

REVISION LIST

CHAPTER 13: FIREWALL FORWARD (PART 1)

The following list of revisions will allow you to update the Legacy construction manual chapter listed above.

Under the “Action” column, “R&R” directs you to remove and replace the pages affected by the revision. “Add” directs you to insert the pages shows and “R” to remove the pages.

PAGE(S)AFFECTED	REVISION # & DATE	ACTION	DESCRIPTION
13-1	1/09-18-02	R&R	Part # correction
13-2	1/09-18-02	R&R	Part # correction
13-3 through 13-9	0/02-15-02	None	Current revision is correct
13-10 through 13-11	1/09-18-02	R&R	Text correction
13-12	1/09-18-02	R&R	Part # Corrections
13-13	1/09-18-02	R&R	Text Correction
13-14	1/09-18-02	R&R	Part # Correction
13-15	1/09-18-02	R&R	Correction of fig. 13:E:1
13-16	1/09-18-02	R&R	Part # Correction
13-17	1/09-18-02	R&R	Part # Correction
13-18	1/09-18-02	R&R	Part # Correction
13-19	1/09-18-02	R&R	Text and Fig 13:F:3 Correction
13-20	1/09-18-02	R&R	Correction of fig. 13:F:4
13-21	1/09-18-02	R&R	Correction of fig. 13:F:5
			Text correction
13-22	1/09-18-02	R&R	Text correction
13-23 through 13-26	0/02-15-02	None	Current Revision is Correct
13-1	2/06-30-04	R&R	Deleted items from parts list.
13-10	2/06-30-04	R&R	Added instruction.
13-11	2/06-30-04	R&R	Added instruction.
13-13	2/06-30-04	R&R	Updated instructions. Added photo.
13-15	2/06-30-04	R&R	Updated part numbers.

<u>PAGE(S) AFFECTED</u>	<u>REVISION # & DATE</u>	<u>ACTION</u>	<u>DESCRIPTION</u>
13-17	2/06-30-04	R&R	New figure 13:F:2 - Nose gear plunger.
13-21	2/06-30-04	R&R	Updated gear door information.
13-22	2/06-30-04	R&R	Updated gear door information.
13-23	2/06-30-04	R&R	Updated gear door spring information.
13-24	2/06-30-04	R&R	Updated gear door plunger information.
13-25	2/06-30-04	R&R	Updated gear door bracket information.
13-26	2/06-30-04	R&R	Updated figure 13:G:1.
13-2	3/12-15-04	R&R	Updated parts list.
13-18	3/12-15-04	R&R	Intentionally blank due to new nose gear door plunger.
13-19	3/12-15-04	R&R	New dimension and instructions.
13-22	3/12-15-04	R&R	Added photo.
13-23	3/12-15-04	R&R	Corrected geometry.
13-24	3/12-15-04	R&R	Updated photo.
13-1 thru 13-2	4/09-29-06	R&R	Corrected parts list.
13-6	4/09-29-06	R&R	Updated torque for engine mount to firewall.
13-10 thru 13-11	4/09-29-06	R&R	Added washers between engine mount and firewall.
13-12	4/09-29-06	R&R	Corrected drawing and added update.
13-1, 13-2, 13-12	6/08-10-07	R&R	Part number change only.
13-2, 13-11, 13-12, 13-14, 13-15, 13-17, 13-18, 13-23, 13-24, 13-25,	6/08-10-07	R&R	Parts changed and new nose gear assembly.
13-2, 13-14b	7/09-10-08	R&R	New page for alternative nose gear installation and update to the parts list.

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1. INTRODUCTION

Chapter 13 covers both the Lycoming 540 and Continental 550 engine mount installations. The subtle differences are pointed out. The main purpose of this chapter is to get your airplane on 3 wheels so you can move it around as needed. After this chapter, the aircraft alignment jig is no longer needed. The firewall forward installation is completed in chapter 26.

2. PARTS LIST

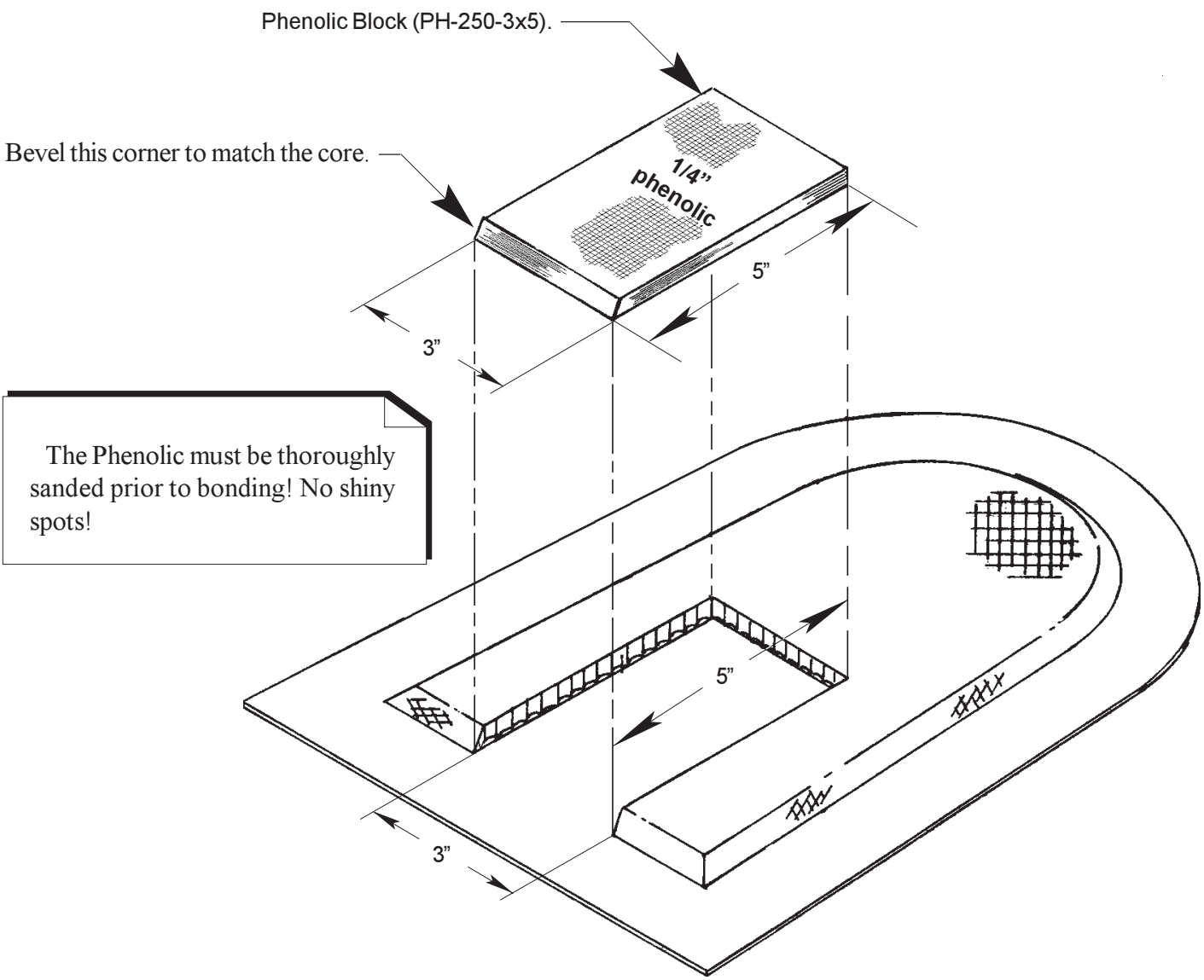
#	PART NO. (P/N)	QTY	DESCRIPTION	OPTIONAL ITEM <i>(not included with kit)</i>
FIREWALL CLOSEOUT				
1)	4023	1	Nose Gear Tunnel Closeout	
2)	PH-250-3x5	1	Phenolic Block	
FIREWALL FLAME BLANKET				
1)	FFB-002	1	Firewall Flame Blanket	
2)	PH-125-4x6	1	Phenolic Block	
3)	RTV-106	1	Silicon, High Temperature	
LYCOMING 540 - ENGINE MOUNT INSTALLATION				
1)	4070	1	Support, Engine Mount	
2)	4861	1	540 Engine Mount	
3)	AN7-25A	3	Bolts, Undrilled	
4)	AN7-13A	2	Bolts, Undrilled	
5)	AN4-10A	4	Bolts, Undrilled	
6)	AN4-11A	4	Bolts, Undrilled	
7)	AN365-720A	5	Nut, Nylock	
8)	AN365-428A	4	Nylock Nut	
9)	PH-250-2x2	1	Phenolic Block	
10)	AN970-7	5	Washer, Large Area	
11)	AN970-4	4	Washer, Large Area	
12)	AN960-416	4	Washer, Flat	
13)	AN960-716	10	Washer, Flat	
CONTINENTAL 550 - ENGINE MOUNT INSTALLATION				
1)	4860	1	550 Engine Mount	
2)	AN4-10A	4	Bolts, Undrilled	
3)	AN4-11A	4	Bolts, Undrilled	
4)	AN7-15A 13A	2	Bolts, Undrilled	
5)	AN7-25A	2	Bolts, Undrilled	
6)	AN365-428A	4	Nylock Nut	
7)	AN365-720A	4	Nut, Nylock	
8)	AN970-4	4	Washer, Large Area	
9)	AN970-7	4	Washer, Large Area	
10)	AN960-416	4	Washer, Flat	
11)	AN960-716	10	Washer, Flat	

#	PART NO. (P/N)	QTY	DESCRIPTION	OPTIONAL ITEM	#	PART NO. (P/N)	QTY	DESCRIPTION	OPTIONAL ITEM
(not included with kit)					(not included with kit)				
550/540 - NOSE GEAR INSTALLATION					NOSE WHEEL & TIRE				
1)	4701	1	Nose Gear w/ Fork and Bushing	(or alternative part 432-0005)	1)	4785	1	Anti-tube-pincher-deal™	
2)	4717-01	1	Nose Gear Bearing Block, Left		2)	AN4- 47A 51A	1	Bolt, Undrilled	
3)	4717-02	1	Nose Gear Bearing Block, Right		3)	AN3-3A	4	Bolt, Undrilled	
4)	433-0001 4721	2	Over-center Link Arms		4)	AN365-428A	5	Nut, Nylock	
5)	4722	2	Bushing		5)	430-0000 FR-5 x 8 PLY	1	Tire	
6)	4736	1	Nose Gear Ball Stud		6)	TU-5.00-11 x 4	1	Tube	
7)	F45-19	1	Bearing, Rod End		7)	AN960-416	10	Washer, Flat	
8)	AN3-10A	3	Bolt, Undrilled		8)	AN960-10	4	Washer, Flat	
9)	AN3-12A	4	Bolt, Undrilled		9)	59-3M-LA GM035-2	1	Wheel, Nose	
10)	AN4-11A	4	Bolt, Undrilled	(**Yes 2 with tow bar plate)	10)	Z02E276	1	Axle	
11)	AN4-12A	9	Bolt, Undrilled	(**Yes 2 with tow bar plate)	11)	GM038	1	Axle bushing	
12)	AN4-13A	2	Bolts, Undrilled (With Tow Bar Plate Option)	**Yes	NOSE GEAR DOORS (Obsolete parts were removed from this list due to space constraints.)				
13)	AN5-7	1	Bolt, Undrilled		1)	6061-T6	6 ft	1 1/4" x 1 1/4" x 1/8" Gear Door Rails (approx. 36")	
14)	AN5-41A	1	Bolt, Undrilled		2)	GM318-01	2	Gear Door, Nose (approx. 35")	
15)	112-0026 6381K103	2	Bushing		3)	GM320-36	2	Aluminum Gear Door Stiffener (34")	
16)	RR-01	2	Circlip		4)	MS20001	2	Hinge, Piano (34")	
17)	198-0004 9416K77	2	Clip, Safety		5)		1	Phenolic crush plate, 3" x 1.125"	
18)	MS24665-140	3	Cotter Pin		6)	240-0001	1	Nose gear door assembly	
19)	HC-08	1	Hydraulic Cylinder, Nose Gear		7)	AN3-6A	1	Bolt, 10-32 x 25/32	
20)	AN363-1032	7	Lock Nut, All Metal		8)	AN960-10L	4	Washer, lite 3/16	
21)	AN363-428A	2	Lock Nut, All Metal		9)	HFC-3AU	12	Female rod ends	
22)	AN363-524	2	Lock Nut, All Metal		10)	BJ-04	2	Rod ends	
23)	AN365-428A	5	Nut, Nylock		11)	AN3-7A	7	Bolt	
24)	AN310-5	3	Nut, Castle		12)	AN315-3	2	Checknuts	
25)	AN316-5	1	Nut, Check		13)	209-0018	2	Bracket	
26)	198-0003 9416K71	2	Socket, Steel Ball		14)	AN3-10A	4	Bolt, Undrilled	
27)	160-0002 9416K15	1	Strut, Gas		15)	AN5-20	2	Bolt, Drilled	
28)	198-0006 9512K73	1	Stud, Ball		16)	AN363-1032	4	Nut, Lock (All metal)	
29)	TB-1-03	1	Tow Bar Plate	**Yes	17)	AN365-1032A	142	Nut, Nylock	
30)	TB-1	1	Tow Bar	**Yes	18)	K1000-3	22	Nutplate	
31)	AN960-10	20	Washer, Flat		19)	AN426A3-5	44	Rivet	
32)	AN960-10L	10	Washer, Flat		20)	AN426AD3-5	68	Rivet	
33)	AN960-416	4	Washer, Flat		21)	MS24694-S48	22	Screw	
34)	AN960-516	14	Washer, Flat		22)	MS24694-S50	4	Screw	
35)	AN960-516L	10	Washer, Flat		23)	AN526-1032R 14	42	Screw, Washer Head	
36)	110-0002	4	Washer, Thrust		24)	AN960-10	2314	Washer, Flat	
37)	212-0073	2	Keeper Plate		25)	CN614CR3P		Nutplate	
NOSE GEAR MICRO SWITCH					26)	MS24694-S51		Screw, Machine	
1)	1XE1-T	1	Micro Switch, Nose Gear		27)	AN960-10L	3	Washer, Flat	
2)	JM-1	1	Switch Arm		 13-2 Chapter 13 REV. 8/09-01-14 FIREWALL FORWARD (Part 1)				
Note: Optional Parts available through : (*) Lancair Avionics (**) Kit Components, Inc.					Lancair International Inc., Represented by Neico Aviation Inc., Copyright © 2008 , Redmond, OR 97756				

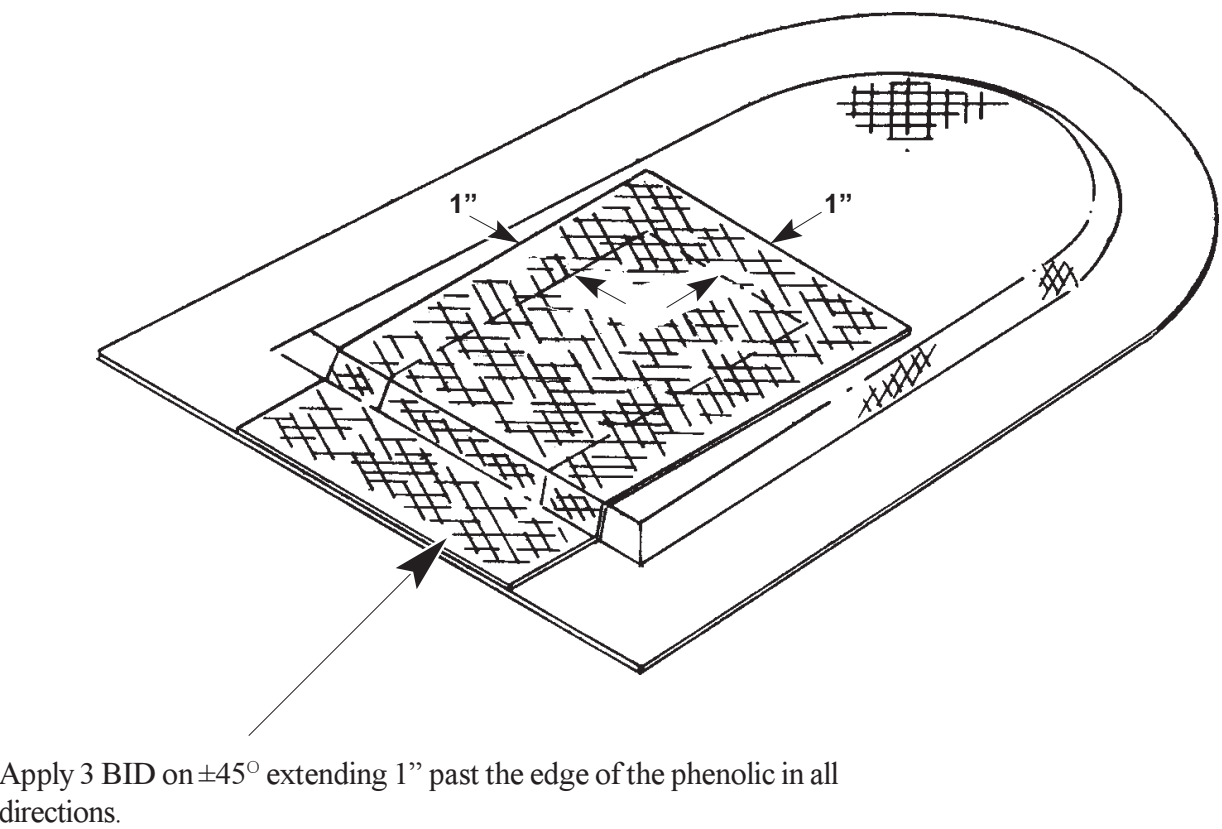
3. CONSTRUCTION PROCEDURES

A. Firewall Closeout

Firewall Closeout Hardpoint
Fig. 13:A:1

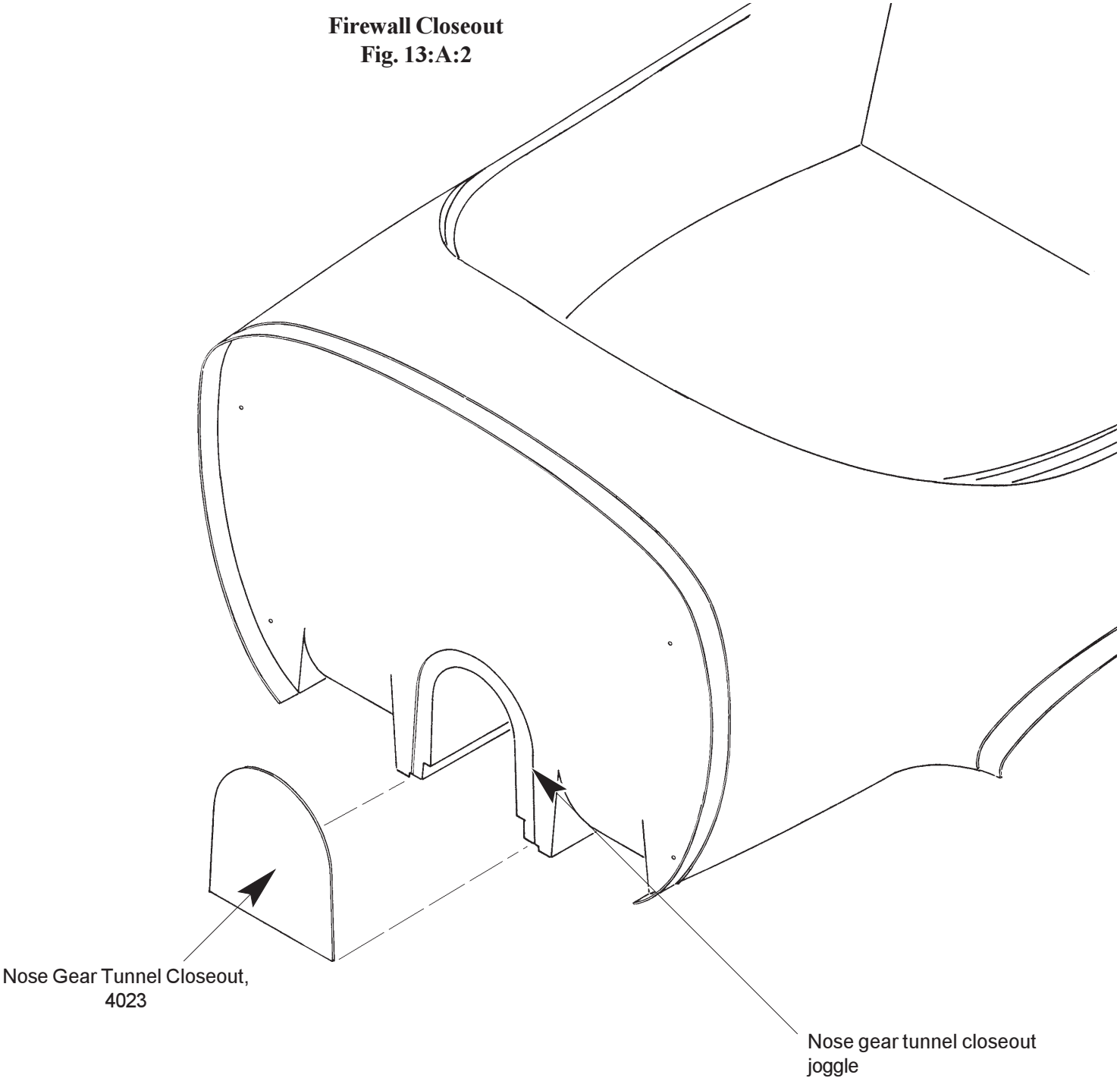


Remove a 3" x 5" section of the aft laminate and core of the nose gear tunnel closeout. Install the piece of phenolic with epoxy/flox using proper bonding procedures.



- A 1. Trim the nose gear tunnel closeout to fit the joggle on the firewall.
- A 2. Bond the nose gear tunnel closeout using epoxy/flox.

Firewall Closeout
Fig. 13:A:2

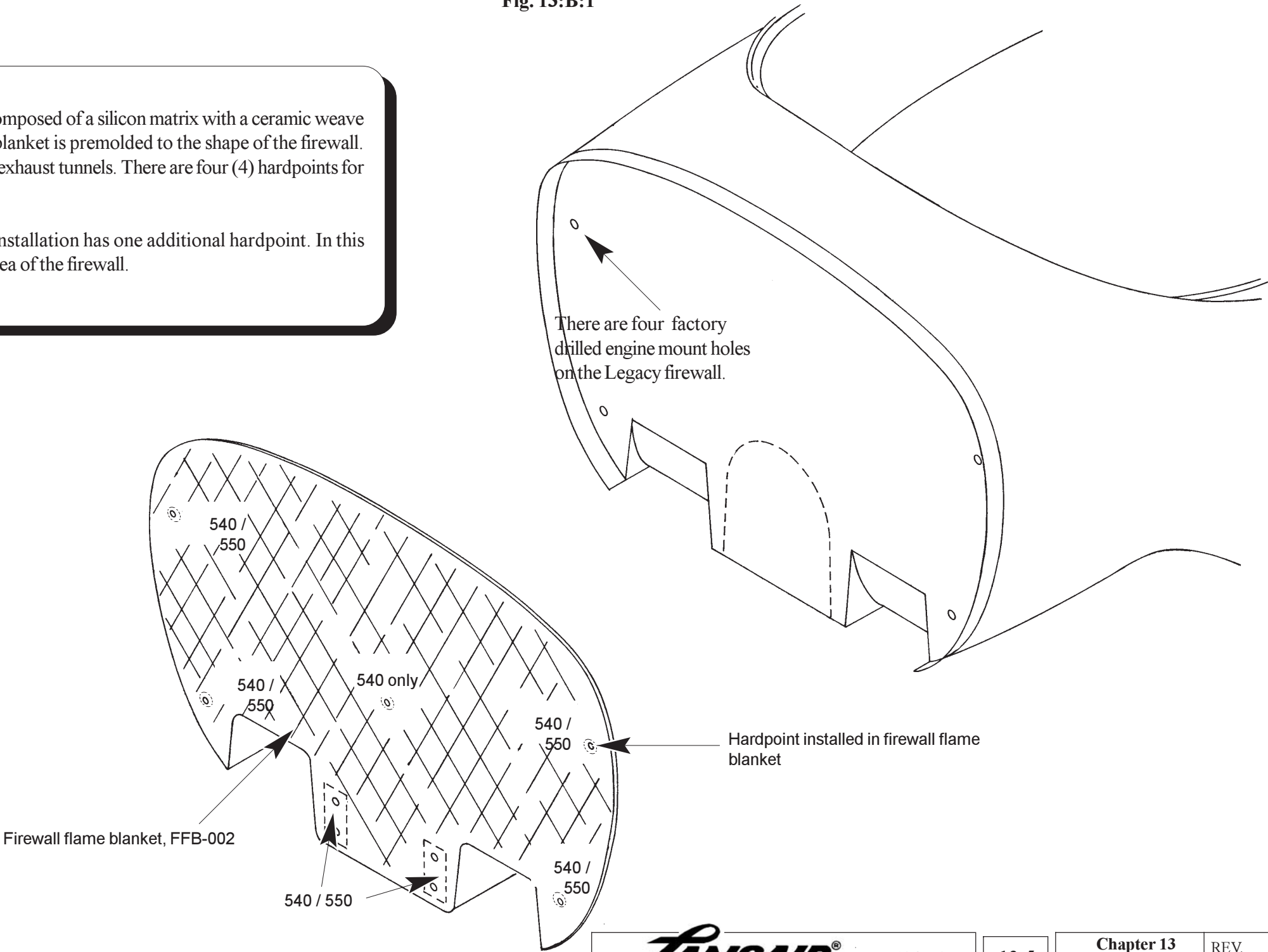


B. Firewall Flame Blanket

Firewall Flame Blanket General Overview
Fig. 13:B:1

The firewall flame blanket is composed of a silicon matrix with a ceramic weave and an aluminized surface. The blanket is premolded to the shape of the firewall. Note the preformed shape of the exhaust tunnels. There are four (4) hardpoints for the engine mount.

Note that the Lycoming 540 installation has one additional hardpoint. In this chapter, you will reinforce this area of the firewall.



Holes #1-#4 are pre-drilled on the firewall. These holes are common to both the 540 and 550 installations. Note that hole #5 is unique to the 540 installation. In this section you will drill for the nose gear brace holes and if you are installing the 540, you need to drill hole #5.

- B 1.

Install the nose gear over center link weldment (4719) on the engine mount. Refer to Figure 13:D:1. The weldment must be installed prior to drilling the holes.
- B 2.

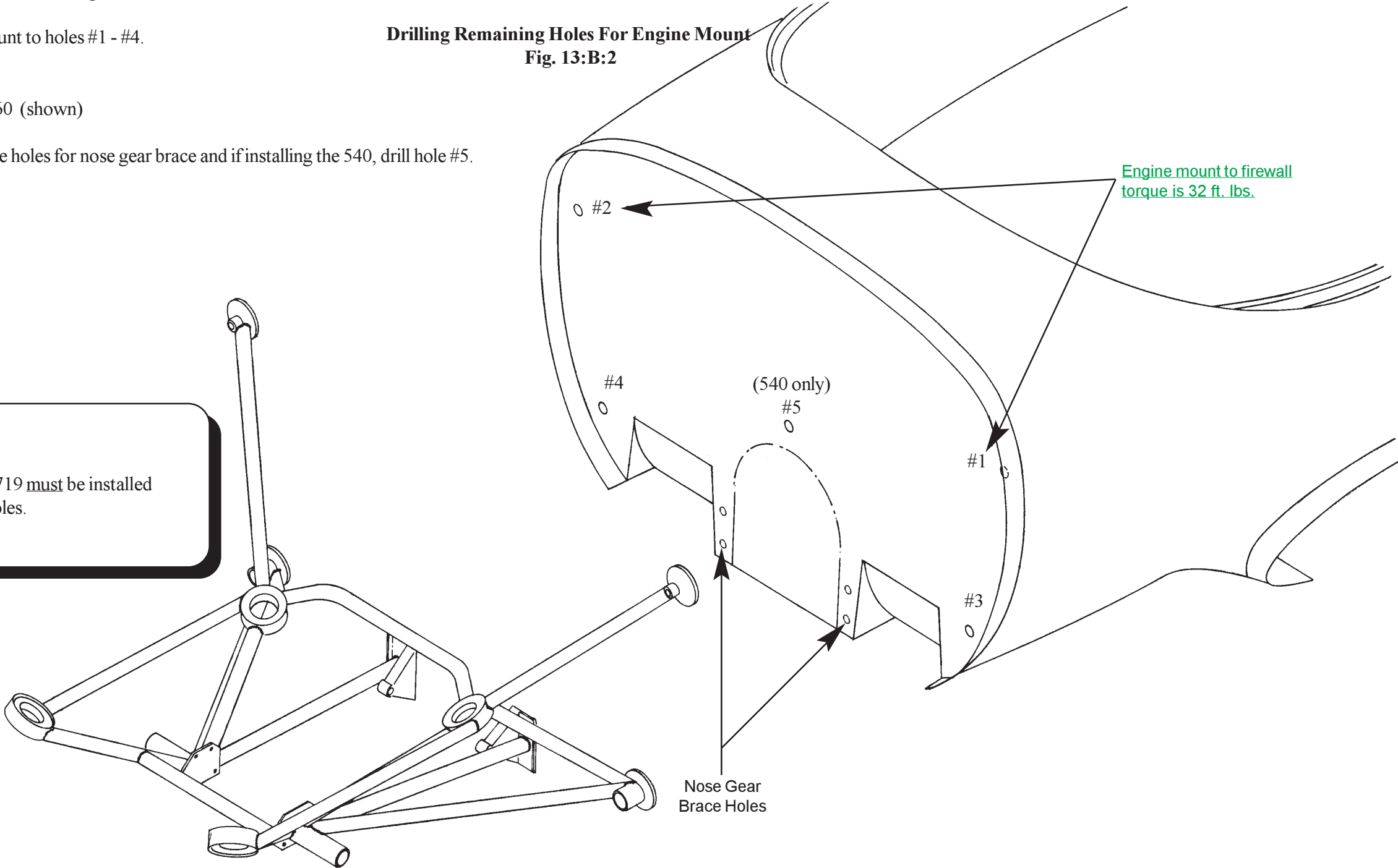
Temporarily mount the engine mount to holes #1 - #4.
Engine mount:
Lycoming 540, P/N: 4861
Continental 550, P/N: 4860 (shown)
- B 3.

Using a 1/4" diameter drill, drill the holes for nose gear brace and if installing the 540, drill hole #5.

Drilling Remaining Holes For Engine Mount
Fig. 13:B:2

WARNING

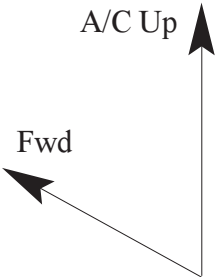
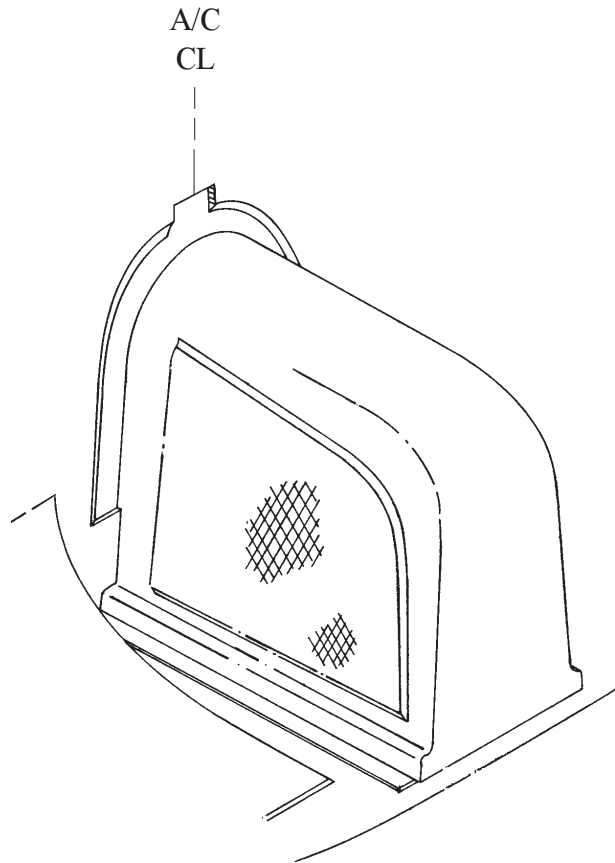
The over center link weldment P/N 4719 must be installed prior to drilling the nose gear brace holes.



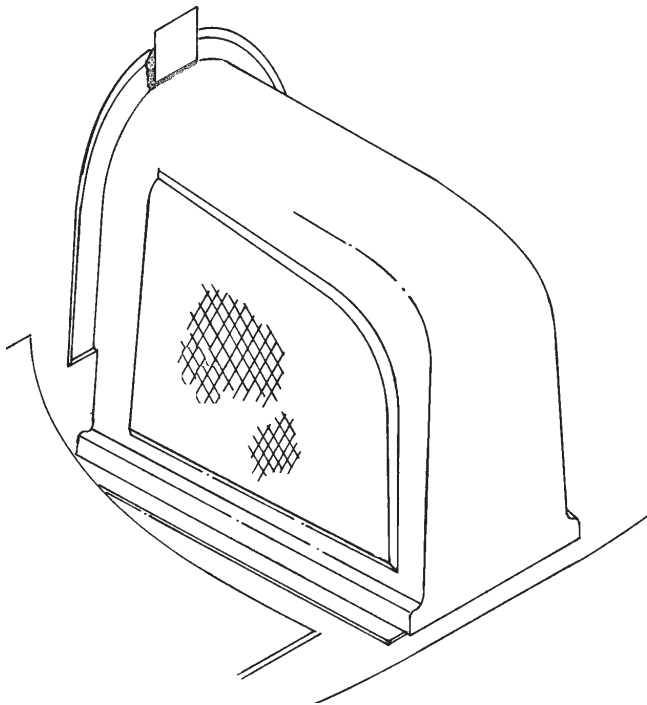
Firewall Reinforcements for 540 Installations only
Fig. 13:B:3

This page is for Lycoming 540 installation only.

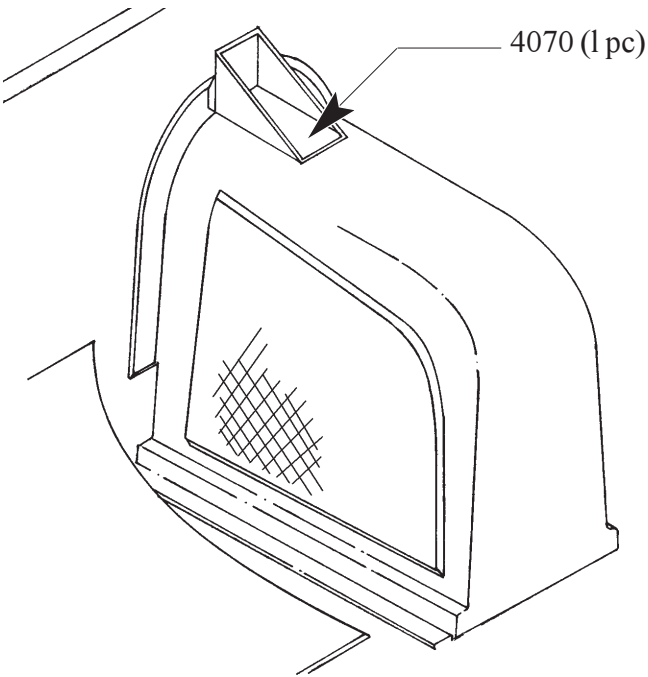
B 4. Remove a 2" x 2" section of the aft laminate and core centered on the hole.



B 5. Install a 2" x 2" x .250 piece of phenolic with epoxy/flox.



B 6. Additional engine mount for 540 installation, P/N 4070. Install with epoxy/flox.



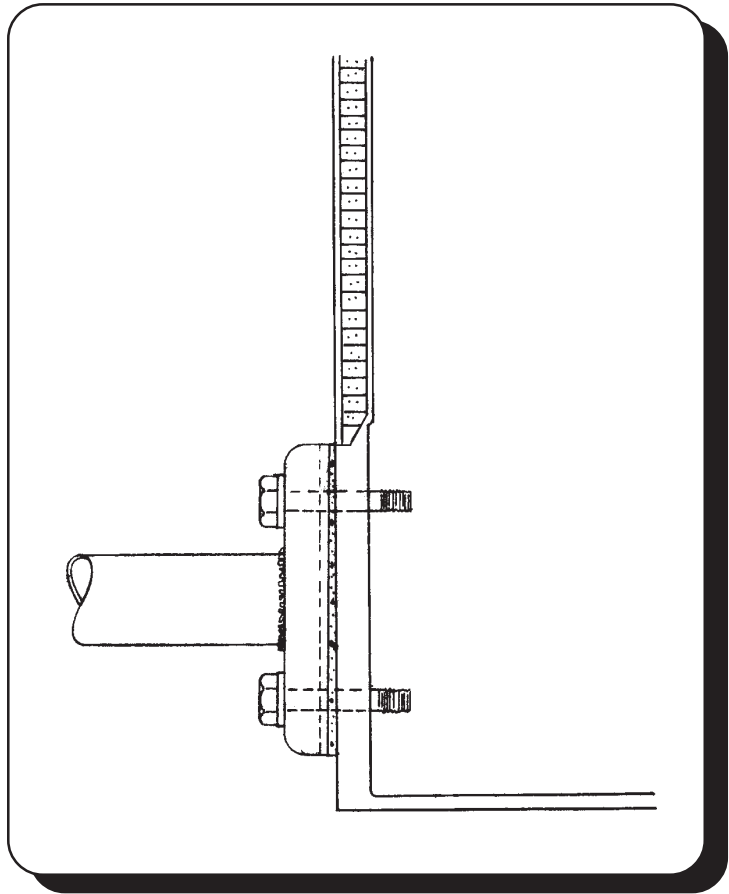
B 7. Reinstall the engine mount and drill the center hole again.

Engine Mount Spacer Bonding
Fig. 13:B:4

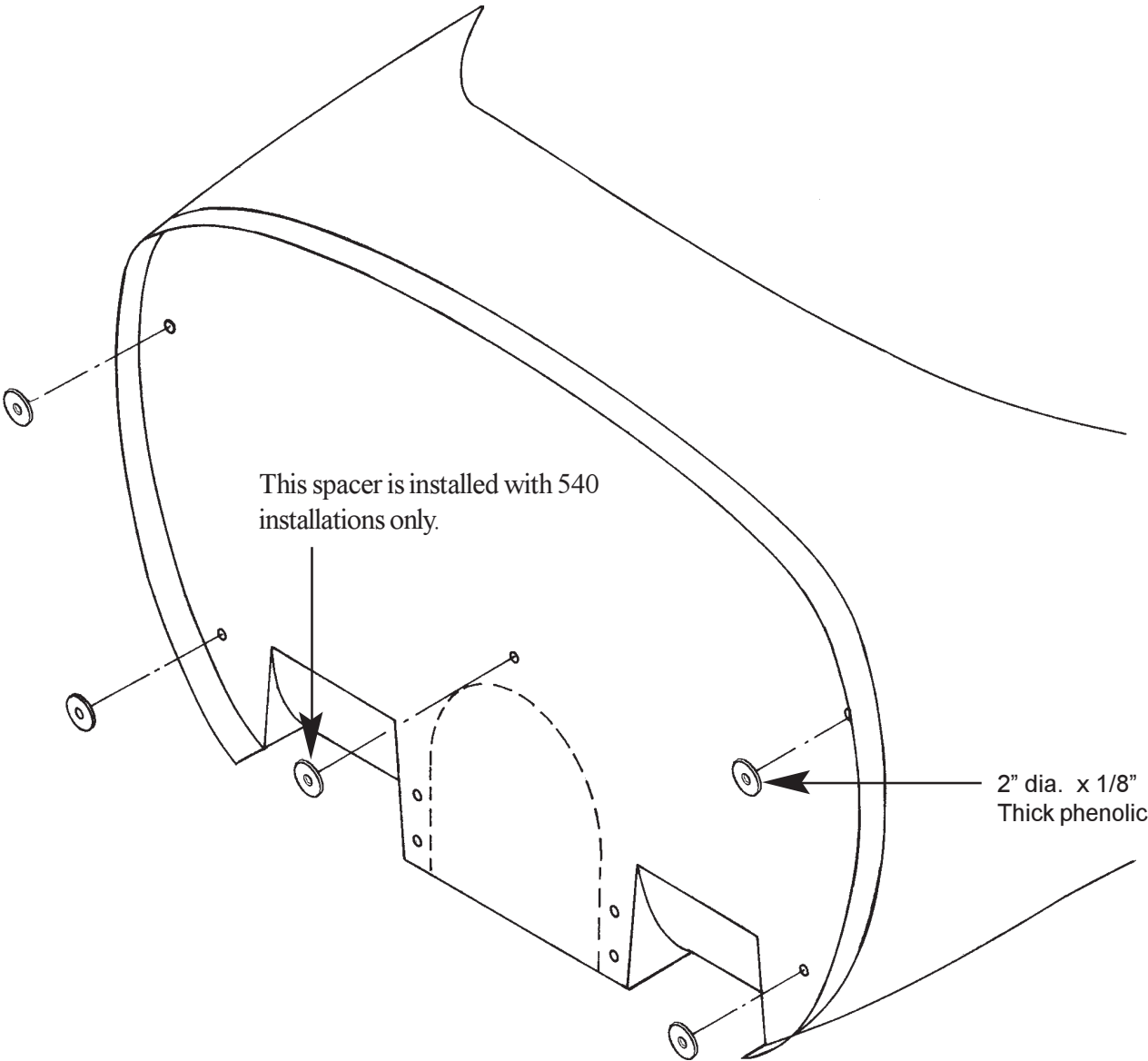
If you look on the aft side of the firewall flame blanket, you will notice seven areas with the insulation removed. To compensate for these recessed areas, we bond spacers to the firewall.

B 8. Bond the phenolic spacers in place with epoxy/flox.

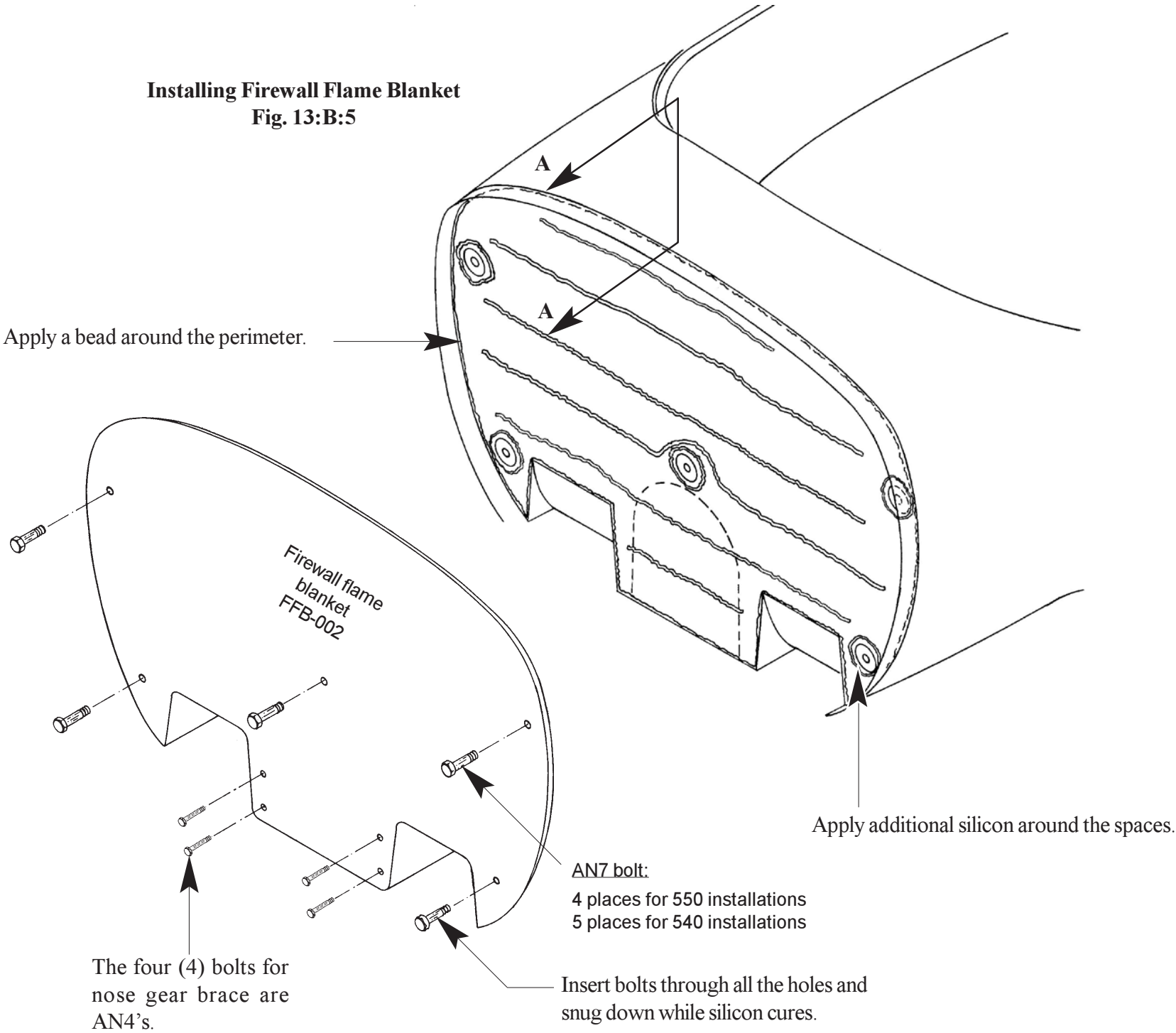
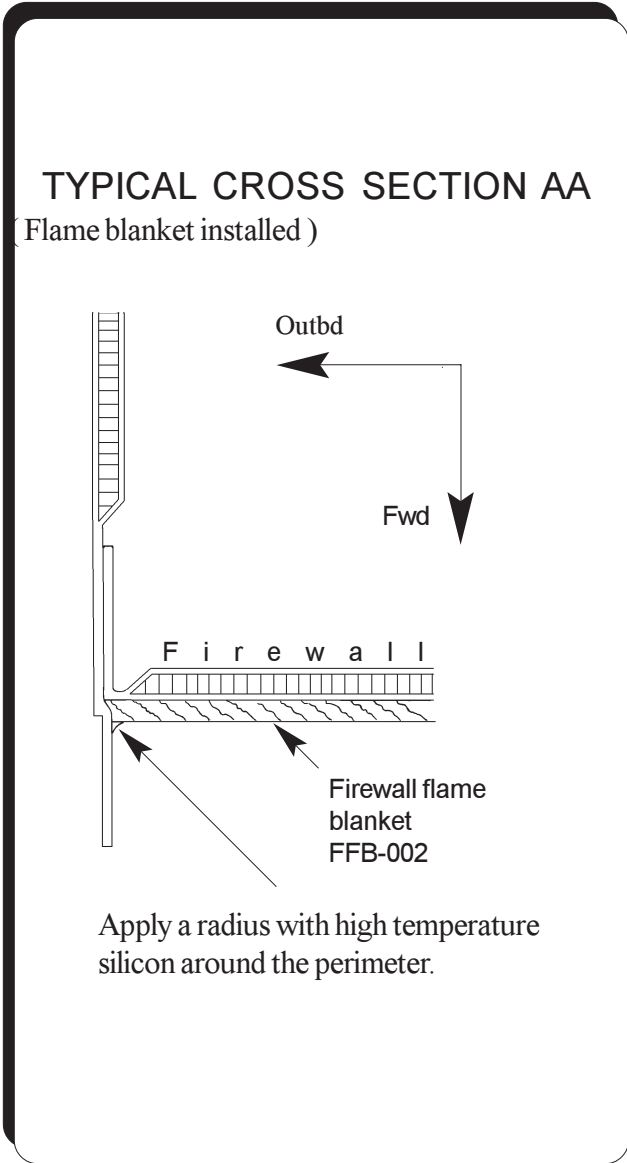
NOSE GEAR BRACE RELEASE



B 9. Install the engine mount and observe the fit of the engine mount at the nose gear brace holes. If the fit is less than perfect, we suggest that you perform a release with epoxy/flox as shown on the left. Bond the spacer in place at the same time as you make the flox pad. Insert bolts through the holes of the engine mount to properly align the spacer.



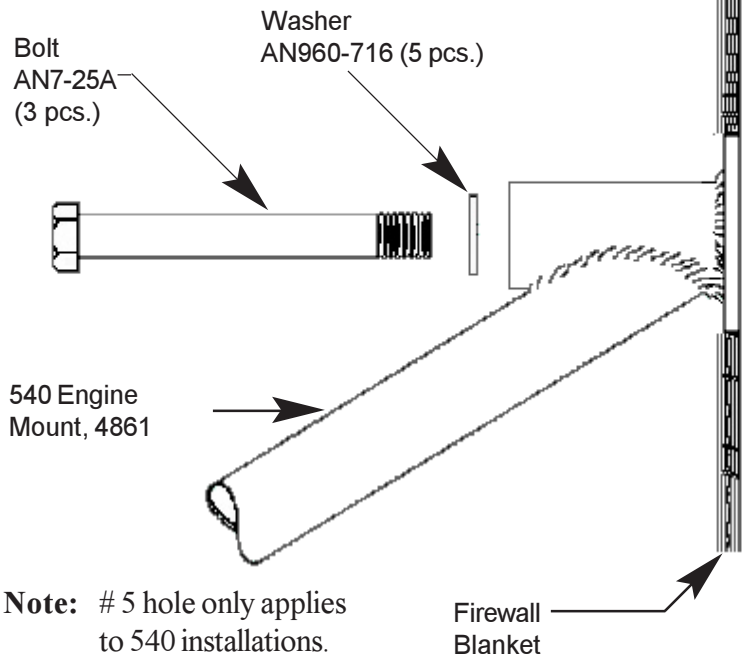
- B 10.** Prior to installing the firewall blanket, we suggest using a punch to create holes in the correct locations.
- B 11.** Apply high temperature silicon (P/N: RTV-106) to the firewall.



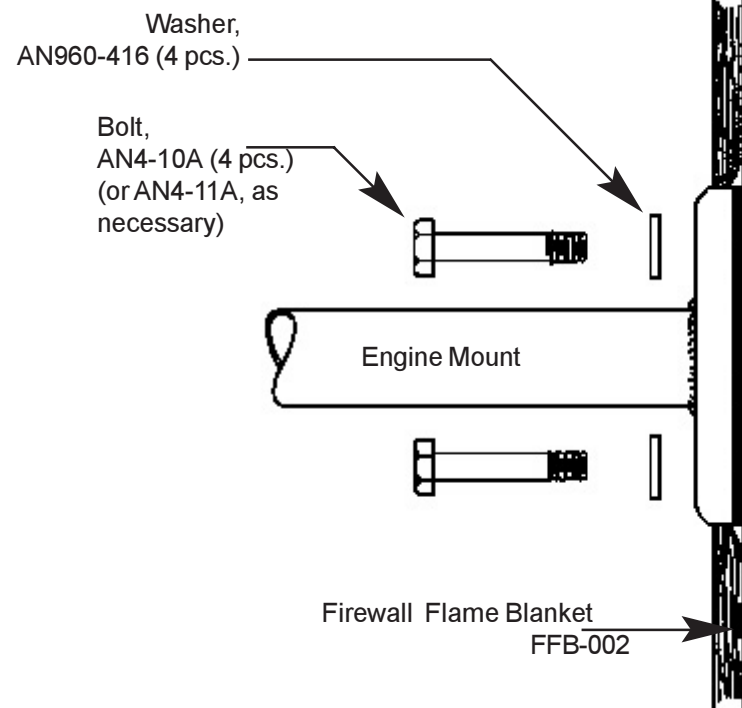
C. Engine Mount Installation

C.1. The four nose gear brace mounting holes are drilled by the builder.

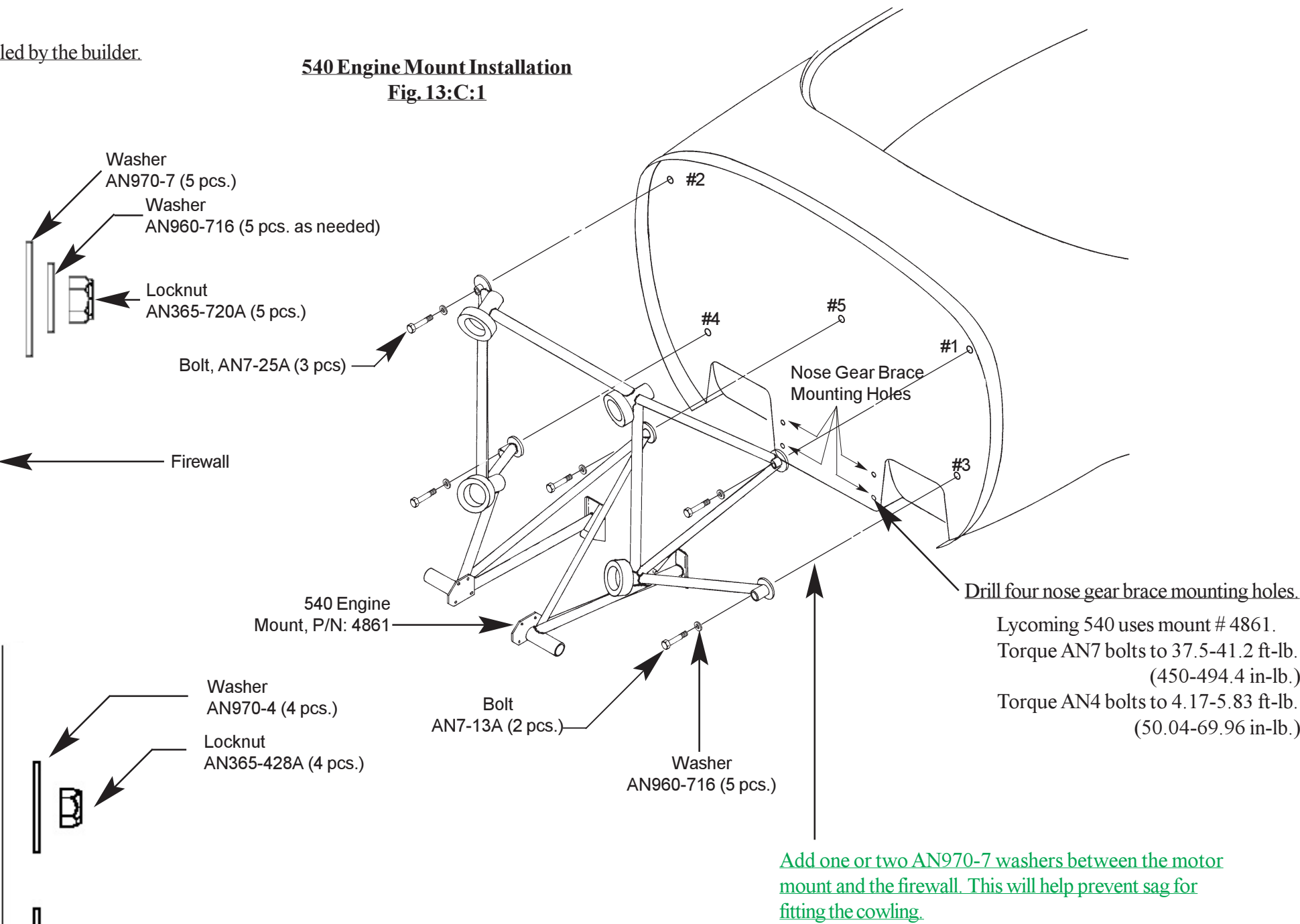
Engine Mount Holes #1 - 5



Nose Gear Brace Mounting Holes



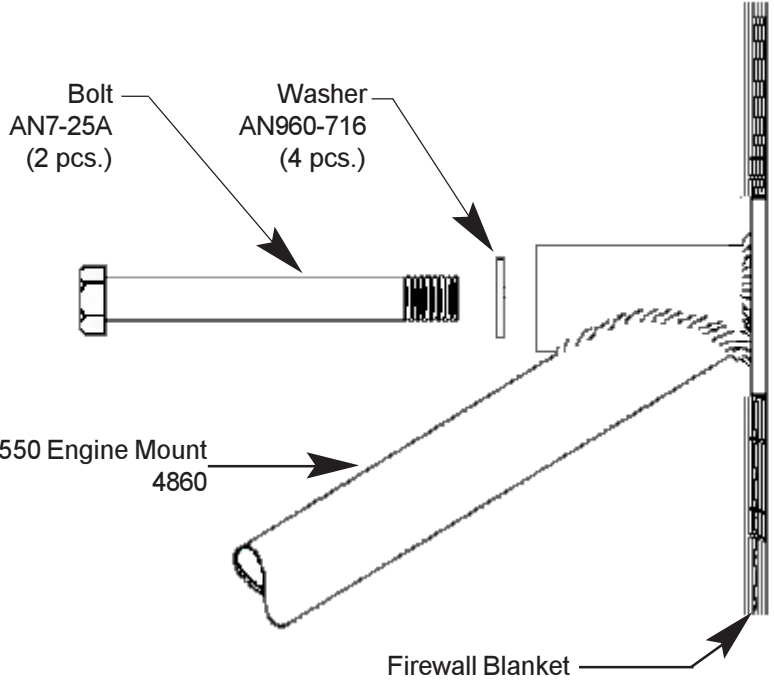
540 Engine Mount Installation
Fig. 13:C:1



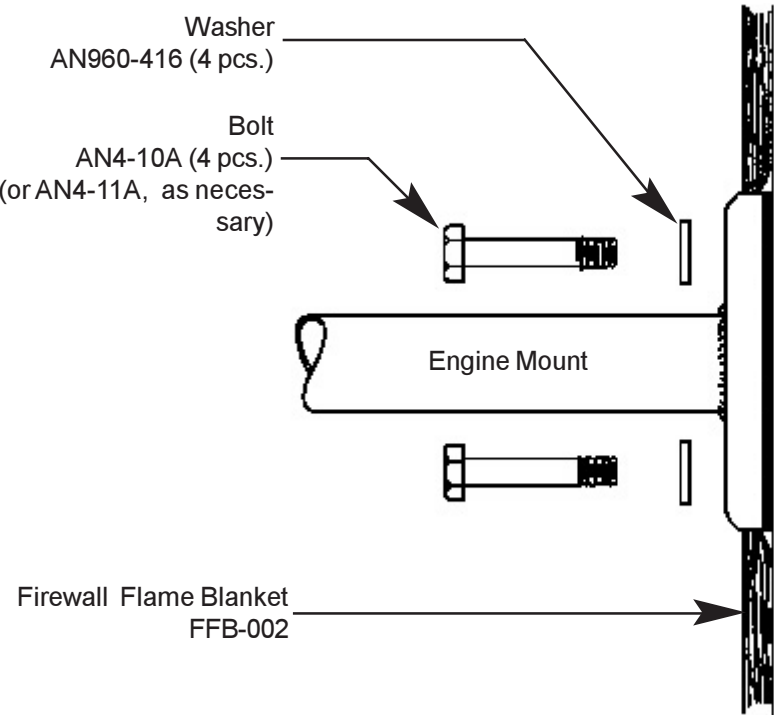
C 1. The four nose gear brace mounting holes in the firewall are drilled by the builder. The actual nose gear brace is pre-drilled.

Engine Mount Holes #1 - 4

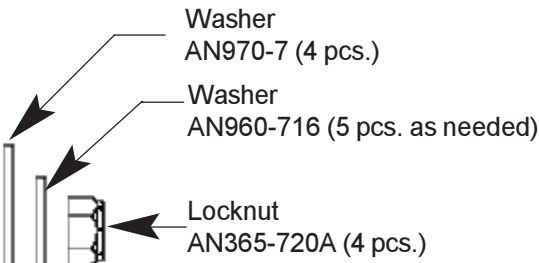
Note: #5 hole only applies to 540 installations.



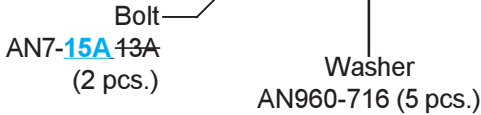
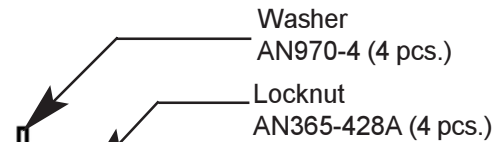
Nose Gear Brace Mounting Holes



550 Engine Mount Installation
Fig. 13:C:2



550 Engine Mount, P/N: 4860



For the top bolts only (bolt hole positions #1 and #2 in this drawing): Add one or two AN970-7 washer between the motor mount and the firewall. This will help prevent sag for fitting the cowling.

Drill four nose gear brace mounting holes in the firewall. The actual nose gear brace is already pre-drilled.

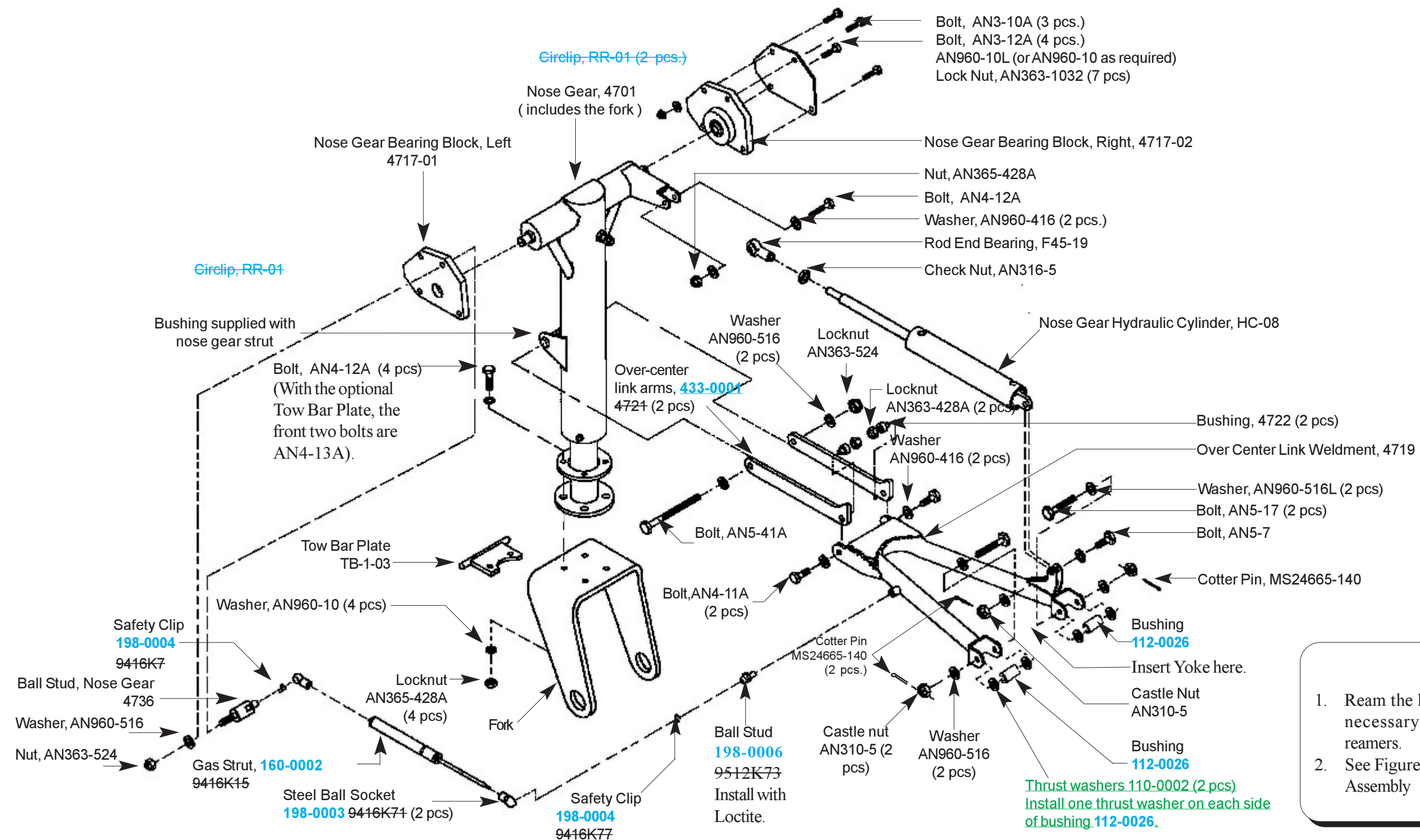
Lycoming 550 uses mount # 4860.
Torque AN7 bolts to 37.5-41.2 ft-lb.
(450-494.4 in-lb.)
Torque AN4 bolts to 4.17-5.83 ft-lb.
(50.04-69.96 in-lb.)



D. Nose Gear Installation

D 1. Assemble!- Install the assembled linkage on the engine mount.

Nose Gear Assembly Exploded View
Fig. 13:D:1



NOTE:

1. Ream the holes of the weldment as necessary using 1/4" and 5/16" reamers.
2. See Figure 13:D:2 for Retract Yoke Assembly

Left Side View

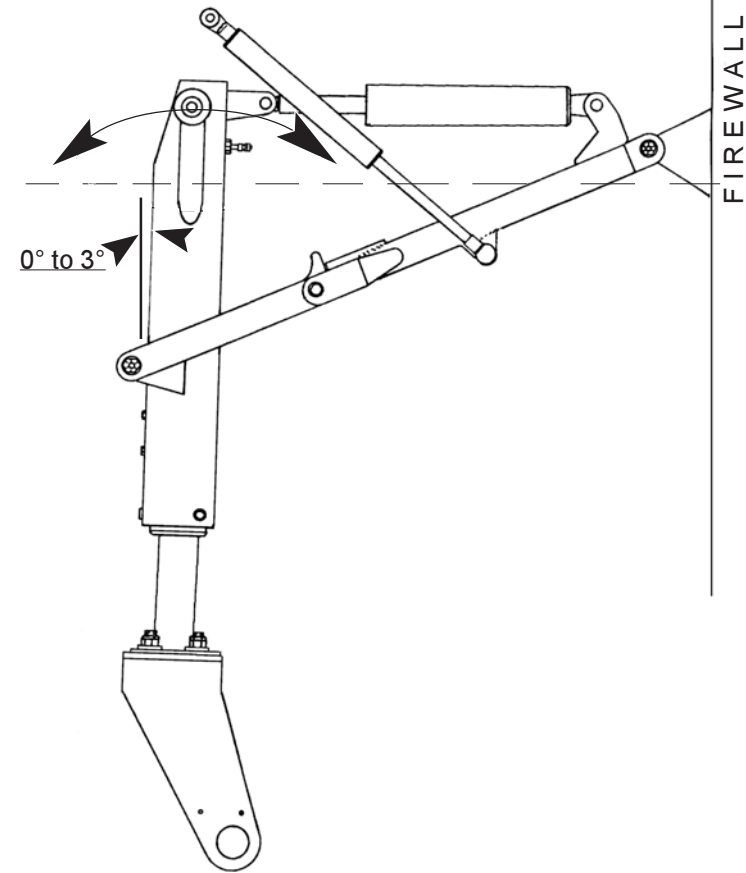
Aligning Nose Gear to Mounting Pads
Fig. 13:D:2

D 2. Adjust the rake of the nose gear between 0 to 3 degrees forward. There are a number of things to consider before final drilling of the gear bearing blocks.

- 1. The bearing block must align to the mating plates of the engine mount such that you get sufficient edge distance around the bolts.
- 2. Prior to drilling the bearing blocks, swing the gear and check for clearances! Pay particular attention to the clearance between the over center link weldment and the nose strut. Also check clearance between the hydraulic cylinder and the over center link weldment.

When you are satisfied that the mechanism clears and swings freely, you can drill for the bearing block.

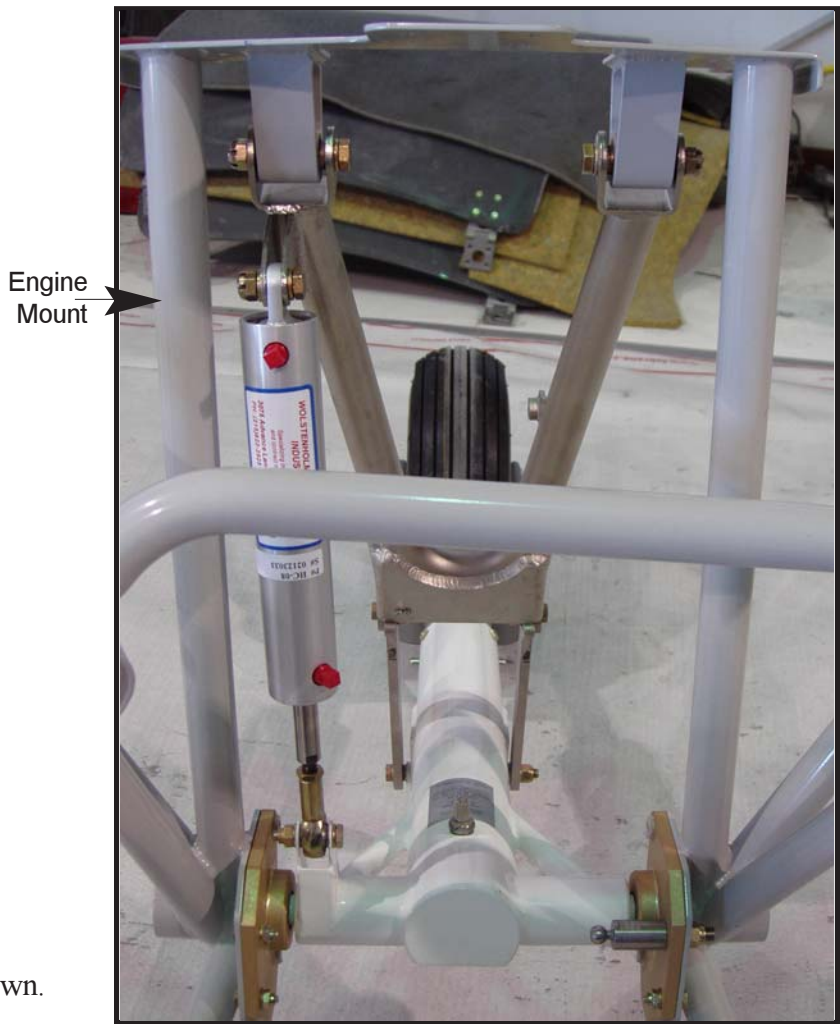
Note: Make all adjustments without the gas strut attached.



D 3. Align the strut as shown in side view, top view and front view. Clamp as shown. Retract the gear to check for any binding.

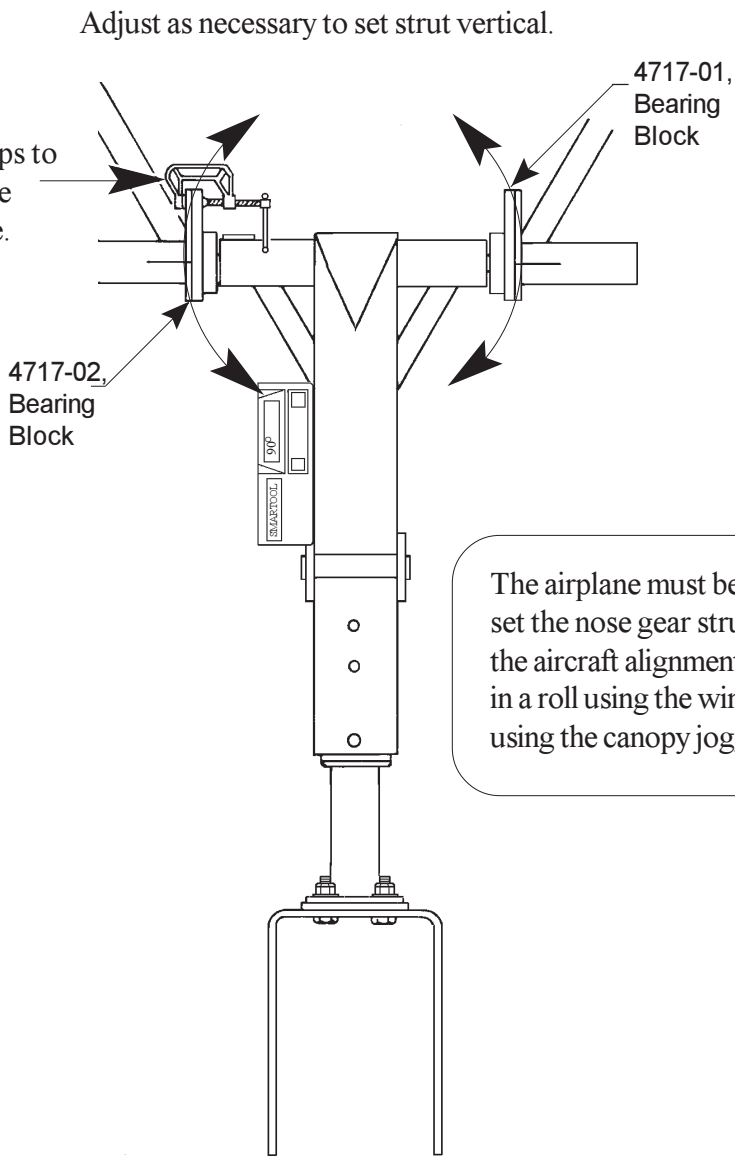
D 4. Once aligned, drill holes through the bearing blocks.

TOP VIEW



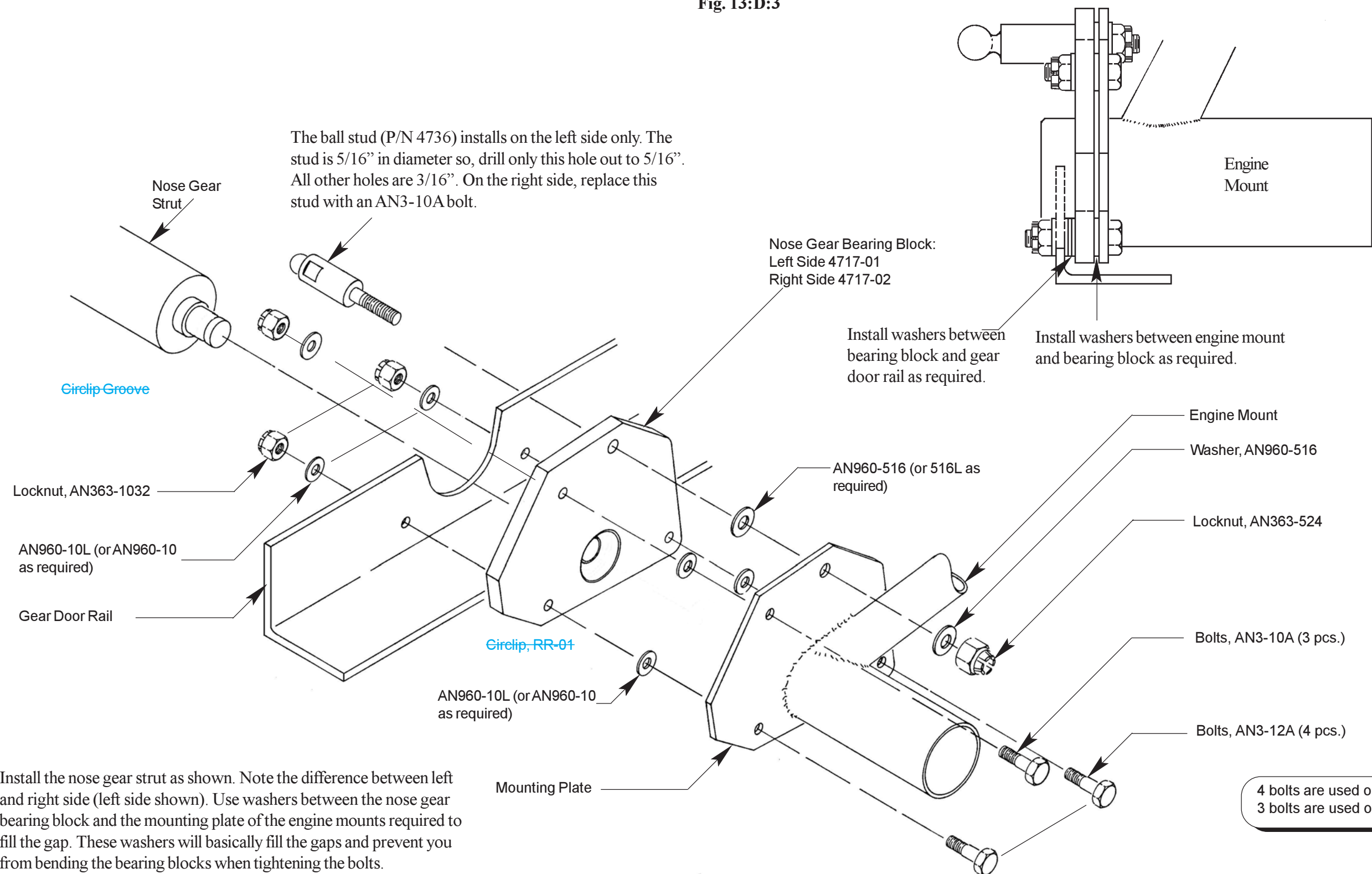
Adjust as necessary to align over center link arms. It will align by itself if assembled.

FRONT VIEW



The airplane must be leveled properly to set the nose gear strut. If you did not build the aircraft alignment jig, level the airplane in a roll using the wing tips and in pitch using the canopy joggle.

Nose Gear Strut Installation Fig. 13:D:3



4 bolts are used on the left side and 3 bolts are used on the right side.

- D 5.** Install the nose gear strut as shown. Note the difference between left and right side (left side shown). Use washers between the nose gear bearing block and the mounting plate of the engine mounts required to fill the gap. These washers will basically fill the gaps and prevent you from bending the bearing blocks when tightening the bolts.

Alternative Nose Gear Installation

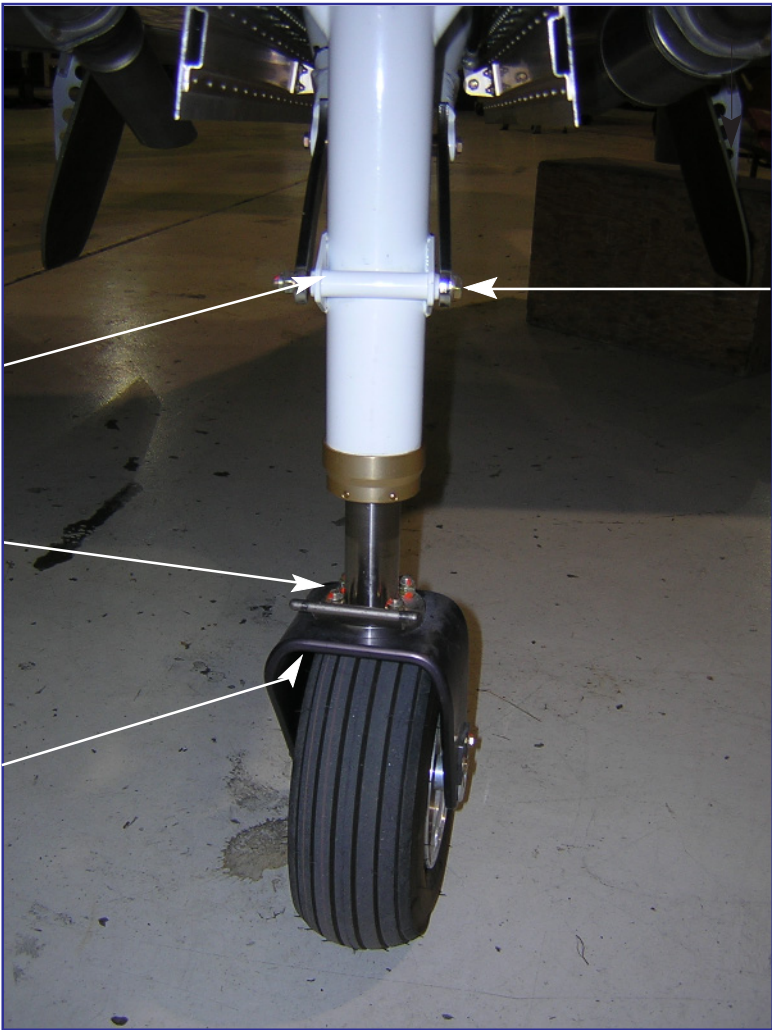
Parts used for this alternative installation are the same as the parts used on the previous page. For greater detail, please refer to the previous page.

Nose Gear, 432-0005 for the retractable gear*
(includes the fork)

Bushing supplied with
nose gear strut

Bolt, AN4-12A (4 pcs)
(With the optional Tow
Bar Plate, the front two
bolts are AN4-13A).

Washer, AN960-10
(4 pcs)
Locknut, AN365-428A
(4 pcs)



Bolt, AN5-41A

Alternative Nose Gear Installation
Fig. 13:D:1b

Over-center link arms
433-0001 4721(2 pcs)

Washer, AN960-516
(2 pcs)
Locknut, AN363-524

Tow Bar Plate
TB-1-03

Fork

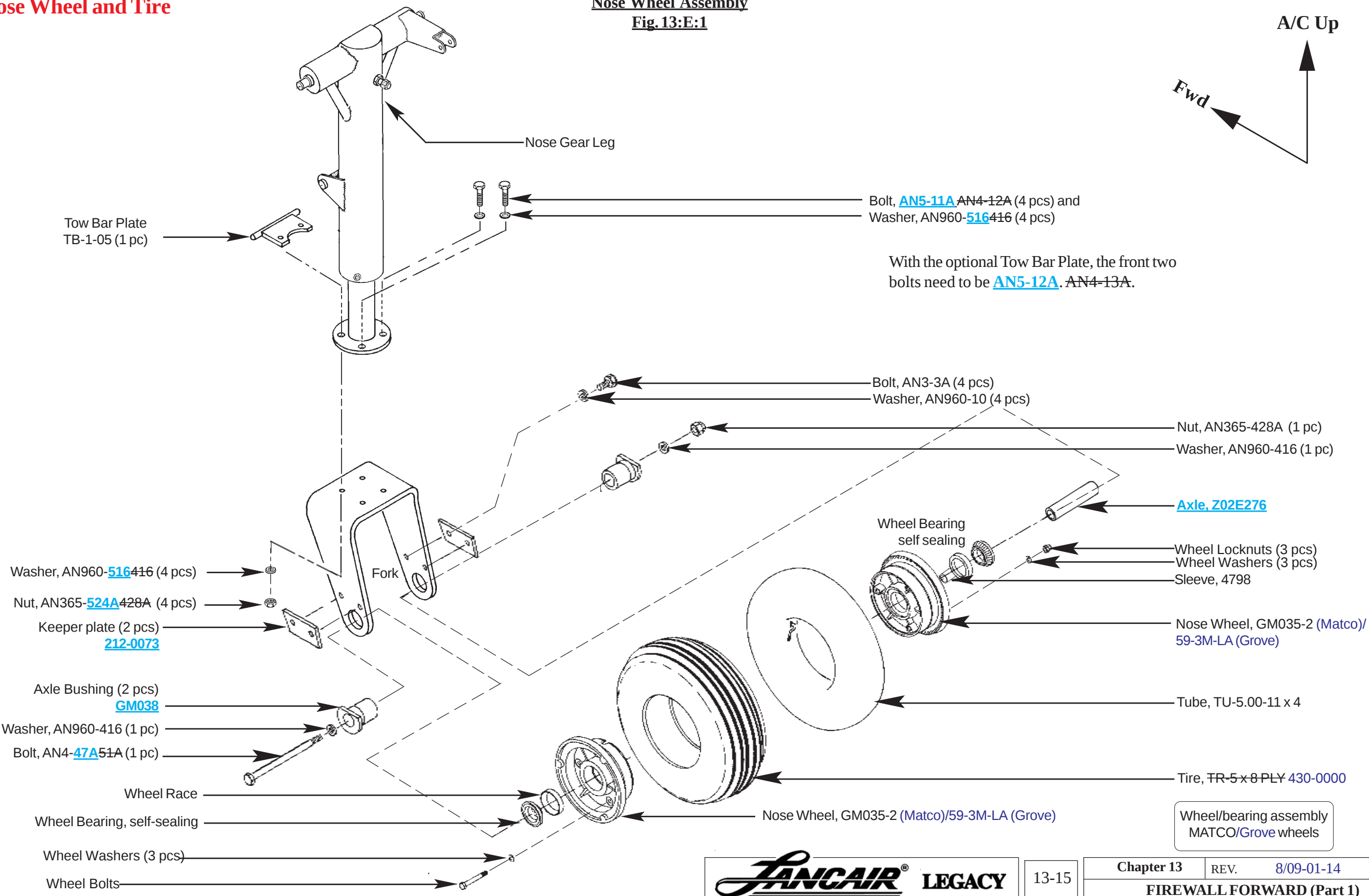
Nose Gear, 432-0005 for the retractable gear*
(includes the fork)



* Note: The part number for the fixed
gear's nose gear is 432-0002.

E. Nose Wheel and Tire

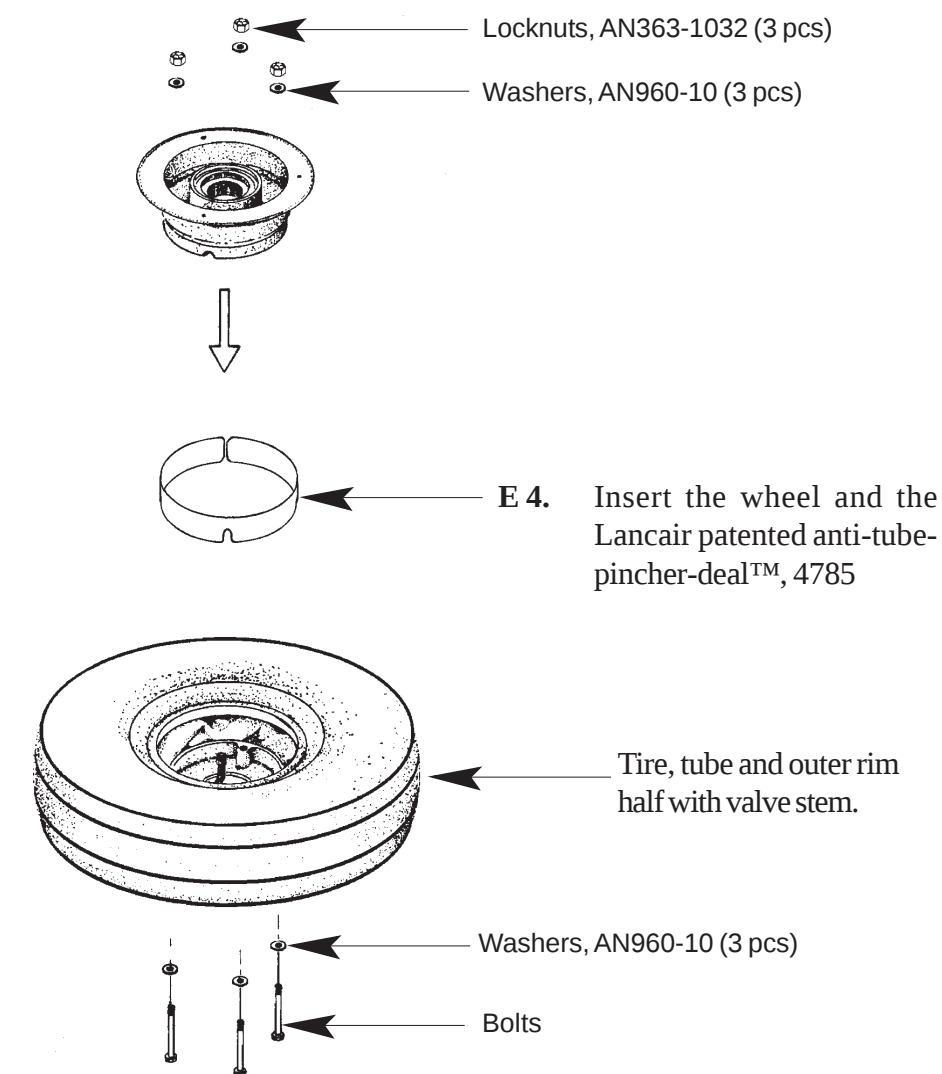
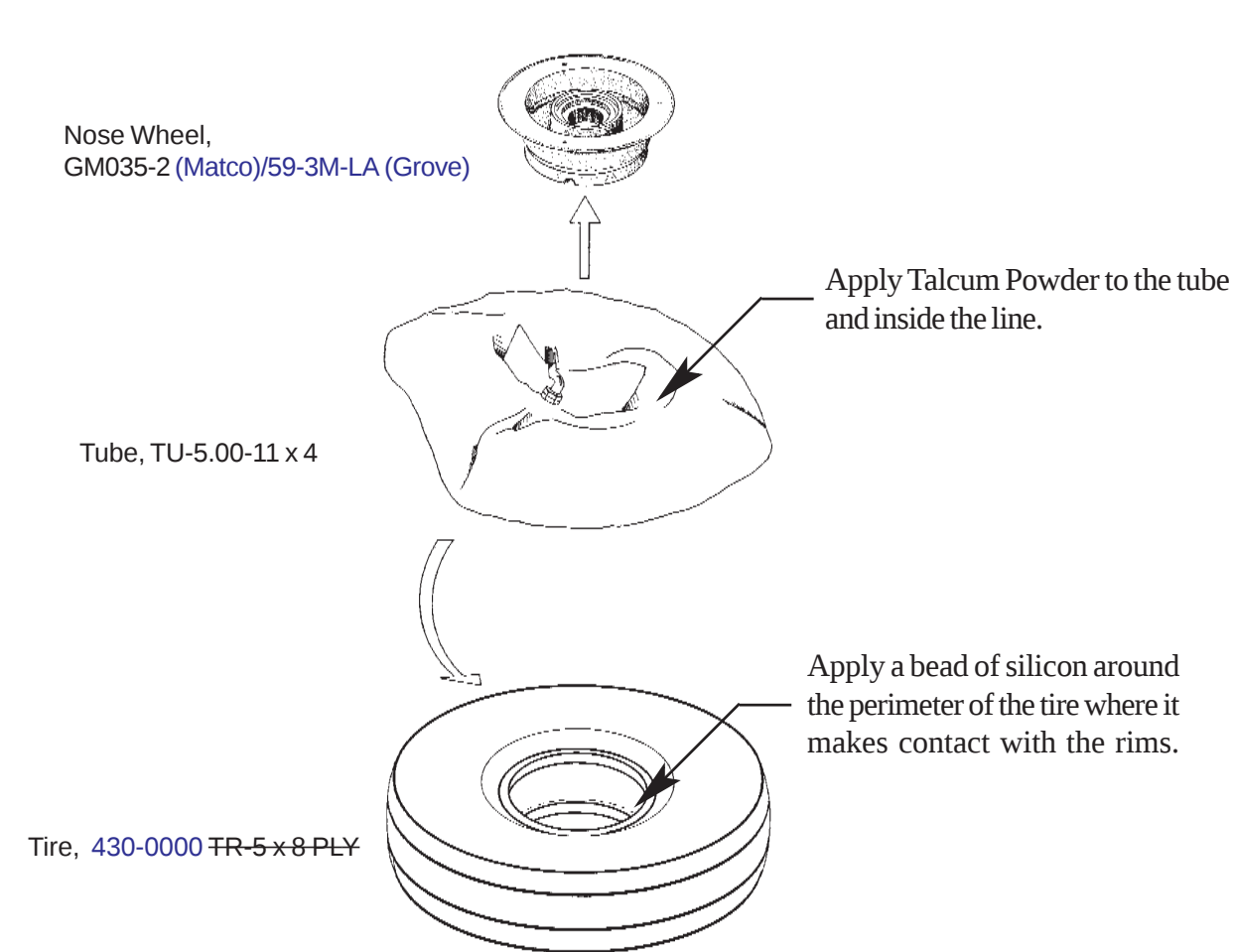
Nose Wheel Assembly
Fig. 13:E:1



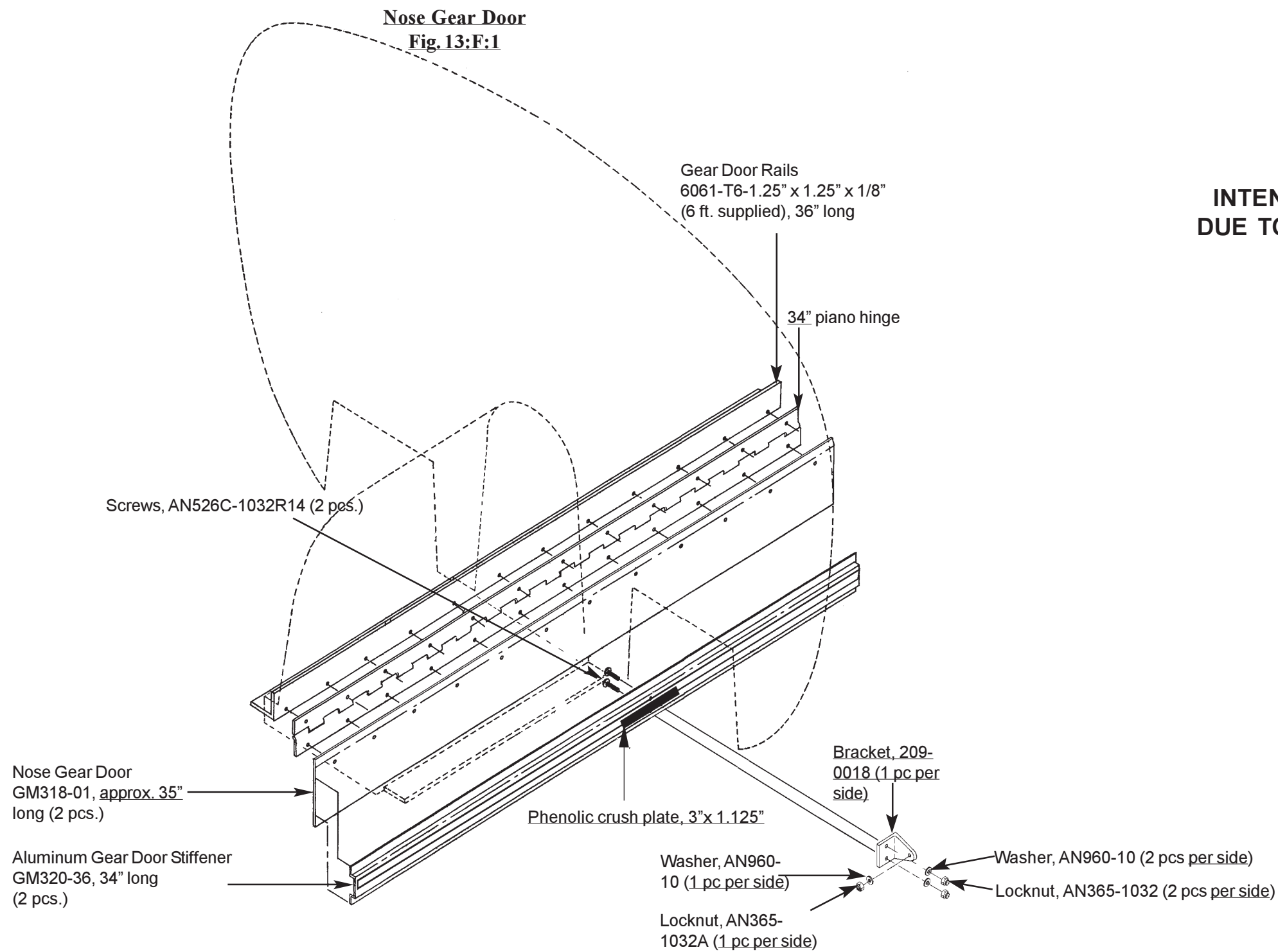
- E 1.** Insert the tube into the tire. Then inflate the tube with a small amount of air.
- E 2.** Insert the tire and tube assembly into the rim half that has the passage for the valve stem. Pull the valve stem through.

- E 3.** Position the assembly on the work bench with the wheel half facing down. Note the world famous Lancair designed anti tire tuber pincher deal. You will see a notch designed to fit around the valve stem. The anti pincher slides between the tube and wheel and helps prevent tube pinching when the two halves are put together.

Assembling Tire and Wheel
Fig. 13:E:2



F. Nose Gear Doors



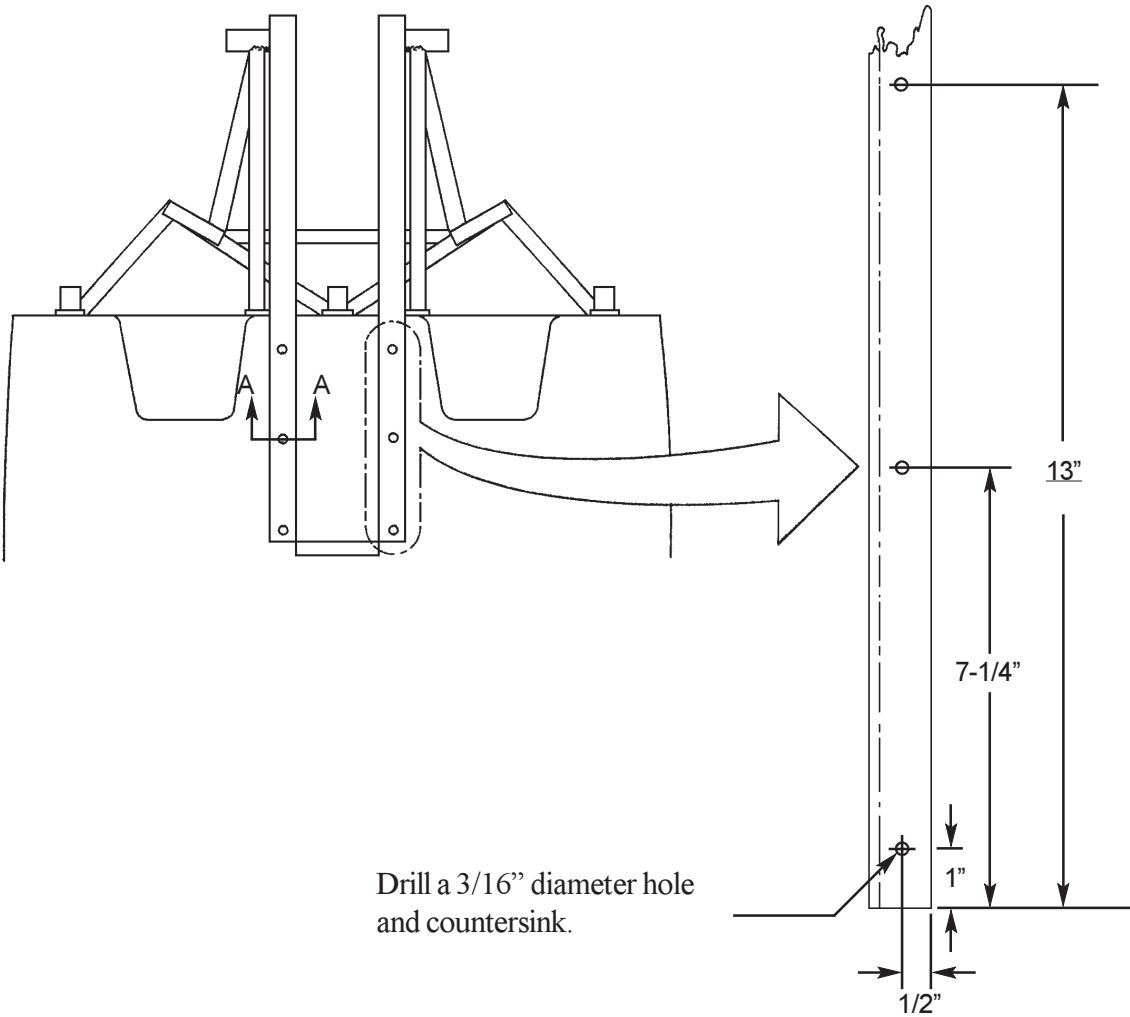
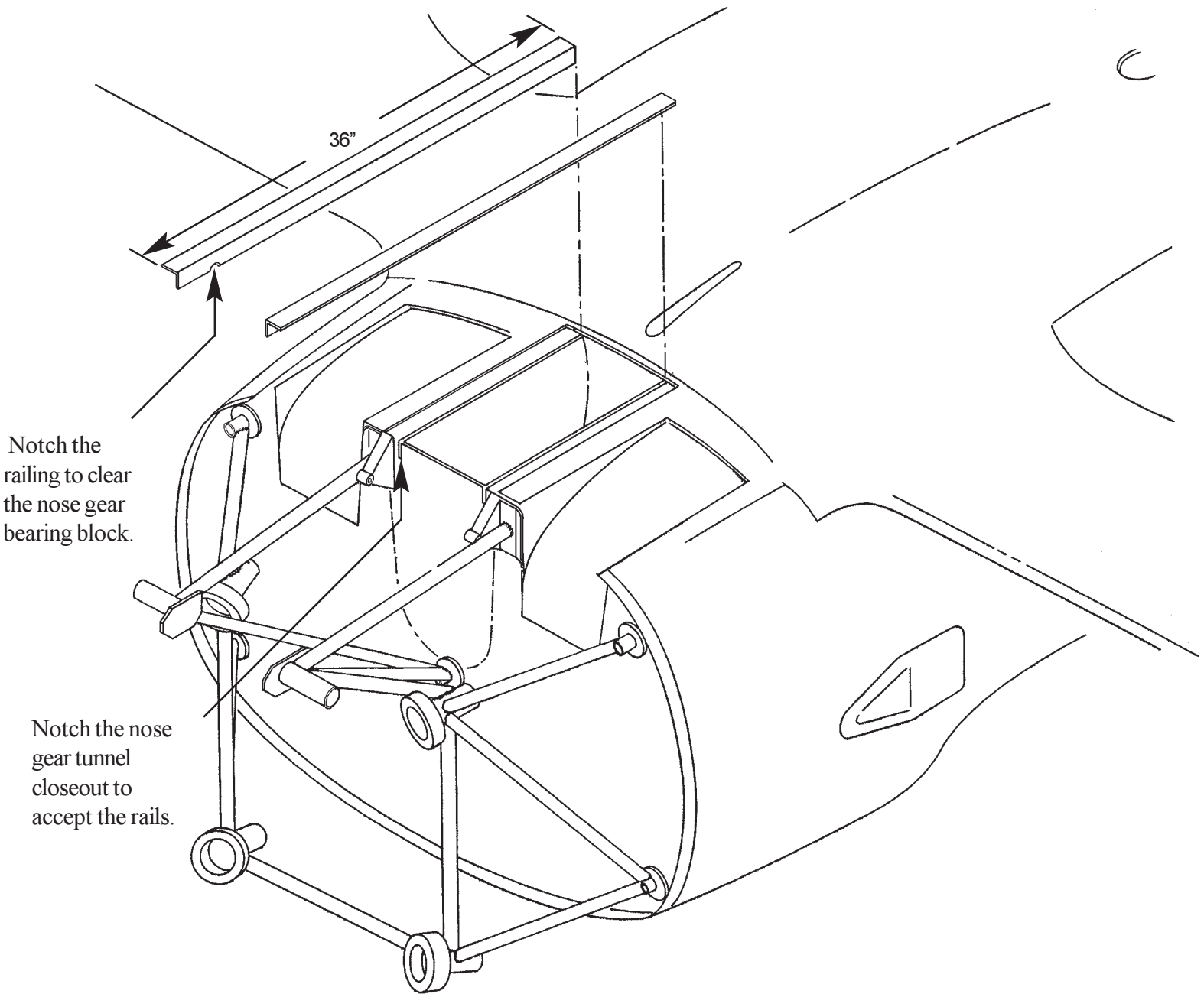
**INTENTIONALLY LEFT BLANK
DUE TO UPDATE REV. 5/06-20-07**

INTENTIONALLY LEFT BLANK
DUE TO UPDATE REV. 3/12-15-04

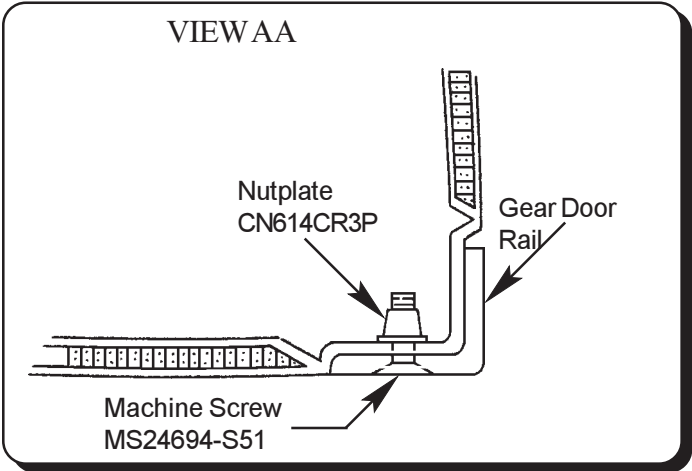
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DUE TO UPDATE REV. 3/12-15-04

F1. Cut 2 pieces of the 6061-T6, 1.25" x 1.25" x 1/8" angle aluminum to 36".

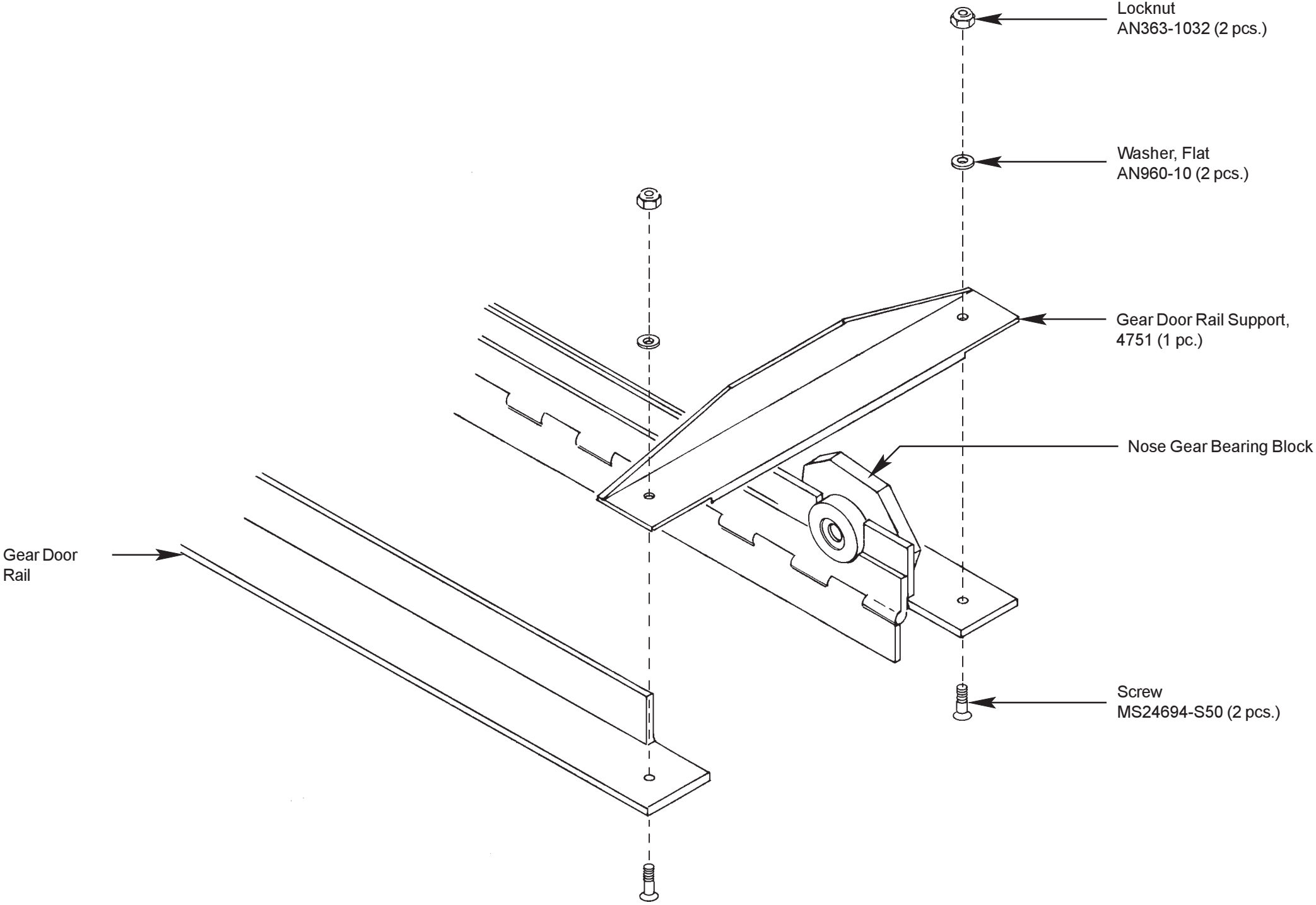
Gear Door Rail Installation
Fig. 13:F:7



You may want to do a micro release between the gear door rail and the nose gear tunnel to get a good fit so the rail cannot move.

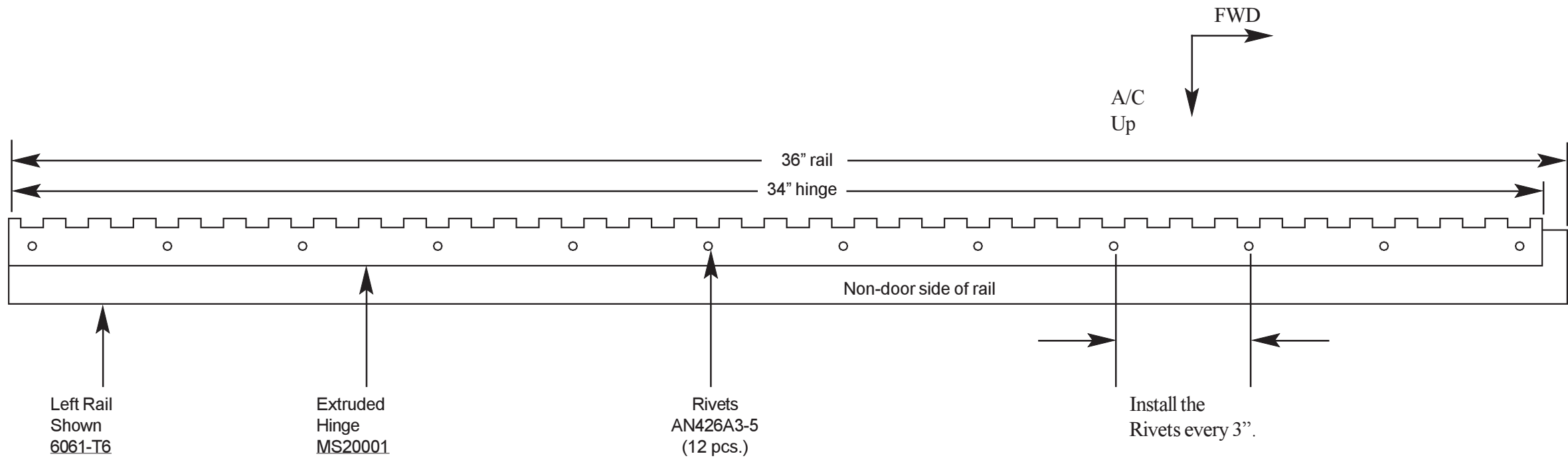


Gear Door Rail Support
Fig. 13:F:8



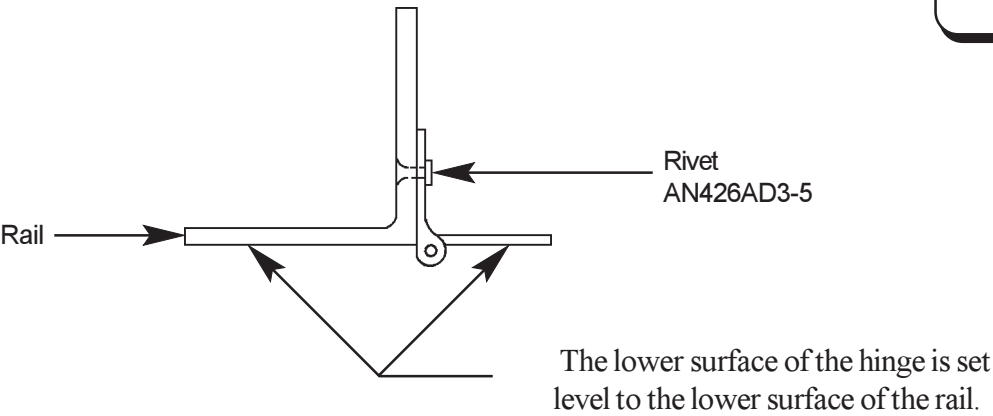
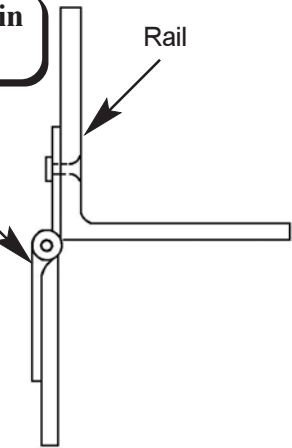
Securing Hinge to Rail
Fig. 13:F:9

SIDE VIEW OF LEFT RAIL

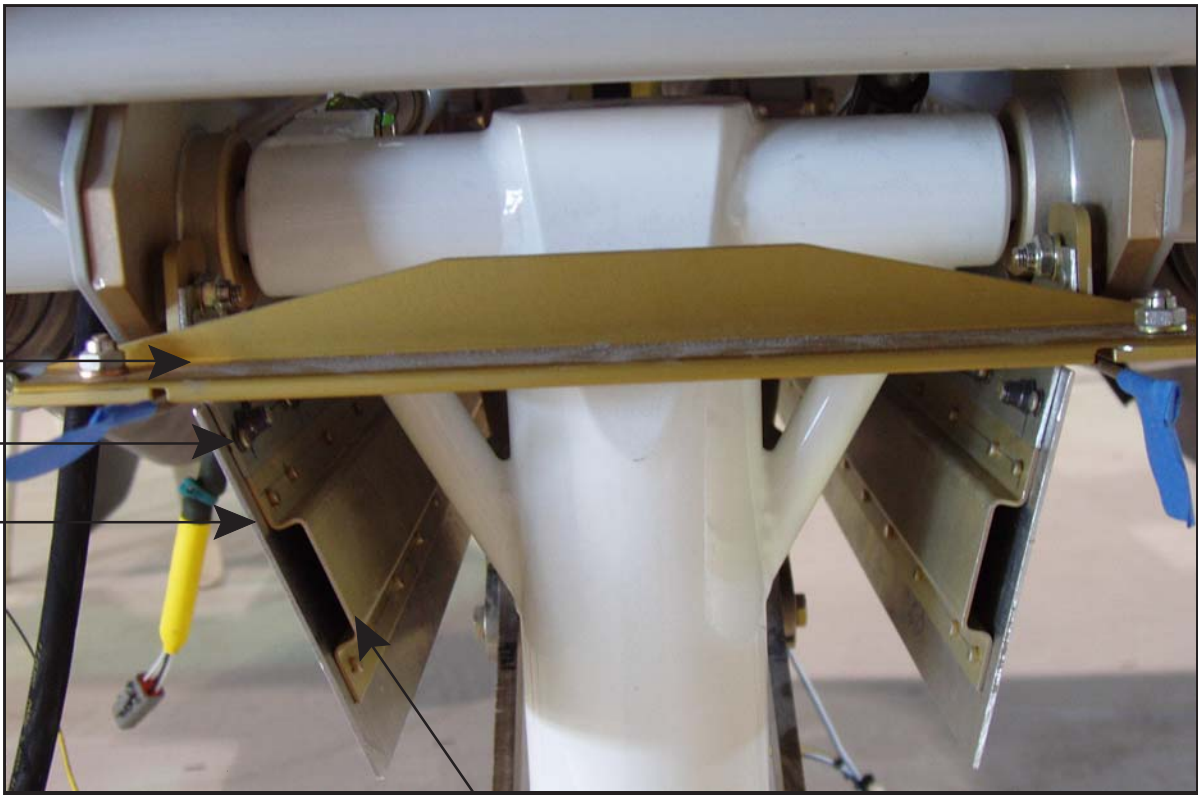
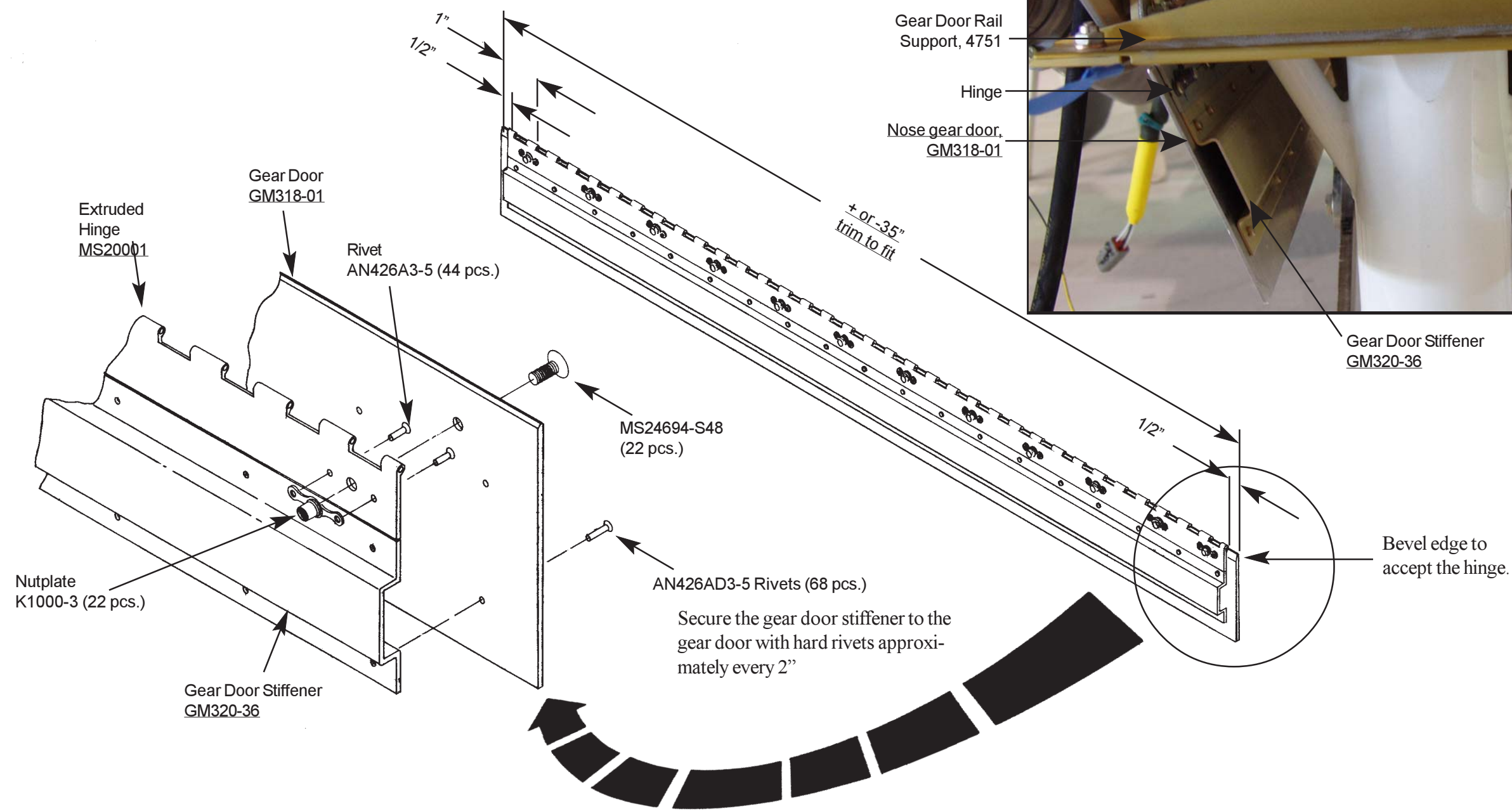


The gear door hinges (MS20001) are riveted to the gear door rails (6061-T6) and attached with screws to the gear doors (GM318-01).

NOTE: Hinge is reversed. Remove pin and flip hinge sides around.

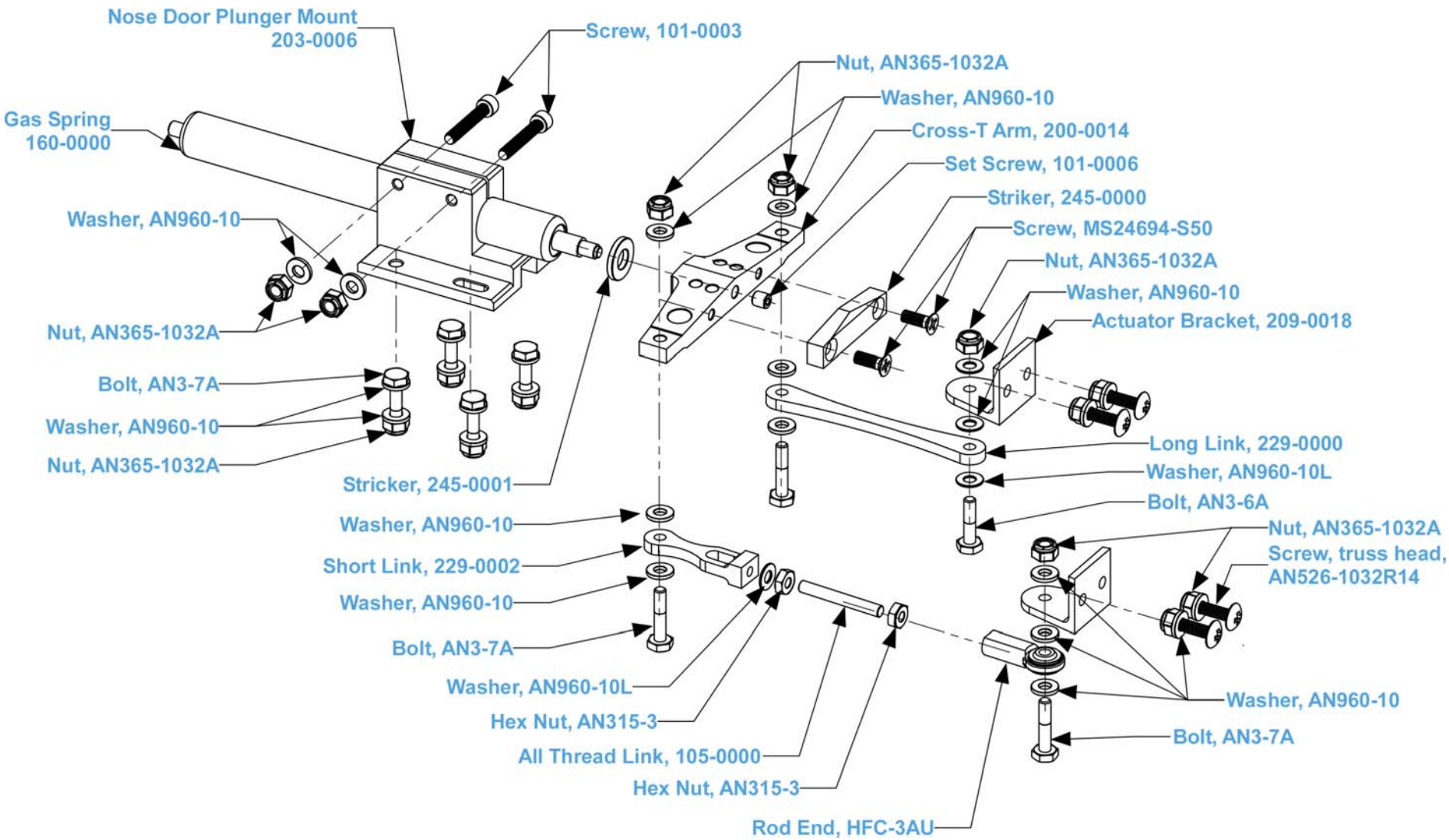


Securing Hinge and Stiffener to Nose Gear Door
Fig. 13:F:10



- F-1. Remove the spring from the back of the nose gear door plunger assembly by removing the Allen “stop” screw.
- F-2. Reassemble the plunger without the spring.

Nose Door Plunger Assembly ~~Nose Gear Door Spring~~
 Fig. 13:F:3



Note: Refer to the next page for a drawing and photo of the completed assembly.

HOW THE GEOMETRY WORKS:

1. By moving the up stop “down”, the gear doors will open wider and you will have more clearance between the pushrod and the over-center link. However, you don’t want the doors too wide.”
2. By moving the up stop “up” the gear door will open less and you will have less clearance between the pushrod and the over-center link.

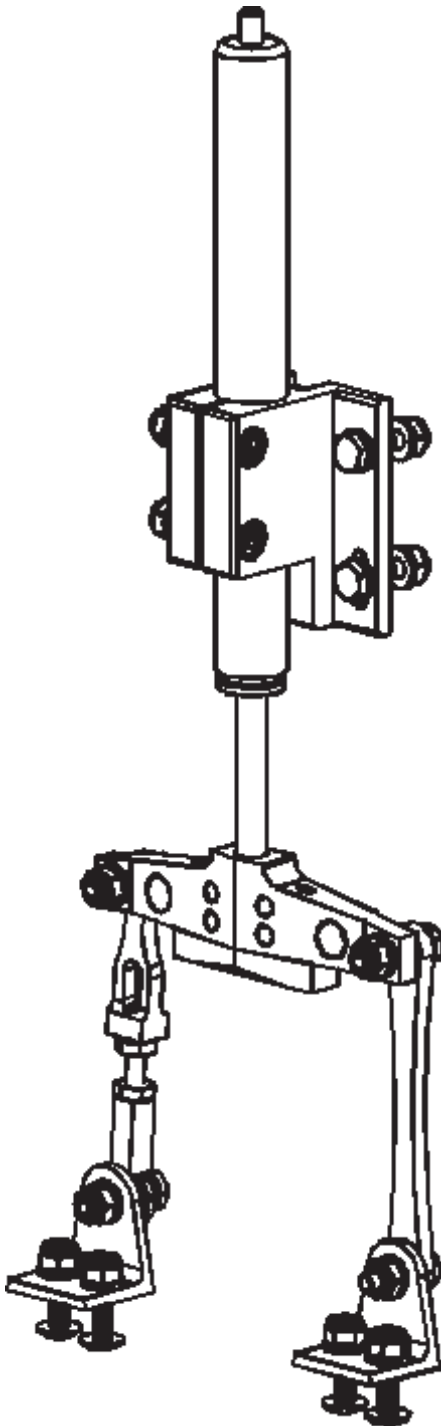
To determine the location of the up stop you need to observe the clearance between the over-center link and the gear door pushrod arm. You will notice when retracting and extending the nose gear that the clearance between the over-center link and the gear door pushrods depends on the length of the pushrods.

F 4. Attach the gear door pushrods to the plunger.

F 5. Position the plunger directly over the nose-gear strut on the firewall.

F 6. Fully compress the plunger.

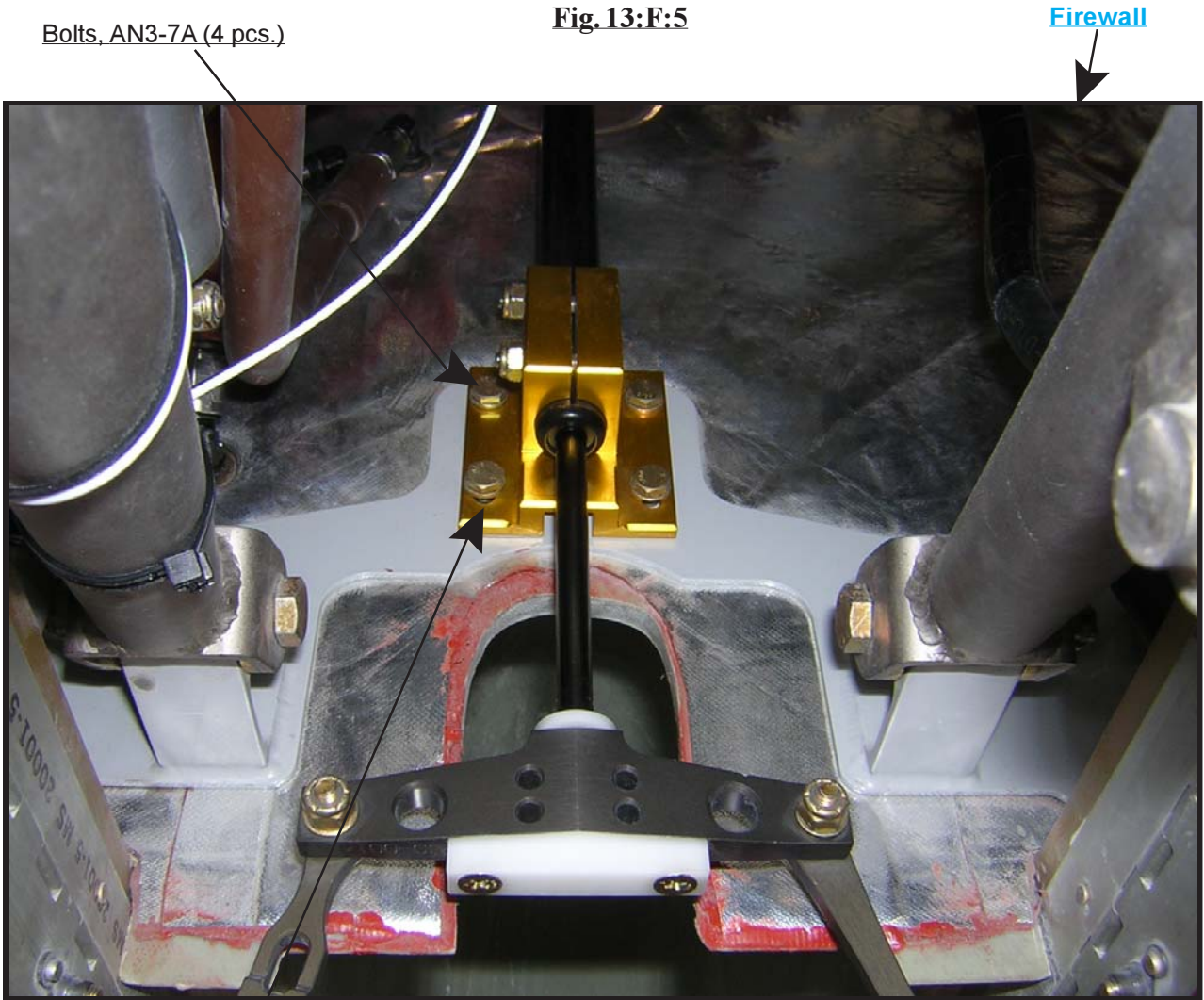
Completed Nose Door Plunger Assembly
Nose Gear Up Stop
Fig.13:F:4



F 7. When you are satisfied with the clearance between the nose gear and nose gear doors, use the plunger housing as a guide to drill the two bottom holes through the firewall in approximately the center of the slots.

F 8. Install the plunger bolts (AN3-7A), washers (AN960-10) and nuts (AN365-1032A).

Plunger Installed on Firewall (new photo)
Fig.13:F:5



The latest engine mounts come with the holes located on the plate. You may need to slot the holes in order to allow the bolts to slide into place.

F 2. Drill the two holes for the two top bolts to secure the plunger to the firewall. Install the bolts (AN3-7A), washers (AN960-10) and nuts (AN365-1032A).

- F3.

Center the control horn on the gear door stiffener and mark the location.

F4.

Fabricate a 3” x 1.125” x .250” phenolic or aluminum plug. See Figure 13:F:1 for a view of its location.

F5.

Sand the plug to fit inside the stiffener rail. This is used to prevent the door from being crushed. Place it in the door, beneath the control horn.

F6.

Position the control horn on the door so that the push rods are vertical.

F7.

Drill the holes and install the hardware.
- F8.

Attach the gear door push rod on one side.

F9.

Retract the nose gear and verify tht the nose gear doors completely close. Adjust the rod ends as necessary.

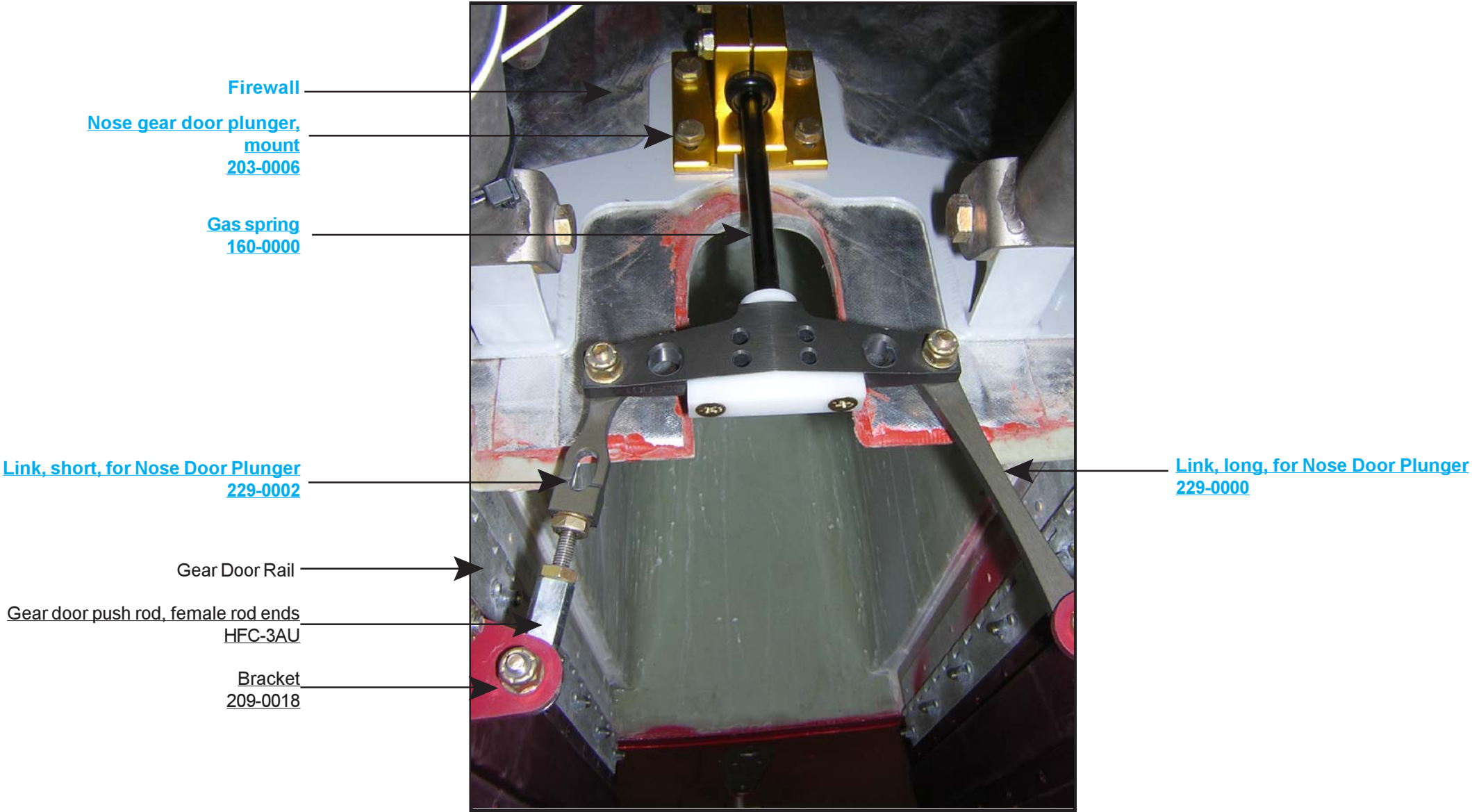
F10.

Repeat these steps for the the other door.

F18.

After the final adjustment, remove the plunger and re-install the spring. Now re-install the plunger assembly.

Nose Gear Door Actuator Assembly Mounted to the Firewall
Fig. 13:F:6



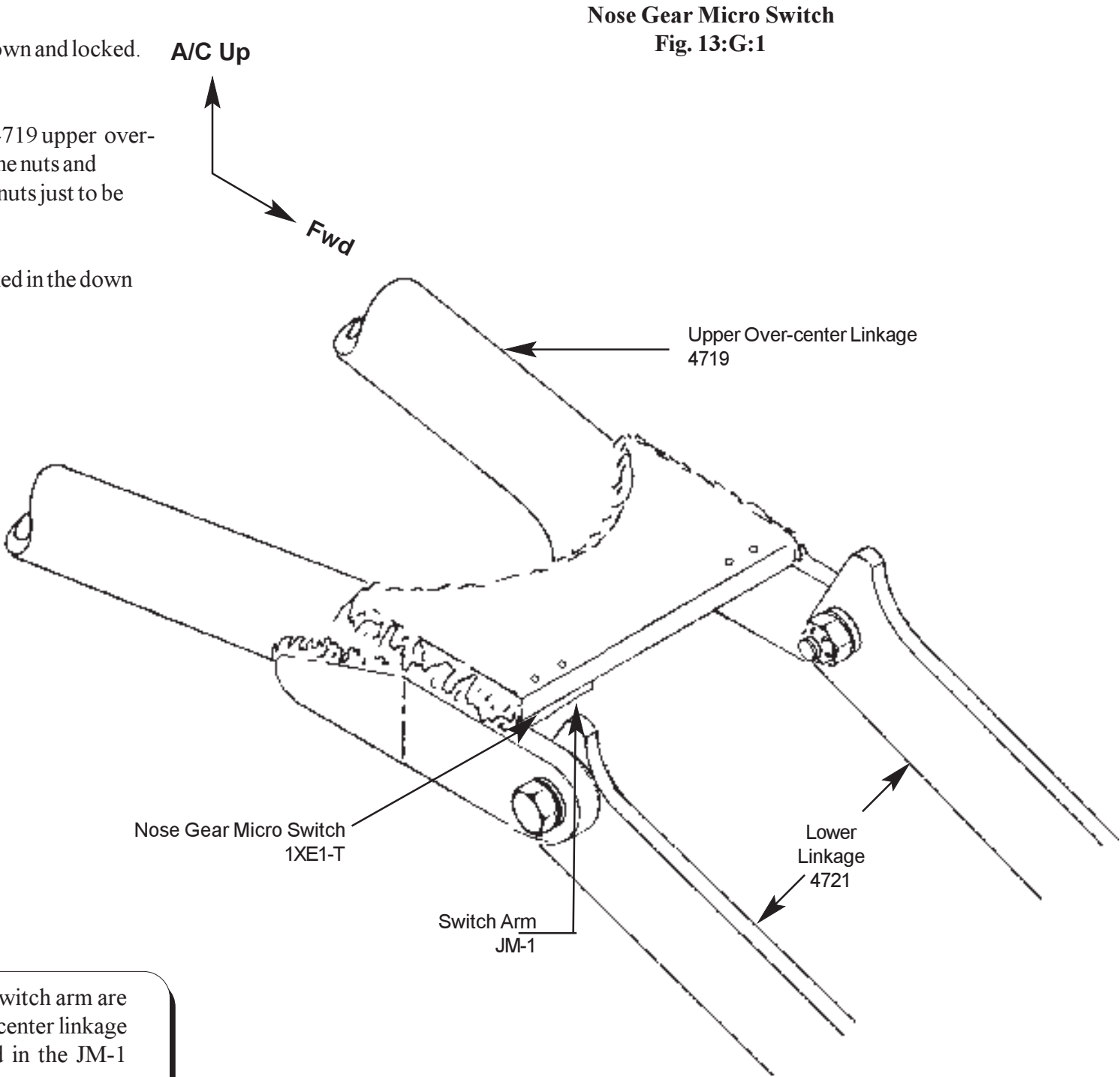
G Nose Gear Micro Switch

Nose Gear Down Switch

A micro switch is mounted to the 4719 over-center linkage to indicate if the nose gear is down and locked. The switch is activated by the 4721 lower over-center linkage.

Use the hardware supplied in the JM-1 packet to secure the 1XE1-T micro switch to the 4719 upper over-center linkage. Two switch mounting holes are predrilled in the linkage for this purpose. The nuts and lockwashers should be on the bottom of the 4721 linkage. Use a drop of Loctite on these nuts just to be sure of a good hold.

The right, 4721 over-center linkage should press the switch arm when the nose gear is locked in the down position. You should be able to hear the “click” of the switch as it contacts and releases.



The micro switch and switch arm are secured to the 4719 over-center linkage with the screws provided in the JM-1 packet.