distance for rivet installation. Reposition and repeat marking as necessary.
5. Clamp the reinforcement splice in its proper position and drill the rivet holes with a #40 (Ø0.098”) drill bit.

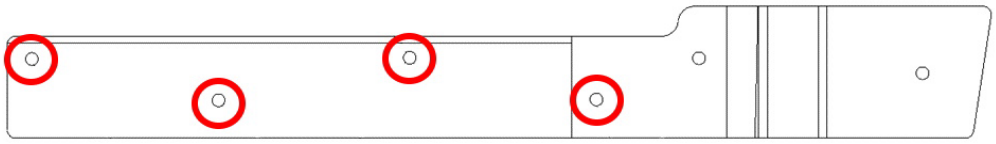

Figure 17: Match Drill Diagram - #40 Bit

6. After drilling the holes, use clecos to secure the reinforcement splice part to the aircraft as shown in Figure 18.

Figure 18: Cleco Reinforcement Angle Splice onto aircraft

7. Use two clamps to secure the aft portion of the tail cone reinforcement splice for match drilling.

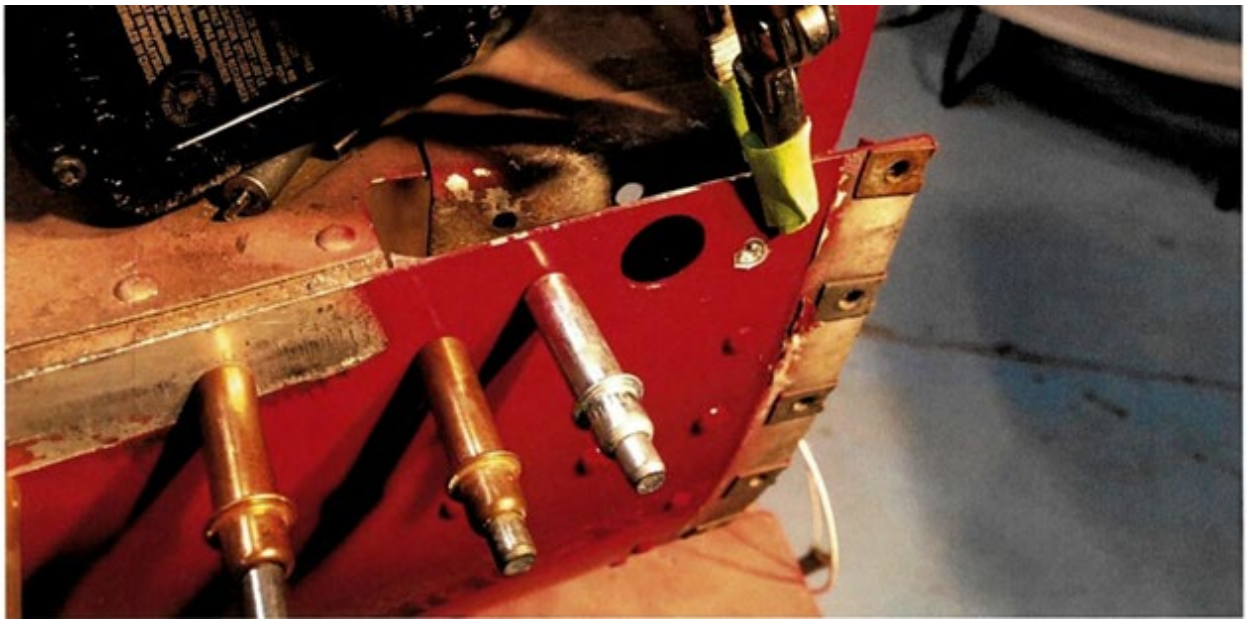

Figure 19: Clamp aft end of Splice to aircraft

8. Using a #30 drill bit, match drill the aft hole in the tail cone reinforcement splice. After match drilling with a #30 drill bit. Run the supplied #19 drill bit through the aft hole as shown in Figure 21.

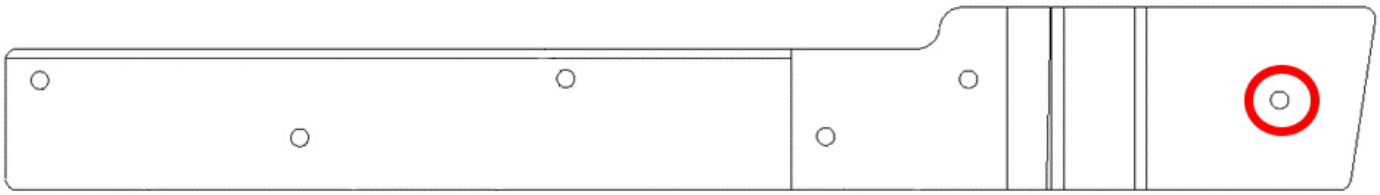

Figure 20: Match Drill Diagram – Most Aft Hole

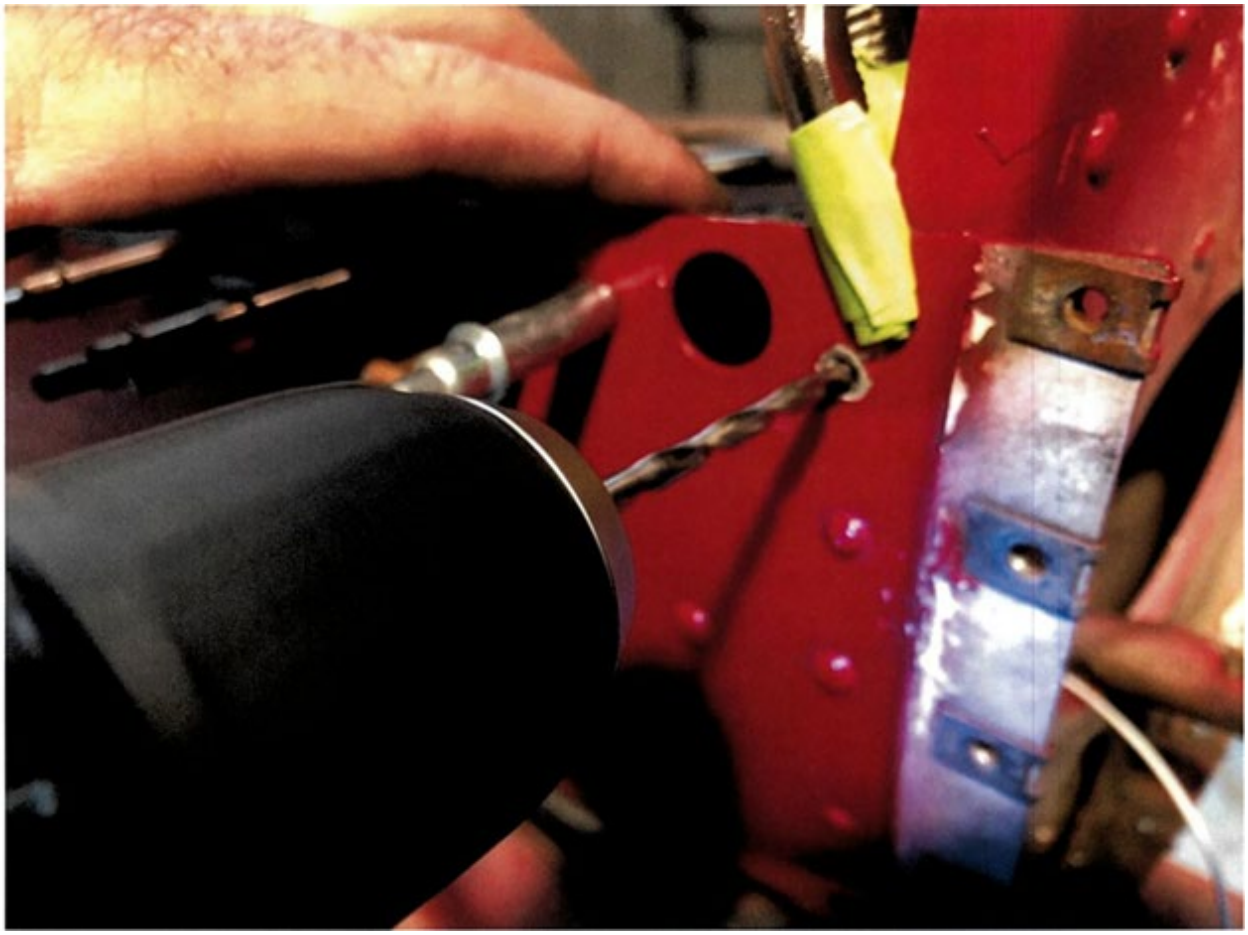

Figure 21: Drill aft tail cone reinforcement hole

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

9. Enlarge the second hole from the aft end from a #30 hole to a number #21 hole using the supplied #21 drill bit and install cleco.

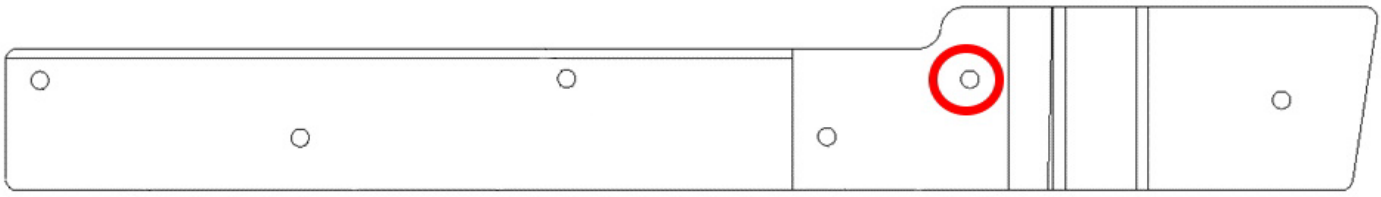

Figure 22: Match Drill Diagram – Second Aft Hole

10. Enlarge the most aft counter sunk #40 hole in steps, first using the supplied #30 drill bit and then the supplied #19 bit. Install cleco to secure.

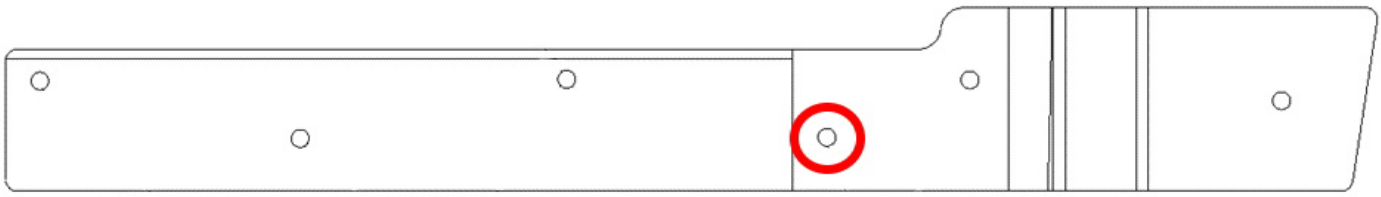

Figure 23: Match Drill Diagram – Third Aft Hole

11. Drill countersunk rivet hole in reinforcer splice. One at a time, remove clecos from remaining forward three holes and drill with the #30 supplied drill bit. Replacing clecos as you go.

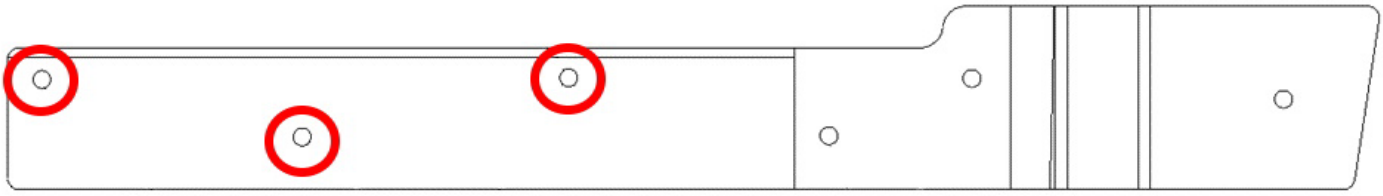

Figure 24: Match Drill Diagram – Countersunk Rivet Holes

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

12. Remove the tail cone reinforcement angle splice and deburr all the holes as shown in Figure 25.

Figure 25: Deburr Angle Splice Holes

13. Reinsert the tail cone reinforcement angle splice and temporally secure with clecos. Wet coat holes and fasteners with a corrosion preventative primer before installing fasteners. Insert an AN525-832R8 bolt (the shorter one) into the far aft tail cone reinforcement angle hole along with an AN960-8 washer and a MS21043-08 nut. Tighten the nut securely. Insert an MS20470AD5-7 rivet* into the second from the aft rivet hole and secure it with a pneumatic rivet gun and appropriate bucking bar as shown in Figure 26.

*For 1961 C180/185 and later use an MS20470AD5-8

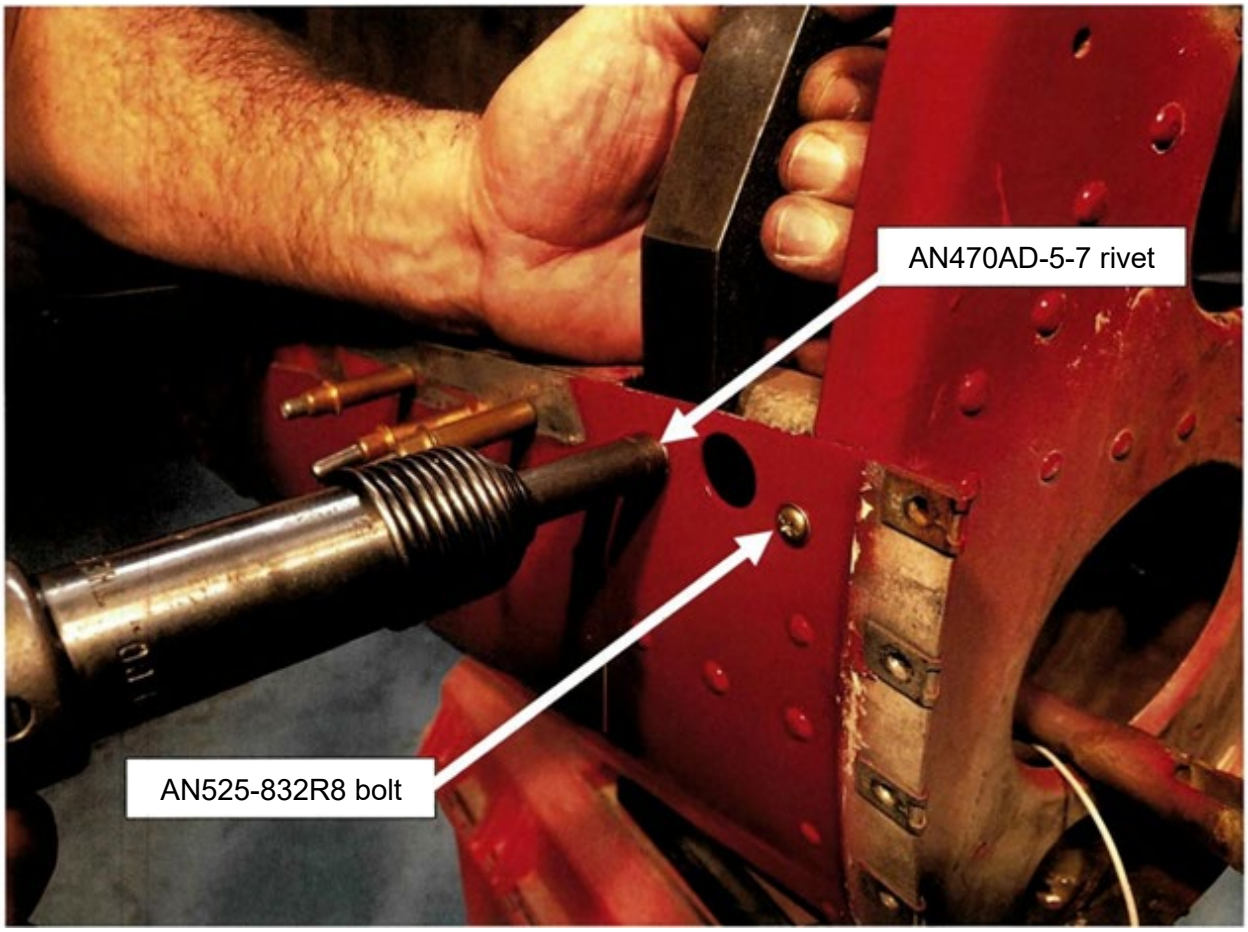

Figure 26: Rivet Reinforcement Angle Splice

14. Your aircraft should now look like Figure 27.

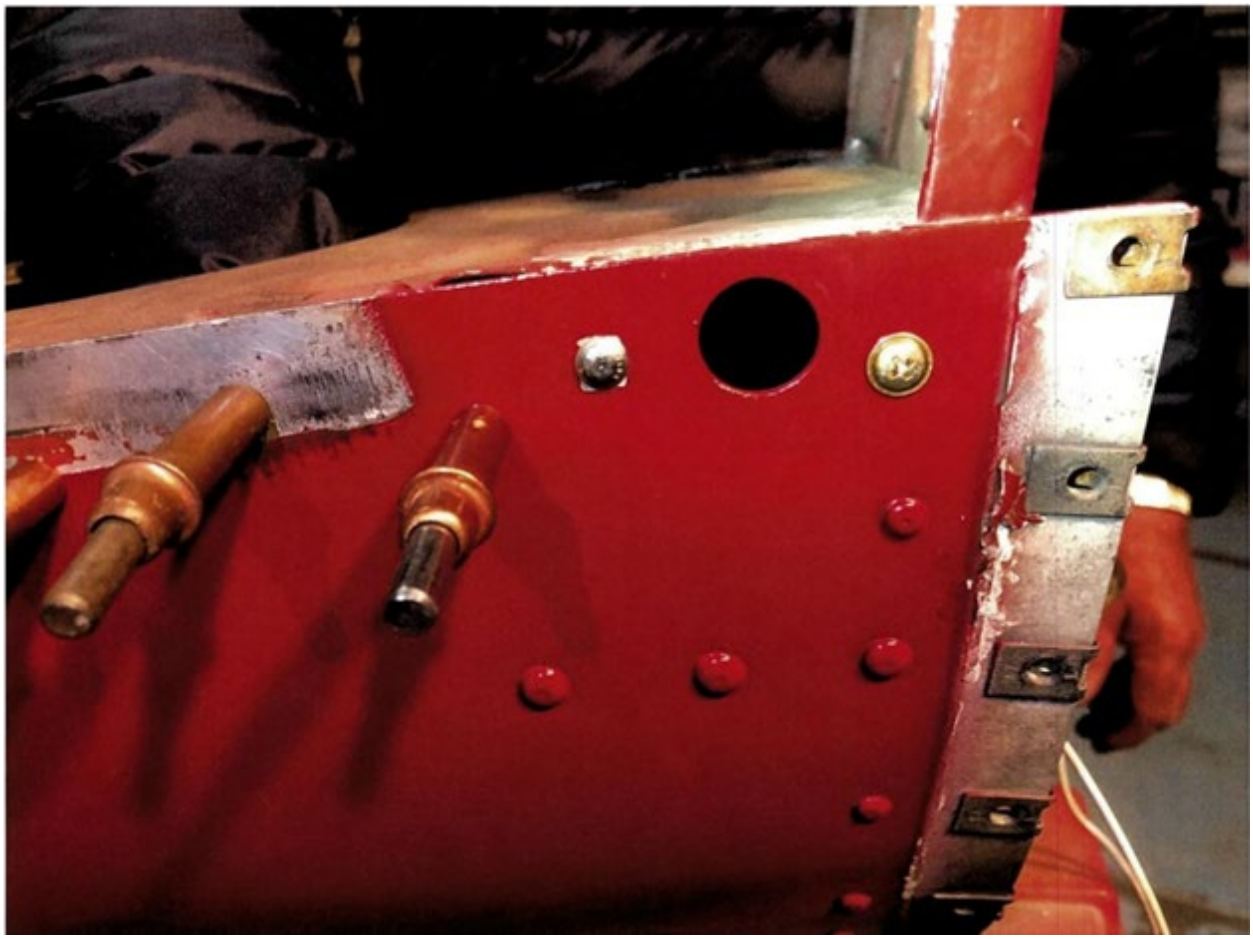

Figure 27: View after AN525-832R8 bolt and MS20470AD5-7 rivet installed

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

15. Remove the cleco from the most aft countersunk hole, and insert an AN525-832R10 bolt (the long one) in the hole. This is the hole you just opened up with the #19 drill bit in step 10. Insert an AN960-8 washer and a MS21043-08 onto the back side of the bolt and tighten until secure.

16. For the last three rivet holes, proceeding one at a time, remove cleco, insert an appropriately sized MS20426AD4-6, -7, or -8 flush head rivet (all supplied in kit) into the rivet hole, and secure with a pneumatic rivet gun and appropriate bucking bar. Repeat for remaining two holes. Your aircraft should now look like the image in Figure 28.

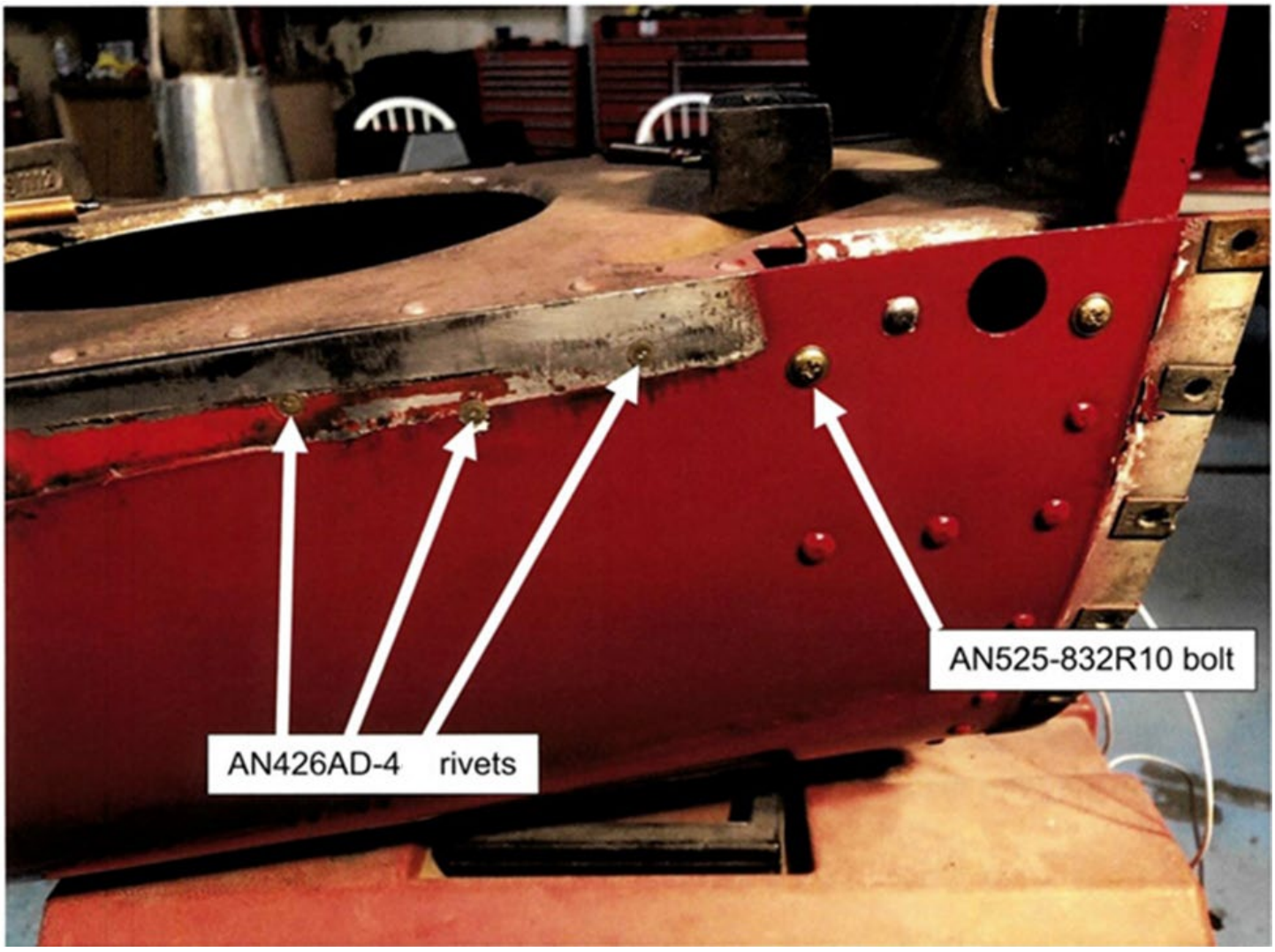

Figure 28: View after installing AN525-832R10 bolt and three MS20426AD4 flush head rivets

17. Now it is time to drill a pilot hole in the tail cone reinforcement angle splice for the horizontal stabilizer rear pivot with the supplied drill guide assembly. Insert the drill guide assembly as shown in Figure 29.

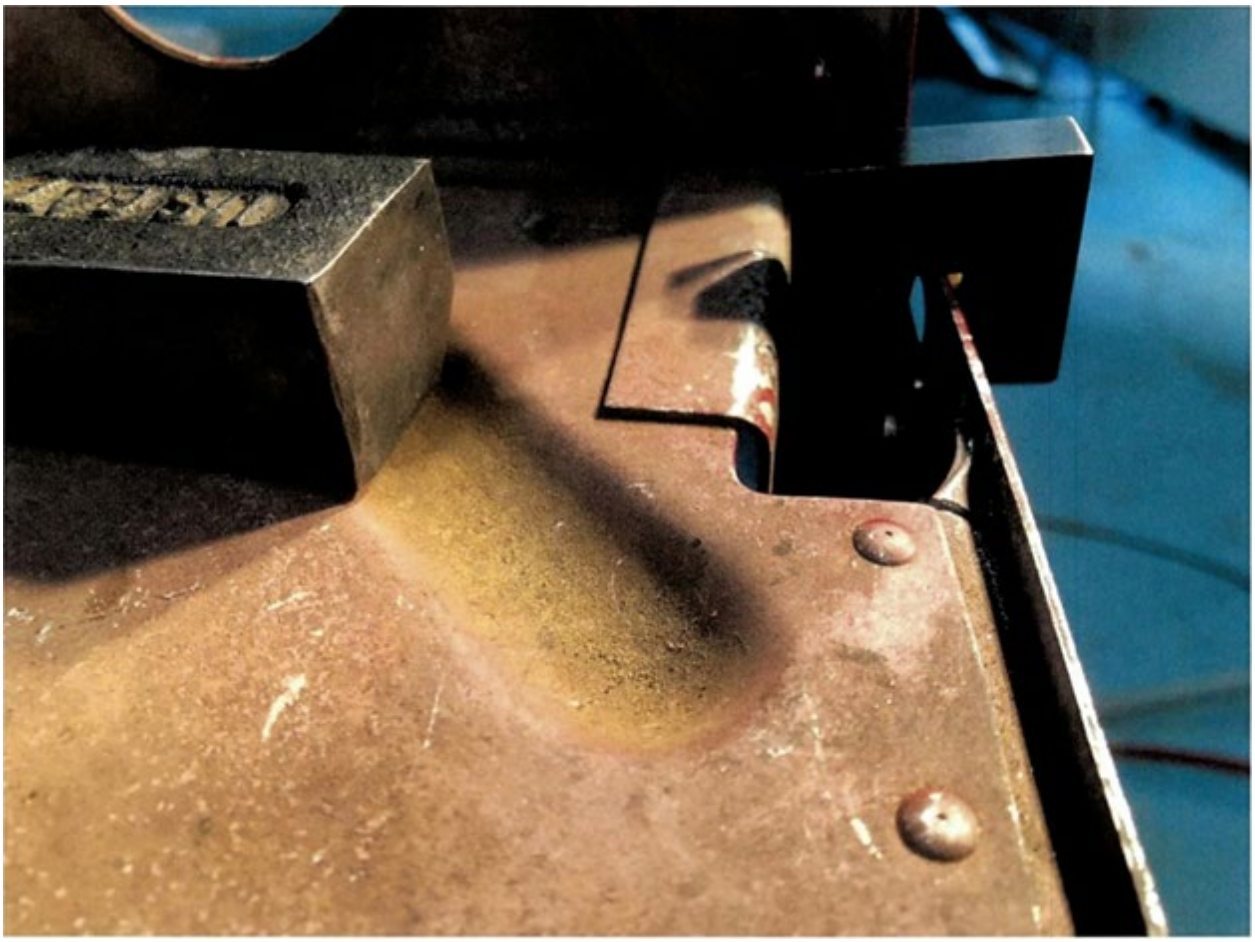

Figure 29: Insert drill guide assembly

18. Using the supplied hex key and box wrench, insert the drill guide shoulder bolt into the drill guide assembly from inside the tail cone through the existing horizontal stabilizer pivot hole as shown in Figure 30.

Figure 30: Insert drill guide shoulder bolt

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

19. Using a #40 drill bit, drill a pilot hole through the tail cone reinforcement angle splice using the installed drill guide fixture as shown in Figure 31.

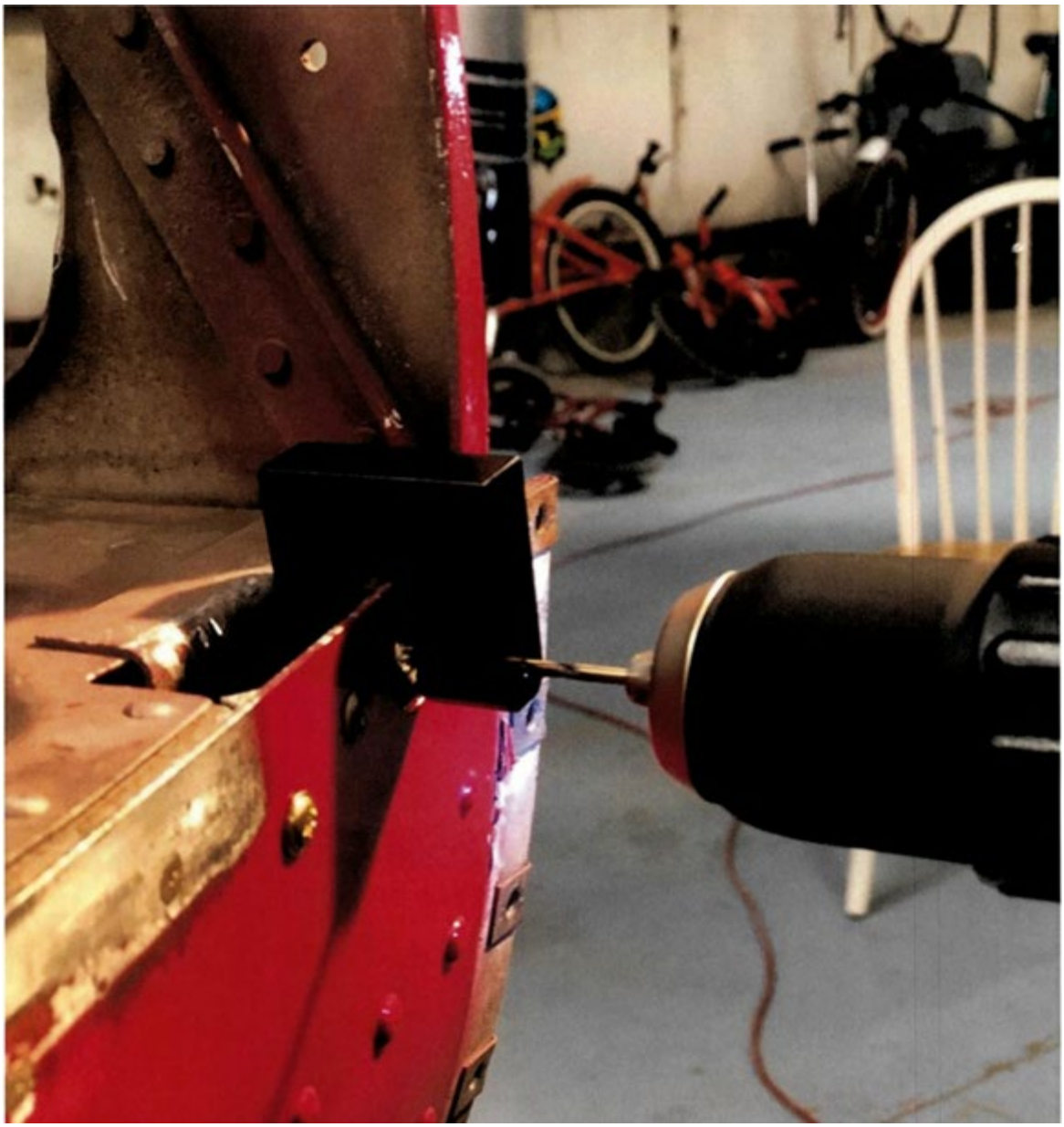

Figure 31: Drill pilot hole through reinforcement splice

20. Remove the drill guide fixture and open up the pilot hole with the supplied 15/64" diameter drill bit as shown in Figure 32. Align the drill bit to be perpendicular to the inner bracket.

Figure 32: Open up pilot hole

McFarlane Aviation, LLC.
696 E 1700 RD
Baldwin City, KS 66006

785-594-2741
785-594-3922 Fax
www.mcfarlaneaviation.com
sales@mcfarlaneaviation.com

21. Using the supplied ¼" diameter reamer, ream the 15/64" hole as shown in Figure 33.

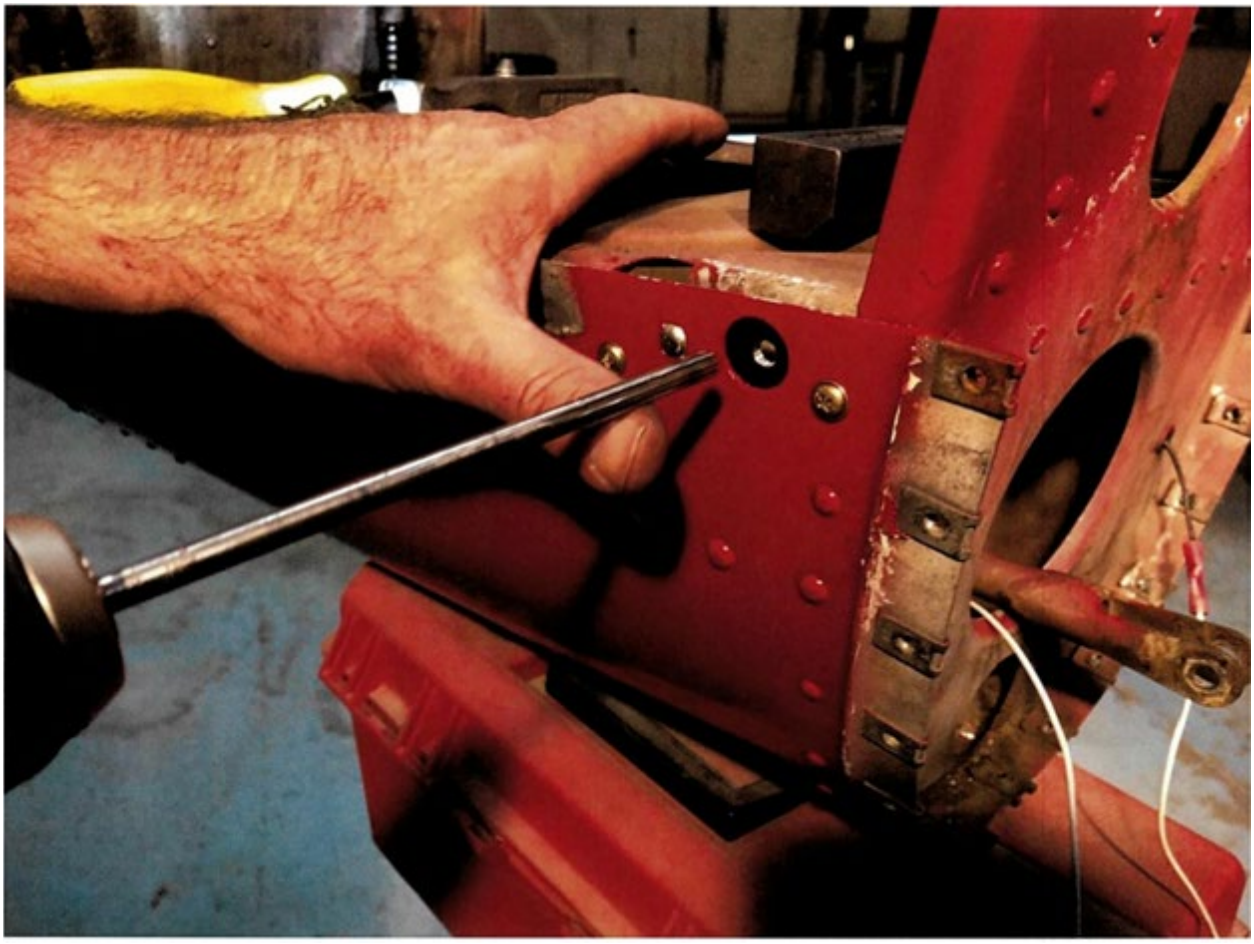

Figure 33: Ream Pivot Hole

22. Using the ¼" diameter reamer continue to ream through the inboard horizontal stabilizer pivot hole as shown in Figure 34.

Figure 34: Ream inboard stabilizer pivot hole

23. Your aircraft should now look like Figure 35.

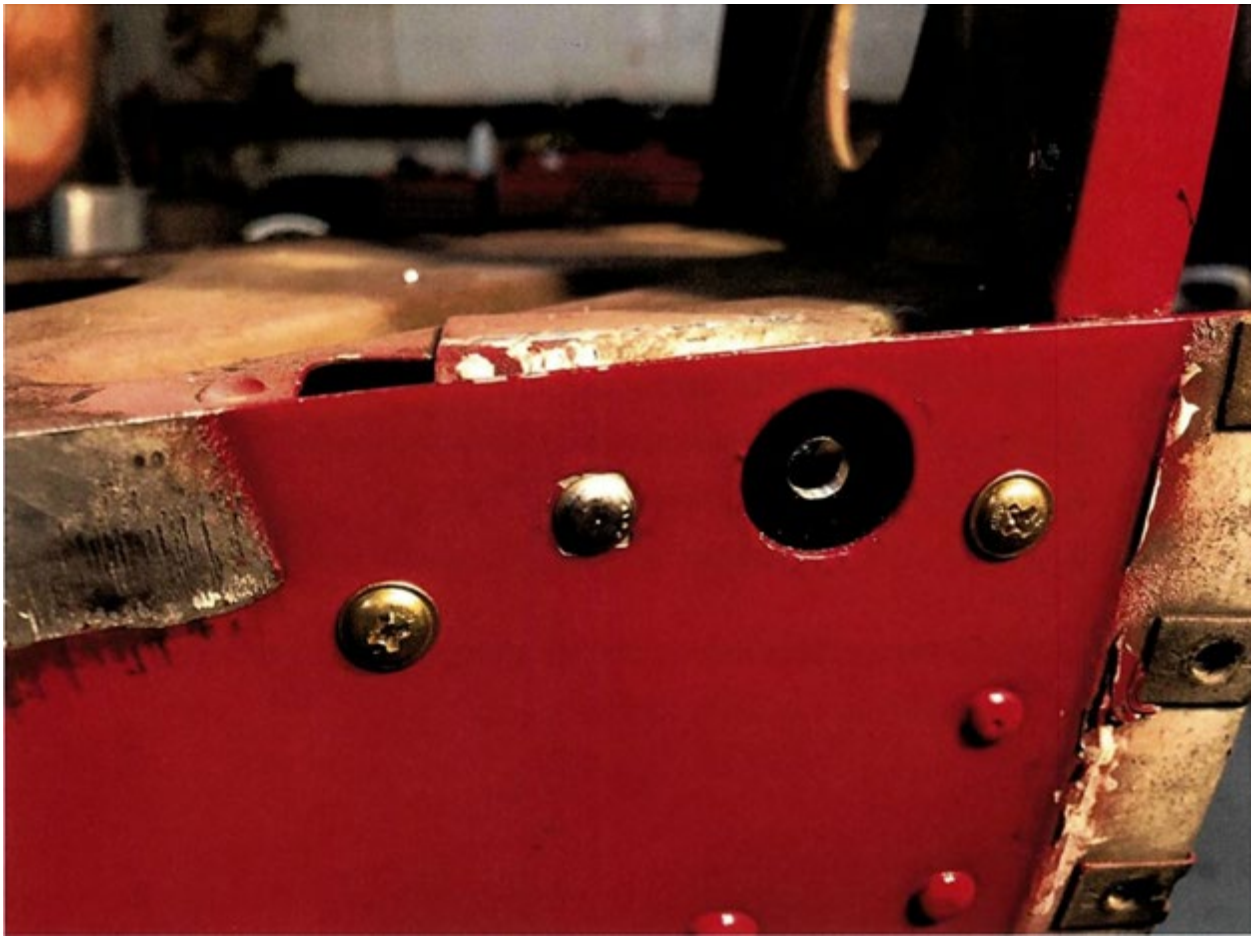

Figure 35: View of finished Reinforcement Splice Installation

24. Repeat all the steps in sections 3.3 and 3.4 on the opposite RH side of the aircraft so that both sides have the tail cone reinforcement angle splice installed.
25. Reinstall the horizontal stabilizer and elevator using new hardware as needed.
26. Reconnect the elevator bell crank tube to the elevator pylon.
27. Reinstall the vertical stabilizer and rudder using the same hardware used when it was removed.
28. Reconnect the rudder control cables to the rudder bell crank.
29. Reinstall all fin and horizontal stabilizer tail fairing as needed.
30. Reconnect electrical power to the aircraft.

31. Fill out a 337 form for the aircraft log book documenting the installation of this STC.
32. All assembly, rigging, and testing for proper operation must be done in accordance with the appropriate Cessna Service Manual.

4 Weight and Balance

The Tail Cone Reinforcement Angel Splice STC exchange weight is negligible therefore no changes to the aircraft Weight and Balance is required after installing this STC.

5 Trouble Shooting

Section to be updated with common Problems and Corrections if necessary when and if arise when more kits are installed in the field.