CHAPTER 19
REVISION LIST

The following list of revisions will allow you to update the Lancair IV 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 shown and "R" to remove the pages.

Page(s) affected	Current Rev.#	Action	Description
19-1	C16	R&R	Deleted section D.
19-2	C9	R&R	Removed reference to Matco
19-3 and 19-4	C10	R&R	Revised for one piece gear door.
19-5	1	None	
19-6	C9	R&R	Corrected Fig.19:A:1
19-7	C13	R&R	Edited parts in paragraph A2.
19-8 thru 19-11	1	None	
19-12	C9	R&R	Corrected Fig. 19:B:1
19-13 thru 19-16	1	None	
19-17 & 19-18	C9	R&R	Corrected Bolt Length in Figures
19-19	C9	R&R	Removed reference to Matco
19-20 thru 19-22	1	None	
19-23 thru 19-24	C3	R&R	Changed Step C8, C9 and C10. Corrected Figure 19:C:5 **ADDED PAGE 19-23.1** Corrected Figure 19:C:6
19-25 thru 19-28	1	None	
19-29	C13	R&R	Edited part no. in Fig. 19:C:10.
19-30 thru 19-32	C16	R&R	Deleted section D.
19-33	C10	R&R	Edited text.
19-34	C9	R&R	Corrected Fig. 19:E:1
19-35	1	None	
19-36	C9	R&R	Corrected Fig. 19:E:3
19-37 thru 44	1	None	
19-45	C9	R&R	Corrected Fig. 19:E:10:a
19-46	1	None	
19-47	C9	R&R	Corrected 19:F:1
19-48 thru 19-56	1	None	
19-57	C3	R&R	Corrected Step F20 & Fig. 19:F:8:a.

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Page(s) affected	Current Rev.#	Action	Description
19-58	C15	R&R	Modified Fig. 19:F:8:b and procedure.
19-59	C9	R&R	Corrected Fig. 19:G:1
19-60 thru 65	1	None	
19-66	C9	R&R	Information is no longer applicable.
19-67	C13	R&R	Removed page.
19-68 thru 19- 70	1	None	
19-71	C9	R&R	Added text to I4.
19-72 thru 19-80	1	None	
19-81	C14	R&R	Edited part number in Fig. 19:I:11.
19-82	C9	R&R	Corrected Fig. 19:J:1
19-83	C9	R&R	Edited seat belt bracket.
19-84	1	None	
19-85	0	None	
19-86	C12	R&R	Edited size of hole in Fig. 19:K:2:a.
19-87 & 19-89	C6	R&R	Revised
19-88	C13	R&R	Added hard point to Fig. 19:K:3.
19-90	C9	R&R	Changed Chapter 22 to Chapter 23
19-91 thru 19-92	C9	R&R	Removed reference to Matco
19-93	C12	R&R	Edited paragraph L7.
19-94	C9	R&R	Corrected Fig. 19:L:3
19-94.1	C15	Add	Setting the Toe Angle.
19-95 thru 19-97	C6	None	
19-98	C16	R&R	Changed section heading, added line.
19-99	C16	R&R	Updated Section with extension fairings
19-99.1 thru 99.6	C16	Add	Updated Section with extension fairings
19-100	C16	R&R	Updated Section.
19-101 - 19-103	C12	R&R	Edited one piece gear door assembly.
19-101	C14	R&R	Edited text in Fig. 19:O:1.
19-104 & 19-105	C13	R&R	Edited Fig. 19:O:4 and Fig. 19:O:5.
19-106	C12	R&R	Added text and Figure 19:O:6.
19-107 thru 111	C10	R&R	

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Page(s) affected	Current Rev.#	Action	Description
19-112	C14	R&R	Added blueprint no.
19-113	C12	R&R	Edited Fig. 19:Q:3.
19-114	C12	R&R	Edited Fig. 19:Q:4.
19-115	C11	R&R	Corrected part number.
19-116	C13	R&R	Edited Figure number referred to in Fig.
19-117 thru 118	C10	R&R	One piece gear door assembly.
19-119 & 19-120	C12	R	Due to revisions, no longer needed.
19-121 thru 123	C12	Add	
19-124	C13	R&R	Edited part no. in Fig. 19:S:2.

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SERVICE BULLETIN **SB051-0999**

Subject: Lancair Gear Shuttle Valve (Lancair IV, IV-P)
Date: 15 October, 1999
Ref: Construction manual, chapter 26, page 33
Pages: 2
Status: Mandatory

Background: Some AN816-4-4D fittings used in the gear shuttle valve assembly were shipped with a smaller inside diameter than is required. This prevents the shuttle spring from extending into the fitting, causing the spring to fully compress and lock the shuttle valve ball closed. The hand pump will not operate correctly in this condition.

Action: If the hydraulic system is completed, perform an emergency gear extension test either in the air or on jack stands to determine proper hand pump operation.

1. Pull the gear breaker.
2. Position the gear lever in the down position.
3. Use the hand pump to lock the gear in the full down position.

To retract the gear, re-pressurize the system by pushing the gear breaker back in. Then move the gear lever into the gear up position.

If the hand pump does not operate properly, or if the assembly has not been completed, make sure that the spring (P/N 10877) will fit inside the AN816-4-4D fitting.

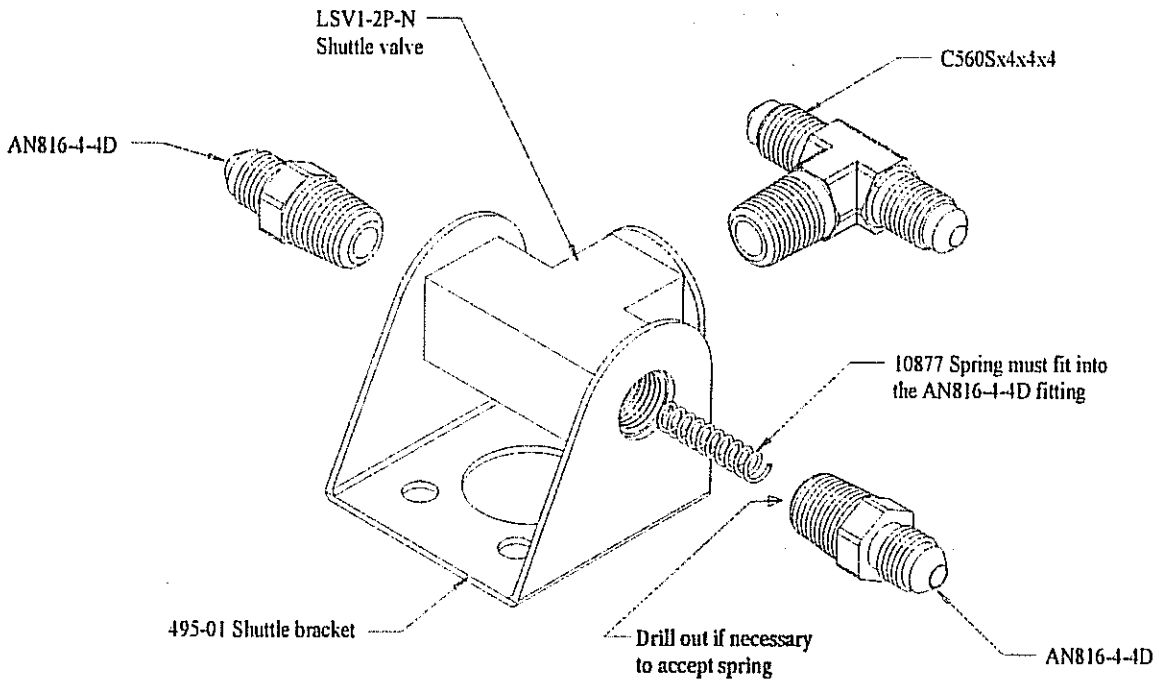
Procedure:

1. If you have completed the system you must first remove the AN816-4-4D fitting on the starboard side of the shuttle valve.
2. Starting from the pipe-threaded end of the fitting, use a ¼" drill bit to open up the inside diameter so that the spring will fit ½" deep into the fitting.
3. Insert the 10877 spring into the enlarged AN816-4-4D fitting and thread the assembly into the shuttle valve. See the figure and refer to the manual.

Note: Add a notation in your logbook that states:

Caution: It is recommended that a monthly emergency gear check be made during normal operations.

Figure 1


LSV1-2P-N
Shuttle valve
C560Sx4x4x4
AN816-4-4D
10877 Spring must fit into
the AN816-4-4D fitting
495-01 Shuttle bracket
Drill out if necessary
to accept spring
AN816-4-4D

CHAPTER 19
MAIN GEAR INSTALLATION

REVISIONS

From time to time, revisions to this assembly manual may be deemed necessary. When such revisions are made, you should immediately replace all outdated pages with the revised pages. Discard the out dated pages. Note that on the lower right corner of each page is a "revision date". Initial printings will have the number "0" printed and the printing date. All subsequent revisions will have the revision number followed by the date of that revision. When such revisions are made, a "table of revisions" page will also be issued. This page (or pages) should be inserted in front of the opening page (this page) of each affected chapter. A new "table of revisions" page will accompany any revision made to a chapter.

ARROWS

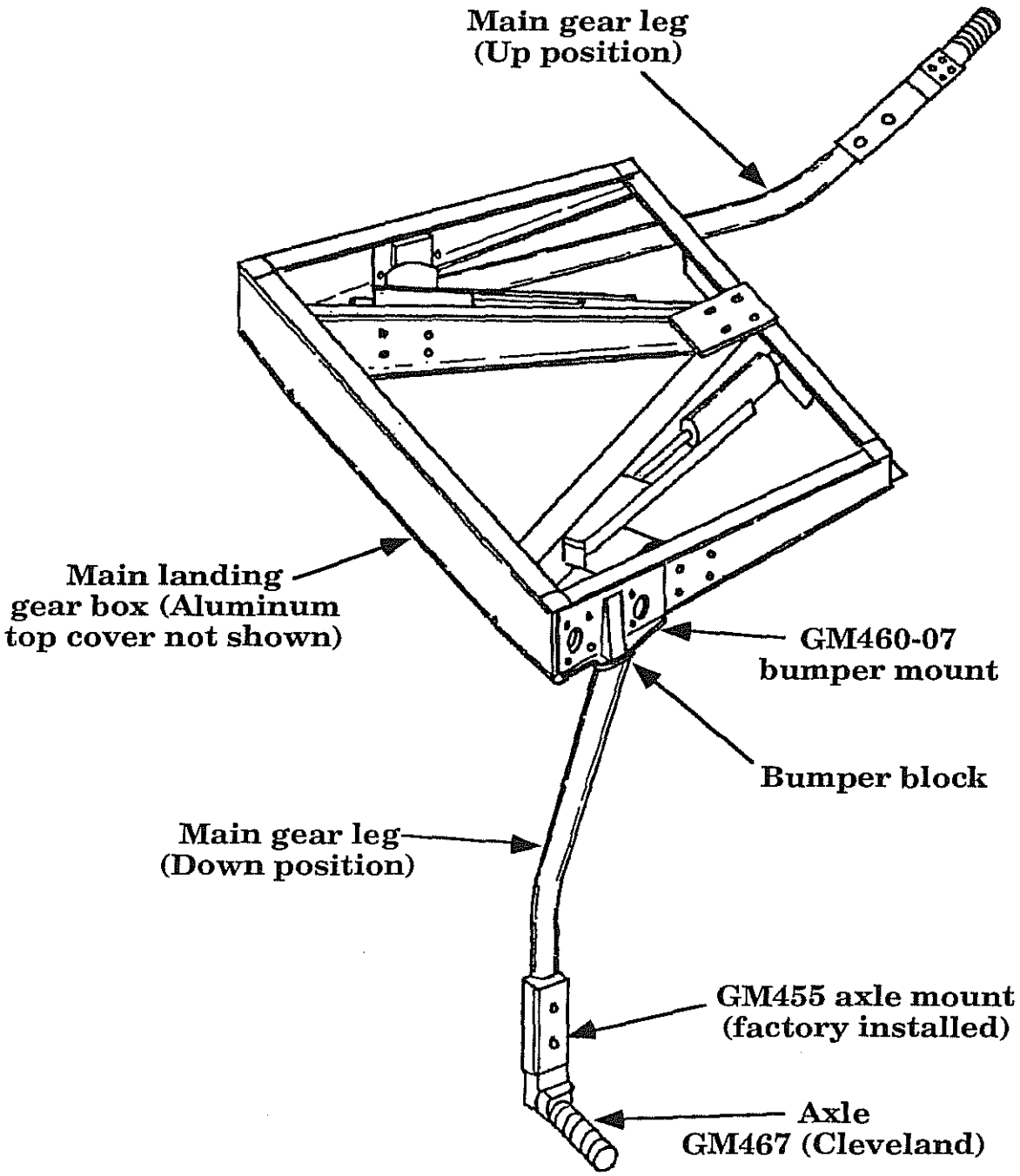
Most drawings will have arrows to show which direction the parts are facing, unless the drawing itself makes that very obvious. **"A/C UP"** refers to the direction that would be up if the part were installed in a plane sitting in the upright position. In most cases the part shown will be oriented in the same position as the part itself will be placed during that assembly step. However, time goes on and changes are made, so careful attention should be paid to the orientation arrows.

CONTENTS

1. INTRODUCTION

The all metal main landing gear box of the Lancair IV was designed for strength, simplicity, and ease of installation. The gear box is largely prebuilt by the factory to insure proper alignment of the main gear legs.

Main landing gear box
Figure 19:i:1



2. SPECIAL PARTS, TOOLS, & SUPPLIES LIST

A. PARTS

	Bottom fuselage shell
1	Main landing gear box (GM459)
2	Main gear legs (Trunions and axle mounts pre-installed)
1	GM461-001 fwd corner bracket
1	GM461-002 fwd corner bracket
1	GM462-001 aft corner bracket
1	GM462-002 aft corner bracket
2	GM459-015 fwd corner brace
2	GM459-016 aft corner brace
1	GM459-028 lower tie
2	GM467 (or 485) axles
2	GM472-03 (3/8") axle spacer (GM472-01 replaces these two spacers)
2	GM472-02 (5/8") axle spacer
1	GM460-07-01 bumper mount
1	GM460-07-02 bumper mount
1	GM460-01 bumper casting
1	GM460-02 bumper casting
1	GM460-03 plastic cushion
4	GM456 pinion plates
2	GM469 pinion
4	GM468 pinion spacers
1	GM451-03 bearing block
1	GM451-01 bearing block
1	GM451-04 bearing block
1	GM451-02 bearing block
1	GM459-04 strap
1	GM459-014-01 (lower aft corner brace)
1	GM459-014-02 (lower aft corner brace)
1	GM459-021 flange doubler
1	Box of 91632A146 Screws

B. TOOLS

Drill
Plumb bob
Carpenter's level
Band or hack saw
Countersink

C. SUPPLIES

Epoxy
Flox
Mixing cups
Tongue depressors
2 x 4 wood stock
Paper towels
MC
Fiberglass
1 mil thick plastic
Release tape

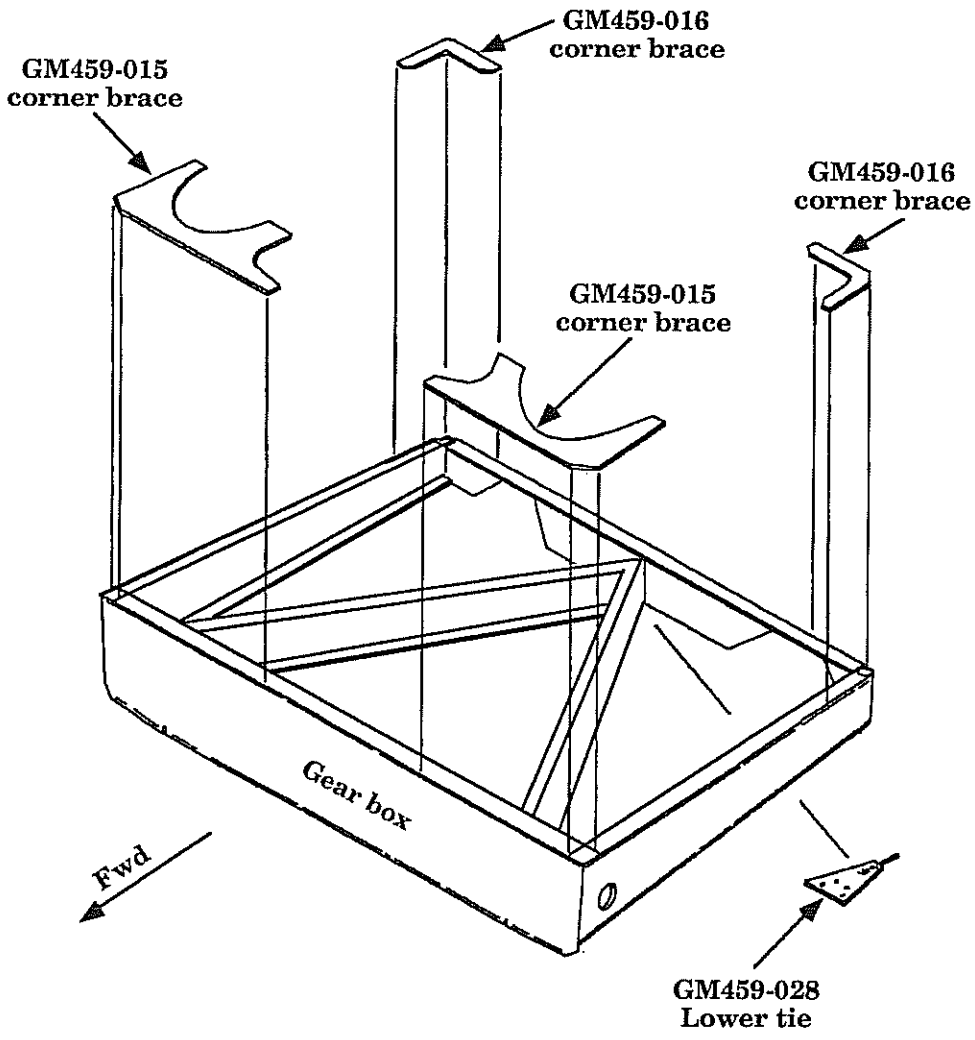
3. CONSTRUCTION PROCEDURE

A. ASSEMBLING GEAR BOX

Although the Lancair IV main gear box is largely preassembled at the factory to assure proper trunion alignment, there are a few bolts the must be drilled for and installed by the builder. Pilot holes are provided for most of these bolts to avoid a lot of measuring.

The braces shown in Figure 19:A:1 must be installed by the builder.

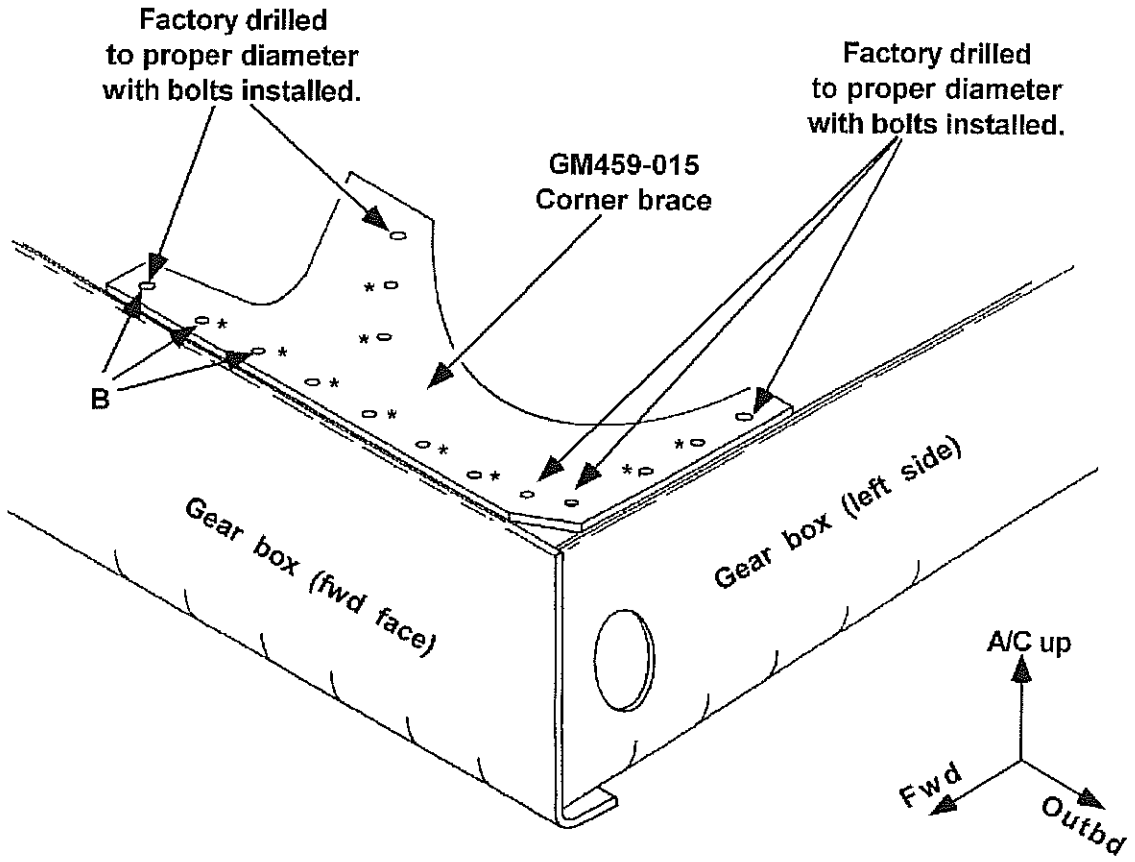
Main landing gear box
Figure 19:A:1



A1. There are reinforcement plates on the upper, forward corners of the gear box. Three of the attachment holes on each plate are predrilled to the proper 1/4" diameter. There are pilot holes through the reinforcement plates at each bolt location for use as guides to drill through the gear box flanges. Drill out these holes now to the proper 1/4" diameter.

A2. Secure the GM459-015 braces to the gear box. Because of the flange doubler, three AN4-10A bolts are used for each GM459-015 (these bolts are marked "B" in Figure 19:A:2). The rest of the securing bolts are AN4-6A's. AN960-416L washers are used under both the head of the bolt and under the AN365-428A nuts.

GM459-015 upper, fwd corner braces
Figure 19:A:2

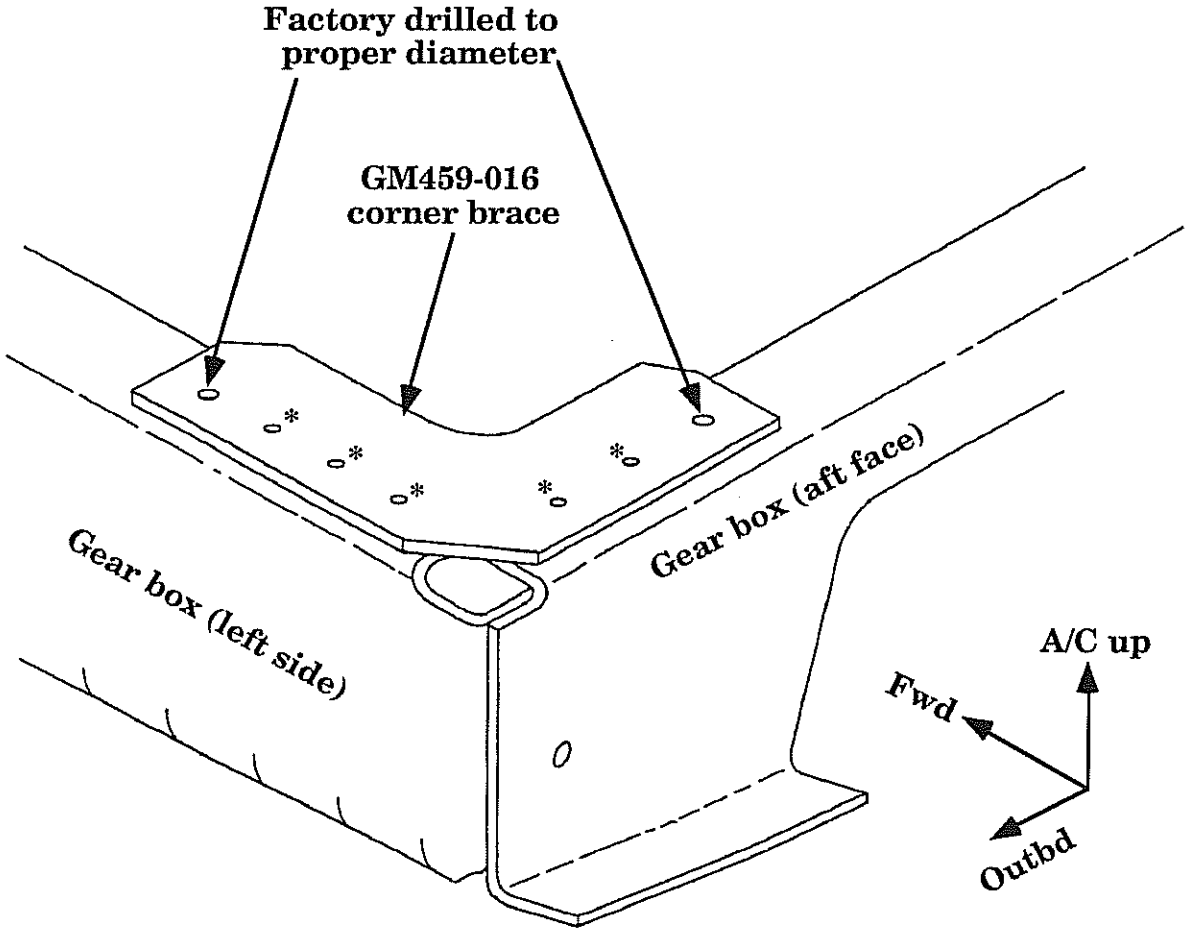


* = Holes with asterisks by them are only pilot drilled through the GM459-015 brace and must be drilled out to 1/4" diameter. Use these holes as guides to drill through the gear box.

A3. There are also braces (GM450-016) at the upper aft corners of the gear box. Two of the mounting holes in each brace are predrilled to 1/4" diameter, but the rest must be drilled out using the pilot holes as guides.

A4. Secure the GM459-016 braces with AN4-6A bolts, AN960-416 washers, and AN365-428A locknuts. There are AN960-416 washers under both the heads of the bolts and under the locknuts.

GM459-016 upper, aft corner braces
Figure 19:A:3



*** = Holes with asterisks by them are only pilot drilled through the GM459-015 brace and must be drilled out to 1/4" diameter. Use these holes as guides to drill through the gear box.**

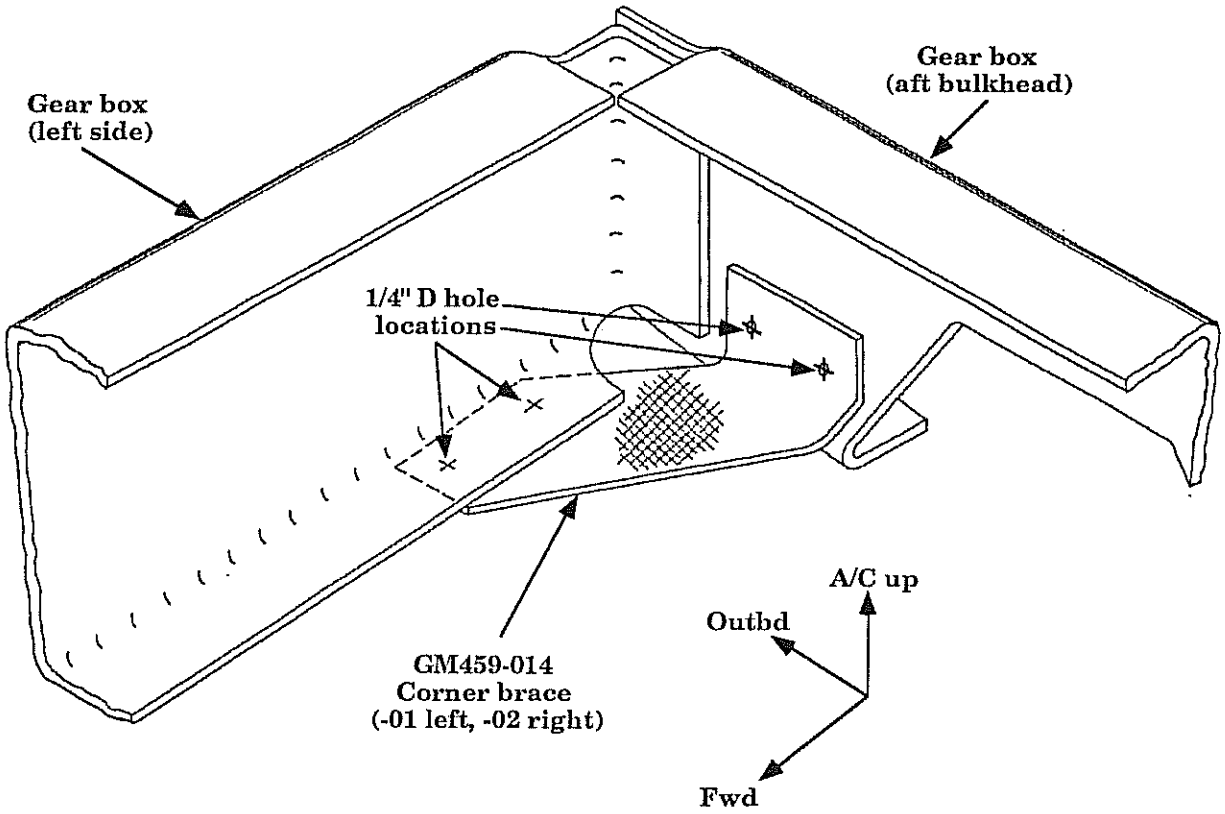
LEFT BLANK INTENTIONALLY

LEFT BLANK INTENTIONALLY

A5. Two more braces, GM459-014-01 (-02 right), are required at the aft, lower corners of the gear box. Position the GM459-014 braces as shown in Figure 19:A:5. Two of the bolt holes in each brace are predrilled to the proper diameter, 1/4". The other holes are only pilot drilled through the brace. Use these pilot holes as guides to drill out both the GM459-014 braces and the gear box flanges to 1/4" diameter.

A6. Secure the GM459-014 braces to the gear box with AN4-6A bolts, AN960-416 washers, and AN365-428A locknuts.

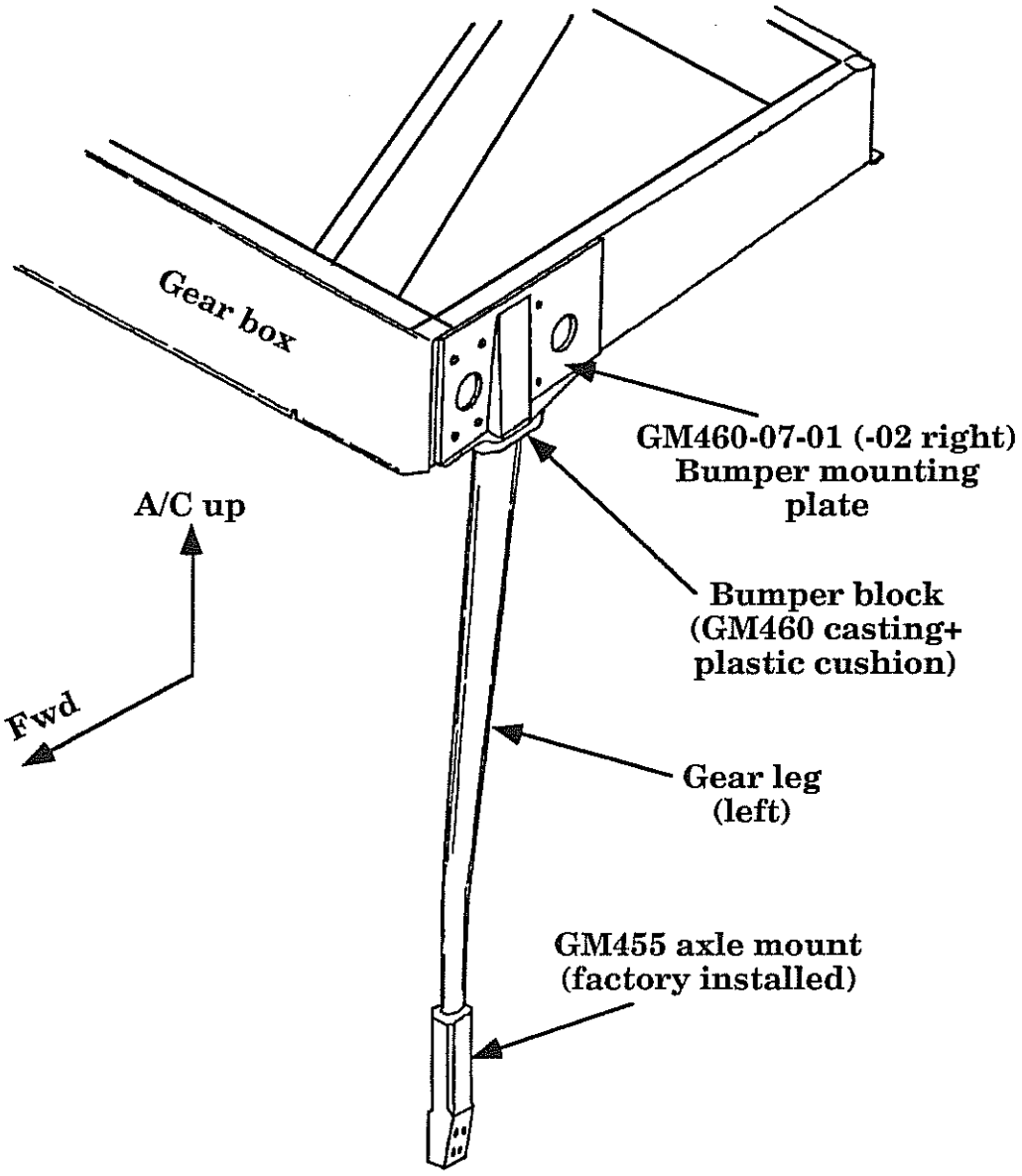
GM459-014 aft, lower corner braces
Figure 19:A:4



B. ASSEMBLING GEAR DOWN STOPS

When the main gear legs are in the down position, they will rest against plastic cushions that are mounted to cast aluminum pieces. These two assemblies are called bumper blocks. The bumper blocks are bolted to the gear box sides and absorb most of the shock forces of gear.

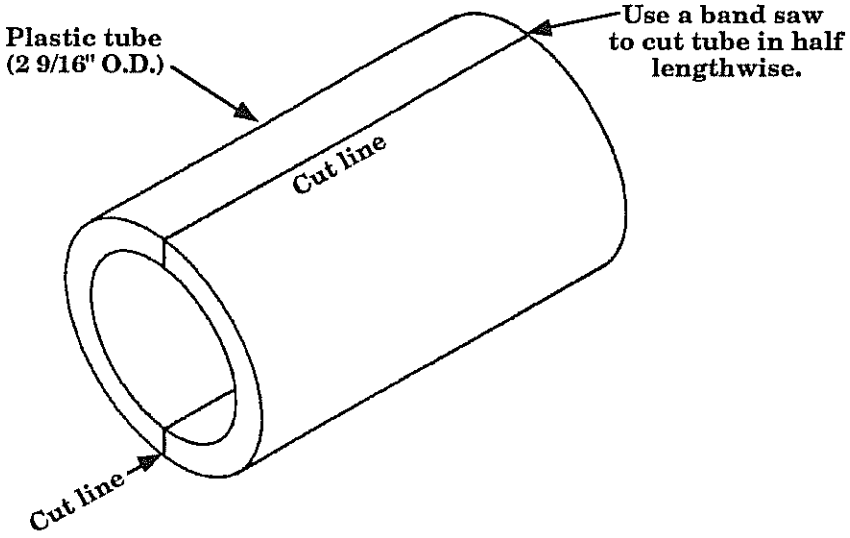
Main gear down stops
Figure 19:B:1



B1. A length of plastic tube is provided in the kit to form both plastic cushions. Cut the plastic tube lengthwise so you have two half round sections. A band saw is best for this job but a hack saw will work fine also. This is only a rough cut. The plastic cushions will be trimmed again later.

NOTE: Although we are refering to the down stop cushions as being simply plastic, they are actually called Ultra High Molecular Weight (UHMW) Polypropelene. This is a type of plastic with a very high density that will not be squashed by years of supporting the Lancair IV weight. So for simplicity and to save ink, we are calling the cushions "plastic".

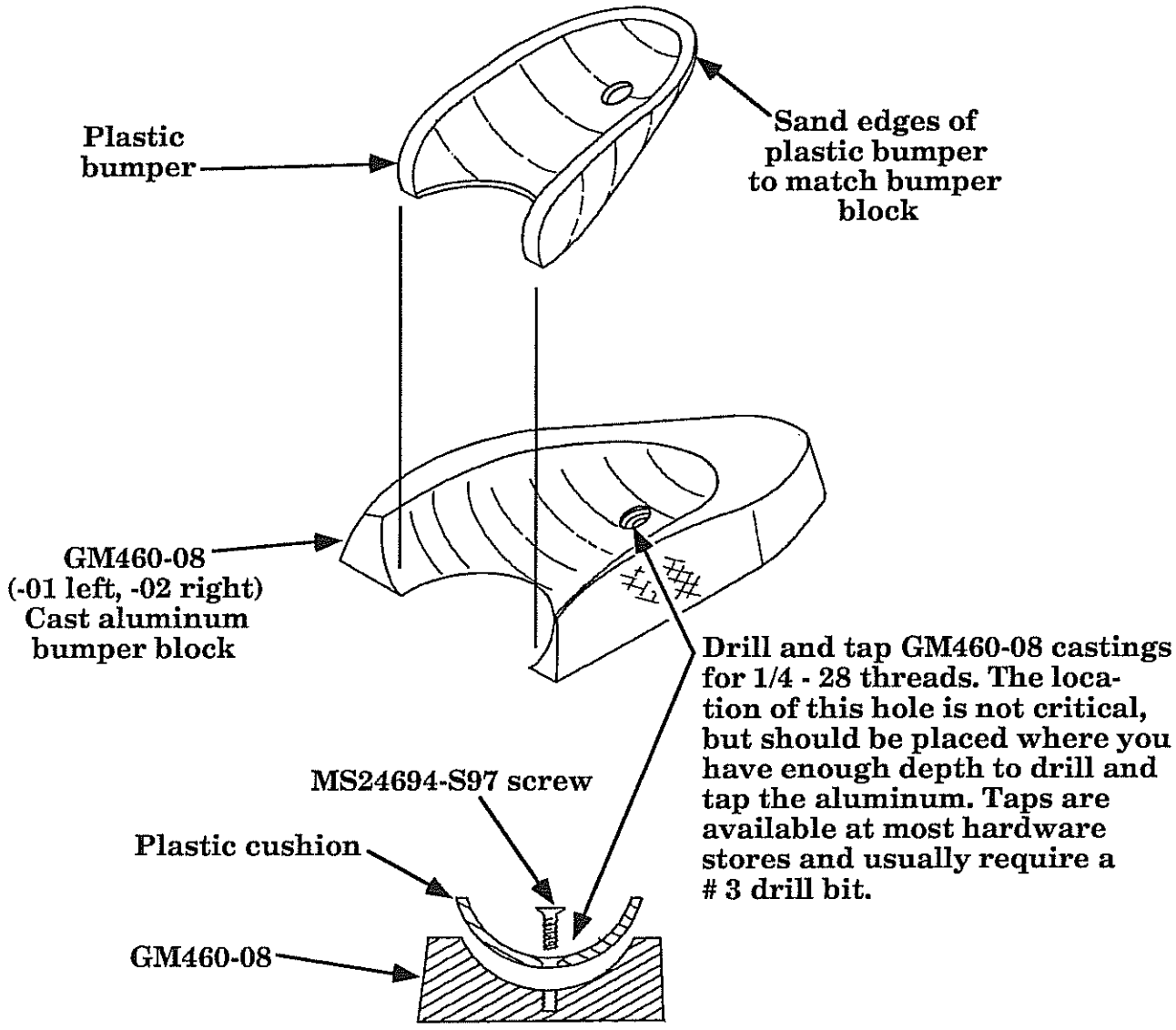
Cutting plastic tube
Figure 19:B:2



B2. Place the half round plastic cushions against the curved area of the GM460-08 aluminum castings where they will be mounted. There should be plenty of excess plastic around the edges of the GM460-08's. Mark the location of the cushion mounting screw holes on the plastic cushions (See Figure 19:B:3). Drill a 1/4" hole through the each plastic cushion at the mounting screw locations. Drill at approximate right angles to the surface of the plastic (although this is not critical). Use a #3 drill to drill the mounting holes in the castings. Use a 1/4-28 tap to thread the casting holes for the mounting screws as shown in Figure 19:B:3.

B3. Countersink the mounting screw holes in the plastic cushions to accept an MS24694-S97 screw. Countersink the holes enough so the screw heads are recessed into the surface of the plastic by about .030". If the screw heads where flush with the plastic cushion surfaces, then the gear legs would be scratched by resting on the screw heads.

Securing plastic cushions to down stops
Figure 19:B:3



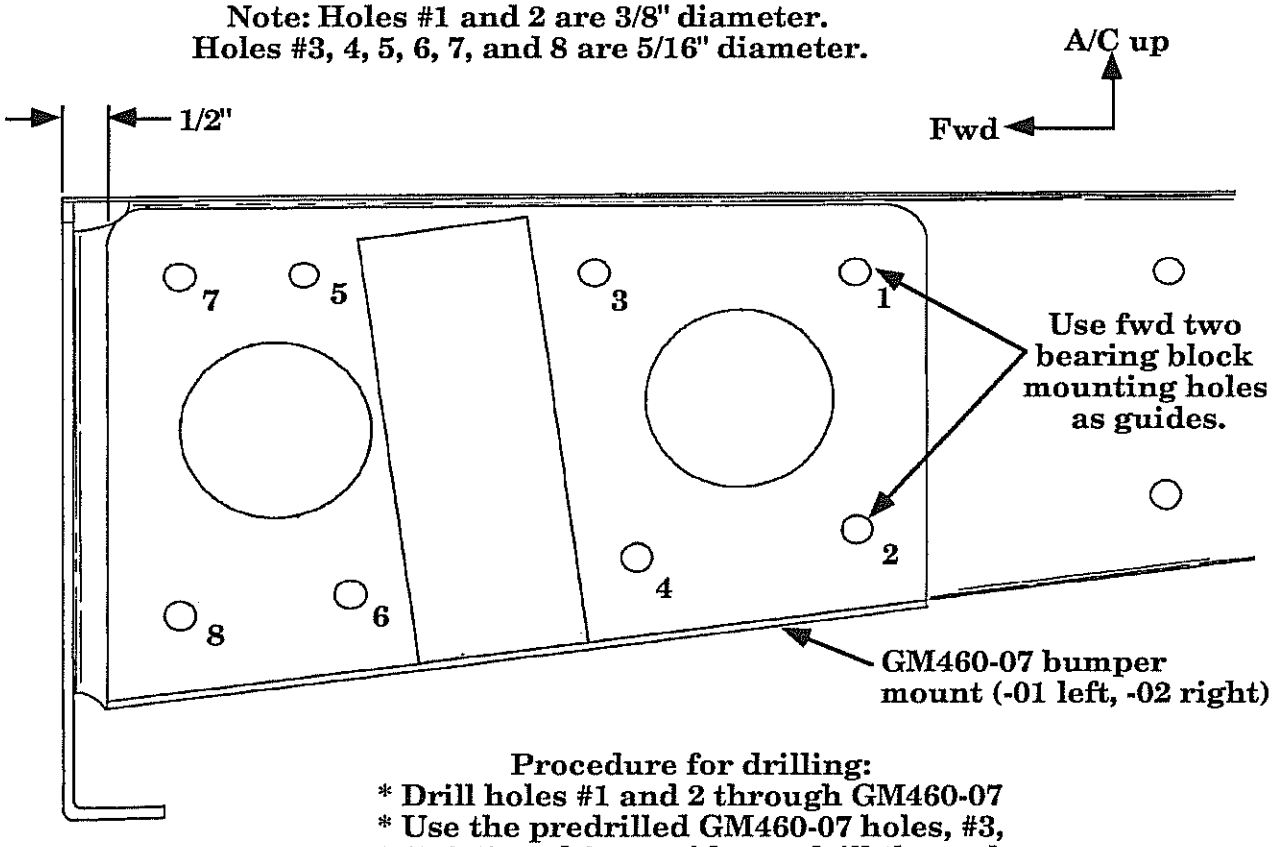
B4. Position the plastic cushions on the GM460(-01 or -02) castings and mark on the cushions the outline of the casting's edges.

B5. Trim the plastic cushion to the outline of the GM460(-01 or -02) edges.

B6. Secure the plastic cushions to the GM460(-01 or -02) castings with MS24694-S97 screws. Use Loctite #242 on the screw threads to prevent loosening.

B7. Place the GM460-07 (-01 or -02) bumper mounts againts the gear box sides as shown in Figure 19:B:4:a & b. The important dimension here is having the fwd edge of the bumper mounts 1/2" behind the fwd face of the gear box. The bottom flange of the bumper mounts should rest against the bottom flange of the gear box sides.

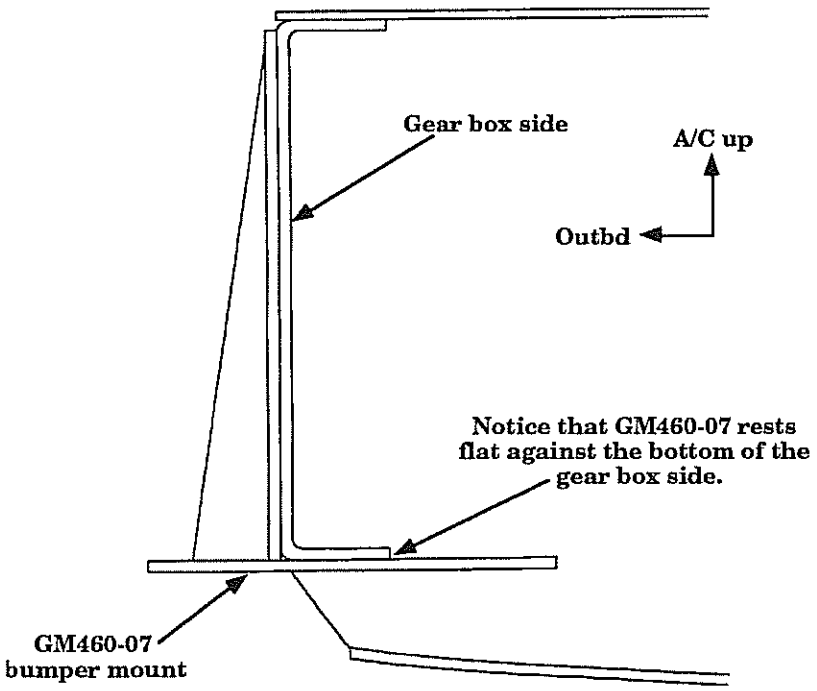
Locating and drilling GM460-07 bumper mounts
Figure 19:B:4:a



Procedure for drilling:
*** Drill holes #1 and 2 through GM460-07**
*** Use the predrilled GM460-07 holes, #3, 4, 5, 6, 7, and 8 as guides to drill through gear box sides.**

Locating and drilling GM460-07's

Figure 19:B:4:b



B8. There are six predrilled holes in each GM460-07 bumper mount. Two more holes need to be drilled in each GM460-07. These two holes are match drilled using the two holes shown in Figure 19:B:4:a as guides. Use the following procedure to match and drill the two holes through each GM460-07.

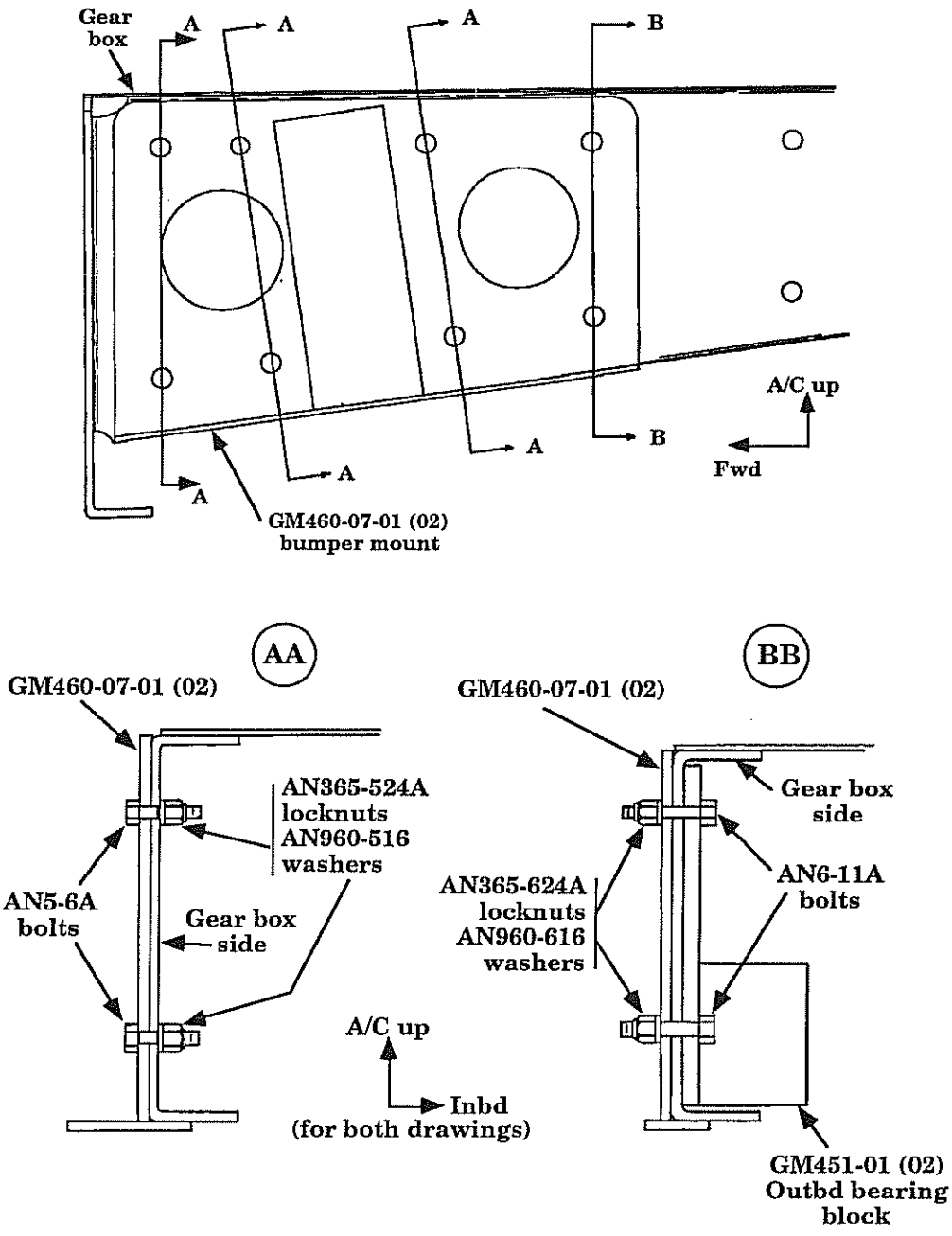
1. Use a transfer punch to mark the hole locations on the inboard face of the GM460-07 bumper mounts.
2. Remove the GM460-07's from the gear box and center punch where the holes will be drilled. This is important because the transfer punch does not put a good enough "dent" in the steel for proper drill alignment
3. Drill a 1/8" diameter pilot hole at the four hole locations.
4. Expand the pilot holes with a 1/4" diameter drill.
5. Finish the holes with a 3/8" diameter drill.

B9. Relocate the GM460-07 bumper mounts on the sides of the gear box by inserting two AN6 bolts through the holes you drilled in Step C8. If you drilled the holes accurately, the bottom flanges of the GM460-07's should rest against the bottom flanges of the gear box sides. If not, you can slightly enlarge the aft two holes in the GM460-07 ONLY, until the bottom flange rests against the gear box side.

B10. When satisfied with the GM460-07 locations, use the six predrilled holes in each bumper mount as guides to drill 5/16" diameter holes through the gear box sides.

B11. Secure the GM460-07 bumper mounts to the gear box sides with six AN5-6A bolts each. Use AN365-524A locknuts and AN960-516 washers. Do not install bolts in the aft two holes of the GM460-07's.

Securing GM460-07 bumper mounts to gear box
Figure 19:B:5



B12. The gear bumper blocks (consisting of the cast aluminum saddles and the plastic cushions) will be mounted to the bottom flanges of the GM460-07's. This will be done in the next section because the bumpers are used to correctly position the gear legs. Read on.

B13. Now is a good time to install the GM459-04 strap between the two GM460-07 bumper mounts. This strap prevents the sides of the gear box from spreading during extremely high "G" landings (not that you would ever do one of course). The GM459-04 strap has three, predrilled, mounting holes in each end. Position the strap as shown in Figure 19:B:6.

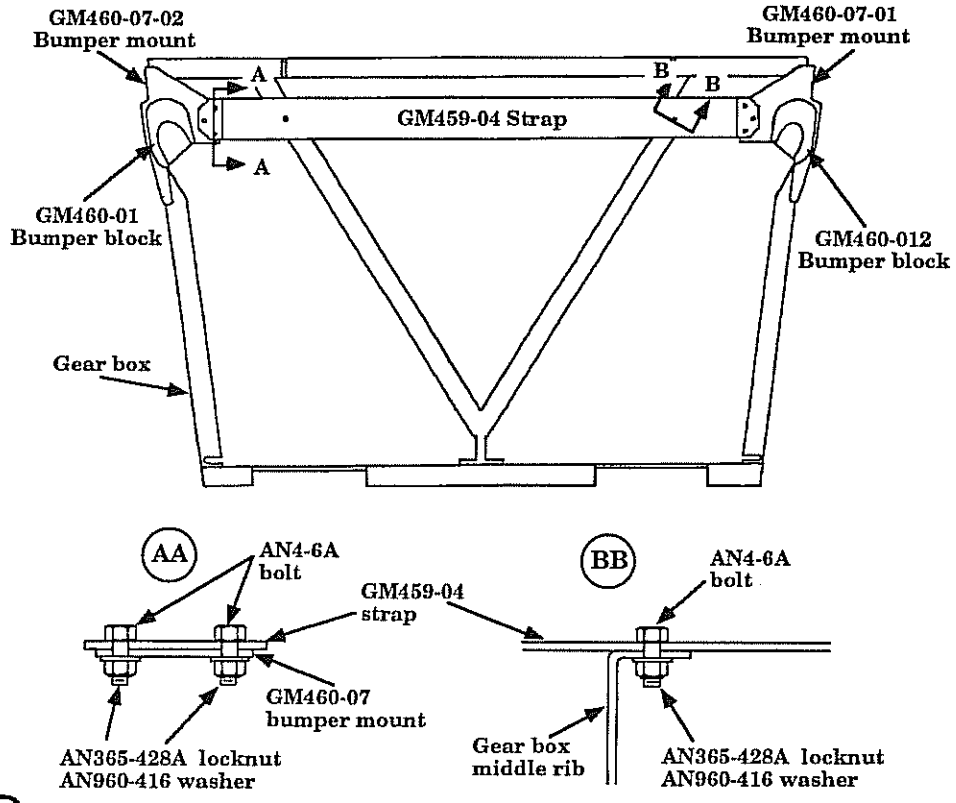
B14. Use the predrilled holes in the GM459-04 strap as guides to drill 1/4" diameter holes through the GM460-07 bumper mounts. The predrilled holes are undersized, so when you drill, you will be expanding them slightly.

B15. Secure the GM459-04 strap to the GM460-07 bumper mounts with AN4-5A bolts and AN365-428A locknuts.

B16. Drill two more 1/4" diameter holes through both the GM459-04 strap and the middle gear box formers as shown in Figure 19:B:6. Secure the GM459-04 strap to these two formers with AN4-6A bolts, AN960-416 washers, and AN365-428A locknuts.

Securing GM459-04 strap

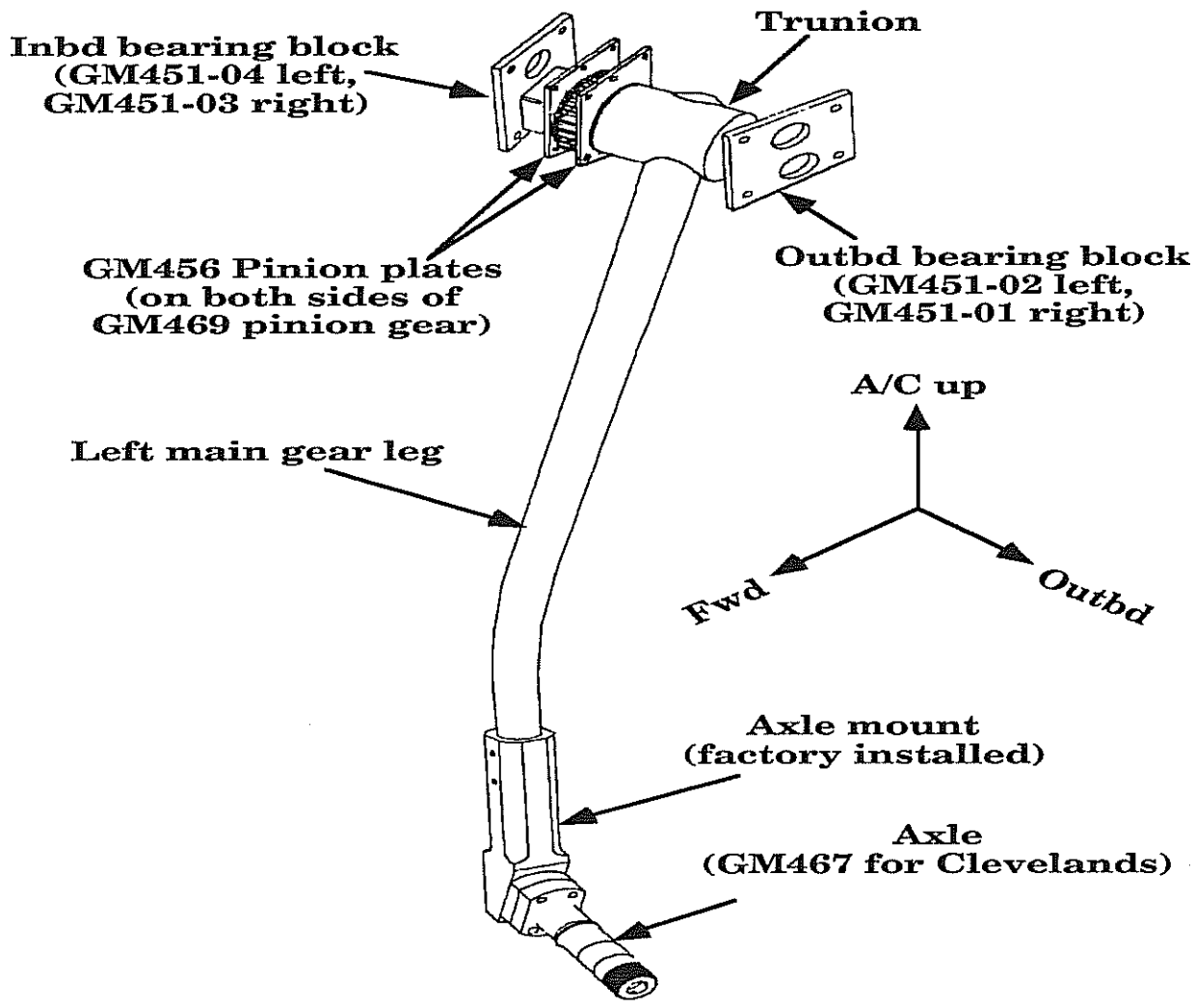
Figure 19:B:6



C. INSTALLING MAIN GEAR LEGS

The main gear legs come to you with the trunions, axle mounts, and internal brake lines pre-installed. To prepare the gear legs to be installed into the gear box, you must install the pinions and pinion plates. The bearing plates and axles are also installed to complete the gear leg assembly.

Main gear leg
Figure 19:C:1

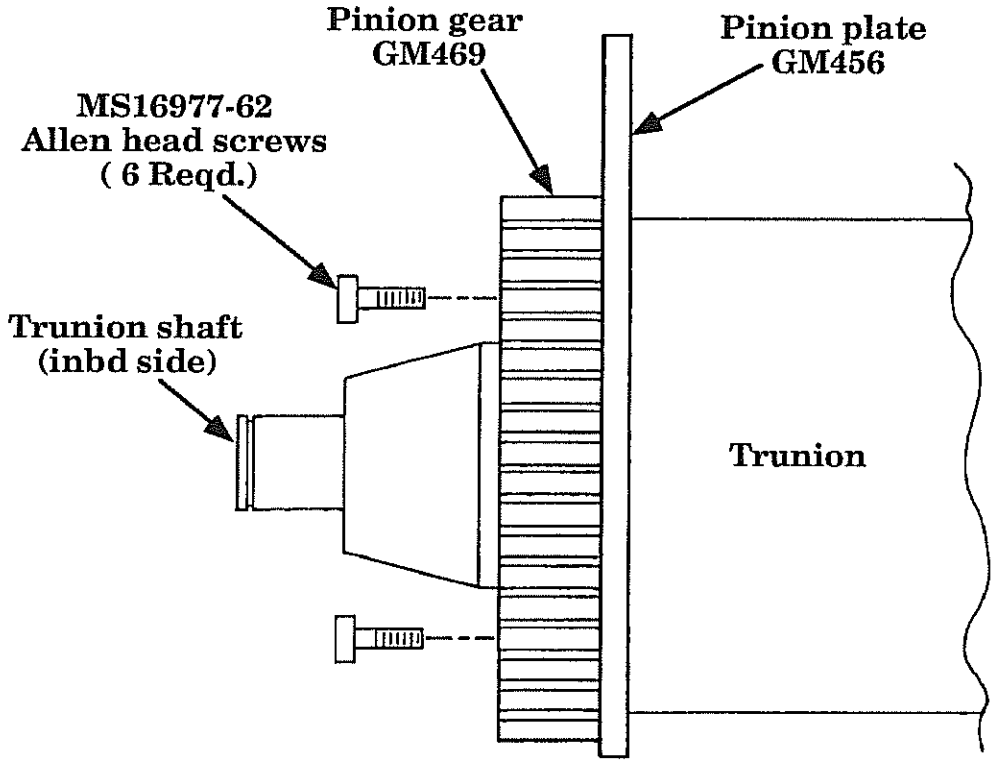


Note: There is a left and right main gear leg. Most parts that are installed onto the main gear legs in this section are all interchangeable from left or right (if they're not interchangeable, we'll tell you). As always, it is a very good idea to read through this chapter and get a good understanding of how the gear works.

C1. Slide one pinion plate (GM 456) onto the inboard end of each trunion as shown in Figure 19:C:2. Lubricate the contacting surfaces of the pinion plates and the trunions with a light coat of general purpose grease (white lithium type is good).

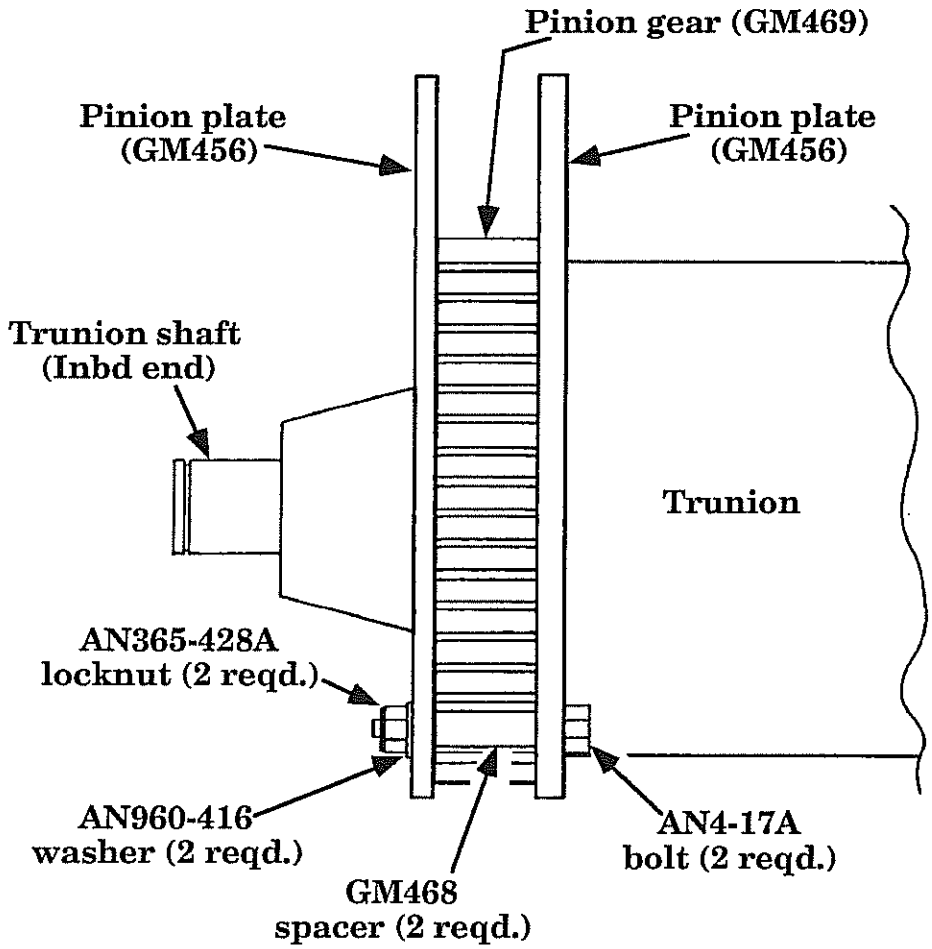
C2. Slide one pinion gear (GM469) onto the inboard end of each trunion. This is a tight fit and will require lightly tapping the pinions onto the trunions. Tap all around the pinions to avoid any misalignment and gouging of the aluminum trunion surfaces. Be sure to align the pinion gears with the dowels that are pre-installed in the trunions. Grease the contacting surfaces of the pinion gear and the pinion plate. Secure the pinion gears to the trunions with six MS16977-62 screws each. Put a couple drops of Loctite #242 onto the threads of each screw before installing it.

Securing pinion gear to trunion
Figure 19:C:2



C3. Slide another pinion plate onto each trunion so the plates are are both sides of each pinion gear. Grease the contacting surfaces of the pinion plate and pinion. Use AN4-17A bolts, AN960-416 washers, and AN365-428A locknuts to secure the pinion plates to each other with spacers (GM468) in between. Secure the pinion plates with the nuts on the inboard side. Don't tighten the spacer bolts yet, because the pinion plates would not be parallel.

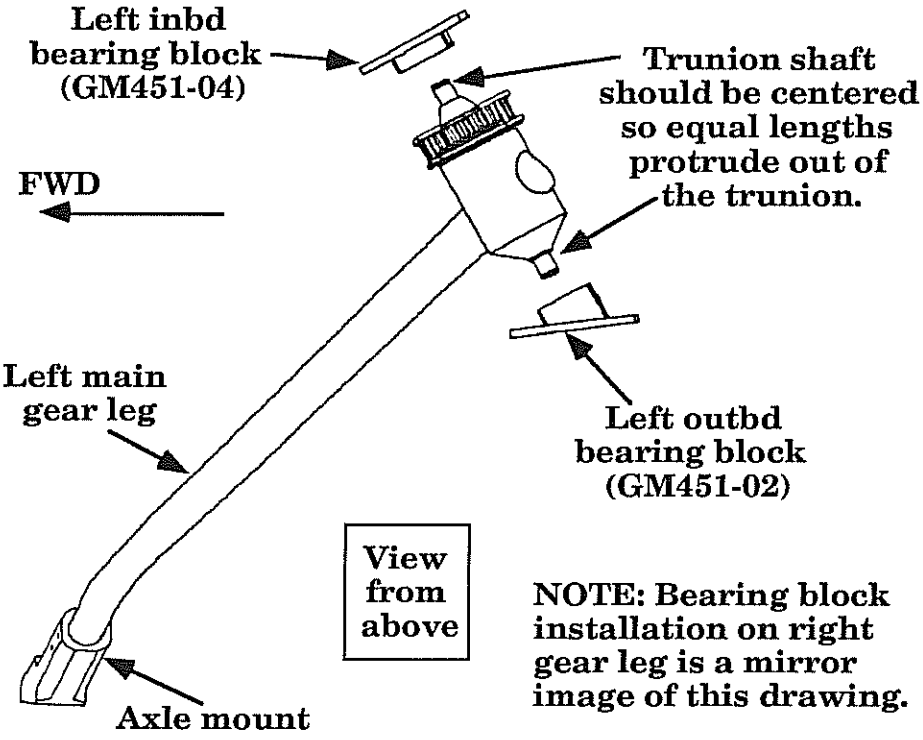
Securing pinion plates together
Figure 19:C:3



C4. To install the bearing blocks on the trunions, you must check that the trunion shafts are centered (equal shaft lengths protruding inboard and outboard of the trunions). Notice that all four bearing blocks are unique. A good way to check the difference between the bearing blocks (beside the factory labeling) is the taper of the top and bottom edges. Each block tapers so it is shorter aft. Slide the outboard bearing blocks (GM451-01 and GM451-02) onto each trunion shaft.

C5. Secure the outbd bearing blocks to the trunions with circlips. Tap the shaft inbd until the circlip rests flat against the bearing block. Use a drift pin between the hammer and the shaft to prevent dinging up the shaft. If this is the first time you have used circlips, you will need a pair of circlip pliers for installing these fasteners. With the pliers, expand the circlips just enough to fit over the trunion shafts, then release the pressure and let the circlips contract into the shaft grooves.

Securing bearing blocks to trunion shaft
Figure 19:C:4

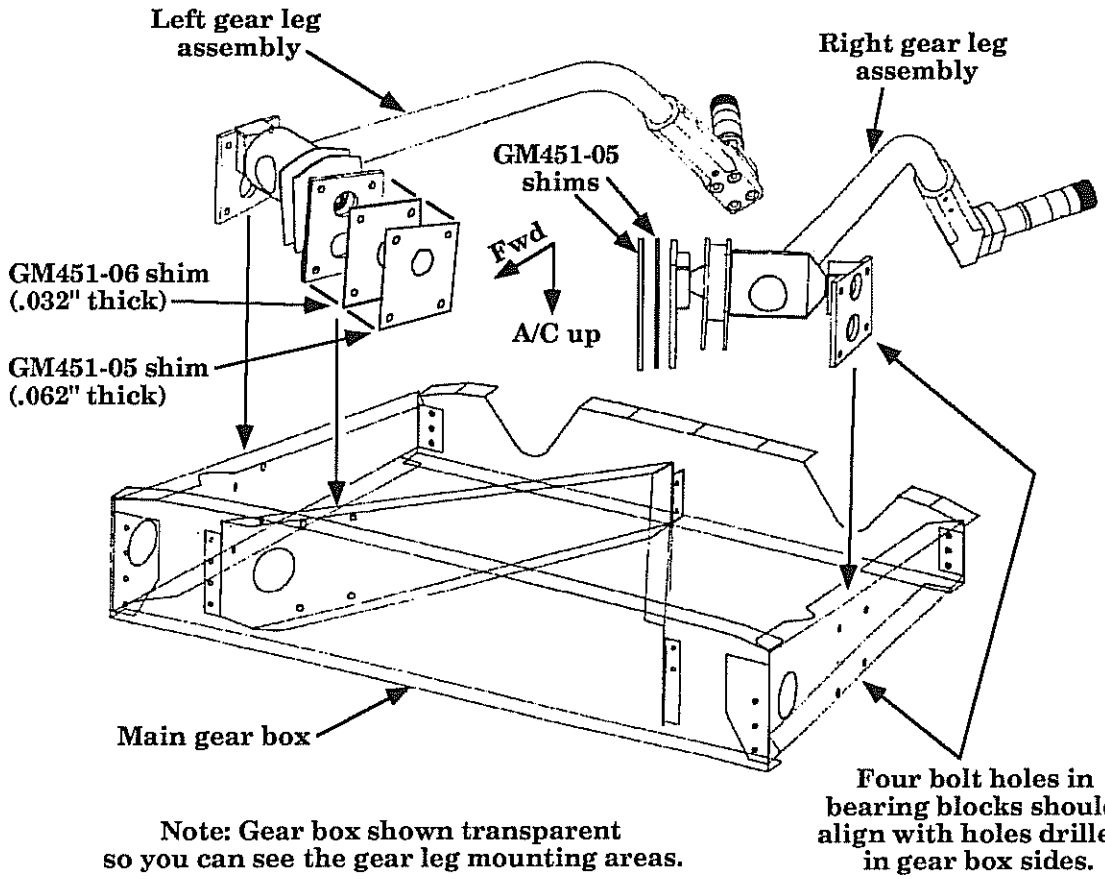


C6. Slip the inbd bearing blocks (GM451-03 and GM451-04) onto the trunion shafts and secure them with circlips. If there is some play between the bearing and the trunion when the circlip is installed, this is acceptable.

C7. Place the gear box upside down on a bench.

C8. The gear box is predrilled for the bearing blocks. Place the gear leg assemblies into the gear box. Remember, the gear box is inverted so the gear legs should be also. Insert the proper shims between the GM451-03 and -04 bearing blocks and the middle gear box formers, as shown in Figure 19:C:5 and 19:C:6. Also, read the NOTE after Step C9 for an explanation of the shims. You may use thicker or thinner shims depending on your gear box. To get the bearing blocks into position, carefully work them forward until the four bolt holes of each bearing block align with the holes in the gear box walls. The bearing blocks are a close fit, so it might take you some careful trial and error to find the best path for installing the gear leg assemblies. See Figure 19:C:5.

Positioning gear leg assemblies
Figure 19:C:5



C8.1 One important factor in gear leg installation is figuring out the exact width of the trunion and bearing blocks. When this is determined, the proper number of shims can be placed between the inbd bearing blocks and the gear box formers. There are several factors to consider when figuring this width:

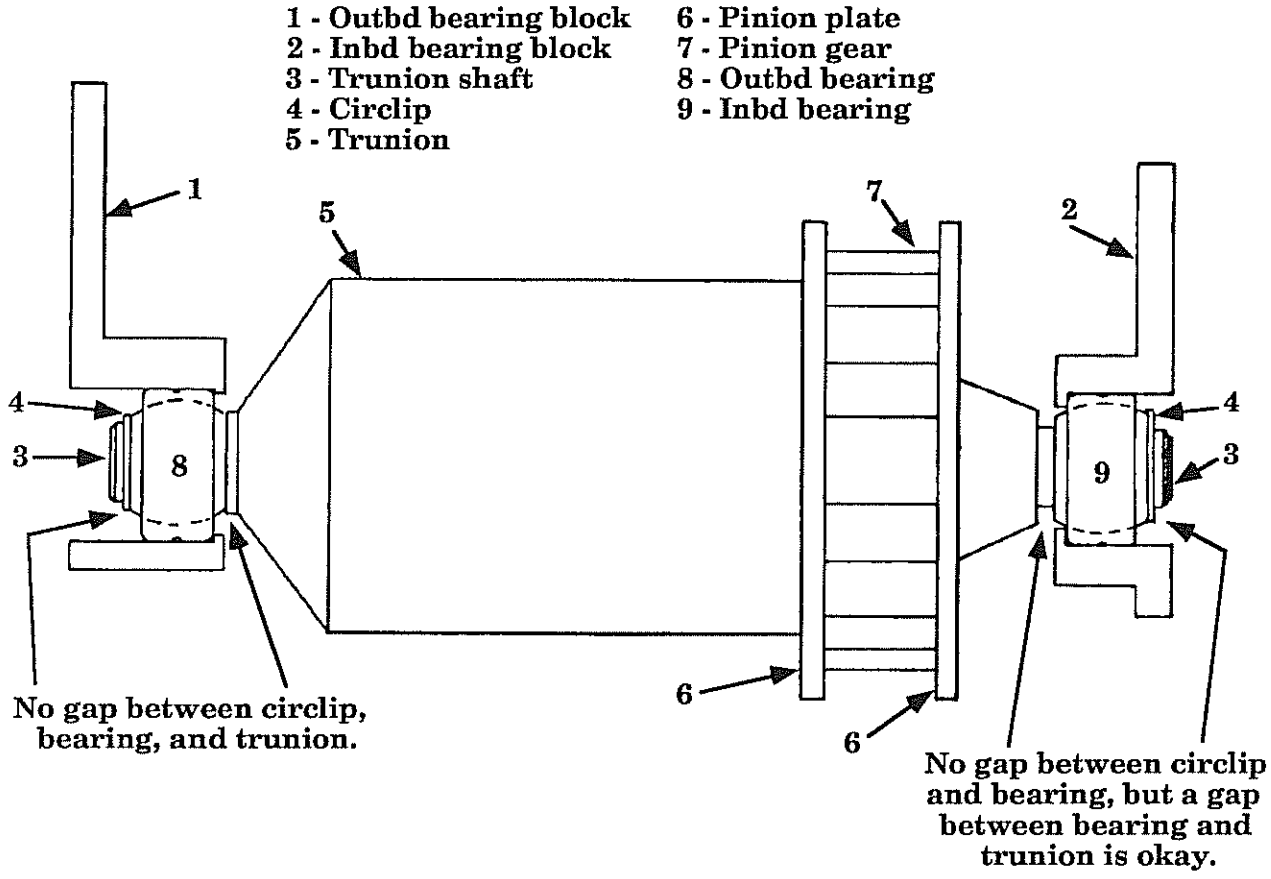
1. The bearings must be pressed down fully against the shoulder of the bearing blocks. This is done at the factory, but it is a good idea to check anyway.

2. The trunion shaft must be tapped inbd until the outbd circlip rests against the bearing. Continue tapping until the outbd bearing touches the trunion.

3. The bearing of the inbd bearing block should touch the inbd circlip. There will then be a gap between the inbd bearing and the trunion, but this is okay.

When these conditions are met, you can accurately gauge the number and thickness of shims needed to fill the gap between the inbd bearing block and the gear box former. Read the next few steps for more information on these shims.

Proper positioning of bearing blocks and trunion shaft
Figure 19:C:5:b

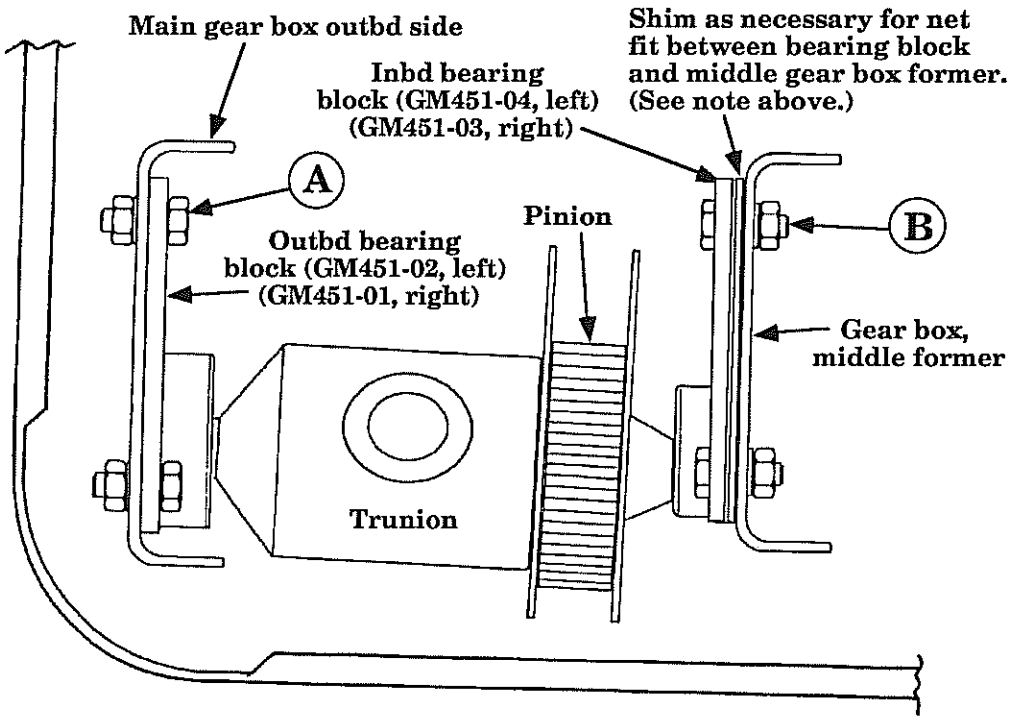


C9. Secure the *outbd* bearing blocks to the gear box with AN6-11A & 12A bolts, AN960-616 washers, and AN 365-624A locknuts. These bolts are oriented so the nuts are on the outbd surface of the gear box.

NOTE: IMPORTANT! If you don't have enough shim thickness between the inbd bearing blocks and the middle gear box formers, it is easy to pop off the circlips when the bearing blocks are bolted in place. We recommend a .032" AND .062" shim between the LEFT inbd bearing block (GM451-04) and the gear box former. We recommend two, .062" shims between the RIGHT inbd bearing block (GM451-03) and the gear box former. Your gaps may differ, so you can vary the number and thickness of shims to attain a near zero slop fit in these areas.

Securing bearing blocks to gear box

Figure 19:C:6



(A) - AN6-11A bolt, AN960-616 washer, AN365-624A locknut

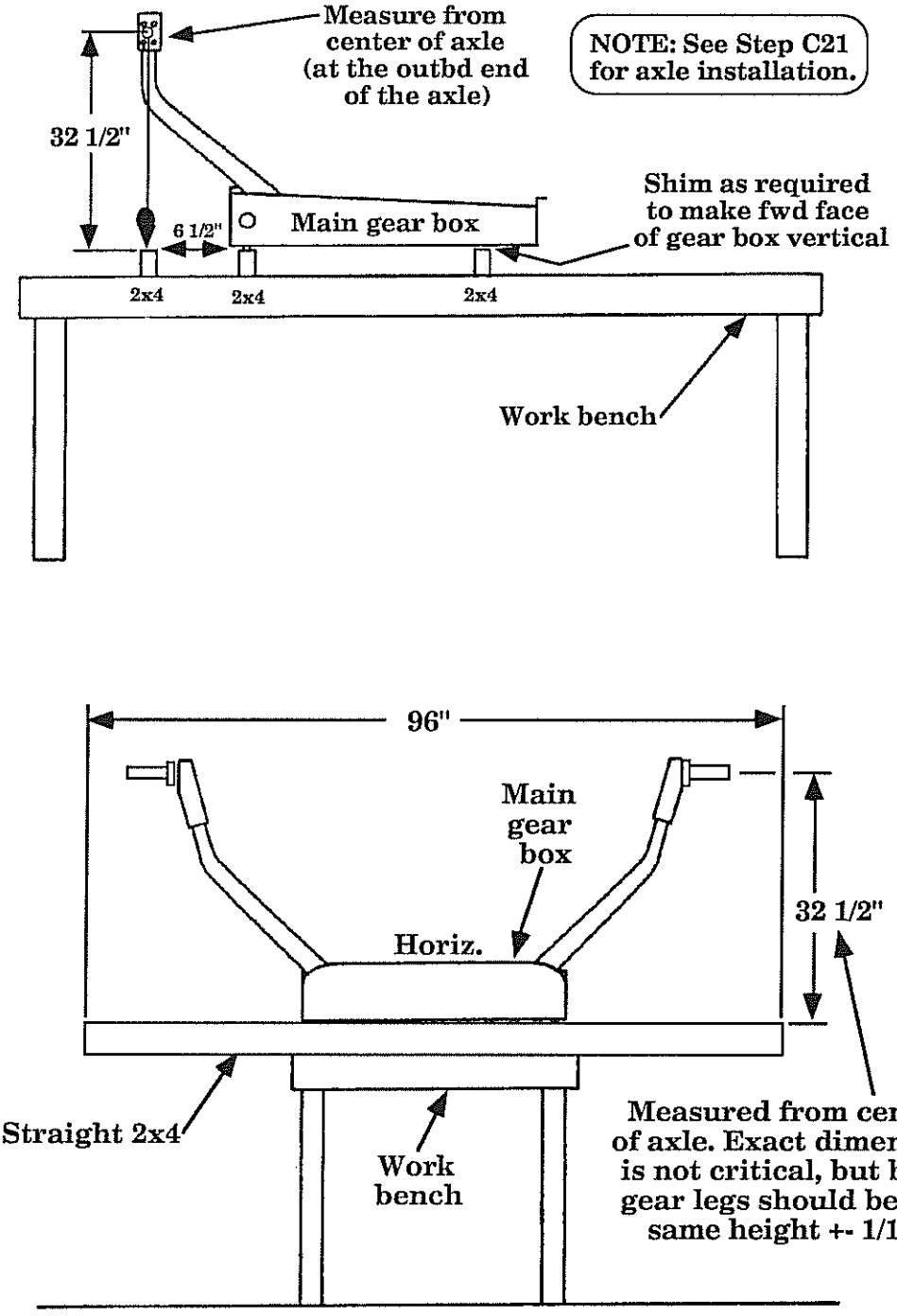
NOTE: The fwd two bolts of the outbd bearing blocks are AN6-12A, because they also secure the bumper mounts.

(B) - (Right side) AN6-12A bolt, AN960-616 washer, AN365-624A locknut
- (Left side) AN6-11A bolt, AN960-616L washer, AN365-624A locknut

C10. Now you can secure the inbd bearing blocks to the gear box with AN6-11A or -12A bolts, AN960-616 washers, and AN365-624A locknuts. These bolts are oriented so the nuts are on the inbd side. Be sure the inbd bearing blocks seat flat against the gear box wall before tightening the bolts.

C11. Position the gear box, with gear leg assemblies installed, upside-down on a bench as shown in Figure 19:C:7. Rest the gear box on two 2x4's. The forward row of bolt heads will rest on the forward 2x4.

Positioning main gear legs
Figure 19:C:7



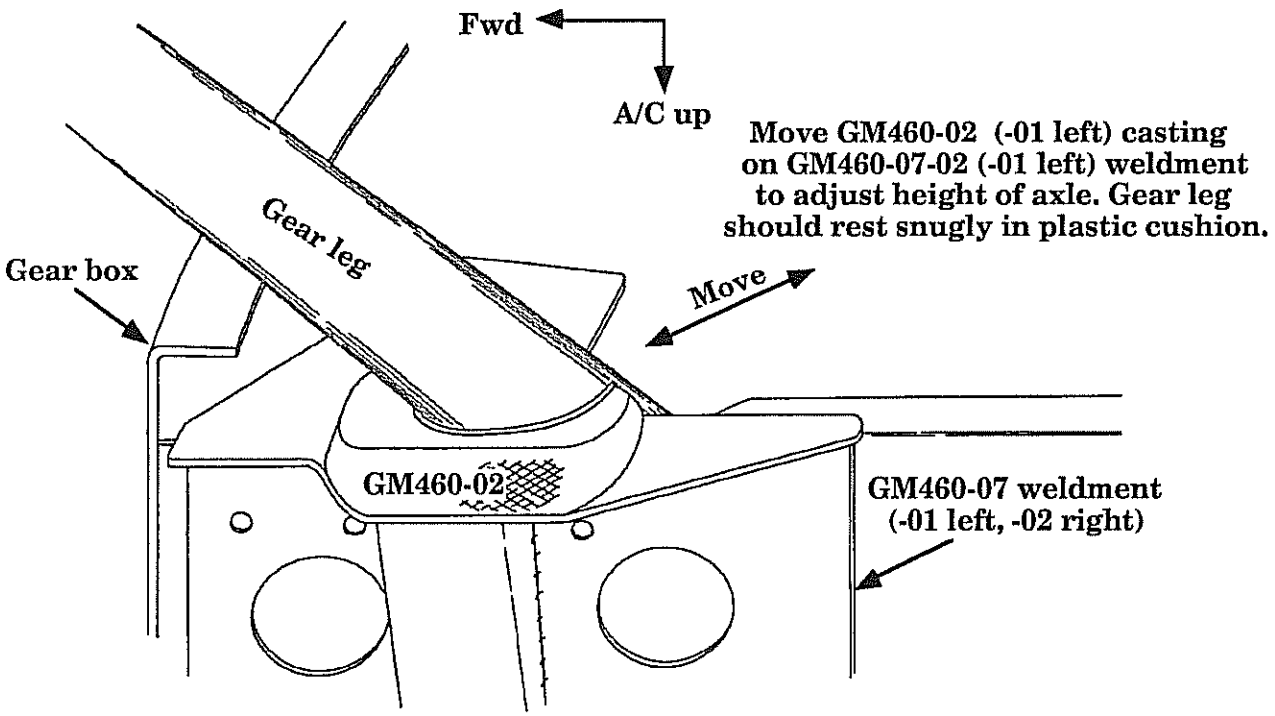
C12. Put shims between the aft 2x4 and the gear box until the forward face of the gear box is vertical.

C13. Position another 2x4 (it must be at least 96" long) on the bench so its edge is 6 1/2" forward of the forward face of the gear box, as shown in Figure 19:C:7. The long edges of the 2x4 should be parallel with the forward face of the gear box. When properly positioned, clamp the 2x4 to the bench.

C14. Place the bumper blocks (the cast aluminum pieces with the plastic cushion) onto the bottom flange of the GM460-07 bumper mounts.

C15. Rest the gear legs against the plastic cushion of the bumper blocks. Because of the shape of the gear legs, the bumper blocks will tend to self-align on the GM460-07's. This is what you want, let the bumpers find their own position on the GM460-07's to attain a snug fit between the gear leg and the plastic cushion.

Positioning gear saddles
Figure 19:C:8

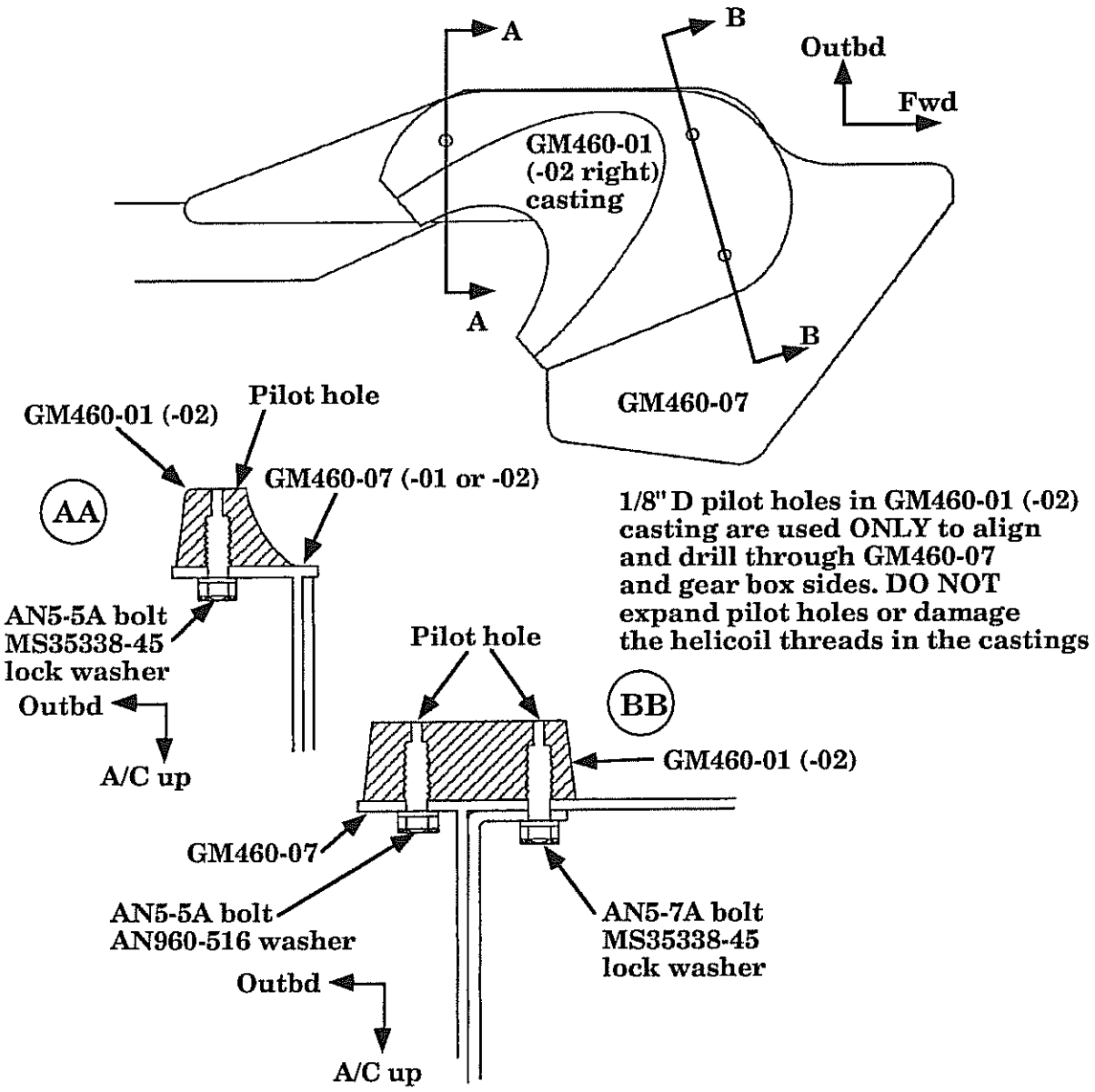


C16. Move the bumper blocks on the GM460-07 bottom flanges until the centers of the axles are 32 1/2" above the long 2x4 as shown in Figure 19:C:7 (See Step C21 for axle installation, we're a little out of sink here, so bear with us). The fore/aft positions of the gear legs are not critical. Because of stack tolerances in the production of the gear box, the FS location of the left and right axles may not match exactly. Properly setting the height of the gear legs is more important to the final setup of the gear box.

C17. When the gear legs have been properly positioned and there is a snug fit between the gear leg and the plastic cushion, use instant glue to hold the bumper blocks in position on the GM460-07 bumper mounts. Rotate the gear legs out of the way (into the "retracted" position).

C18. Use the three pilot holes in each cast aluminum bumper block to drill 1/8" pilot holes through the GM460-07's and gear box flanges. Be careful, there are helicoil threads installed in the cast aluminum saddles and you don't want to damage them.

Securing gear saddles
Figure 19:C:9

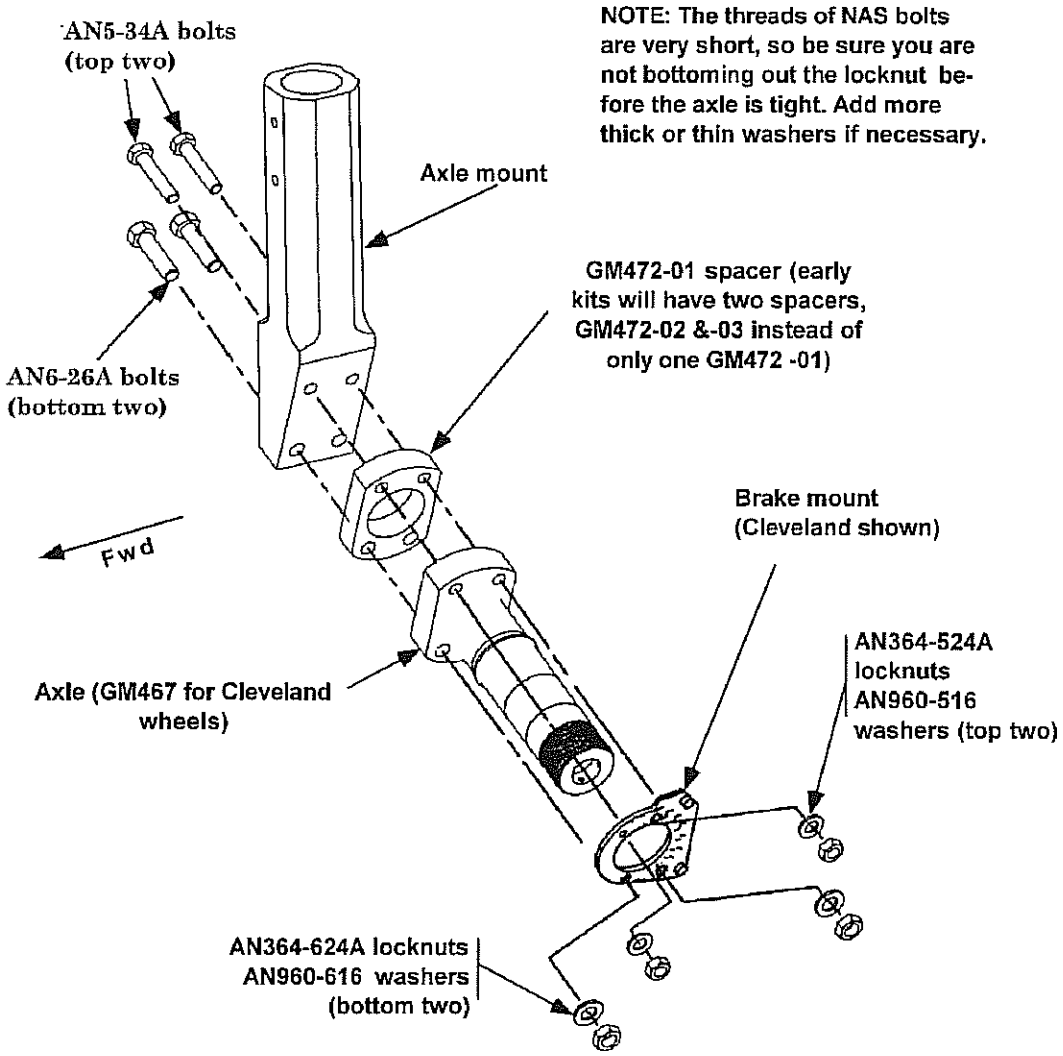


C19. Remove the bumper blocks from the GM460-07's and enlarge the pilot holes you just drilled to 5/16" diameter.

C20. Secure the bumper blocks to the gear box with AN5-5A or -7A bolts and MS35338-45 lockwashers as shown in Figure 19:C:9.

C21. The last parts to bolt onto the gear legs are the wheel axles. Although you will not install the wheels until later, the axles will help you align the gear box in the fuselage. Two spacers (GM472-02 & -03) are placed between the axle mount and the axle. In later kits, these two spacers have been replaced with a single one, GM472-01. Check your packing list and hardware to see what spacers you have. Secure the spacers and axles to the axle mounts as shown in Figure 19:C:10.

Securing axle and axle spacer
Figure 19:C:10



Due to revisions, this page has been removed.
Reference Section N for Extension Fairings.

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E. INSTALLING GEAR BOX IN FUSELAGE

The Lancair IV main gear box is positioned in the fuselage using the rear wing spars for reference. So, obviously, you should have both your wings installed on the fuselage for this section. You should also put a longitudinal support system along the centerline of the fuselage under the area where the gear box will go.

The rear spar bolt plates you installed in Chapter 5 should also be installed for this section. And please notice that there are two spacer washers between each rear spar bolt plate and GM461 corner bracket. These spacer washers will provide the necessary clearance for the bolts that secure the GM461's to the gear box (read ahead to Section F for GM461 installation).

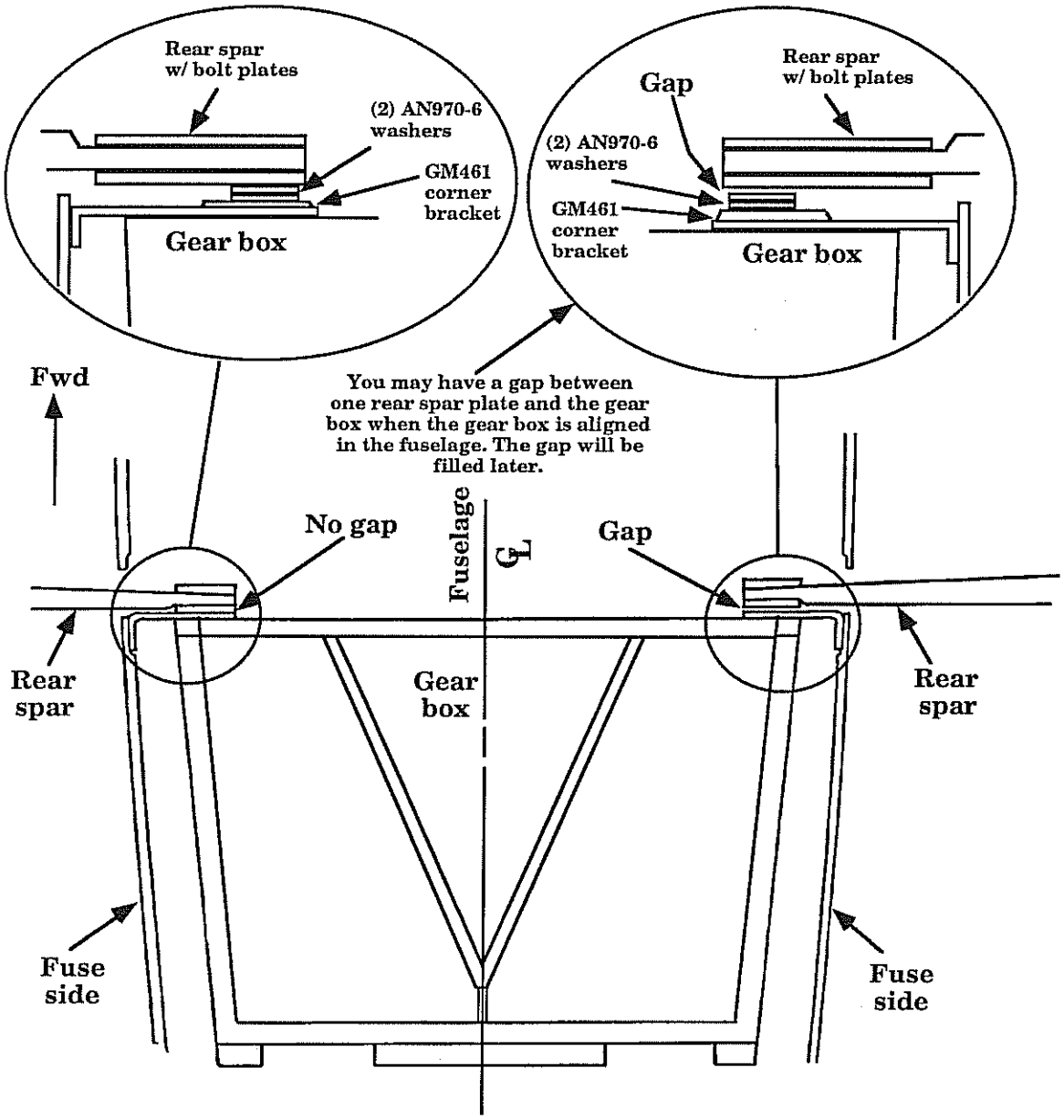
NOTE: If you want to install the gear box into the fuselage with the GM460 bumper blocks installed, you must cut a hole in the fuselage for adequate clearance. Otherwise the bumper blocks will hit the curved corners of the fuselage *before* the gear box is in position. DO NOT cut or trim the bumper blocks to lower the gear box into position. Trim the fuselage just enough so you can remove and install the bumper blocks without removing the gear box. For better access to the bumper block area, cut a hole in the wing fairing rib.

E1. Make a centerline mark on the forward and aft faces of the main gear box. These marks will be used to align the gear box in the fuselage, so take care with the measurements. Also mark a centerline reference on the inside surface of the bottom fuselage shell.

E2. Place the two fwd corner brackets (GM461-001 and GM461-002) against the rear spar bolt plates as shown in Figure 19:E:1. Two, AN970-6 washers should also be placed between each corner bracket and rear spar bolt plate as shown in Figure 19:E:1. You are not installing these pieces yet, just using them to properly locate the gear box.

E3. Place the main gear box against the rear spar, so the GM461 corner brackets and spacer washers are sandwiched in between.

Positioning gear box
Figure 19:E:1

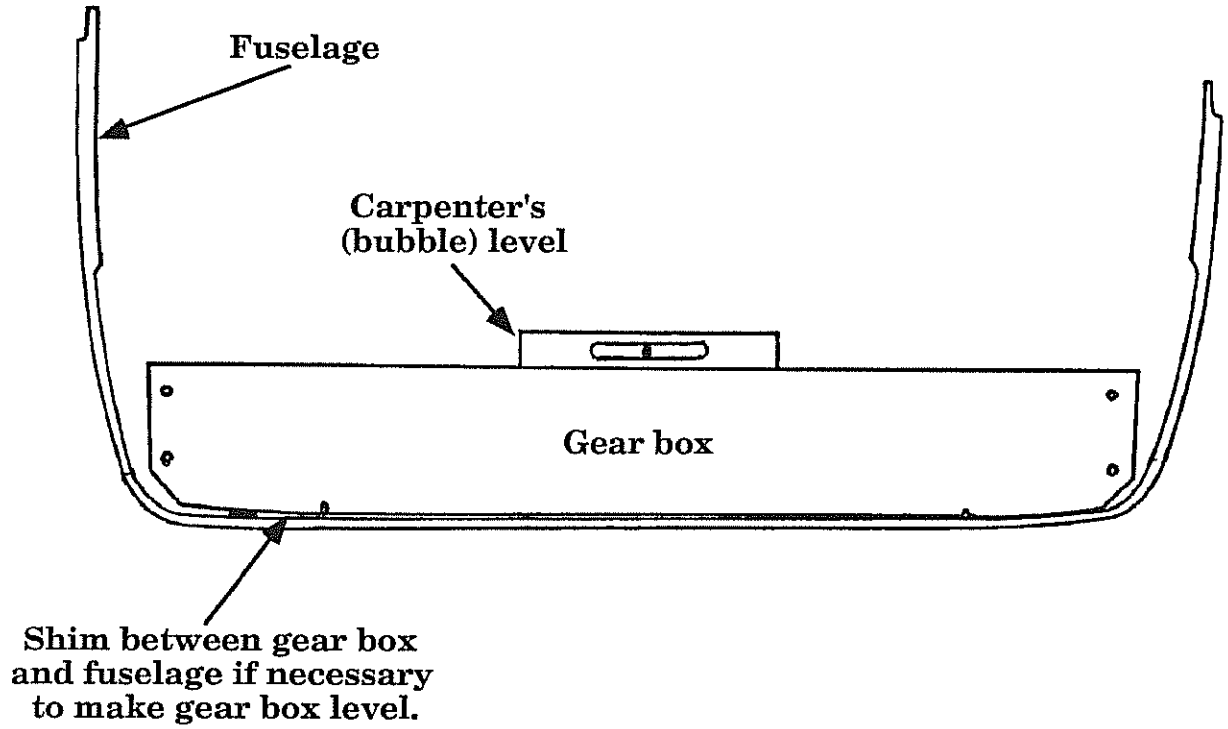


E4. Position the gear box so it is centered in the fuselage. Use the reference marks you made in Step E1 and the fuselage centerline on the bottom shell. Be accurate (+-1/16"), because your wheel tracking depends on this alignment.

In centering the gear box, one side may have to pull away from one of the rear spars. This is almost gauranteed because you would have had to position the rear wing spars *exactly* the same in both wings for the gear box to butt up to each spar snugly. So at this time, your gear box will probably rest only against the aft-most rear wing spar. You will later do a flox release on the other rear spar to remove the gap.

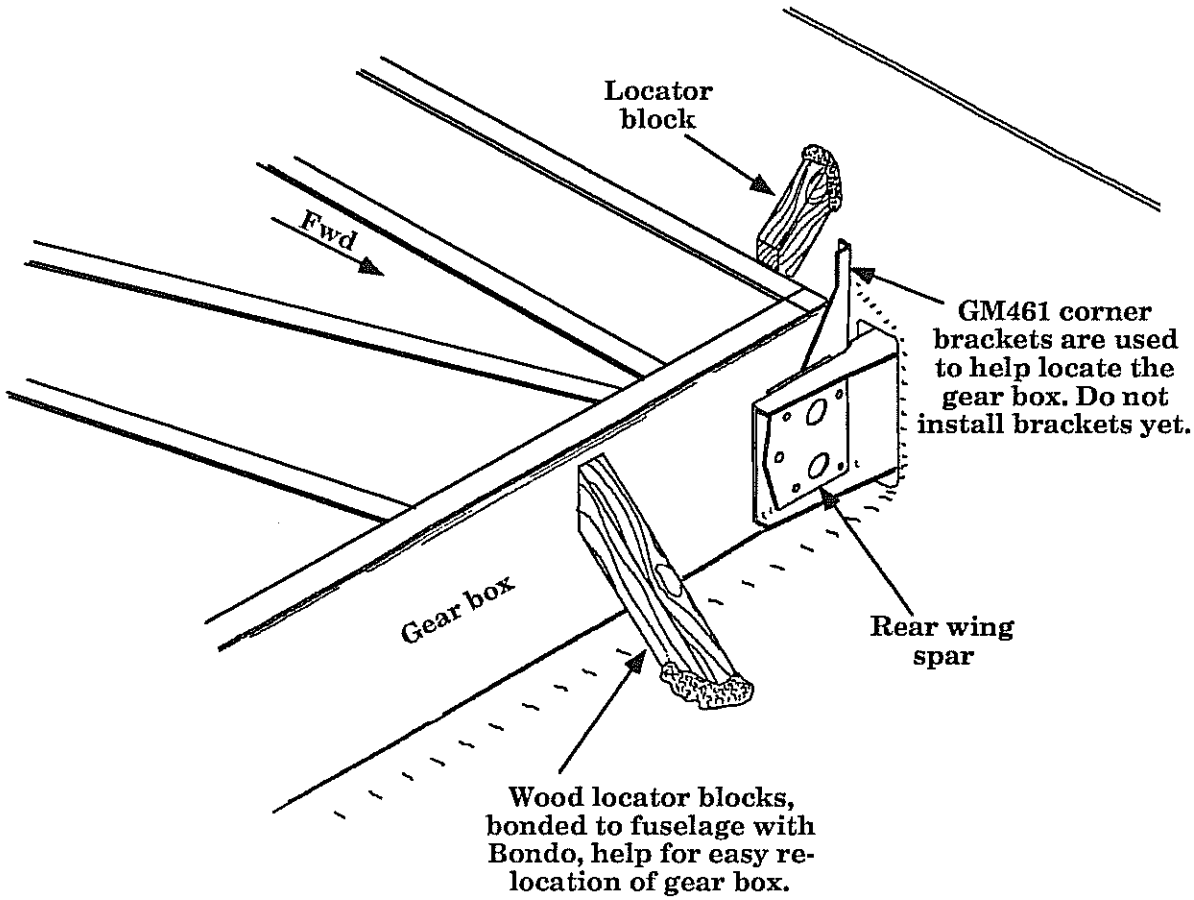
E5. Use a carpenter's level or a Smart level to check the gear box across the fwd edge. This surface should be level, but if needed, use a tongue depressor to adjust to gear box.

Leveling gear box
Figure 19:E:2



E6. Now that your gear box is positioned correctly, use some scrap wood to make locator blocks (two against the forward face and two against each side works well). Use Bondo to temporarily secure the locator blocks to the fuselage. These blocks will allow you to quickly reposition the gear box without going through the alignment steps again.

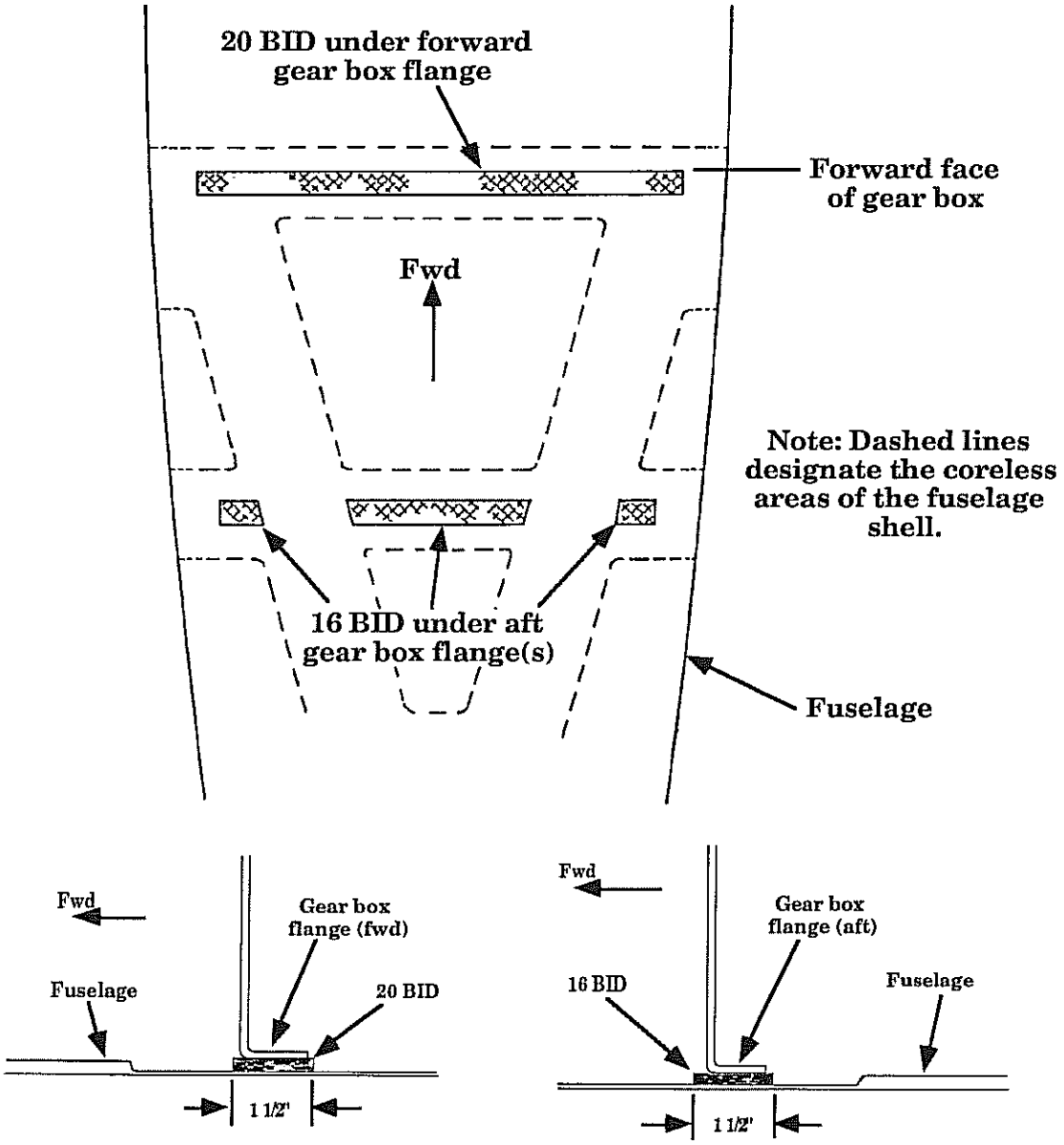
Using locator blocks
Figure 19:E:3



E7. Mark the locations of the four gear box mounting flanges (1 fwd, 3 aft) onto the bottom fuselage shell. These outlines will be used to locate the multiple BID reinforcements needed for the gear box.

E8. Remove the gear box from the fuselage, being careful not to break your wood locators from the fuselage. Use 40 grit to sand the areas of the fuselage where the BID reinforcements will be located under the gear box mounting flanges. Clean these areas with MC.

Reinforcing gear box flange areas
Figure 19:E:4



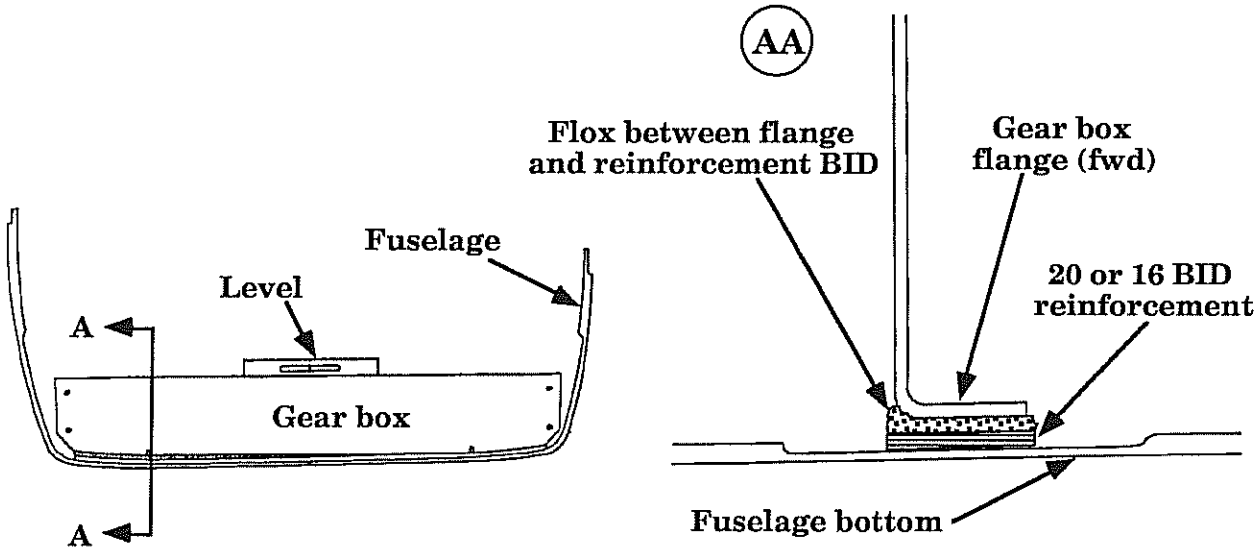
E9. When applying the reinforcement BID under the gear box mounting flange areas, it is best to do all the laminates in one session and let them cure while the gear box is sitting in position. 20 BID is required under the fwd gear box flange and 16 BID is required under the aft flanges. Use the plastic sandwich method of wetting out the BID and apply only four layers at a time in the following order:

1. 4 BID on the fwd flange area
2. 4 BID on the aft flange areas
3. 4 BID on the fwd flange area
4. 4 BID on the aft flange areas
5. 4 BID on the fwd flange area
6. 4 BID on the aft flange areas
7. 4 BID on the fwd flange area
8. 4 BID on the aft flange areas
   (leave the plastic on these laminates)
9. 4 BID on the fwd flange area
   (leave the plastic on this laminate)

After you have applied the last of the BID, carefully reposition the gear box, using the locator blocks as guides, and let it rest on the plastic covered laminates. This will custom fit the laminates to the gear box flanges (although if you had to shim the gear box level, you'll still have to do a flox release between the flanges and the laminates).

E10. When the 20 BID and 16 BID laminates have cured, remove the gear box and peel the last plastic layer off the BID. If you had to shim up the gear box to level it in Step E5, now is a good time to relevel the box by doing a flox release between the gear box flanges and the reinforcement BID. Sand the BID with 40 grit before applying a thick flox mixture and cover the gear box flanges with release tape to prevent the flox from sticking to them. Recheck that the top of the gear box is level while the flox dries.

Flox release under flanges
Figure 19:E:5



E11. Remove the gear box once again, and clean up any flox squeezeout with a Dremel tool.

E12. To secure the gear box to the fuselage, you must drill through the mounting flanges, then transfer those holes for drilling the fuselage. A drilling jig is made from the 1 1/4" wide, .040" thick, aluminum strips provided in the kit. Cut lengths of this aluminum to match the mounting flanges.

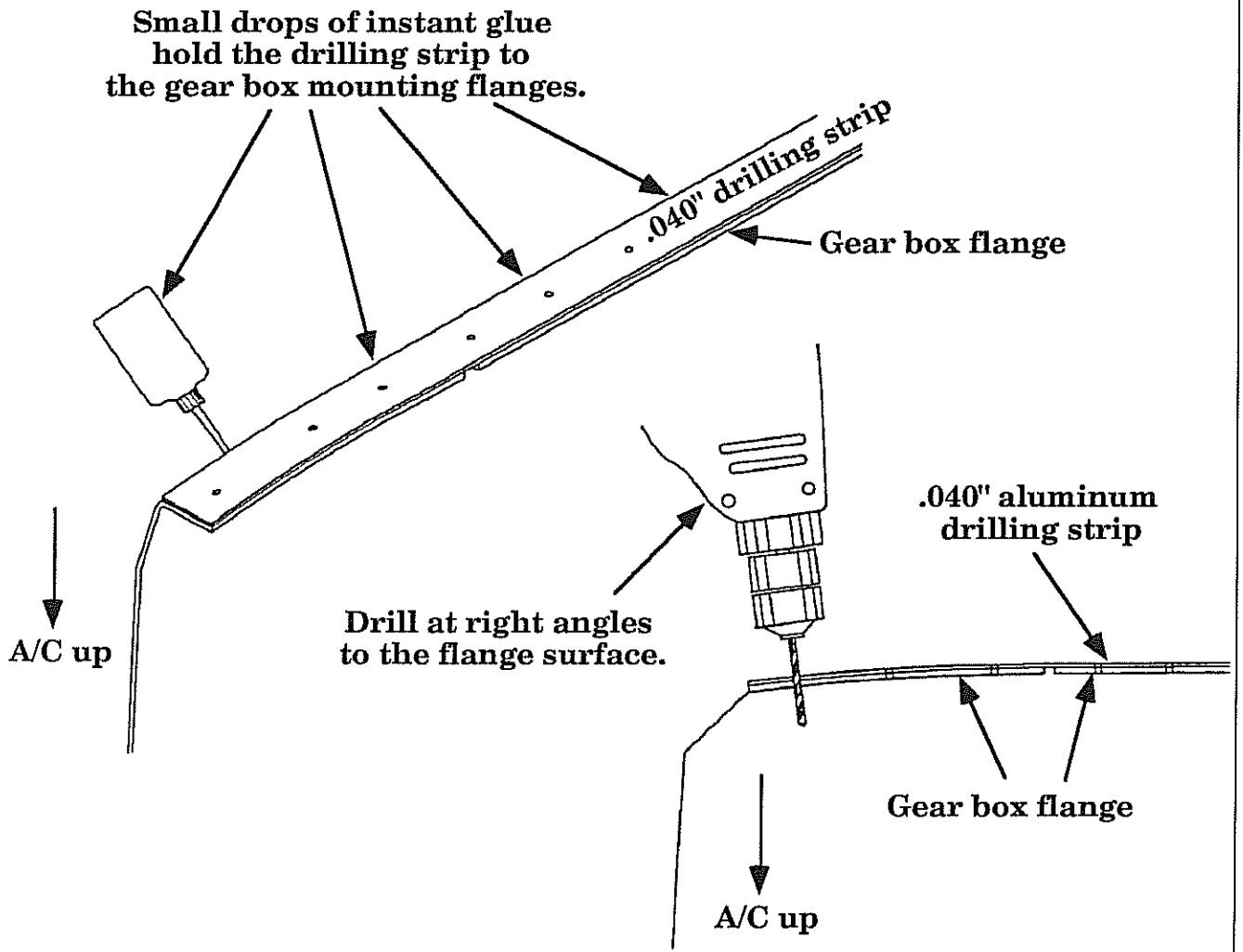
E13. Use a few drops of instant glue to tack the .040" thick aluminum strips to the gear box mounting flanges. It is important to only tack the aluminum in place because you will have to break these pieces away from the flanges easily.

E14. Drill 1/8" diameter holes through both the .040" aluminum strips and the gear box flanges as shown in Figure 19:E:6:a&b. Keep the drill at right angles to the flanges for best alignment. These are only pilot holes and will be enlarged later.

Drilling flanges and aluminum strips

Figure 19:E:6:a

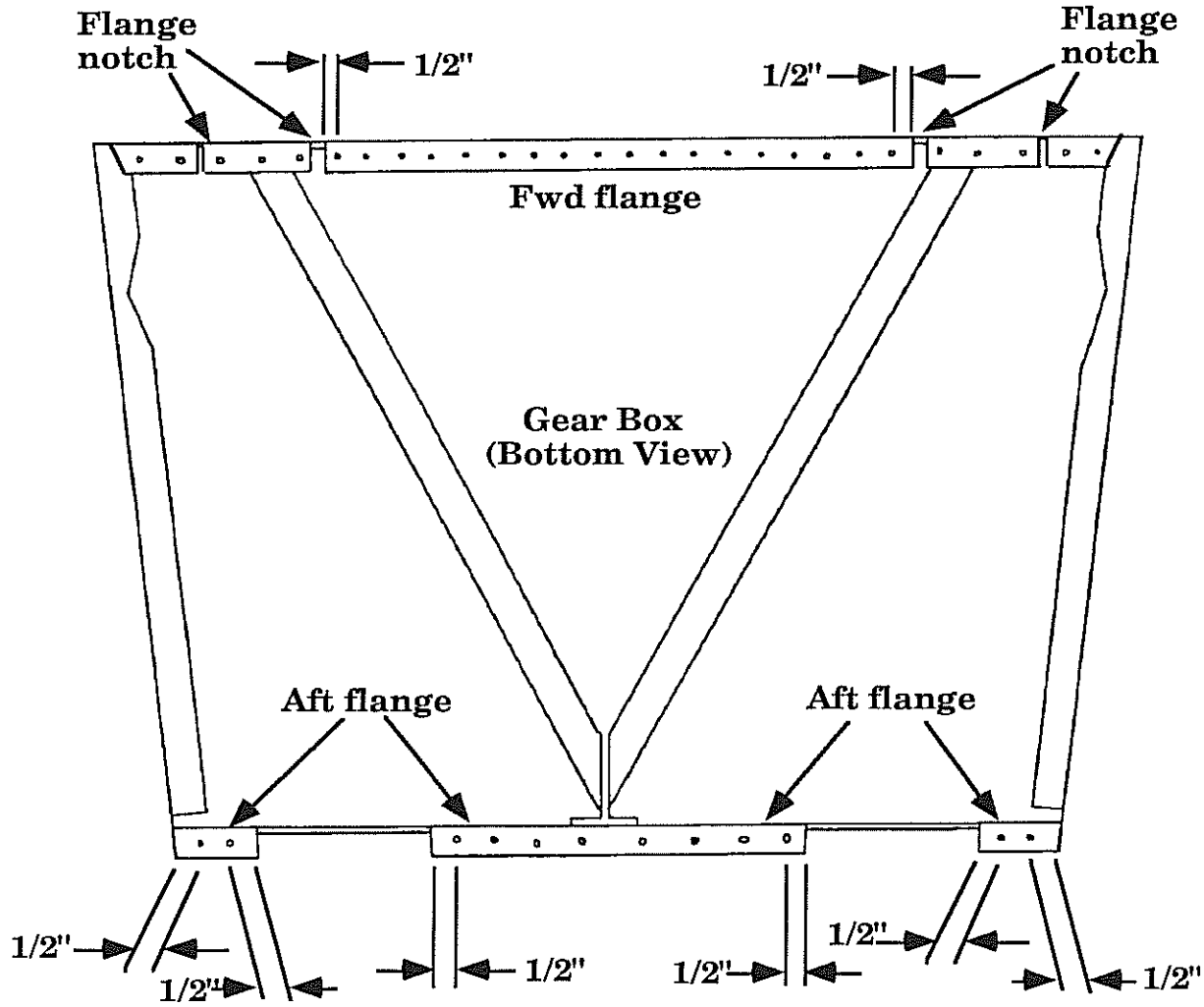
*****IMPORTANT: Drill holes so the washers and nuts will not ride up on the inner radius of the aluminum. See Figure 19:E:9.**



Flange hole locations

Figure 19:E:6:b

28 holes total in fwd flange. Space holes evenly (about 1 1/4" apart, but this is not critical) and keep them at least 1/2" away from the notches of the flange and the outbd edges of the flange.



12 holes total in aft flanges. Space holes evenly (about 1 1/4" apart, but this is not critical) and keep them at least 1/2" away from the flange edges.

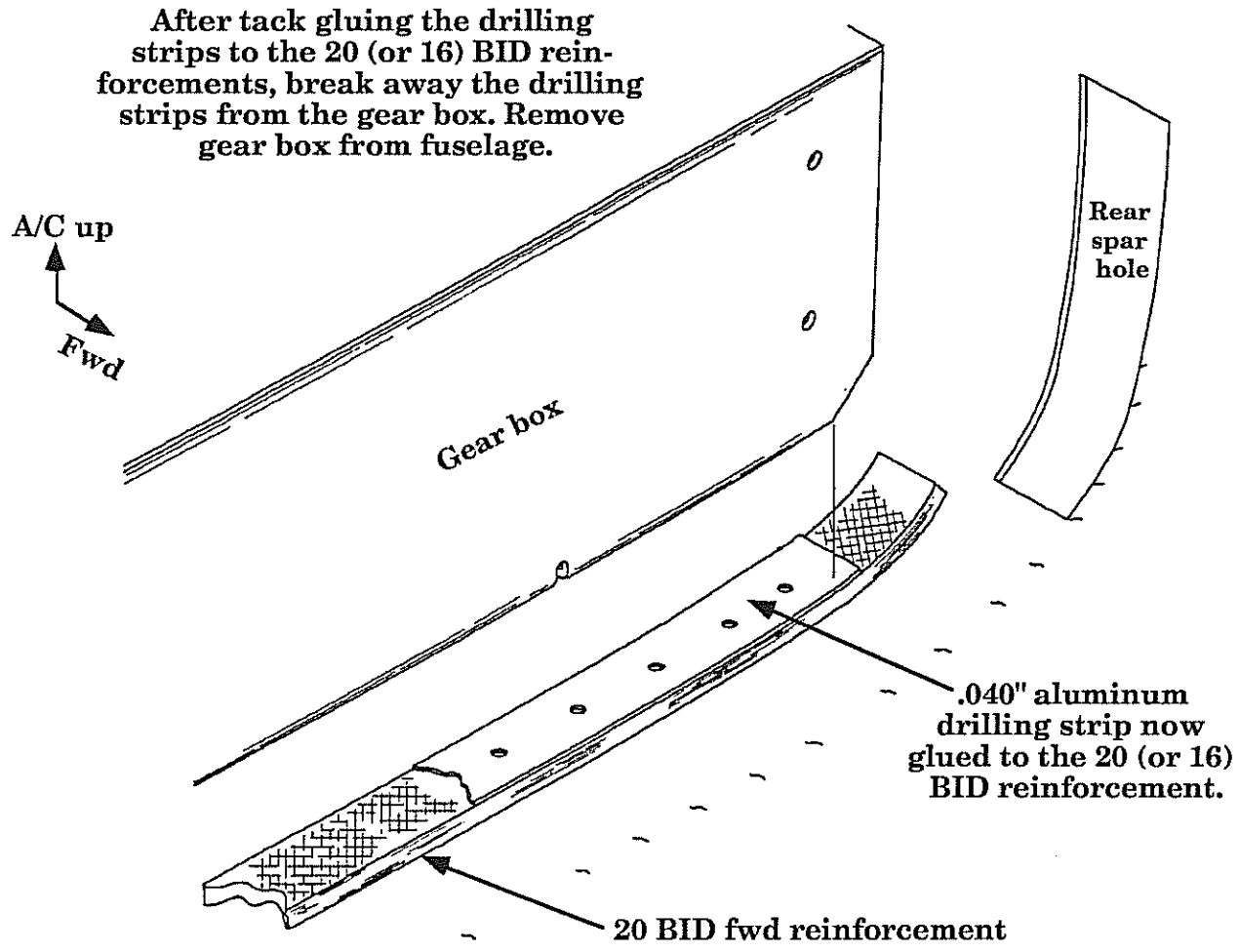
*****IMPORTANT: Drill holes so the washers and nuts will not ride up on the inner radius of the aluminum. See Figure 19:E:9.**

E15. Reposition the gear box into the fuselage, being careful not to break away the .040" aluminum strips from the flanges. Use instant glue to temporarily secure the .040" aluminum strips to the 20 and 16 BID reinforcements.

E16. Now comes the delicate part. Carefully break the .040" aluminum strips away from the gear box flanges, leaving the thin strips glued to the fuselage. A small wood chisel is a good tool to crack the dabs of instant glue that bond the .040" aluminum to the gear box flanges. Remove the gear box from the fuselage. Now you have transfered the flange hole locations to the fuselage.

E17. Use the holes in the .040" aluminum strips as guides to drill 1/8" diameter holes through the 20 and 16 BID reinforcements. Be sure to keep the drill roughly perpendicular to the surface (when the fuselage curves up, angle the drill accordingly).

Transfering flange hole locations to fuselage
Figure 19:E:7

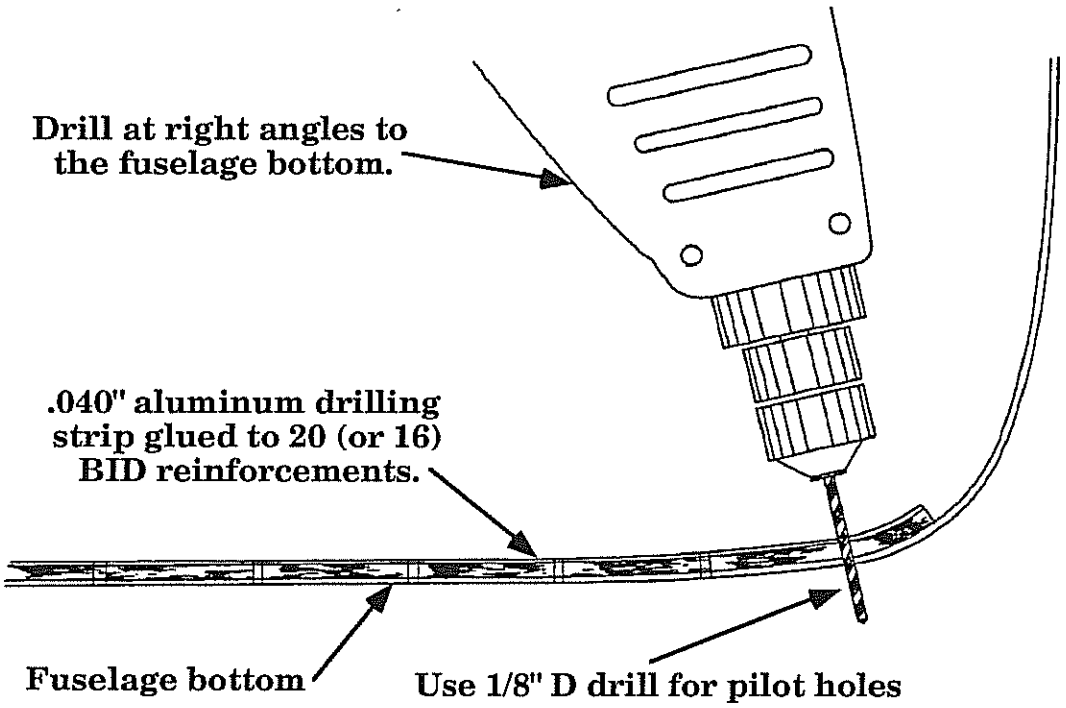


E18. Remove the .040" aluminum strips from the fuselage.

E19. Reposition the gear box in the fuselage and align the 1/8" pilot holes. A few 1/8" clecoes will both align the gear box and hold it there for drilling.

E20. From underneath the fuselage, enlarge the pilot holes through both the fuselage and the gear box flanges to 1/4" diameter. Don't use a 1/4" drill immediately. Instead, use a 3/16" drill first, then step up to 1/4". This gradual enlarging produces cleaner, tighter tolerance holes. Be sure to keep the drill at right angles to the bottom of the fuselage.

Drilling through bottom fuselage
Figure 19:E:8

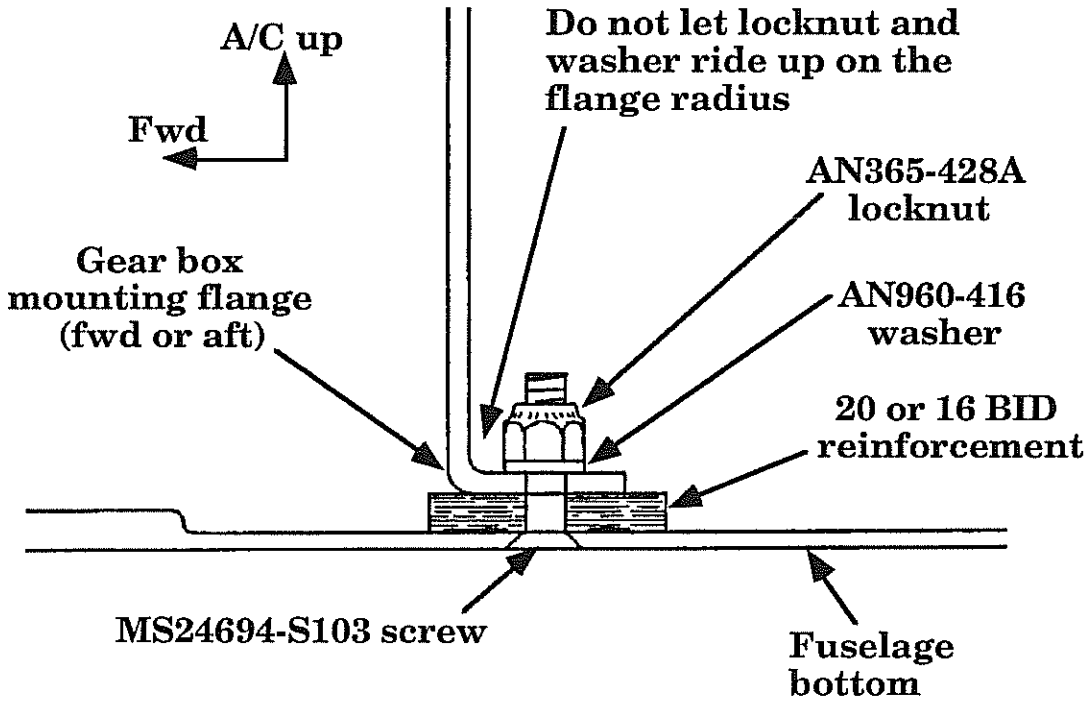


E21. Countersink the 1/4" diameter holes you have just drilled to accomodate MS24693-S103 flush head screws. Yes, the screw heads, although flush, will be visible from the bottom of the fuselage.

E22. The gear box is secured to the fuselage with MS24694-S103 screws (except in the doubler area), AN960-416 washers, and AN365-428A locknuts.

NOTE: Don't permanently install the gear box at this time. Because you'll be removing and installing the box for the rest of this chapter, it is a good idea to secure the box in place with just a few (4 or 5) screws using castle nuts for easier removal.

Securing gear box
Figure 19:E:9



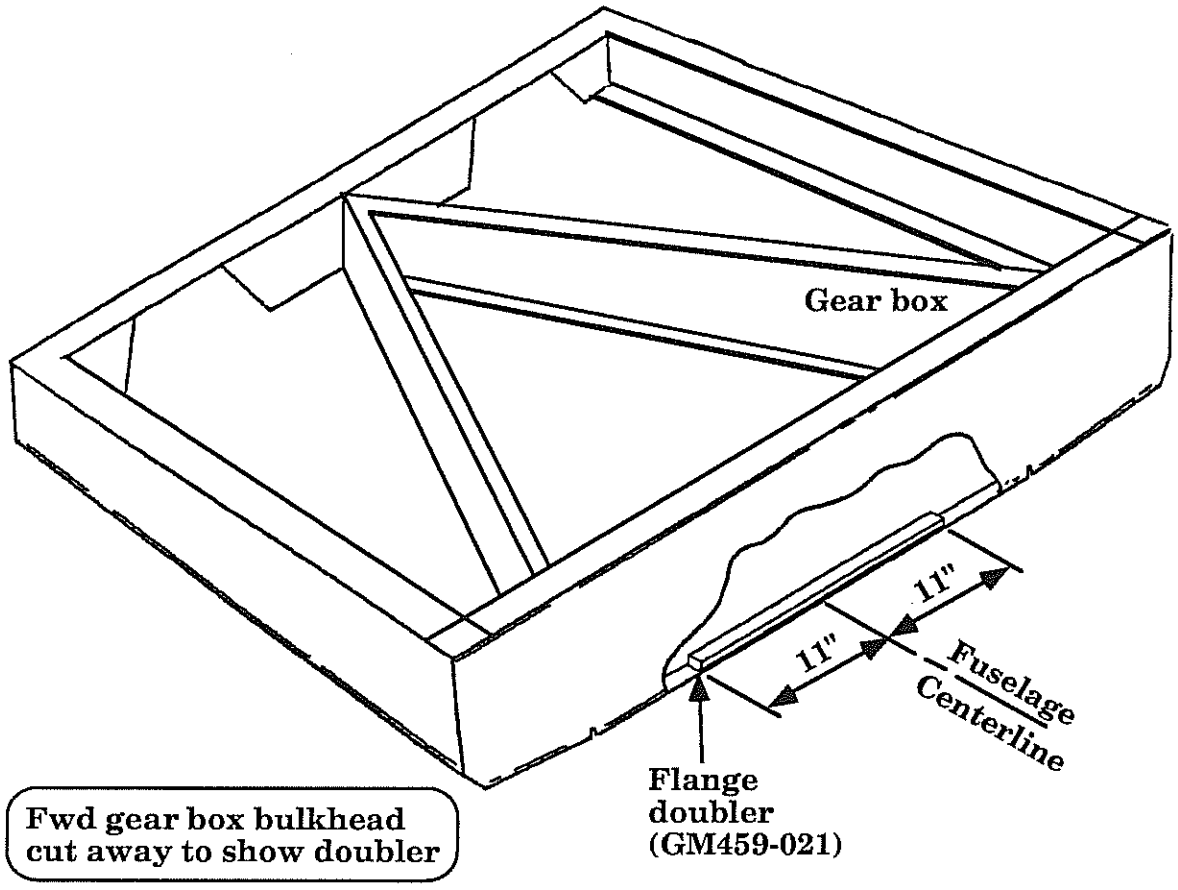
E23. Position the aluminum flange doubler (GM459-021) over the forward flange as shown in Figure 19:E:10:a &b.

E24. Match drill the GM459-021 doubler using the 1/4" diameter holes you drilled through the flange.

E25. Secure the GM459-021 doubler using the same screws that hold the gear box to the fuselage, as shown in Figure 19:E:10:b. Of course, longer screws (MS24694-S109) will be required.

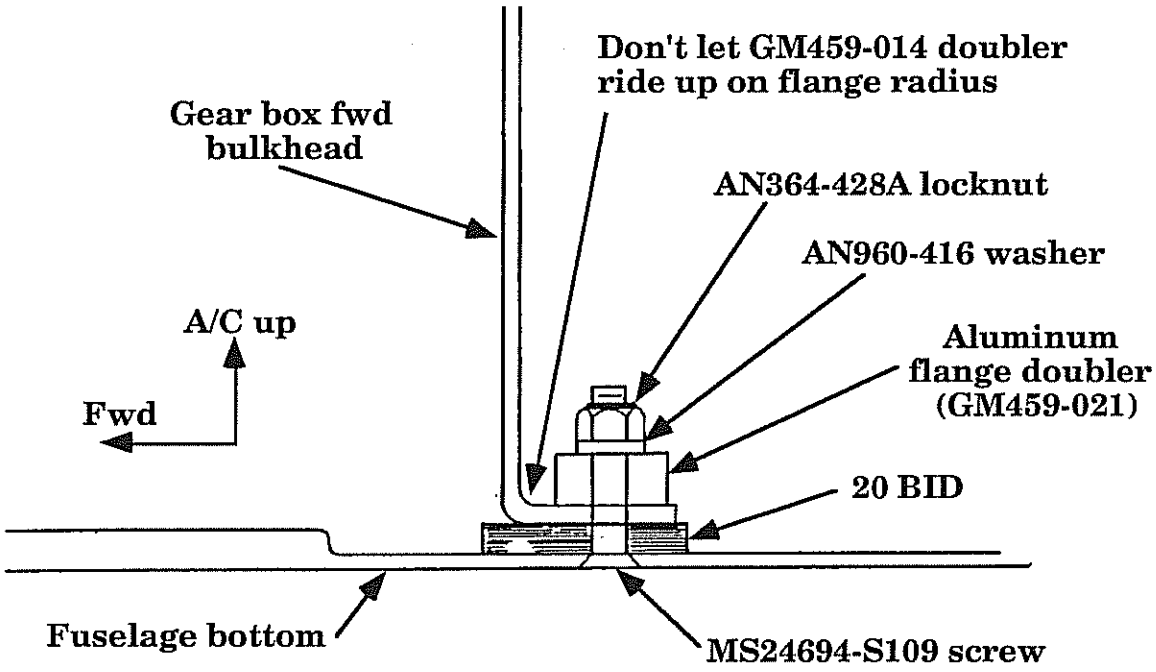
Securing GM459-021 flange doubler

Figure 19:E:10:a



Securing GM459-021 flange doubler

Figure 19:E:10:b

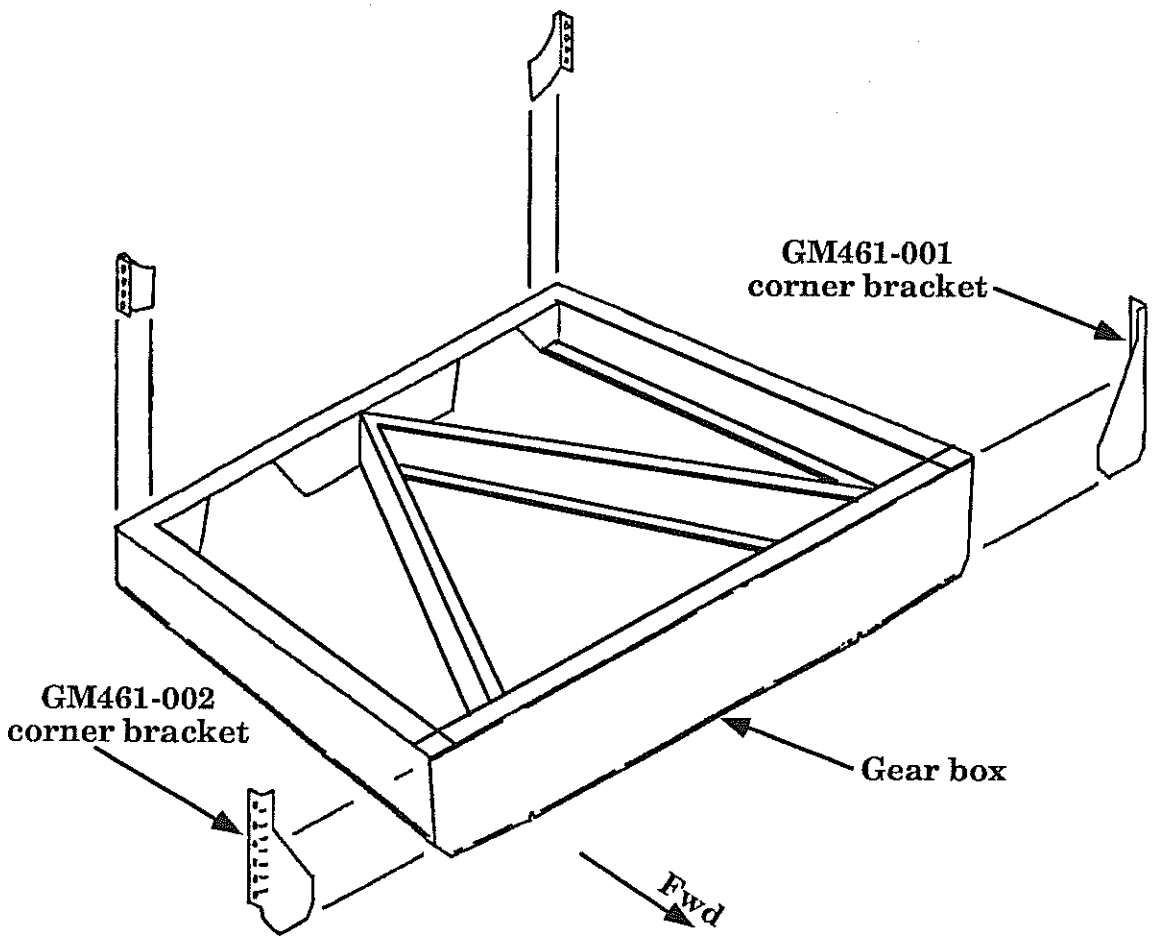


F. INSTALLING GM461 CORNER BRACKETS

To secure the gear box to the fuselage sides, metal brackets are installed at all four corners of the gear box. You have already used the fwd two brackets to space the gear box back from the rear wing spars. Now you will install these fwd brackets. GM461-001 is the left, fwd corner bracket, and GM461-002 is the right.

For this section, you should have the wings installed to properly position the fwd corner braces. The gear box should also be installed with just a few screws because you will be removing it a few times in this section. Remove the gear legs, the GM460-07 bumper mounts, and the bumper blocks from the gear box. This will ease getting the gear box in and out.

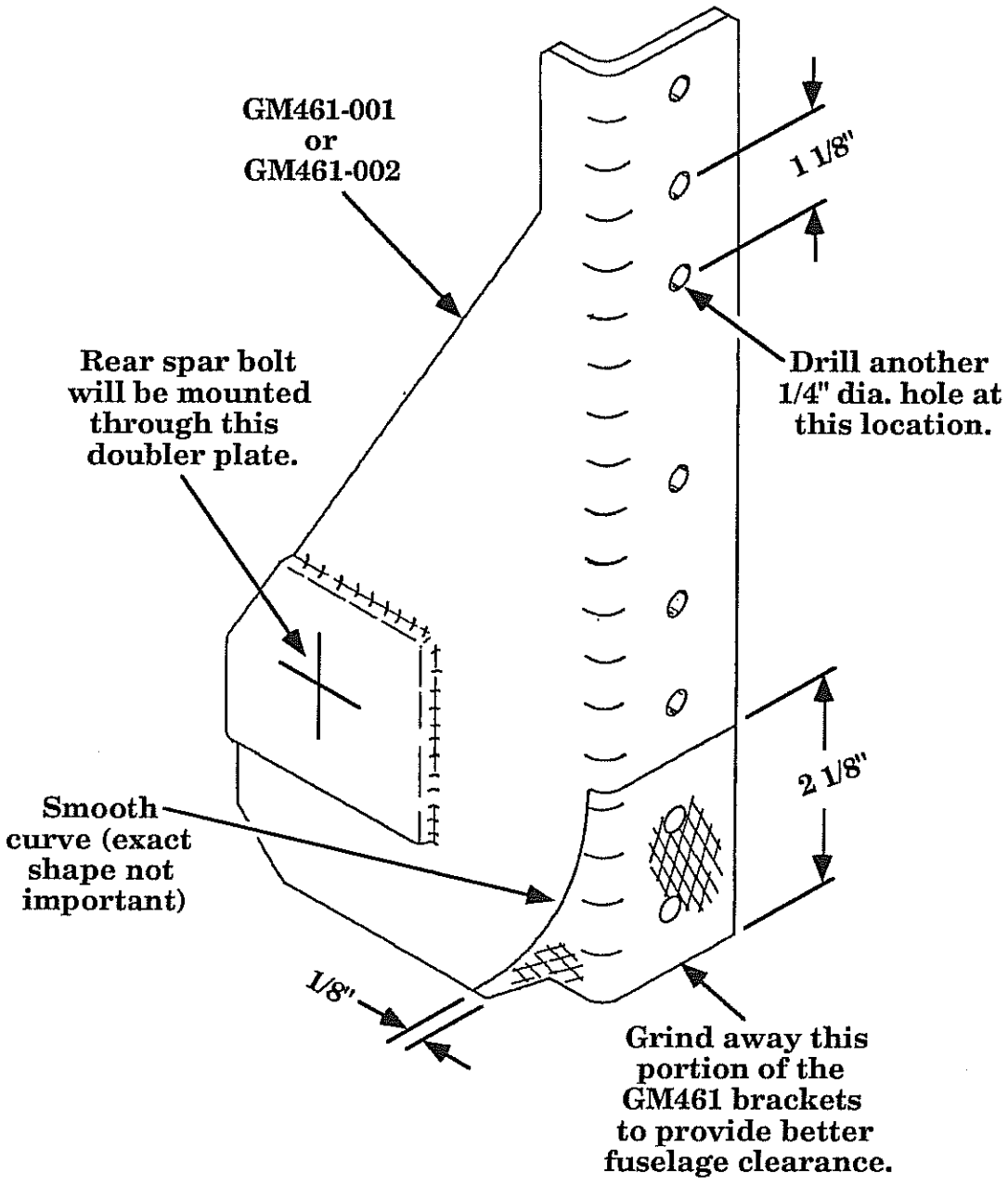
GM461 gear box corner brackets
Figure 19:F:1



F1. The forward two corner brackets (GM461-001 and GM461-002) must be modified slightly for ease of installation. Figure 19:F:2 shows the areas of these corner braces that must be trimmed away. Use a bench type grinder for trimming. If you have a later kit, the forward corner braces may not require modification. Check the dimensions as shown in Figure 19:F:2 to see if you must modify the braces.

Fwd corner bracket modification

Figure 19:F:2

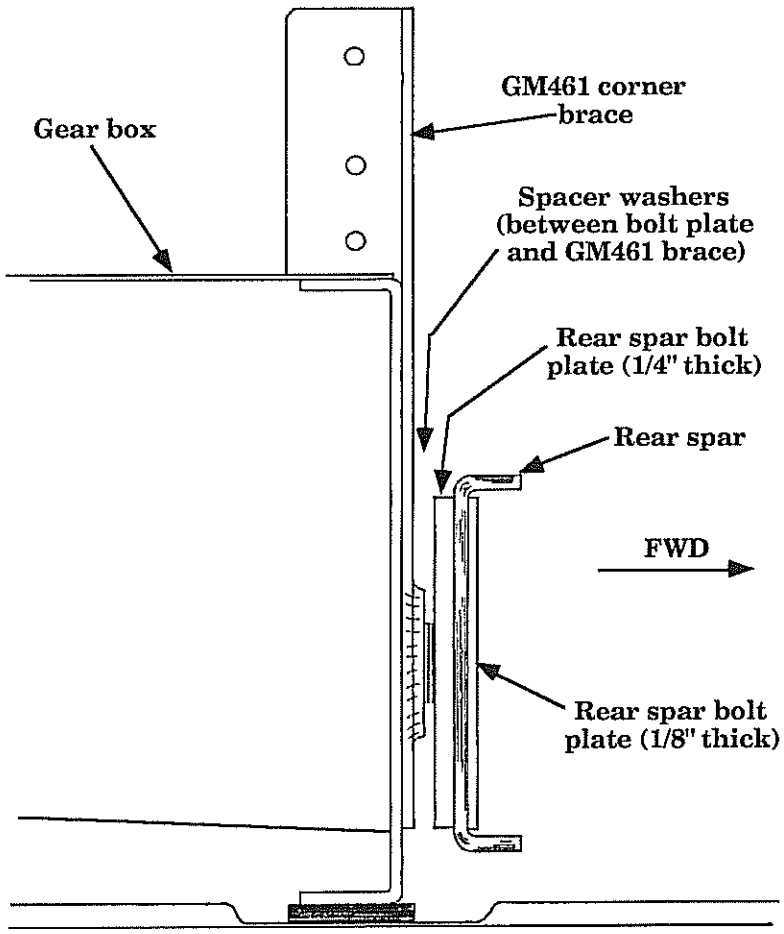


F2. Position the GM461 fwd brackets against the fwd face of the gear box as shown in Figure 19:F:3. Notice that there is a left and right corner bracket. Position the brackets so the reinforced area is centered behind the rear spar bolt. The brackets should be spaced about .250" away from the fuselage sides to allow for the BID reinforcement that you will apply. When satisfied with the bracket positions, mark on the inside of the fuselage where brackets will be mounted. The exact position of these brackets is not critical, as long as they rest flush against the gear box and roughly follow the contour of the fuselage sides.

F3. Use 40 grit to sand the areas of the fuselage where the reinforcement BID will be applied for the two GM461 corner brackets. Clean these areas with MC.

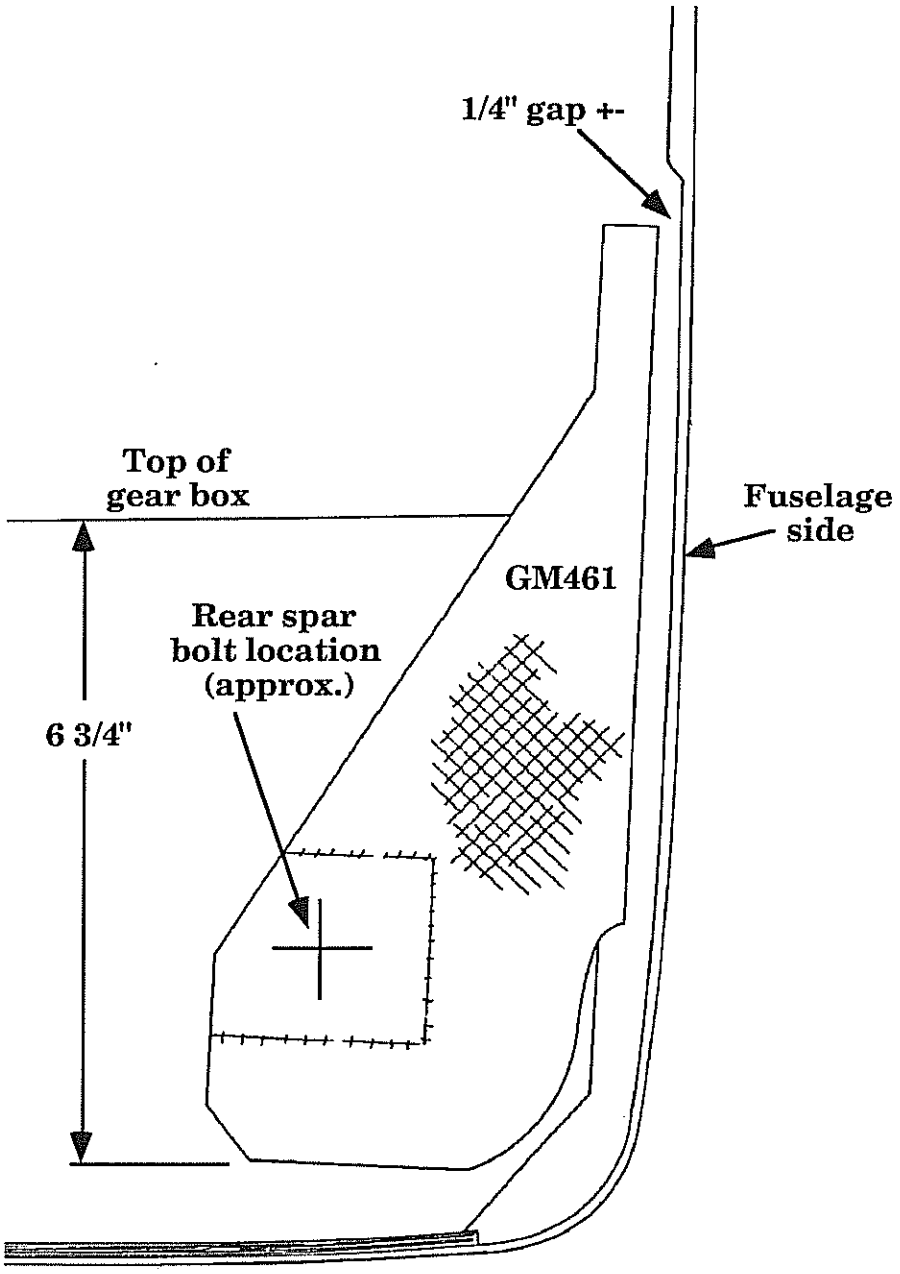
F4. Apply 20 BID to the fuselage sides where GM461 corner braces will be mounted. Size the 20 BID about 1/4" larger than the outline you drew of the brace's mounting areas.

Locating GM461 brackets
Figure 19:F:3:a



Locating GM461 braces

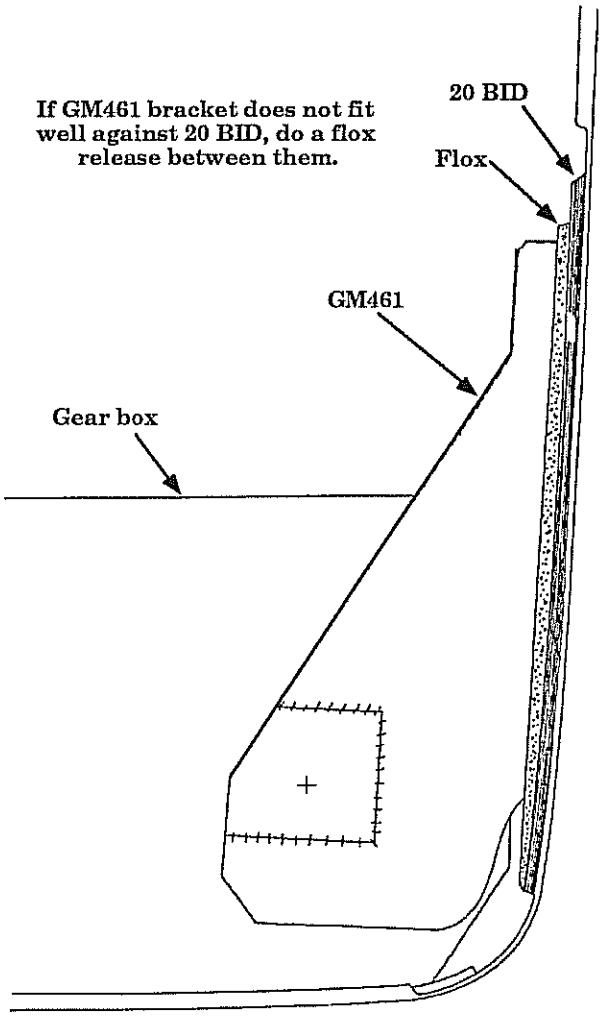
Figure 19:F:3:b



F5. Reposition the GM461 corner brackets and push them flat against both the fwd face of the gear box and the 20 BID reinforcement laminates you just applied.. Do the brackets rest flush with the 20 BID? Probably not. If they don't, do a flox release between the brackets and the 20 BID reinforcements. Apply release tape to the brackets where they set into the flox. Also remember to sand and clean the areas where flox is applied. When the flox is curing, be sure the brackets are held flat against the fwd face of the gear box.

F6. When the flox has cured, remove the gear box from the fuselage. With the GM460-07 bumper block mounts removed , you will be able to remove the gear box without removing the corner brackets. Otherwise, the corner brackets will have to be removed with the box. Reposition the corner brackets against the flox release you just did, and secure the brackets with a few drops of instant glue.

Forming flox pad on 20 BID
Figure 19:F:4



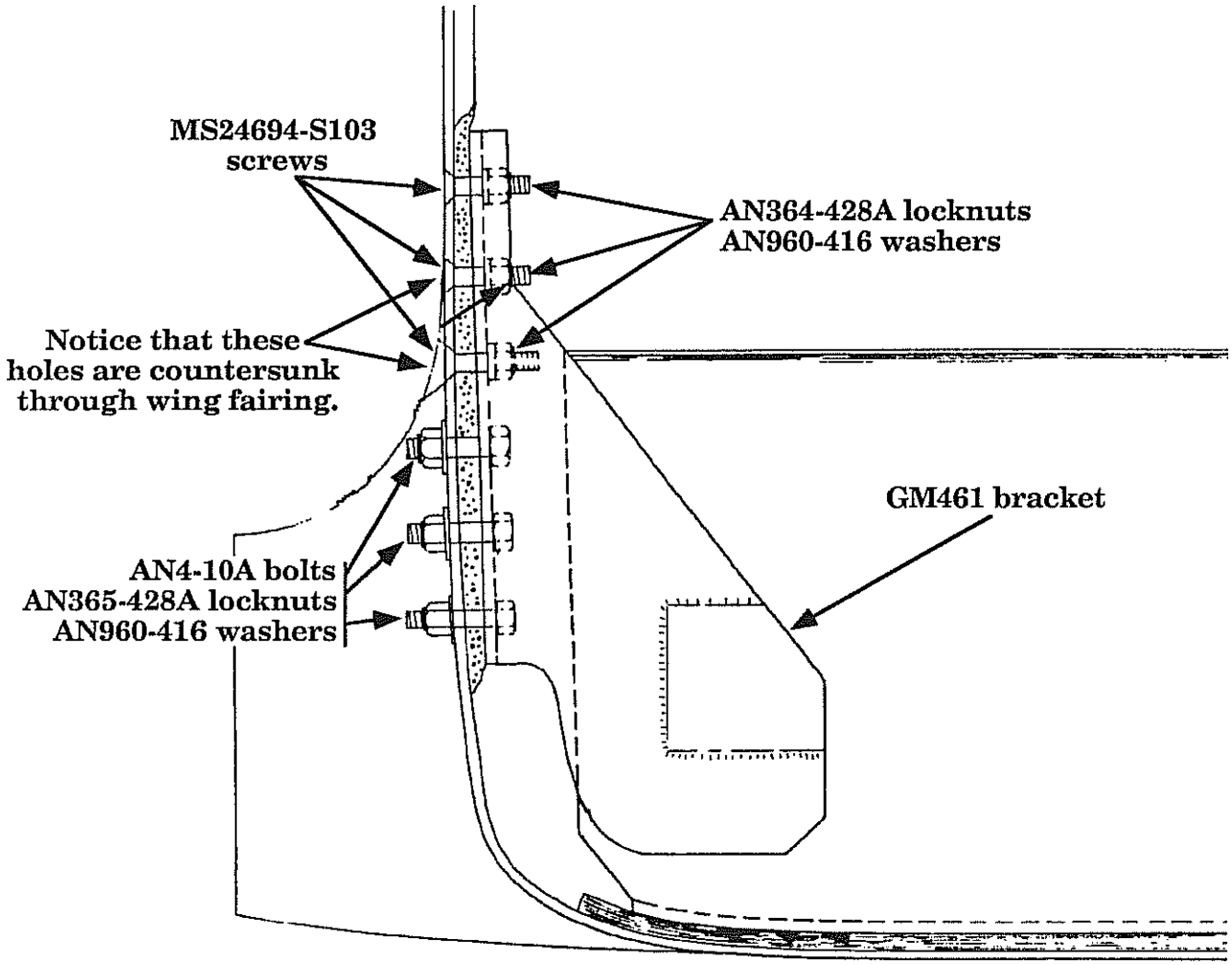
F7. Use the predrilled holes in the GM461 corner brackets as guides to drill 1/4" diameter mounting holes through the fuselage sides (six holes per side). The top three holes will be drilled all the way through the fuselage, exiting above the wing fairing. The bottom three holes will also be drilled through the fuselage, but will *not* extend through the fairing. The bottom three bolts will be accessible from inside the wing fairing (an access hole can be cut through the Clark foam wing fairing rib in the flap area, after the wing has been removed).

F8. Countersink the top three holes on each side of the fuselage. Countersink from the outside for a MS24694-S103 screw.

F9. Secure the GM461 corner brackets in place with AN4-10A bolts through the bottom three holes of each brace. The final bolt length may differ between planes, so add washers if necessary. For proper gear box clearance, the heads of the bolts must be on the inside of the fuselage. The nut for these bolts must be tightened through access holes in the wing fairing. If your wing is still installed, just wait to tighten these bolts until it has been removed.

F10. Use MS24694-S103 screws through the top three holes of each bracket to secure them to the fuselage sides. The final screw size required may differ between planes, so add washers if necessary.

Securing GM461 corner brackets
Figure 19:F:5

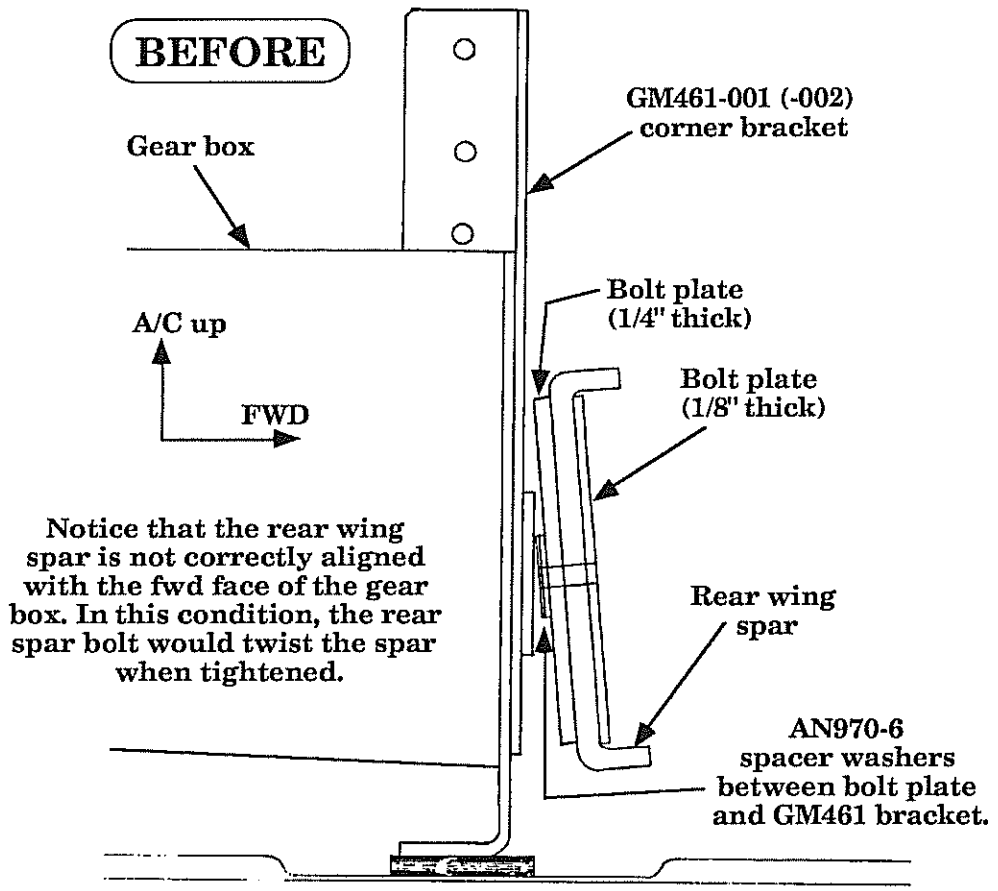


F11. Reinstall the gear box into the fuselage with a few screws.

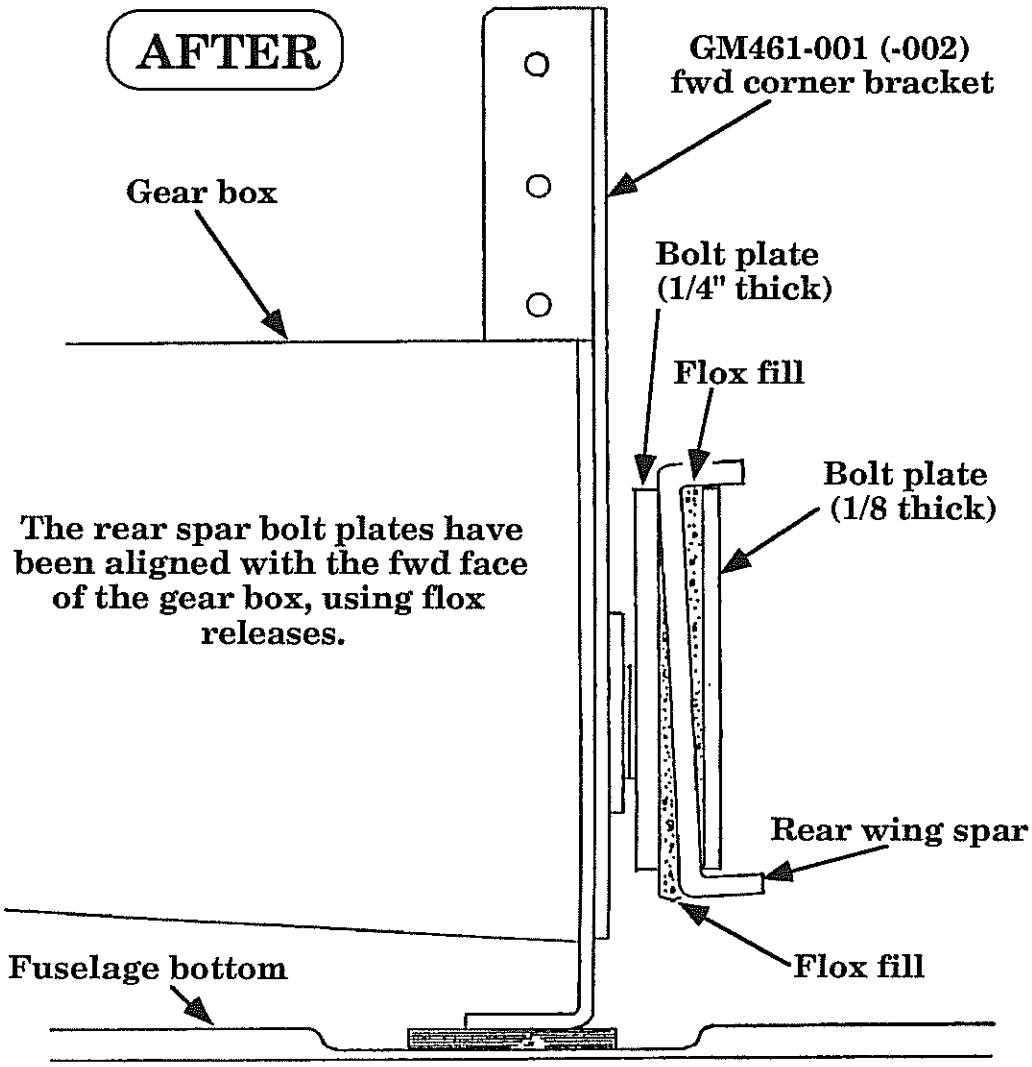
F12. To secure the rear wing spars to the gear box, the rear spar bolt plates should be parallel with the forward face of the gear box. With all the different factors and parts involved, your rear spar bolt plates most likely will not meet this condition. To fix this, unscrew the bolt plates from the rear spars and cover the forward face of the 1/4" thick bolt plates with release tape. Do a flox release between the 1/4" thick bolt plates and the rear spar, keeping the 1/4" thick plates parallel with the fwd face of the gear box as shown in Figure 19:F:6:a&b. Remember to insert the AN970-6 spacer washers between the rear spar bolt plates and the GM461 brackets. The flox will tend to fill up the four bolt plate mounting holes in the rear spar, but these are easily redrilled later.

F13. Now cover the aft face of the 1/8" thick rear spar bolt plates (the ones that are on the fwd face of the spar) with release tape. Do a flox release between these bolt plates and the rear spar to make the plates parallel with the 1/4" thick plates. See Figure 19:F:6:a&b.

Aligning rear spar bolt plates
Figure 19:F:6:a



Aligning rear spar bolt plates
Figure 19:F:6:b

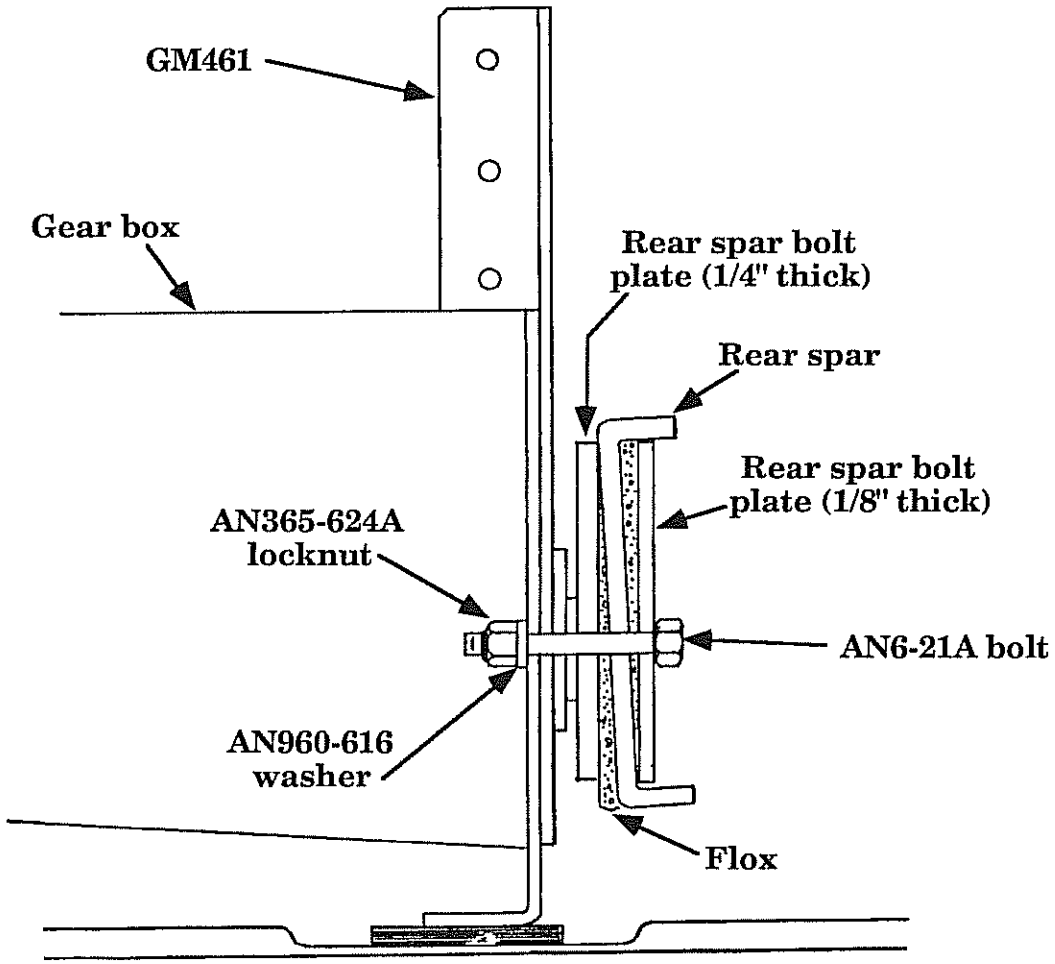


F14. After the flox has cured, redrill the four bolt plate mounting holes in each rear spar. Secure the bolt plates to the rear spars with the same hardware. Longer screws, MS24694-S106, are provided in the kit if necessary because of the flox release.

F15. Recheck the incidence on your wings to make sure they have not strayed from +1.6°. Use the alignment you made back when you joined the wings to the fuselage.

F16. Use the 3/8" diameter holes in the rear spar bolt plates as guides to drill similar sized holes through the GM461 corner brackets and the gear box. Simply running a 3/8" drill through all that steel and aluminum would be difficult and not produce clean holes. It is best to use a 3/8" drill to spot the hole locations in the GM461 brackets to a shallow depth (you're basically using the drill as a centerpunch), then remove that drill and use a 1/8" diameter bit to drill a pilot hole all the way through the GM461's and the gear box. Once you have two pilot holes, increase their size with 1/16" larger bits until you have reached 3/8" diameter. An angle drill is required for this step because of interference from the aileron bellcrank mounts.

Securing rear wing spars
Figure 19:F:7



F17. The rear wing spars are secured to the gear box with AN6-21A bolts, AN960-616 washers, and AN365-624A locknuts. Don't bother to secure the rear spars right now, but this is the hardware you will eventually use. Congratulations, your wing mounting structure is now complete.

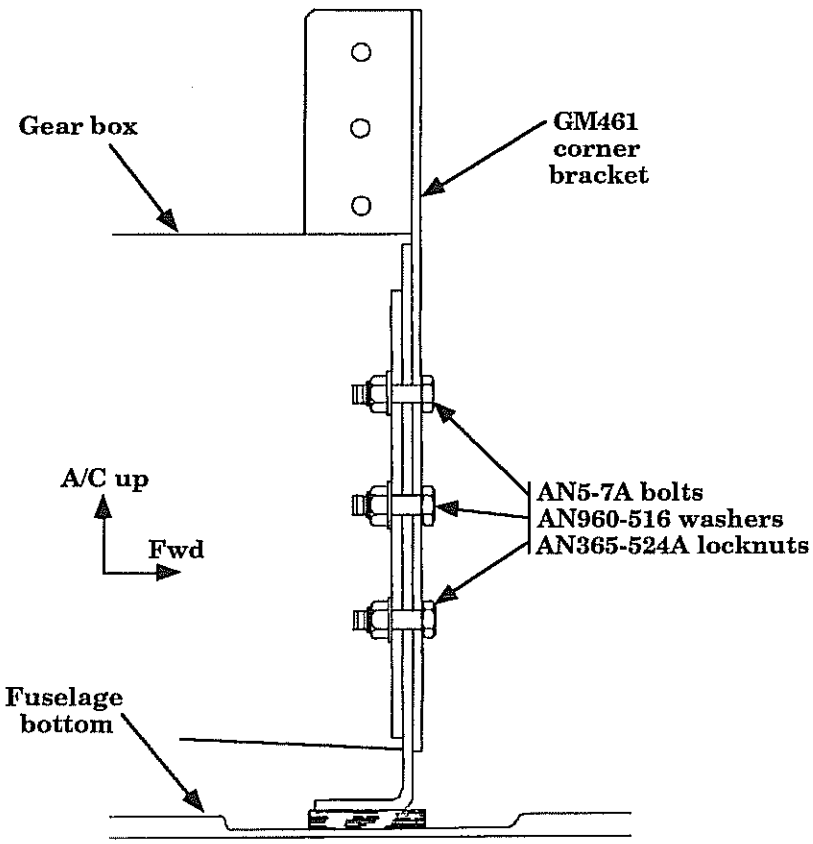
F18. Remove the wings from the fuselage so you can complete the GM461 corner bracket installation.

F19. To help maintain good alignment, insert the AN6-21A rear spar bolts through the GM461 brackets and the gear box. No need to tighten them.

F20. The GM461 corner brackets are secured to the gear box with three AN5-7A bolts each. The left-right alignment of these bolts is important so the nuts will be located in the middle of the flanges formed by the gear box sides. Because these flanges are inside the gear box (and hidden by the top cover of the gear box), small pilot holes should be drilled before going to the 5/16" diameter drill. Use Figure 19:F:8:b to find the approximate hole locations. Again, an angle drill is required for this step because of interference from the aileron bellcrank mounts.

Securing GM461 brackets to gear box

Figure 19:F:8:a



Securing GM461 brackets to gear box

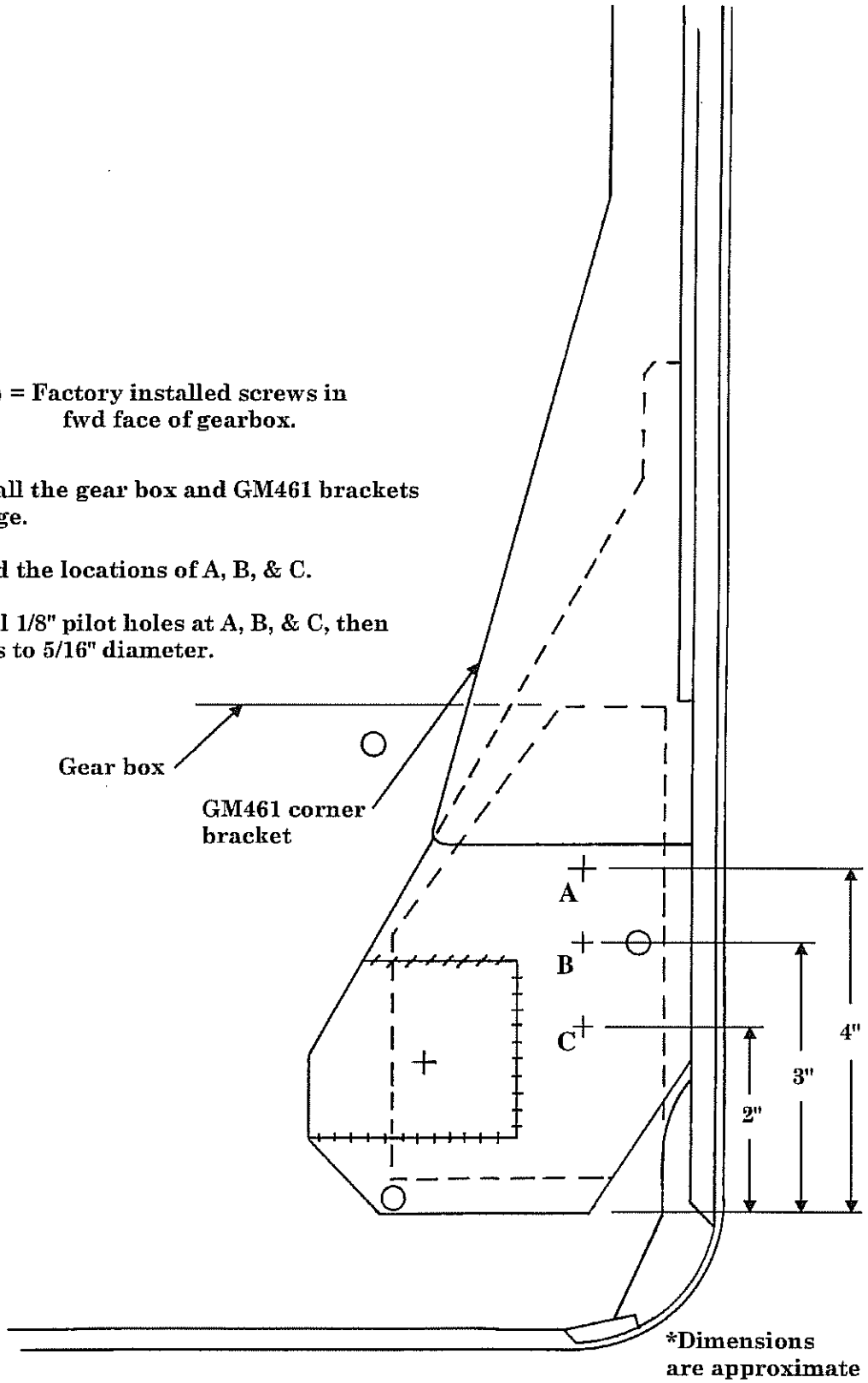
Figure 19:F:8:b

○ = Factory installed screws in fwd face of gearbox.

Step #1. Install the gear box and GM461 brackets in the fuselage.

Step #2. Find the locations of A, B, & C.

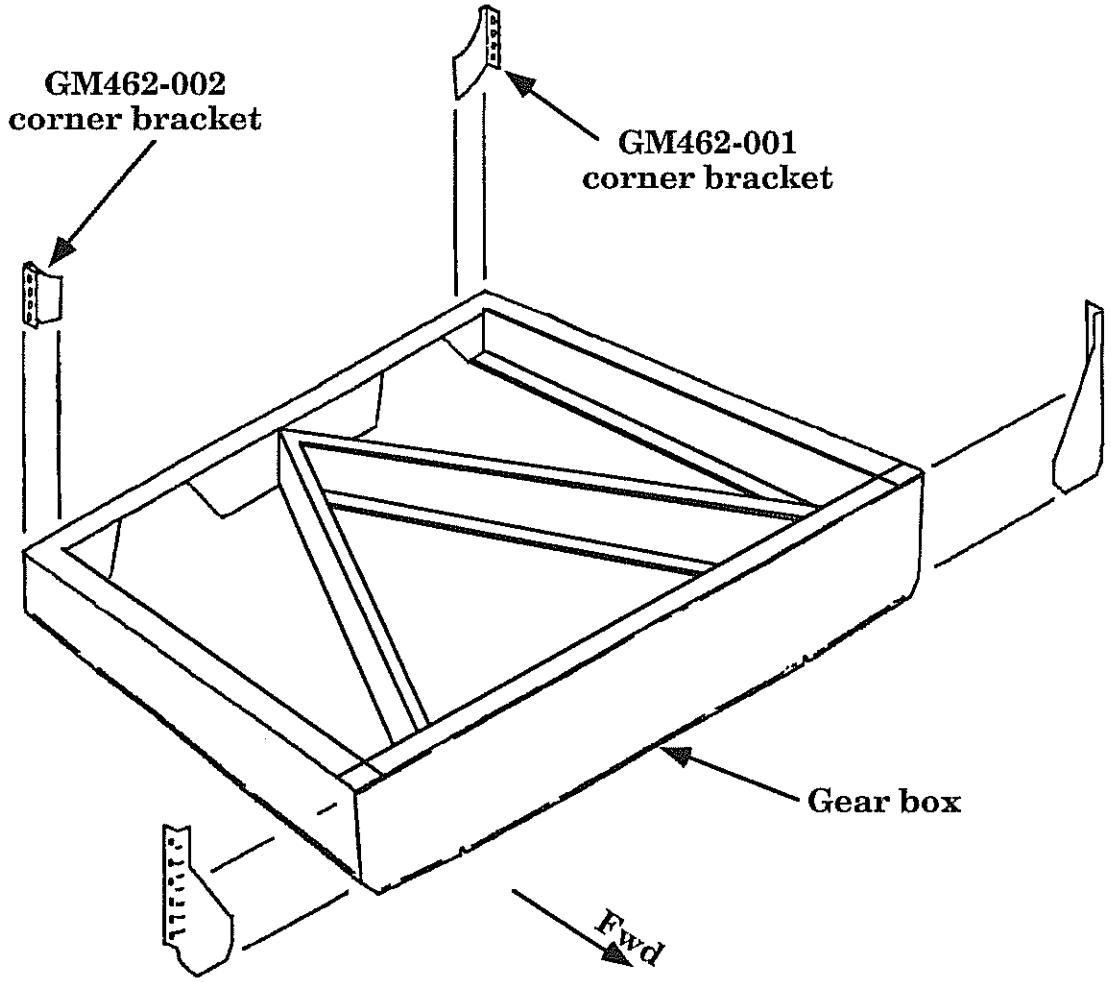
Step #3. Drill 1/8" pilot holes at A, B, & C, then enlarge holes to 5/16" diameter.



G. INSTALLING GM462 CORNER BRACKETS

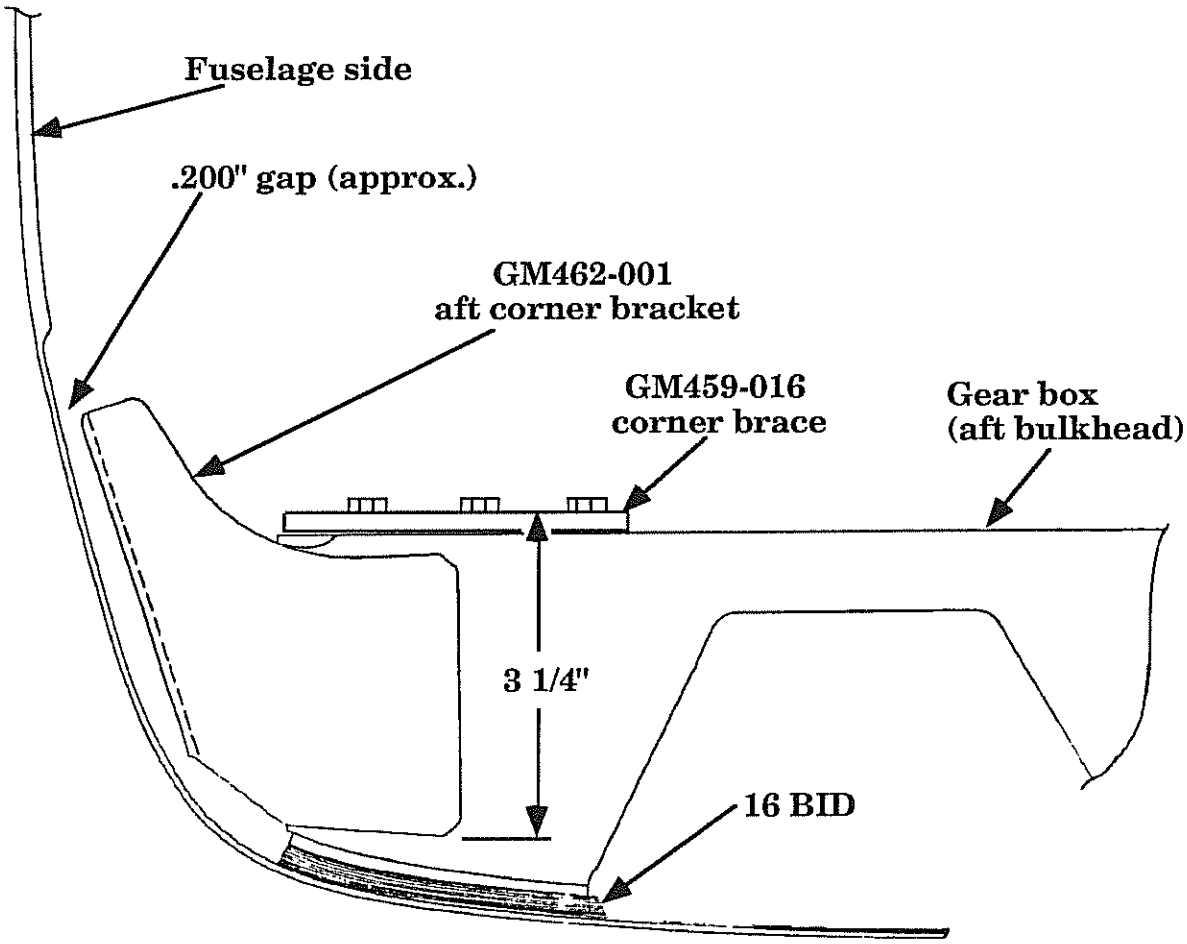
The GM462 corner brackets secure the aft corners of the gear box to the fuselage sides. They are installed very similar to the GM461 brackets.

GM462 gear box corner brackets
Figure 19:G:1



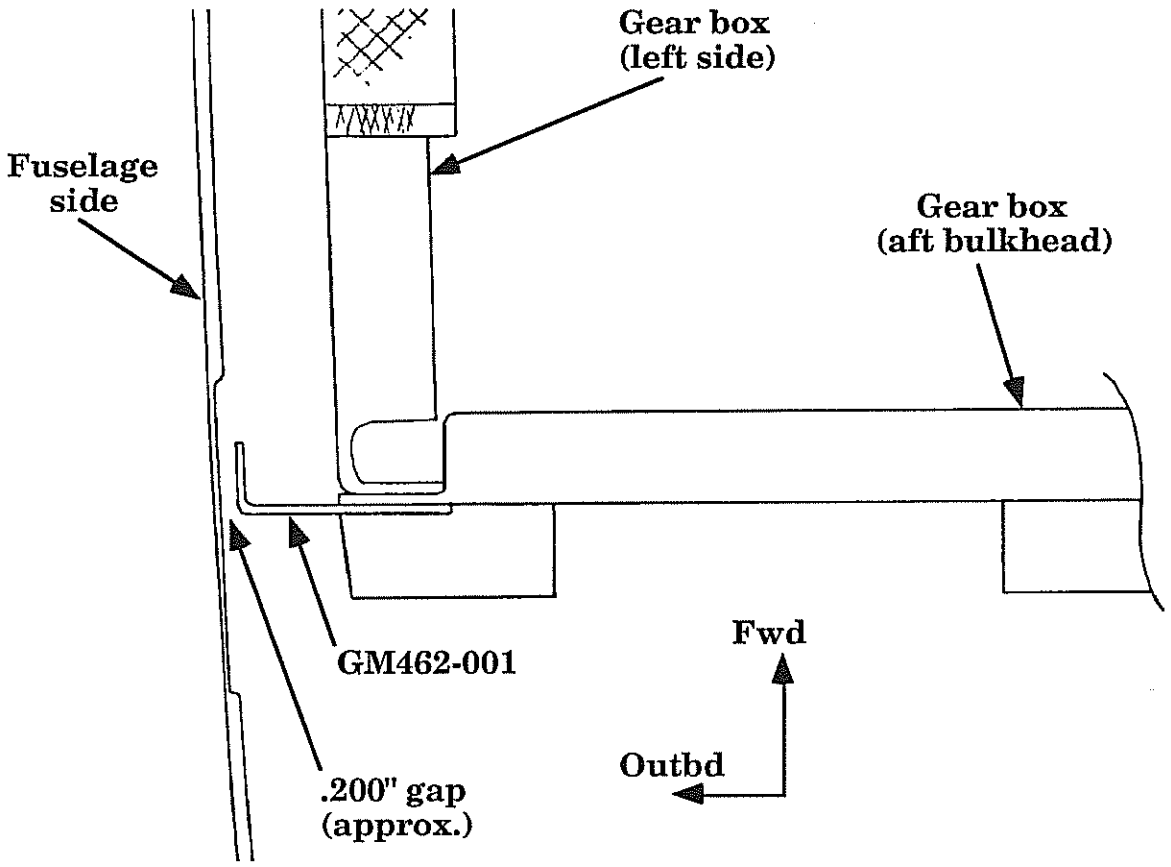
G1. Place the GM462 corner brackets against the aft side of the gear box, at each corner. Position the GM462 brackets as shown in Figure 19:G:2. Mark on the fuselage side where the brackets will be mounted.

Positioning GM462 corner brackets
Figure 19:G:2:a



Positioning GM462 corner brackets

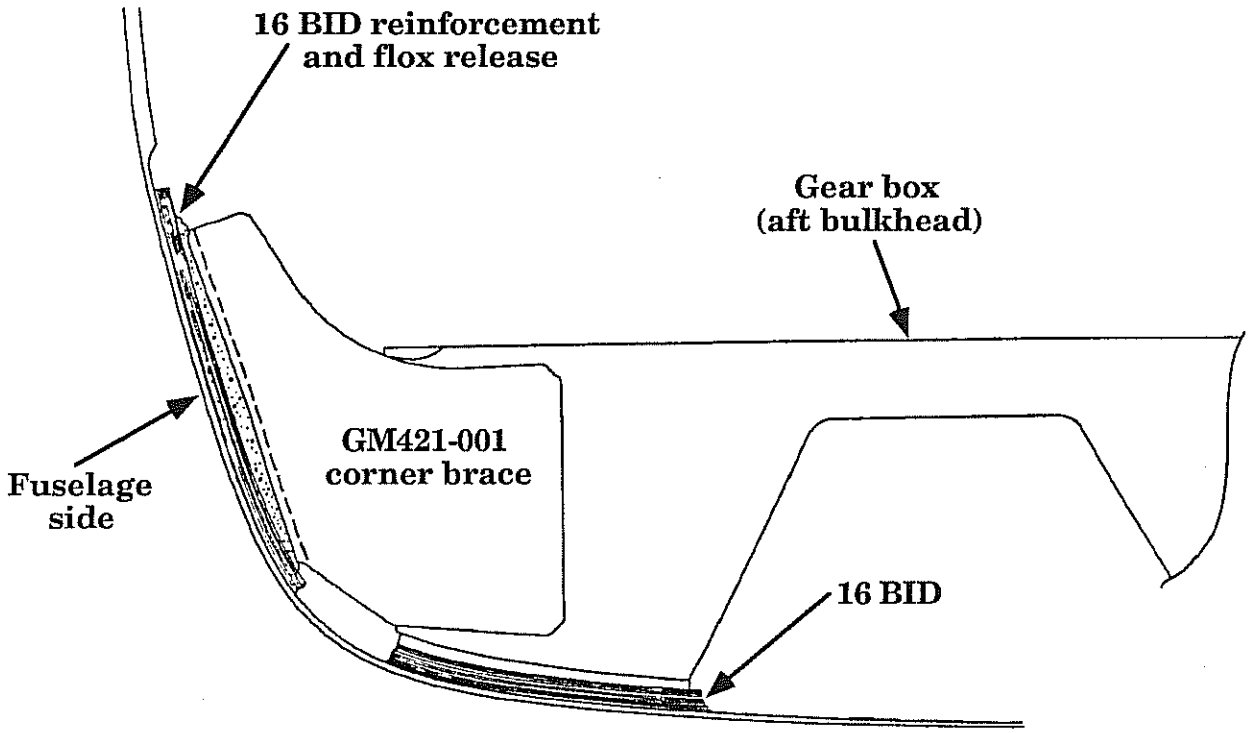
Figure 19:G:2:b



G2. Remove the brackets and use 40 grit to sand the fuselage sides where they will be mounted. Clean these areas with MC.

G3. Apply 16 BID to the fuselage sides in the areas where the GM462 brackets will be mounted. Make the 16 BID 1/4" larger than the flanges of the GM462 brackets.

Reinforcing GM462 mounting area
Figure 19:G:3

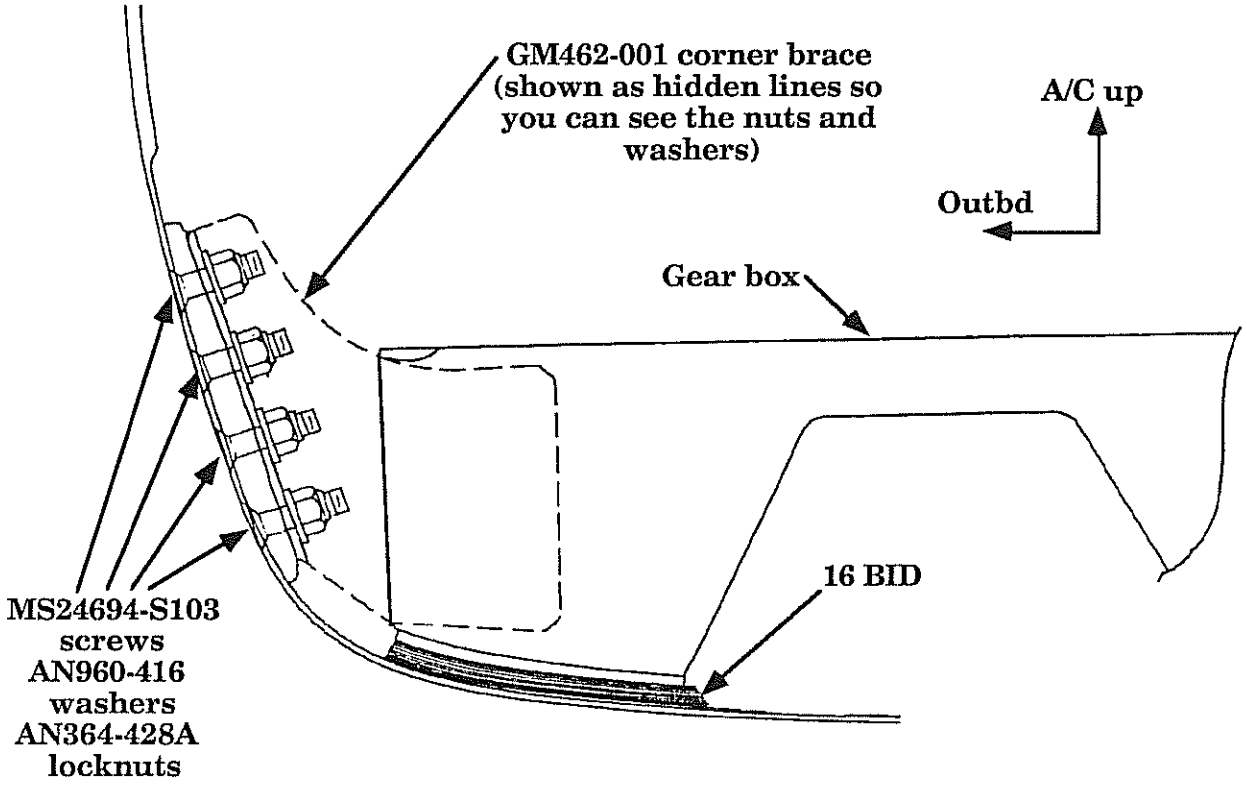


G4. When the 16 BID reinforcements have cured, reposition the GM462 brackets against the gear box and fuselage side. Like the fwd corner brackets, the GM462 brackets will probably not rest flush against the 16 BID reinforcements. A flox release should now be done between the GM462 brackets and the 16 BID. Be sure to cover the mounting flanges of the GM462's to prevent the flox from sticking. Also sand and clean the 16 BID reinforcements where the flox is applied. The GM462 brackets should be held firmly against the aft face of the gear box while the flox is curing.

G5. When the flox has cured, use the predrilled holes in the GM462 brackets as guides to drill through the fuselage sides for the mounting screws as shown in Figure 19:G:4. The screws are 1/4" diameter.

G6. Countersink the fuselage sides for the MS24694-S103 mounting screws as shown in Figure 19:G:4.

Mounting GM462's to fuselage side
Figure 19:G:4

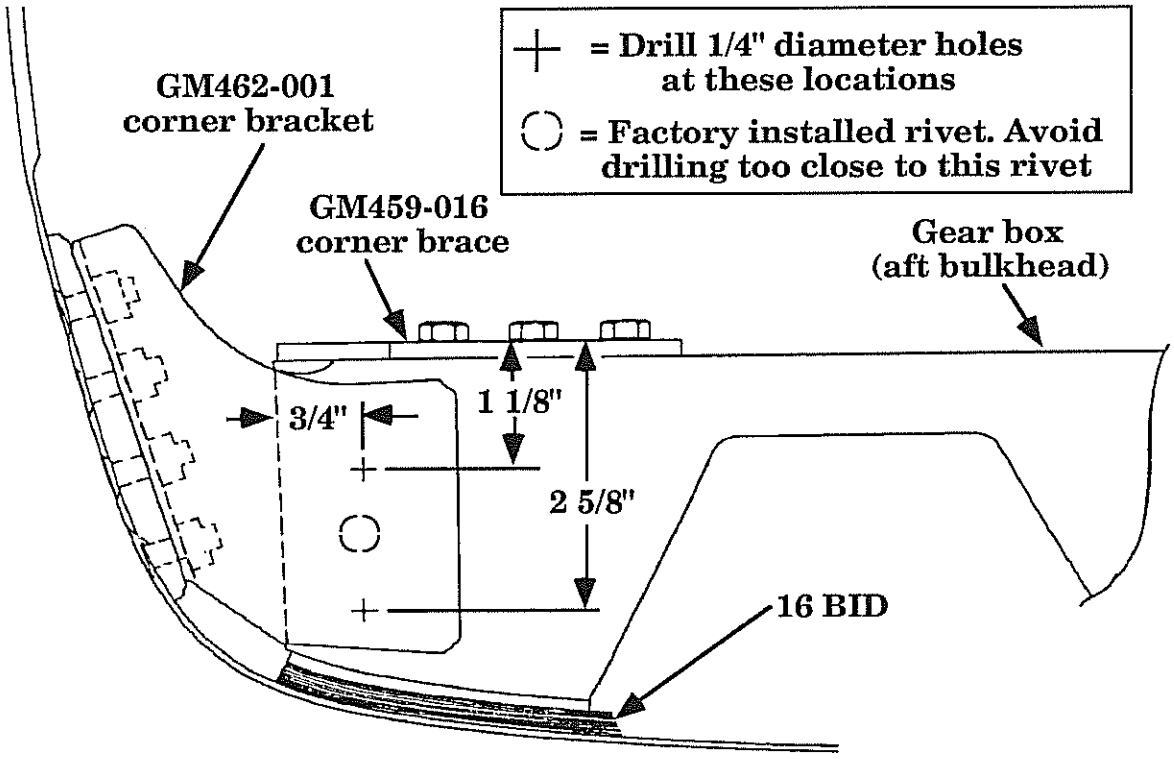


G7. Secure the GM462 brackets to the fuselage sides with MS24694-S103 screws, AN960-416 washers, and AN364-428A locknuts. The final screw length required may differ between planes, so add washers if necessary.

G8. With the gear box installed and the GM462 brackets secured to the fuselage sides, drill for the bolts that will secure the brackets to the gear box. See Figure 19:G:5 for hole locations. Beware not to drill through the rivet that holds each gear box side to the aft bulkhead. Use a 1/8" drill to make pilot holes for the for bolts, then increase the size of the drills until you have reached 1/4" diameter. This will produce cleaner holes than drilling with 1/4" right away.

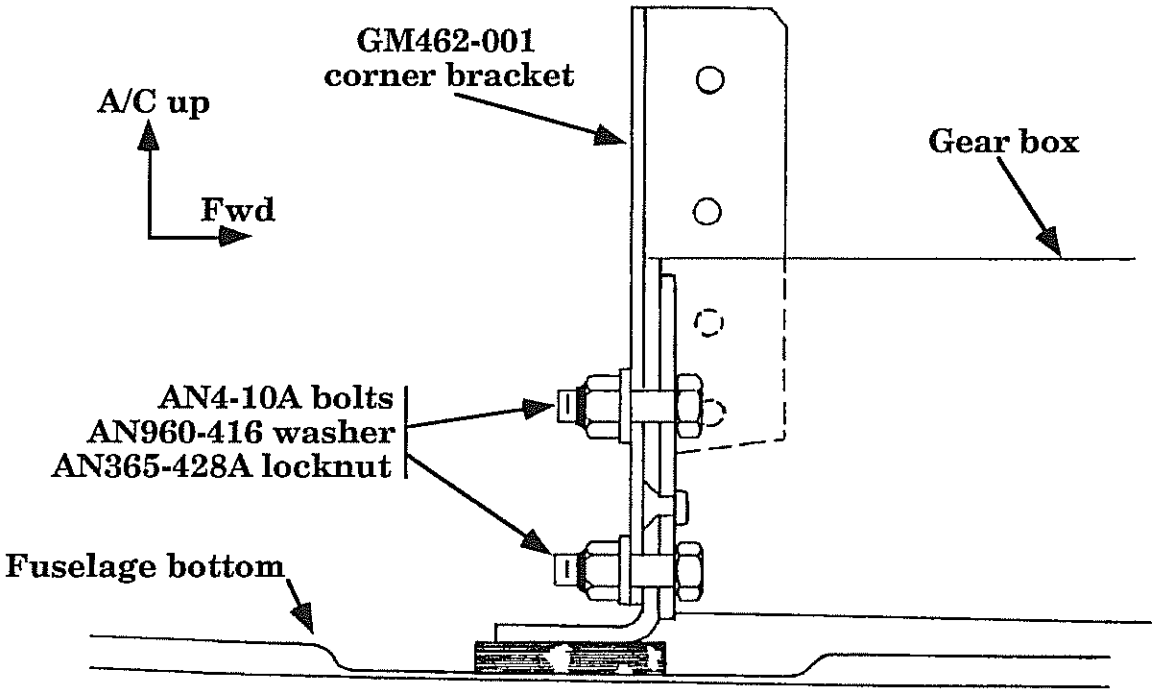
Securing GM462 brackets to gear box

Figure 19:G:5:a



Securing GM462 brackets to gear box

Figure 19:G:5:b



G9. Secure the GM462 brackets to the gear box with AN4-10A bolts, AN960-416 washers, and AN365-428A locknuts.

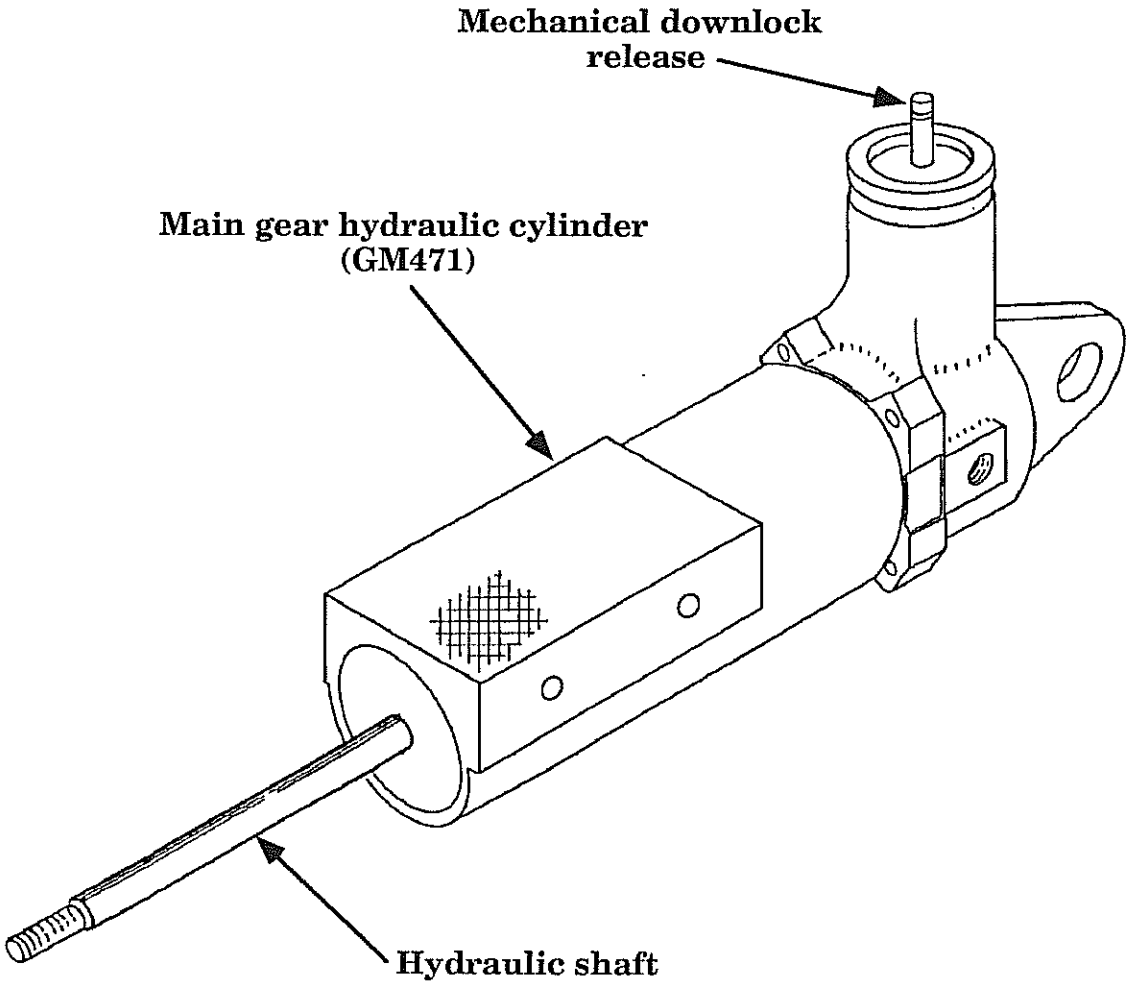
LEFT BLANK INTENTIONALLY

LEFT BLANK INTENTIONALLY

I. HYDRAULIC CYLINDER INSTALLATION

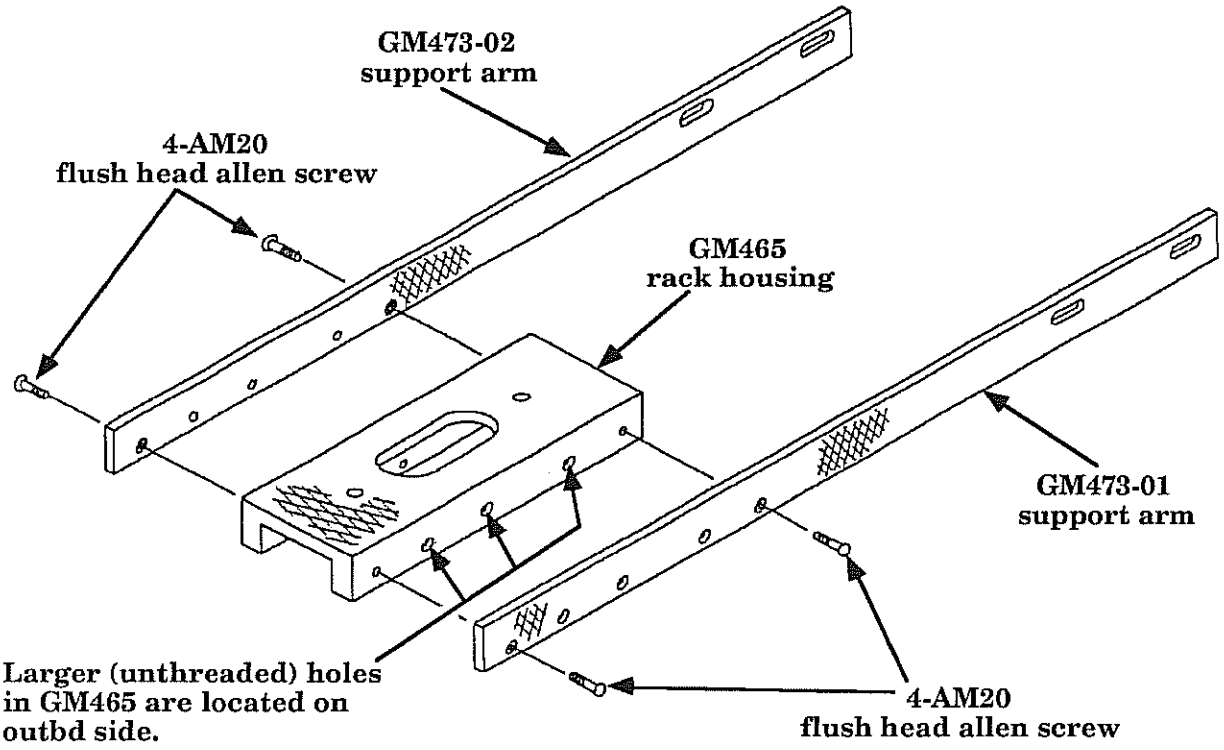
The Lancair IV main gear legs are retracted using a rack and pinion system. You have already installed the pinions on the gear legs. Now you will install the rest of the retraction linkage in the gear box. The text and drawings in this section will refer to the left hydraulic cylinder installation. The right cylinder installation is just a mirror image.

Hydraulic cylinder
Figure 19:I:1



I1. Secure the support arms (GM473-01 & 02) to the rack housing (GM465) with 4-AM20 screws as shown in Figure 19:I:2. The GM473-01 support arms should be secured to the outbd side of both GM465's. The *GM473-02* arm should be secured to the *inbd* side of the GM465. The mounting holes in the support arms are countersunk on both sides for this reason. Use a drop of Loctite #242 on each screw.

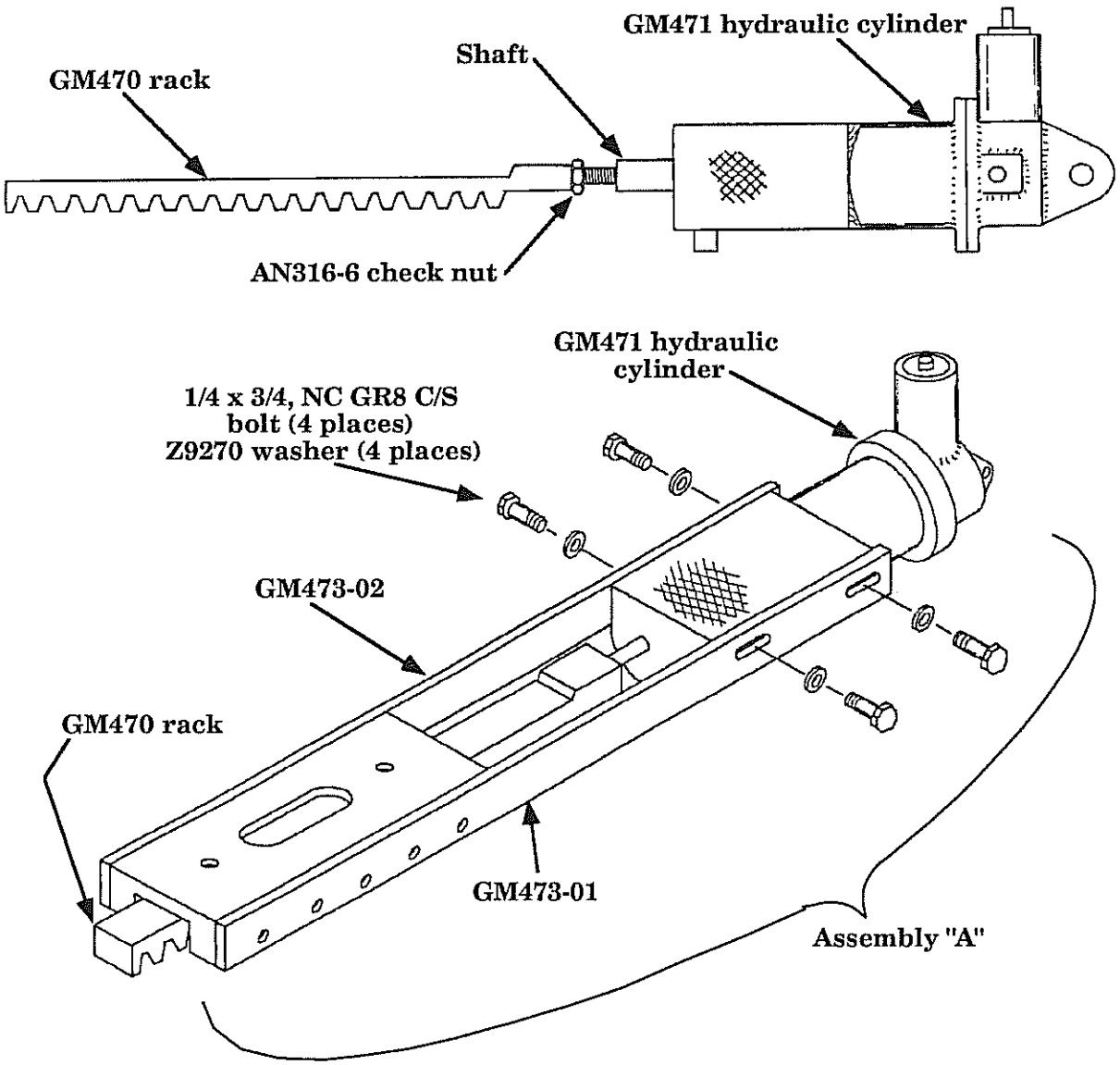
Rack housing/Support arm assembly
Figure 19:I:2



I2. Screw an AN315-6 check nut and the rack (GM470) onto the end of the cylinder until they bottom out on the threads.

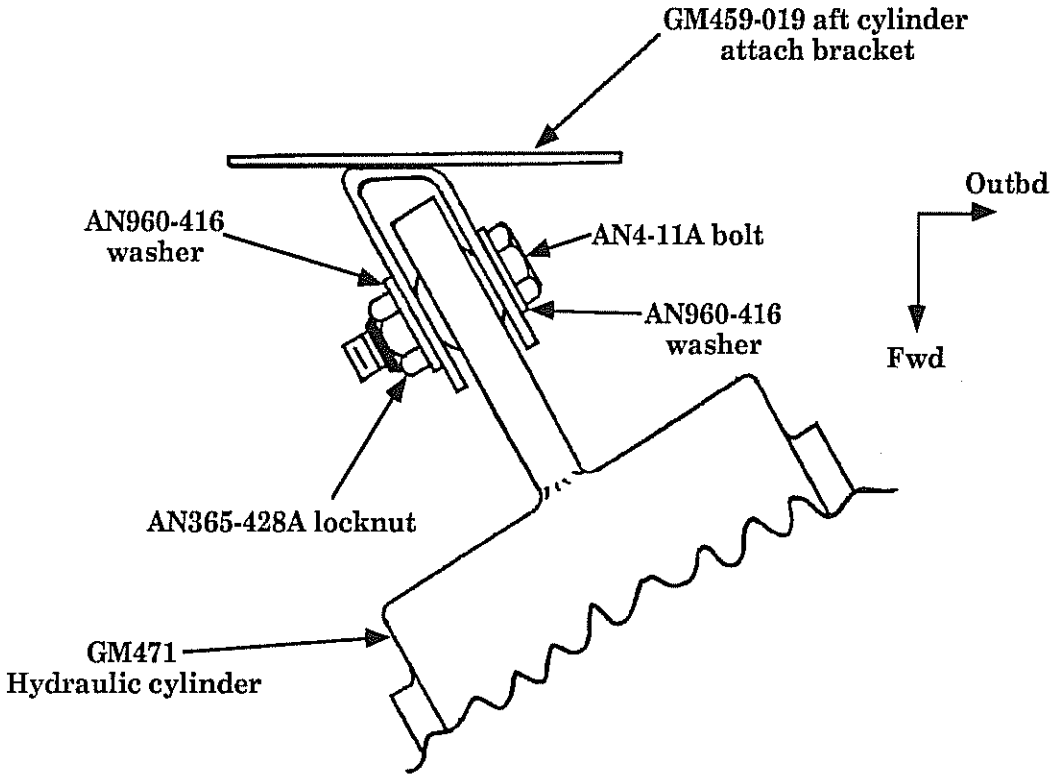
I3. Loosely bolt the support arms to the hydraulic cylinder housing as shown in Figure 19:I:3. Do not tighten the bolts yet because adjustment may be required. To save a little ink, let's call this collection of parts (cylinder, rack, support arms, and rack housing) "Assembly A". You will be installing this assembly a few times to get the proper alignment.

Assembly "A"
Figure 19:I:3



I4. Bolt the cylinder attach bracket (GM459-019-01 left, GM459-019-02 right) to the aft end of the hydraulic cylinder as shown in Figure 19:I:4. Install the cylinders in the low position. If they are installed in the high position, they will protrude through the seat.

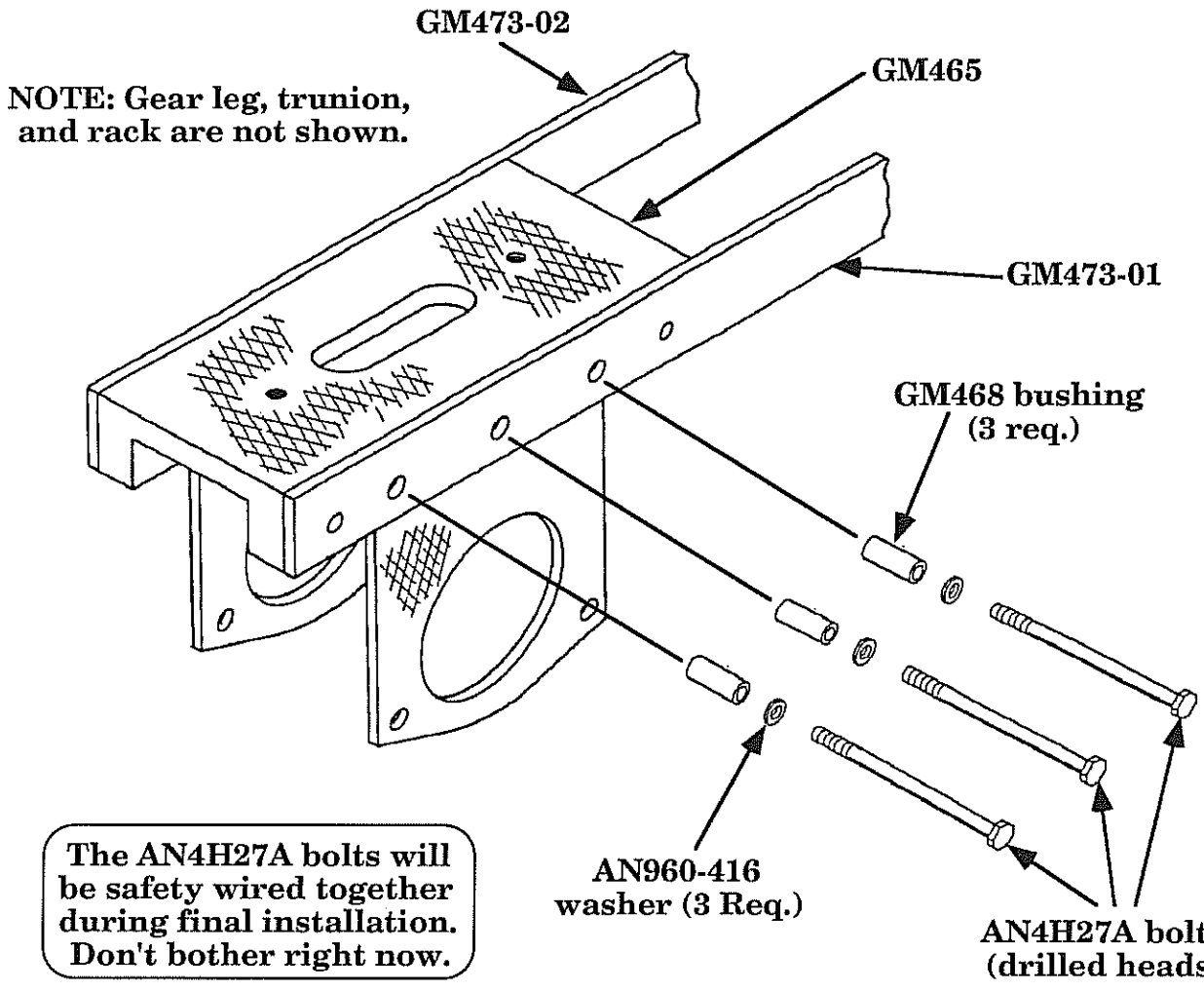
Aft cylinder bracket
Figure 19:I:4



I5. Lower Assembly "A" into the gear box. Bolt the rack housing (GM465) to the pinion plates (GM456's) as shown in Figure 19:I:5. GM468 spacers (acting here as bushings) are required in the rack housing. The GM459-019 cylinder bracket should rest flush against the aft gear box bulkhead. The bottom edge of the

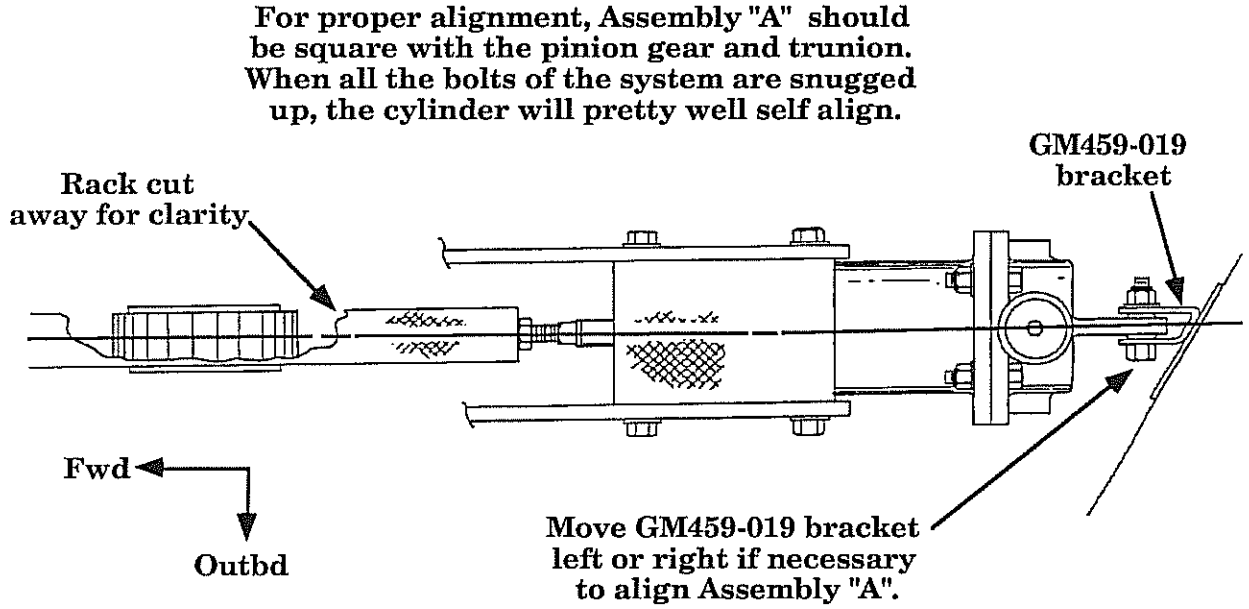
I5. Lower Assembly "A" into the gear box. Bolt the rack housing (GM465) to the pinion plates (GM456's) as shown in Figure 19:I:5. GM468 spacers (acting here as bushings) are required in the rack housing. The GM459-019 cylinder bracket should rest flush against the aft gear box bulkhead. The bottom edge of the cylinder bracket should be level with the bottom edge of the GM459-019-03 bracket (GM459-019-03 is the bracket that secures the middle gear box formers to the aft gear box bulkhead. This "T" shaped bracket is pre-installed at the factory).

Installing Assembly "A"
Figure 19:I:5



I6. The final alignment of the GM459-019 cylinder bracket is done left and right. With all the bolts of Assembly "A" snugged up, there should be very little left and right play between the Assembly "A" and the main gear trunion. Shift the cylinder bracket left or right slightly to get the best alignment between the GM470 rack and the GM469 pinion. When the alignment looks good, use instant glue to hold the cylinder bracket to the aft gear box bulkhead. Unbolt the bracket from the cylinder and remove the rest of Assembly "A" from the gear box.

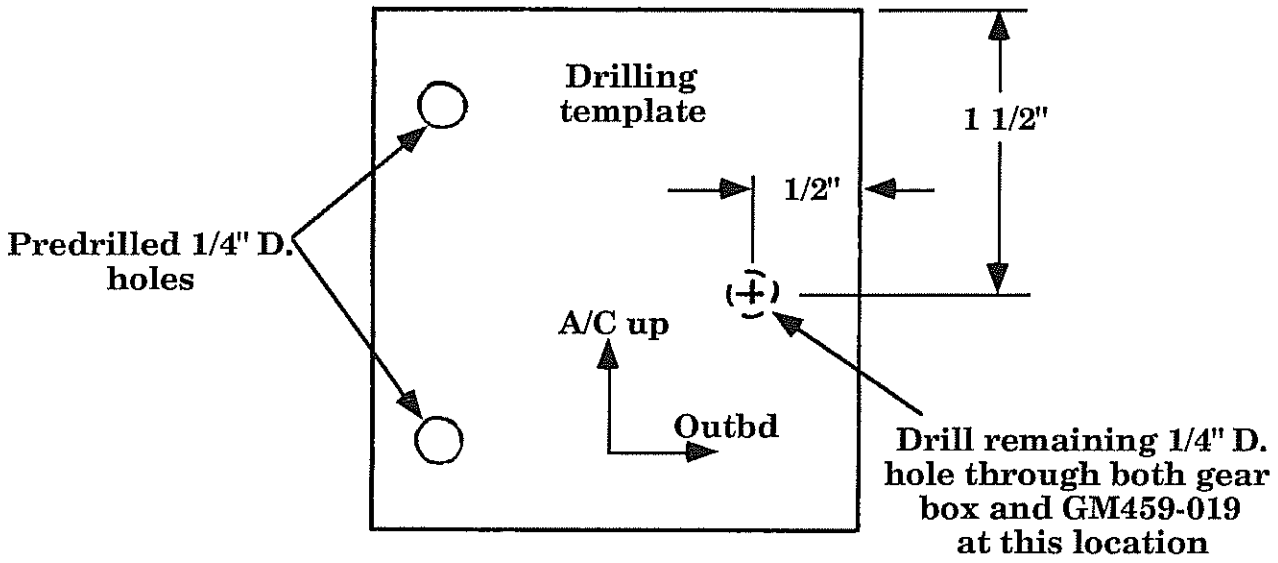
Aligning rack and pinion
Figure 19:I:6



I7. Use the two predrilled inbd holes of the GM459-019 cylinder bracket as guides to drill 1/4" diameter holes through the aft gear box bulkhead. An angle drill is required for this step because of the middle gear box formers. Also, the drilling is much easier if the gear box is removed from the fuselage. The instant glue bond can easily be broken, so a clamp should also be used to maintain the bracket alignment.

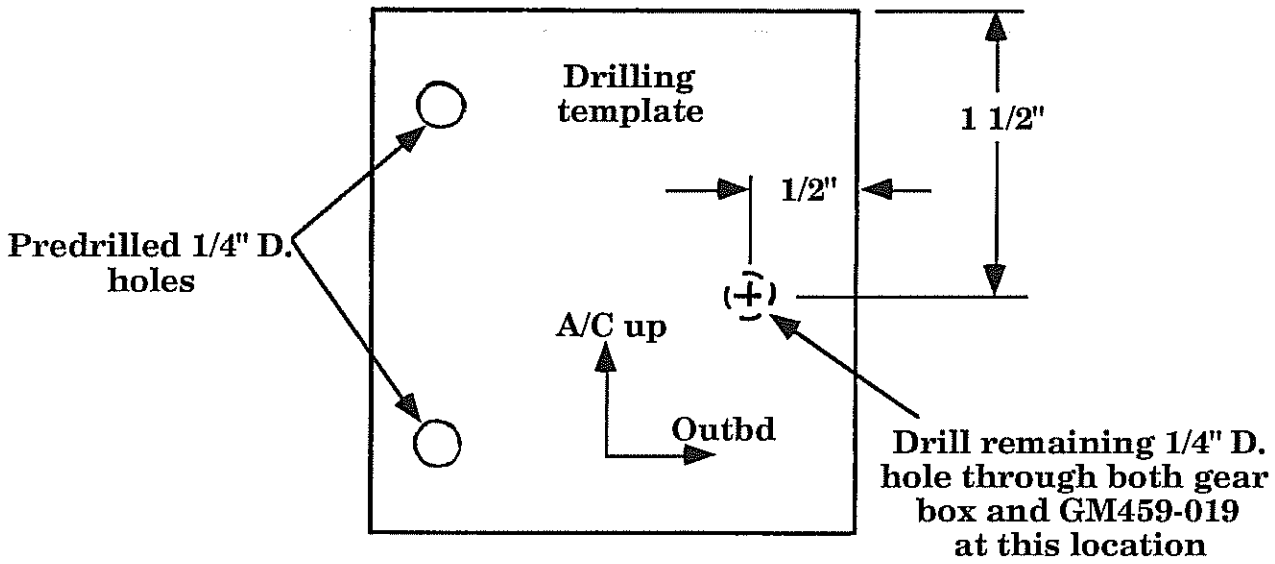
I8. One more 1/4" diameter bolt hole needs to be drilled through the GM459-019 bracket and the aft gear box bulkhead. This remaining hole is best drilled from behind the gear box. Place the template in Figure 19:I:7 against the aft face of the gear box, using the two holes you drilled in Step I7 as references. (To avoid having to cut up or copy this page, a duplicate template is provided on the next page.) The template will show you where the remaining 1/4" diameter hole needs to be drilled. Drill the hole at this time. Again, to prevent the GM459-019 bracket from wandering during the drilling process, you should secure it to the gear box with the proper bolts as shown in Figure 19:I:8.

Drilling template for GM459-019 bracket
Figure 19:I:7



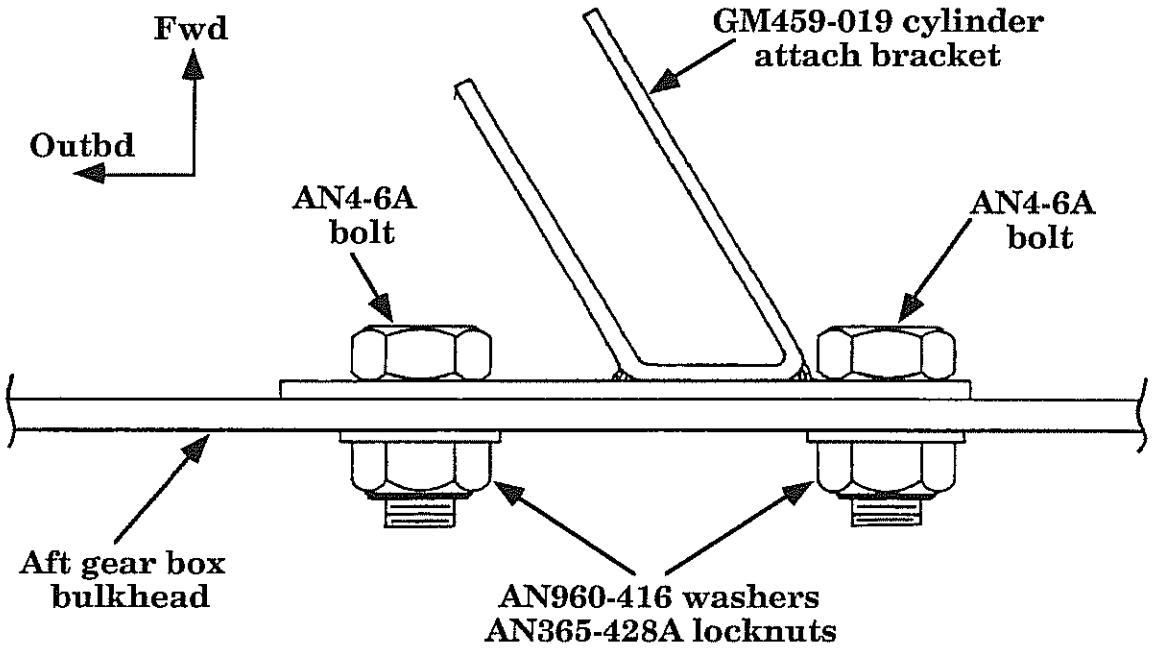
Drilling template for GM459-019 bracket (Duplicate)

Figure 19:I:7:a



I9. Secure the GM459-019 cylinder bracket to the aft gear box bulkhead with AN4-6A bolts, AN960-416 washers, and AN365-428A locknuts as shown in Figure 19:I:8.

Securing GM459-019 bracket
Figure 19:I:8



I10. Now we will adjust the rack to get the correct meshing of the rack and pinion gears. Bolt the hydraulic cylinder to the GM459-019 bracket. *Do not* bolt the GM465 rack housing to the GM468 pinion plates.

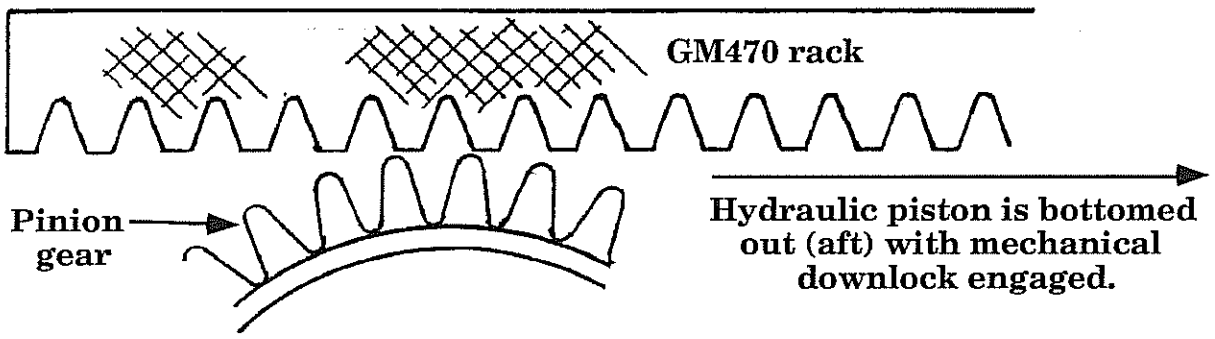
I11. Push the GM470 rack aft until the hydraulic piston has bottomed out in the cylinder. The mechanical downlock will have to be lifted for the piston to bottom out. After the piston has bottomed, the mechanical downlock will lock the piston in the proper position. The rack gears will probably not mesh perfectly with the pinion gears. For now, just let the rack ride up on the pinion gears.

I12. To make the rack and pinion gears mesh properly, you must slowly unscrew the GM470 rack from the hydraulic cylinder. Grasp the rack with a wrench to prevent it from turning. Grasp the shaft of the hydraulic cylinder with a wrench also. There are flats ground into the shaft for this purpose. Make sure the check nut behind the rack is loose. Now turn the shaft of the hydraulic cylinder, slowly unthreading the rack until the gears of the GM470 rack and the GM469 pinion mesh properly. You will be moving the rack forward in the gear box when you unthread it from the shaft. Secure the rack with the check nut when satisfied with its position.

The important factors in this process are:
1). The piston must be bottomed out in the cylinder with the mechanical downlock engaged.
2). The gear leg should be resting against the downstop cushion.
3). You should adjust the rack forward ONLY until it meshs with the first gear of the pinion.

Adjusting rack position #1

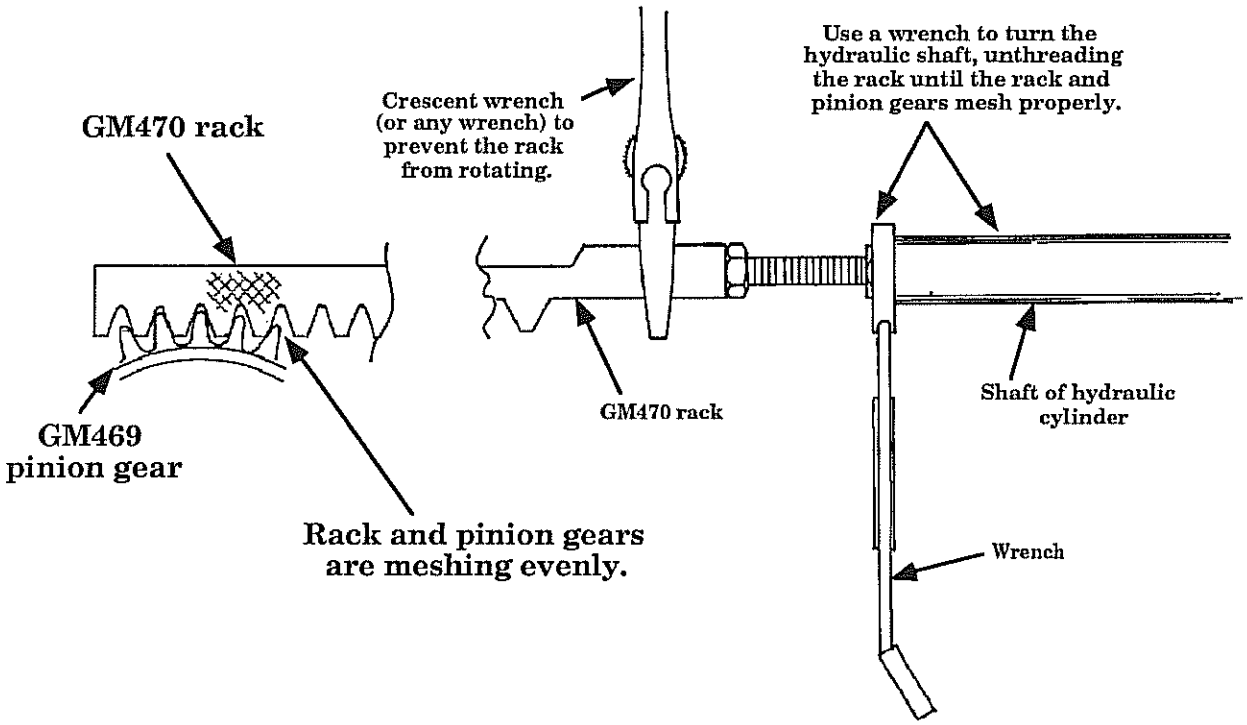
Figure 19:I:9:a



NOTE: Rack and pinion gears do not mesh properly.

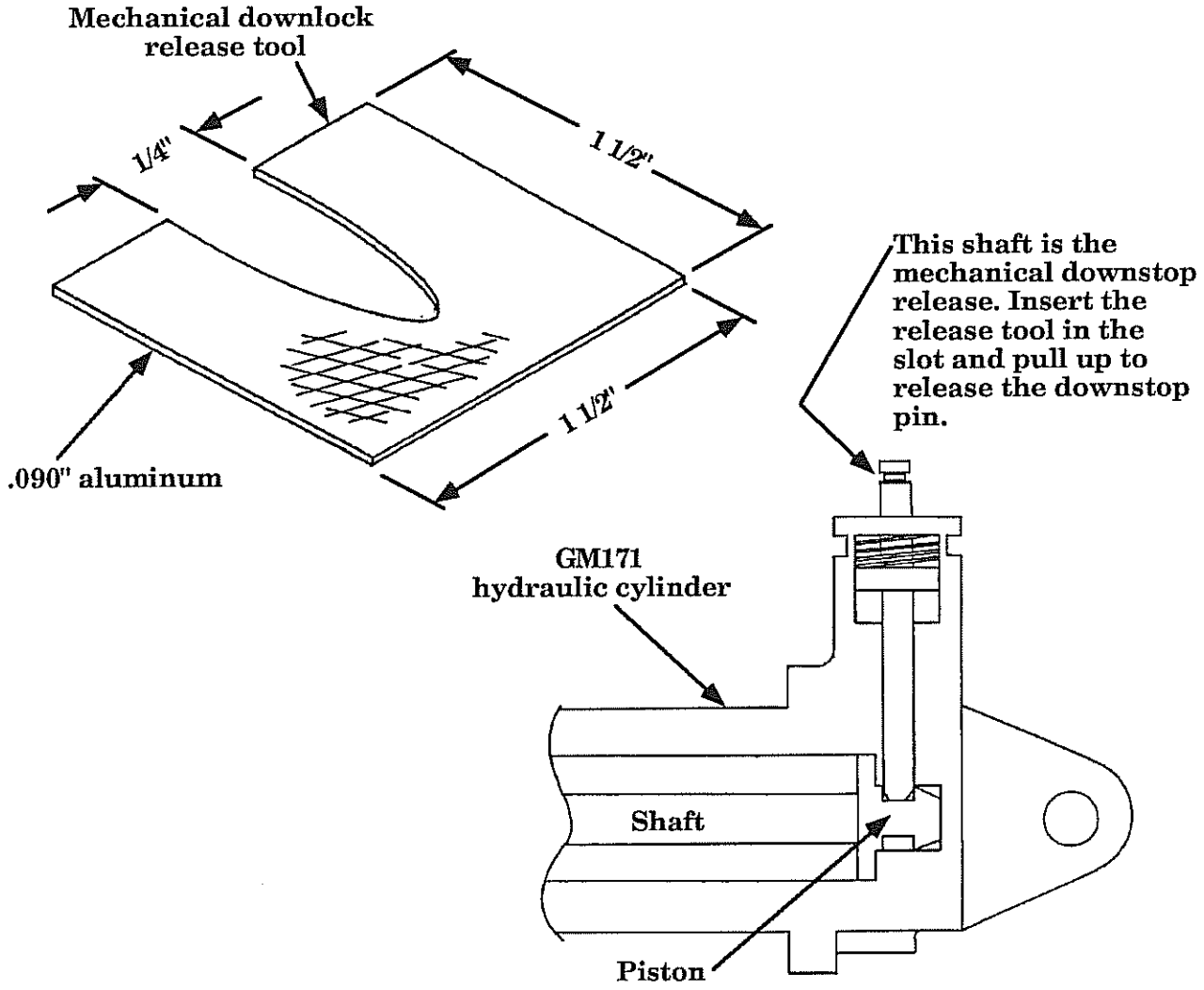
Adjusting rack position #2

Figure 19:I:9:b



Adjusting rack position #3

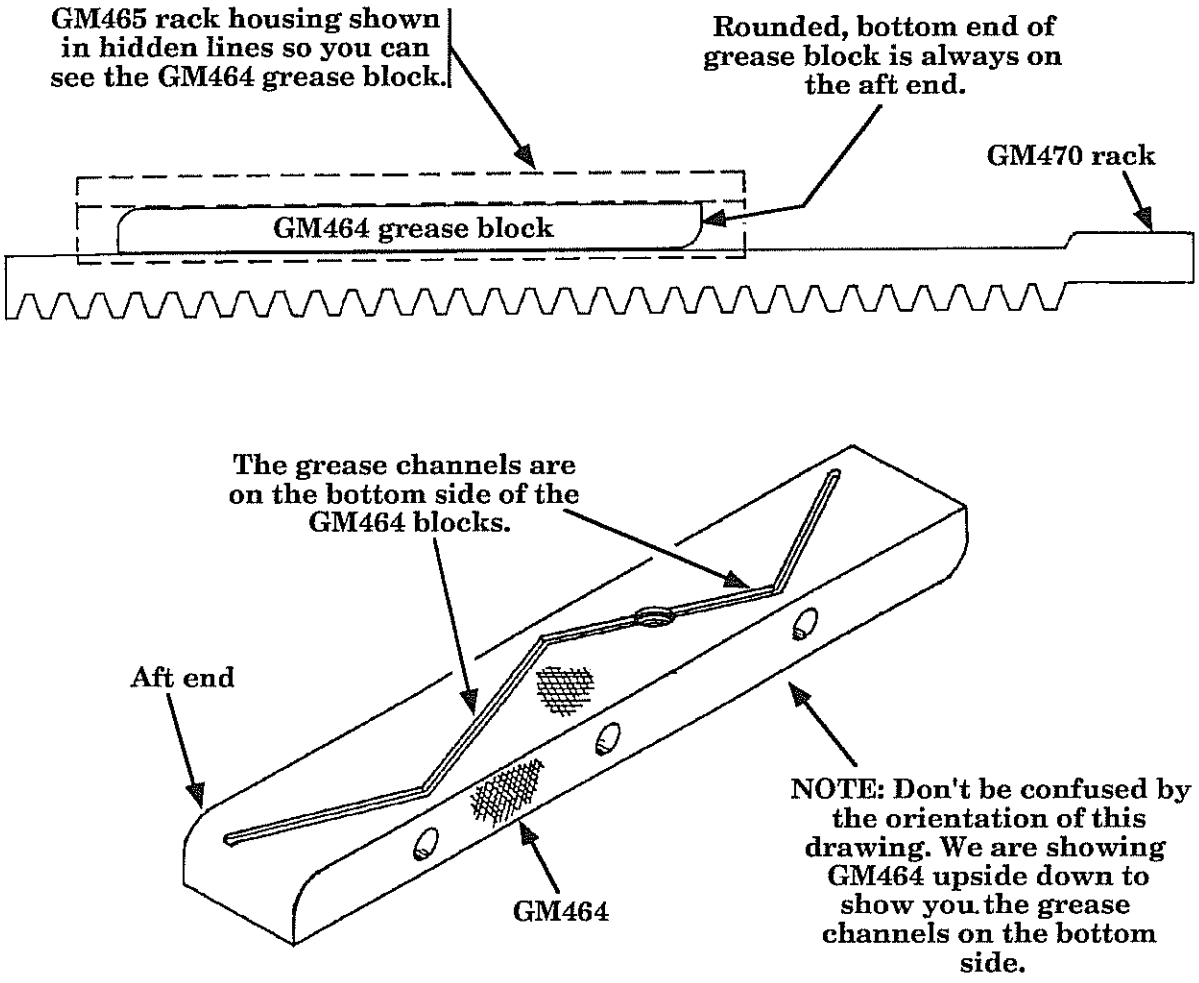
Figure 19:I:9:c



NOTE: At this point in the hydraulic cylinder installation, we will be describing the final installation. However, given that you have a lot of work left to do around the gear box, it may be a good idea to hold off final installation to avoid fouling the cylinder with fiber-glass dust, metal shavings, etc. Whatever you decide, just be sure to keep the cylinder and rack clean of anything but lubricating grease.

I13. Now that the gears of the rack and pinion are meshing properly, you can again secure the GM465 rack housing to the GM456 pinion plates. This time, though, slide the GM464 grease block between the rack and the rack housing as shown in Figure 19:I:10. The threaded hole for the grease fitting should be biased forward in the rack housing.

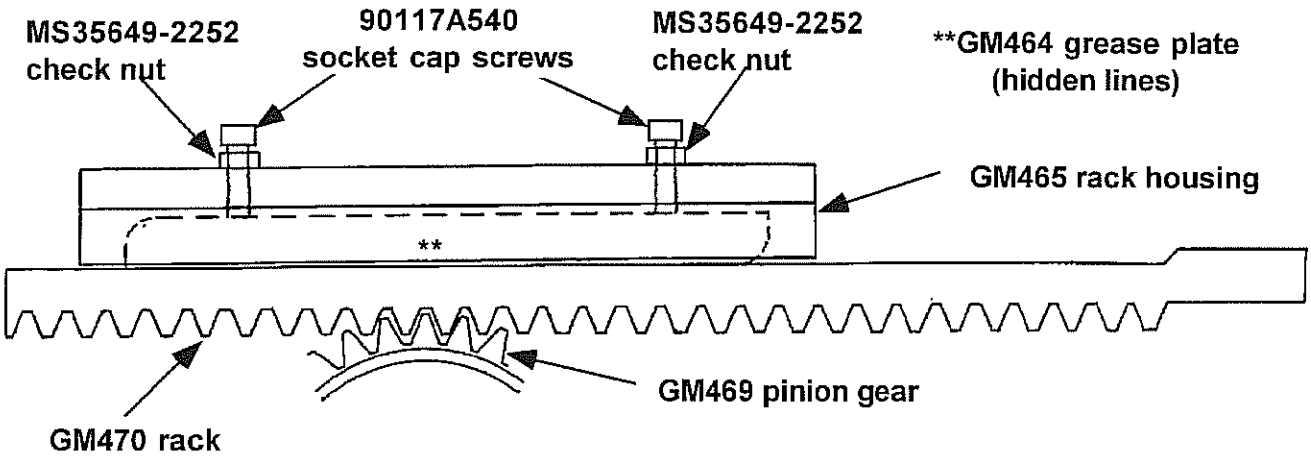
Installing rack housing and grease plate
Figure 19:I:10



I14. Screw a grease fitting (Part # 1095K11) into the GM464 grease plate.

I15. Install 90117A540 socket cap screws and MS35649-2252 check nuts into the GM464 grease plate as shown in Figure 19:I:11. These screws will press the GM464 grease plate against the GM470 rack, keeping the rack and pinion gears meshing properly. Adjust the height of the screw just until there is light pressure against the rack. Tightening the screws too much will cause excessive wear in the system. Lock the set screw in position by tightening the check nut against the rack housing.

Installing set screws in GM465
Figure 19:I:11

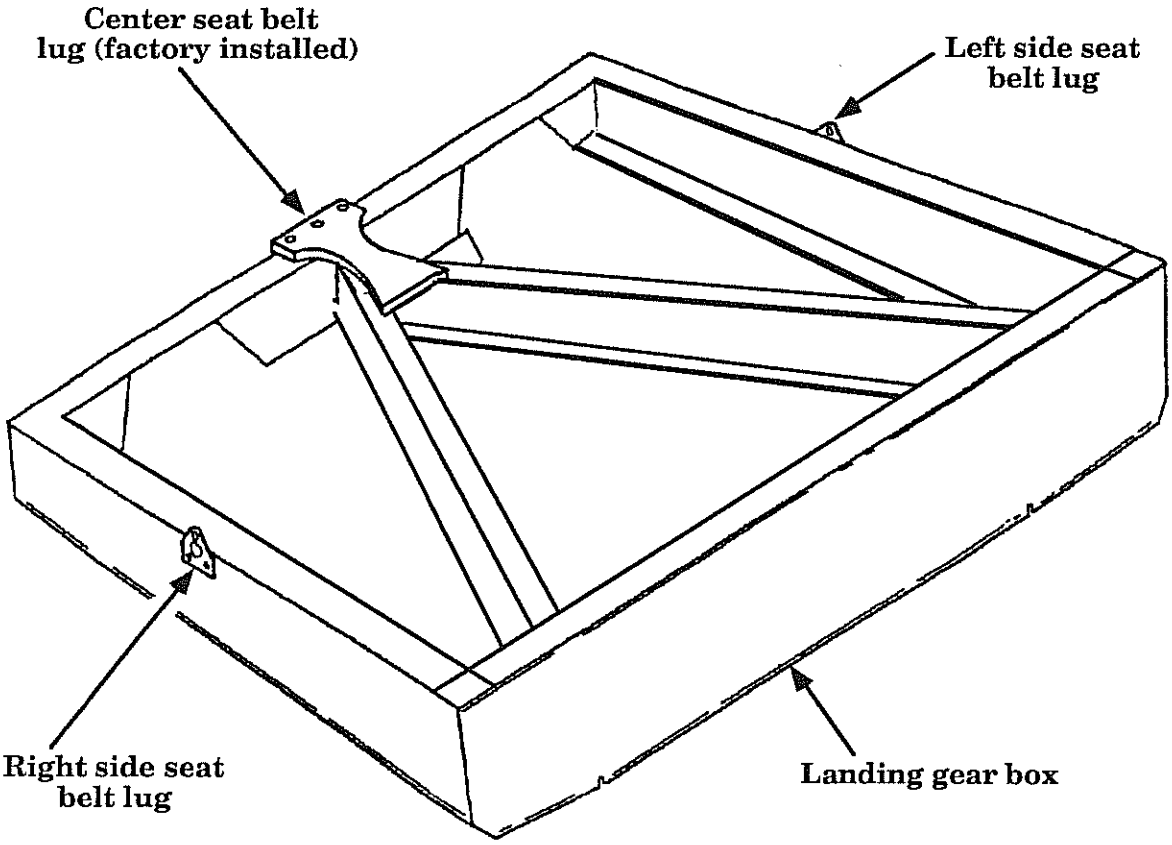


The cap screws push the grease plate against GM470. This ensures that the rack and pinion gears do not separate. Only slight pressure against GM470 is required.

J. AFT SEAT BELT ATTACHMENTS

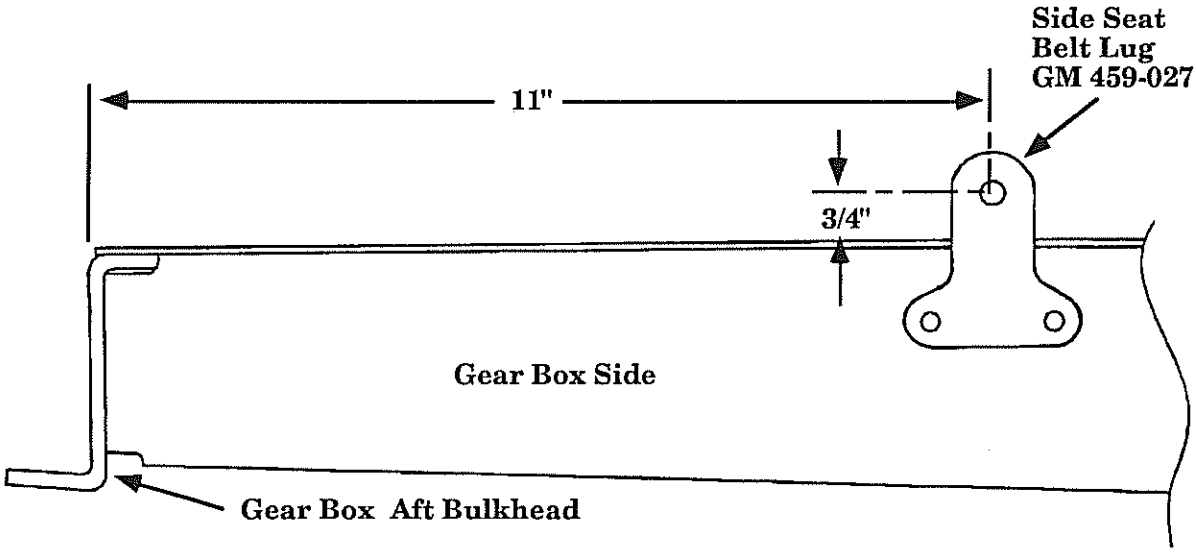
The aft seat belts attach in three places. The two inboard belts for the rear passengers both attach to the factory installed center seat belt lug. The outbd seat belts attach to lugs mounted to the sides of the gear box.

Aft seat belt attachment points
Figure 19:J:1



J1. Position the side seat belt lugs as shown in Figure 19:J:2.

Locating aft seat belt lugs
Figure 19:J:2

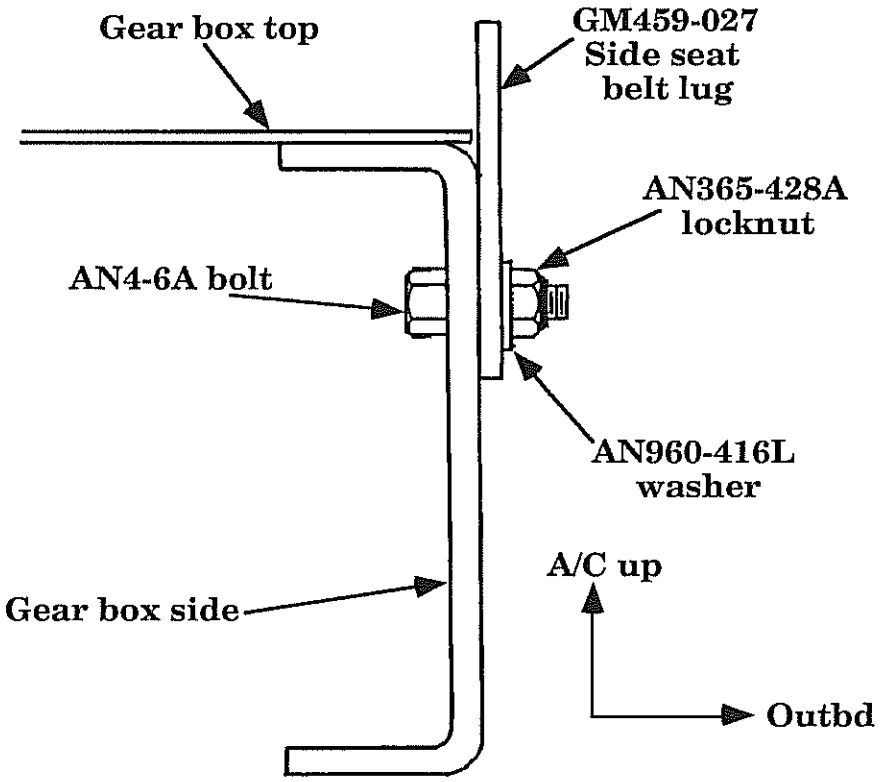


J2. Use the predrilled holes in the side seat belt lugs as guides to drill the 1/4" mounting holes through the gear box sides.

J3. Secure the side seat belt lugs to the gear box with AN4-6A bolts, AN960-416L washers, and AN365-428A locknuts.

J3. Secure the side seat belt lugs to the gear box with AN4-6A bolts, AN960-416L washers, and AN365-428A locknuts.

Securing seat belt lugs
Figure 19:J:3

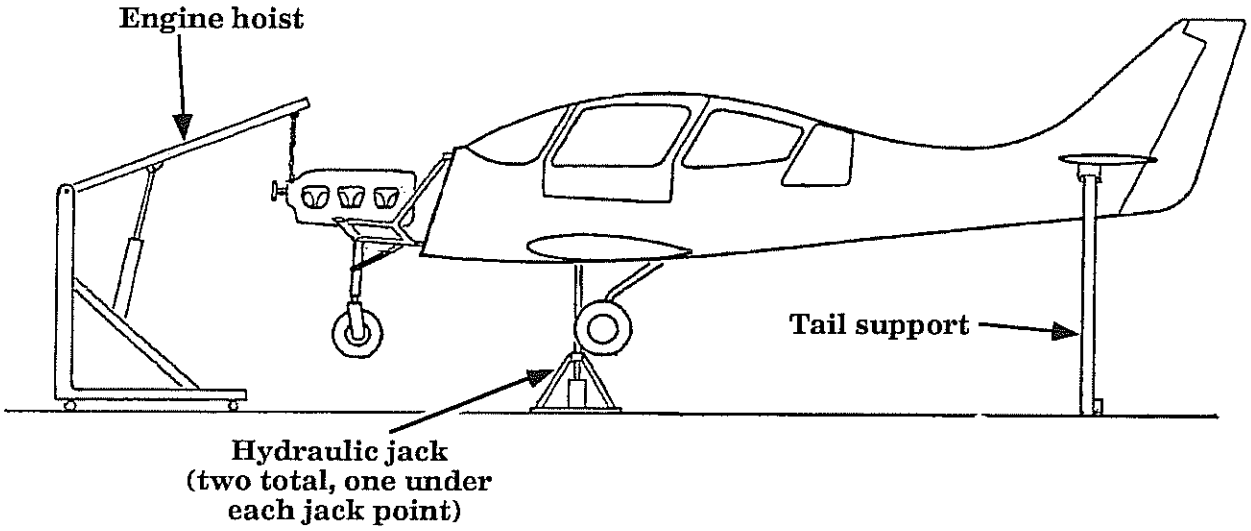


K. JACK POINT INSTALLATION

To provide hardpoints for raising the Lancair IV for gear retraction tests, two jack point weldment are bolted to the forward face of the fwd shear panel. These two weldments use the beefy spar carrythru to raise the aircraft. An engine hoist is used to raise the nose of the aircraft for retracting the nose gear.

NOTE: Early jack point weldments had two 3/16" D. holes in their top flange. If you have one of these early weldments, please drill out these top two holes to 5/16" diameter.

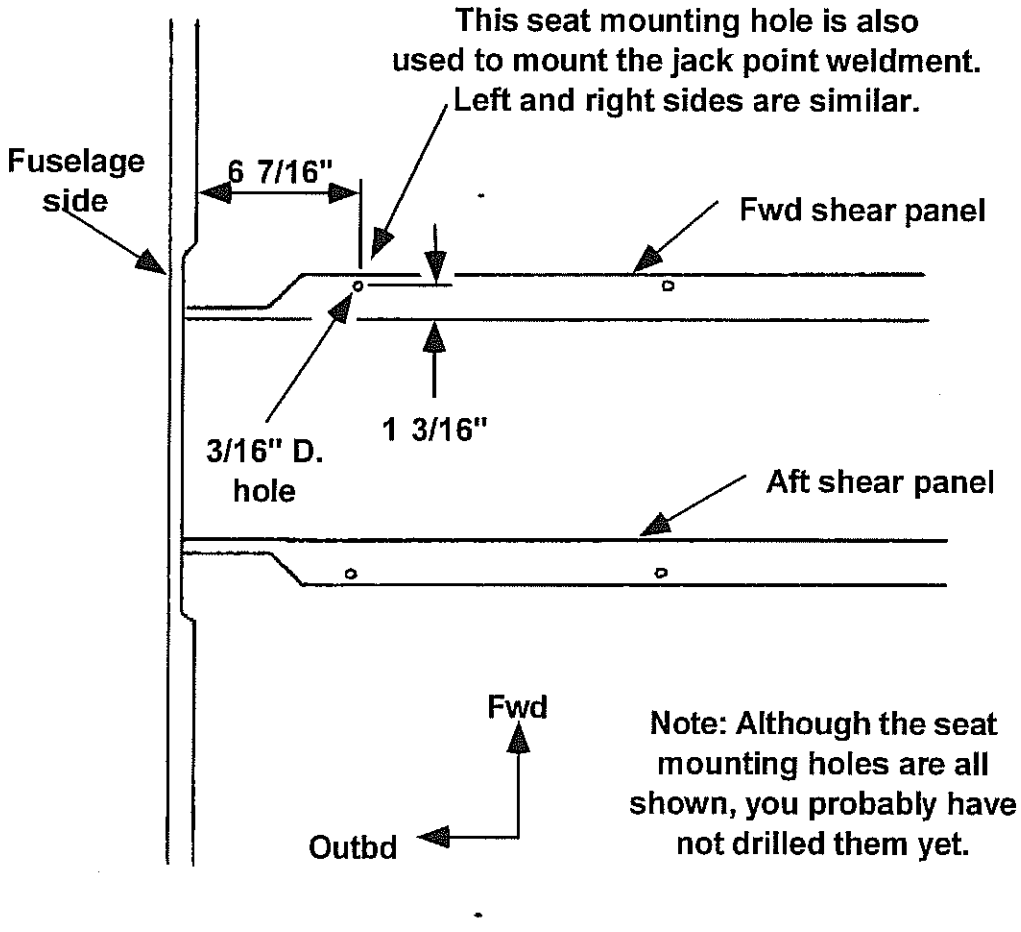
Lancair IV jack points
Figure 19:K:1



K1. The jack point weldments (JP 324's) are indexed off the fwd, outbd mounting holes for the pilot and copilot seats. In fact, the weldments also use these two holes for mounting. Check that these two holes are each 6 7/16" from the fuselage side and 1 3/16" fwd of the shear panel's aft face.

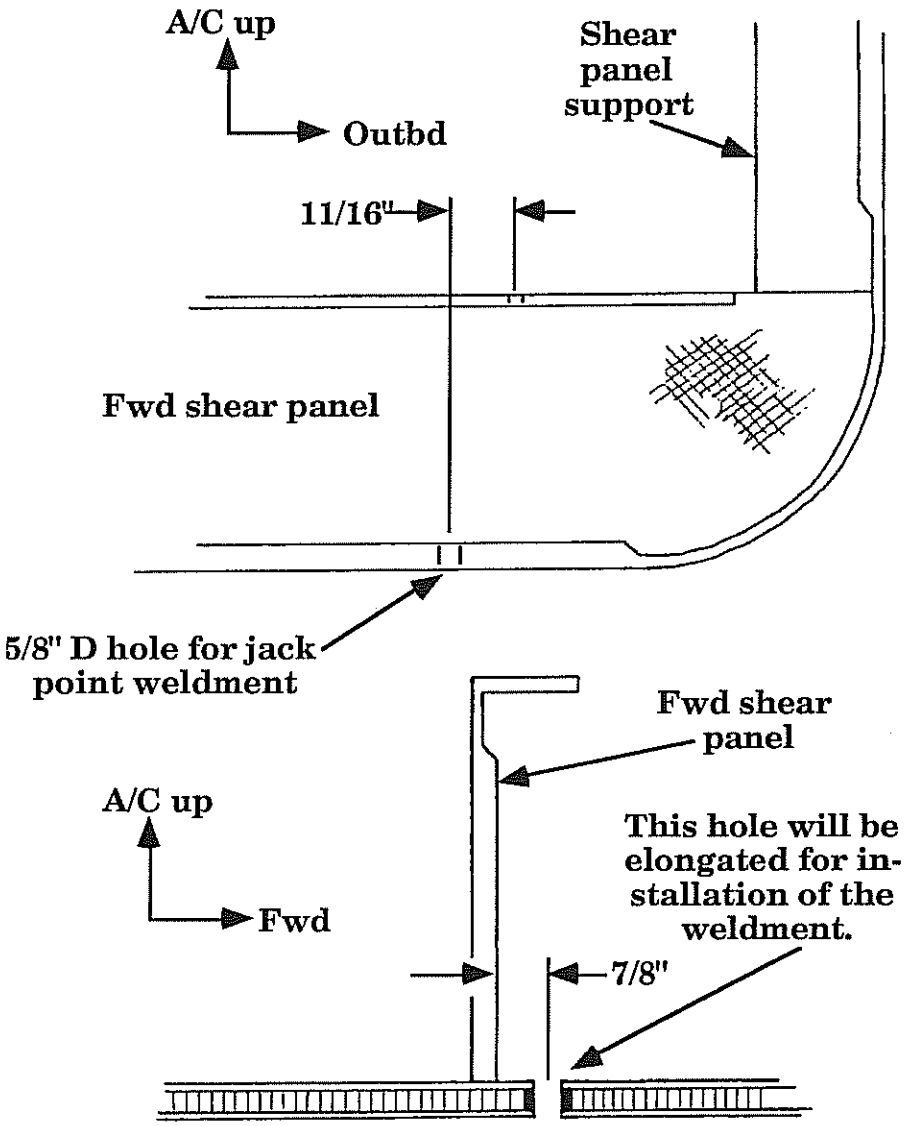
K2. From the centers of the seat mounting holes decribed in Step K1, measure inbd 11/16". This will be the center of the jack point weldment's vertical tube. Transfer these two points to the inside of the fuselage floor. Drill a 5/8" hole through the fuselage floor at the two reference points.

References for locating jack point weldments
Figure 19:K:2:a



References for locating jack point weldments

Figure 19:K:2:b



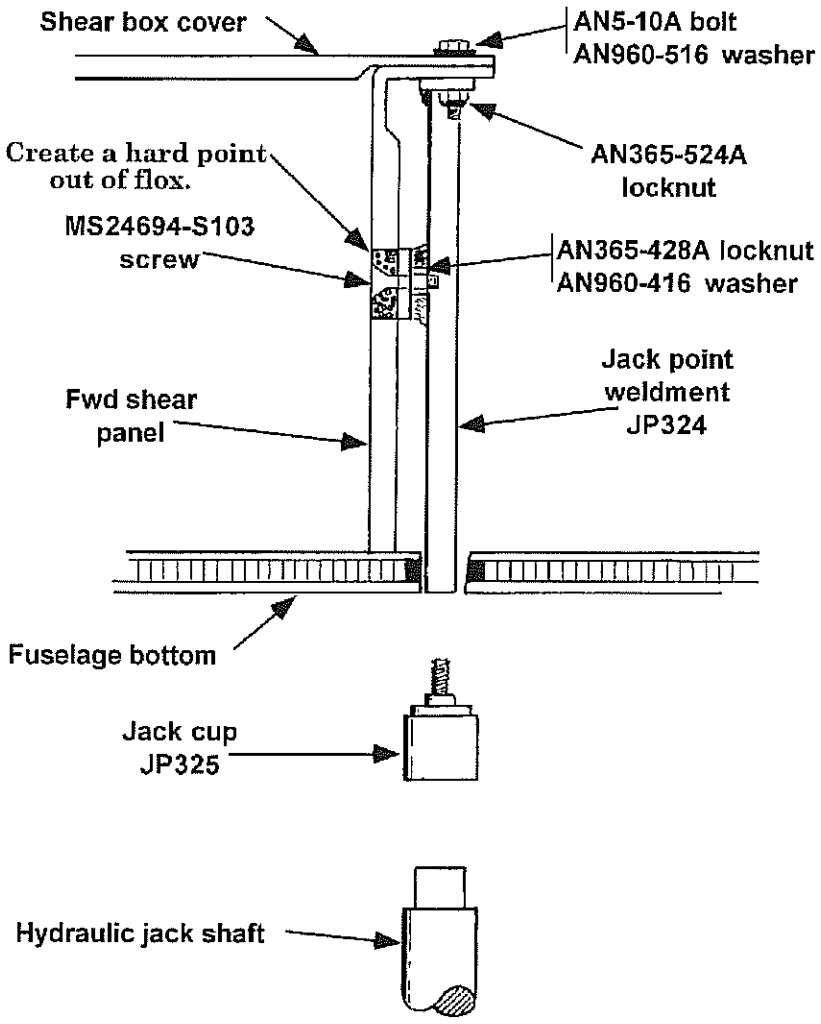
K3. Insert the jack point into the holes in the fuselage floor. These holes will have to be elongated so the jack point can be inserted, then tilted back until it rests against the fwd shear panel.

K4. Temporarily secure the jack point weldment to the shear panel flange using the fwd, outbd seat holes. Use a 5/16" D. bolt through these holes.

K5. Check that the vertical tube of the jack point weldment is truly vertical (perpedicular to the top of the shear panel). Hold the jack point in position. Use the two holes in each vertical jack point flange as guides to drill two, 1/4" D. holes through the vertical shear panel. Slide a couple AN4 bolts through these holes and drill the last mounting hole (5/16"D.) through the shear panel flange, using the top weldment flange as a guide.

Mounting Jack point weldment

Figure 19:K:3

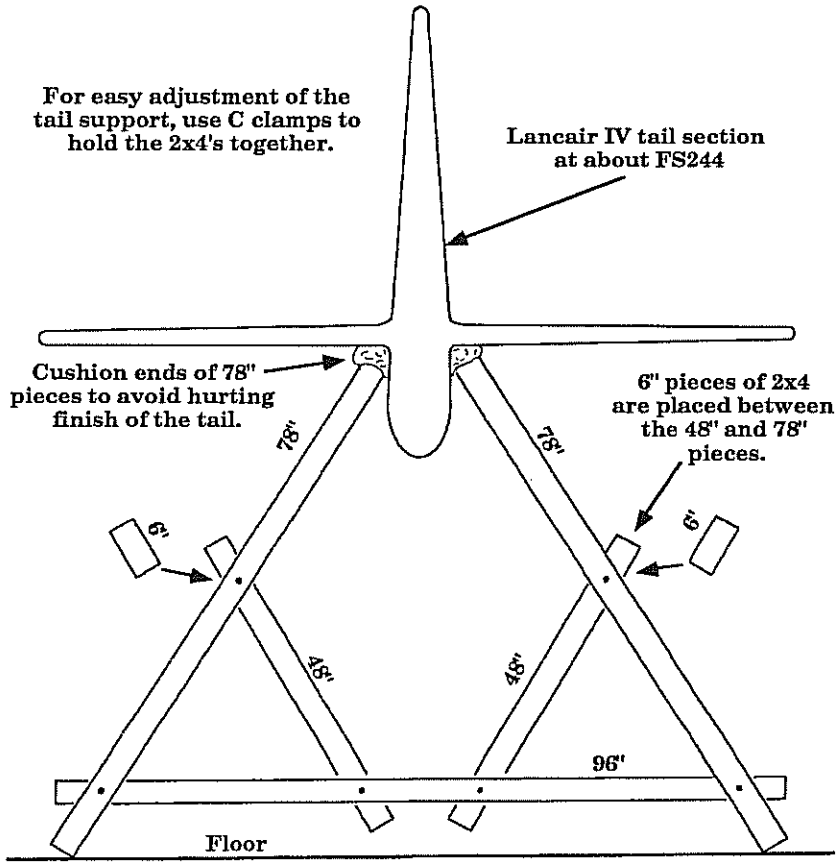


K6. To avoid interfering with the wing spars, countersink the four jack point mounting holes on the aft face of the shear panel. Use MS24694-S103 screws (pointing forward) to secure the jack point weldment to the shear panel. Use and AN5-10A bolt to secure the top, inbd holes of the weldments. The top, outbd holes, of course, are secured with the seat bottom studs.

K7. To stabilize and support the tail of the aircraft when it is jacked up, a simple frame is made out of 2x4's as shown in Figure 19:K:4. Clamp the 2x4's together with C clamps so you can adjust the height and width. tape a cushion to the supports where they contact the airframe to avoid scratching. The 2x4 frame supports the tail at about FS244.

WARNING: When the airplane is lifted on the jacks, DO NOT work inside the cockpit aft of the main spars without the tail support in place. You could push the CG too far aft and the aircraft could fall off the jacks. Also beware of jostling the aircraft when it is on the jacks and stay out from under it at all times. Safety first!

Tail support
Figure 19:K:4

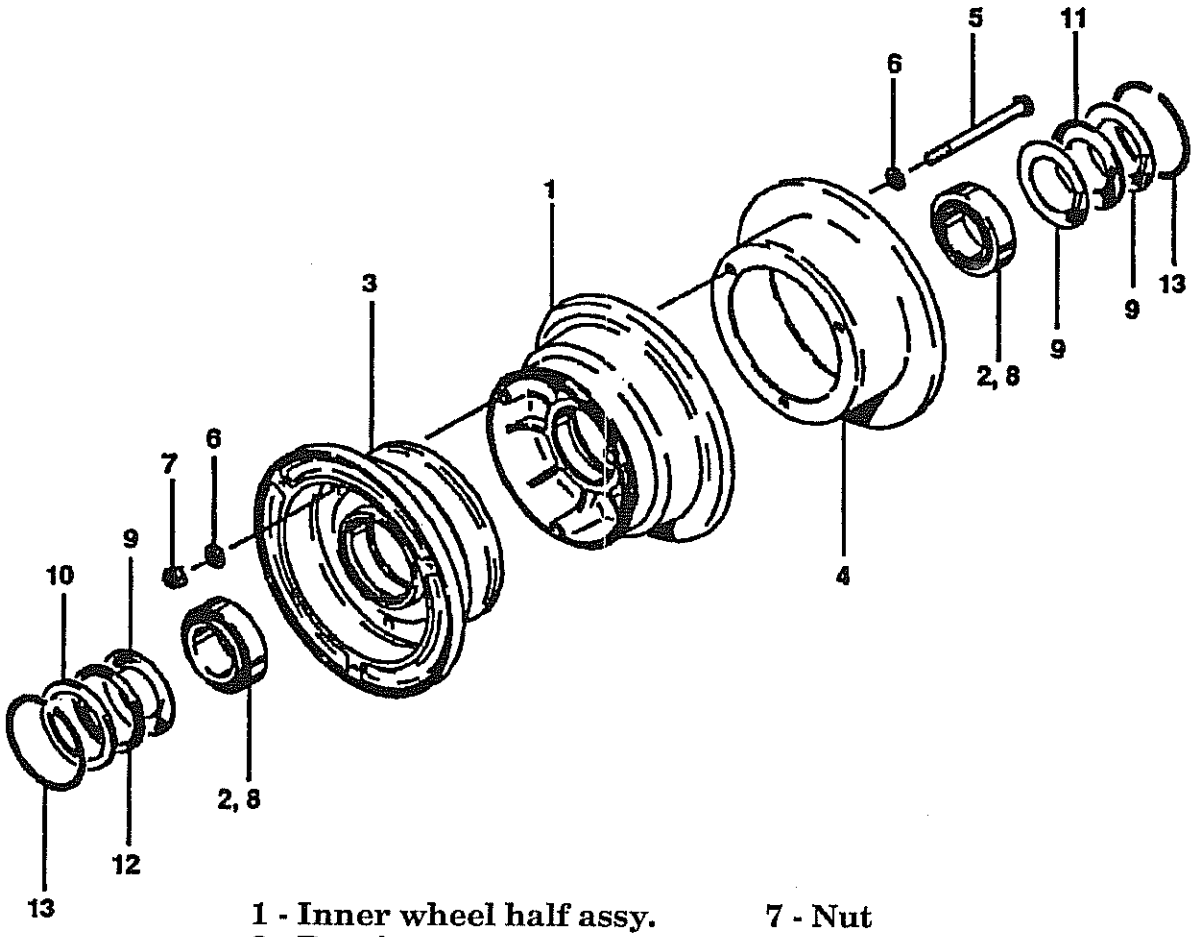


L. MAIN GEAR WHEELS AND TIRES

The main gear of the Lancair IV uses 6.00 x 6 wheels and tires. In this section, we will describe the assembly and installation of the wheels and tires. Installation of the brakes we will leave to a later chapter (Chapter 23). For proper fitting of the main gear doors, the wheels and tires should be installed.

6.00 x 6 main wheel (Cleveland)

Figure 19:L:1:a



1 - Inner wheel half assy.
2 - Bearing cup
3 - Outer wheel half assy.
4 - Disc brake assy.
5 - Bolt
6 - Washer
7 - Nut
8 - Bearing cone
9 - Ring, grease seal
10 - Ring, grease seal
11 - Felt, grease seal
12 - Felt, grease seal
13 - Ring, snap

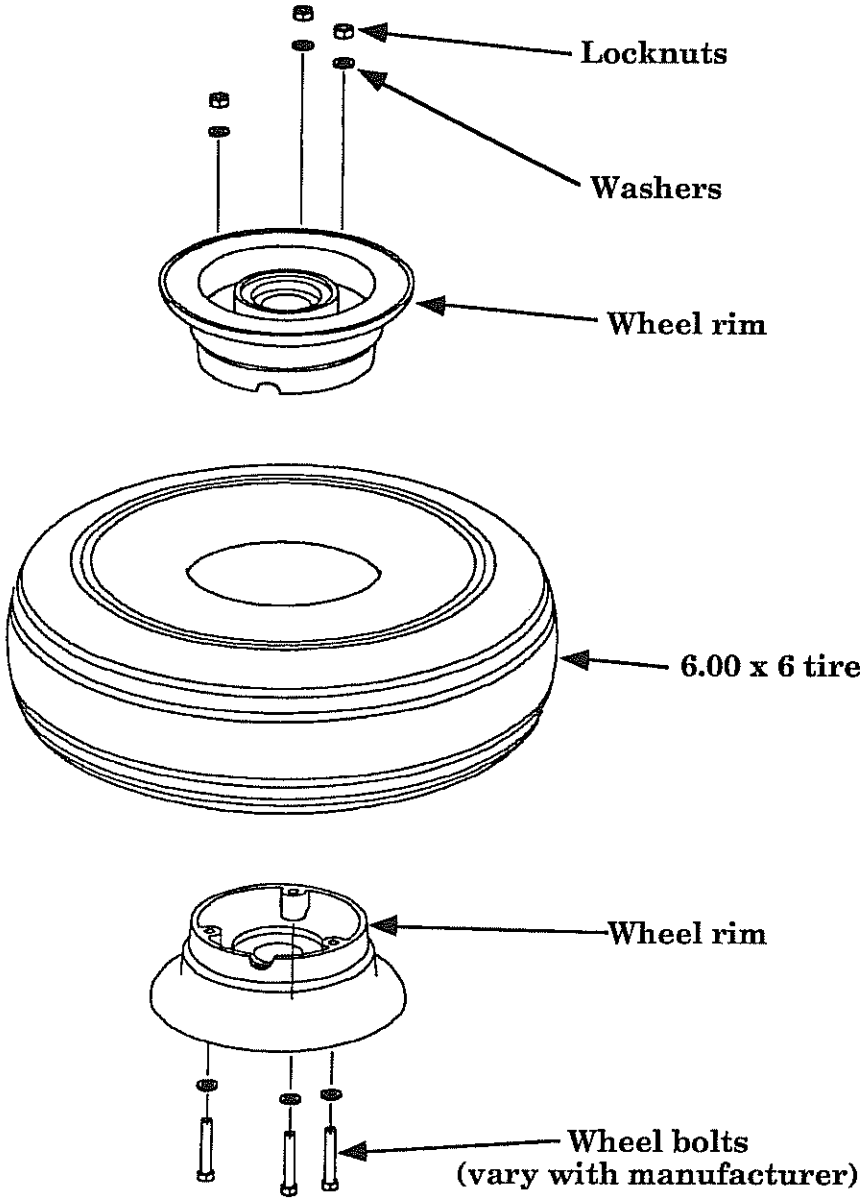
L1. Disassemble the 6.00 x 6 wheels, bearings and all.

L2. Place the half of the rim without the valve stem on a bench with the outbd face of the rim down.

L3. Insert the 6.00 x 6 tube into the tire. Inflating the tube with a very small amount of air (just enough to unfold it) helps ease assembly and prevents kinks.

L4. Place the tire and tube onto the rim you have set on your bench. Push the tire down onto the rim, always avoiding pinching the tube. You will not be able to push the tire all the way onto the rim, the tire will be fully seated with air pressure.

Assembling tire and wheel
Figure 19:L:2



L5. Place the other half of the rim onto the tire, aligning the valve stem hole to the red dot on the tire and the three bolt holes. Pull the valve stem through the rim as you work the rim down. Here is where most people damage the tube. If you're not careful when pushing the rims together, you can easily pinch the tube or stem between the rims. Instant leak! This problem can be avoided by just being careful and aware of the danger.

L6. Before the two halves of a Cleveland rim can be secured together, the brake disc assembly must be placed onto the inbd face of the wheel (the side opposite the valve stem). The two rim halves and the brake disc are secured together with the manufacturer supplied bolts and nuts.

The brake discs of the Matco rims are not installed until the brake assemblies are mounted in Chapter 23. You can secure the two rim halves together without the brake disc.

L7. If you have the **Condor** brand 6.00x6 tires inflate them to 40+/- psi. If you have the **McCreary** brand 6.00x6 tires, inflate them to 60+/- psi. It is a good idea to do this slowly and bounce the tires a few times before reaching full inflation. This will help loosen any folds in the tube.

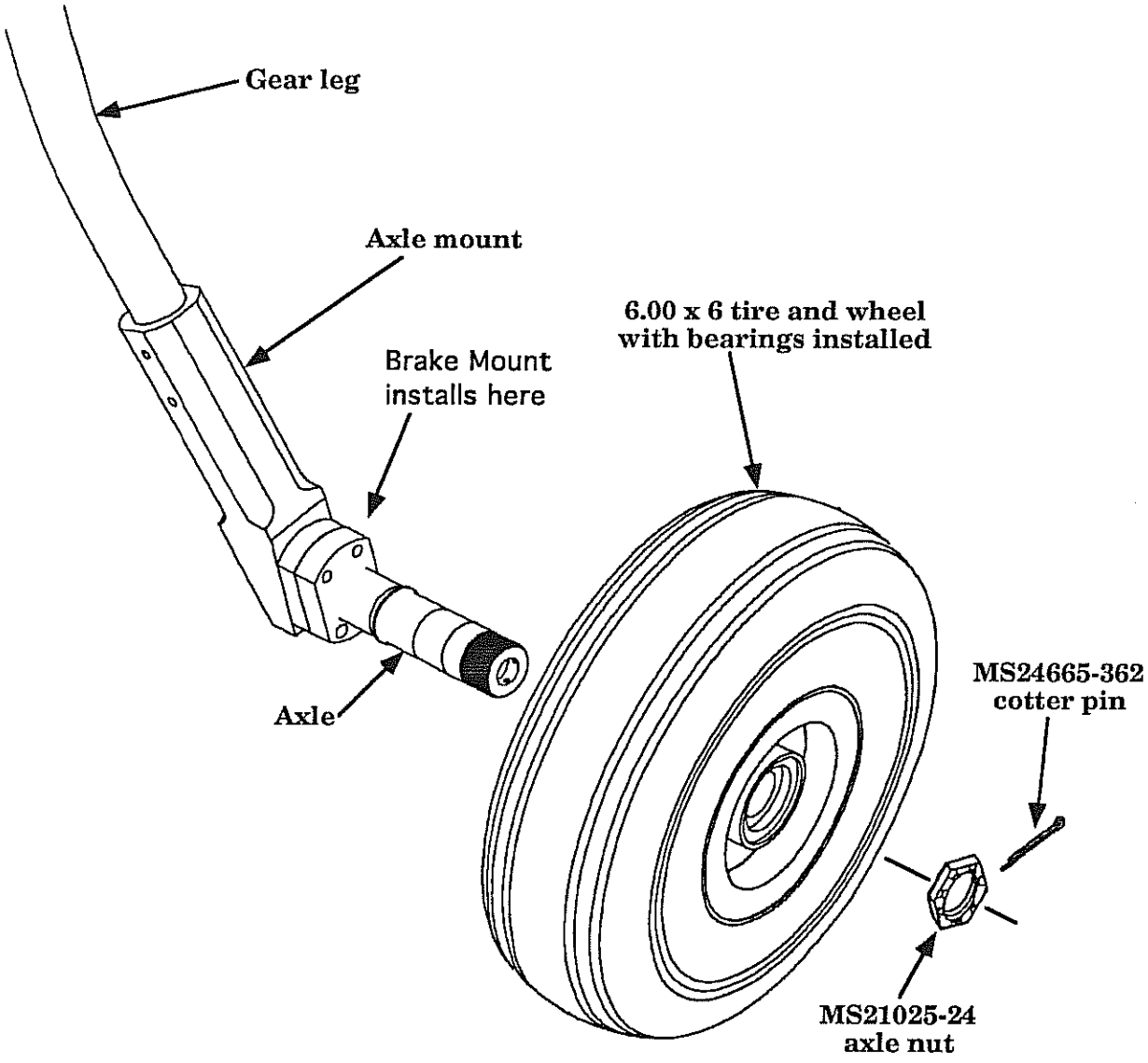
L8. Grease the two wheel bearings with a quality grease, making sure the grease penetrates the entire bearing.

L9. Place the bearings into the races of the wheel. After the bearings are placed into the race, a seal consisting of two thin steel washers and a felt washer is secured with a retainer ring. The seals and rings retain the bearings in the wheel.

L10. Now the wheels are ready to be mounted to the axles. Carefully slide the wheel onto the axle until the inbd bearing is seated. Secure the wheel with an MS21025-24 axle nut. Tighten the nut until there is no slop in the wheel bearings, then lock the axle nut in position with an MS24665-362 cotter pin.

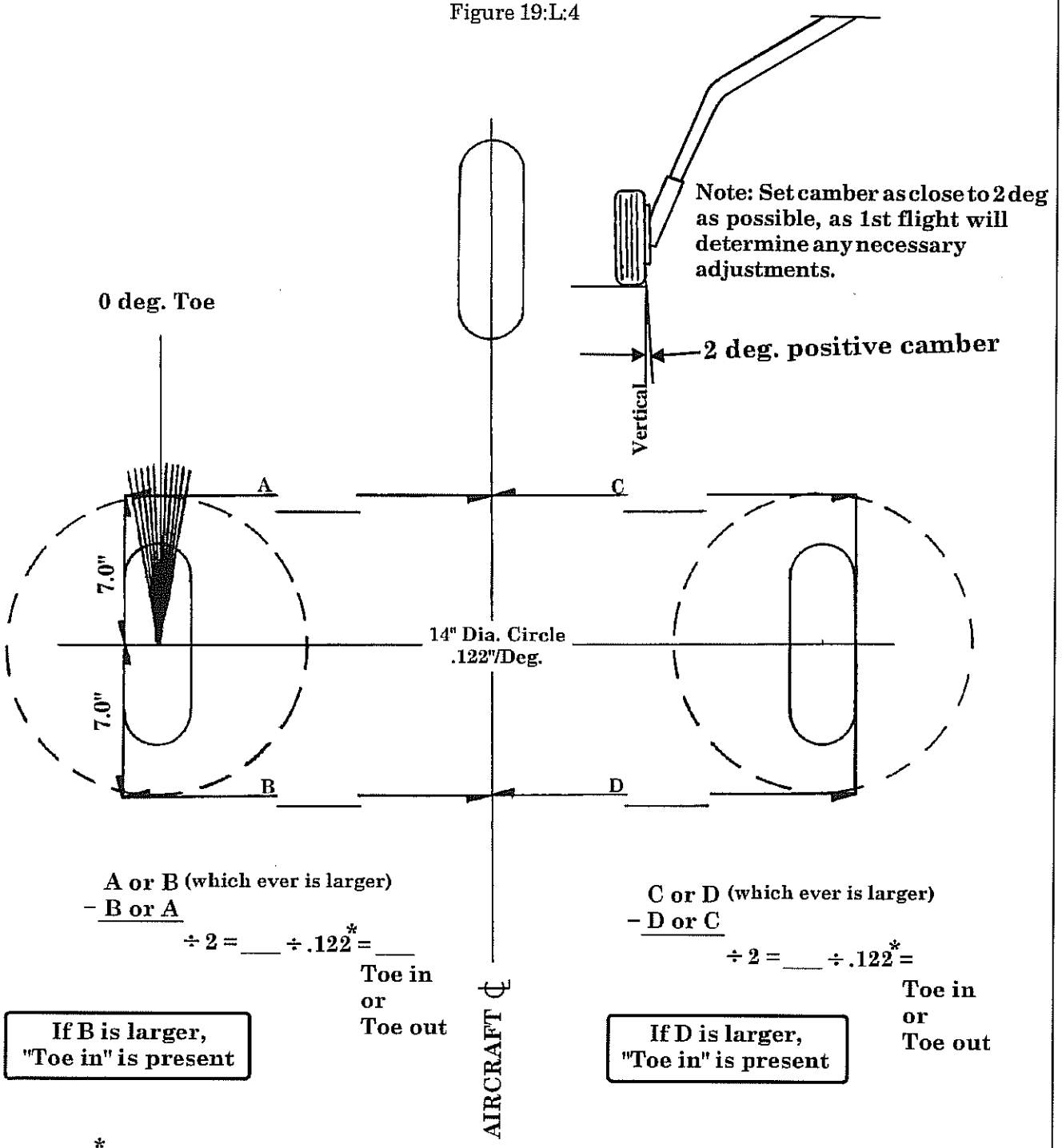
Securing wheels to axles

Figure 19:L:3



TOE ANGLE

Figure 19:L:4



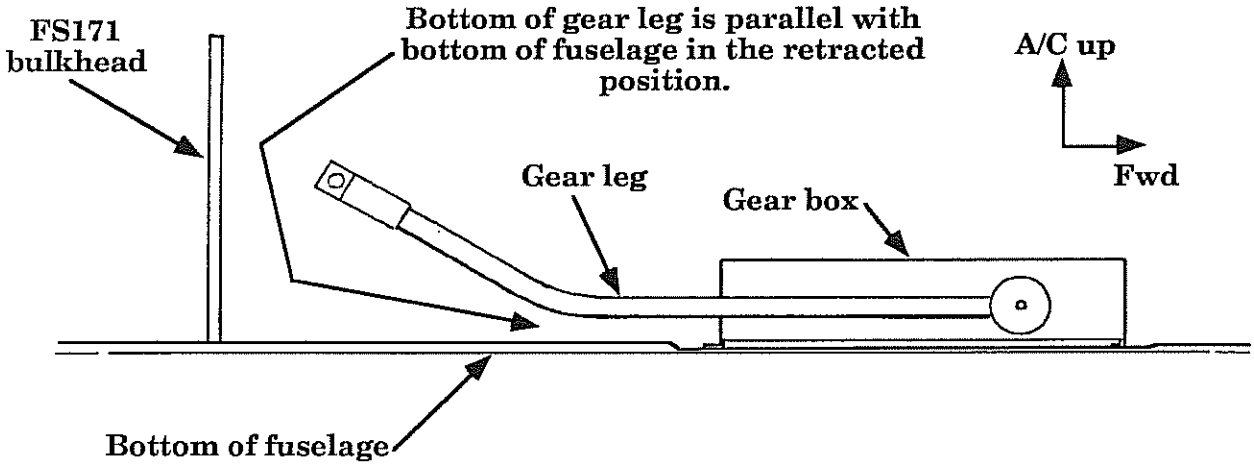
*Any Dia. circle may be used, simply measure equal distance, perpendicular to center of axle to obtain Diameter x 3.1416 = Circumference ÷ 360 = Distance/Degree

M. MAIN GEAR UP STOPS

Two nylon bumpers are bolted to the aft bulkhead of the gear box to act as up stops. As the main gear legs rise fully into the fuselage, they contact these up stops. With the main gear legs blocked (and the nose gear too), the hydraulic pressure in the system builds up. A pressure switch then turns off the hydraulic pump.

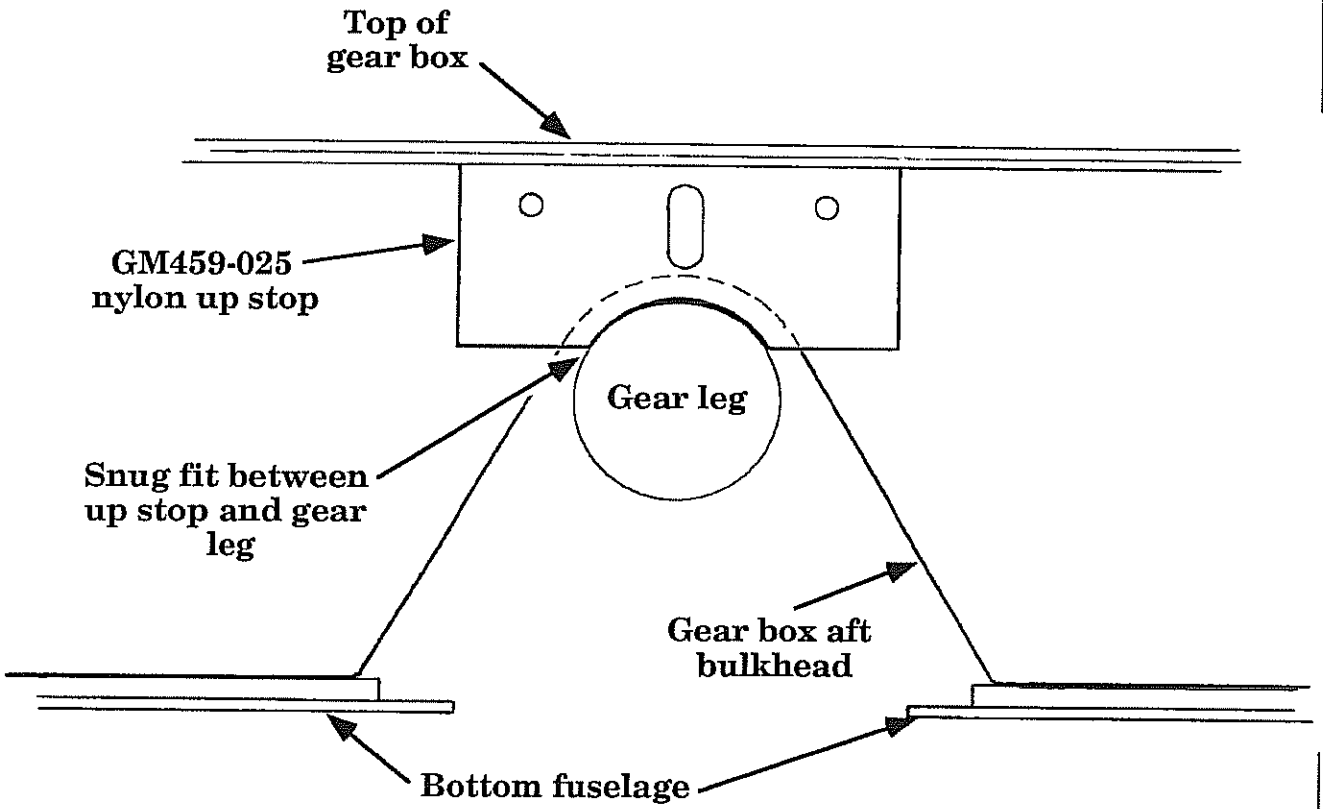
M1. Retract the main gear legs into the fuselage until the bottom edges of the legs are roughly parallel with the bottom of the fuselage. In this condition the tires will be fully enclosed in the wheel well (yet to be installed). You should have at least 1/8" clearance between the gear legs and the aft gear box bulkhead. If you don't, grind or file the aluminum bulkhead to suit.

Main gear leg in retracted position
Figure 19:M:1

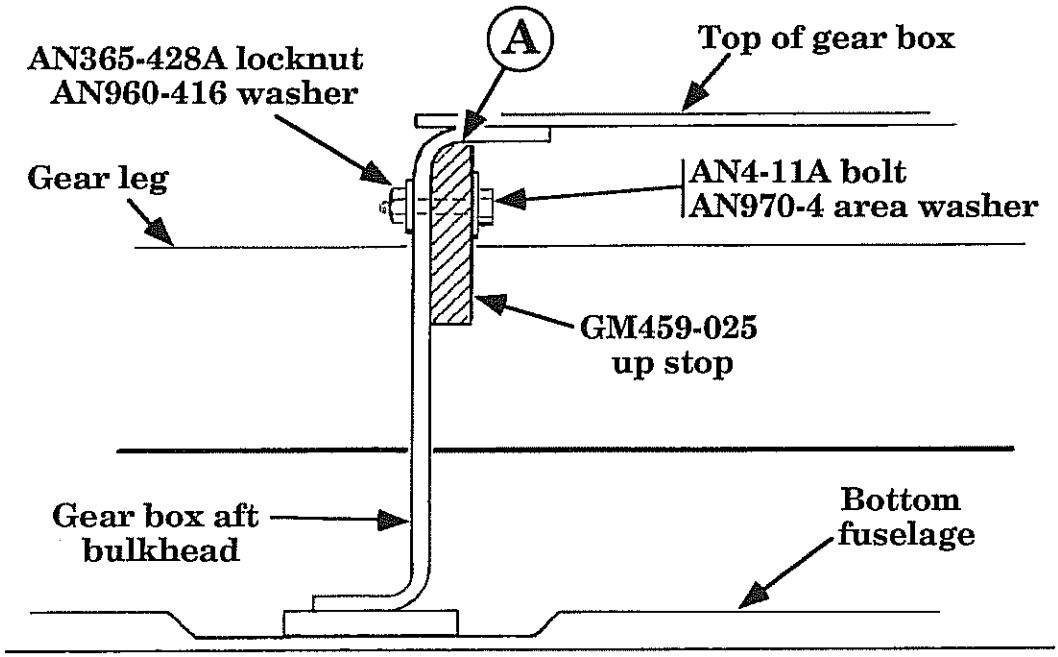


M2. With the main gear legs in the retracted positions, place the plastic up stops on top of the gear legs and against the aft gear box bulkhead, as shown in Figure 19:M:1. For the up stop to rest against the aluminum bulkhead, you will probably have to radius the plastic to accomodate the radius of the aluminum.

Fitting the plastic up stop
Figure 19:M:2:a



Fitting the plastic up stop
Figure 19:M:2:b



(A) Note: The plastic up stop may have to be radiused for the aft gear box bulkhead.

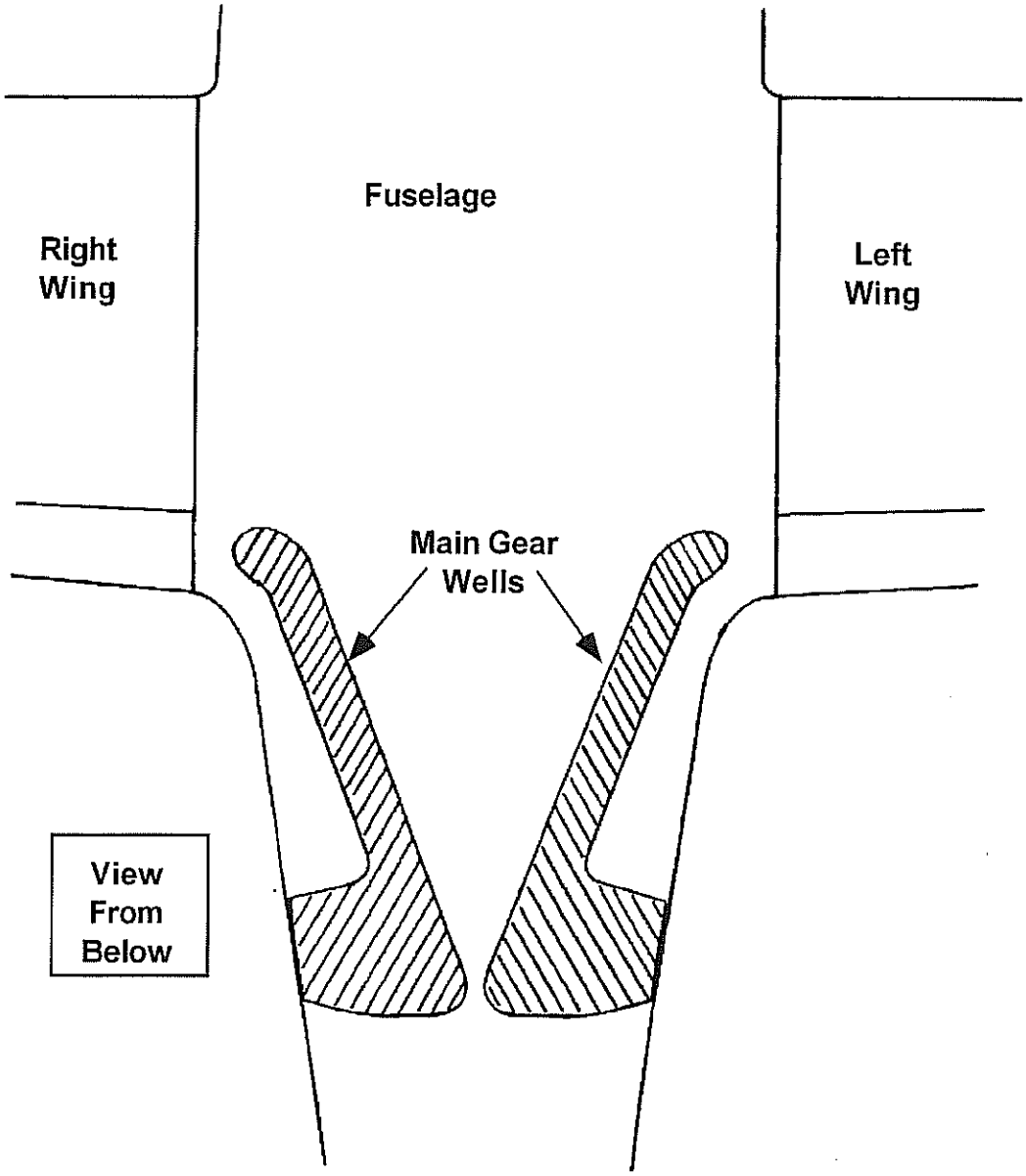
M3. When the plastic up stops have been positioned, use the two, 1/4" D. predrilled holes in each up stop as guides to drill similar size holes through the aft gear box bulkhead. Do not use the center, elongated hole of the up stops.

M4. Secure the up stops with AN4-11A bolts, AN365-428A locknuts, and AN960-416 washers. Place an AN970-4 area washer under the bolt head to protect the plastic.

N. GEAR WELLS AND FAIRING EXTENSIONS

The gear legs retract into the fuselage through long holes (gear wells) in the bottom of the fuselage shell. Since the geometry of the gear box and gear legs have been set at the factory, the gear wells should all have the same shape and location. The portion cut out of the fuselage becomes the gear door. The aft, outboard part of the gear door is actually part of the fairing extenstion. The gear wells (gear doors) are already cut out on the fast build.

Landing Gear Wells
Figure 19:N:1

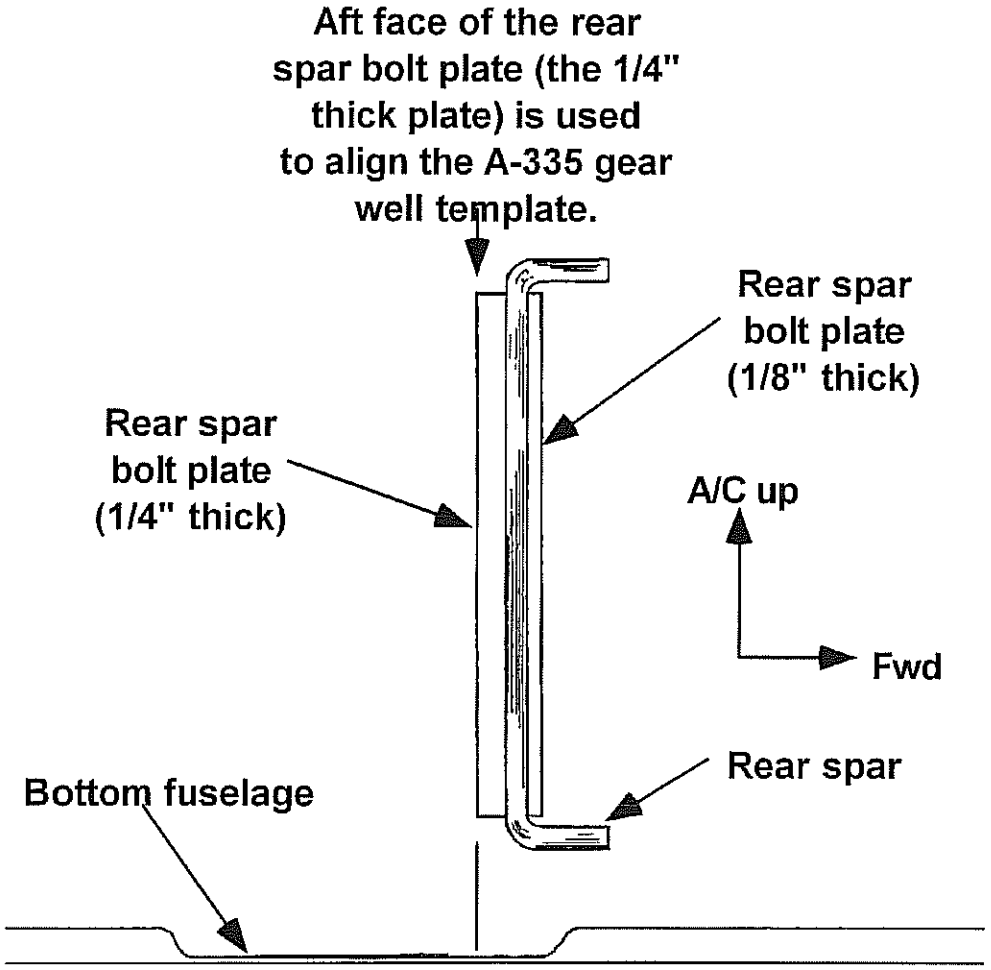


N1. Be sure that you have accurate reference marks on the outside surface of the bottom fuselage showing the fuselage centerline and the aft face of the rear spar bolt plates.

N2. Use blueprint #A-335 as a guide to mark out the gear well locations on the outside of the bottom fuselage shell. The blueprint is aligned using the rear spar bolt plate and the fuselage centerline. By flipping the template left or right, the gear wells will be symmetrical. Adjust the gear well template fore or aft so it is aligned with the aft face of the rear spar bolt plates.

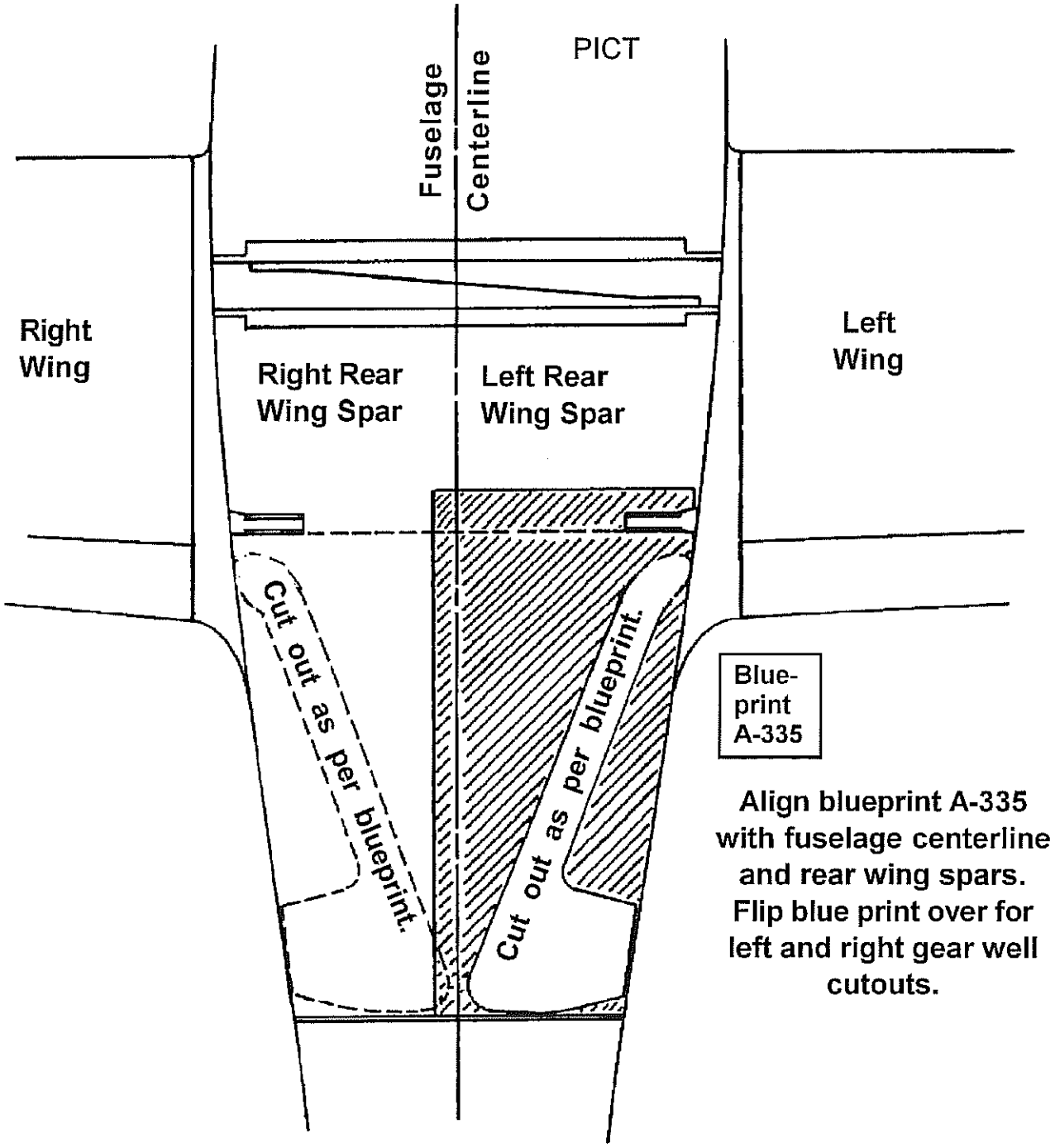
NOTE: The A-335 gear well template is actually a tracing from the bottom of the fuselage. It may be easier to work from the inside of the fuselage.

Aligning Gear Well Template
Figure 19:N:2



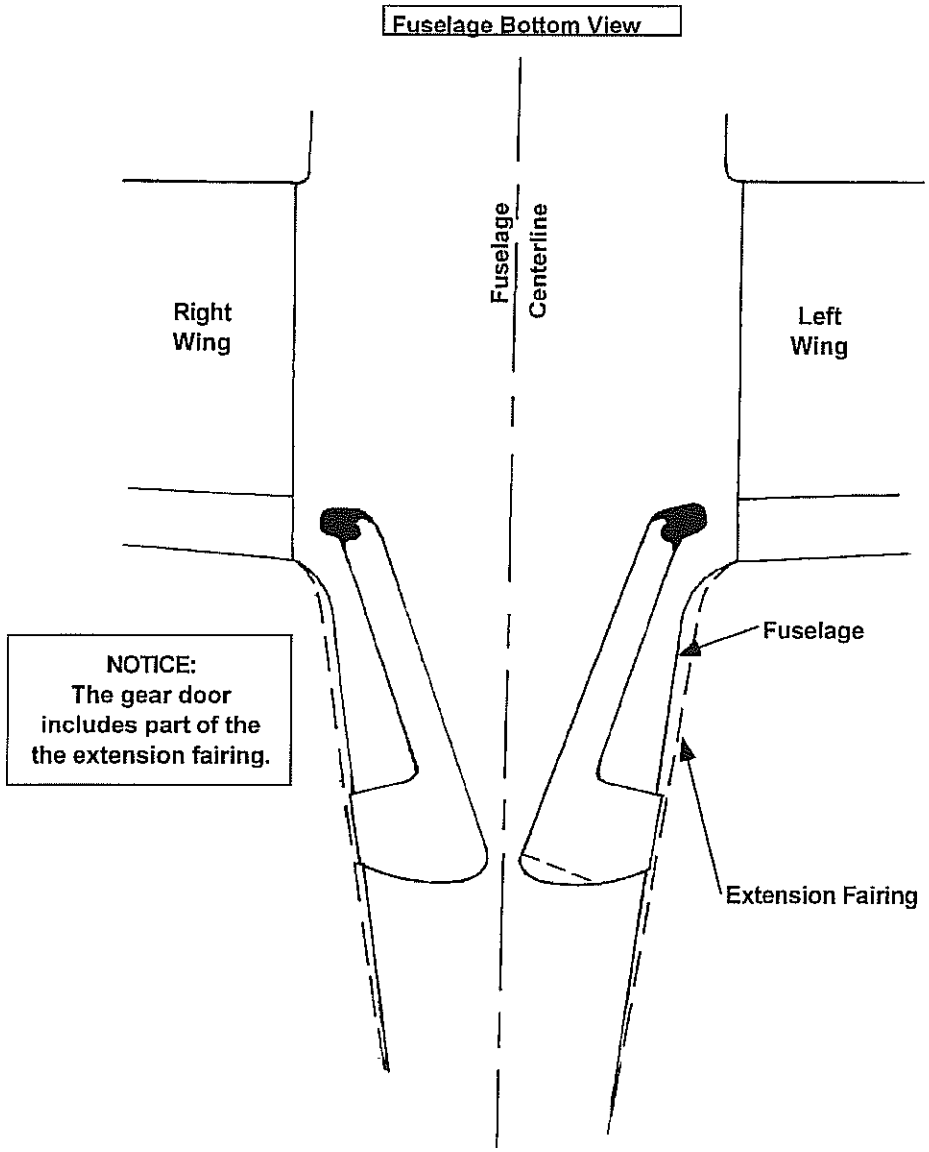
Aligning The Gear Well Template

Figure 19:N:3



N3. Cut out the gear doors. Take care to make your cuts clean and straight because the cut out pieces will be used as your main gear doors. (So, don't throw them away!) It is necessary to install extension fairings on each side of the Lancair IV, so that the one piece gear doors will be able to close up the bottom of the aircraft. (See Figure 19:N:5.) You should have both wings installed and the flaps up for this section, unless the upper and lower wing fairings are already installed and you can accurately locate the position of the extension fairings.

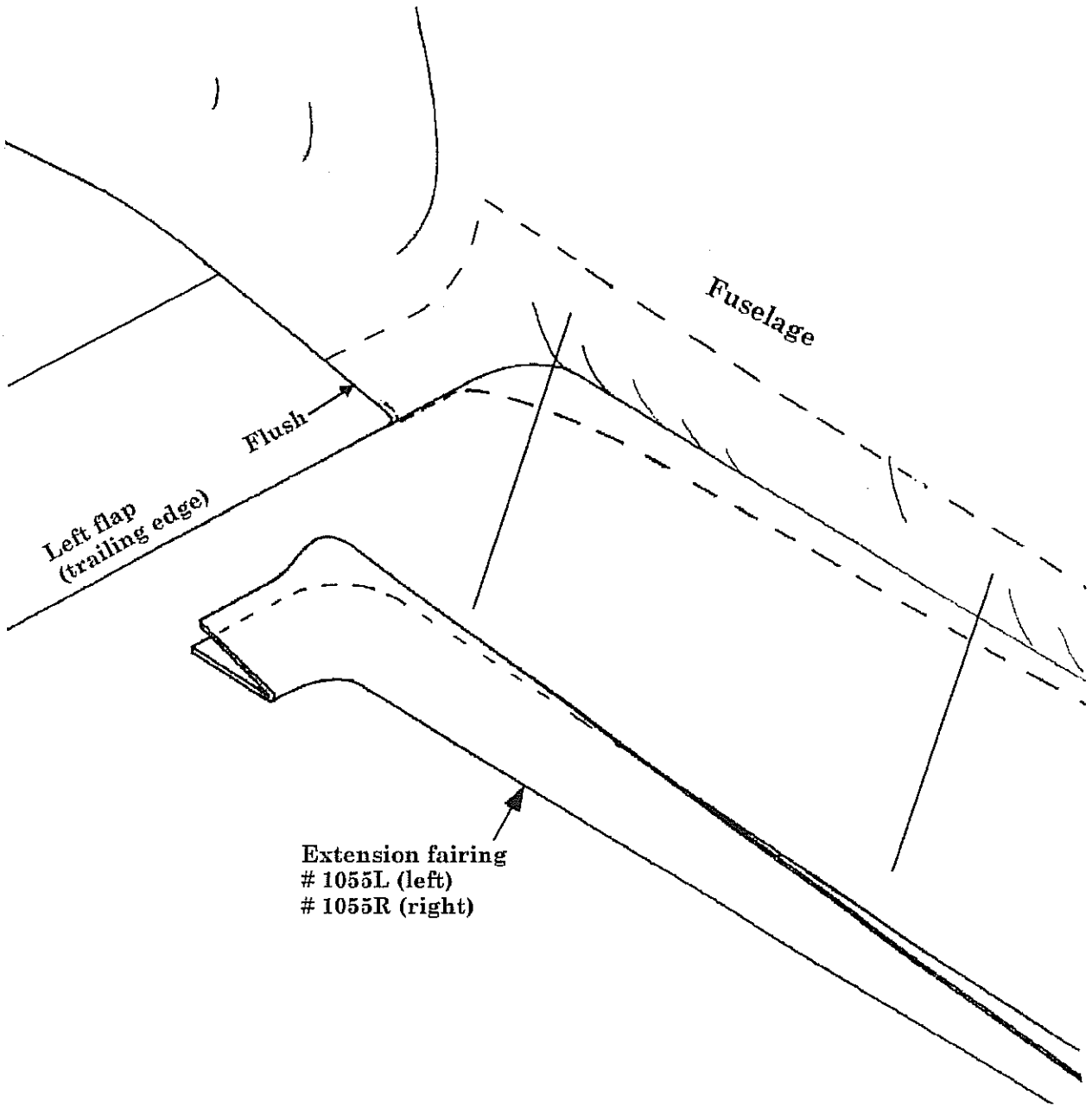
Gear Door Position
Figure 19:N:4



N4. Make sure the gear doors are closed and flush with the fuselage skin. Set them temporarily in place. Push the fairing cap up against the T.E. of the upper and lower fairings.

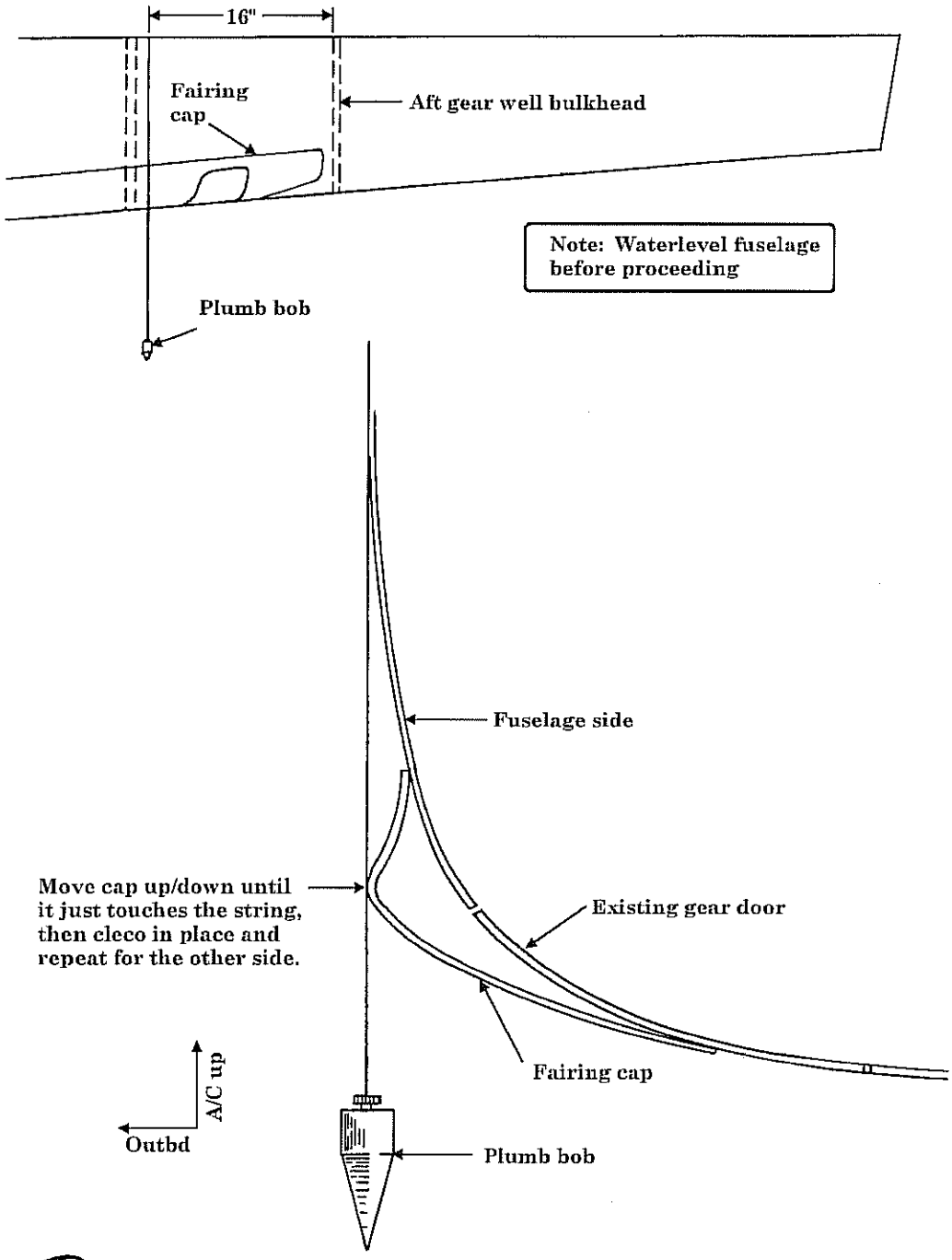
Extension Fairing Position

Figure 19:N:5



N5. Measure 16" forward of the aft gear well bulkhead and drop a plumb bob over the side of the fuselage. Slide the fairing cap upor down until the outside edge just touches the string and drill holes, approximately 2" apart, all the way around the fairings for clecos.

Locating the Fairing Cap on the Fuselage
Figure 19:N:6



N6. Remove the fairings and sand the fuselage in preparation for bonding. Also, sand 1 1/2"-2" of the inside edges of the fairings.

N7. Attach the fairings using either hysol or flox, and (91632A146) screws every 2"-3". Allow to cure before continuing.

N8. Remove the screws counter sink the holes, and fill the holes with flox/micro.

N9. Sand the edges of the fairings smooth to the fuselage. Sand the fuselage around the edge of the fairings 2".

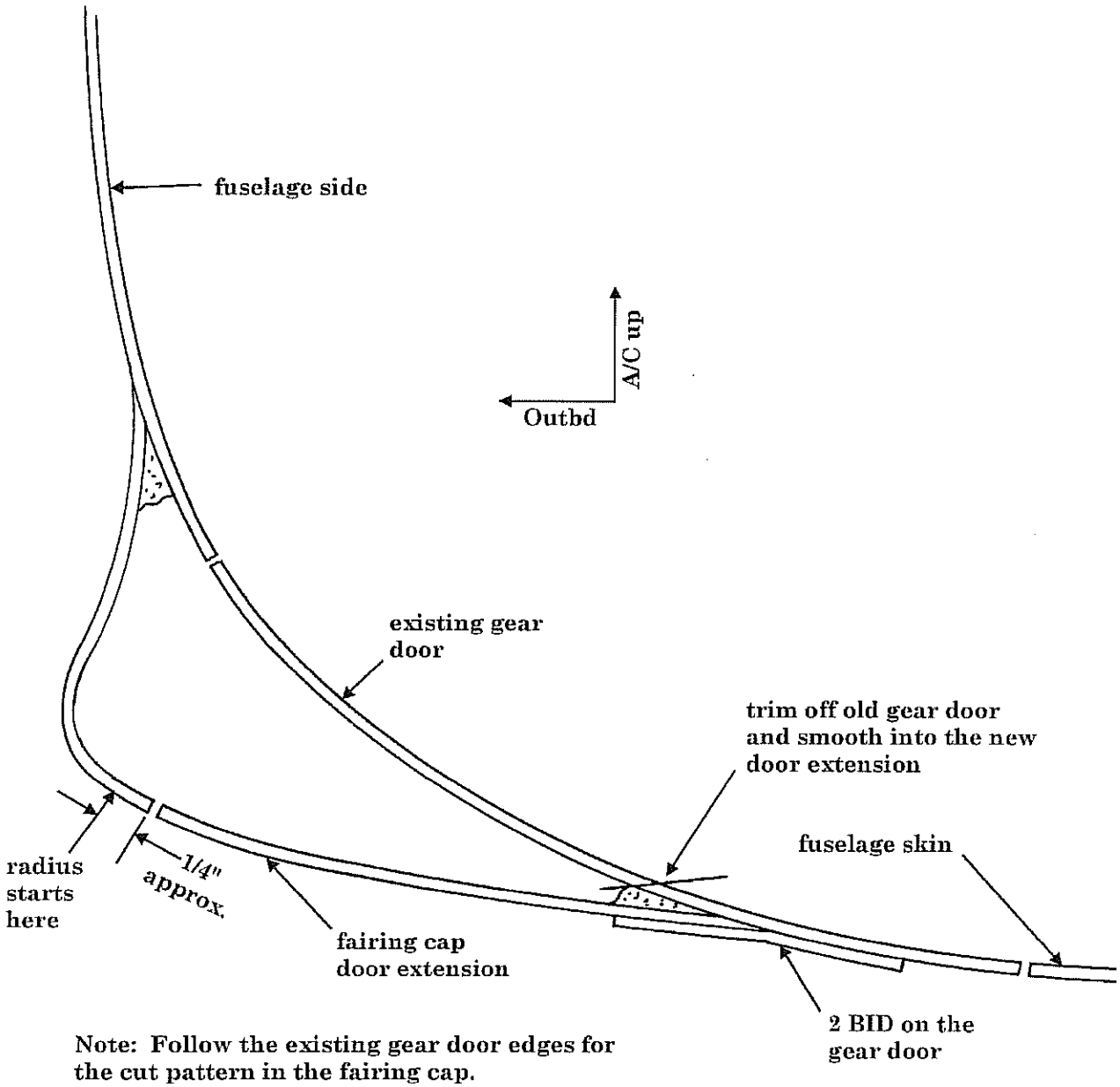
N10. Apply 2" wide 2 BID and peel ply to the edges of the fairings.

N11. Lay the gear well template over the gear doors on the bottom side and trace the outline for the gear door on the fairing.

N12. Cut out the gear door extension from the fairing.

Cutting the Gear Door Extension

Figure 19:N:7

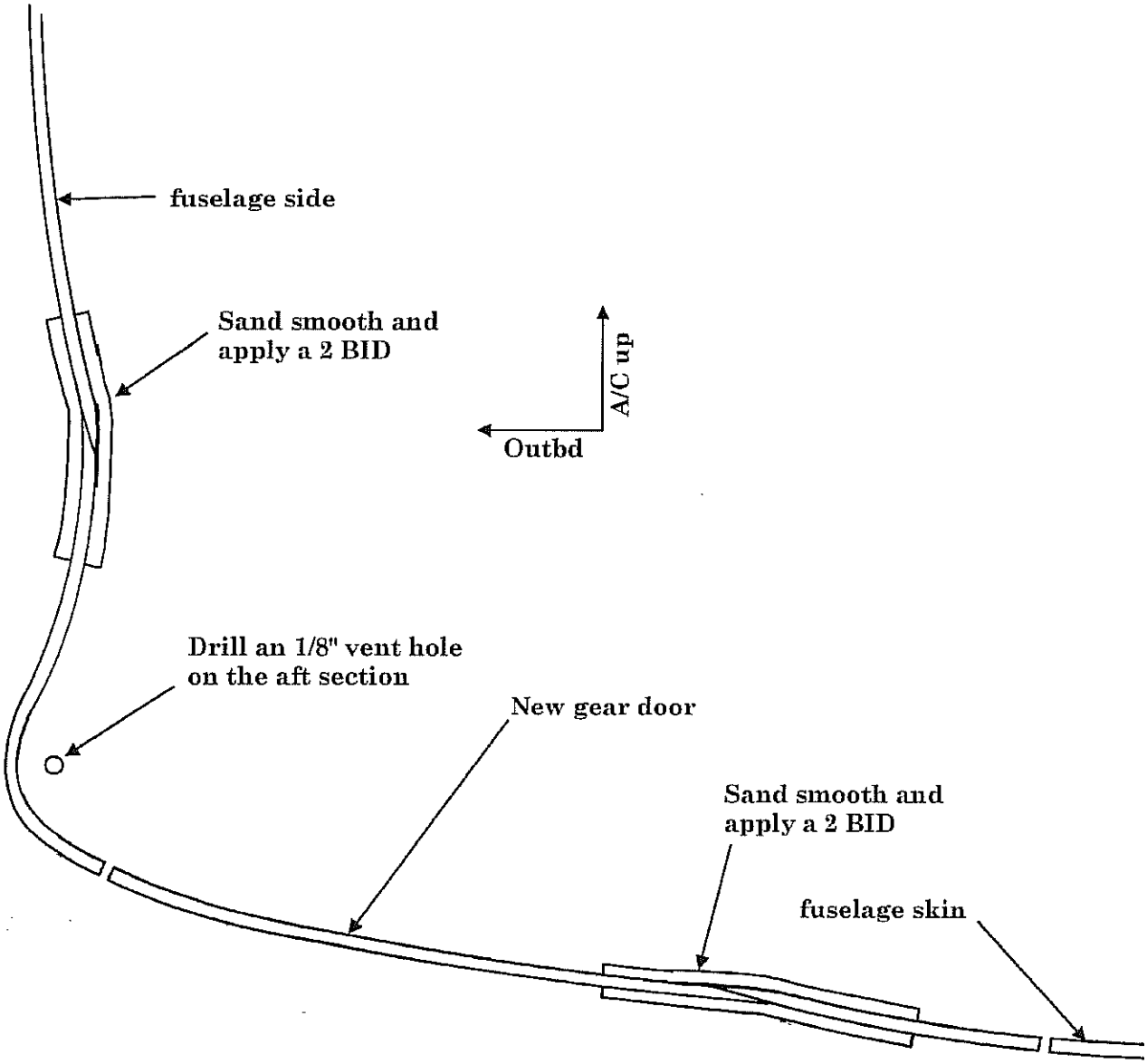


Note: Follow the existing gear door edges for the cut pattern in the fairing cap.

N13. Trim off the old gear door and smooth the new extension into the gear door.

N14. Apply a 2 BID to the fairing extension and to the gear door extension.

Cross Section of Fuselage and Fairing
Figure 19:N:8

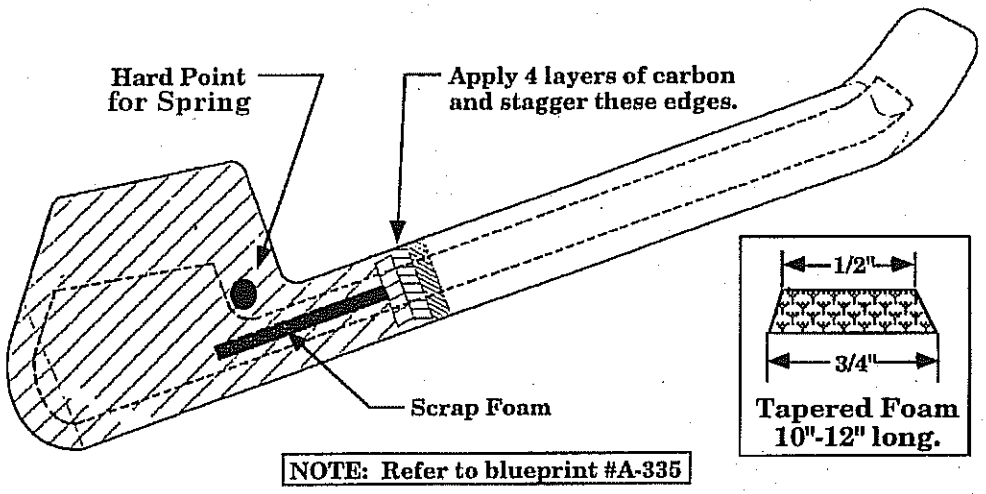


O. HINGING MAIN GEAR DOORS

There are two doors that enclose the main gear of the Lancair IVP. Simple slider systems open and close the doors when the gear legs are up or fully extended. Also, the gear doors are designed so that they can close when the gear is fully extended.

It is assumed at the beginning of this section that there is a longitudinal support near the centerline of the fuselage under the location of the Gear Box. And, that you have two large gear doors that you have cut from the bottom fuselage shell and fairing.

Preparing the Gear Doors
Figure 19:O:1



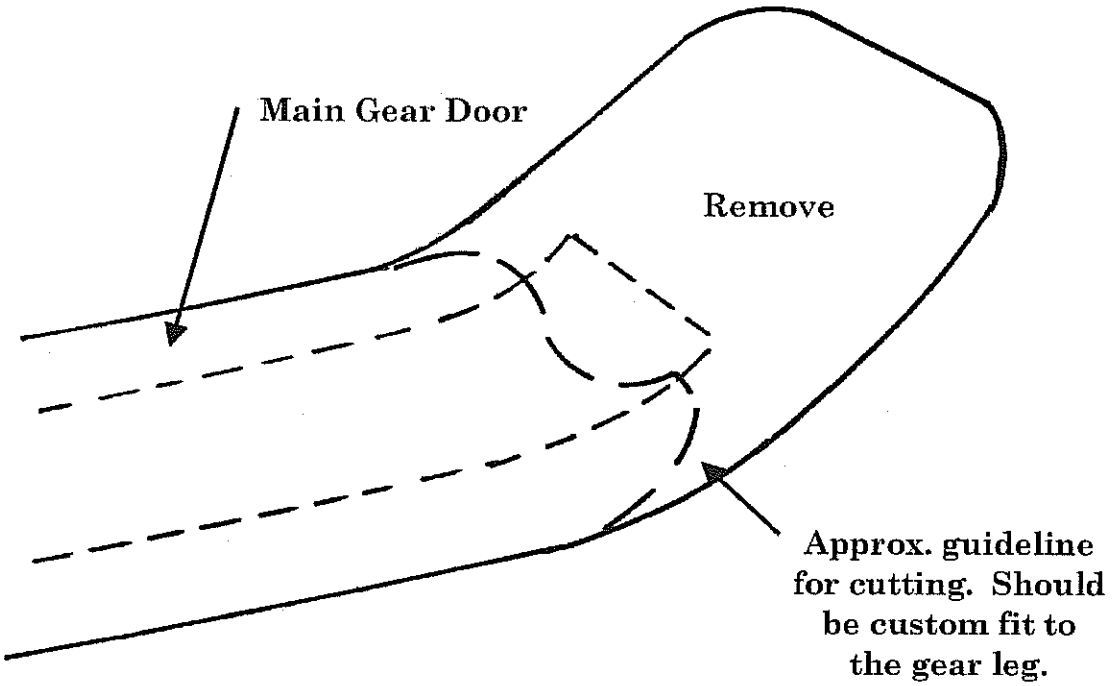
O1. Lay blueprint A-335 over the gear door and mark where the prepreg, hard point, and carbon are to go. The flox hard point should be approximately 2"x2" as shown on blueprint A-335. Create the hard point by grinding out the core (if core exists in that spot on the gear door) and fill with flox.

O2. Taper a piece of 1/4" thick foam, 3/4"x10"-12" long as shown in Figure 19:O:1. Attach with micro and cover the area shown on the blueprint with 4 layers of carbon.

O3. It will be necessary to grind down the old (curved) piece of fuselage on the gear door (refer to Figure 19:N:3:a.) The finished product should have little or no curve. Reinforce the juncture on the inside of the door where the fuselage and fairing meet with 4 BID as shown on blueprint A-335.

O4. The two large gear door cutouts include part of the fiberglass wing fairing. These wing fairing sections will be trimmed as required to provide clearance for the main gear leg. Using blueprint #A-335 as a guide only, custom fit the fwd. piece of your gear door around the gear leg. There should be at least 1/4" of clearance all around the gear leg when it is in the "down and locked" position. The area removed should leave enough clearance available so that the bumper blocks and bolts are accessible. The gear door is trimmed to provide at least 3/16" clearance between it and the main gear leg. Do this now, referring to Figure 19:O:2.

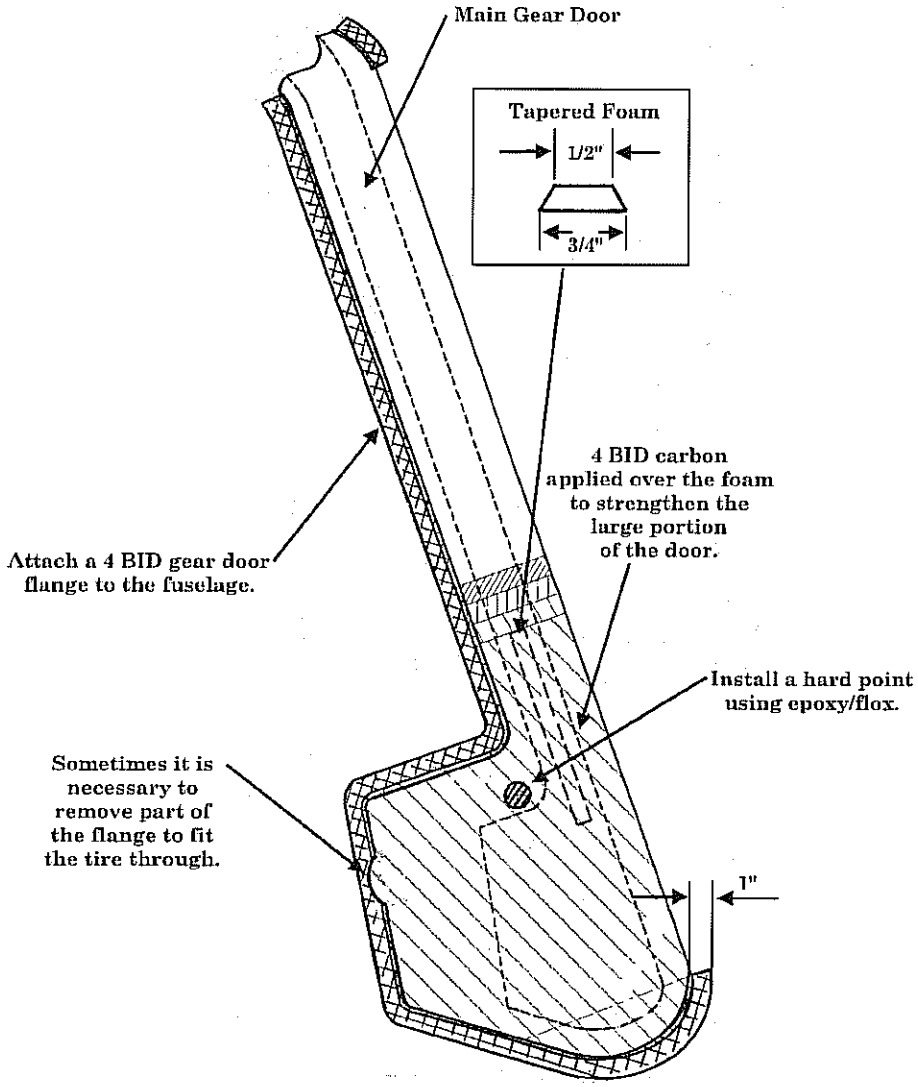
Shaping the Fwd. Section of Main Gear Doors
Figure 19:O:2



O5. A 4 BID flange needs to be formed for the gear doors to close against. Apply release tape to the inner surface of the gear doors. Reposition the gear doors on the bottom fuselage shell and tack glue them in place from the outside. Use pieces of tongue depressors and instant glue for this job, just enough to temporarily secure the doors.

O6. Apply a 4 BID flange to the inside of the fuselage, overlapping onto the gear doors 1/2". Eventually these flanges will be trimmed to 5/16" width, but leave excess for now. A flange is also needed in the wing fairing area, at the fwd end of the gear doors. Be sure to sand and clean all areas where the BID is applied.

Gear Door Flange Locations
Figure 19:O:3



O7. When the 4 BID flanges have cured, remove the gear doors. Sand the 4 BID flange to 5/16" width. Cut two, 44" lengths of MS20001-5 extruded hinge.

O8. Notch the fuselage bottom and the gear where the hinges will be mounted to accommodate the curved portion of the hinge (see Figure 19:O:4.)

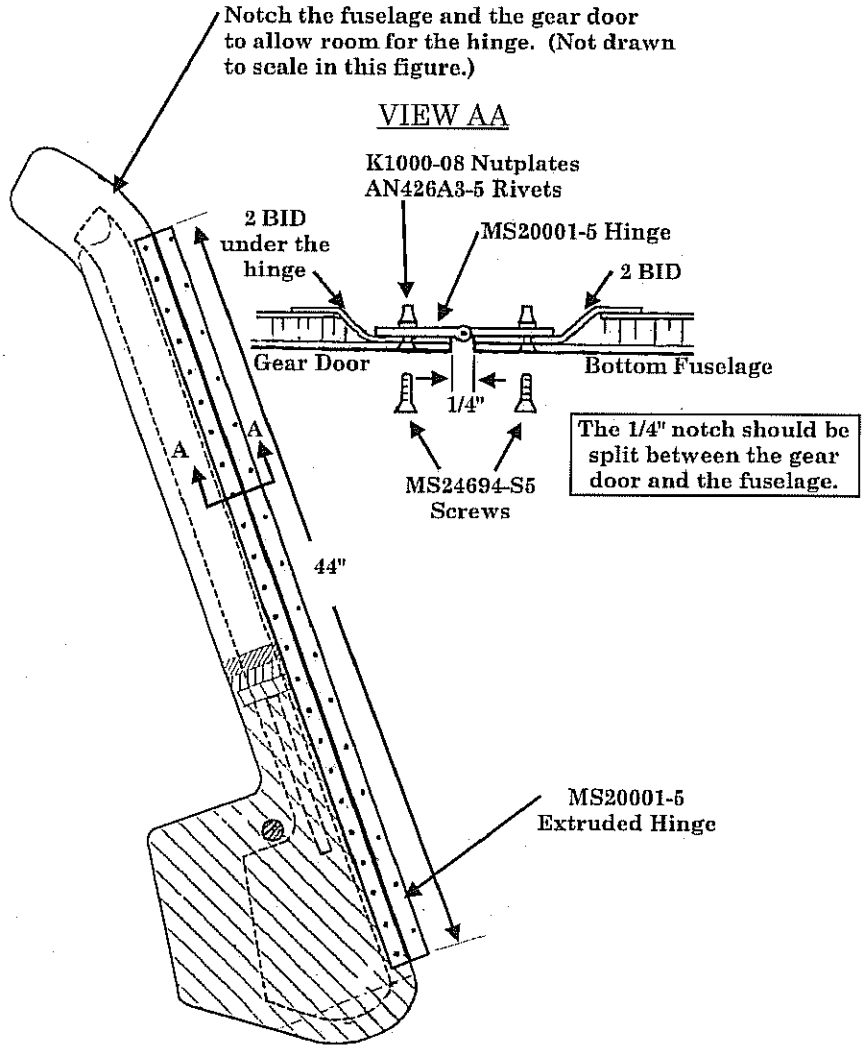
O9. Apply 2 BID to the inside of the fuselage and the gear doors where the hinges will attach.

O10. Reposition the gear doors and locate the hinges. Use instant glue to tack the hinges in place and check for smooth movement. This may take a few tries, but a smooth operating hinge is important. Each hinge must be located on the flat part of the fuselage bottom along its length.

O11. When satisfied with the hinge placement, secure the hinges to the gear doors and the hinges to the fuselage with MS24694-S5 screws and K1000-08 nutplates (one nutplate every 3"). The nutplates are secured with AN426A3-5 rivets to the inside surface of the fuselage.

Securing Inbd Hinge to Gear Door

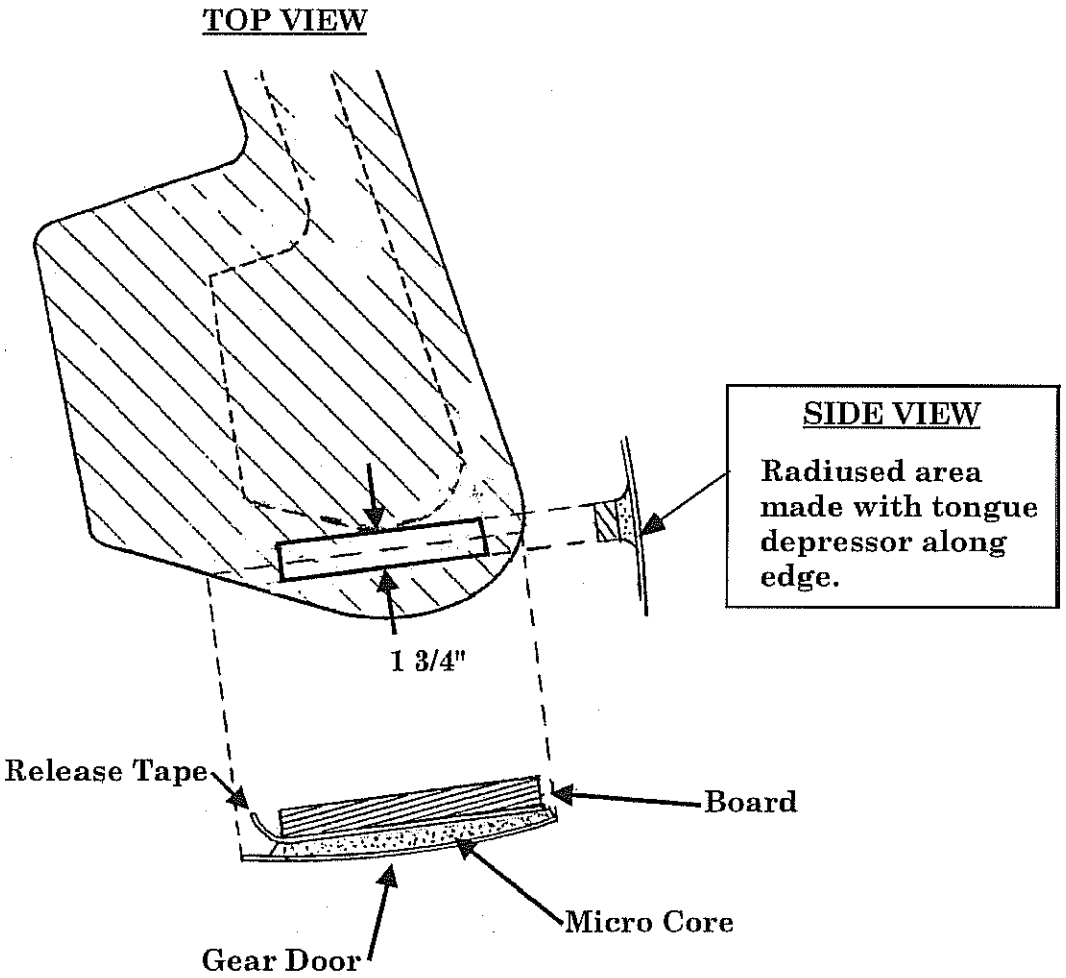
Figure 19:O:4



O12. Now you have two large, one piece gear doors hinged at their inbd edges. Due to the tight geometry of the gear system, it is necessary to hinge the aft edge of one of the gear doors in order for the gear doors to fully open, as shown in Figure 19:O:5. As the gear doors approach the full open position, they will touch at the aft edge. The doors further open while the spring loaded hinged portion gives way. This way the large one piece gear doors can fully open. By referring once again to blueprint #A-335, notice the cut mark across the end of the door. Transfer this mark +/-1/8" to the right gear door.

O13. Notice in Figure 19:O:5 that, because the door is curved, it will be necessary to build up a flat surface of micro to mount a hinge. Keep the width of the micro to about 1 3/4" and don't micro all the way to each edge of the door. Lay a board with release tape on it, across the top to get a flat surface. Radius the edges with a tongue depressor for a smooth curved edge and allow to cure.

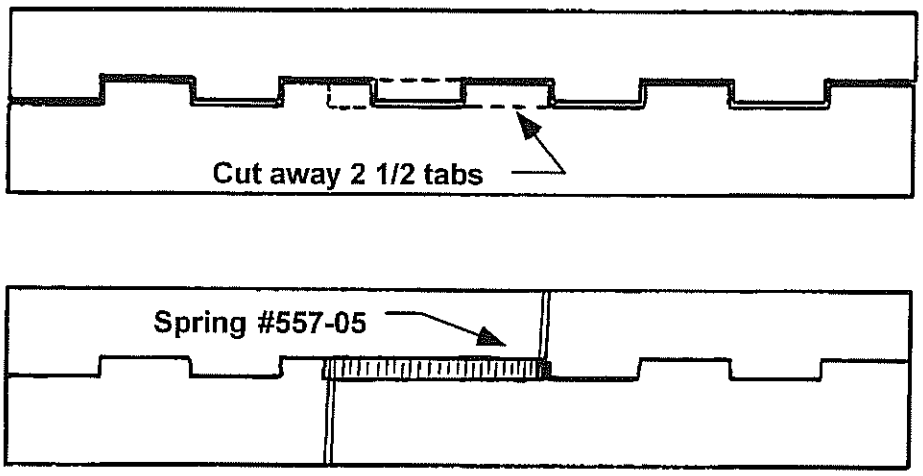
Right Gear Door Hinge
Figure 19:O:5



O14. Cut approximately 6 1/2" of MS20001-5 extruded hinge (enough to cover the length of the micro area). Lay the hinge on the micro surface and drill holes for MS24694-S8 counter sunk screws. Depending upon the depth of your micro, you may need different lengths. On each end of the hinge, mark the center pivoting point on the outside skin by drilling through the micro and outer skin. Use a #50 drill bit. Remove the hinge and cut the end of the door off along this mark.

O15. Pull the pin out of the hinge and lay the hinge halves together. Cut 2 1/2 tabs from the center of the hinge (see Figure 19:O:5). Install the hinge pin and fill the gap with spring #557-05. Wind the spring up a couple of turns. Reattach the hinge, to the gear door, using the necessary counter sunk screws and lock nuts (AN364-832A).

Hinge Tab Removal
Figure 19:O:6

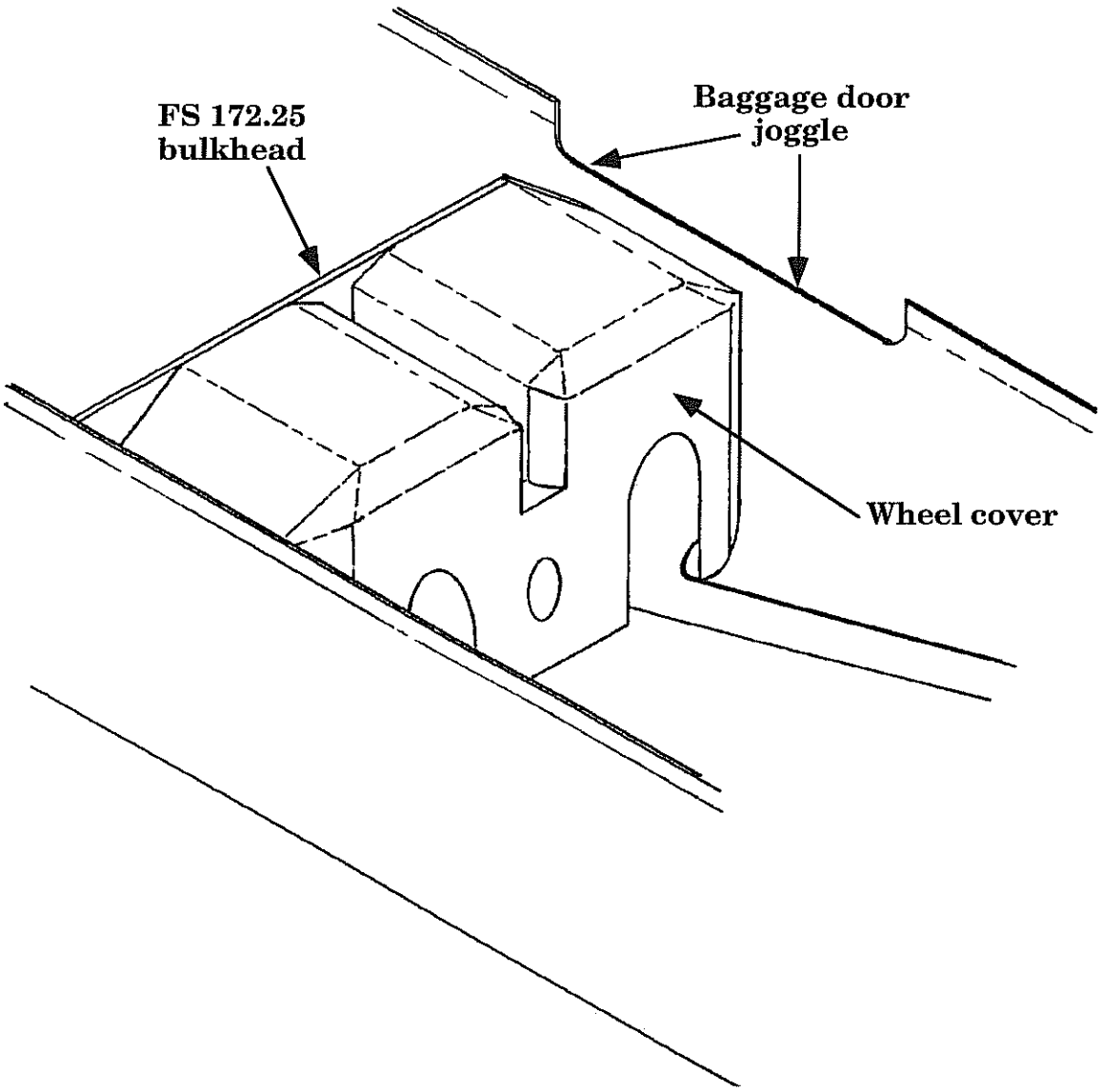


P. MAIN WHEEL COVER

The main wheels and tires of the Lancair IV are enclosed in the retracted position by a single, premolded fiberglass cover.

The elevator pushrod that passes through the wheel cover will also be enclosed in a fiberglass tunnel for protection. Both the tunnel and the wheel cover must be trimmed enough so the elevator pushrod can be installed and removed.

Main wheel cover
Figure 19:P:1

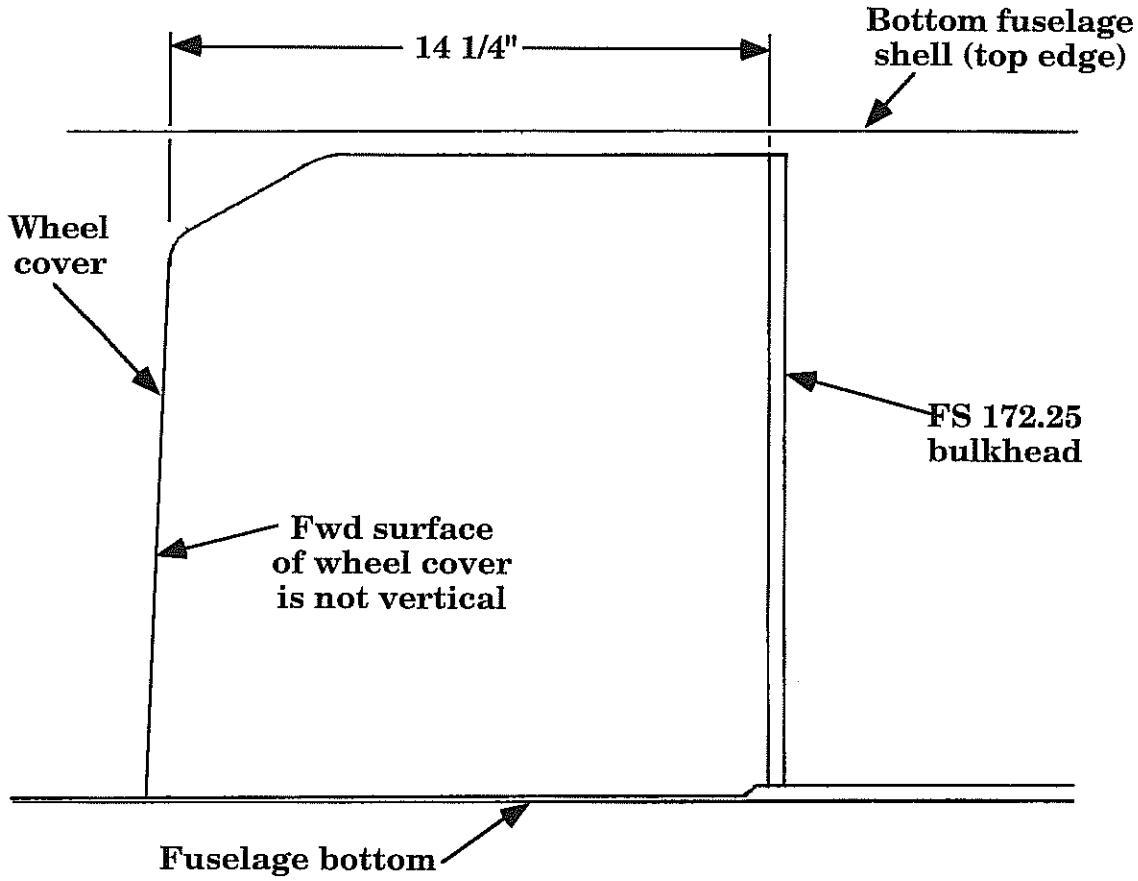


P1. Locate the wheel cover using the dimensions in Figure 19:P:2. The wheel cover should be oversized so trimming will be required to fit. A slot for the elevator pushrod and slots for the main gear legs will have to be cut into the wheel cover.

P2. Use a thick epoxy/micro mixture to bond the wheel cover to the FS172.25 bulkhead and the fuselage. Sand and clean all bonding areas.

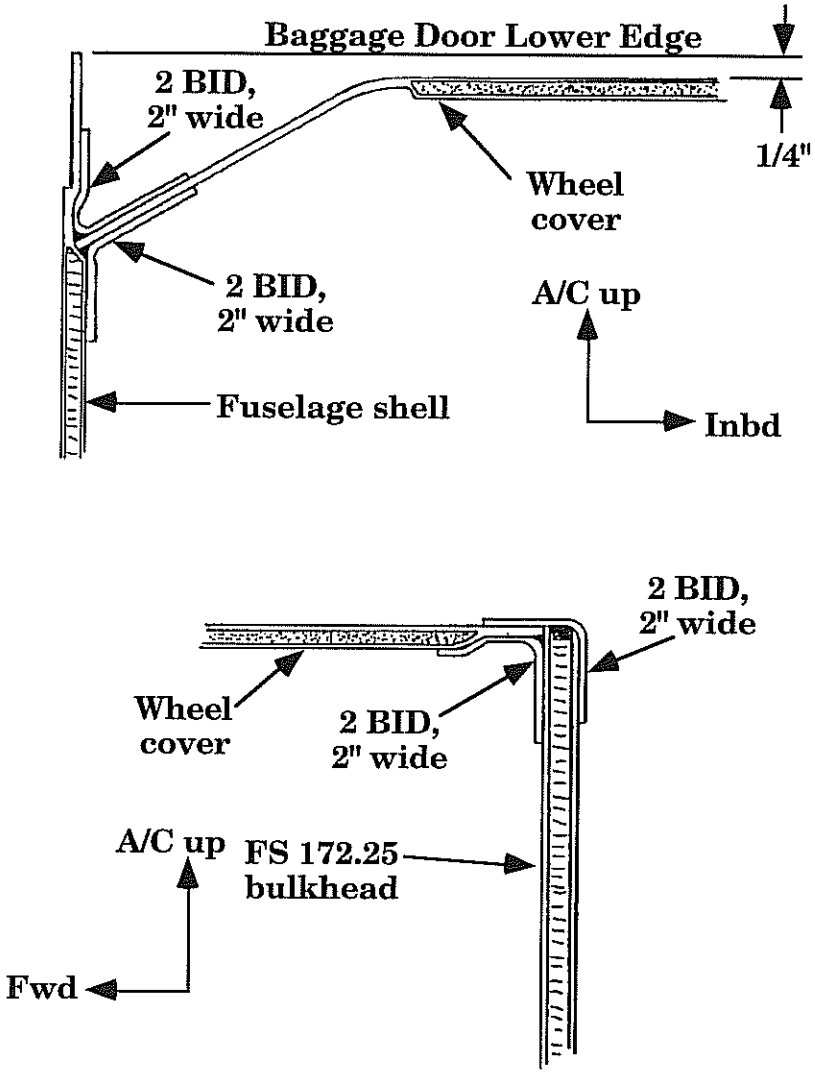
P3. Secure the wheel cover to the fuselage and FS172.25 bulkhead with 2" wide, 2 BID strips. These 2 BID strips are applied to both the inside and outside of wheel cover. Sand and clean all areas when applying BID.

Securing wheel cover
Figure 19:P:2:a



Securing wheel cover

Figure 19:P:2:b

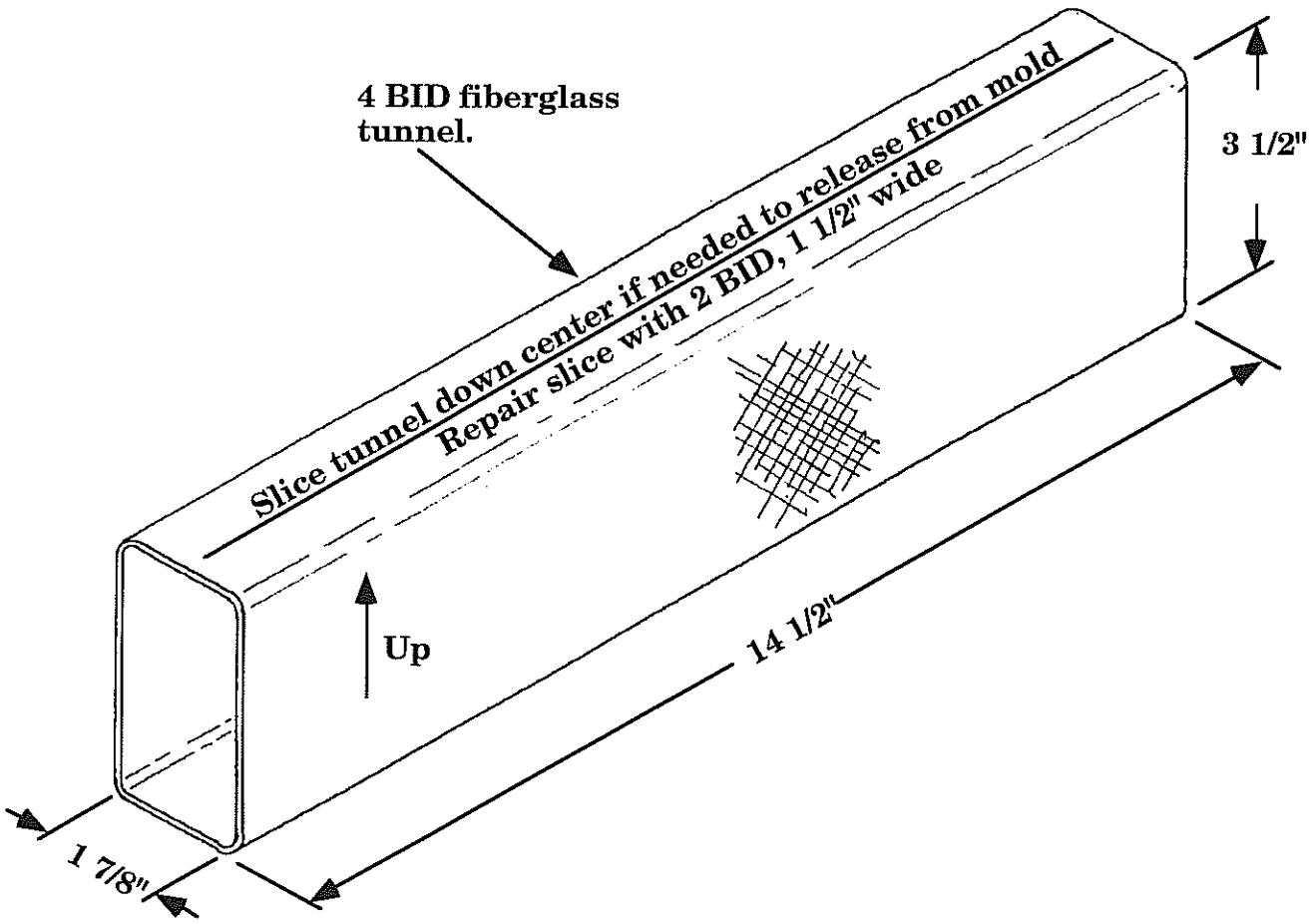


P4. A cover is recommended inside the wheel cover to protect the elevator pushrod from mud. A simple mold is made from cardboard to form this tunnel. Cut and tape together pieces of cardboard to make the box shape described in Figure 19:P:3. Cover the outside of the box with release tape.

P5. Apply 4 BID around the tunnel mold.

P6. When the 4 BID has cured, remove the mold from inside. Cutting a slit in the tunnel can make this job a lot easier, just patch the slit with 2 BID.

Forming elevator pushrod tunnel
Figure 19:P:3

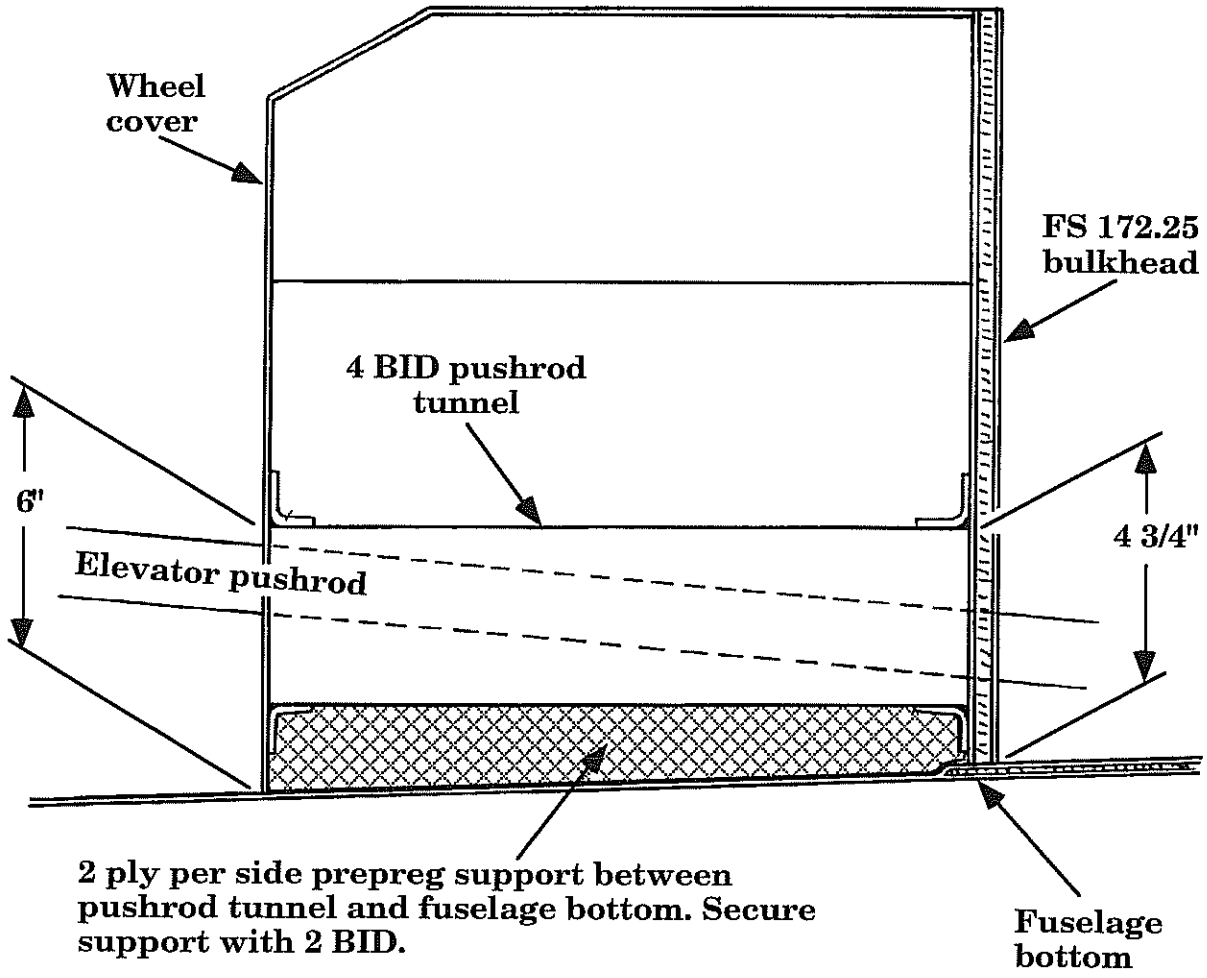


P7. Trim the 4 BID pushrod tunnel so it will fit inside the wheel cover. There should be at least 1/8" clearance between the elevator pushrod and the tunnel sides. At the maximum height of the pushrod during its travel range, there should be 1/4" clearance between the top of the pushrod and the tunnel.

P8. Cut a support piece of 1/4" thick, 2 ply per side prepreg to fit between the pushrod tunnel and the bottom fuselage. This support will be mounted on the fuselage centerline, between the two long gear door hinges. Secure the prepreg support in position with micro and 2" wide, 2 BID.

P9. Use instant glue to help position the tunnel in place. Then, bond the tunnel in place with epoxy/micro. Secure the fwd edge of the tunnel to the wheel cover and the aft edge to the FS172.25 bulkhead with 2" wide, 2 BID.

Securing pushrod tunnel
Figure 19:P:4



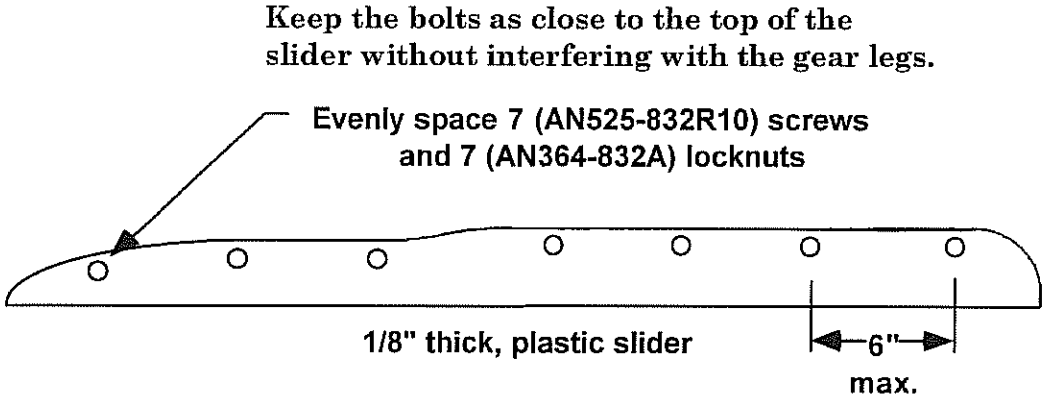
Q. MAIN GEAR DOOR ACTUATION

The two main (inbd) gear doors of the Lancair IVP are spring loaded against the gear legs. A plastic slider is attached to each door providing the necessary clearance for the gear leg and wheel during retraction. At the last bit of travel during gear retraction, the gear legs pull on a cable which is attached to the gear doors. These cables hold the doors shut tight.

Before cutting out the plastic slider, make a template out of 1/8" masonite to the dimensions shown in Figure 19:Q:1. Lay enough plastic clear tape on each side of the masonite to make the template as thick as 1/8" plastic (which will be used later to fill the slot between the glass lay ups). Position as shown in Figure 19:Q:2 and glass as in paragraph Q4 and Q5. Test gear doors using the masonite. Change the masonite as needed.

Q1. The sliders are cut from 1/8" thick High Density Polyethylene (HDPE or plastic for short. The Lancair part number is POLY-125-6x36). Use the dimensions in Figure 19:Q:1 to cut two sliders from the plastic.

Plastic slider dimensions
Figure 19:Q:1



DIRECTIONS: The plastic slider is custom fit to each gear leg. Shape the sliders such that the left and right gear doors close at the same rate. The two sliders may have different shapes. If it is desired that the doors shut when the gear legs are down, make sure that the sliders run all the way to the front of the door. All curves should be smooth and large. The exact radius of each curve can be changed to suit when the gear legs and doors are tested. SEE BLUE PRINT #2-114001!

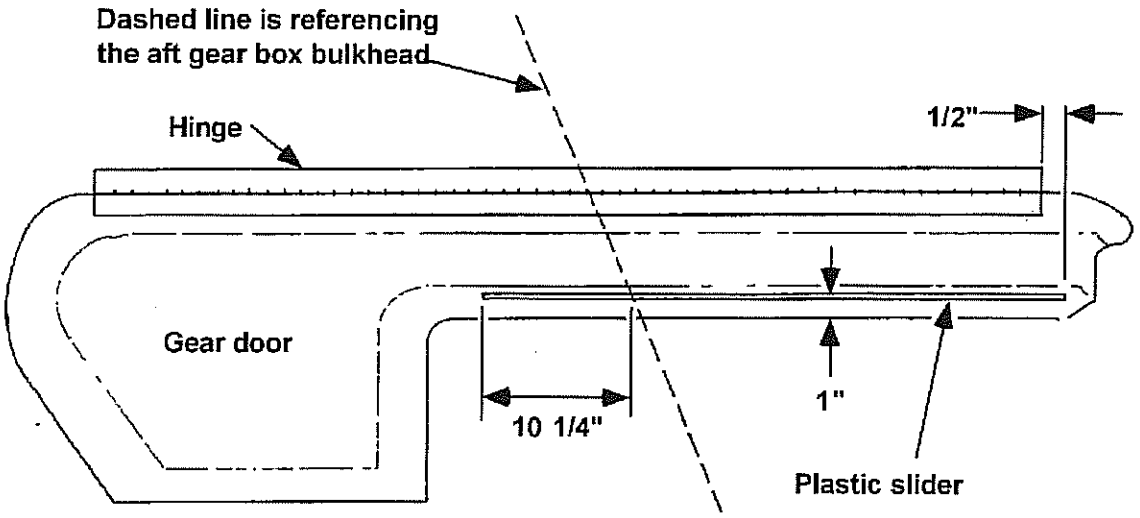
It is possible to pull the gear doors open at the same time and actuate one gear leg at a time.

Q2. Position the plastic sliders on the inbd main gear doors as shown in Figure 19:Q:2. Use a few dabs of Bondo to temporarily hold the sliders in place.

Q3. Slowly push the main gear into the retracted position while holding the gear door against the leg. The gear leg should slide along the plastic edge without binding. The wheels, brakes, and tires should all clear the door.

Locating plastic sliders

Figure 19:Q:2

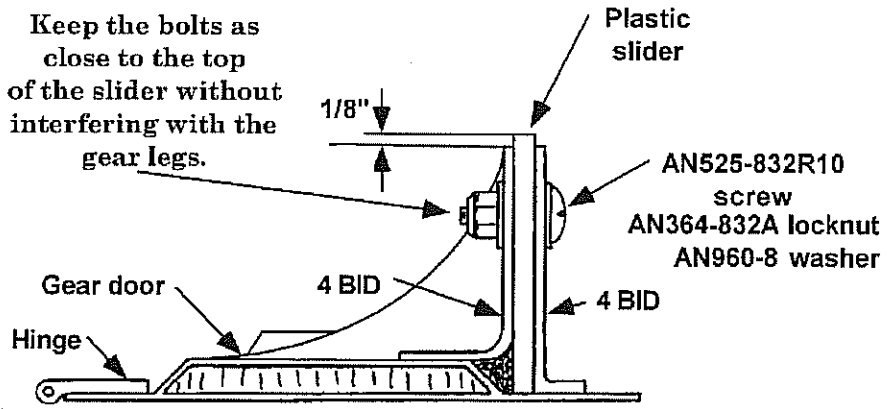


Q4. When satisfied with the slider shape and position, apply 4 BID to secure the pastic pieces to the gear doors as shown in Figure 19:Q:3. The 4 BID should lap onto the plastic within 1/8" of the edge which contacts the gear leg.

Q5. To further reinforce the bond between the plastic and the 4 BID, drill 3/16" holes through both at the locations shown in Figure 19:Q:2. Sandwich the plastic and BID material together with AN525-832R10 screws and AN364-832A locknuts. Use AN960-8 washers under the locknuts.

Securing plastic sliders

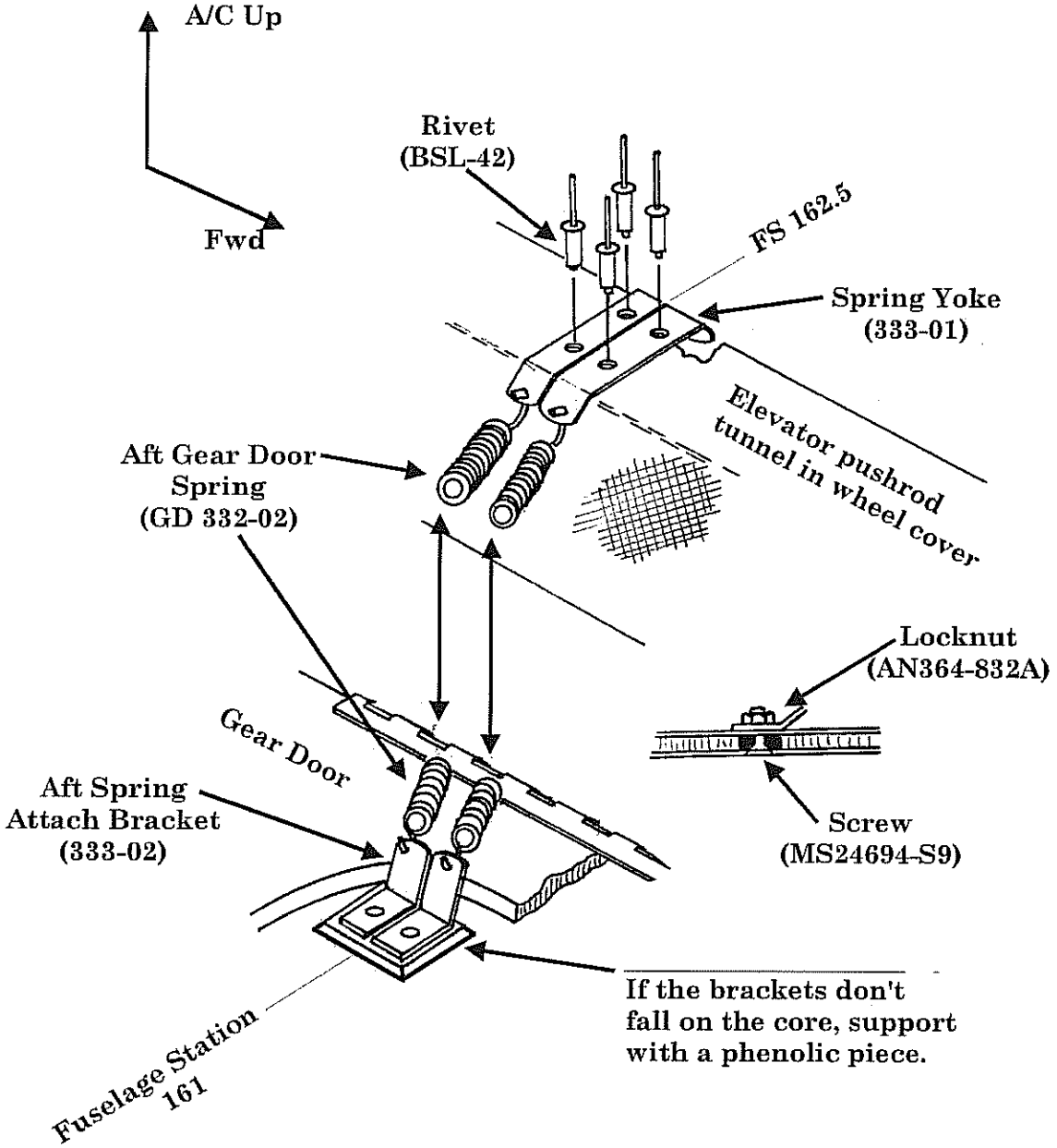
Figure 19:Q:3



Q6. Two springs assist each inbd main gear door in closing. Both of the aft springs are attached to a bracket that spans the top of the elevator pushrod tunnel. These aft springs are then attached to the inbd gear doors as shown in Figure 19:Q:4:a&b. Secure the attach bracket to the pushrod tunnel with BSL-42 rivets and secure the two gear door mounted attach brackets with MS24694-S9 screws.

Q7. Install the aft main gear door springs (GD 332-02).

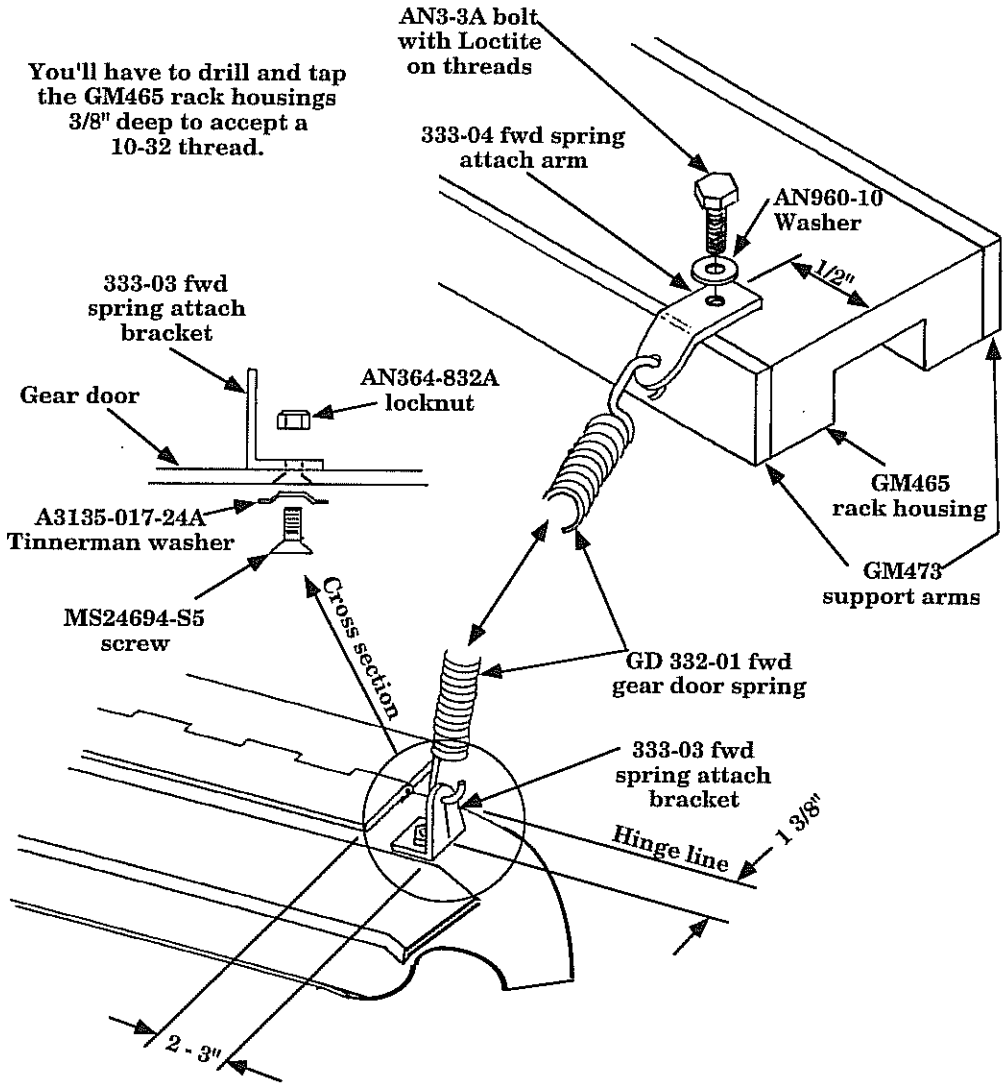
Inbd main gear door aft springs
Figure 19:Q:4



Q8. Another spring is required to hold tension on the forward sections of the main gear doors. Install the two fwd spring attach brackets to the gear doors as shown in Figure 19:Q:5. These fwd spring brackets do not require a flox hardpoint because they are not located on the gear door core areas.

Q9. Drill and tap the GM468 rack housings for 10-32 thread as shown in Figure 19:Q:5. Use AN3-3A bolts to secure a 333-04 spring attach arm to each of the tapped holes. Use Loctite on the bolt threads. Install the fwd gear door springs (GD 332-01's).

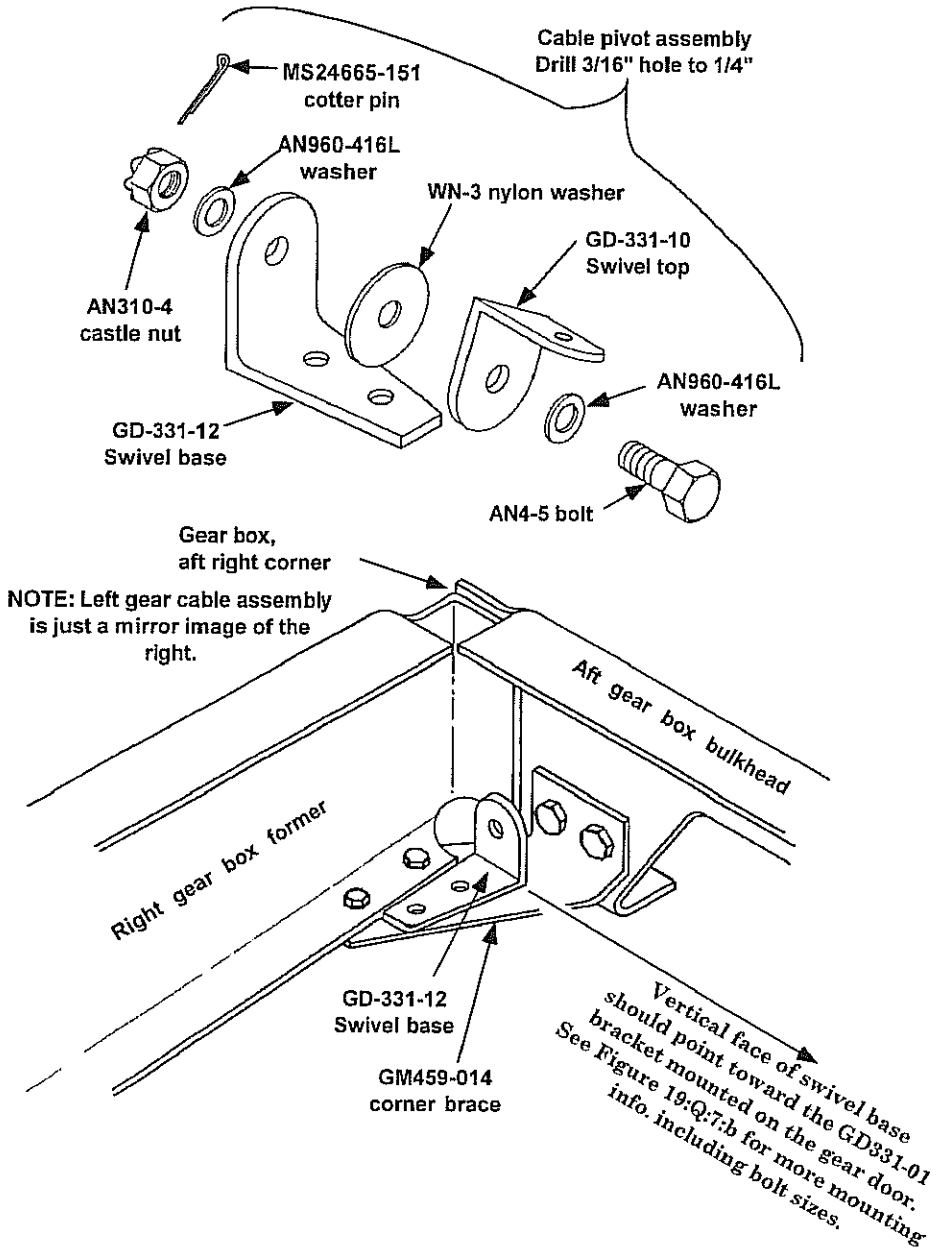
Gear door fwd springs
Figure 19:Q:5



Q10. To hold the inbd main gear doors up tight when the gear is fully retracted, a cable is installed which the gear leg pulls on. Each cable is mounted to a gear door and a pivot assembly. Assemble two cable pivot assemblies as shown in Figure 19:Q:6.

Q11. Secure the cable pivot asemblies to the GM459-014 corner braces as shown in Figure 19:Q:6. To refresh your memory, the GM459-014 braces are located at the lower, outbd, aft corners of the gear box.

Cable pivot assemblies
Figure 19:Q:6

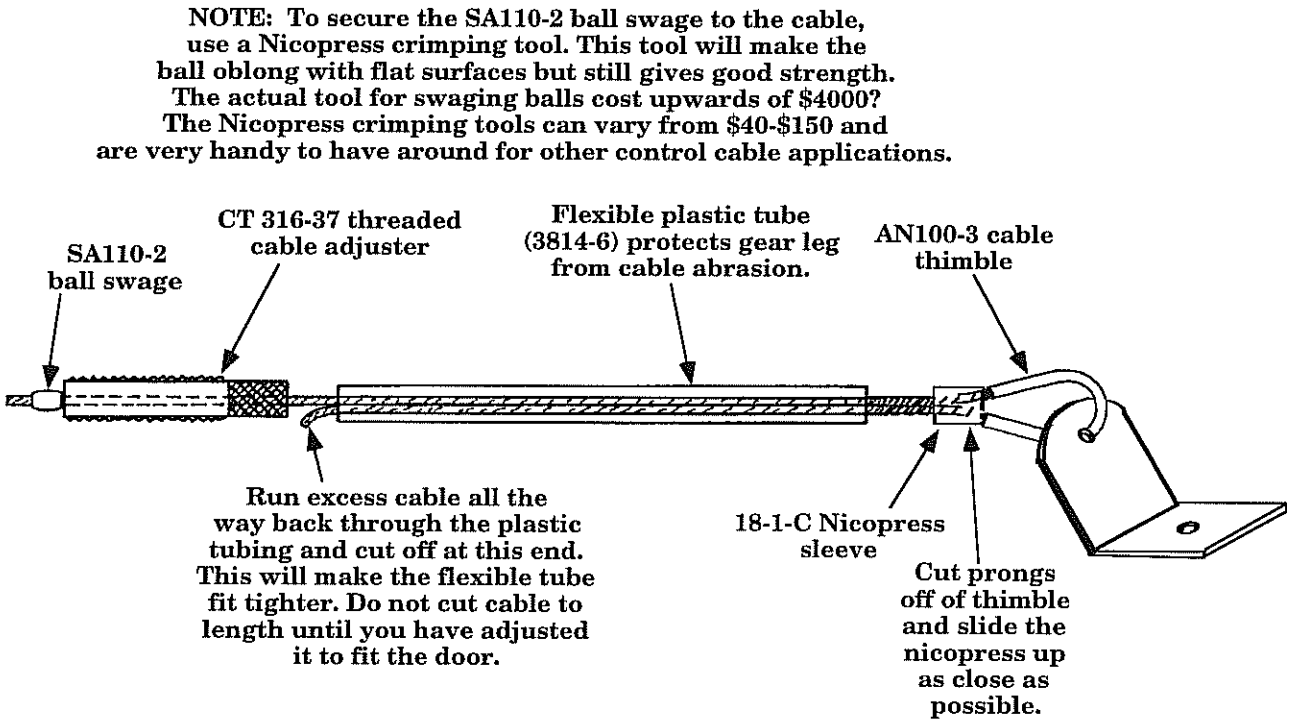


Q12. Locate the cable attach brackets on the gear doors as shown in Figure 19:Q:7. Secure the brackets with MS24694-S52 screws and AN365-1032A locknuts. Use NAS390B10P Tinnerman washers under the screw heads, and AN960-10L washers under the locknuts.

Q13. Connect the cable pivot assemblies to the gear door attach brackets with 1/16" cable as shown in Figure 19:Q:7. To adjust the cable, retract the main gear legs in the full up position, bracing them against the plastic upstops. From inside the fuselage, pull the cables tight and tape them to hold that length. Remove the cables and crimp the nicopress sleeves. Reinstall the cables and do any final cable length adjustment with the threaded cable end. When the inbd gear door is "up and tight", lock the threaded cable end with the two AN316-4 stop nuts. Trim the excess cable length.

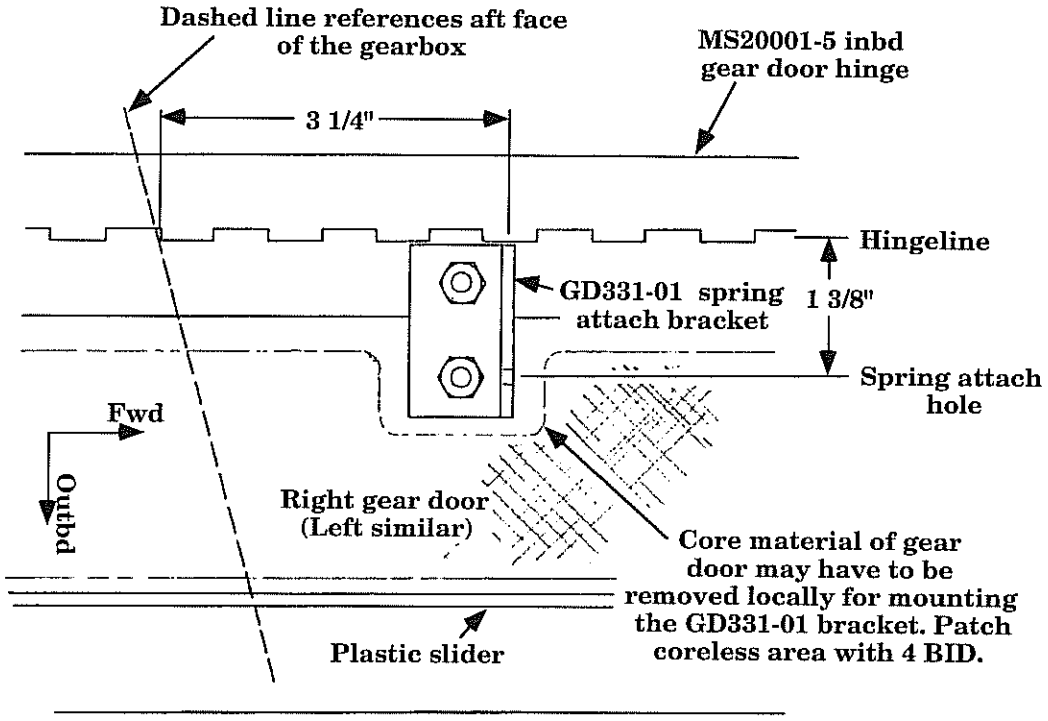
Gear door cable assembly

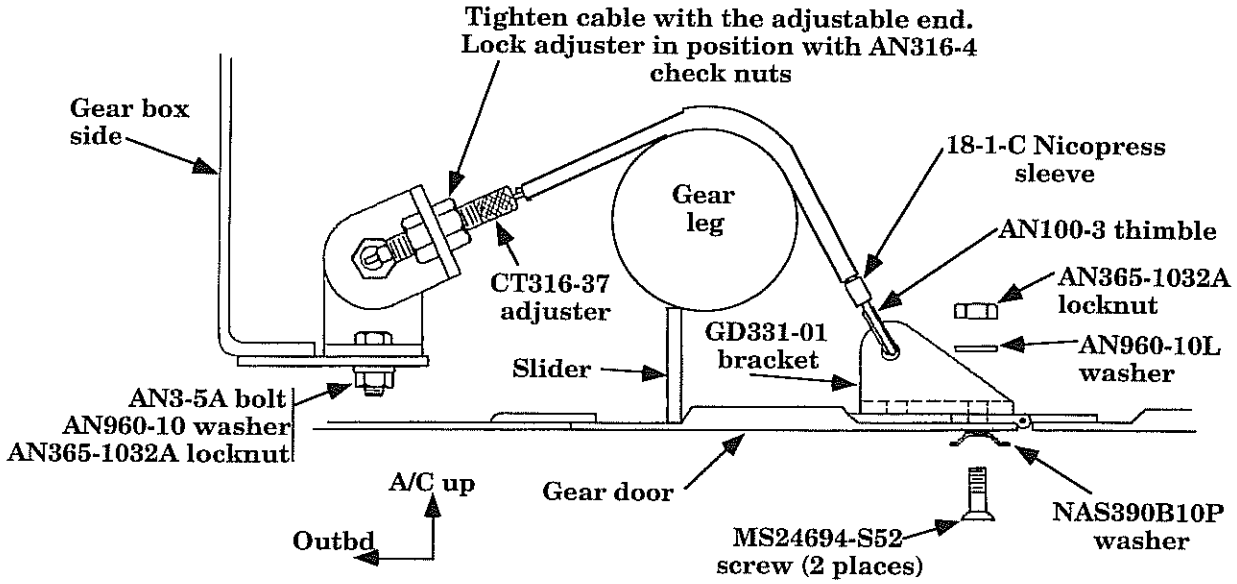
Figure 19:Q:7:a



Adjusting cable lengths

Figure 19:Q:7:b





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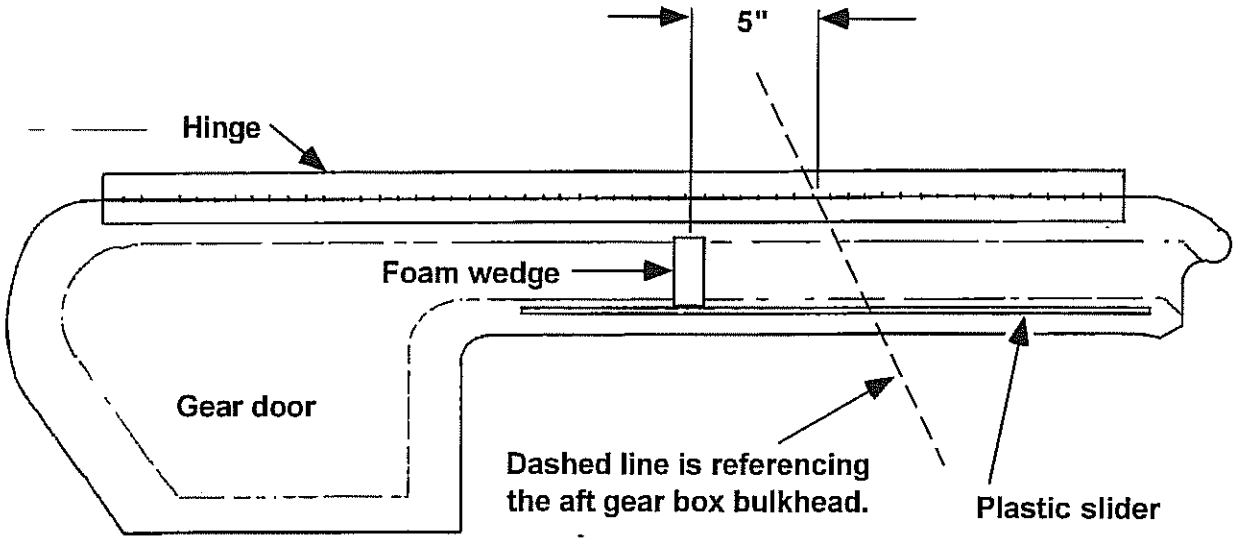
Due to revisions, pages 119 & 120 have been removed.

In some circumstances, the main gear legs can hit the plastic slider rather hard when extending. The gear leg can also get hung up in the corner formed by the slider and the gear door. To avoid the direct blow to the side of the slider, a foam wedge is installed to deflect the door.

Location of foam wedge
Figure 19:R:1



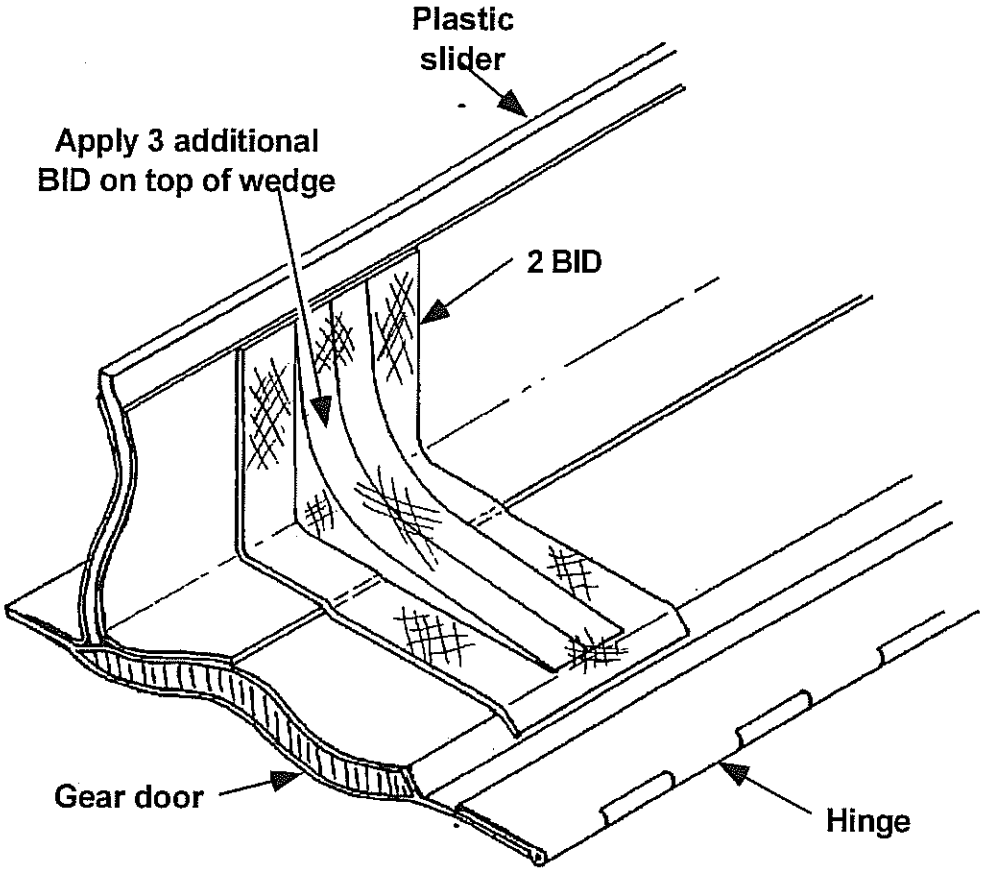
R1. Cut and shape foam wedges from 1/2" thick Clark foam. Notice that two pieces of the foam are bonded together to form the 1" thick wedge for each door.

NOTE: The exact radius of the wedge is not important. 2" - 2 1/2" radius will be fine.

R2. Use micro to bond the foam wedges to the gear doors as shown in Figures 19:R:1 & 2. **The 5" dimension off the aft gear box bulkhead may vary some from aircraft to aircraft. The exact location is best determined by operating the gear to check where the gear leg tends to "bump into" the slider on its way to the extended position. This is where the ramp (or support wedge) will "help" the gear leg onto the plastic slider.**

R3. Apply 2 BID over the foam wedges, overlapping onto the gear door and slider 1". Apply an additional 3 BID to the upper surface of the wedges, where the gear legs will be striking them.

Installing foam wedges
Figure 19:R:2

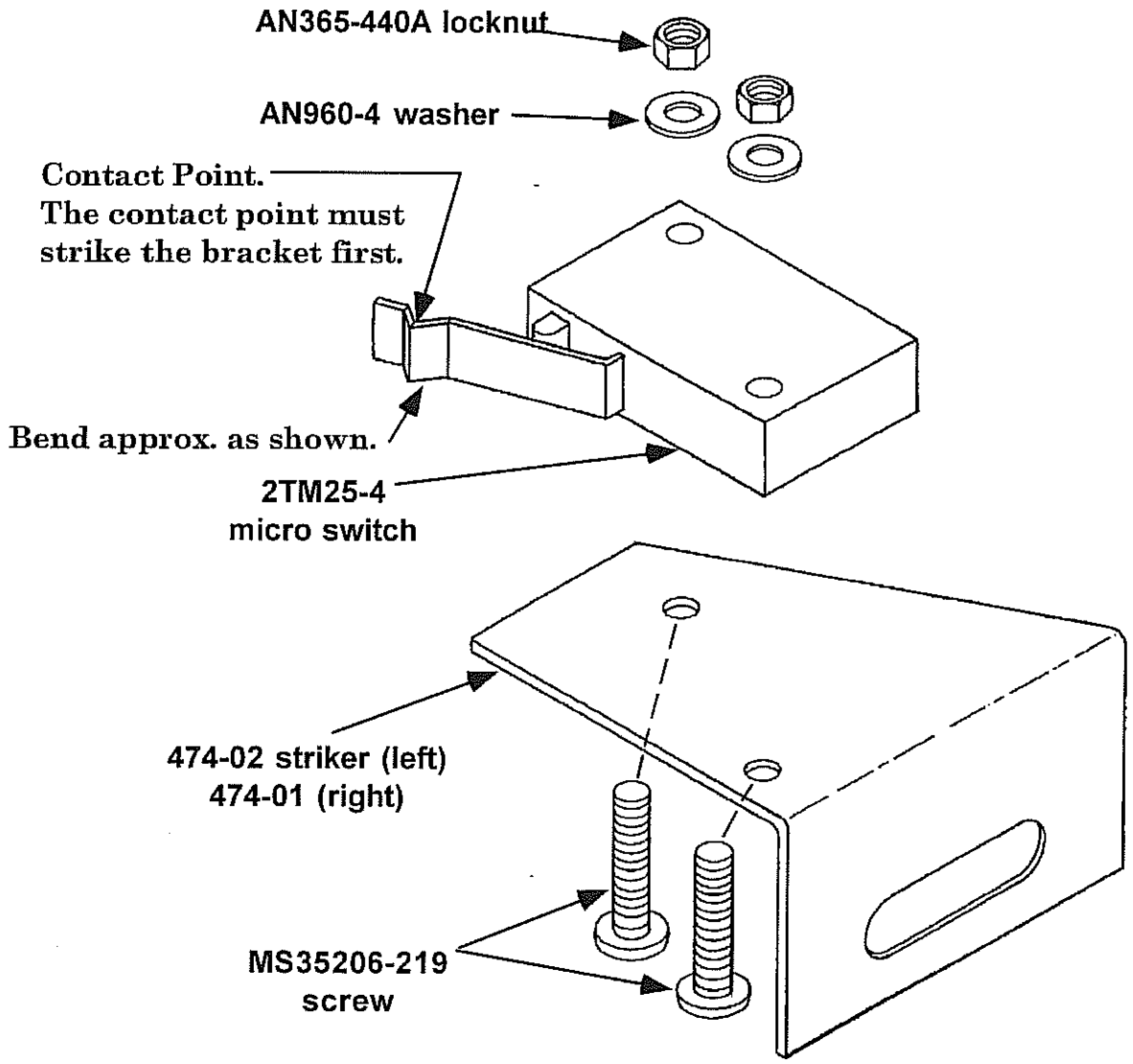


S. MAIN GEAR DOWN INDICATOR SWITCHES

To signal that the main gear legs are down and locked, a micro switch is mounted on each hydraulic cylider. An aluminum striker mounted on the rack contacts the micro switch when the gear is fully down.

S1. Attach a 2TM25-4 micro switch to each switch mount (474-01 or -02) using MS35206-219 screws and AN365-440A locknuts. Note that there is a left (-02) and a right (-01) switch mount.

Mounting micro switch
Figure 19:S:1



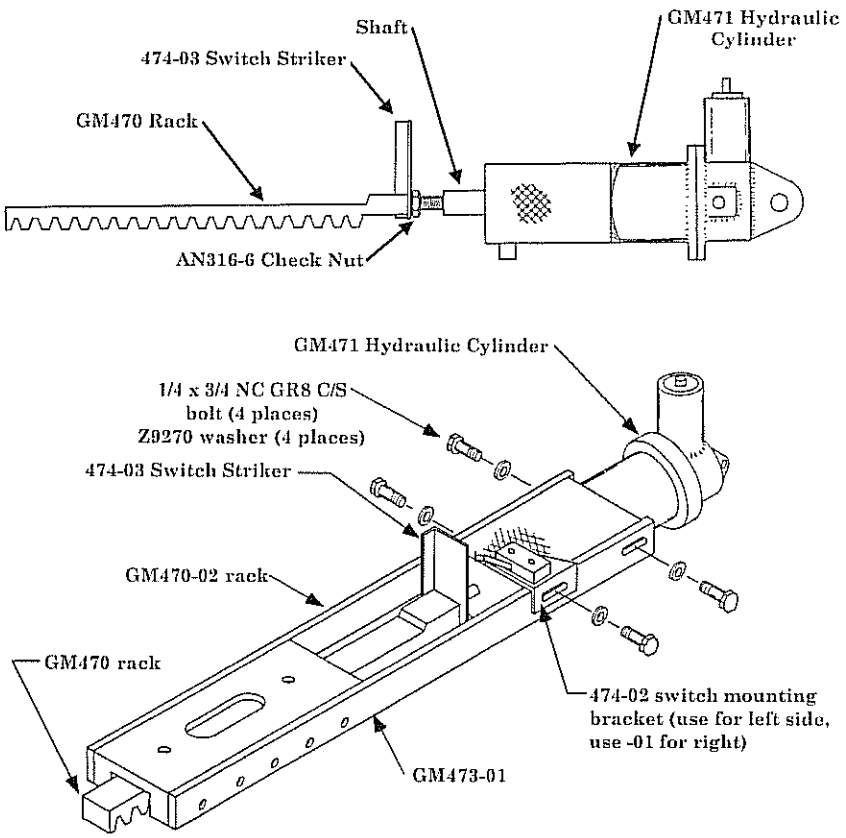
S2. Secure the 474-01 and -02 switch mounts to the GM473-01 support arms. Remember, these are the *outbd* arms of each "Assembly A". Use the fwd bolt (1/4 x 3/4, NC GR8 C/S) that attaches each support arm to the cylinder housings.

S3. The switch strikers (474-03) are mounted between the GM470 racks and the AN316-6 check nuts. Back off the check nut enough so that you can slide the striker down around the cylinder shaft. Retighten the check nut, sandwiching the striker between it and the GM470 rack. Be careful not to turn the cylinder shaft, which might change the gear meshing between the rack and pinion. See Figure 19:S:2.

S4. Adjust the switch mounting plate fore or aft so the switch striker hits the switch arm when the gear is fully down and locked. The switch must "click" for the contacts to properly work the gear lights. Wiring for the gear down switches will be shown in a later chapter.

Gear down switch installation

Figure 19:S:2



Supplement–Main Gear Doors

S.1 Introduction

The main gear doors have been cut from the fuselage when you receive your kit. In this supplement you will complete the main gear doors so they will be ready for installation.

When the tires are warm they will expand as much as a 1/2" (12 mm). When you are checking the size of the gear door and its opening, make sure you allow for tire expansion.

When you are finished with the gear door it should not be seen when viewing the side of the airplane.

Steps to Completion

- Shape the forward end of the gear doors to match the provided pattern.
- Mark and cut the aft wing fairings.
- Mark and trim the gear doors.
- Bond the piece cut from the aft wing fairings to the gear doors.
- Install the hinge to the gear doors.
- Cut and install the runner.
- Create the flange around the fuselage gear doors.

Before You Start

Before you start this supplement the aft wing fairings must be bonded in place.

A Word about Sanding and Cleaning

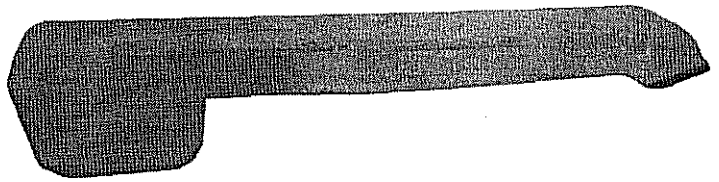
The instructions in this chapter refer to preparing a surface or preparing a bonding area. When we recommend preparing a surface or a bonding area, we expect each of the following steps to be completed every time.

1. Sand the area using 40-grit sandpaper.
2. Vacuum all sanded areas.
3. Clean all sanded surfaces with Acetone.

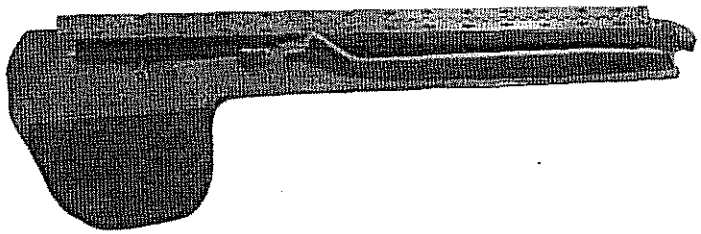
S.2 Parts List

Item	Part Number	QTY	Description
1)	AN3-5A	20	Bolts
2)	AN365-1032A	20	Locknuts
3)	AN426A3-4	130	Rivets
4)	AN960-10	20	Washers
5)	K1000-3	65	Nutplates
6)	MS20001	2	Piano hinge
7)	MS24694-S7	65	Bolts
8)	Poly-250-6x36	1	Plastic sheet for runner

Shape of the gear leg door in the kit.



Shape of the gear leg door when it is ready for installation.



S.3 Construction Procedures

S.3.A Shaping the Main Gear Doors

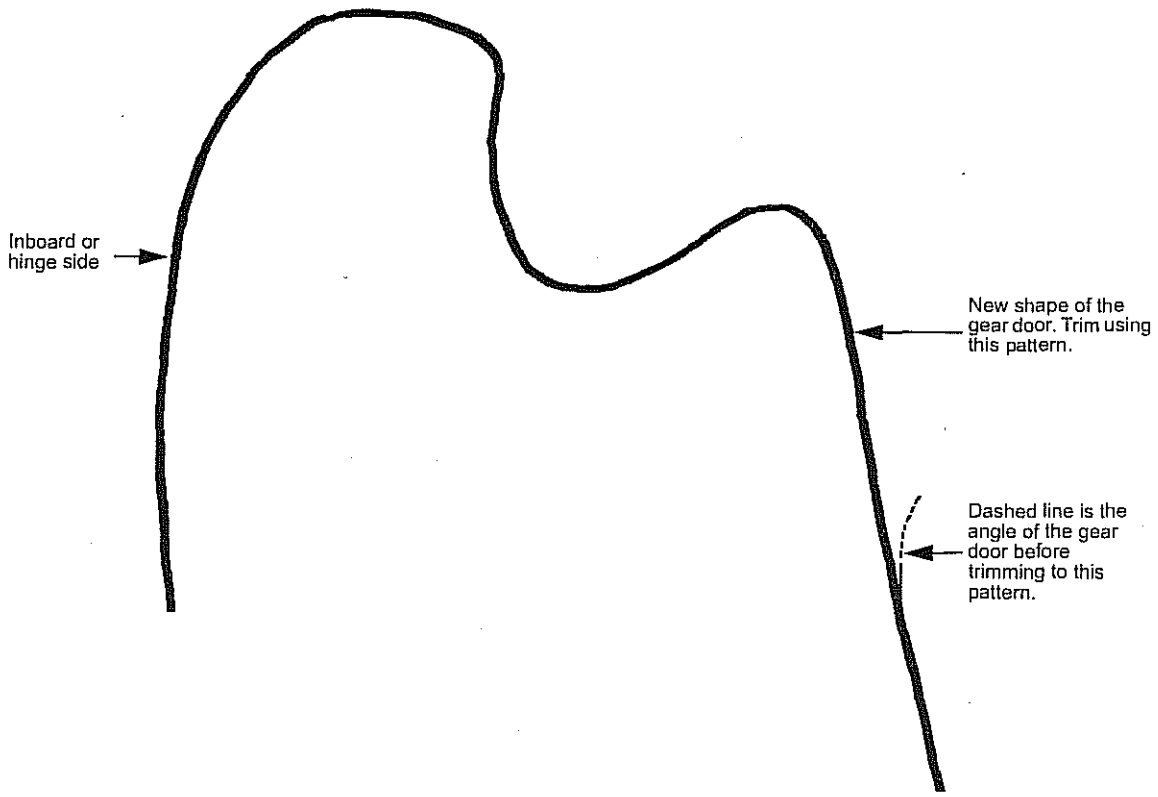
Before you can fit the main gear door, you need to shape the forward portion of the gear door so it will fit into its opening in the fuselage. Then you will determine how much of the aft wing fairing becomes part of the gear door.

Steps...

1. Trim the forward end of the gear door using the pattern in Figure S.3.A.1.

   The forward end of the gear door must be shaped before it can be held in the gear door opening.

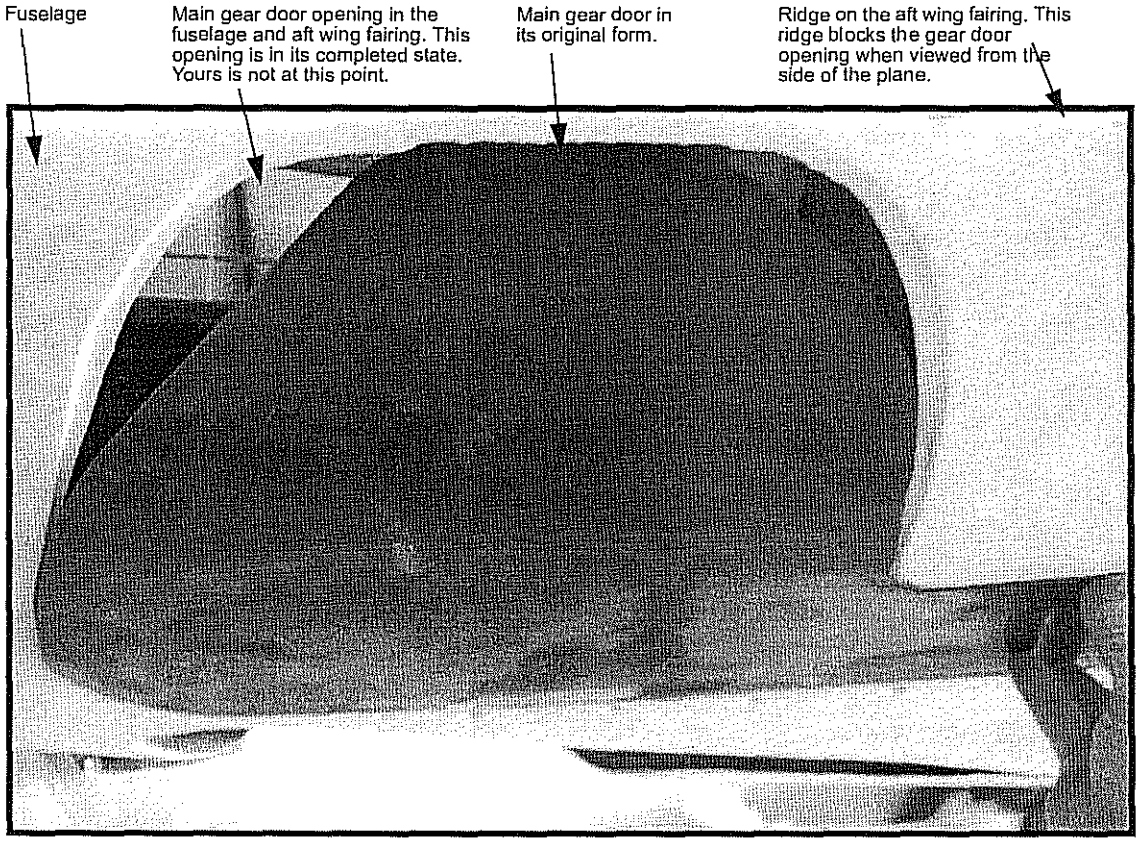
Figure S.3.A.1 Pattern for the forward end of the main gear door



2. Hold the gear door in place in the main gear door opening. Observe the shape of the door and the shape of the opening in Figure S.3.A.2. Plan for the following fit:
   - Allow for a 1/16" (1.5 mm) clearance all the way around the door.
   - Part of the aft wing fairing will need to be removed and applied to the gear door as shown in Figure S.3.A.3.
   - The hinge side (inboard edge) will need a 1/8" to 1/4" (3 to 6 mm) clearance.

   Note: Please ignore the fact that the gear door opening is completed in Figure S.3.A.2.

Figure S.3.A.2 Main gear door and the completed opening for the main gear door



3. Hold a pen perpendicular to the floor and against the gear door opening. Trace an outline of the gear door opening onto the installed aft wing fairing.

   The mark you make on the fairing should meet the following criteria:

   - Approximately 4" of the aft wing fairing will be removed,
   - Should not extend into the ridge on the fairing. See Figure S.3.A.2 to identify the ridge.
   - The tire will need to fit through the opening.

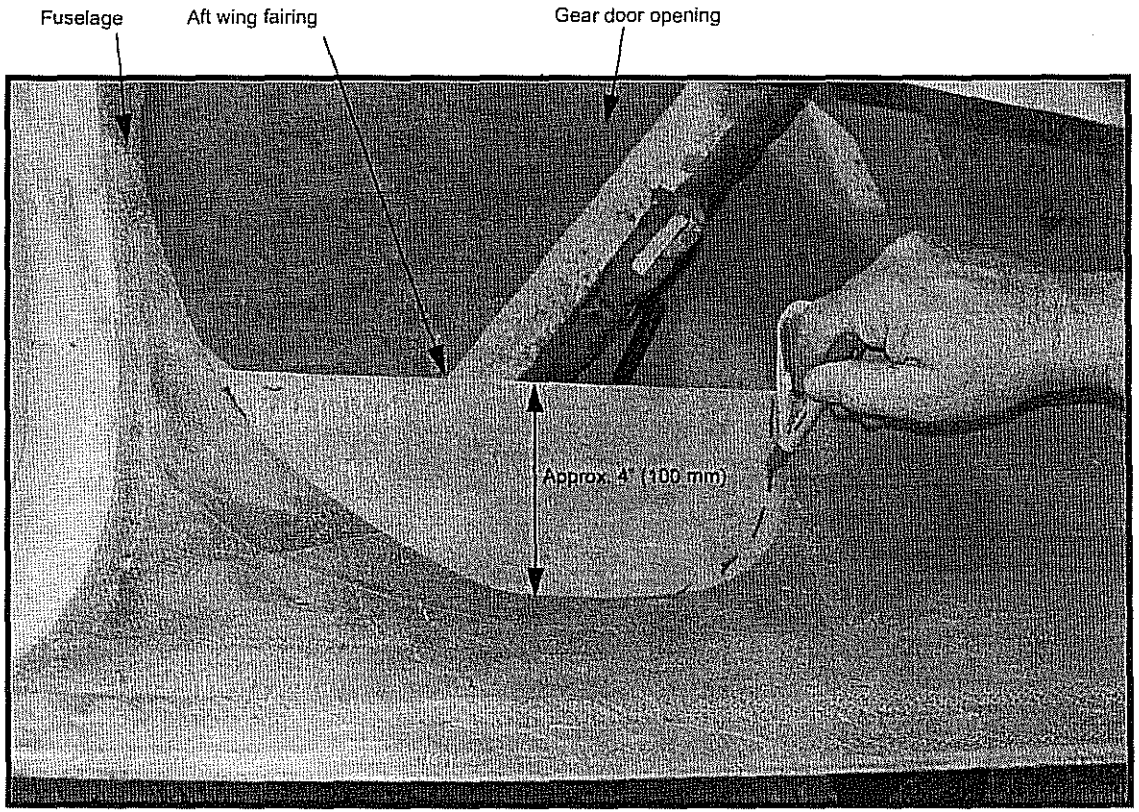
   Tip: Another method is to make a paper pattern of the gear door opening.

4. Trim the aft wing fairing along the pen line.

   Now you have the section of the aft wing fairing that is glued to the gear door on the outside edge to create a door that will fit into the gear door opening. But first the gear door must be trimmed.

5. Make a pattern of the aft portion of the gear door opening, including where you cut away the wing fairing.

Figure S.3.A.3 Main gear door opening and installed aft wing fairing looking down from inside the fuselage



6. Arrange the gear door and the piece of aft wing fairing on the pattern to determine how much of the gear door to trim.
7. Mark the gear door and trim to fit the pattern.
8. Bond the fairing piece onto the gear door.
9. Apply the following BID layups over the bond and the fairing piece.

   Inside:

   - 2-BID over the bond,
   - 2-BID over the bond and extend 1 1/2" beyond the first layup,
   - Continue to layer the 2-BID on until the bond and the fairing piece have a total of 6-BID applied.

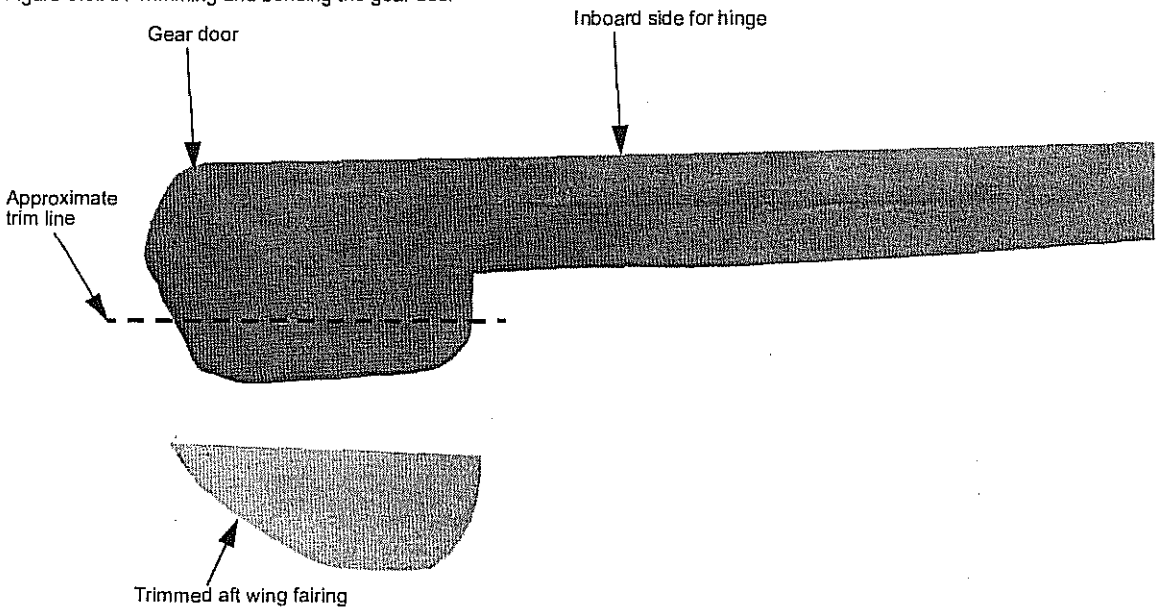
   Outside:

   - 2-BID over the bond.
10. Cut a piece of piano hinge to 45 1/2" (1.137 meters).
11. Lay the hinge on the inboard edge of the gear door and cleco into place.

    Determine whether the door edge has enough room for the hinge to lay flat. If the hinge needs more room you will need to do the following:

    - Cut and decore the stiffener in any areas where the hinge does not lay flat.
    - Do a micro/flox release to create a flat surface for the hinge.
    - Cleco the hinge in place on the gear door.
12. Place the gear door into the opening again and check the hinge spacing. The piano hinge needs 1/8" to 1/4" (3 mm to 6 mm) of space. Mark any areas of the gear door that need to be trimmed
13. Remove the door and trim any marked areas on the gear door.
14. Drill 3/16" (4.5 mm) holes in both sides of the hinge every 3" (75 mm) for the nutplates.
15. Rivet (AN426A3-4) the nutplates (K1000-3) in place on both sides of the hinge.
16. Secure one side of the hinge to the gear door using MS24694-S7 bolts. See Figure S.3.C.1.
17. Drill the inboard side of the gear door opening in the fuselage for the hinge. Again the drilled holes are 3/16" (4.5 mm) every 3" (75 mm).

Figure S.3.A.4 Trimming and bonding the gear door



S.3.B Cutting and Applying the Runner

In this section you will cut the plastic runner that the gear leg slides along to open the gear doors.

Note: Before you install the runner, you can apply a stiffener to the gear door by using a 1/4" or 3/8" (6 or 9 mm) aluminum tubing. The tubing runs next to the plastic runner, and beyond it to the forward end of the gear door. Micro the tubing in place and then start the following steps for the runner.

Steps...

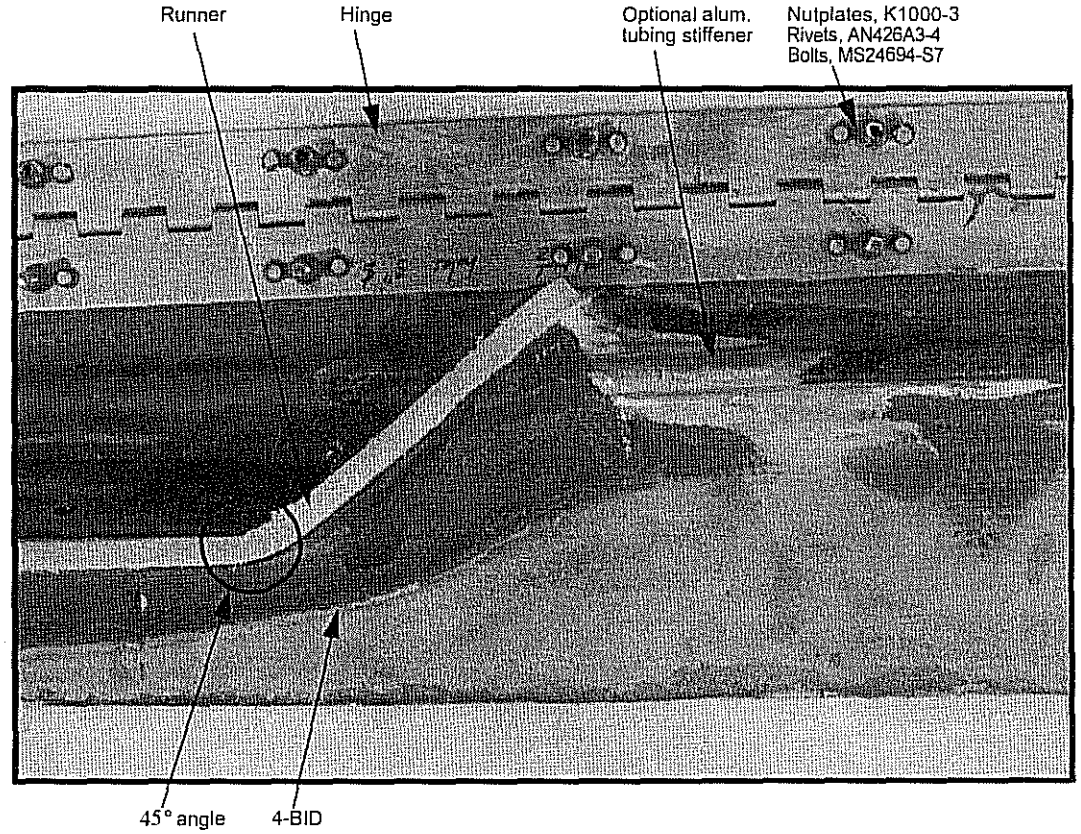
1. Cut the plastic runner (Poly-250-6x36) using blueprint 426-0004 as a pattern.
2. Measure the gear leg to find the location of the bend for the runner. Mark the location on the runner.
3. Heat the runner with a heat gun until you see the nylon start to bend. Place a 2x4 flat against the surface of the runner and bend it to 45°.

   The bent portion will face inboard 45°on the gear door.
4. Locate the straight portion of the runner 3" (75 mm) from the hinged side of the gear door.

   The 45° portion is angled toward the hinge.

   See Figure S.3.B.2 on the next page to view the tapers at the forward and aft end of the runner.
5. Secure the runner to the gear door with super glue.
6. Apply a micro radius to both sides of the runner.
7. Apply a 4-BID to both sides of the runner and within 1/4" (6 mm) of the forward end.

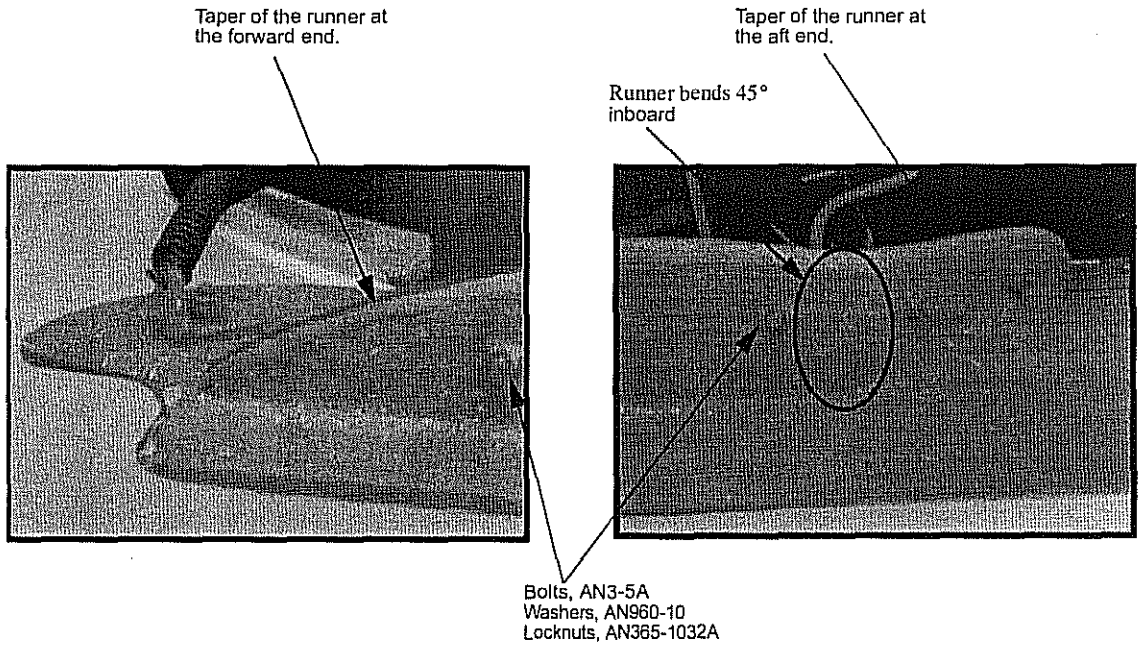
Figure S.3.B.1 Aft end of the plastic runner with layups and optional stiffener



Steps after cure...

1. Drill 3/16" (4.5 mm) holes every 4" (100 mm) the length of the runner.
2. Use AN3-5A bolts with washers (AN960-10) and locknuts (AN365-1032A) to hold the runner in place.

Figure S.3.B.2 Side views of the forward and aft end of the gear door runner



S.3.C Creating the Flange

In this section you will create the flange on the fuselage along the gear door opening.

Steps...

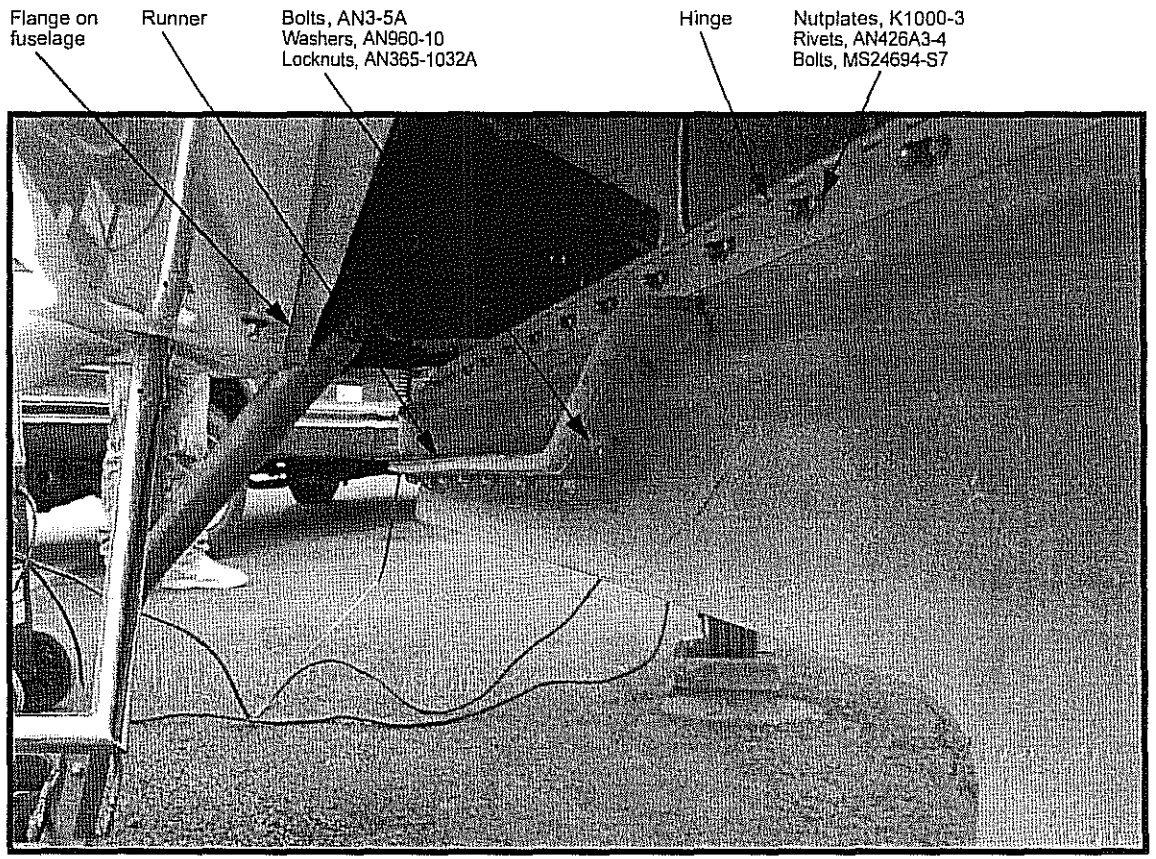
1. Apply clear tape to the gear door.
2. Fit the gear door in the opening and secure in place with small sticks.
3. Apply a 2" (50 mm) 4-BID to the fuselage non-hinge side of the gear door opening. Make sure that 1/2" (12 mm) overhangs onto the gear door.

Remove the gear door once the layup is dry.

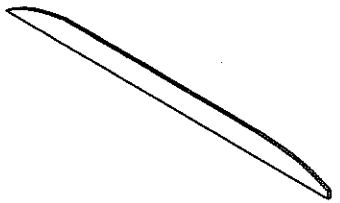
Test fit both gear doors and the gear legs. The gear leg needs to slide on the runner to open the door. The leg and door should not bind. Make sure there is a 1/2" (12 mm) minimum clearance on both sides of the tire.

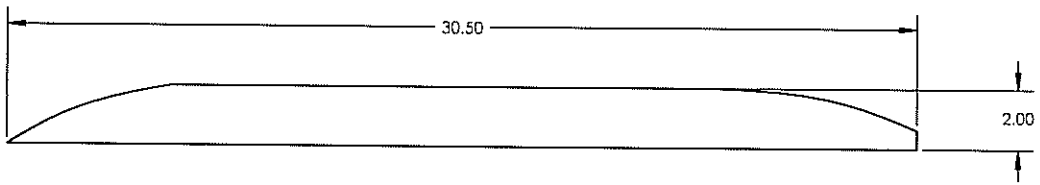
Now return to the section of the manual where you were working.

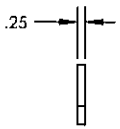
Figure S.3.C.1 Gear door with the hinge and runner installed



ZONE	REV.	DESCRIPTION	DATE	APPVD
	A	INITIAL RELEASE	00/00/0000	







NOTE: THIS PROFILE IS A GENRAL ROUGH OUTLINE, ONCE INSTALLED THE SLIDER SHOULD BE TRIMMED FOR SMOOTH GEAR DOOR OPREATION

4. DIMENSIONS ON FLAT PARTS MADE BY PROFILE CUTTING MACHINES ARE FOR INSPECTION PURPOSES ONLY. ALL DIMENSIONS ARE NOT INCLUDED.
3. ALL SURFACE FINISHES ARE $\sqrt{63}$ OR BETTER.
2. APPLY P/N & REV LETTER IN THIS LOCATION USING THE FORMAT "123-4567X". METHOD IS OPTIONAL.
1. ALL HOLE DIMENSIONS ARE AFTER FINISH IS APPLIED, SUCH AS PLATING, ANODIZE AND POWDERCOAT.

LANCAIR INTERNATIONAL INC.
REDMOND, OR 97756
541-923-2244

PER ASME Y14M - 1994
ALL DIMS IN INCHES UNLESS OTHERWISE NOTED.
TOLERANCES
.XXX ±.005
.XX ±.01
.X ±.025
FRACTIONS ±1/32
ANGLES ±30'

DRAWN:	CHK'D:	VENDOR / VENDOR P/N:
B PHILLIPS	B PHILLIPS	
DATE:	DATE:	LCI P/N/REF:

FINISH: DEBURR & REMOVE SHARP EDGES

SHEET SIZE: B

MATERIAL: 1/4" PLASTIC

FIRST USED ON: L-IV

SCALE: 1:4

PART NUMBER	REV	TITLE	SHEET
426-0004	A	Main gear door slider	1 OF 2

CAD FILE: \\Lindbergh\data\Engr\Drawings\L-IV - L-IVP\Main Gear Door Slider\ 426-0004A Main gear door slider

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