

# Main Gear Doors (Apr 2009)

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A few thoughts to consider if you are having a problem with the main gear doors retracting and/or fitting properly on your Comanche – Read section 6-39 (below) from the Single Comanche Service Manual; see section 7-30 in the TCSM. There can be multiple issues to deal with while restoring the proper fit and adjustment of these doors.

## 6-39: Adjustment of Main Landing Gear Door

- a. Ascertain that there is an all-around even clearance between the door and wing panel when the door is in the retracted position.
- b. Adjust by loosening the door hinge screws in the wing panel, repositioning the door and retightening the screws.
- c. The gear door actuating rods should be adjusted so that a nine-pound weight suspended at the center line of the inboard edge of the door, in the retracted position, will create a 0.125 of an inch deflection from the wing contour at the inboard edge of the door.

*Per "c" above; refer to **note c**.*

To correct "a" and "b" above, I would like to pass on two additional tricks. First, and important to consider, there should be minimum looseness in the gear door hinges. The Piper original and replacement hinges use a pin diameter of 0.116 inches in a 0.125-inch hinge bore; that makes for a naturally loose condition. Here's an inexpensive remedy to tighten up the looseness without the laborious operation of replacing the hinges. Webco Aircraft has already accommodated this first trick in their PMA hinges.

**First Trick:** Remove the AN4 bolt from the upper end of the gear door retraction rod. With the airplane on jacks and the tail tied to an adequate weight, retract the landing gear and remove the offending door. The door removal is done with the gear retracted because that way the strut is away from the area where you need access with your hands and tools to remove the hardware. With the door removed and on a suitable work area, drive the old 0.116-inch diameter pin out of the hinge. Mount the hinge half in a vise, make sure it is straight, and then drill through the pin bore using a **long** #30 drill bit with some lubricant; repeat for the door portion of the hinge. Procure a 1/8-inch (0.125-inch) diameter tempered stainless steel welding rod and cut a piece exactly four inches long; deburr and chamfer the ends, and you now have a new hinge pin which will greatly reduce that loose feeling. Apply a little grease to the pin and assemble the hinge. Close both ends slightly to retain the pin; don't get aggressive with this, a little will do.



*“Ascertain that there is an all around even clearance between the door and wing panel when the door is in the retracted position”. This is a good example illustrating a poor job of fitting the door after a repair.*

Temporarily reinstall the door using the hardware in the center position hole only. Note: Use #10 AN525 washer head screws with a shank length adequate to capture the total thickness of the rib, hinge, and the skin. Keep in mind that you will need to use A MINIMUM of two #10 thick washers at each position; otherwise the nut will bottom against the shank portion of the screw before clamping the assembly (this is a very common condition from the factory). Don't use fully-threaded screws or bolts here.

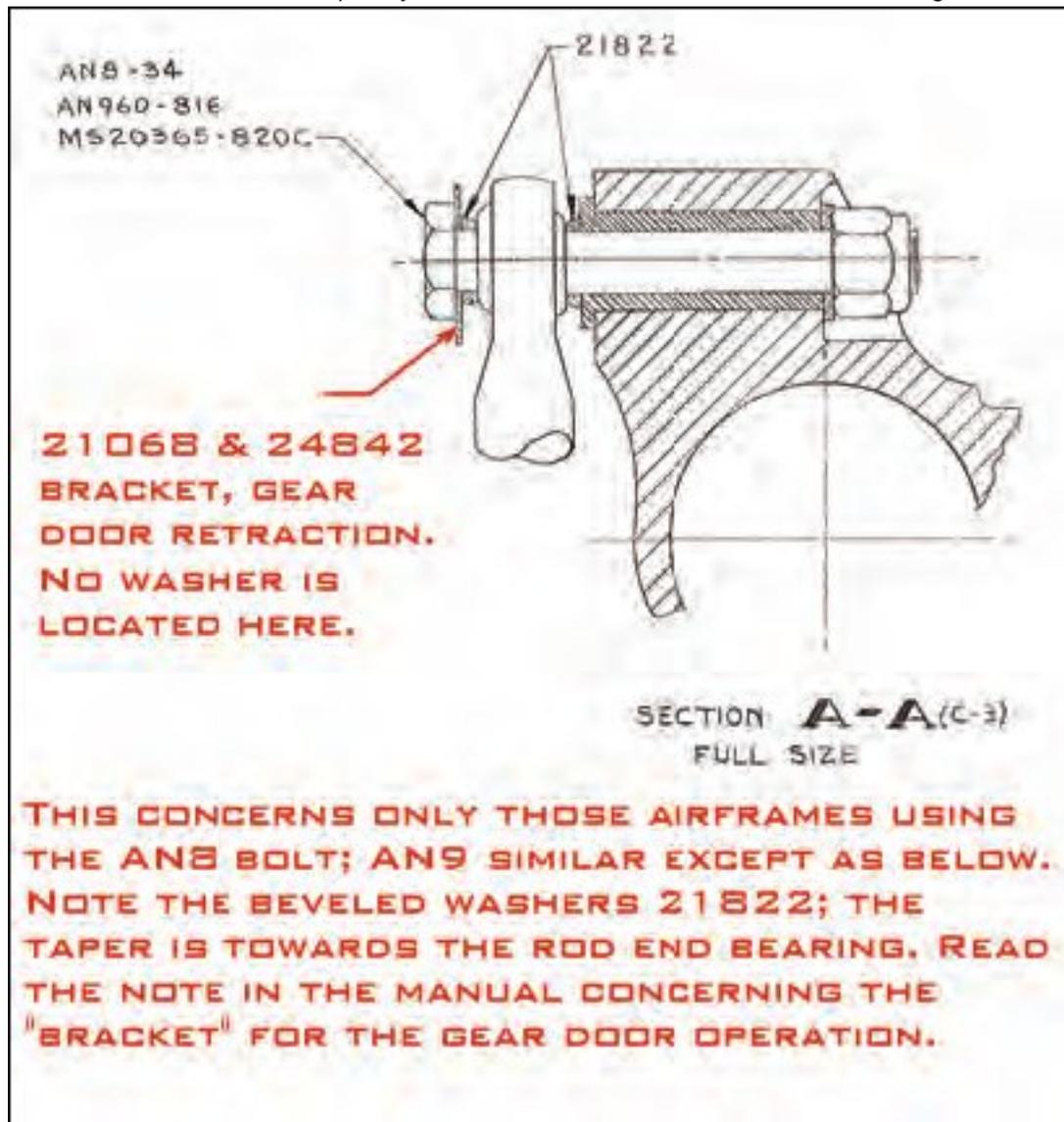
**Second Trick:** Position the door in the opening with a little aft bias (see note below). Using a fine-line marker, mark on the hinge through the holes in the wing skin where the hardware was removed; again remove the door. Using a 1/8-inch carbide burr and a high-speed rotary tool, or rat-tailed file, enlarge the fore and aft holes in the hinge to the marked positions. Please don't drill those holes larger; you may end up with a mess.



*If you have a bent bracket, now is the time to rectify that condition.*



This bolt (left) is installed backward causing the nut to interfere with the torque link which then does not allow the strut to extend completely. The result is shown below, a torn tab at the gear door up-stop.



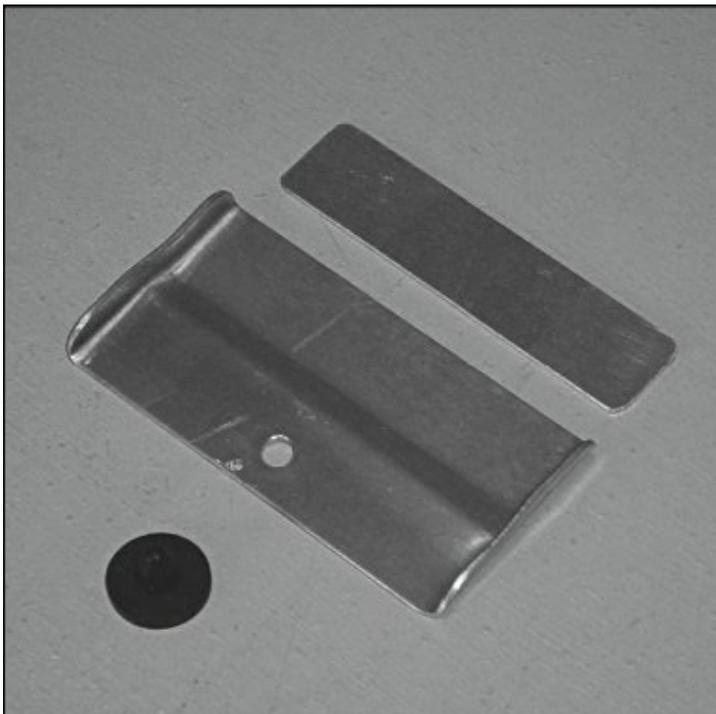
Section A-A (above) is a typical Piper assembly drawing. Check the torque on the hardware where the long bolt attaches the rod end bearing to the strut. If that bolt, either AN8 or AN9, is allowed to rotate from inadequate torque, then the gear door retraction bracket likewise can move during the retraction operation, thereby disallowing proper gear door adjustment. Also look for a bent bracket which is quite common after 45 years of service. The torque values for the long bolts are: AN8 = 480-690 in-lbs dry; AN9 = 800-1,000 in-lbs dry.

**Note:** Understand that as the door is closing, the natural tendency for it is to be pulled forward due to the geometry of the actuating linkage and the force imposed by the nine-pound load mentioned in 6-39, c. Keep that in mind when you adjust the door position, i.e., use a rearward bias. Trick number one helps with this also.

**Note c:** The 0.125-inch deflection means exactly that; you must have some deflection or the closure load on the door is excessive. Excessive, and you may have a bent bracket, and stress the gear door near the hinge causing a crack, which is why you typically see that ugly patch repair at that location, which appears in the first photo.

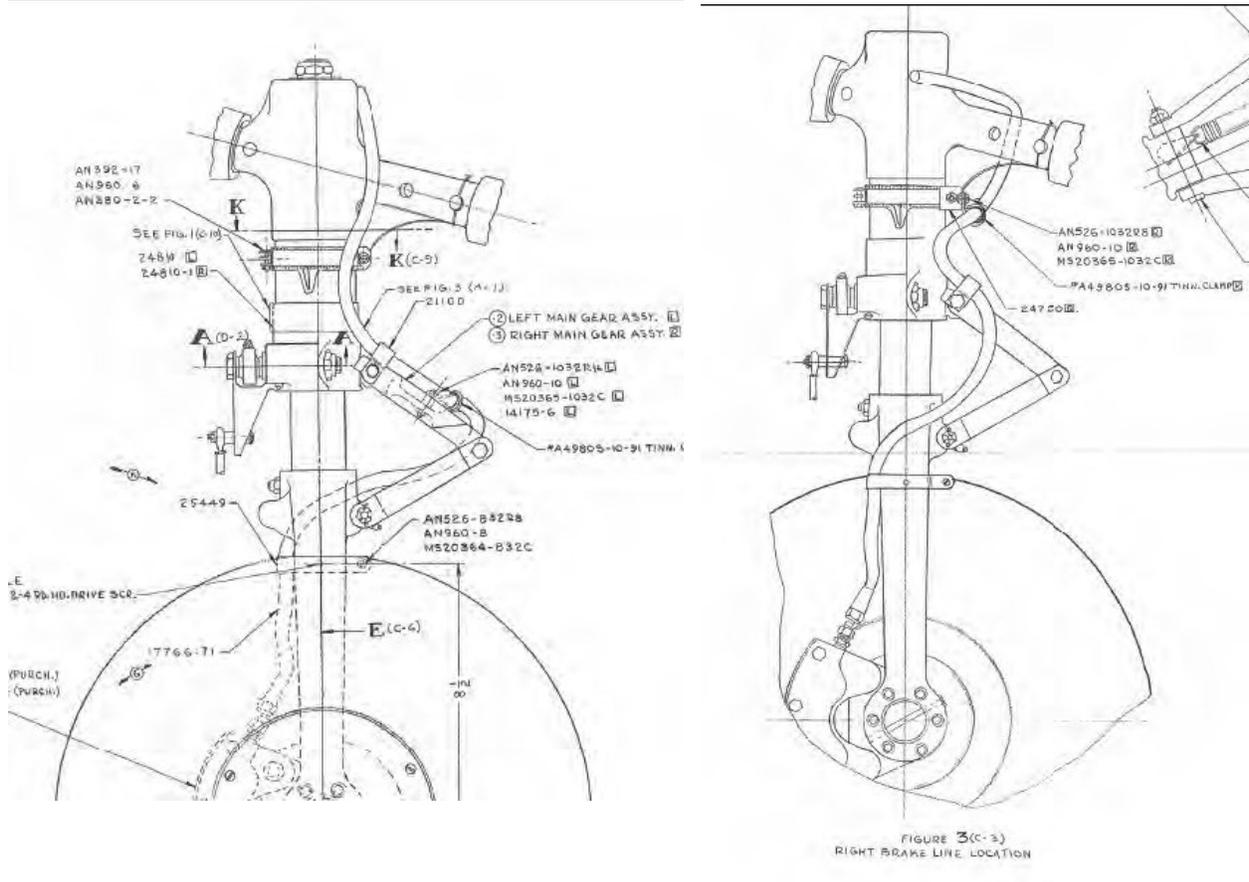


If you plan on doing a bunch of gear door adjustments, here is a tool suggestion. Purchase an Easy-Adjust Threaded Connecting Rod, four-inch overall length, with ¼-inch -28 Threaded Female Ends. This rod is aluminum, hex shaped, and has a left-hand and a right-hand threaded end. Also purchase male threaded rod end bearings and the jamb nuts, one each LH and RH. Use this tool in place of the retraction rod for the adjustment mentioned in 6-39, c. Mimic the length for each retraction rod and install the retraction rod with the correct length preset. You'll spend about \$30 for materials on this tool.

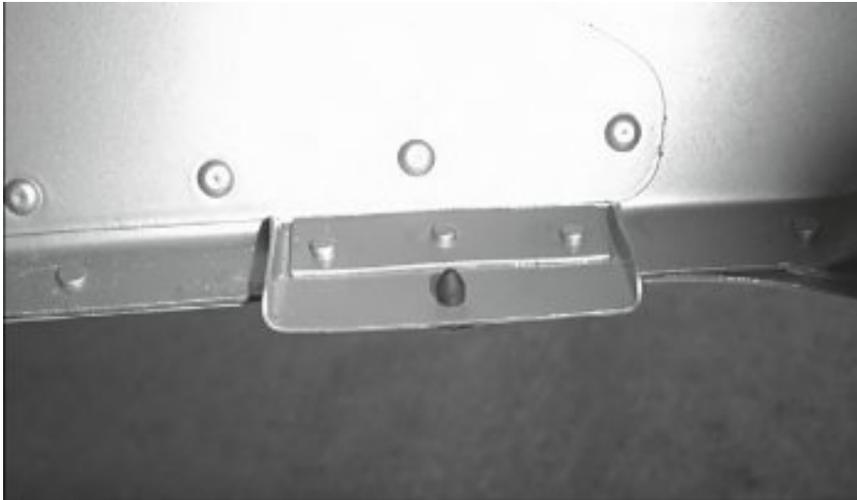


*Fabricated main gear door stop plate with doubler. The 3/16-inch hole is for the rubber stem bumper.*

Another problem seen in the main gear door area is a damaged, broken, or missing door stop bracket. The main landing gear door stop is a small plate which I have named the "main gear door stop plate." It is riveted to the wing at the rear of the gear door opening. Its purpose is to help align the retracted gear door flush with the lower wing skin. The thin gear door stem bumper P/N 453-887 (in the twins it's P/N 453-641) is also located here; without that bumper you will chafe the aluminum. And please don't drill a larger hole to accommodate whatever bumper you can find at the hardware store. Let me know if you need the bumpers; I have both the thick and thin styles. These bumpers are included in my landing gear wiring replacement kits, and the landing gear push/pull cables (conduits) installation kits.



Left-side brake line location (left) and right-side brake line location (right) from typical Piper assembly drawing. Note this routing applies to the single-fork gear which has the brake calliper on the inboard side of the wheel.



*Plate, main gear door stop repair showing added doubler*

The most common cause of damage to this plate is from improper routing of the brake hose. Possibly when the brake hose is removed and not properly routed and secured when reinstalled, it can foul that plate upon gear retraction. See the damaged plate (photo on page 25, top and the drawing insets pictured top right).

Another less common condition is improper orientation of the AN4 bolt at the gear fork where the strut oleo tube fits. If that bolt head is not aft, the lower torque link will touch the bolt. Then the oleo will not fully extend and the pivot between the torque links will be too far aft and consequently contact the plate and bend it upon retraction. This can be assembled incorrectly after tube replacement or other service/repair. Another cause is retracting the gear with a deflated/compressed oleo.

This plate is not to be found by me in the parts catalogs (I have wasted way too much time looking; but it has to be there!), and one would assume it would be like so many other Comanche parts, NLA. So I had a fabricating shop make a set of forming dies to duplicate the plate including the joggle; I felt a doubler was a good addition. Since this would be an unapproved part from me, it might be a good idea if you did the "owner-produced" route by fabricating your own - that's called a disclaimer in legal parlance.

If you have any questions, you can contact me at (239) 593-6944, (239) 404-7524 (cell) or by e-mail at [mkurke@comanhegear.com](mailto:mkurke@comanhegear.com).

