Supplement – Installing the ES Engine Mount and Nose Gear

S.1 Introduction

This supplement provides the instructions for installing the ES engine mount for the IO-550 and assembles and installs the nose gear. The ES nose gear is mounted on the engine mount, thus the engine mount must be installed first, followed by the installation of the nose gear.

Many builders are curious how Lancair can use such a simple looking nose gear strut and still have adequate shock absorption and shimmy dampening (notice that there are no scissor linkages or external dampeners on your nose gear strut). Internal oil dampening is the key to the strut's simplicity. Typical nitrogen pressurization is used for shock absorption but an internal oil wiper system takes care of the shimmy.

When you complete this chapter you will be able to set your Lancair ES on the landing gear. We recommend leaving the fuselage in the jig until it is finished, but if need be, you can roll the fuselage shell around your shop.

Steps to Completion

- Install the engine mount.
- Assemble the nose gear wheel, tire and tube.
- Assemble the nose gear strut.
- Install the nose gear’s drag link.
- Install, align and build a bulkhead for the wheel pant.
- Install the firewall blanket.

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S.2 Parts List

#	Part Number	QTY	Description
1)	112-0036	2	Nose gear bushing
2)	212-0041	1	Nose fork plate, octagon for nutplates
3)	212-0073	2	Keeper plate (refer to GM483-A)
4)	3455	1	Mounting plate for nose gear's wheel pant
5)	3457	1	Nose gear link (known as drag link)
6)	40-77	1	Nose wheel (reference only. This is included in the wheels & brakes assembly)
7)	432-0002	1	Oleo strut
8)	4717-03	2	Bearing
9)	7448	1	Scotch Brite pad
10)	AN3-3A	4	Bolt (keeper plate)
11)	AN3-7A	2	Bolt (bearing block)
12)	AN365-1032A	1	Locknut
13)	AN365-428A	3	Locknut
14)	AN365-516A	1	Nut
15)	AN365-524A	5	Locknut
16)	AN365-528A	1	Nut
17)	AN365-720A	4	Locknut (for engine mount bolts)
18)	AN4-7A	4	Bolt (bearing block)
19)	AN426A3-5	4	Rivets
20)	AN426AD-4-4	8	Rivets for K1000-5 nutplates
21)	AN4-60A	1	Bolt
22)	AN5-11A	2	Bolt
23)	AN5-12A	2	Bolt
24)	AN5-13A	4	Bolt

(Continued)

#	Part Number	QTY	Description
25)	AN5-17A	5	Bolt
26)	AN5-60A	1	Bolt
27)	AN525-10R6	2	Screws
28)	AN526-832-R8	2	Screws
29)	AN7-13A	2	Bolts, bottom for engine mount
30)	AN7-25A	2	Bolts, top for engine mount
31)	AN960-10	5	Washers
32)	AN960-10L	4	Washers (as spacers)
33)	AN960-416	4	Washers
34)	AN960-516	4	Washers
35)	AN970-7	4	Area washers
36)	EM-550A	1	Engine mount (for IO-550 engine)
37)	GM014-4-1	1	Fork
38)	GM477-01	1	Bearing block, left
39)	GM477-02	1	Bearing block, right
40)	GM483-A	1	Axle, bushings and plates assembly
	• 212-0073	2	Keeper plates
	• Z02A137		Axle bushings
	• Z02E295	1	Axle
41)	K1000-08	2	Nutplates
42)	K1000-5	4	Nutplates
43)	TB-1-05	1	Tow bar plate, angled (optional item, purchased separately)
44)	TR-5.00x5	1	Tire
45)	TU-5.00x5	1	Tube
46)			2 PPS prepreg for bulkhead

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S.3 Construction Procedures

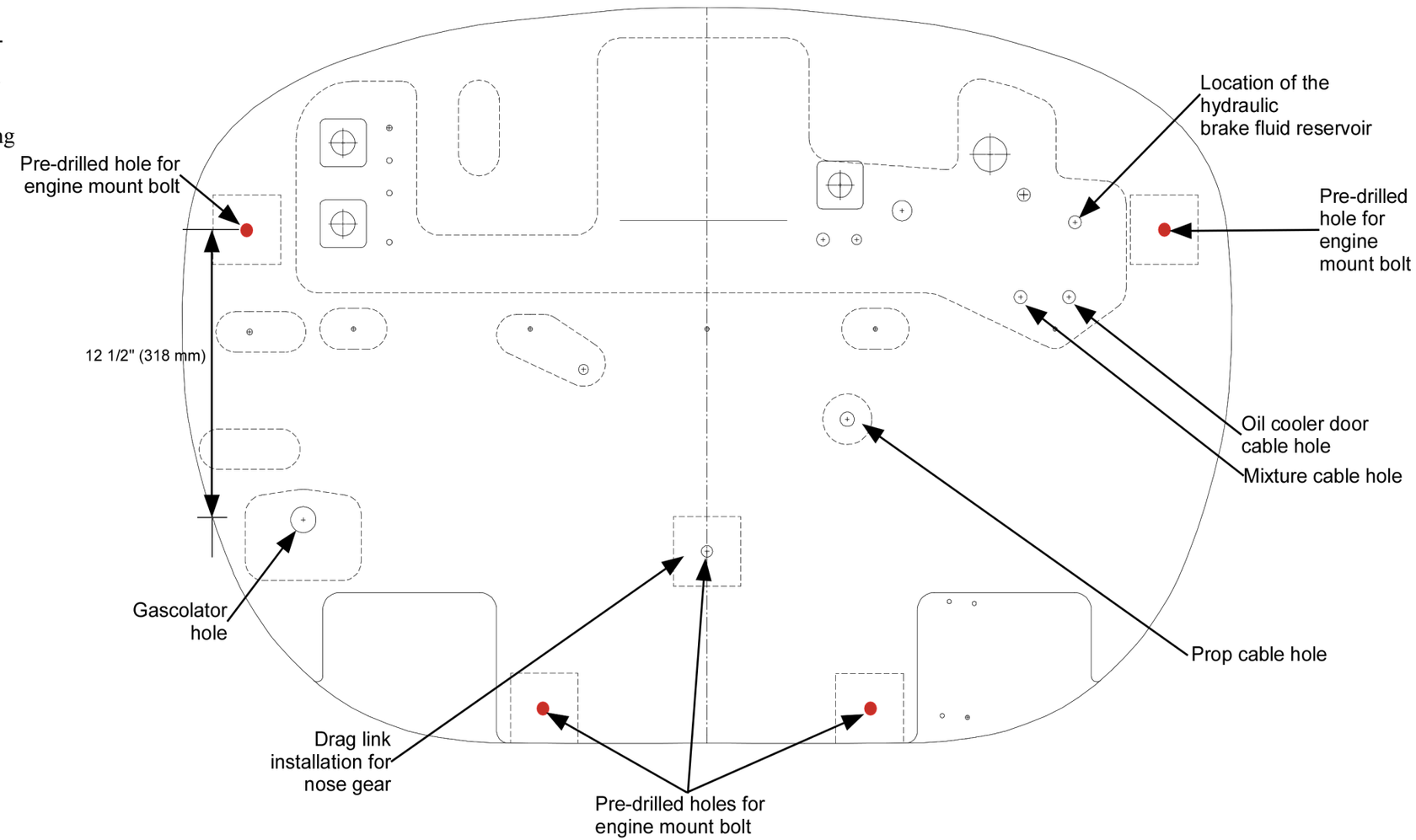
S.3.A Installing the Engine Mount

The engine mount supports the engine and the nose gear structure. This supplement concerns only the IO-550 engine. A different engine mount is required for the IO-360.

The IO-550 engine requires the following parts to be bolted to the firewall:

- Engine mount – EM-550A
- Nose gear drag link – 3457

Figure S.3.A.1 Forward side of firewall, displaying locations for the engine mount bolts



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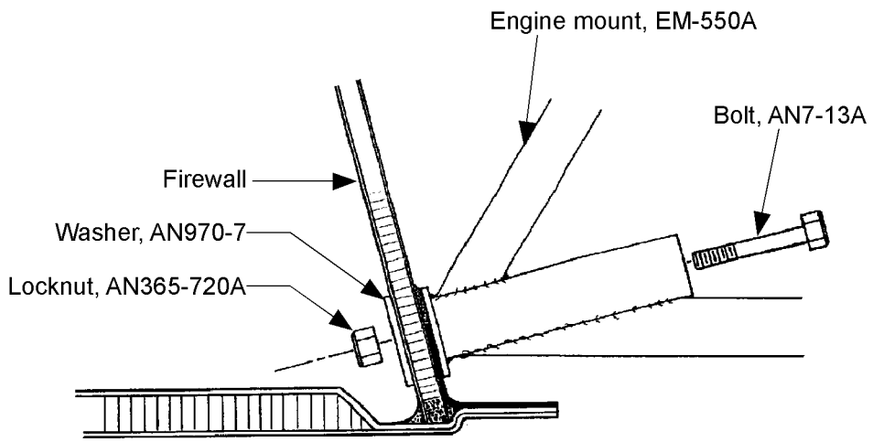
Your firewall has pre-drilled bolt holes for the engine mount. Before you start bolting the engine mount to the firewall, double check that your fuselage is level in the jig.

Steps...

1. Level your fuselage if you have not already done so.
2. Place the area washers, AN970-7, over the bottom engine mount holes on the aft side of the firewall.
3. Slide the bottom bolts, AN7-13A, through the engine mount, the firewall and the area washers. Secure them temporarily with a nut.
4. Now do the same for the top two bolts, AN7-25A.

WARNING: Do not bolt the engine mount permanently in place until you have installed the firewall blanket in section *S.3.G Installing the Firewall Blanket*.

Figure S.3.A.2 Securing the bottom bolts for the engine mount



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S.3.B Assembling the Nose Gear Wheel and Tire

The Lancair ES uses a 5" wide rim as a nose wheel with a 5.00 x 5, 6-ply tire. Do not confuse the 5.00 x 5 tire and rim with the 6.00 x 6 main gear tires and rims. The Cleveland wheel assembly includes the wheel sections, bearings, seals, rings, washers and nuts.

Steps...

1. Disassemble the 5" (125_mm) nose wheel rim, 40-77, bearings and all.
2. Place the bearings into the races of the wheel.

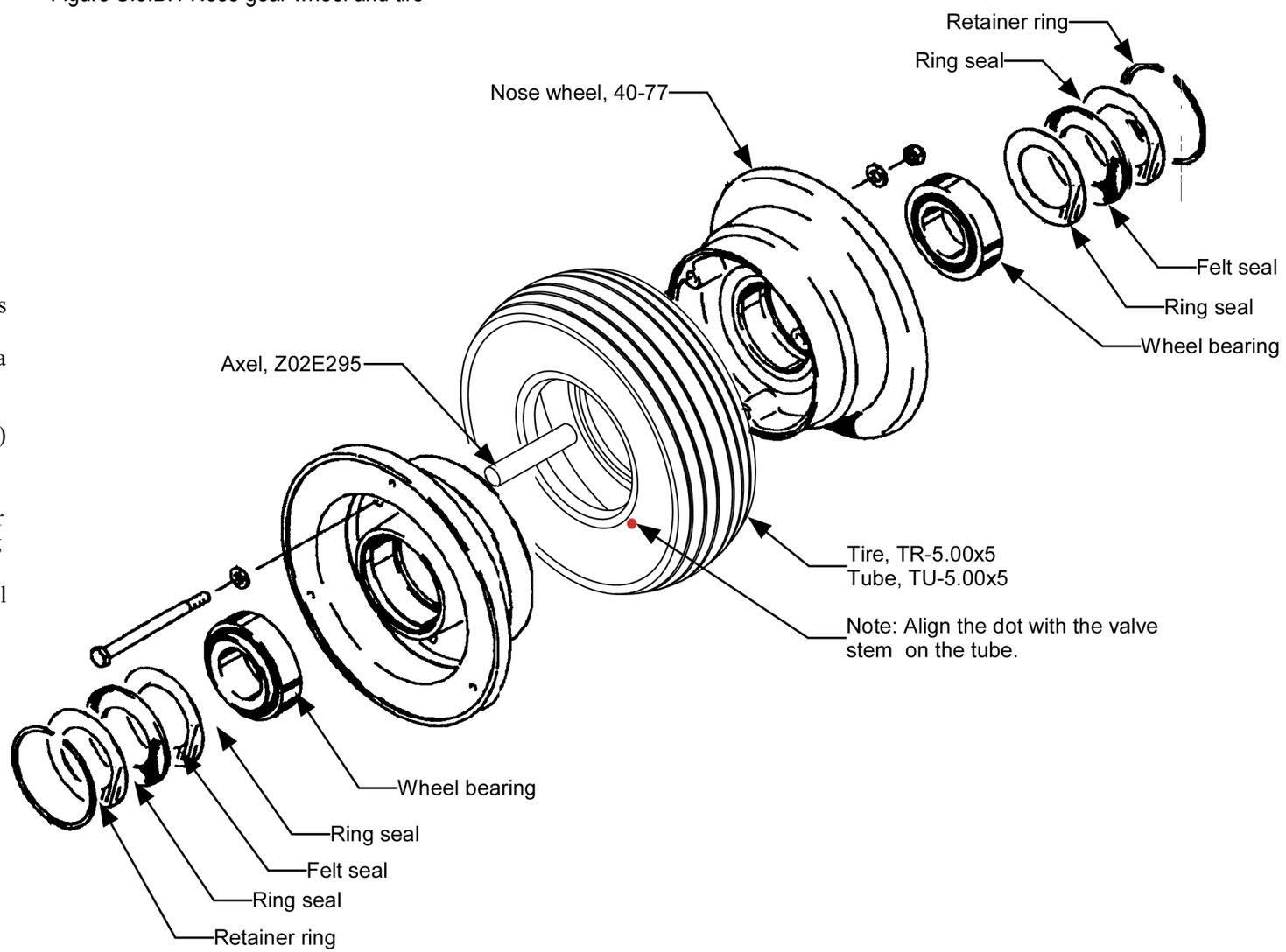
   On the Cleveland wheel, after the bearings are placed into the race, a seal consisting of two thin steel washers and a felt washer is secured with a retainer ring. The seals and rings retain the bearings in the wheel.
3. Place the half of the rim without the valve stem hole on a bench with the outboard face of the rim down.
4. Insert the 5.00 x 5 tube into the tire. Inflating the tube with a very small amount of air (just enough to unfold it) helps ease assembly.

   Note: Align the red dot on the tire with the valve stem.
5. 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.

   Do not push the tire all the way onto the rim. The tire will be seated with air pressure a bit later.
6. Place the other half of the rim onto the tire, aligning the valve stem hole and the three bolt holes. Pull the valve stem through the rim as you work the rim down.

   WARNING: 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. This creates an instant leak! This problem can be avoided by simply being careful.
7. Secure the rim halves together with the bolts and nuts provided with the wheel. Again, be careful to avoid pinching the tube and/or valve stem.
8. Inflate the tire to 28-30 psi. Do not inflate the tire over 32 psi.

Figure S.3.B.1 Nose gear wheel and tire



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Installing the Nose Wheel

Now you are ready to finish the axle and install the nose wheel.

Steps...

1. Grease the two wheel bearings with a quality grease. Make sure the grease is pushed all the way through the bearings.
2. Slide the axle, Z02E295, through the nose wheel bearings.
3. Slide the nose wheel and axle between the nose wheel fork (GM014-4-1). Push the axle bushings through the fork to secure the axle.

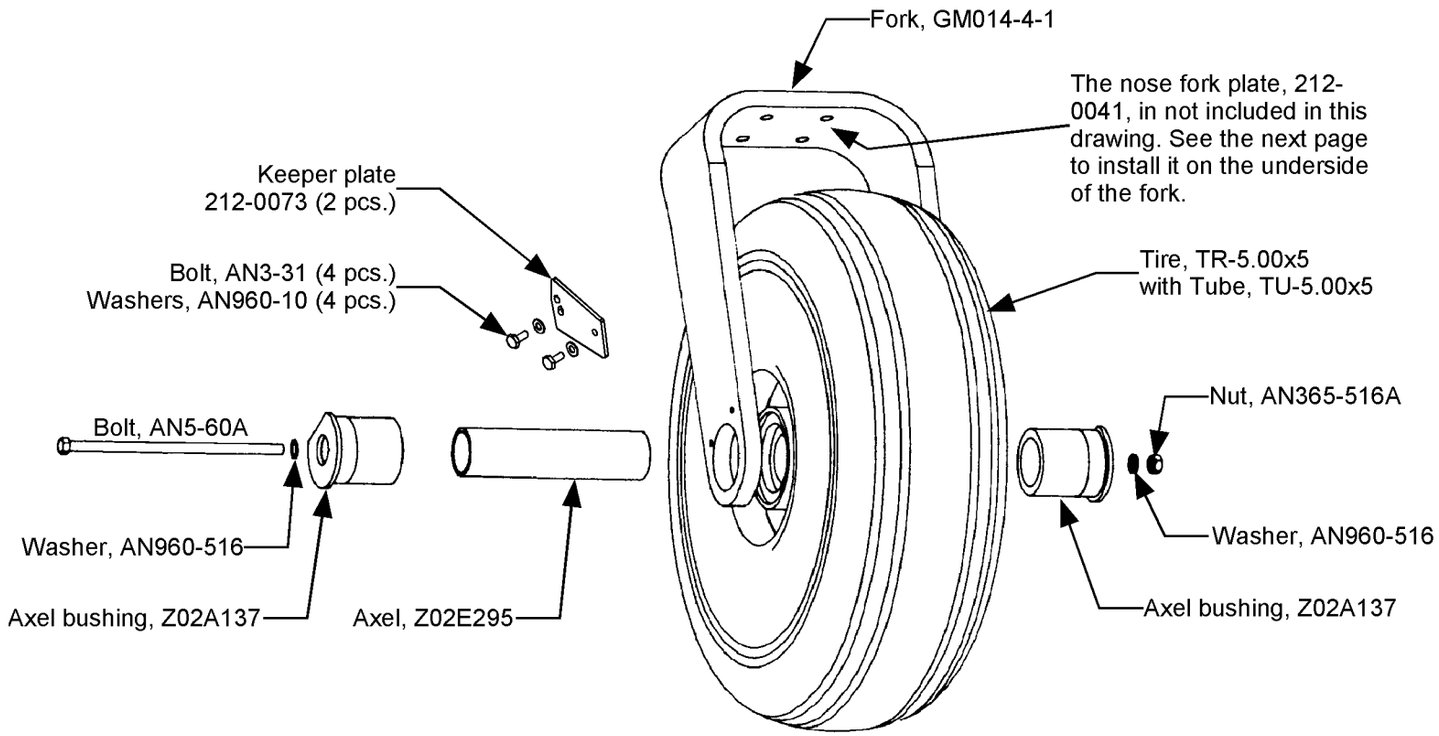
   The bushings are included in the GM483-A assembly.
4. Slide an AN5-60A bolt through the entire nose wheel assembly, using a washer, AN960-516 on each side and tighten with an AN365-516A locknut.

   Tighten the locknut only enough so when the tire is spun by hand it will only complete one revolution. (This is easier when the fork is mounted to the nose gear strut).

5. Install the keeper plates (212-0073), one on each side of the fork.

   Note: Use Loctite 242 on the bolts attaching each keeper plate.

Figure S.3.B.2 Installing the nose wheel to the fork



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Connecting the Fork to the Nose Gear Strut

Now you need to prepare the nose fork. This must be done before permanently attaching the wheel and tire.

Steps...

1. Install the four nutplates, K1000-5 to the underside of the nose fork plate, 212-0041 using rivets AN426AD-4-4.

   The purpose of these nutplates is to allow you to remove the wheel assembly without taking off the wheel pant.

2. Attach the fork, GM014-4-1, and nose gear fairing mounting plate, 3455, to the nose gear strut using screws, AN525-10R6, inserted from the bottom of the fork. Refer to the photos on the next page in Figure S.3.B.4.

Note: Use Loctite 242 on each of the screws AN525-10R6.

Figure S.3.B.3 Completing the nose fork and plate

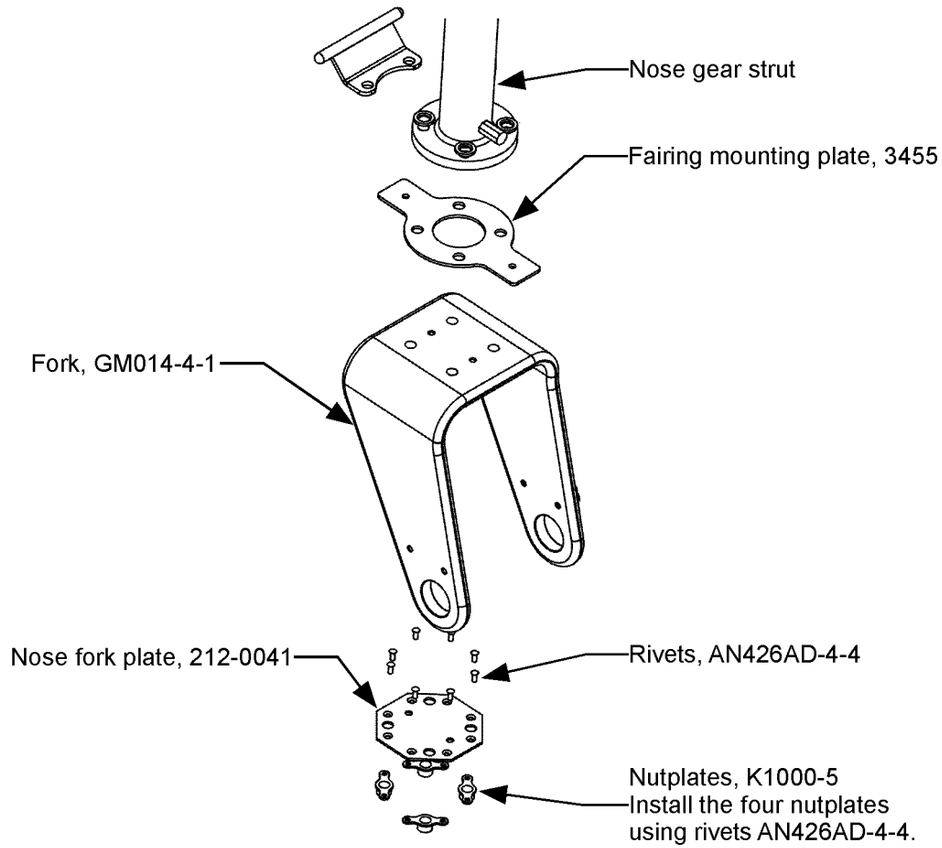

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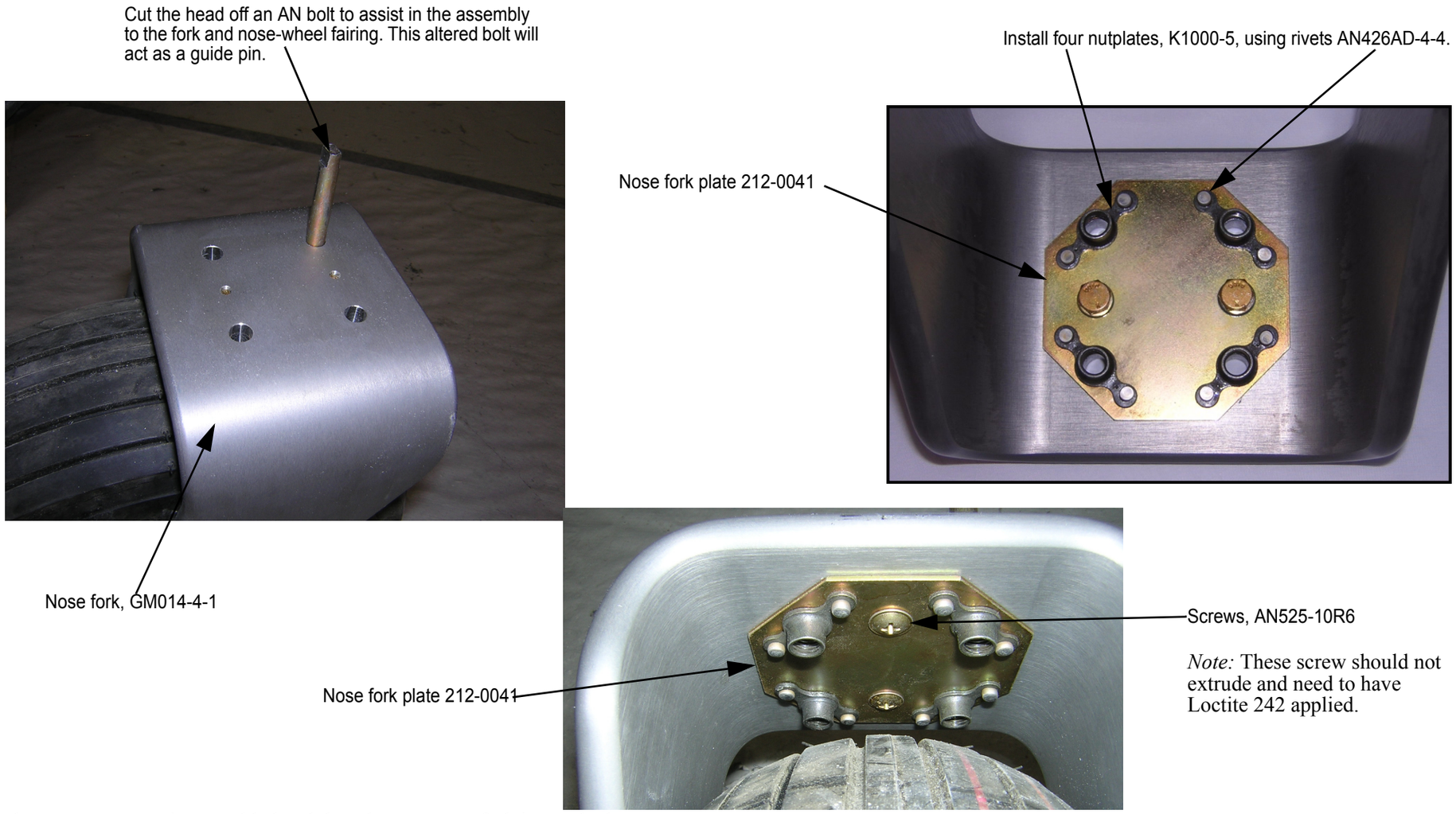
Figure S.3.B.4 Installing the nose fork plate



In the next section the nose gear strut is assembled and then the nose gear fork is attached.

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S.3.C Assembling the Nose Gear Strut

The nose gear strut mounts on two spherical bearings, the bearing blocks, that are bolted to the engine mount. Then the drag link secures the nose gear strut in place.

Installing the Bearing Blocks

Steps...

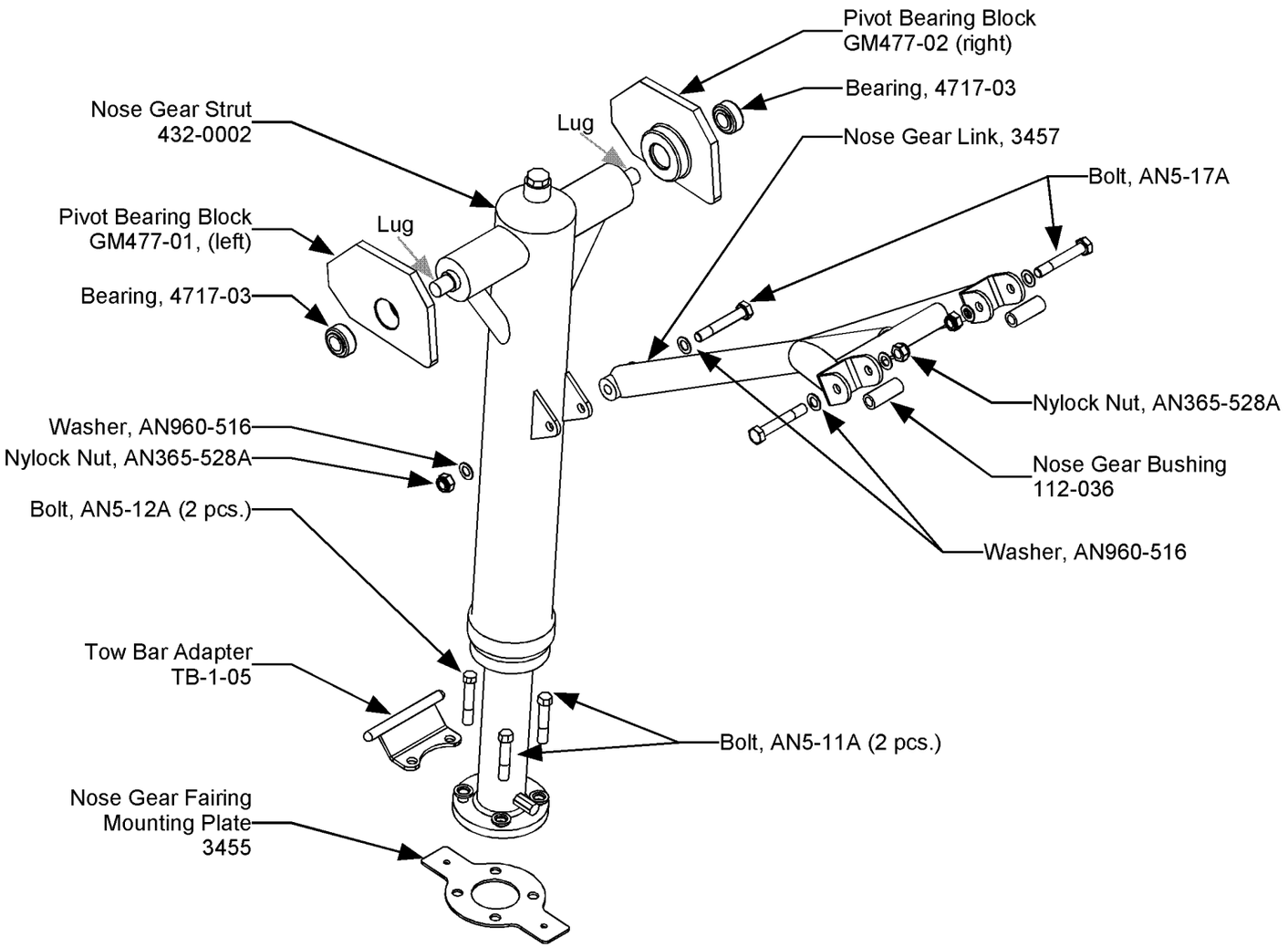
1. Slide the pivot bearing blocks (GM477-01(left) and GM-477-02(right)) onto the lugs of the nose gear strut. Make sure they are on the correct sides, left and right.

   Make sure the lugs are clean and free of paint or debris. You may need to lightly polish the lugs with an ultra-fine Scotch Brite pad (7448).

   Refer to Figure S.3.C.1 to make sure your bearing blocks are oriented correctly.

Note: If the AN bolts (AN5-12A and AN5-11A) used to connect the strut to the nose gear fairing mounting plate and the nose gear fork are not long enough, AN5-13A bolts can be substituted. But the bolts should not protrude through the nose gear fork!

Figure S.3.C.1 Detail view of the nose-gear strut



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S.3.D Installing the Drag Link

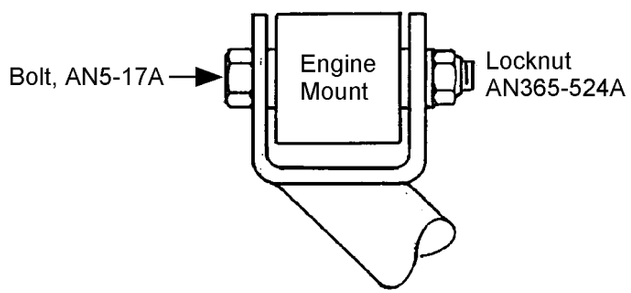
The drag link secures the nose gear in position. The drag link should be attached to the engine mount first and then to the strut. After the drag link is installed, then the angle, or rake, can be set.

Steps...

1. Install the drag link using the hardware in the figures on this page. You have been supplied with extra washers should you need to stack the washers differently in order to make the drag link fit.

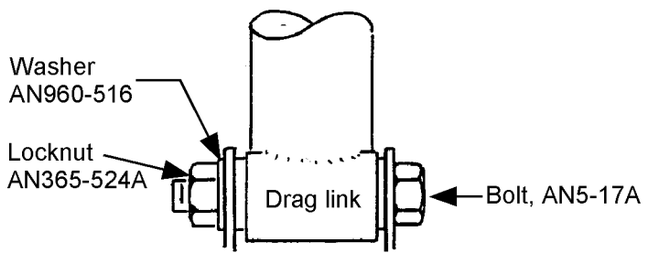
   Attach the drag link to the engine mount using the following diagram.

Figure S.3.D.1 Drag link to engine mount



2. Next attach the drag link to the strut using the following diagram.

Figure S.3.D.2 Drag link to strut



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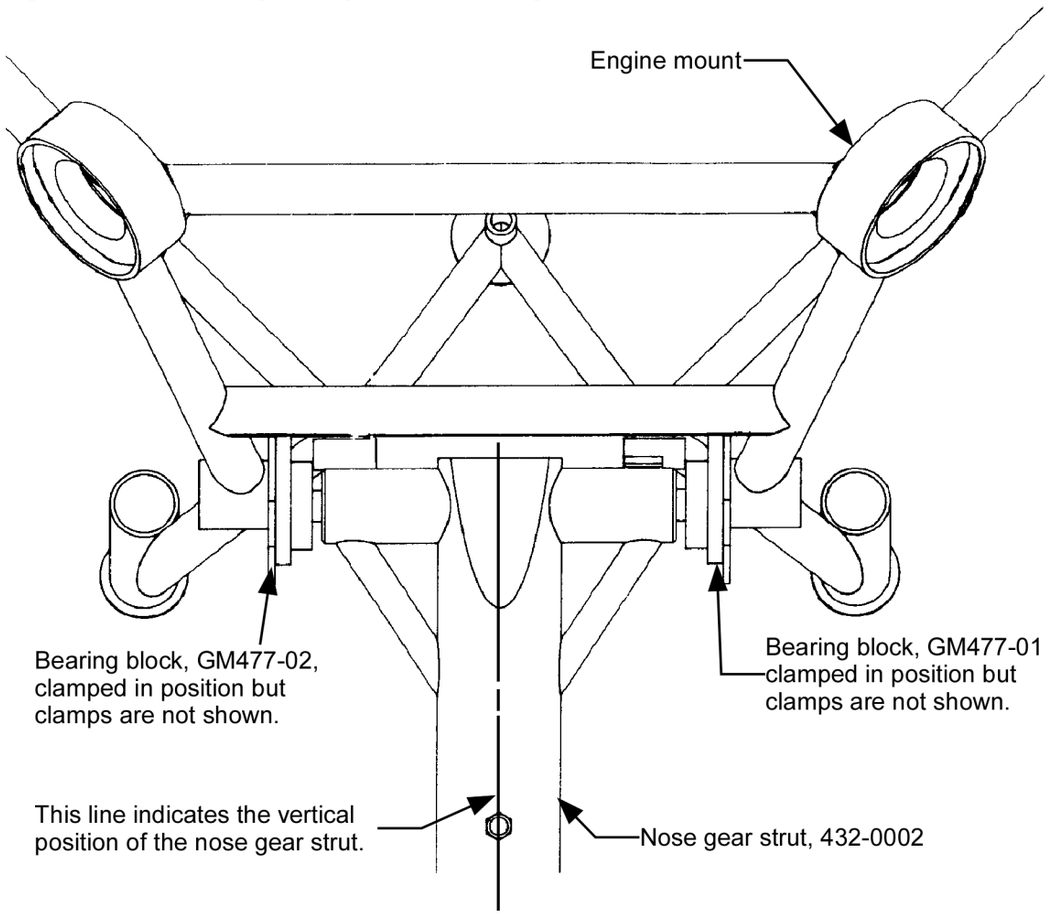
3. Use a of couple small C-clamps to temporarily secure the nose gear bearing blocks to the engine mount plates.

   The bearing blocks and plates have roughly the same shape. The plate surfaces on the engine mount will probably be uneven. This is an unavoidable consequence of the welding procedure. Do not forcibly clamp the bearing blocks against the engine mount plate. Use light clamping pressure, just enough to hold the bearing blocks in place.

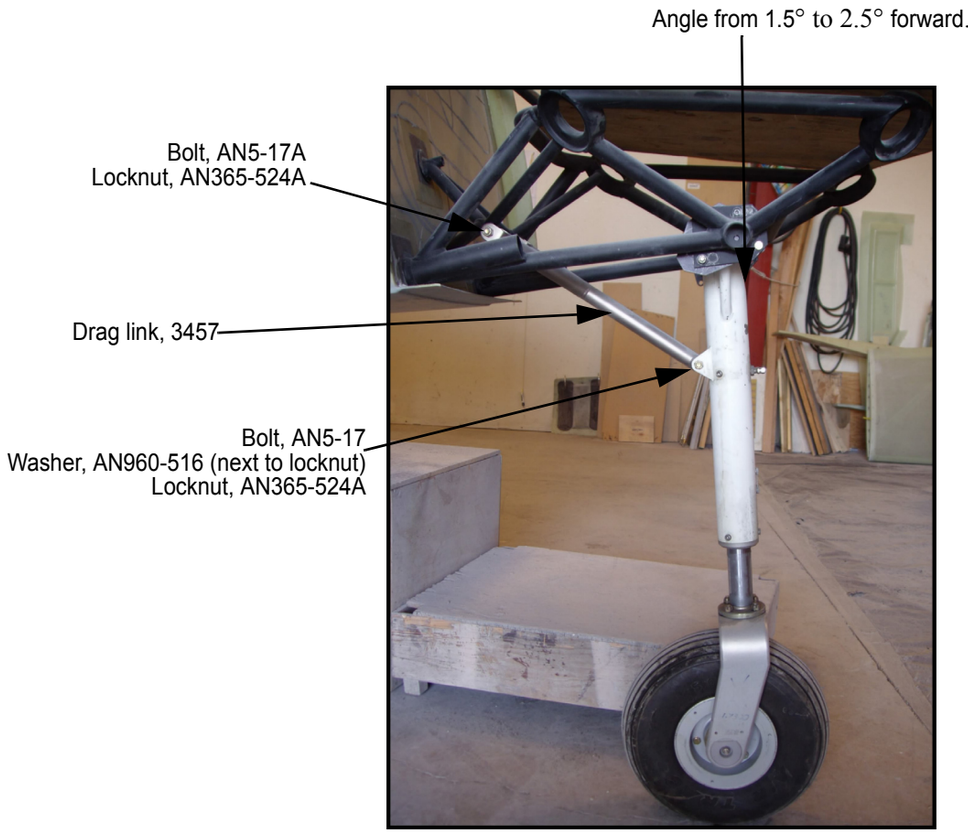
Figure S.3.D.3 Clamping bearing blocks to the engine mount



4. Check the fore/aft angle of the nose gear strut. The strut should be angled +2.0° forward, ±0.5°.

   Loosen your "C" clamps and adjust the bearing blocks fore or aft to change the strut angle.

Figure S.3.D.4 Installing the drag link



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Make sure the nose gear bearing blocks are securely clamped in position.

5. Drill the mounting holes for the nose gear bearing blocks.

   More recent engine mounts have predrilled pilot holes in the engine mount plates. Use these holes as guides and drill in the following order

   Hole sizes:

   Bottom - two holes, 1/4" (6 mm) diameter

   Top - one hole, 3/16" (5 mm) diameter

   Use the dimensions in Figure S.3.D.5 to find the hole centers.

6. Bolt the bearing blocks in place.

   Remember, bolting the bearing blocks to the engine mount needs to be completed carefully. The uneven mounting surfaces may create a gap between the bearing block and the engine mount plate. Slip a thin washer, AN960-10L or AN960-416L, between these surfaces at one or two of the bolt locations. These washers will fill the gaps and prevent the bearing blocks from bending when you tighten the bolts.

Figure S.3.D.5 Locations for drilling holes in bearing blocks

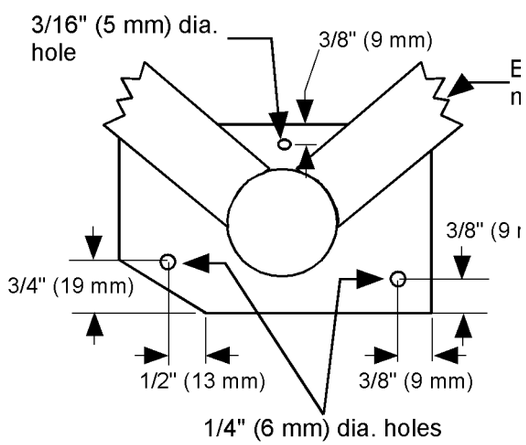
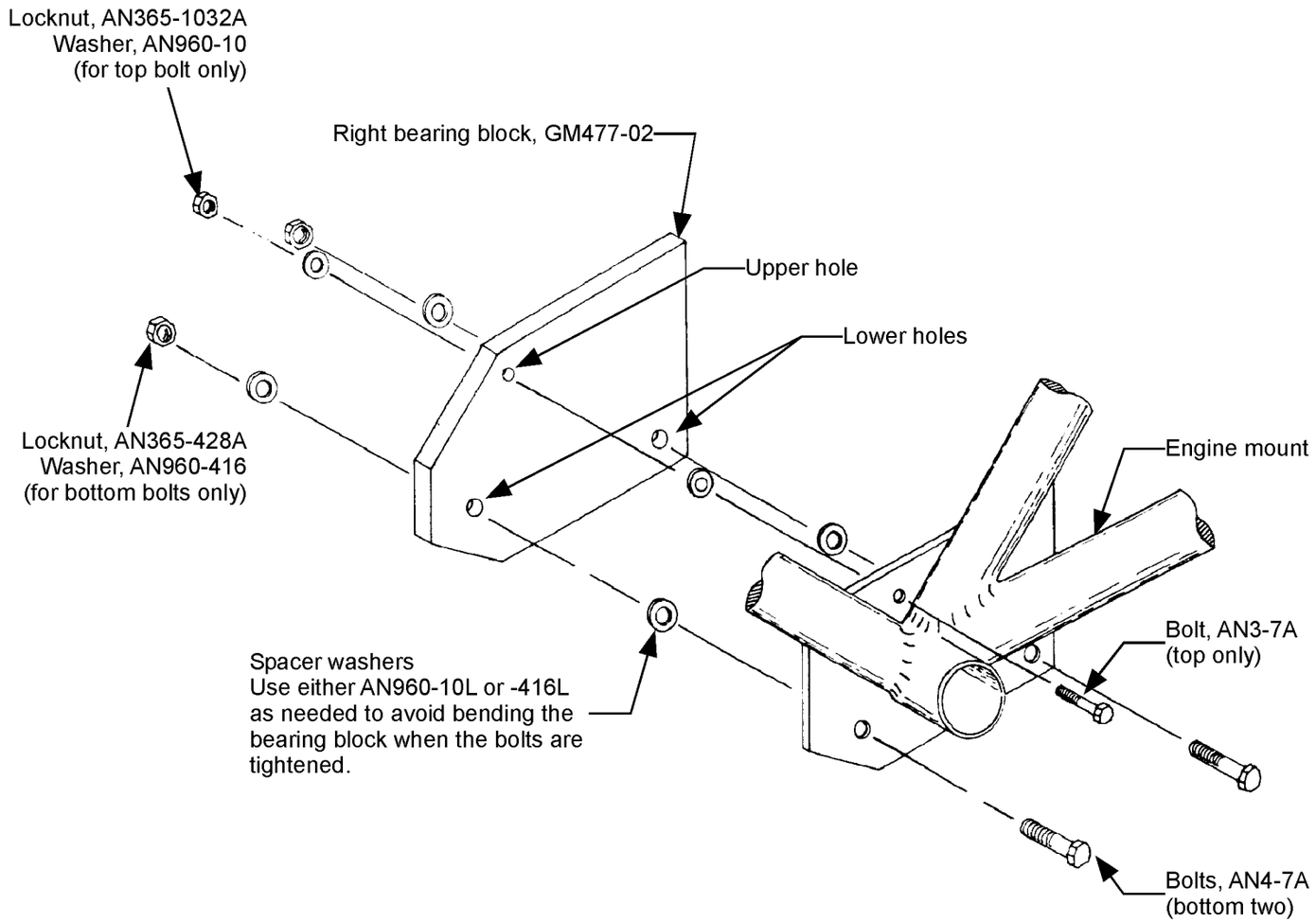


Figure S.3.D.6 Bolting the bearing blocks to the engine mount



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S.3.E Installing the Nose Gear Wheel Pant

In this section you will install the nose gear wheel pant only.

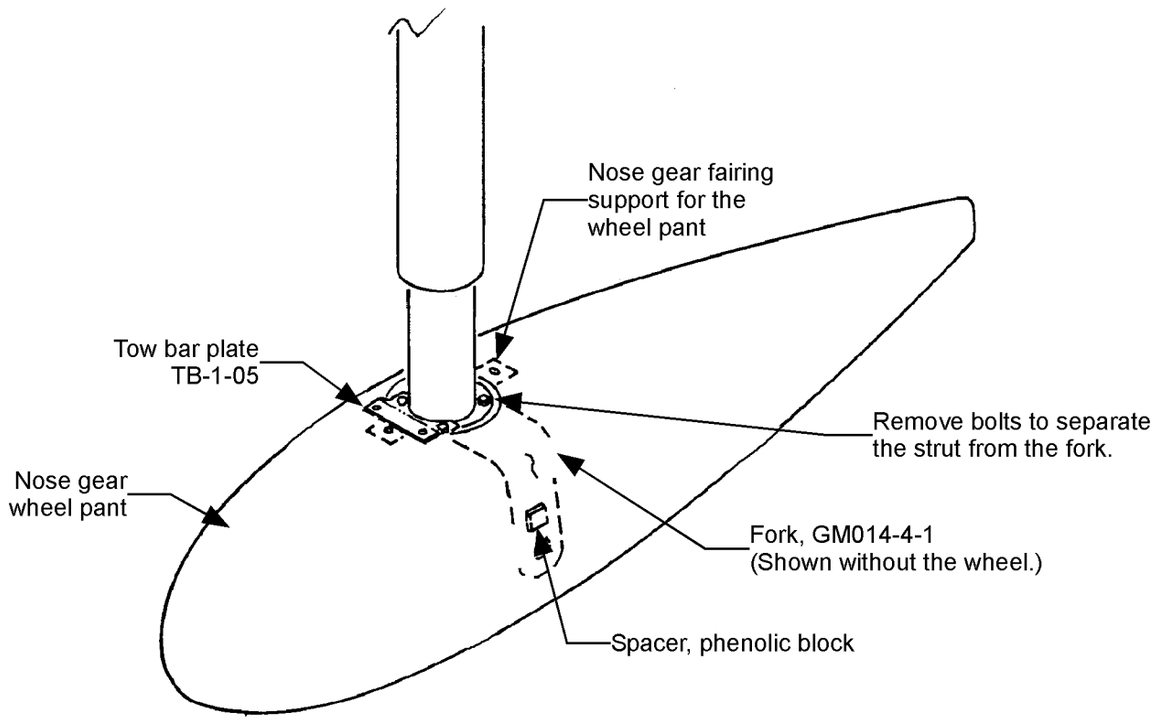
There is also a gear-leg fairing that covers the nose gear strut. It is not installed at this time since the cowling needs to be in place in order to complete the nose gear's leg fairing.

Steps...

1. Remove the four bolts securing the fork to the strut.

   This separates the fork from the strut so you can position the nose gear fairing more easily.

Figure S.3.E.1 Nose gear wheel pant



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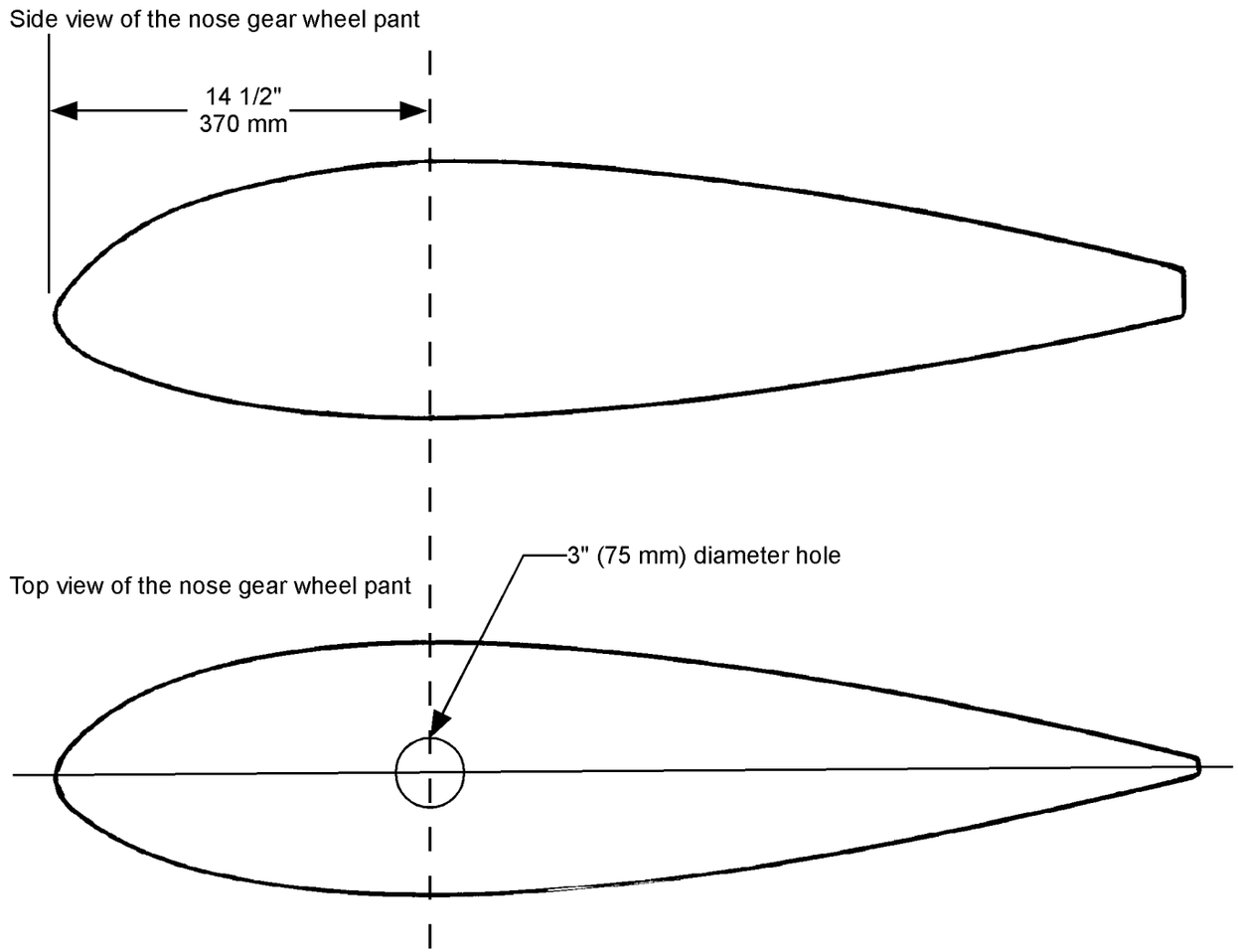
2. Drill a 3" (75 mm) diameter hole in the top center of the nose gear wheel pant.

   Center the hole on:

   - 14 1/2" (362 mm) aft of the tip of the nose gear wheel pant
   - Width wise on the centerline

   See Figure S.3.E.2 at the right.

Figure S.3.E.2 Locating the wheel pant hole



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Installing the Mounting Bracket

Now you will install the mounting bracket for the nose gear wheel pant.

Steps...

1. Temporarily superglue the nose gear wheel pant mounting bracket to the inside of the nose gear wheel pant.

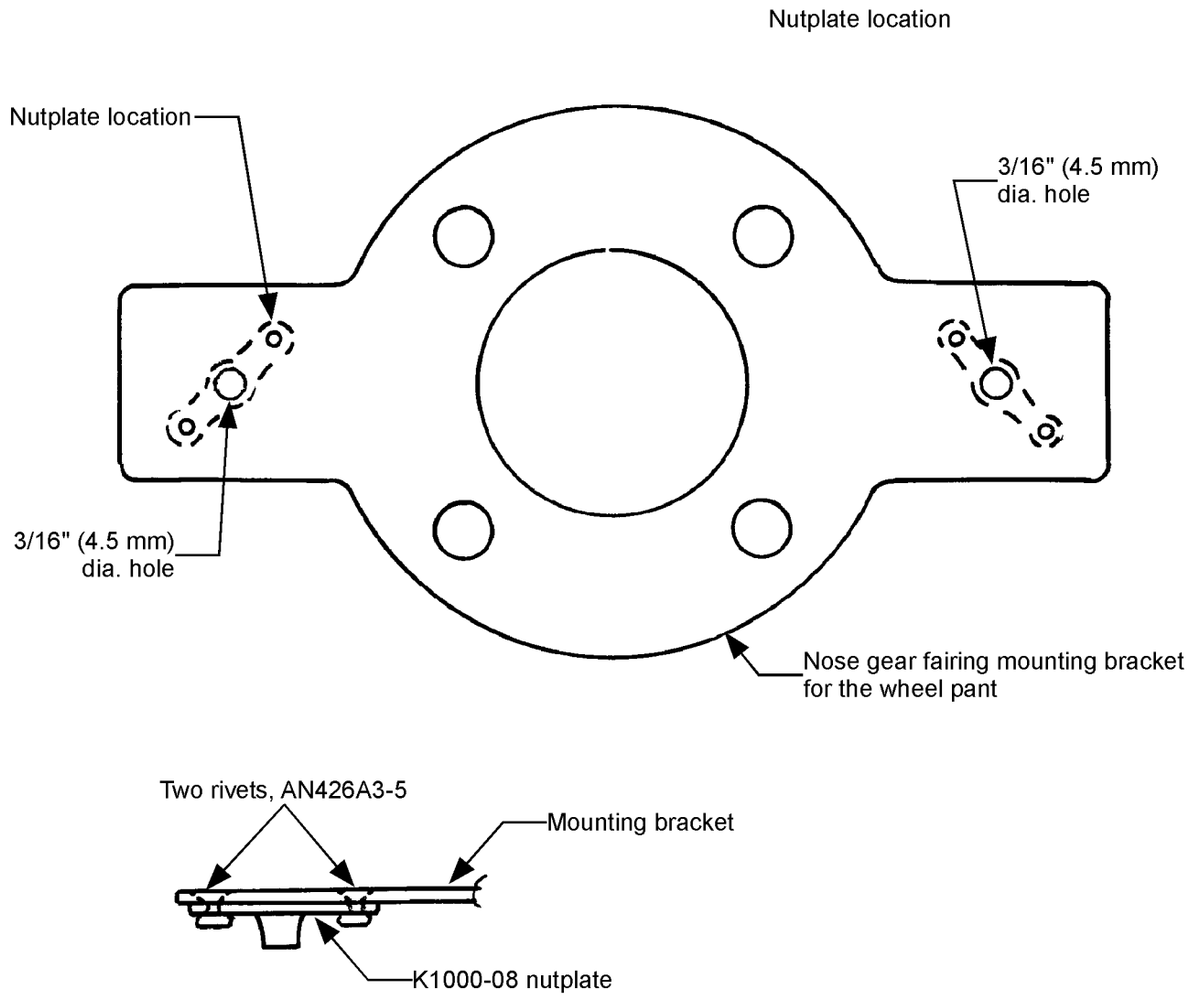
   Position the mounting bracket by these guidelines:

   - The mounting bracket must centered on the centerline of the wheel pant.
   - The mounting bracket should be centered on the 3" (75 mm) diameter hole.
2. Match drill two 3/16" (4.5 mm) diameter holes through the wheel pant using the two holes in the mounting bracket for alignment.

   Check that both holes are centered on the centerline of the wheel pant before you drill.
3. Remove the mounting bracket.
4. Install two nutplates, K1000-08, using two rivets, AN426A3-5, per nutplate.
5. Secure the wheel pant to the bracket using two screws, AN526-832-R8.
6. Reinstall this assembly using the four bolts you removed in step 1.

Now the completed nose gear wheel assembly with the wheel pant is connected to the gas strut.

Figure S.3.E.3 Drilling and installing the mounting bracket



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S.3.F Aligning the Nose Wheel Pant

The wheel pant should be approximately level but the alignment of the nose gear wheel pant is not critical. Contrary to the main gear wheel pants you don't have to worry about ground clearance during take-off rotation.

Steps...

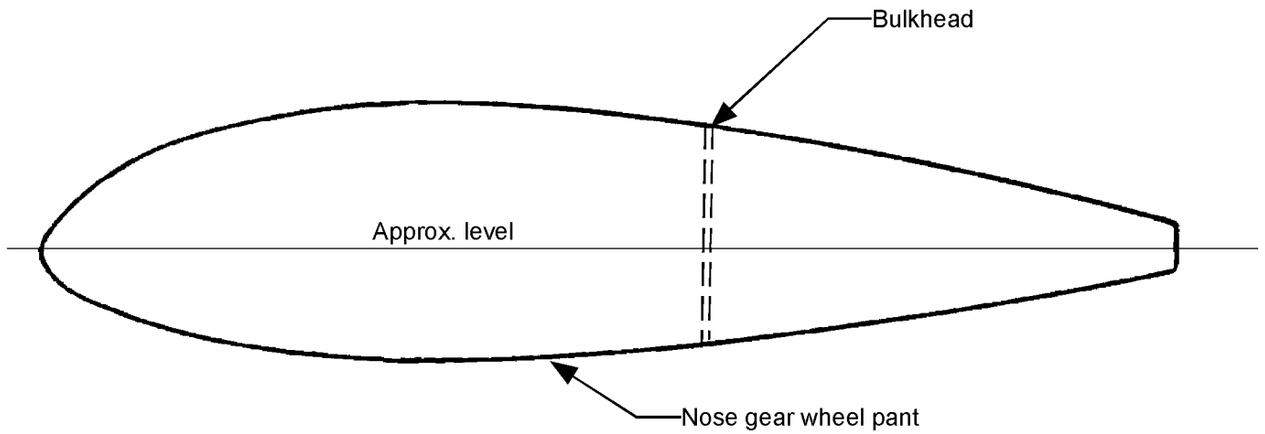
1. Align the nose gear wheel pant to where it "looks right". Perhaps the easiest method of aligning this wheel pant is to stand back and look at it from the side and move it until it looks right.
2. Make four spacers from pieces of 1/4" (3 mm) phenolic glued together. Sand as necessary. The piece of phenolic should be approximately. 3/4" x 3/4" (20 mm x 20 mm).

   The spacers should be of equal thickness on each side. The spacers should be located approximately 2" (50 mm) above the axle. Perhaps the easiest method of determining the thickness of the spacer is to build up with pieces of tongue depressor until you have the right thickness to fill the space between the fork and the wheel pant.
3. Install the phenolic spacers into the wheel pant by temporarily supergluing them to the wheel pant to maintain alignment.
4. Drill with a #21 drill through the spacer and the fork. Remove the wheel pant and tap the fork with a 10-32 tap.
5. Sand the bonding surfaces of the wheel pant and the piece of phenolic. Bond the piece of phenolic to the wheel pant with epoxy. Make sure the hole in the piece of phenolic and the wheel pant are aligned.

   Check for adequate clearance between the tire and the wheel pant.
6. Install a bulkhead in the aft portion of the nose gear wheel pant to prevent dirt buildup in the back of the wheel pant.

   Place it vertically and at least 2" (50 mm) aft of the tire. Construct the bulkhead from 2 PPS prepreg. Install with micro and secure with 2-BID on the front side.
7. Drill a 1/8" (3 mm) diameter vent hole in the about the center of the bulkhead.

Figure S.3.F.1 Bulkhead in wheel pant



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S.3.G Installing the Firewall Blanket

The protective barrier on the firewall of the Lancair ES, the firewall blanket, is composed of a silicon matrix with a ceramic weave and an aluminized surface.

We use this material because of its lightweight, excellent fire resistance, its simplicity and good looks. The blanket is premolded to the firewall to protect the exhaust tunnels.

Steps...

1. Fit the firewall flame blanket by holding it against the firewall. Make sure the fit meets the following criteria:
   - Does the blanket fit snugly into the exhaust tunnels?
   - Do the edges of the blanket come within 1/4" (6 mm) of the cowling flanges?

   When you've obtained this fit, you are ready to bond the blanket to the firewall.
2. Clean the forward face of the firewall with acetone.
3. Apply a bead of high temperature silicon caulk (available at most auto parts stores) to the forward face of the firewall where the blanket will be bonded. Carefully press the firewall blanket into position.

The nose gear's leg fairing is installed after the engine and propeller are installed and the cowling is fitted. Refer to *Chapter 26 Firewall Forward – Continental IO-550N* in the *ES Assembly Manual*. The cowling is fit starting on page 26.46 toward the end of the chapter.

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