REVISION LIST

CHAPTER 16: HYDRAULIC SYSTEM COMPLETION

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

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

PAGE(S) AFFECTED	REVISION # & DATE	ACTION	DESCRIPTION
16-1 through 16-4	0/02-15-02	None	Current revision is correct
16-5	1/09-18-02	R&R	Correction of Fig. 16:A:3
16-6 through 16-7	1/09-18-02	R&R	Text correction
16-8	1/09-18-02	R&R	Correction of Fig. 16:B:2
16-9 through 16-16	0/02-15-02	None	Current revision is correct
16-17	1/09-18-02	R&R	Correction of Fig. 16:H:1
16-18 through 16-22	0/02-15-02	None	Current revision is correct
16-23 through 16-24	1/09-18-02	Add	Fig. 16:N:1 and 16:N:2 Added
16-1	2/06-30-04	R&R	Updated intro. for new hydraulic pump location.
16-3	2/06-30-04	R&R	Updated for new hydraulic pump location.
16-4 through 16-6	2/06-30-04	R&R	Deleted pages.
16-1	3/12-15-04	R&R	Updated table of contents with page numbers.
16-2	3/12-15-04	R&R	Updated parts list.
16-3	3/12-15-04	R&R	Added bolt information used to install pump.
16-4 through 16-6	3/12-15-04	R&R	Added back blank pages to replace deleted pages.
16-8	3/12-15-04	R&R	Added photo and instructions for hydraulic line routing.
16-9	3/12-15-04	R&R	Replaced figure 16:B:3 with photo.
16-17	3/12-15-04	R&R	Replaced figure 16:H:1 with photo.
16-23 through 16-24	3/12-15-04	R	Deleted pages.

PAGE(S) AFFECTED	REVISION # & DATE	ACTION	DESCRIPTION
16-2	4/09-30-06	R&R	Updated parts list.
16-3	4/09-30-06	R&R	Updated fuel pump mount.
16-9	6/08-10-07	R&R	Corrected hydraulic fittings.

Chapter 16: Hydraulic Systems Completion

1. INTRODUCTION

In this chapter you will complete the hydraulics installation. This installation can be divided into three sections.

1. The first section is that portion of the hydraulics located between the main and aft spar. This section was installed in chapter 3.

2. The second section is that portion of the hydraulics aft of the aft spar. It includes the hydraulic pump which installs aft of the co-pilot's seat back. This will be completed in section A of this chapter.

3. The final portion is that forward of the main spar. It includes the dump valve and the nose gear hydraulics. This will be completed in section B of this chapter.

Prior to actually running the hydraulics, the system is adjusted. The gear legs are adjusted to the up stops. Note that the up stops are mechanical stops. Both in the up and down position the hydraulic system will continue to exert a force against the stops. The gear doors are also adjusted. Prior to hydraulic operation the system is checked by moving all parts by hand. These adjustments are in section C, D and E of this chapter.

The next few sections include wiring and adjustments of the pressure switches of the hydraulics.

2. PARTS LIST

#	PART NO. (P/N)	QTY	DESCRIPTION	OPTIONAL ITEM *(not included with kit)*
HYDRAULIC LINES: AFT OF AFT SPAR				
1)	5052	210”	Aluminum Tube 1/4” O.D., .035 wall	
2)	MS21919D6-4	6	Clamp	**Yes
3)	CS125-1032-12GCR	6	Clickbond Stud	**Yes
4)	2611-4x2x2	2	Fitting	
5)	AN816-4D	1	Fitting, Nipple	
6)	AN832-4D	3	Fitting, Union	
7)	637715	1	Hydraulic Pump with Reservoir	
8)	AN365-1032A	6	Nut	**Yes
9)	AN924-4D	3	Nut, Check	
10)	AN818-4D	12	Nut, Coupling	
11)	PS-550	1	Pressure Switch, Low	
12)	016942004 1016	1	Pressure Switch, High	
13)	AN819-4D	12	Sleeve, Coupling	
~~14)~~	~~MS20074-06-05~~	~~2~~	~~Screws~~ (not included in kit)	**Yes
15)	AN960-10	6	Washer	**Yes
16)	4356	1	Mount for hydraulic pump	
HYDRAULIC LINES: FORWARD OF MAIN SPAR				
1)	4275	1	Bracket, Hydraulic Fitting	
2)	4745	1	Premade Line	**Yes
3)	4746	1	Premade Line	**Yes
4)	4747	1	Premade Line	**Yes
5)	4748	1	Hydraulic Line (Short)	
6)	4749	1	Hydraulic Line (Long)	
7)	4862	1	Blueprint #	
8)	5052	144”	Aluminum Tube 1/4” O.D., .035 wall	
9)	HK822-4	1	Fitting, Elbow 90° (Restricted)	
10)	AN822-4	1	Fitting, Elbow 90°	
11)	AN833-4D	3	Fitting, Elbow 90°	
12)	AN833-4	2	Fitting, Elbow 90° (Steel)	
13)	AN924-4D	3	Nut, Coupling	
14)	AN924-4	2	Nut, Coupling (Steel)	

Note:

Optional Parts available through :

(*) Lancair Avionics

(**) Kit Components, Inc.

3. CONSTRUCTION PROCEDURES

A. Hydraulic Lines - Aft of Aft Spar

A 1. Hook up the pre-made lines to the hydraulic pump.

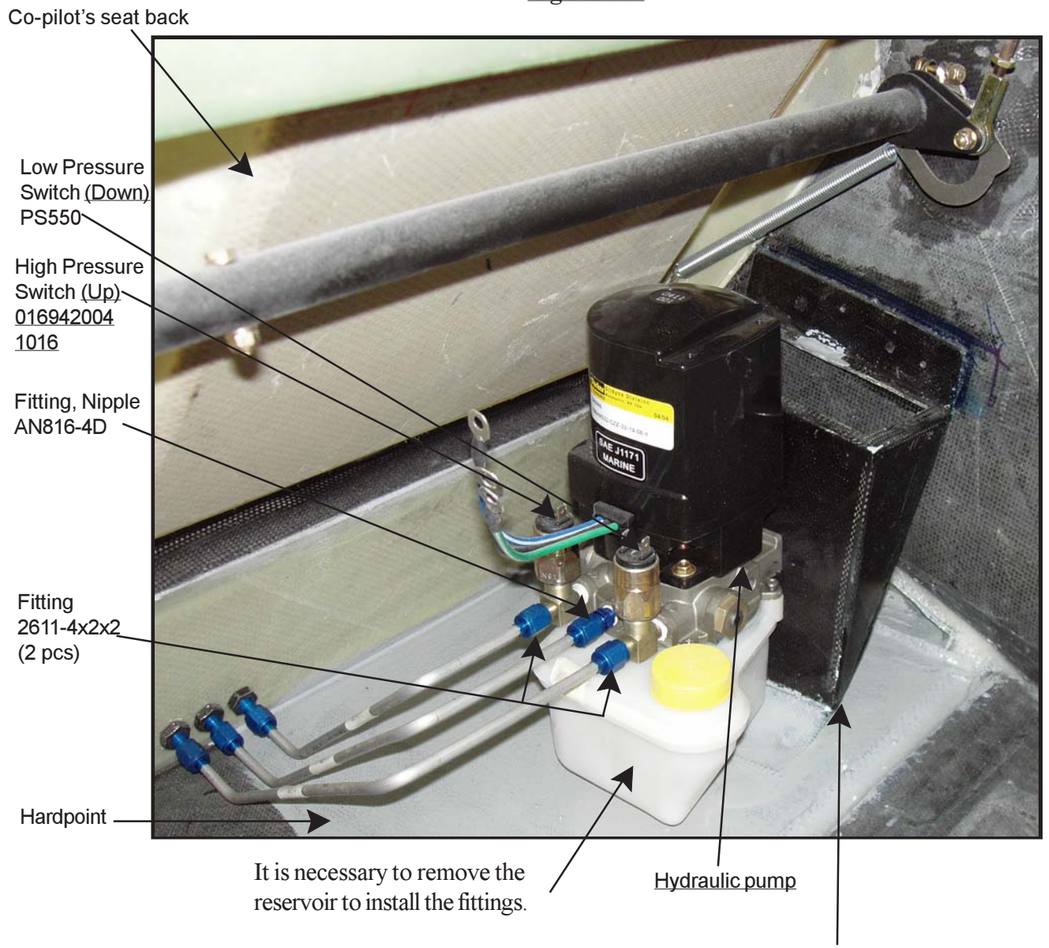
A 2. Now you are ready to locate the pump behind the co-pilot's seat. Locate the pump fore and aft.

A 3. Install the mount (4356) by bonding it in place.

A 4. Attach the pump to the mount. Use two 3/8" 16-course thread bolts 5/8" long to attach the pump to the mount.

Make sure the reservoir clears the floor by 3/8".

Hydraulic Pump Installation behind Copilot Seat
Fig. 16:A:1



INTENTIONALLY LEFT BLANK
DUE TO UPDATE REV. 2/06-30-04 ON PAGE 16-3.

INTENTIONALLY LEFT BLANK
DUE TO UPDATE REV. 2/06-30-04 ON PAGE 16-3.

INTENTIONALLY LEFT BLANK
DUE TO UPDATE REV. 2/06-30-04 ON PAGE 16-3.

INTENTIONALLY LEFT BLANK
DUE TO UPDATE REV. 2/06-30-04 ON PAGE 16-3.

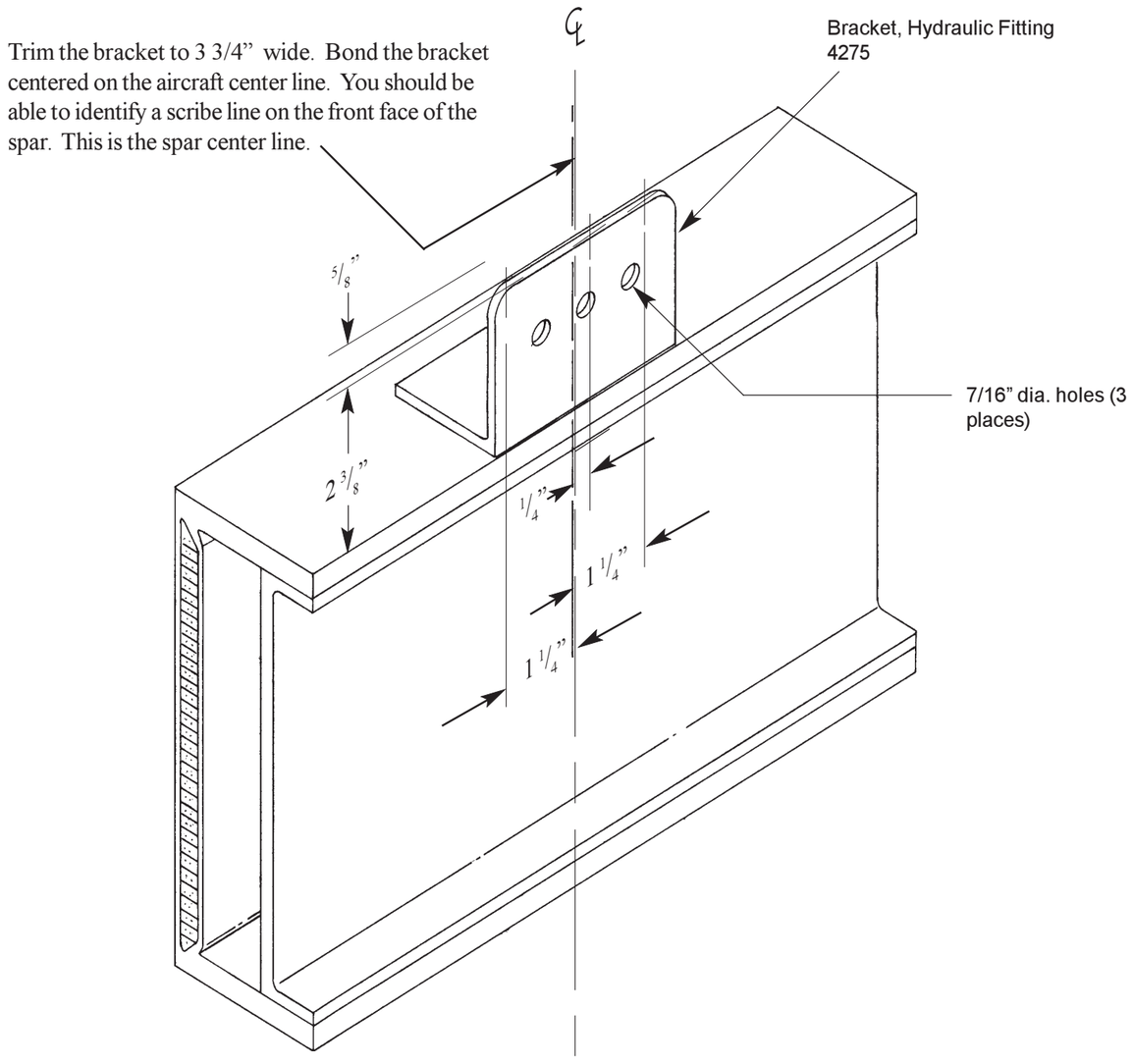
INTENTIONALLY LEFT BLANK
DUE TO UPDATE REV. 2/06-30-04 ON PAGE 16-3.

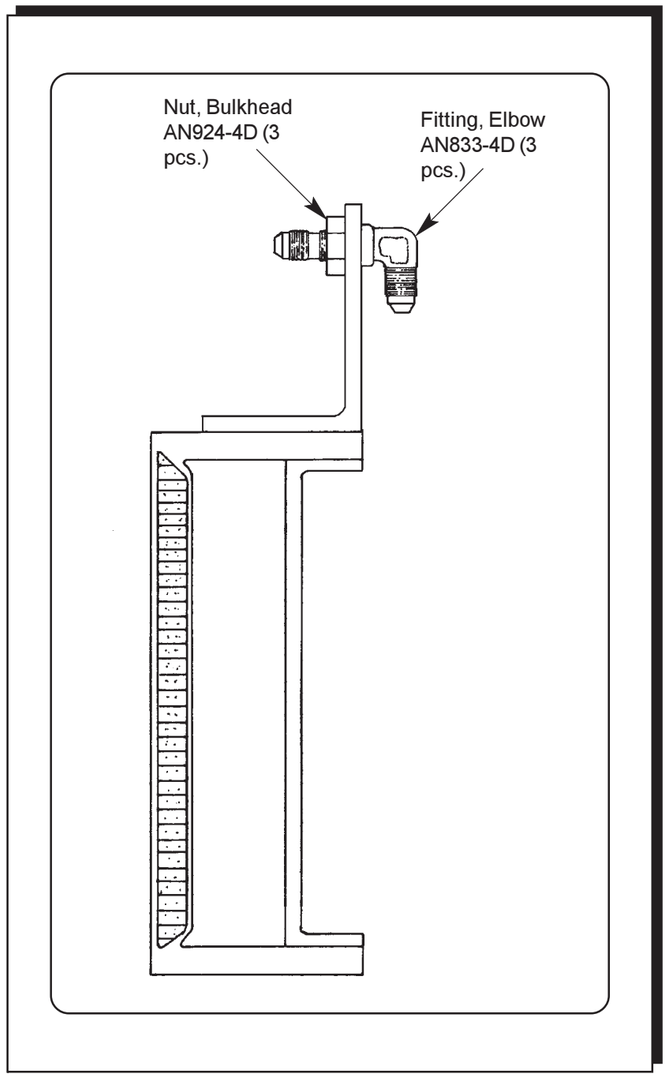
INTENTIONALLY LEFT BLANK
DUE TO UPDATE REV. 2/06-30-04 ON PAGE 16-3.

B. Hydraulic Lines - Forward of Main Spar

Hydraulics Marking Bracket on Main Spar
Fig. 16:B:1

There is a junction in the hydraulics above the main spar. The hydraulic lines connect through bulkhead fittings installed in a bracket at the main spar.

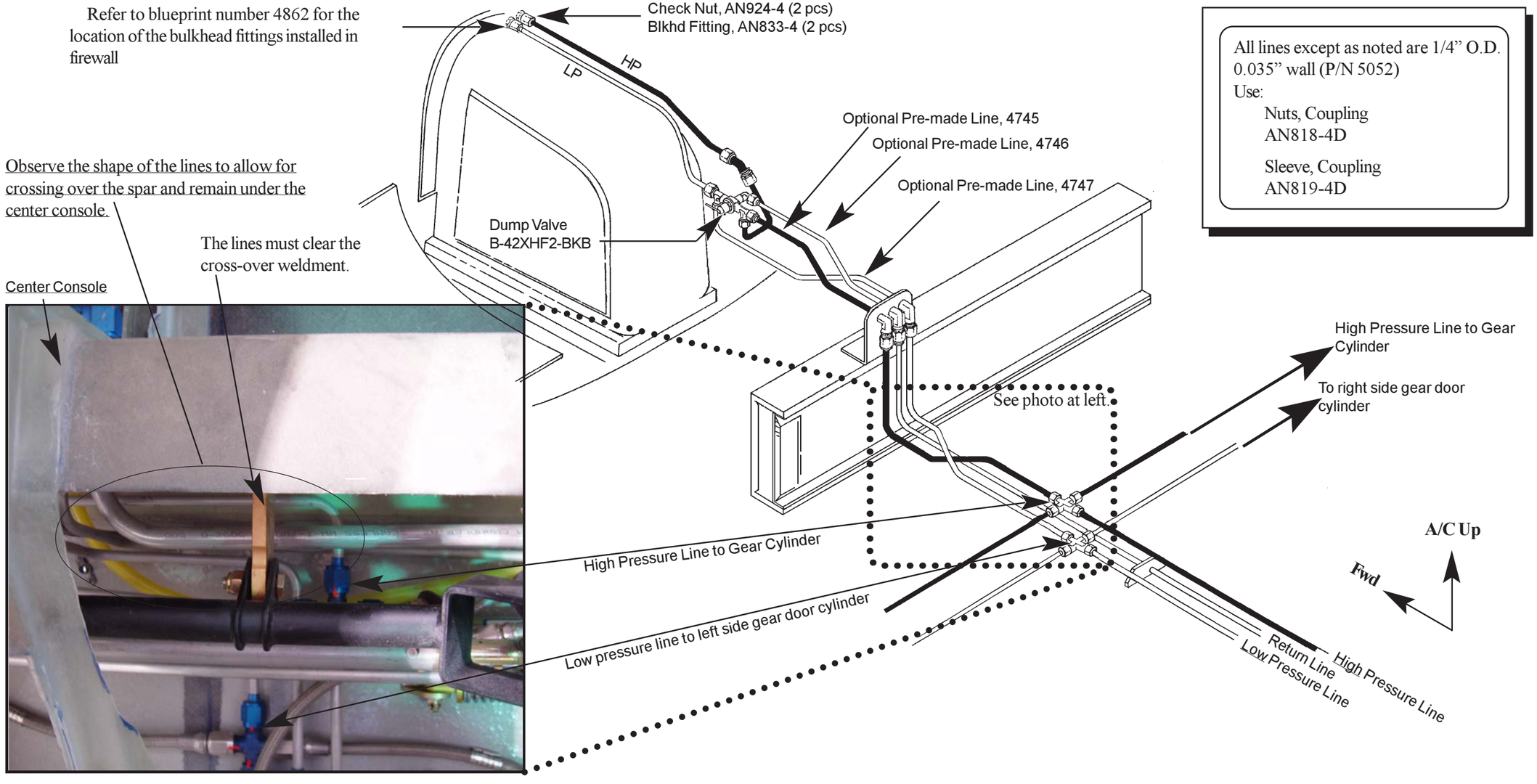




Hydraulics: Lines Going to Hydraulic Valve
Fig. 16:B:2

Note: Center Console not shown for clarity

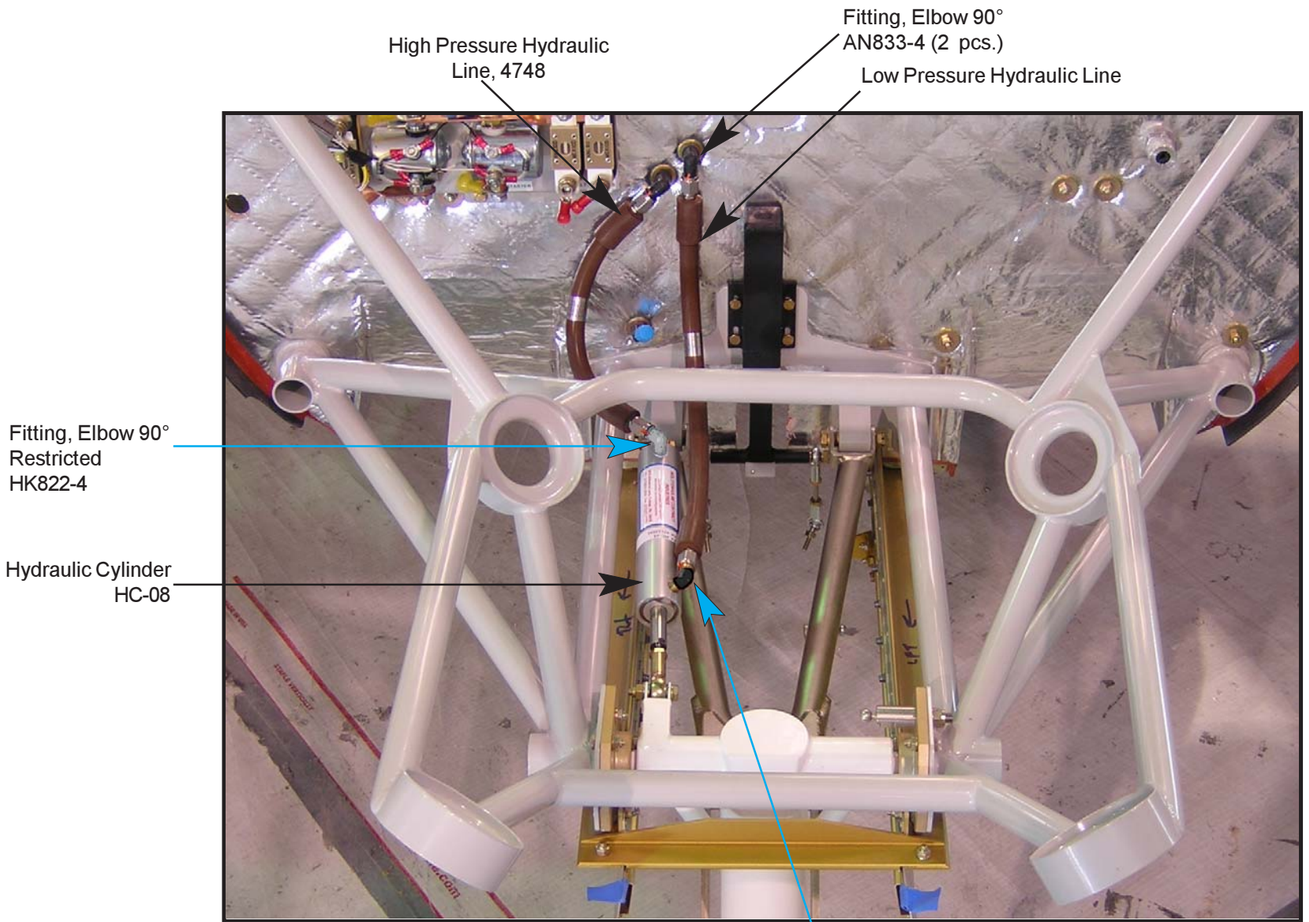
Refer to blueprint number 4862 for the location of the bulkhead fittings installed in firewall



All lines except as noted are 1/4" O.D. 0.035" wall (P/N 5052)
Use:
Nuts, Coupling
AN818-4D

Sleeve, Coupling
AN819-4D

Hydraulics: Firewall Forward
Fig. 16:B:3

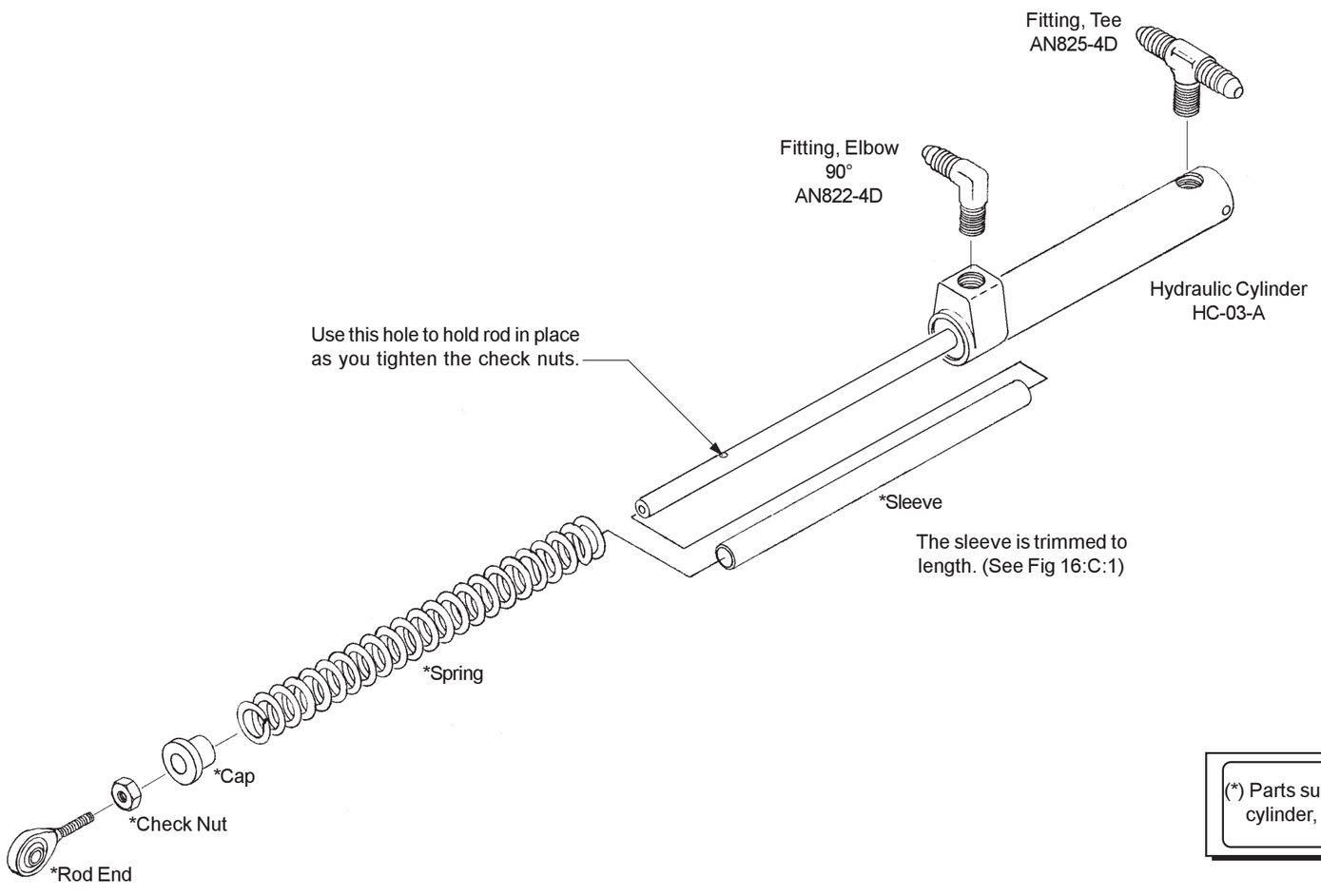


Note: Restricted fitting should be installed on the high-pressure side of the cylinder.

Note: Engine mount for Continental 550 shown. Lycoming installation similar.

C. Adjusting the Inboard Main Gear Doors

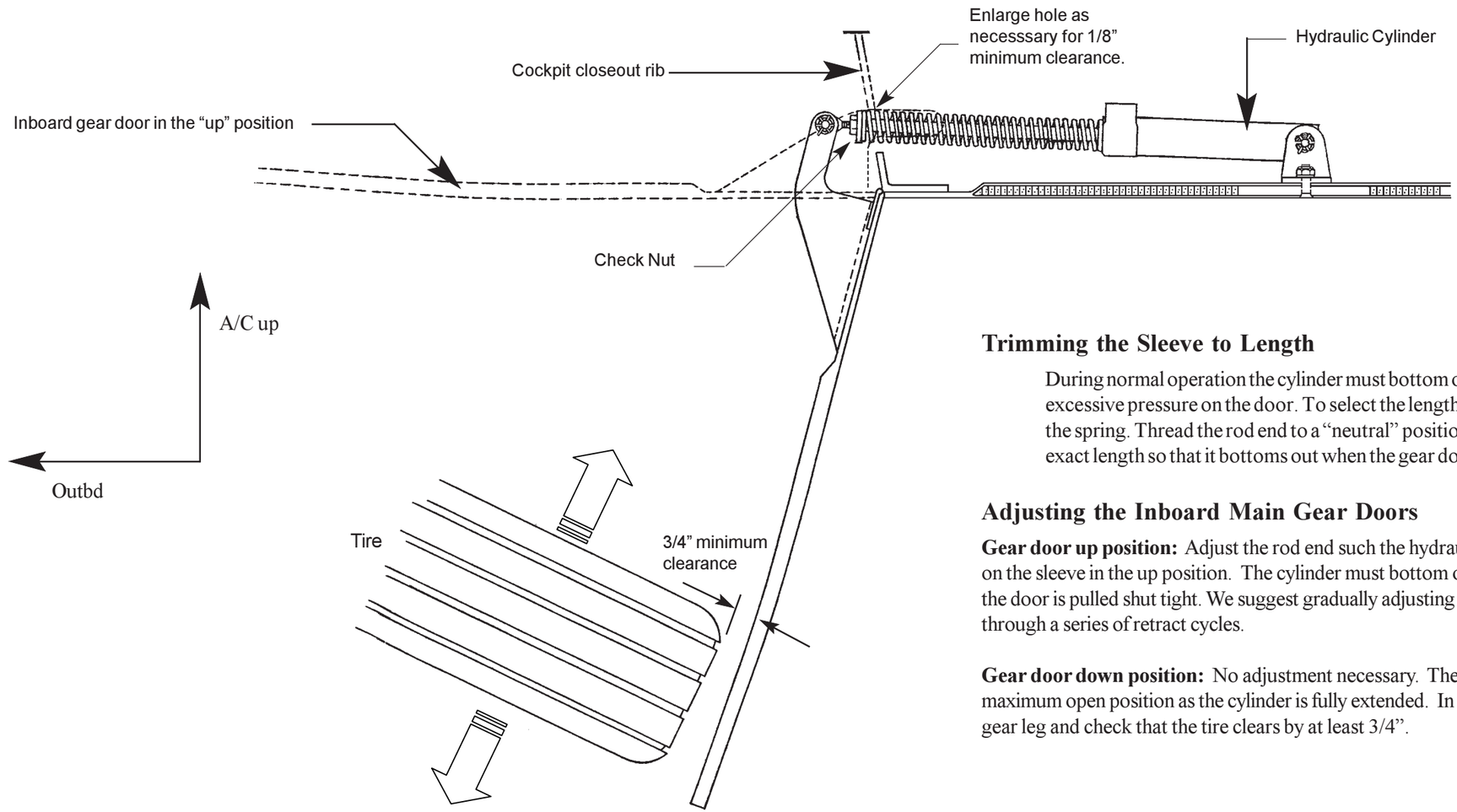
Inboard Gear Door Hydraulic Cylinder
Exploded View
Fig. 16:C:1



(*) Parts supplied with hydraulic cylinder, HC-03-A.

Note: Parts shown and labeled are for one side of the airplane only.

Adjusting Inboard Main Gear Doors
Fig. 16:C:2



Trimming the Sleeve to Length

During normal operation the cylinder must bottom out on the sleeve to avoid excessive pressure on the door. To select the length it is easiest to remove the spring. Thread the rod end to a "neutral" position. Cut the sleeve to the exact length so that it bottoms out when the gear door is closed.

Adjusting the Inboard Main Gear Doors

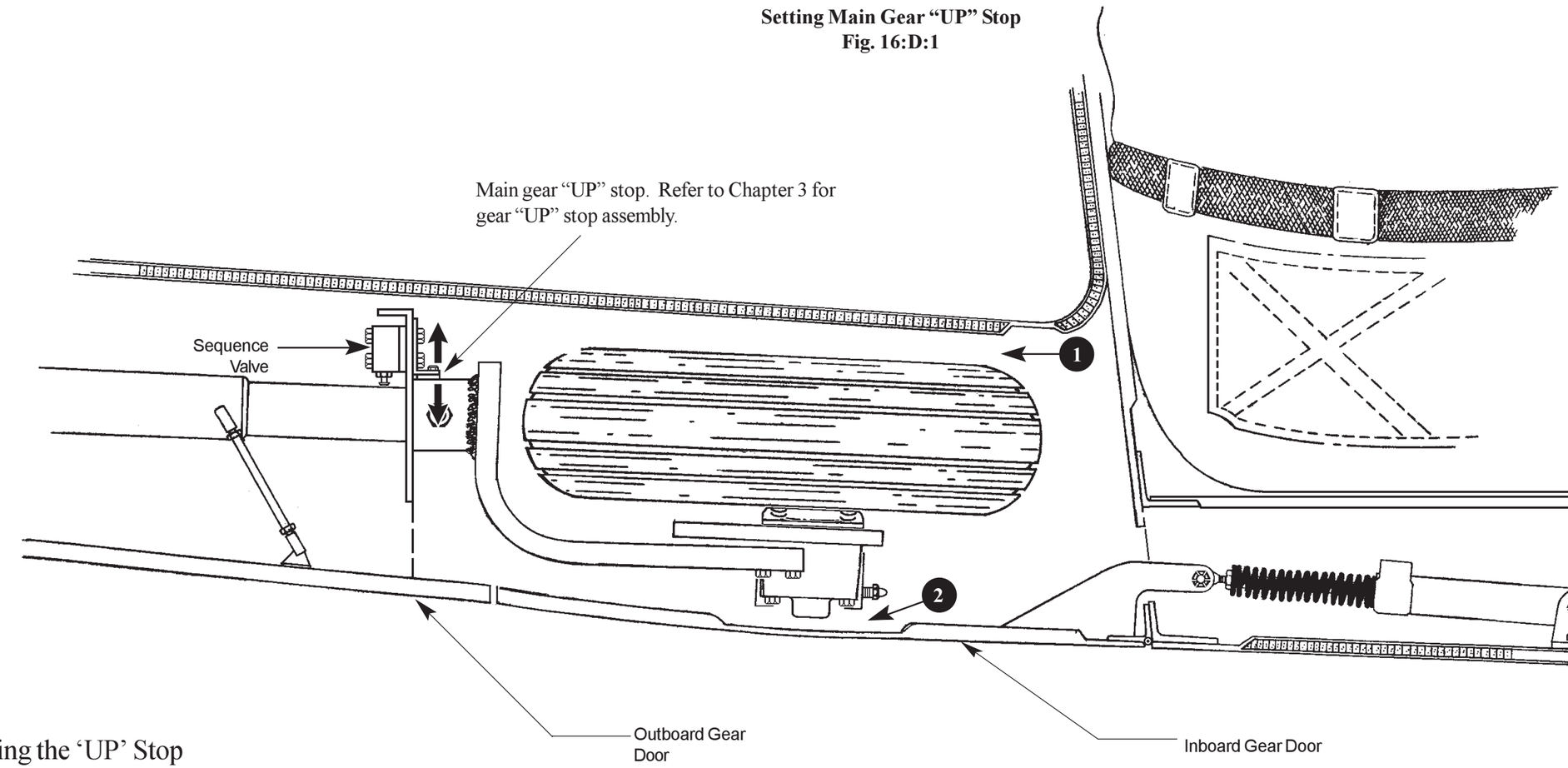
Gear door up position: Adjust the rod end such the hydraulic cylinder bottoms out on the sleeve in the up position. The cylinder must bottom out at the same time as the door is pulled shut tight. We suggest gradually adjusting the inboard doors through a series of retract cycles.

Gear door down position: No adjustment necessary. The door will travel to its maximum open position as the cylinder is fully extended. In this position, swing the gear leg and check that the tire clears by at least 3/4".

D. Setting the Main Gear 'UP' Stop

The main gear "UP" stop is the mechanical adjustment for limiting the "UP" travel of the main gear. Note that the hydraulic cylinder continues to exert pressure against the "UP" stop when you retract the gear.

Setting Main Gear "UP" Stop
Fig. 16:D:1



Setting the 'UP' Stop

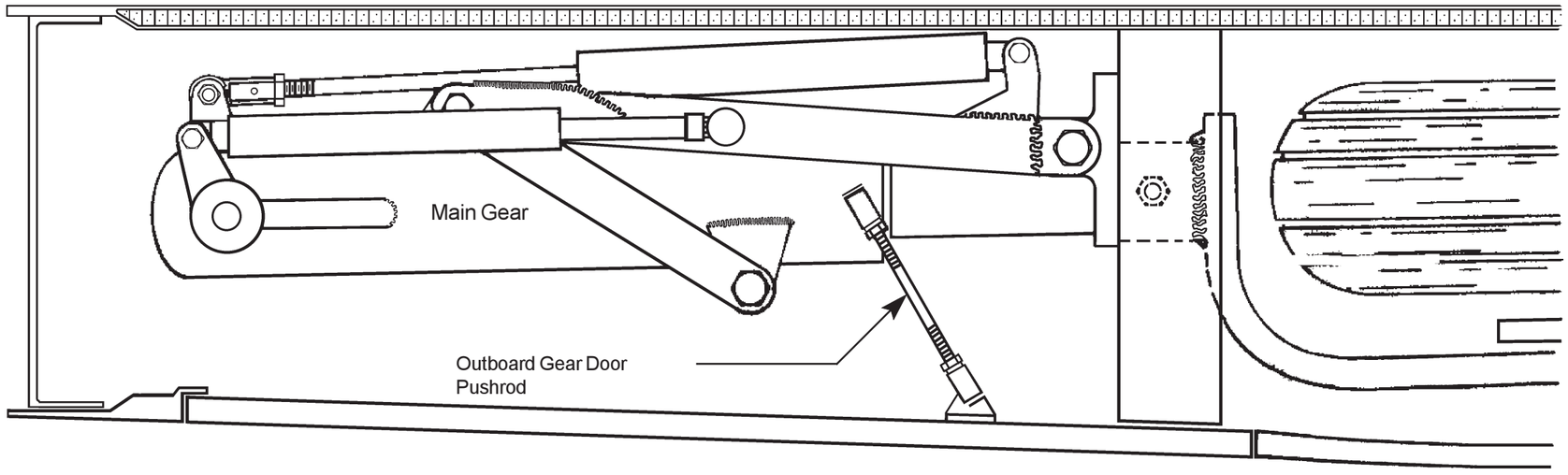
1. The 'UP' stop is adjusted such that the line sits as high as possible in the wing. There should be a minimum of 1/8" clearance between the tire and the upper wing skin. One method of setting the height is to tape 1/8" thick spacers around the perimeter of tire. Then retract the gear (by hand!). Set the up stop in the position.

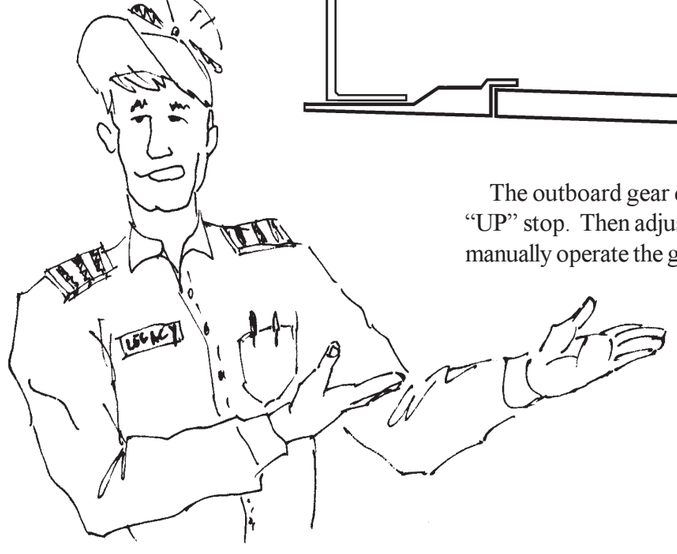
2. Check for adequate clearance between the brake and the inboard gear door.

Adjust the sequence valve. The sequence valve is adjusted so that it engages (but not bottoms out) when the gear is in the "up" position.

E. Adjusting the Outboard Main Gear Doors

Adjusting Outboard Main Gear Door
Fig. 16:E:1





The outboard gear door is adjusted by holding the gear up against the "UP" stop. Then adjust the gear pushrods so the door is closed. Always manually operate the gear before you operate it hydraulically.

F. Gear Switch and Lights

The standard gear switch is a locking switch, as shown in Figure 16:F:1. It takes up little room on the instrument panel. The switch is an SPDT meaning that it "pulls" voltage from a single source and can "throw" that voltage in either of two directions. The switch is in addition positive locking and must be gently pulled out of its detents before it can be shifted to the opposite position. As with all electrical parts, it should be handled with care and kept clean.

The center contact of the gear switch will have the primary "hot" lead from the battery soldered to it. The other two contacts will connect to either of the pressure switches. The wire on the pressure switch that connects to the gear switch can be either the red or the blue lead (the white lead is not used at all).

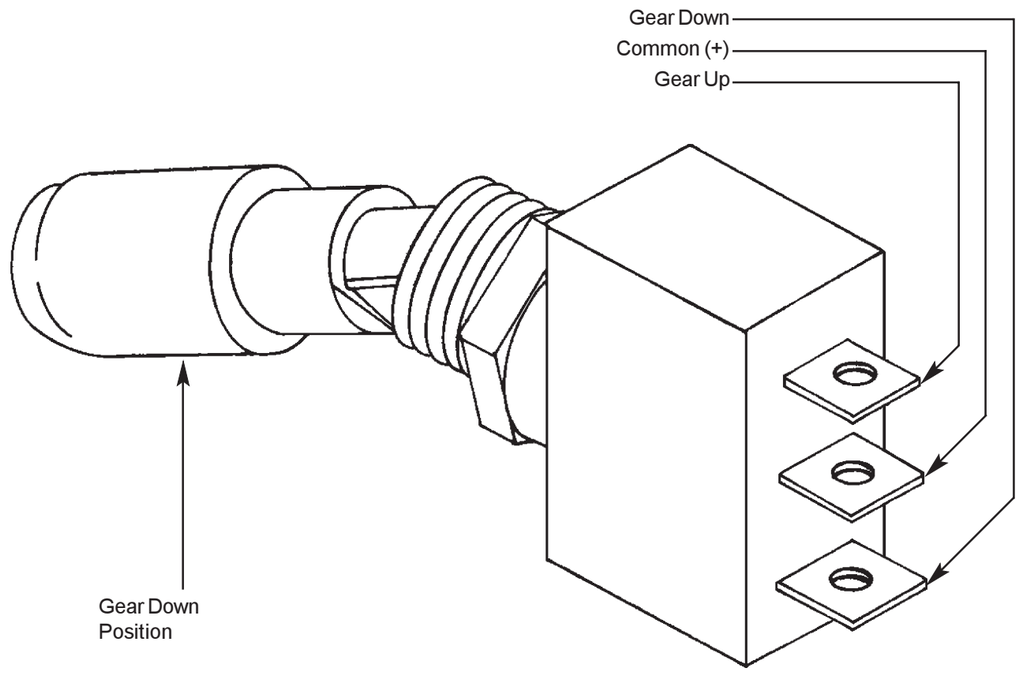
NOTE: It should be pointed out that the alignment between gear switch handle position and the back contacts is perhaps opposite to what you might think is correct, i.e., if the gear switch handles is "UP" then the contact on the "bottom" is activated, and vice versa. This will obviously become important when you wire it.

Gear Transition Light

A gear "transition" light (amber or yellow) is provided. This light allows you to monitor exactly when and how long the gear motor runs. It is an excellent safety feature in that it can indicate problems that you might not otherwise be aware of.

Example: If you have a small hydraulic leak, the gear transition light will warn you of the condition since you will see this transition light blinking on and off repeatedly during cruise. This will alert you to start looking for leaks as soon as you next land. That's much better than running the system out of fluid unexpectedly. Also, if for any reason the pump motor does not shut off within 20 to 30 seconds, you will be alerted and you should then immediately pull the relay breaker on the instrument panel to shut down the system. Otherwise you would run the risk of burning up the pump motor.

Wiring Landing Gear Switch
Fig. 16:F:1



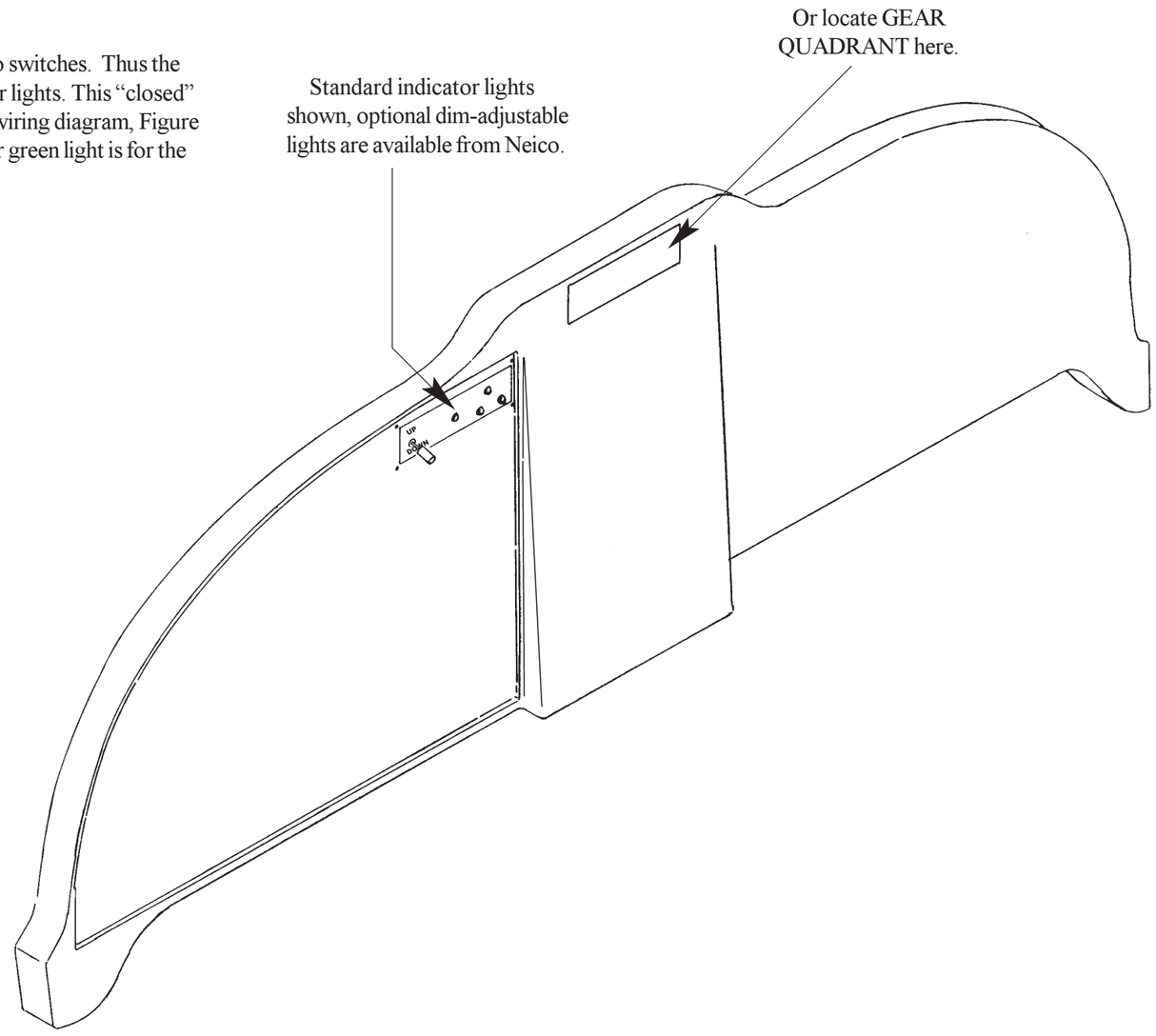
The gear transition light is generally placed just to the left of the three green gear down lights, near the gear switch. These units together comprise the "gear quadrant".

Gear Down Lights

The standard gear lights are AMP type lights and are non-dimmable. For night flight, you will want to install an adjustable "pot" to be able to dim the lights at night. Optional gear lights with push to test and dim features are now available from Neico.

These lights will be illuminated by voltage that is interrupted by the gear micro switches. Thus the micro switches must be "CLOSED" in order for voltage to pass by and reach the gear lights. This "closed" position is only achieved when the gear is down and locked. See Figure 16:G:1 and wiring diagram, Figure 16:I:1. Generally, the gear down (green) lights are arranged visually so that the center green light is for the nose gear and the left is for the left main, etc.

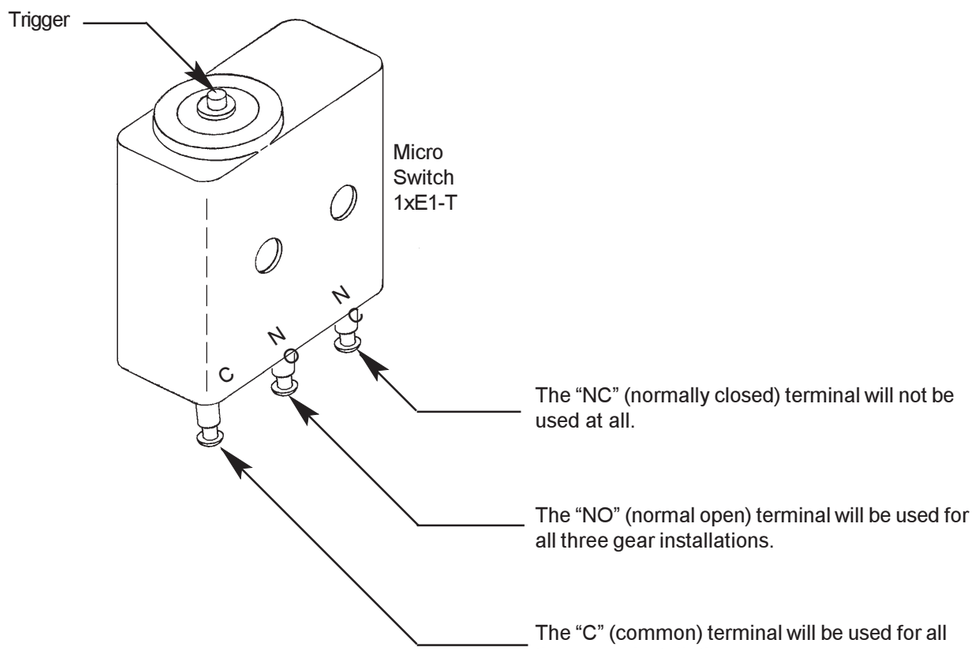
Gear "Quadrant" Location
Fig. 16:F:2



G. Gear Micro Switch Wiring

The wiring for the micro switches is quite simple. The stock switches are built such that they can be used as NO (normally open) or NC (normally closed). We will only use the NO (normally open) circuit and thus one spade connector will not be used on the switch. If you look closely you will see the markings on the switch case.

Micro Switch Wiring Connectors
Fig. 16:G:1



The micro switch wires should be soldered directly to the switch.

The micro switch wires should be tied securely in the gear wells since considerable air turbulence will be encountered. Use the nylon type wire ties Also, it is important to use the insulated type of terminal connectors to prevent water, etc., from making a contact and giving a false reading.

We generally use the (-) side of the electrical system to route through the micro switches and wire the (+) side directly to the gear lights. See page 18.

The wiring can be 18 or 22 gauge. Two wires are needed for each micro switch which must be routed to the back central area of the instrument panel. This wiring can enter the cockpit area through the cockpit closeout rib. A good location is between the spar closeout web and the aft phenolic attachment for the retract cylinder.

From there, route under the main spar (at the central console area) and up behind the instrument panel. The nose gear switch wiring can simply travel up the side of the tunnel and punch through the radius where the side of the tunnel rolls into the top portion.

H. Gear Pressure Switch Wiring

Gear Pressure Switch Wiring
Fig. 16:H:1

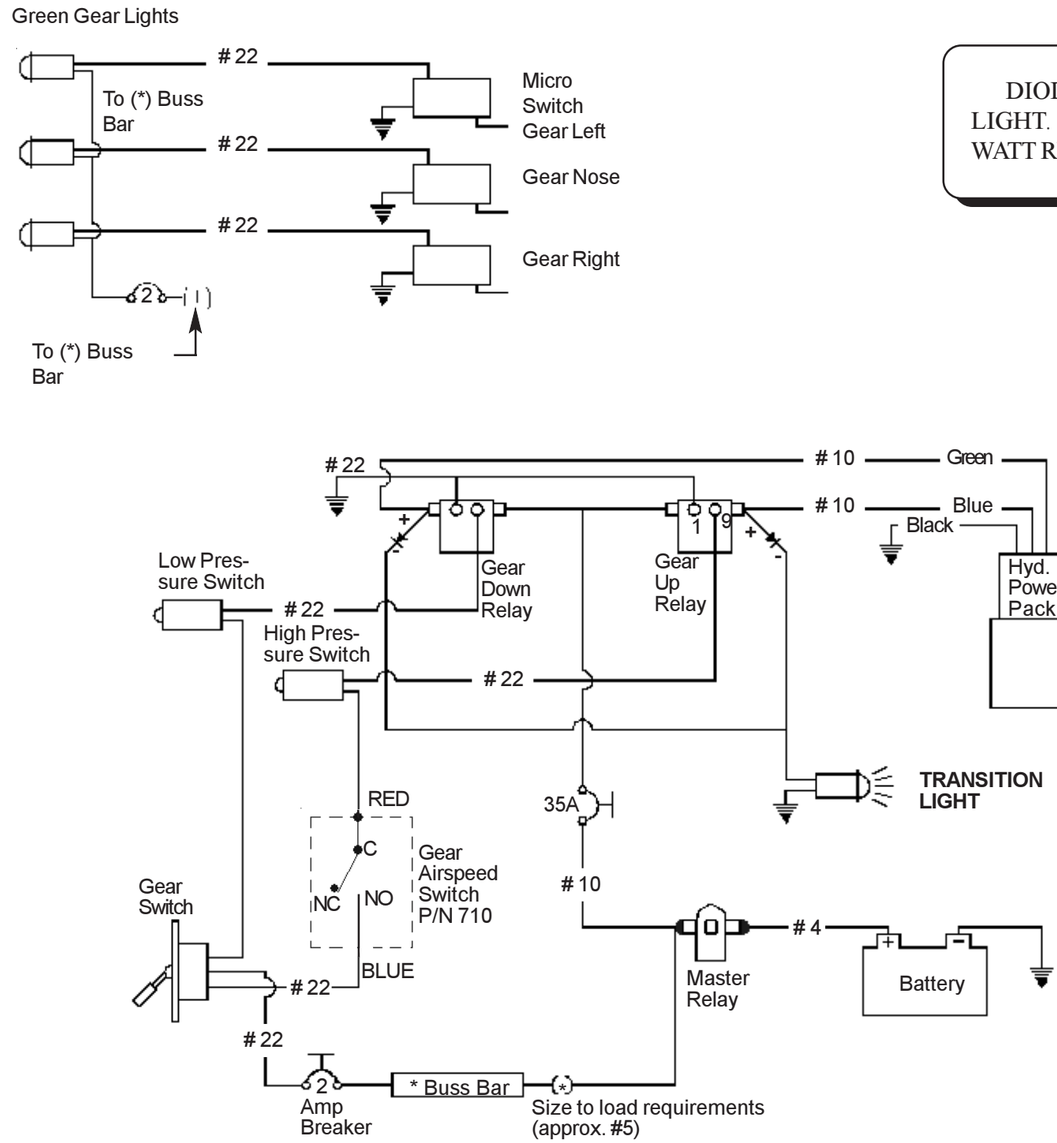
The high pressure switch which operates the "gear up" cycling is located above the left port on the power pack. One wire on that switch will connect to the relay that operates the pump (high pressure side). The other wire on the pressure switch will connect directly to the lower solder terminal on the gear switch (remember that the lower terminal makes electrical contact when the switch handle is up).

The low pressure switch will connect in a similar manner to its respective contacts.

Also see section K of this chapter for possible adjustments of the pressure switches.

I. Gear Wiring Schematic

Gear Wiring Schematic
Fig.16:I:1



DIODES FOR TRANSITION LIGHT. USE ANY COMMON 1/4 WATT RECTIFIER DIODE.

J. Hydraulic Gear Start Up and Test Operations

Adding Hydraulic Fluid

Fluid type: Petroleum based
MIL-H-5606-Red (old #)
Shell Fluid 4, Code 60421 (new #)

You'll need about 1 quart minimum therefore you should get 2 quarts. This fluid is the same as used for the brake system.

1. Remove the filler cap and fill with fluid. A piece of 1/4" vinyl tubing works well as a siphon tube from a 1-quart can of fluid. Pinch off the tube when the reservoir is full.

   NOTE: Before starting the system up for the first time, go around and check each and every fitting to insure that it is tight. The odds are very high that no matter how many times you "thought" you checked that fitting, it will still be loose and that will cause a mess. Also, have many rags around and have a very quiet room when you first start up. A quiet room will allow you to hear the "**fissss**" of a leaky fitting that's under pressure.

2. The reservoir will hold about a pint of fluid, which will be emptied as the gear is first run and the empty lines are filled. This will then require refilling of the reservoir. The reservoir will usually require three or even four fillings until all is working well and the reservoir is again full.

NOTE: The gear system will self bleed but this will take many back and forth cycles which is OK but time consuming so don't expect the cycle time to be particularly fast in the beginning. You will encounter many small "**burps**" of the pump motor once the gear is fully retracted because the air in the lines is compressing and the motor therefore comes on for only an instant to re-establish the operating pressures dictated by the pressure switches.

Start up of the Hydraulic Gear

When the gear is all installed, and known to operate by hand without any binds or interferences, and the pump is filled… its time for the real thing. This, for most builders, is considered to be a monumental event and a major milestone. There is great joy in watching all that gear tuck up into the airframe and totally disappear-all by itself. Of course the odds are abut 25% that you'll have some sort of a small problem to correct before it all tucks away neatly but in a short tie all will be working well and the excitement of the event will still be real.

1. The airframe will have to be supported for this testing and there are two good ways to do that. One is to simply use the jack pads for the main gear if you put them into the fuselage. Jack the airframe up only enough to clear the main tires of the ground and then weight the tail down or pull it down so as to lift the nose gear off the ground. The other means is to simply use a portable jack and lift the engine by the normal engine hook that temporarily bolts to the upper case bolts of the engine and slide a rigid support under the forward baggage area of the fuselage. The fuselage is strong enough to be supported from such a point. (Don't ever try that with a sheet metal plane though.) We've used a small stool with a good thick foam pad on it to disperse the loads over an area of about 1 square foot. You'll then have to steady the wing tips. Whichever approach you use to elevate the airframe, check to verify that it is indeed stable before retracting the gear.

   WARNING: Don't ever assume that you have wired everything correctly prior to this first start up. You must assume that you have wired everything **WRONG** and that the gear switch, although placed in a down position, might actually cycle the gear up as soon as power is put through it. Thus don't put power to the system until the plane is supported and can thus tolerate those kinds of surprises!

2. If you prefer, with the help of a friend, undo a line as far down stream as possible. Place a piece of hose on the line and place the other end in a clean container. One guy watches the hose while the other works the gear and master switch. Bump the system on and off until fluid and no air is coming out of the hose. Reconnect the hydraulic hose or aluminum line. Do this in a couple of locations and your system will take fewer cycles to come on line.

3. Install a battery temporarily into the system and establish the following:
   a. Plane supported off the ground, steady and secure.
   b. Gear switch is in the down position.
   c. Gear itself is down and locked.
   d. Free-fall valve is closed.
   e. Nose gear is straight.
   f. Cycle each gear leg up by hand to verify that there are no obstructions or interferences, etc.

Now connect the power (12V DC)

The motor will produce a good deal of noise and will run for several seconds beyond the normal 6-7 seconds for cycling since there is no fluid in the lines at this time.

WARNING: The motor must not be allowed to run more than 20 seconds continuously. Running beyond that length of time could generate too much heat and damage the motor.

4. If the motor runs more than the 20 seconds allowed, remove the power thus shutting the motor off. The motor is not designed for continuous operation and must be allowed to cool down somewhat before operation can continue. Give it just a few minutes (5 minutes should be sufficient) to cool down before continuing.

5. Check all fittings for leaks and correct as required.

6. Check the reservoir to see if all the fluid has been pumped out, refill and continue to pump in the down direction. Fill three runnings like this do not shut the pump off automatically then stop and continue with the next step. Thus don't worry about it for the moment.

7. Check again that the nose gear is straight.

8. Flip the gear switch to the up position and observe as it starts to retract. The order of retraction is unimportant as that is strictly a function of which system gets the fluid first.

9. As the gear retracts, generally the mains will retract first and the nose will follow last. Once all the gear is up, assuming it all goes up on the first try here, the motor should run for just two or three seconds only and automatically shut down.

WARNING: If the motor has adequate amounts of fluid available, you will hear a distinctive tone change as the pump reaches its higher PSI loads. It will slow down and sound as if it is working harder. This is when the heat can really build up fast in the motor as it can pull over 40 amps so do not let it run more than two or three seconds in this condition.

10. If the gear comes up and the motor bogs down without shutting down automatically, then the pressure switch will require adjustment. This rarely will happen though.

    If the gear comes up most of the way and the motor continues to run with little or no tone change, then you are again out of fluid in the reservoir. Shut the system down, free-fall the gear down and locked and crawl back in to refill the reservoir.

11. Cycling the gear up and down several times will work to bleed the air out of the system and you'll notice that the cycle times will become shorter. Once the system is fully charged and free of air, the cycle time should be about 7 seconds.

12. When the gear retracts, the motor will shut off due to the pressure switch being tripped which cuts the current to the "UP" relay. If, as mentioned in step 9, the pump does not shut off automatically, then the pressure switch will need adjusting (or you've got a basic wiring problem that's having the effect of bypassing the high pressure switch). See wiring diagram and the section following this one, "Pressure switch adjustment".

    NOTE: As the nose gear retracts into the well, if it is allowed to hit the GM27 weldment, a pretty loud "clunk" may result. This should be avoided by attaching a rubber strip around the weldment to serve as a cushion. A couple of nylon wire ties will adequately secure it in place.

13. It is common for the motor to cycle on for a couple of periodic "burps" when the gear retracts. This is the system "tightening" up on itself as air is compressed and slowly forced out of the loop as cycling continues.

    If you get repeated, continuous bursts of the pump motor, then there is a leak some place so shut it down and go hunting.

14. At some point it is a good idea to run the gear up with some of the gear doors removed so that you can inspect the condition of everything up in the wells. Look for any interferences, binds or rubs.

K. Pressure Switch Adjustment

These must be corrected immediately.

1. The two pressure switches control the power to the pump motor through the relays and thus the power to the motor itself. These switches are preset but they are also easily adjustable. They are wired in the NC (normally closed) configuration. When the pressure setting is reached, they will open thus cutting current flow to the motor, opening the relay and shutting the system down.

   Sometimes the pressure switches will require a little adjustment to achieve proper operation of the gear system. Here are two possible problems:

2. **SYMPTOM 1:** The gear in the retract mode runs in short, on and off bursts until the gear is fully retracted.

   CAUSE 1: The high-pressure switch is most likely prematurely shutting off current to the relay and as the backside pressure drops, the switch closes again thus providing current.

   CURE 1: The UP side pressure switch will require a higher setting.
   a. There is small slotted screw in the top of the pressure switch. Turn this screw 1/4 turn to the right. Turning to the right increases pressure and to the left decreases pressure.

   b. Test the gear again and tighten additionally if required.

3. **SYMPTOM 2:** The gear retracts up but the motor does not shut off at all, it merely bogs down and continues running (As previously mentioned, this is dangerous to the life of the motor and should therefore be disconnected immediately if this symptom occurs.

   CAUSE 2: The high-pressure switch is set too high and although the power pack has reached full pressure, the motor cannot shut off since the pressure switch has not reached its higher-pressure setting. **NOTE:** The power pack has internal bypass valves that are factory set. The pressure switch must be set lower than the internal bypass valve setting.

   CURE 2: Lower the pressure of the high-pressure switch, see "cure 1" above. The procedure is similar except you will be backing off the internal screw 1/4 turn at a time.

4. It is also possible that similar circumstances could occur involving the low-pressure side of the system. History has however indicated that usually no problem is found or if there is a problem, it will be with the high-pressure system.

This must be conducted on a regular basis to insure safety on the event of either a hydraulic loss or an electrical loss.

L. Free Fall Test

The ability for the gear to successfully free fall to the down and locked position is critical. Flight cannot be made if this condition is not achievable. In addition, you should make it a practice to check it on a regular basis (monthly) during operation so you will not be caught off-guard by a broken spring or deflated pressure strut.

1. While still in your ground testing setup, run the gear up and disconnect the power.

2. Open the free-fall valve by making the 90° rotation of the handle in one smooth, quick movement.

   A bit of "clang" will result and the gear will start coming down. The nose gear will usually be the first down and locked due to the 100 lb gas spring up front.

3. The main gear will usually fall about halfway very quickly and the remaining half could be a slow struggle for the springs. This is OK. In fact it is OK if they never do lock down by themselves but you must measure the pressure against the sides of the tires that is required to bring them down and locked.

4. If the main gear does not lock down, take a scale and press against the inside of the tire bottoms. The force required to lock the gear down should not exceed about 5-8 lbs. This force is easily achieved by simply kicking a little rudder left to create a sideslip, which will lock the left main then right rudder to lock the right main. If more force is required, then you have a "bind" condition somewhere in the linkage or the springs are stretched out of shape. You'll have to correct the condition before flight.

M. In-flight Free Fall Testing

CAUTION: This Free-fall check should be made monthly during normal operations. It's easy and only takes a couple of quick steps.

1. Start with the A/C in a normal gear up, cruise mode at a speed of 140 m.p.h. or less.
2. Pull the circuit breaker (or fuse) that operates the gear relays.

   WARNING: Do not pull ***only*** the 50A gear pump circuit breaker, this would appropriately disconnect the pump but it would not disconnect the relays. This would then allow the relays, which are for intermittent use ***only***, to close. Possible damage could result to the relays if left on for too long. Thus you should pull the circuit breaker ***for the relays*** when shutting down for this test.

3. With the electrical system disconnected, place the gear switch into the down position. Of course, nothing will happen.

4. Open the Free-fall valve with a fast smooth 90° rotational movement.

   The gear will now drop down and lock in place, the three green gear down lights should illuminate. There is no particular locking sequence between the three gears. Sometimes the nose will lock first and we've seen cases where the nose gear is last to lock down. And you ask, "what if they don't lock down?"

If the main gear does not lock down: If, after one minute, the mains do not lock down (no green light appears) then try kicking a little rudder to cause a slip in the direction of the non-locking gear leg, i.e., left rudder to lock the left main, etc. This additional air load on the gear door and gear itself will provide the extra force to cause the gear to lock. The main gear should easily lock down with no more than half rudder applied at 140 m.p.h. indicated. If this is not successful, then you have a problem of either too much friction or too little spring pull. Ground adjustments must be made before your next flight.

If the nose gear does not lock down: If the nose gear does not lock down, first try slowing up to reduce the air loads acting against the gas strut that is trying to push the gear out into the air stream. Slow up by 10 m.p.h. increments, wait at least 1 minute between speed changes and not the speed at which the nose gear does lock down, keep this for reference to determine whether or not the nose gear is requiring more and more help as the flight hours build.

If at 85 m.p.h. indicated, you still cannot lock the nose gear down, then you have a problem, do not go slower in attempting to lock it down. Increase speed back to about 110 m.p.h. and try pulling about 2 g's. If after two or three attempts at this, you still cannot lock the nose gear down, then you have a problem and ground adjustments must be made before your next flight.

5. With the test completed, either all the gear will be down and locked or the stubborn ones will not be locked down. At this point, there is a three-step procedure to follow when reactivating the hydraulic power system.

   1. Close the Free-fall valve by rotating it 90° back to the closed position.
   2. Check to make sure the gear switch is still in the "down" position.
   3. Push in the ***gear relay*** circuit breaker to reactivate power to the pump. The gear will now recharge and establish a down and locked position under hydraulic pressure.

WARNING: If there is ever a test which results in the inability to free-fall the gear down and locked, pump the gear down, land and do not resume flight until the problem has been identified and corrected.

6. If you had Free-fall trouble with any of the gear, then ground inspection and adjustment MUST be made prior to your next flight. Repeat the ground cycling procedure until all the gear is free-falling well. Then go back up and repeat this test procedure. Normal flight cannot be made until this free-fall test is successful.

   (As a final note, it should be mentioned that the free fall test has an extremely high percentage of first flight test successes).

This concludes the chapter on the landing gear hydraulic systems.

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

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

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

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