MAINTENANCE MANUAL

LA4 Series

and

Model 250

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SECTION 1

INTRODUCTION

1.1 Scope of Manual

This manual contains maintenance information for the LAKE Model 250 and LAKE Models LA4-200 and LA-4 amphibians (FAA Type Certificate Data Sheet: Revo 1A13). This manual supersedes and replaces all previous maintenance manuals for the Model 250 and LA4 series aircraft. The material supplied in this manual will concern primary components made by Aerofab, Inc. ("factory"), who manufactures the airplane for Lake Aircraft, Inc. ("Lake"). Information necessary for maintenance and inspection of components such as the engine, propeller, accessories, instruments and avionics shall be obtained from the manufacturer of the applicable component. The operations described in this manual should be performed only by persons qualified under current FAA regulations.

1.2 General Description

The aircraft is a single pusher-type engine, mid-wing, boat-hulled amphibian of conventional riveted aluminum construction, with the exception of some non-structural items of fiberglass laminate. Significant differences between models are identified in Table 1.

1.3 Fuselage

The fuselage is designed in a watertight boat-hull configuration. The hull primary structure is constructed as a single unit, and is all metal with stressed skin. The secondary structure consists of the fiberglass laminate portions of the cabin top, doors, and forward deck skin.

1.4 Wing

The wing consists of left and right panels of all metal stressed skin construction, and is considered all primary structure except for the wing tip fairings. The wings are bolted to the fuselage, to fittings extending from the sides of the hull. Sponsons provide lateral stability on the water and are bolted to the underside of each wing. Aileron controls within the wing are all pushrods. The ailerons are not balanced, either statically or aerodynamically. The wing flaps are hydraulically operated. Some models incorporate wing fillets on the inboard trailing edge of each wing.

1.5 Landing Gear

The landing gear is a retractable, hydraulically operated tricycle gear, with only the nose gear having doors. The main gear incorporate a trailing beam suspension. Shock absorption is by conventional oleo (air-oil) struts. The nose wheel is free to castor, and steering is accomplished through differential braking. Brakes are toe-operated by master cylinders on the rudder pedals assembly.

1.6 Empennage

The empennage consists of the vertical fin, rudder, horizontal stabilizer, elevator, longitudinal trim surface, and rudder trim tab. The structure is all primary with the exception of the tip fairings and the rudder tab. The elevator and rudder controls are all pushrods, the longitudinal trim surface is hydraulically operated, and the rudder trim tab is electrically operated.

1.7 Power Plant

The engine is pylon mounted in a pusher configuration, with a welded steel mount, pylon side panels and rear channel being primary structure. The forward and aft pylon fairings, and the entire cowling, are secondary structures. The engine and propeller are operated via cables with controls mounted in the cabin overhead. The engine is Lycoming horizontally opposed and air cooled. The propeller is Hartzell.

1.8 Fuel System

The fuel system consists of a 40 gallon main fuel cell (rubber bladder) in the hull. Some models also include an integral metal fuel tank inside each wing float, and a wet wing tank in each wing leading edge. Main fuel transfer to the engine is accomplished with one engine driven fuel pump and one electric boost pump. Wing float fuel is transferred to the main fuel tank through the use of an electric transfer pump in each wing. Wet wing tank fuel is transferred to the main fuel tank by gravity.

1.9 Flight Controls

The flight controls are conventional pushrod type (aileron is cable/pushrod), with the elevator and ailerons operated by the control wheel, and the rudder by pedals. Dual controls, with the exception of the brakes, are standard equipment.

1.10 Trim System

Longitudinal trim is provided with hydraulically operated trim tab(s) installed outboard of the elevator. A fixed trim tab is installed on each aileron, with an electrically operated trim tab available as optional equipment. A fixed trim tab is installed on the rudder of the LA4 series aircraft, with an electrically operated trim tab available as optional equipment. An electrically operated trim tab installed on the rudder is required equipment on the Model 250.

1.11 Hydraulic System

The airplane is equipped with a hydraulic system that operates the landing gear, wing flaps, and longitudinal trim surface. Primary components are an electric pump with fluid reservoir, pressure accumulator, control valves, check valves, pressure switch, filter, vent, and a hand-operated pump for emergency operation. The hydraulic fluid reservoir also supplies fluid to the brake system.

1.12 Electrical System

The electrical system is a conventional 14 or 28 volt DC, negative ground system, with the entire metallic portion of the airframe grounded. Primary components are the battery, alternator/generator, master and starter relays, distribution buses, switches, and circuit breakers. Dual alternators and an auxiliary power receptacle are available as optional equipment.

1.13 Instrument Panel

Standard equipment consists of conventional required basic flight and powerplant instruments. Panel space is available for additional instruments and avionics. An overhead glareshield is required equipment of the Model 250, but is available as optional equipment on the LA4 series.

1.14 Reserved

1.15 Reserved

Model Comparison

S = Standard   O = Optional

	SEAWOLF	LA-250	LA-4-200	LA-4	C-2	C-1
AIRFRAME						
Produced	1992 - Pres	1983 - Pres	1970-1986	1960-1969	1957-1959	1948-1957
Maximum Weight	3140 (3400)	3140	2600 (2690)	2400	2350	2150
Aluminum Conversion Coating	S	S	S	S		
Primed Detail Parts	S	S	S			
Steel Conversion Coating	S	O				
Hull Seam Sealing	S	S	S	S		
ENGINE						
TIO-540-AA1AD (290 hp) Lycoming	O					
TIO-540-AA1AD (270 hp) Lycoming	S	O				
IO-540-C4B5 (250 hp) Lycoming		S				
IO-360-A1B (200 hp) Lycoming			S	O		
IO-360-A1B6 (200 hp) Lycoming			O	O		
O-360-A1D (180 hp) Lycoming				S		
O-360-A1A (180 hp) Lycoming				S	S	
O-320-A2A (150 hp) Lycoming						S
PROPELLER						
HC-E3YR-1RLF (3-blade) Hartzell	S	S				
HC-C2YK-1BL(F) (2-blade) Hartzell			S			
HC-E2YR-1BLF (2-blade) Hartzell			O			
HC-E2YK-1BL (2-blade) Hartzell			O			
HC-C3YR-1RLF (3-blade) Hartzell			O			
HC92ZK-8 (2-blade) Hartzell				S		
HC92WK-8L (2-blade) Hartzell				S		
HC92WK-6DL-1 (2-blade) Hartzell					S	
HC92ZK-6DL-1 (2-blade) Hartzell					S	
HC82XG-6L (2-blade) Hartzell						S
FLIGHT CONTROLS						
Dual Controls	S	S	S	S	S	S
Single Contols	O					
Ailerons - Push Rod/Cable	S	S	S	S	S	S
Rudder - Push Rod	S	S	S	S	S	S
Elevator - Push Rod	S	S	S	S	S	S
Flaps - Hydraulic	S	S	S	S	S	S
Aileron Trim - Electric	O	O	O	O		
Rudder Trim - Electric	S	S	O	O		
Elevator Trim - Hydraulic	S	S	S	S		
FUEL SYSTEM						
Main 40 gal bladder in hull	S	S	S	S	S	S
Wing 17 gal integral in each wing	S	O	O			
Aux 7.5 gal integral in each float	S	O	O	O		
(2) Underwing 35 gal tanks	S					
Overwing Aux Float Filler	S					

Model Comparison
Table 1

S = Standard O = Optional

	SEAWOLF	LA-250	LA-4-200	LA-4	C-2	C-1
LANDING GEAR						
Hydraulic Actuation	S	S	S	S	S	S
Emergency Hand Pump	S	S	S	S	S	S
6.00x6x8 ply main tire	S					
6.00x6x6 ply main tire		S				S
5.00x5x4 ply nose tire	S	S	S	S	S	S
Single Puck Brakes			S	S	S	S
Dual Puck Brakes	S	S	O	O		
Corrosion Resistant Brake Disks	S	O	O	O		
Dual Pilot Brakes	O	O	O	O		
ELECTRICAL						
28 v, Dual Alternator	S	O				
28 v, Alternator, Single 24v Battery	O	S				
28 v, Alternator, Dual 12v Batteries	O	O				
12 v, Alternator		S	S			
12 v, Generator				S	S	S
Aux. Power Receptacle	S	O				
Lightweight Battery	O	O				
Lightweight Starter	O	O				
Lightweight Alternator	O	O				
CABIN CONFIGURATION						
6-Place	O	S				
4-Place	S	O	S	S	S	
3-Place	O					S
2-Place	O					
Dual Canopy Doors	S	S	S	S	S	S
Side Cargo Door	S	S	O	O		
Cabin Baggage Compartment	S	S	S	S	S	S
Extended Baggage Compatment	O	O				
OTHER OPTIONS						
Structural Enhancements	S					
Bow Lockers	S	O	O	O		
Aft Hull Drain System	S	O	O	O		
Bilge Pump System	S	S	O	O		
Wing Fillets			O	S		
Hydroboosters	S	S	O	O		
Rajay Normalizer			O	O		
Heater	O	O	O	O		
Cabin Fresh Air Circulator	S	O	O	O		
Lifting Rings	S	O				
Underwing Hardpoints	S					
NVG Cockpit	O					
Deployable Config. (Quick Disassembly)	O					
Autopilot	S	O	O	O		
Radome	O	O				
Weather Radar	O	O				
SAR/Weather Radar	O					
Stabilized Thermal Imaging - FLIR	O					
Digital Multi-Spectral Imaging	O					
Stabilized CCD Video Camera	O					
Water Sample Pick-Up System	O					

Model Comparison (Cont.)
Table 1

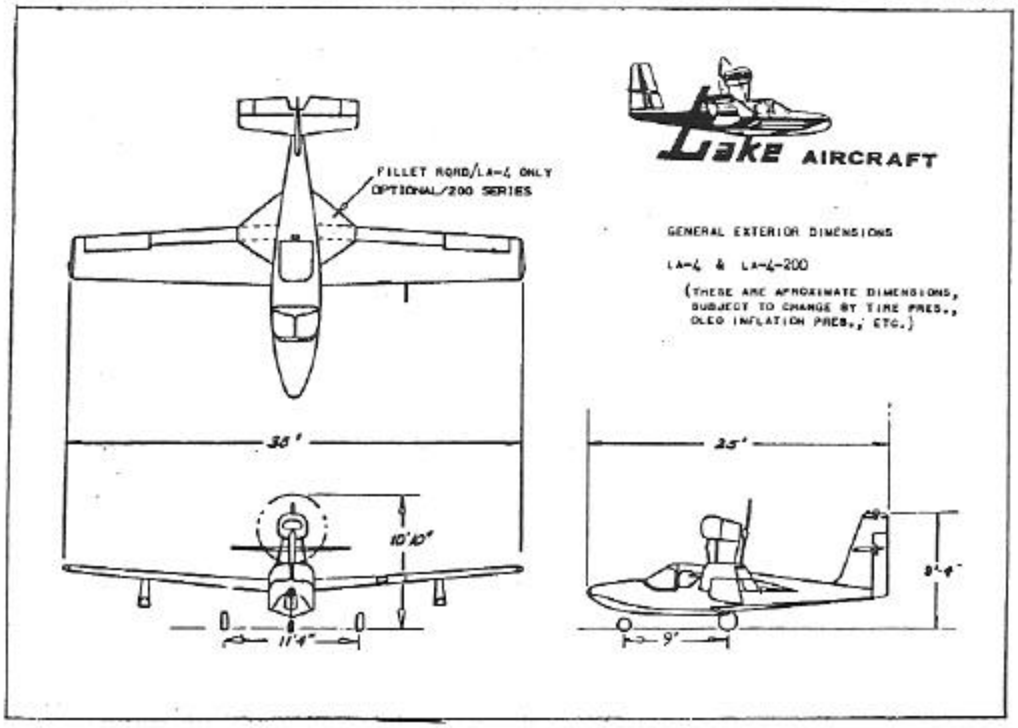


Fig. 1.1 3-View (LA4 Series)

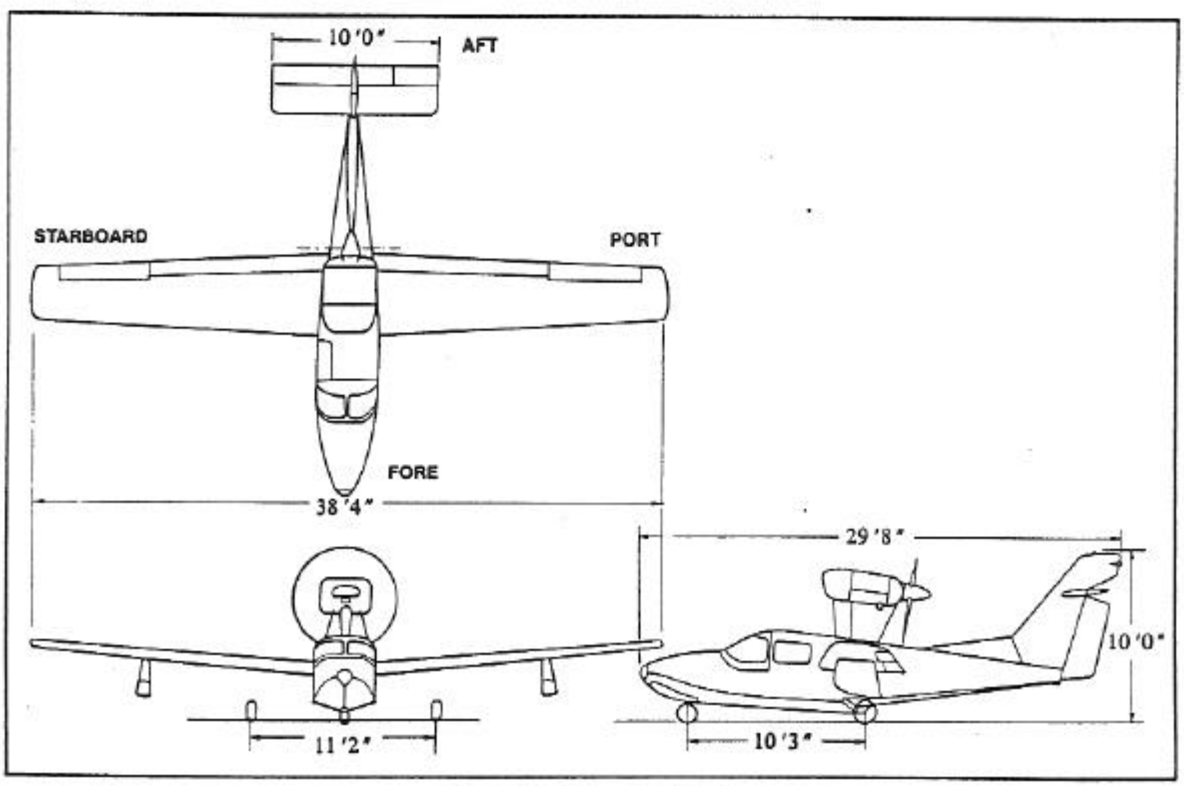


Fig. 1.2 3-View (Model 250)

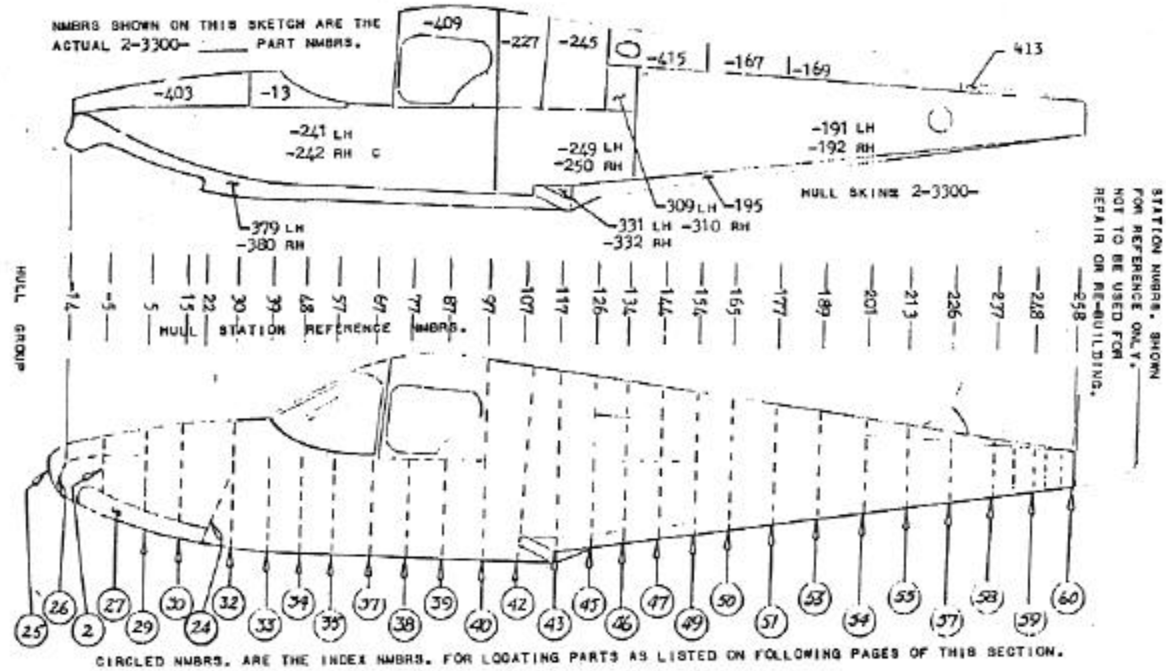


Fig. 1.3 Hull Stations (LA4 Series)

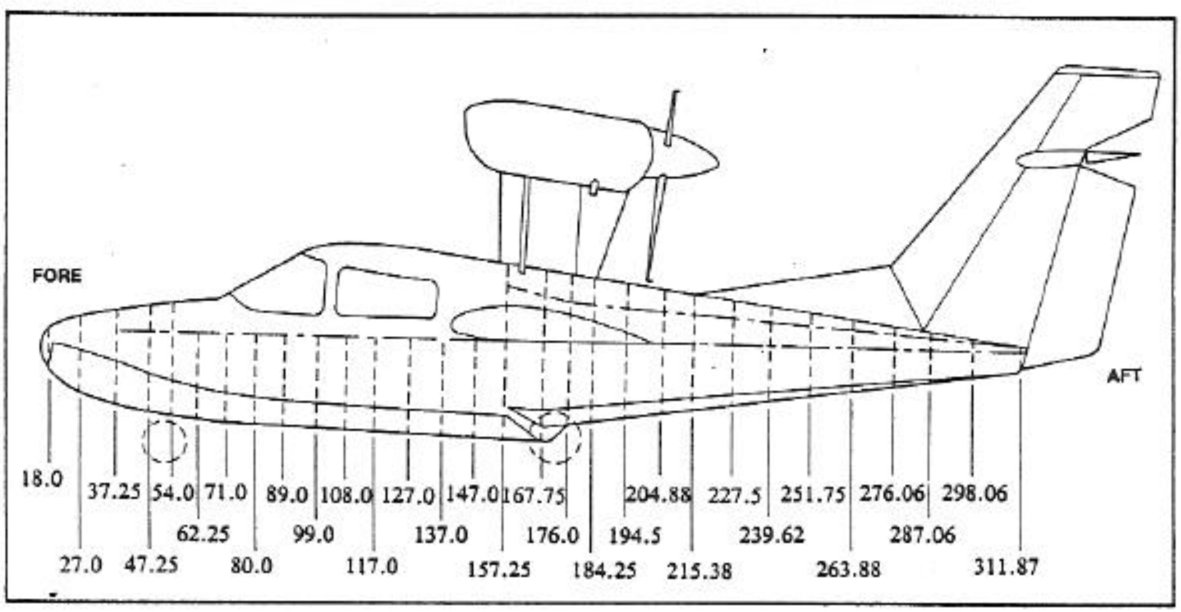


Fig. 1.4 Hull Stations (Model 250)

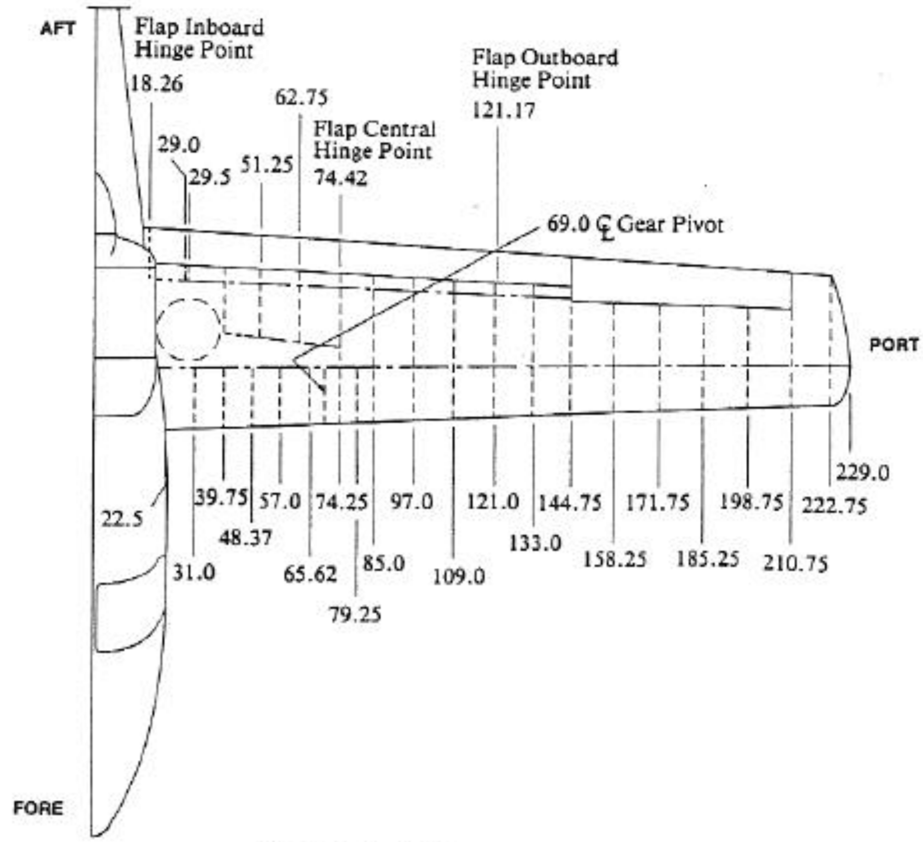


Fig. 1.5 Wing Stations

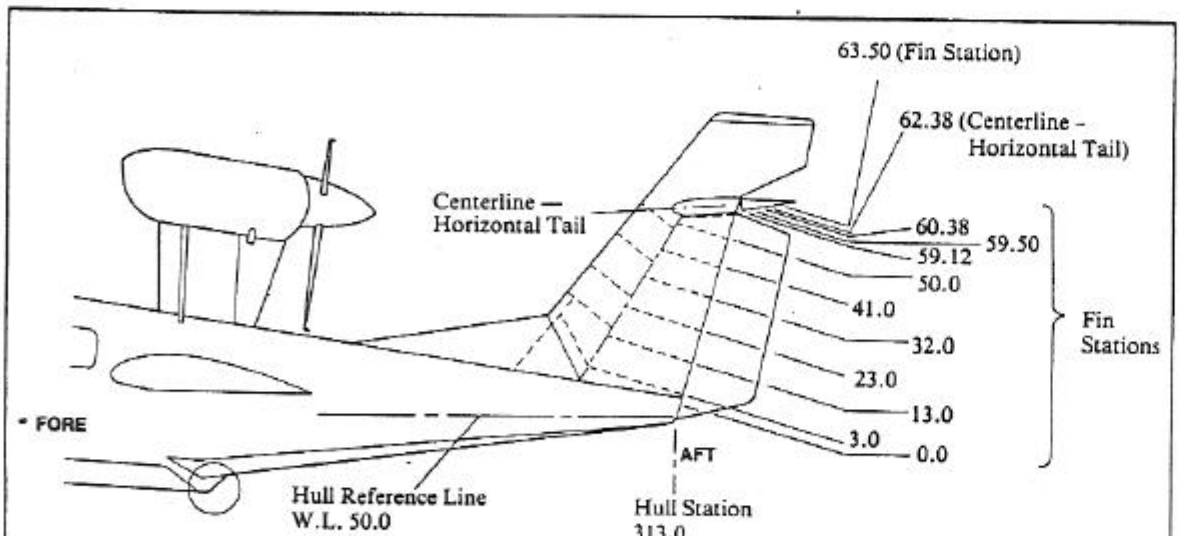


Fig. 1.6 Vertical Stab. Stations (Model 250)

SECTION 2

HANDLING AND SERVICING

2.1 Towing

The airplane is most easily moved by lifting the nose by hand, using the forward edges of the nose wheel well as a handhold. A tow bar system may be installed as optional equipment. Do not push on any of the control surfaces, horizontal stabilizer, or wing flaps.

CAUTION: Landing gear positive downlock is achieved by hydraulic pressure. Ensure that the hydraulic pressure is present before moving the aircraft.

CAUTION: The nose gear can be damaged if nose wheel turn limits are exceeded.

2.2 Jacking

A jack pad is provided under each wing, outboard of the main gear. When jacking the airplane, be aware of the center of gravity (which normally lies around the jack pads). A weighted tail stand should be attached to the tail tie-down ring. Observe all normal jacking precautions. Jack up each wing evenly, while maintaining fore-and-aft leveling. Once the aircraft is jacked, a precautionary support may be used under the keel just aft of the nose wheel well.

CAUTION: Confirm landing gear are down and locked with hydraulic system pressure applied prior to removing the aircraft from jacks.

2.3 Leveling

The leveling points are the hull longerons in the cabin area. Level longitudinally by placing a bubble level fore-and-aft on either longeron. Level laterally by placing the level on a straightedge laid across the cabin from one longeron to the other.

Leveling may be accomplished during weighing by placing blocks under the appropriate wheels, depending on the type and height of the scales being used. Refining the level position laterally may be accomplished by minor adjustments in the main gear oleos extension, and longitudinally adjustment of the nose oleo extension. Refer to the Airplane Flight manual for weighing information.

2.4 Weighing

1. Weighing must be performed in still air, preferably in an enclosed area.
2. Ensure that all water is drained from each watertight compartment (section 7.2).
3. Remove all items not required for Airworthiness, including all removable ballast. (see AFM)
4. Drain all fuel except unusable quantities.
5. Fill hydraulic reservoir and engine oil.
6. Level the aircraft longitudinally and laterally (section 2.3).
7. The aircraft may be weighed on the wheels, or on the jack pads and tail tie-down ring. (fig. 2.1, 2)
8. With tare weight removed, the aircraft empty weight center of gravity can be calculated as follows:

Weighed on Wheels

$$\frac{\text{Arm of main wheel} \times (\text{Left scale wt.} + \text{Right scale wt.}) + (\text{Arm of nose wheel} \times \text{Nose scale wt.})}{\text{Empty Weight}}$$

$$\frac{\text{MW Arm} \times (\text{LW} + \text{RW}) + (\text{NW Arm} \times \text{NW})}{\text{EW}} = \text{E.W.C.G.}$$

Weighed on Jacks

$$\frac{\text{Arm of jack pads} \times (\text{Left scale wt.} + \text{Right scale wt.}) + (\text{Arm of tail tie-down} \times \text{Tail scale wt.})}{\text{Empty Weight}}$$

$$\frac{\text{MP Arm} \times (\text{LP} + \text{RP}) + (\text{TP Arm} \times \text{TP})}{\text{EW}} = \text{E.W.C.G.}$$

2.4 Weighing (cont.)

Example: ***LA4 series aircraft weighed on wheels:***

Left Main = 764.0 lbs
Right Main = 758.0 lbs
Nose Wheel = 129.0 lbs

Aircraft Empty Weight = **1651.0 lbs**

$$\frac{120.75 \times (764.0 + 758.0) + (16.25 \times 129.0)}{1651.0} = \frac{185{,}877.75}{1651.0} = \mathbf{112.58''}$$

NOTE: Ensure that aircraft empty weight and empty weight center of gravity fall within any envelopes specified in the Airplane Flight Manual or AFM Supplements.

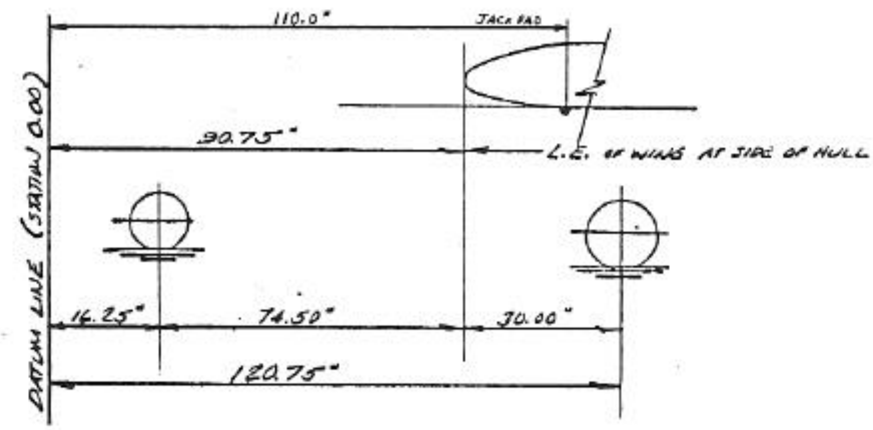


Fig. 2.1 Weighing Point Stations (LA4 Series)

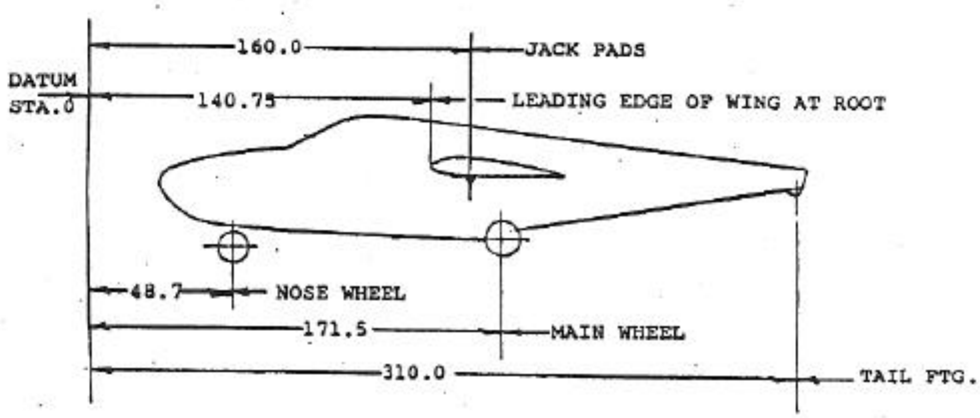


Fig. 2.2 Weighing Point Stations (Model 250)

2.5 Walkways

Non-skid material is provided on surfaces where walking is normally necessary (except the wings). Walking should be accomplished along rivet lines, with soft-soled shoes. Avoid stepping on the wing flaps. Use extra caution on wet surfaces or with wet shoes.

CAUTION: Do not install non-skid material to any wing surface.

2.6 Filling Fuel Tanks

Observe all normal precautions for handling gasoline. Ground the aircraft and fuel nozzle. Fill main tank (40 gallons) first, then wing tanks (17 gallons), and float tanks (7 gallons) each to the bottom of filler necks. Fuel quantity determination should be made by fuel dipstick (not gauges).

2.7 Fuel Drains

There are 1-5 fuel tank sump drains and 1-3 fuel system drains on the airplane (depending on the model and number of tanks installed). The main tank sump and system drains are together on the left hand side of the hull near the wing trailing edge. The integral wing tank sumps are located on the bottom inboard wing tank skins. The float tank sump drains are on the aft inboard sides of the wing floats. The float tank system drains are under the wing just aft of the main wheel wells. All drains are of the spring loaded push type, with a lock-open feature for extended draining. Drains should flow freely. Be sure drains are properly closed after sumping fuel.

2.8 Engine Oil Sump Drain

Drain engine oil from either of two plugs provided on the bottom of the engine sump, near the sides of the engine pylon.

2.9 Servicing Hydraulic System

The hydraulic system uses MIL-H-5606(red) fluid. The reservoir filler opening is located on the upper right hand side of the hull forward deck (just ahead of the canopy opening), inside the bow locker, or under the propeller arc (depending on aircraft model). The reservoir vent is located on the right side hull skin (forward of the instrument panel), or on the left side hull skin (near the flap), depending on the model.

1. The reservoir should be filled to the top hole in the dipstick with the pressure in the hydraulic system at approximately 1000 psi. (NOTE: if the 2-7861-105AWL1 aluminum cylinder reservoir is not installed, then hydraulic fluid level must be checked with the pressure at zero psi.) Add fluid before the level gets below the lower hole in the dipstick. This reservoir also supplies fluid to the brake master cylinders, and draining either the brake system or the hydraulic system will deplete the other system.

2. Accumulator pressure can be checked with the hydraulic pressure at zero psi, by activating the hydraulic pump and noting the first pressure indication during pressure build-up. (The hydraulic pressure should remain at zero for a couple seconds before jumping quickly to accumulator pressure, then proceeding gradually as the hydraulic system pressurizes.) With hydraulic fluid full, and fluid pressure bled to zero psi (ref. section 4.2), charge accumulator with air or nitrogen to 350 psi (± 50 psi), then check accumulator pressure as described above. Repeat process as required until accumulator pressure is maintained within limits. Check fluid level.

   NOTE: If hydraulic fluid comes out of the accumulator valve core, the accumulator's internal seal has failed.

2.10 Bleeding Hydraulic System and Brakes

The hydraulic system is self-bleeding during hydraulic pump operation, but the brake system is not. Reverse pressure bleeding is the preferred method of bleeding the brake system. Proper operation of the braking system is critical, as the braking system is also used to steer the aircraft on the ground.

1. Brake Bleeding - Reverse Pressure. Open bleeder valve (or remove plug) on brake cylinder on wheel, and connect pressure bleeder. As hydraulic pressure is applied, fluid and air will be forced into the hydraulic reservoir (be prepared to catch any overflow). Pump fluid up through system until no air bubbles can be seen or heard entering the reservoir. Close bleeder valve (or reinstall plug) and check brake action and hydraulic fluid level. If spongy brakes persist, repeat process while slowly pumping the brake pedals.
2. Brake Bleeding - Pedal. Open the bleeder valve (or remove plug) on the brake assembly on the wheel, connect a hose, and submerse the free end of the hose in a container partially filled with clean hydraulic fluid. Depress the brake pedals slowly and tighten the bleeder valve (or reinstall the plug) just as the pedal bottoms out. Once the bleeder valve or plug is securely tightened, allow the brake pedals to raise. Repeat the process as required to force all air bubbles down the brake system and out of the brake assemblies. Be sure that sufficient fluid remains in the hydraulic reservoir throughout the bleeding process (to prevent introduction of air into the system).
3. Hydraulic System Bleeding. The hydraulic system is bled by running the hydraulic pump and operating each portion of the hydraulic system several times (returning air bubbles to the externally vented reservoir). The emergency hand pump can be bled by placing the flap handle in the "bleed" position and operating the hand pump slowly while the electrical pump is running.

   CAUTION: the aircraft must be jacked when operating the landing gear system.

4. Post-Bleeding Service. Service the hydraulic system, ensure that the brake bleeder valves are closed (or the plugs are installed) and the brake discs and linings are free of hydraulic fluid. Confirm that the landing gear is down and locked, and hydraulic pressure is present. Perform leak checks as required and perform final operational check of the brakes and emergency hand pump.

2.11 Landing Gear Oleo Struts

With the airplane unloaded, the main gear oleos should have approximately 3 inches (approximately 4 fingers) of piston exposed, and the nose gear oleo should be fully extended.

1. Servicing Oleo Struts

   The fluid used is the same as that for the hydraulic system, MIL-H-5606. Bleed off all air pressure, then remove the air valve from the top of the cylinder. With the strut fully compressed, fill the cylinder with fluid, then slowly extend and compress the strut several times to evacuate air bubbles. With the strut compressed and filled with hydraulic fluid, re-install the air valve, and pressurize the cylinder with air or nitrogen. Pressure for the nose oleo is 100 psi, and for the main oleos 170 psi.

   CAUTION: DO NOT USE OXYGEN to service struts.

   CAUTION: Oleo pressure is important to the proper operation of the nose gear for retraction and extension. If the piston is collapsed after take-off, the nose wheel can "bind" itself on the nose gear door, pushrods, and hinges, preventing it from retracting or extending completely.

2.12 Crankcase Breather System

The engine crankcase breather hose connects to an oil separator can. This can is mounted on the forward bulkhead of the engine cowling, or mounted on the aft pylon channel (behind the aft pylon fairing), depending on model. A second hose from the can exits through the bottom of the cowl or the left side of the pylon side skin depending on model. The can should be drained at each oil check. Note that the hose from the crank-case to the can has a slit (or the elbow in the top of the breather can has a whistle slot) to permit the crankcase to vent should the can or its outlet should become plugged.

CAUTION: In the event of a breather system obstruction, the absence of this slit in the breather hose (or whistle slot in the elbow of the breather can) can result in oil starvation and subsequent loss of engine power.

2.13 Nose Wheel Shimmy Damper

The shimmy damper consists of a friction band compressed by a clamp at the lower nose gear scissors. It is adjustable, and should be tightened just enough to prevent shimmy. Correct tightness would result in applying approximately 20 lbs of side pressure, using both hands to turn ther wheel (when it is free of the ground). CAUTION: Overtightening the shimmy damper will hinder nose wheel steering

2.14 Tire Pressures

Nose tire - 30 psi.
Main tires - 40 psi.

2.15 Lubrication

Lubrication is of major importance on amphibious aircraft. The chart on the following page indicates the primary points requiring lubrication. The following list gives the types of lubricant and recommended frequency of treatment. As a general rule: if it moves, lube it.

1. Types of Lubricant

A.	General purpose lubricant/penetrant for all moving parts.	(LPS or Tri-Flow)
B.	Waterproof grease all grease fittings and wheel bearings.	(MPG-2 or AGC-2)
C.	Hydraulic fluid.	(MIL-H-5606)
D.	Aircraft propeller grease.	(Hartzell Manual 115)
E.	Engine oil.	(Lycoming S.I. #1014)
F.	Thread compound.	(Titeseal #T2566)

2. Lubrication Frequency

The required frequency of lubrication will vary with the type of operation of the airplane. The frequencies given below are based on typical operational profiles, but should be adjusted by the operator as his own service experience indicates is necessary.

Type of Operational Flight Hours Between Lubrication

Frequency Code	Primarily Land	Fresh Water	Salt Water
I	50	30	10
II	100	50	30
III	100	100	100
IV	50	50	50

2.15 Lubrication (cont.)

3. Lubrication Guide

NO.	ITEM	LUBRICANT	FREQUENCY CODE
1	Main gear grease fittings (7)	B	I
2	Main wheel bearings	B	I
3	Drain plugs, floats and hull (7)	F	III
4	Aileron pushrods and bellcranks	A	I
5	Main gear uplock and downlock	A	I
6	Flap hinge bearings	A	I
7	Flap pushrods	A	I
8	Water rudder pivot and cable	A	I
9	Rudder horn bearing	A	I
10	Trim actuator bearing	A	II
11	Control surface hinges (all)	A	I
12	Aileron cable pulleys	A	II
13	Nose wheel bearings	B	I
14	Nose gear scissors	A & B	I
15	Nose gear door hinges, pushrods	A	I
16	Nose gear uplock and downlock	A	I
17	Nose gear grease fittings	B	I
18	Control shaft bearings, universals	A	III
19	Aileron control chains	A	III
20	Hydraulic reservoir	C	I
21	Seat rollers and tracks	A	III
22	Elevator and rudder pushrods, idlers	A	II
23	Flap actuator pivots	A	II
24	Engine oil (see Lycoming Service instruction 1014)	E	IV
25	Propeller (see Hartzell Manual 115N)	D	IV

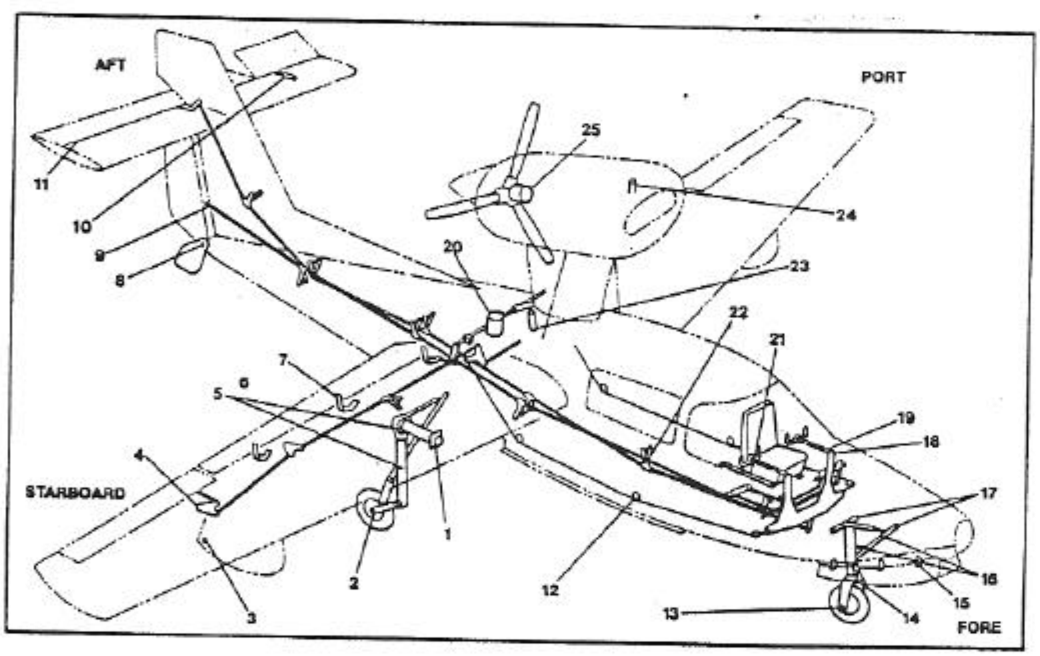


Fig. 2.3 Lubrication Guide

2.16 Landing/Taxi Light Adjustment

Adjustmnent of the landing and taxi lights is accomplished through the use of adjustment screws on the light assembly mounting plate. Make adjustments to the specifications below:

LA4 Series

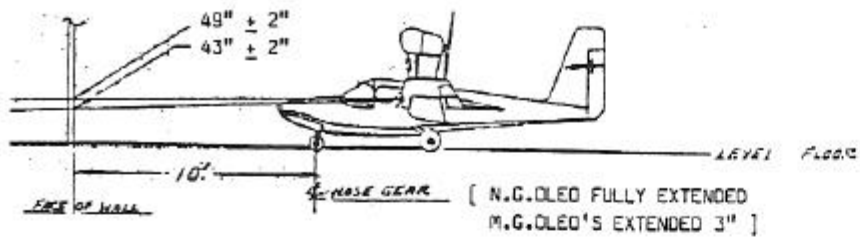


Fig. 2.4 Landing and Taxi Light Adjustment (LA4 Series)

Model 250

1. Nose of aircraft 20' from a vertical surface.
2. Nose oleo fully extended, main oleos extended 3".
3. Beam height as measured on vertical surface from floor:

Landing Light	82" ± 2"
Taxi Light	37" ± 2"

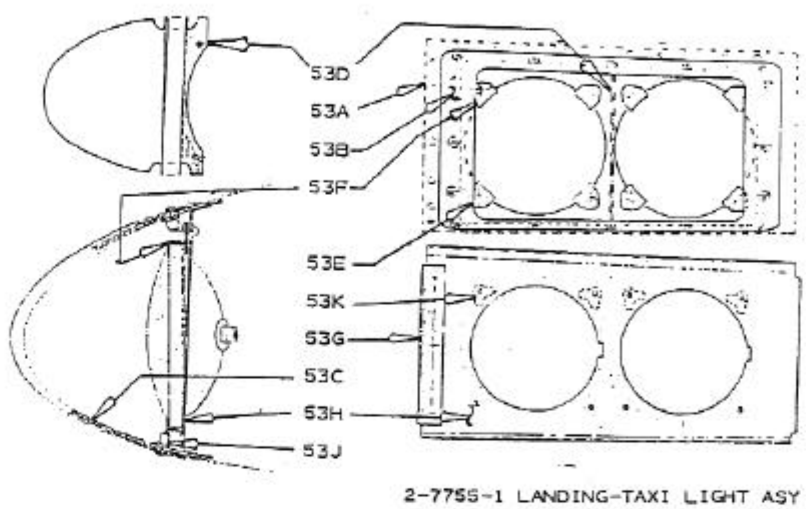


Fig. 2.6 Landing / Taxi Light Assembly

SECTION 3

INSPECTION

3.1 General

This section provides an outline for conducting inspections. Specific information on the airplane systems is given in the following section, or in manuals provided by the manufacturers of items such as the engine and propeller.

100 Hr and Annual Inspections are complete inspections of the aircraft, and are both identical in scope and detail. All inspections must be accomplished by properly certificated inspectors, using the inspection checklist provided in Appendix A.

3.2 Overhaul Intervals and Life-Limited Parts

Parts with recommended replacement or overhaul at scheduled intervals are identified below:

1.	Flexible Fluid Lines	Replace every 5 yrs
2.	Engine Shock Mounts and Hardware	Replace every Engine Overhaul or 12 years
3.	Wing Attach Bolts	Replace whenever wing bolts are removed
4.	Airframe Non-Repairable Items	Replace per Section 7.1.4 of this manual
5.	Hydraulic Pump De-sludge and Overhaul	500 hrs or 5 yrs
6.	Boost Pump Overhaul	500 hrs or 5 yrs
7.	Engine and Engine Accessories Overhaul	Refer to Lycoming S.I. 1009
8.	Propeller Overhaul	Refer to Hartzell SL61

3.3 Inspection Techniques

There are no special or unusual inspection techniques required for the airframe or systems of the airplane, other than attention should be paid to water damage, and identifying unapproved repairs and alterations.

3.4 Inspection Intervals

Except for the special inspections specified in Section 3.5, inspection intervals are specified in the Inspection Checklist at the end of this section. Calendar-time equivalents are as follows:

50 hrs	or	4 months
100 hrs	or	12 months
500 hrs	or	5 years
Engine TBO	or	12 years

3.5 Special Inspections

1. Wing / Wing Attach Bolt Removal

1. Whenever a wing attach bolt is removed, clean and inspect the bolt hole for cracks in the spar cap angle and spar doubler with 3X magnification and a suitable light source (or equivalent). Inspect each hole from both sides of the spar, with the light shining through the opposite side of the hole. (3X magnification may be omitted on the leading edge side due to lack of access, but a magnifying mirror is recommended.)
2. Inspect the wing spar in accordance with the latest revision of Service Bulletin B-79.
3. Inspect the wing attach fitting with 3x magnification for corrosion, cracks, and damage.
4. If a crack is suspected, further inspection will be required before the aircraft can be returned to service. (Ref. AC43.13-1b for additional inspection techniques)
5. Whenever a wing is removed, inspect the root rib for distortion, corrosion, and cracks. Inspect the integrity of the sealant where the wing attach fitting exits the fuselage. Replace the aileron boot at the fuselage.

3.5 Special Inspections (Cont.)

2. Engine Removal

1. Inspect cowling and cowl frames for security, cracks, chafing, corrosion, and general condition.
2. Inspect cowl hinges and latches for security, wear, damage, corrosion, proper installation, and proper operation.
3. Inspect firewall for damage and condition of through-the-firewall sealant.
4. Clean engine mount. Inspect for security, cracks, distortion, corrosion, chafing, damage, and general condition.
5. Inspect pylon side panels and attach angles for cracks, distortion, corrosion, and general condition.
6. Inspect engine shock mounts and attach hardware per Section 3.5.4.

3. Hard Landing

1. Landing On Gear
   1. Inspect trailing beam, forward tube and axle for damage. (Fig. 3-2, Item 10)
   2. Inspect nose gear piston for damage due to bending, and upper drag strut attach tube for cracks and security to the wheel well.
   3. Inspect web behind landing gear cutout (2-1611-1&2).
   4. Inspect clip and angles at the forward and sta 74.25.
   5. Inspect web of rib at station 74.25 for buckles and cracks.
   6. Inspect leading edge skin between root and sta 74.25 for diagonal shear buckles and loose or missing rivets in the spar (top & bottom). (Wing fuel tank skin on Model 250)
   7. Inspect main beam web for buckles and cracks at corners of cutout for wing fittings.
   8. Inspect web of root rib for buckles and cracks.
   9. Inspect bottom of root rib below wing fittings for compression buckle.
   10. Inspect upper clip angles at wing sta 39.75 aft of main beam.
   11. Inspect rear wing attach and adjacent structure inside and out for evidence of damage.
   12. Inspect empennage for looseness and damage.
   13. Inspect lower engine mount at cabin attachment for security and evidence of damage. Can be accomplished by removing interior panel of cabin aft wall. Check pylon side struts (or flying wires) for looseness, damage, and security.
   14. Inspect aft cowl bulkhead for cracks, and damage from starter and/or alternator.
   15. Inspect top fuselage skin below propeller for evidence of a prop strike.
   16. Inspect engine shock mounts and bolts for damage.
   17. Inspect cowling, cowl frames, and baffles for damage.
   18. Inspect engine mount and cowl attach points for cracks and damage.
   19. Inspect aft seat bottom frames.
2. Landing on Hull Bottom
   1. Inspect items 7-19 above, and:
   2. Inspect interior hull bottom skins, side skins, & frames, paying particular attention to the area extending (4) webs on either side of the "step" area. (Fig. 3-2, Item 1)
      Note:The hull "step" is located at sta. 117 on the LA4 series & sta. 168 on the 250's.
   3. Inspect exterior hull chine, keel, bottom skins, & side skins for possible buckling or other deformity, paying particular attention to area immediately behind step. (Sta. 157.25 to 184.25) (Fig. 3-2, Item 2)
   4. Inspect nose gear doors, hinges, retraction rods, and drag strut, for distortion, cracks, and general condition.
   5. Inspect the integrity of watertight compartments with a leak test.

3.5 Special Inspections (cont.)

4. Engine Shock Mounts

At each Annual inspection all mounting assemblies should be visually inspected in their installed state while supporting the engine weight. The correct visual inspection procedure is as follows.

1. Inspect all bonded sandwich mountings for metal-to-rubber bond separation, flex cracks, rubber deterioration due to exposure to fluids, and mechanical damage such as cuts in the rubber surface.
2. Inspect all unbonded steel parts for cracks, and excessive nicks, scratches, or gouges.
3. Inspect all mounting hardware torque, and re-torque as necessary.
4. Measure propeller tip-to-turtle deck clearance to check engine shock mount sag. Minimum allowable clearance is as follows:

LA-4	2.5"	(72" prop)
LA 4-200	1.5"	(74" prop)
Model 250	3.0"	(76" Q-tip)

At each hard landing inspection, or whenever the engine shock mount bolts are removed, it is necessary to perform the Annual inspection above, then remove the shock mounts and inspect as follows:

1. Wipe oil and dirt from bonded mountings, but do not dip in cleaning solvents. Wash metal parts in any standard solvent.
2. Steel bolts and spacers should be inspected for nicks, chafing, cracks, corrosion, or damaged threads. Examine spacers for crushing of ends, caused by excessive bolt torque.
3. Examine bonded rubber mountings for swelling, bond or rubber separation, and shear and compression set.

   Separation, swelling, or flex cracks in the surface of the rubber is cause for rejection.

   The effects of shear and compression set are determined by measuring the dimensions shown in figure 3.1. Reject parts which have an eccentricity greater than dimension "A" or an overall thickness less than dimension "B".

Mounting Series #	Eccentricity Max. "A"	Thickness Min. "B"
J-3049	.07"	.71"
J-7763	.08"	1.02"
J-8381	.06"	.75"
J-9612	.08"	1.22"

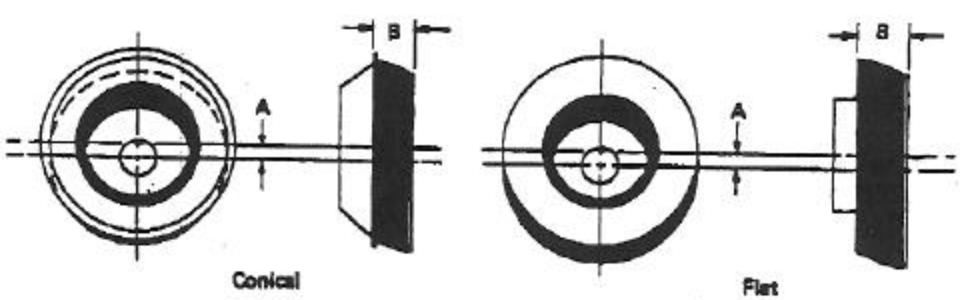


Figure 3.1 Lord Mount Inspection

3.5 Special Inspections (Cont.)

5. Main Gear Leg and Trunnion

Refer to Revo, Inc. Service Bulletin B-76

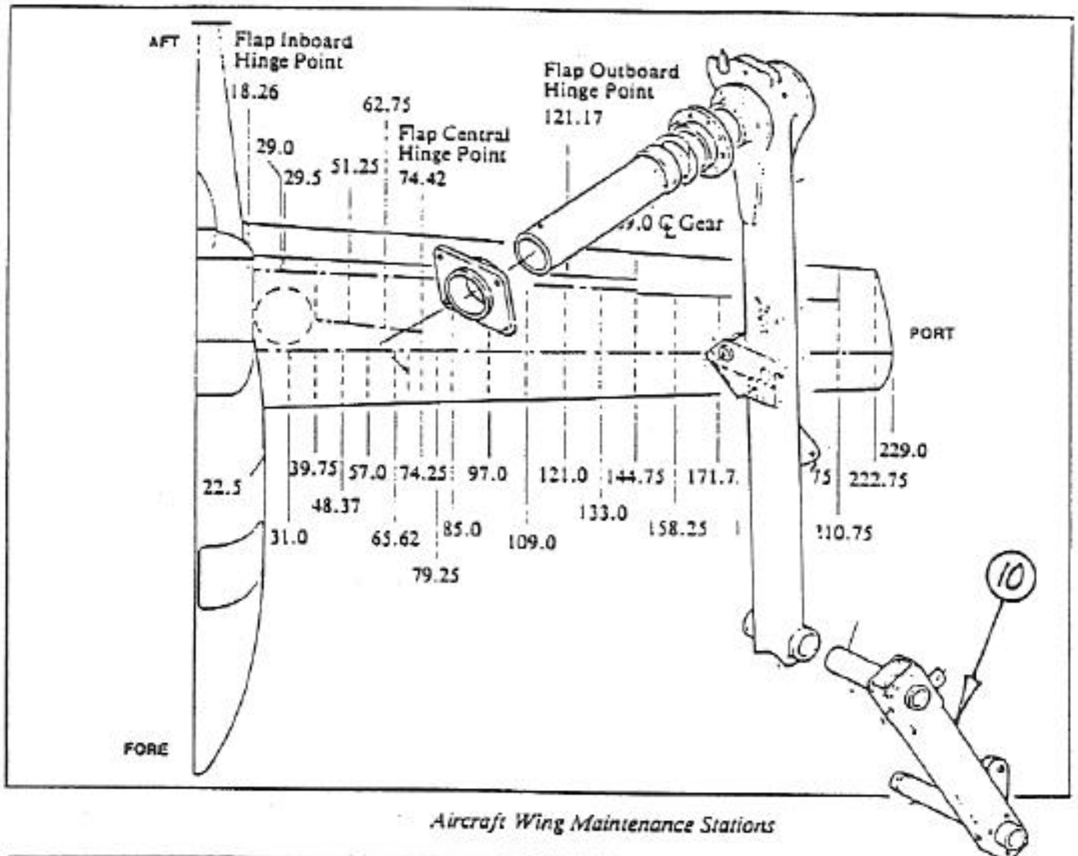
6. Corrosion

Inspection for corrosion should be performed in accordance with the Inspection checklist in Appendix A. The following areas should receive special attention if the aircraft is operated in a salt water environment, or if a corrosion problem is suspected.

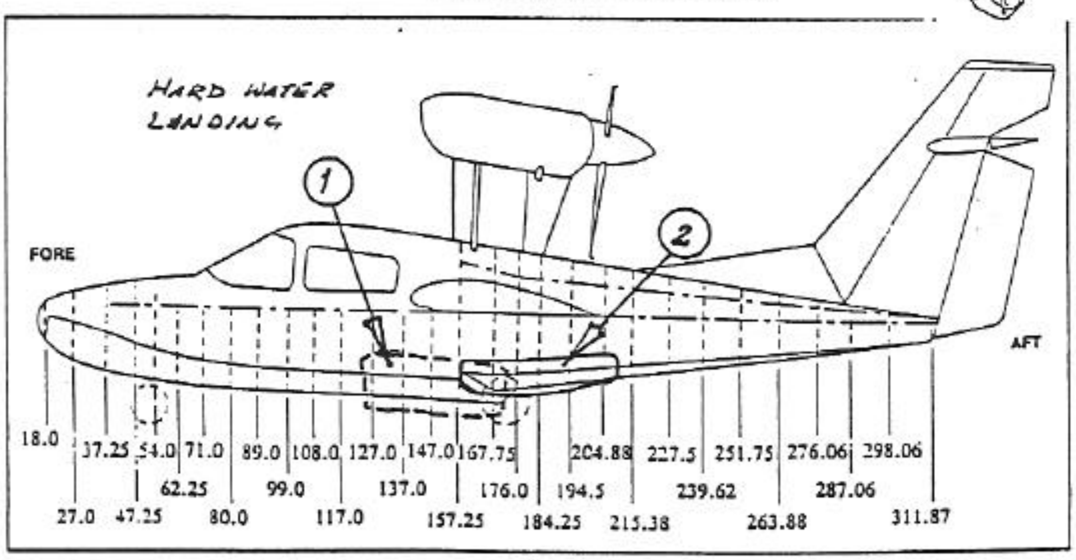
1. Nose gear doors
2. Nose gear trunnions
3. Longerons (the window sill area aft of the aft cabin windows and forward of the main cabin bulkhead)
4. Wing spar doubler, cap angle, and wing attach fittings (in the wheel well area)
5. Main gear legs, axles, and trunnions
6. Engine mount and attach points
7. Flap hangars
8. Push rod tubes (where rubber accordion boots attach to the pushrod)
9. Anyplace where paint and primer have been compromised
10. Areas where field repairs or alterations have been made

7. Unapproved Parts, Repairs, and Alterations

Airworthiness is maintained so long as the aircraft is in a condition safe for flight and, it meets the original or properly altered type design. All parts, repairs, and alterations require some form of design approval, must be properly identified, and the installation requires proper maintenance entries. It is recommended that only factory approved parts, repairs, and alterations are installed on the aircraft, and all sections of this manual should be adhered to.



Aircraft Wing Maintenance Stations



Aircraft Hull Maintenance Stations

Figure 3-2
Hard Landing Inspection Points

SECTION 4

SYSTEMS

4.1 General

This section provides description of the airplane systems, excluding items such as engine, propeller, wheels and brakes, instruments and avionics.

4.2 Hydraulic System

1. General

The hydraulic system operates the landing gear, flaps, and elevator trim; and supplies the brake system with hydraulic fluid (Fig. 4.1). The standard installation incorporates toe-operated brakes on the left side only, with the right hand pedals able to be folded down. An optional dual brake installation provides brake cylinders on both the left and right pedals.

CAUTION: Hydraulic pressure provides the positive downlock in the landing gear system. Insure that hydraulic pressure is up prior to working on or moving the aircraft.

If hydraulic pressure must be removed for maintenance purposes, an alternate positive downlock is required. This can be accomplished by clamping (ie. vise grips) the knee of each drag strut in the closed position, and/or safety wiring the downlocks in the closed position.

CAUTION: Install visible warning flags on each landing gear and on the landing gear lever in the cockpit whenever an alternate landing gear downlock system is installed.

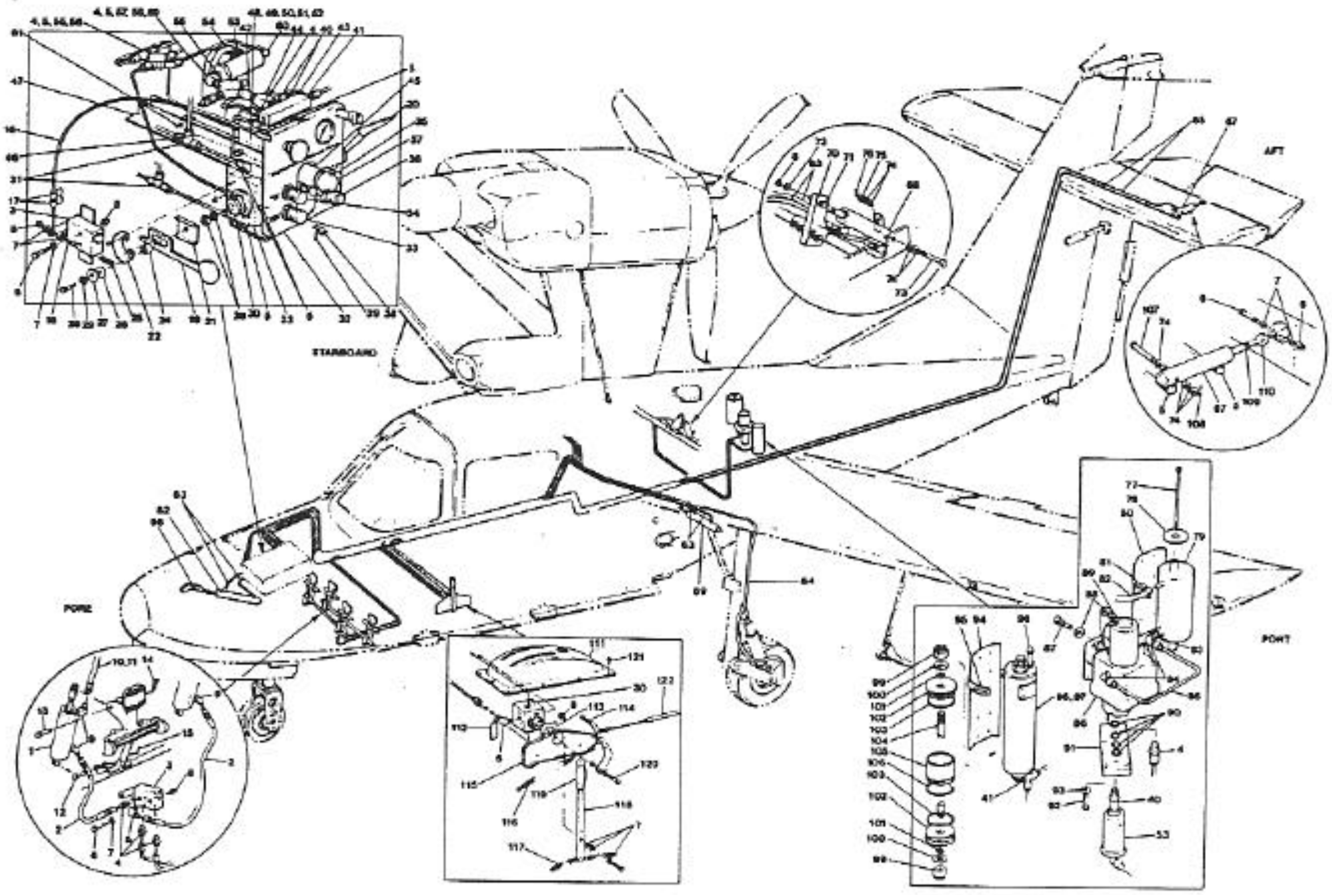


Fig. 4.1 Hydraulic System (Model 250)

4.2 Hydraulic System (cont.)

2. Variations Between Aircraft Models

1. All airplanes with Prestolite or Oildyne pumps have a pressure relief valve built into the pump. Eastern Industries pumps have a relief valve (1300-1350 psi) installed externally.
2. All airplanes with Oildyne pumps have a check valve built into the pump. (Prestolite and Eastern Industries pumps require external check valves.)
3. C-2, LA-4, and LA4-200 have hydraulic filters installed in the system return line. (Fig. 4.2, item, A) Model 250 have hydraulic filters installed downstream of the pump. (Fig. 4.2, item B)
4. Model 250 airplanes after s/n 94 have two system return lines. (All other airplanes have one.)
5. Restrictor location and types vary significantly by aircraft model and serial number. (Contact Product Support as required.) Some restrictors are fabricated from standard hydraulic fittings.
6. The hydraulic pump and reservoir is located behind the right-hand instrument panel on the earlier models, and on the left-hand side of the aft main fuel tank wall on later models.
7. The accumulator is located in front of the hydraulic sled (under the instrument panel) on the earlier models, and mounted with the hydraulic pump and reservoir on later models.

3. Operation: (starting with system pressure at zero).

With the battery switch "on", turning the hydraulic pump switch "on" will energize the relay to the pump motor (Fig. 4.3). With the pump operating, the system pressure remains at zero briefly, then jumps up rapidly as system pressure overcomes accumulator pressure (300-400 psi) and one side of the accumulator begins to fill with hydraulic fluid. (Accumulator may be a spherical diaphragm type or a cylindrical piston type; the function and charging pressure are the same in either case.) The pressure will increase to 1200 psi ($\pm$ 50 psi), at which point the pressure switch (Fig. 4.4) contacts will open, causing the relay contacts to open (Fig. 4.3), which shuts off the pump motor.

If the hydraulic system is then used, to actuate flaps, trim, or landing gear, the pressure will drop. When it drops below 900 psi ($\pm$ 50 psi), the pressure switch contacts close, energizing the relay, which starts the motor again, and the pump begins building pressure (Fig. 4.3).

The accumulator can deliver a large quantity of fluid at high pressure very quickly, providing rapid landing gear actuation. However, the action would be too rapid for safety in the case of the flap actuation and the trim actuation, therefore, restrictors are incorporated in these systems

Note: Adding or removing restrictors is prohibited unless specific FAA approval is obtained.

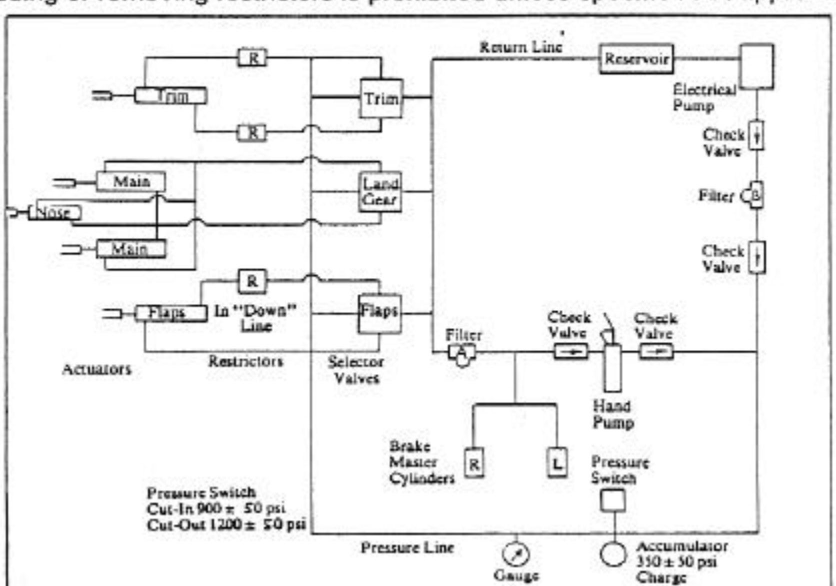


Fig. 4.2 Hydraulic System Schematic

4.2 Hydraulic System

4. Pressure Switch Adjustment:

The cylindrical aluminum pressure switches installed on the earlier models are not adjustable. When hydraulic pressure operation exceeds the limits specified below, K-156 kit must be installed. The B1S type pressure switch is pre-set at the factory with a 300 (± 100) psi pressure range. The limits of this range can be adjusted in the field with the 3/8" slotted hex screw (Fig. 4.4)

If the pressure switch can not be adjusted to operate within the following limits, the switch must be rejected.

Limits:	High	1200 psi	(± 50)
	Low	900 psi	(± 50)

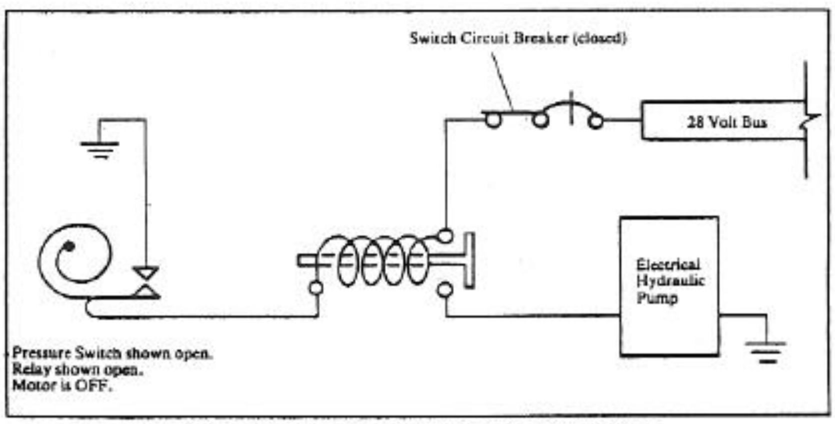


Fig. 4.3 Hydraulic System Electrical Schematic

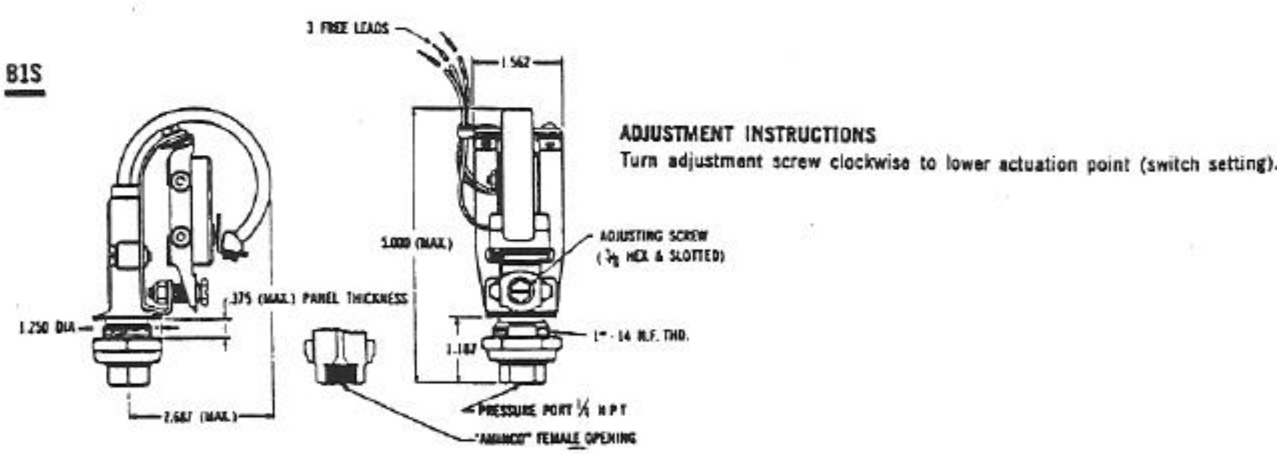


Fig. 4.4 B1S Hydraulic Pressure Switch

4.2 Hydraulic System (cont.)

5. Selector Valves:

Hydraulic fluid is directed to the actuating cylinders through manually operated four-way selector valves. The operation of these valves is shown in Figure 4.5. Flap and landing gear operation is obtained by moving the valve between position I and position II. In case of the trim actuator, the valve is spring-loaded in an intermediate (closed-center) position and trim adjustment is made by moving the valve momentarily into position I or II.

The same closed-center position may be used in the flap and landing gear valves to isolate the particular system from the rest of the hydraulic system. An intermediate position between either position I or II, and the closed-center position, is the "bleed" position (when hydraulic pressure is up, an audible "whoosh" can be heard without corresponding action of the applicable actuating cylinder(s)).

Note: The landing gear and flap selector valves contain an internal stop pin (Fig. 4.7), and an external stop (Fig. 4.6, item 21f), to prevent valve operation beyond position I or position II.

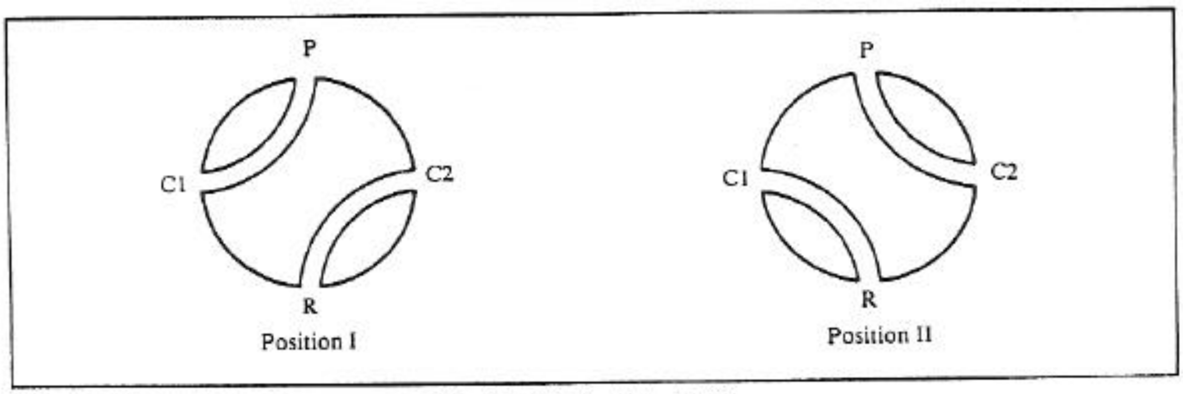


Fig. 4.5 Selector Valve Positions

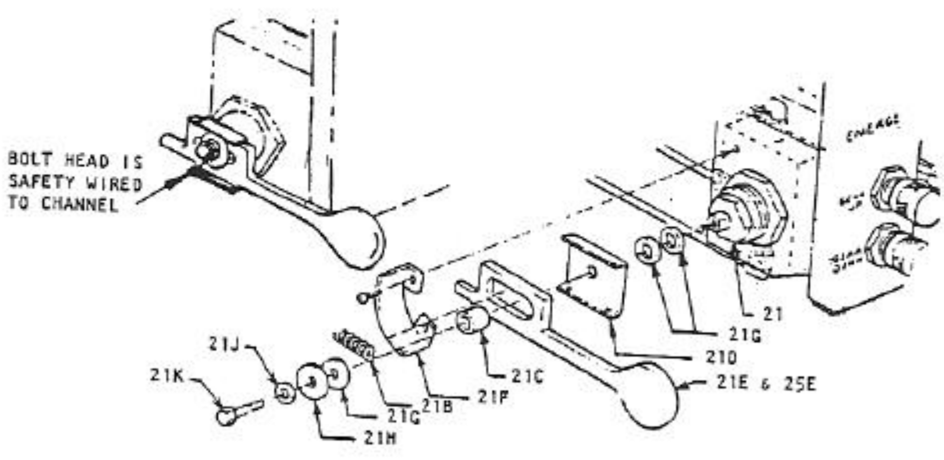


Fig. 4.6 Landing Gear and Flap Control Levers

4.2 Hydraulic System (cont.)

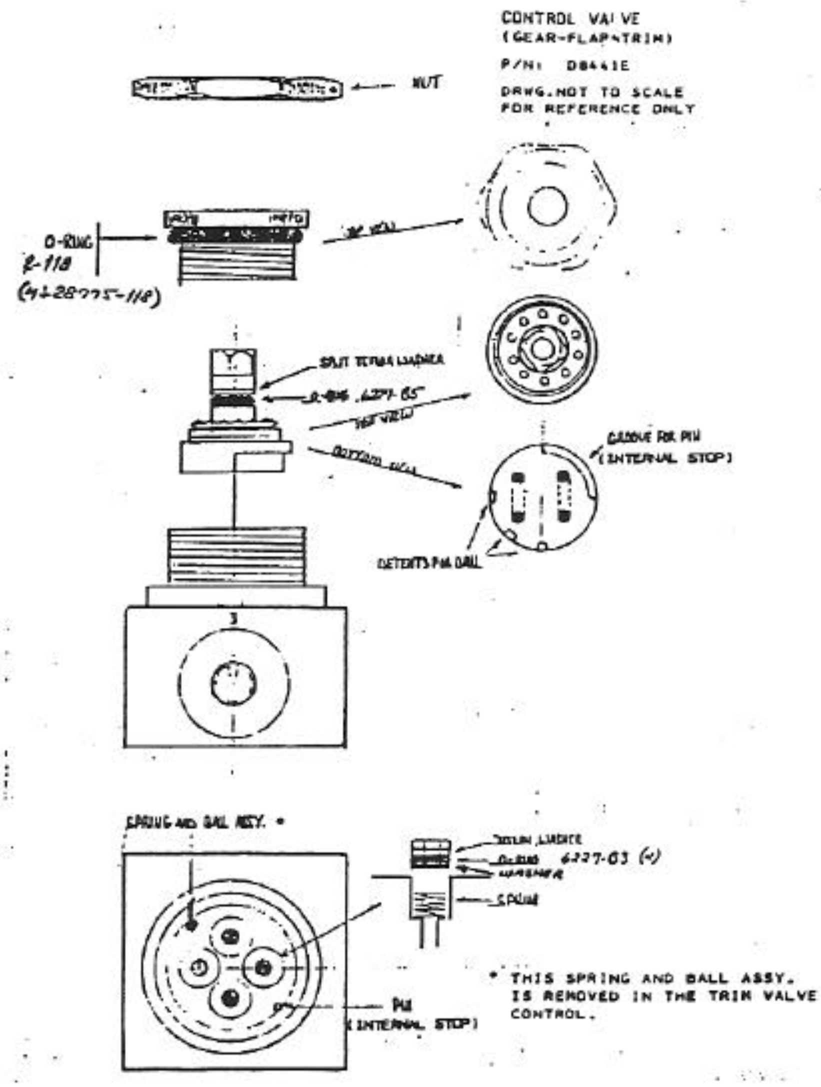


Fig. 4.7 Selector Valve Exploded View

4.2 Hydraulic System (cont.)

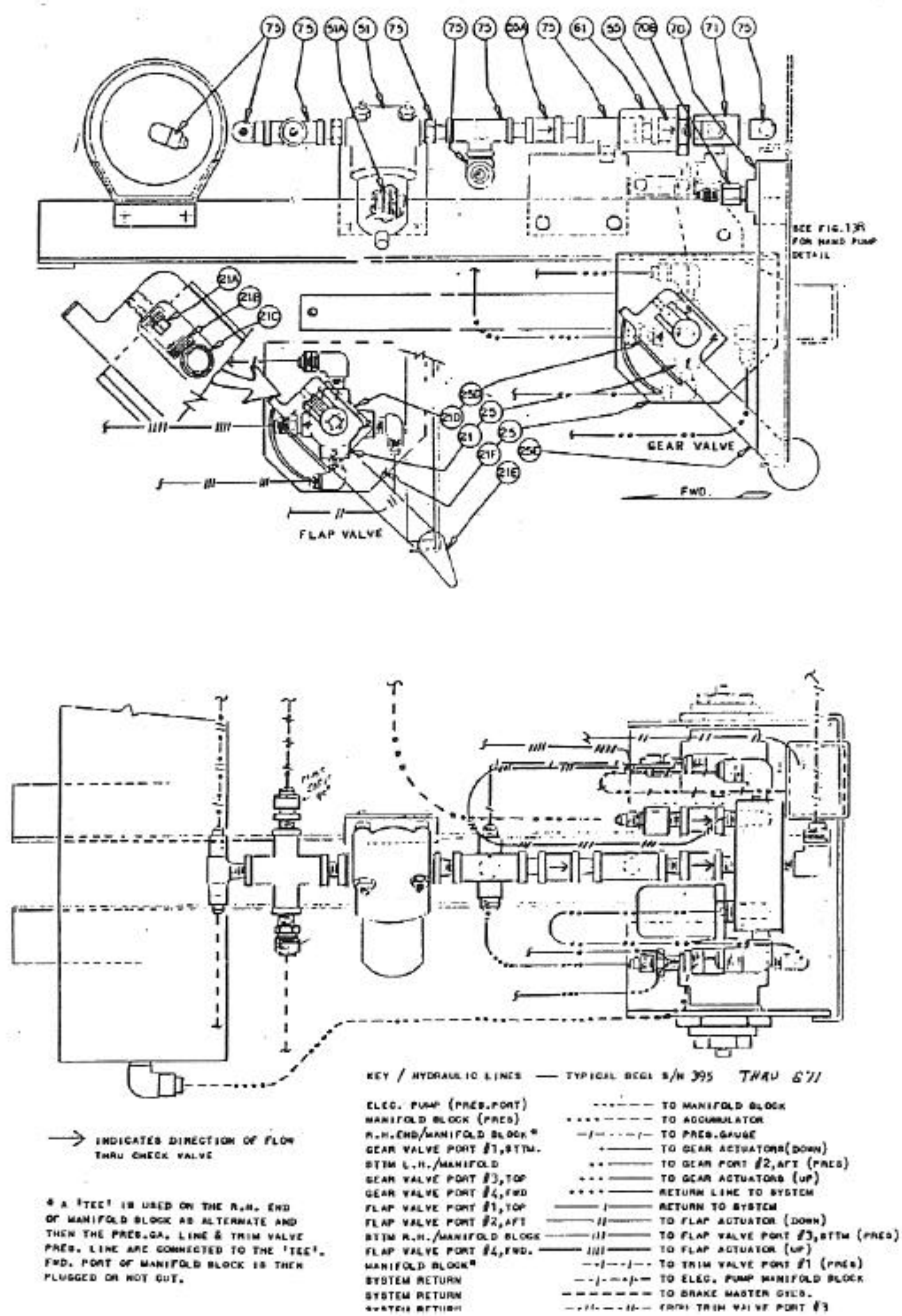
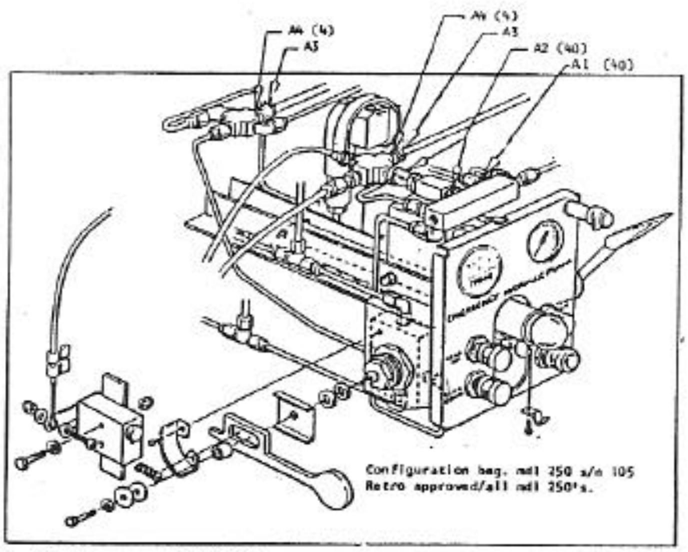


Fig. 4.8 LA4 Series Hydraulic Sled (Side and Top Views)

4.2 Hydraulic System (cont.)



KEY NO.	QTY.	PART NO.	DESCRIPTION
A1	1	AN816-4D	NIPPLE-FLARED TUBE,PIPE
A2	2	CMM10B	CHECK VALVE
A3	2	AN816-6-2D	NIPPLE-FLARED TUBE,PIPE
A4	2	AN818-6D	NUT-COUPLING
	2	AN819-6D	SLEEVE

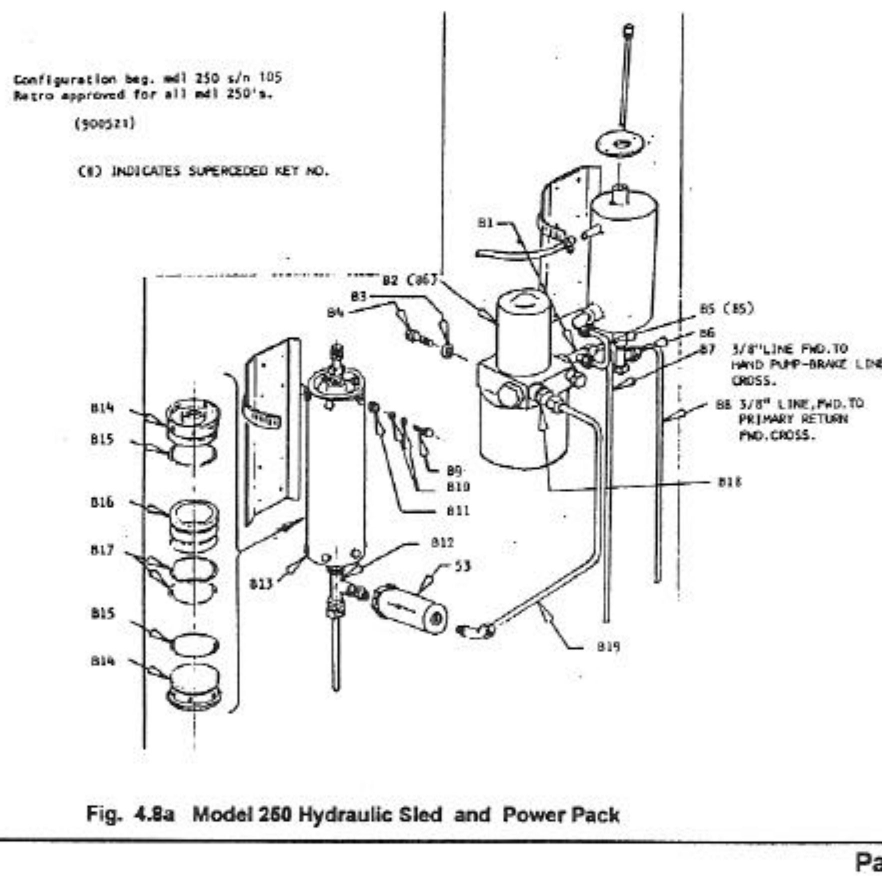


Fig. 4.8a Model 250 Hydraulic Sled and Power Pack

4.2 Hydraulic System (Cont.)

6. Actuators:

Resealing Hydraulic Actuators

The following procedures apply to the resealing of most hydraulic actuators:

1. When rebuilding landing gear actuators, place aircraft on jacks.
2. Bleed pressure from hydraulic system.
3. Remove actuator from aircraft.
4. Remove bolts and bushings as applicable from blank ends of actuators.
5. Gently tap threaded portion of rod with soft (nylon) punches to remove plug and piston assembly from blank end of actuator.
6. Discard all old O-rings.
7. Clean actuator assembly with mineral spirits and dry with shop air.
8. Pre-lubricate new O-rings and insert in their respective locations.
9. Reassemble in reverse order of disassembly, using care not to damage o-rings.

7. Accumulator:

Resealing Hydraulic Accumulator

Only accumulators with bolted ends can be resealed. Welded accumulators are unrepairable. Rebuild the hydraulic accumulator by following the procedures below:

1. Bleed hydraulic pressure from system.
2. Disconnect and plug hydraulic lines from AN 826-40 fitting on the (L/H) side of accumulator.
3. Loosen two clamps holding accumulator and remove from aircraft.
4. Drain waste hydraulic fluid
5. Remove nut from either end of accumulator.
6. With shop air, carefully (short bursts) remove ends of accumulator.
7. Push piston out of either end of accumulator and separate from the tie rod.
8. Discard all (6 each) old O-rings.
9. Pre-lubricate O-rings with hydraulic fluid and insert in their respective slots.
10. Reassemble accumulator in reverse order of disassembly.
11. Reinstall accumulator in reverse order of removal.

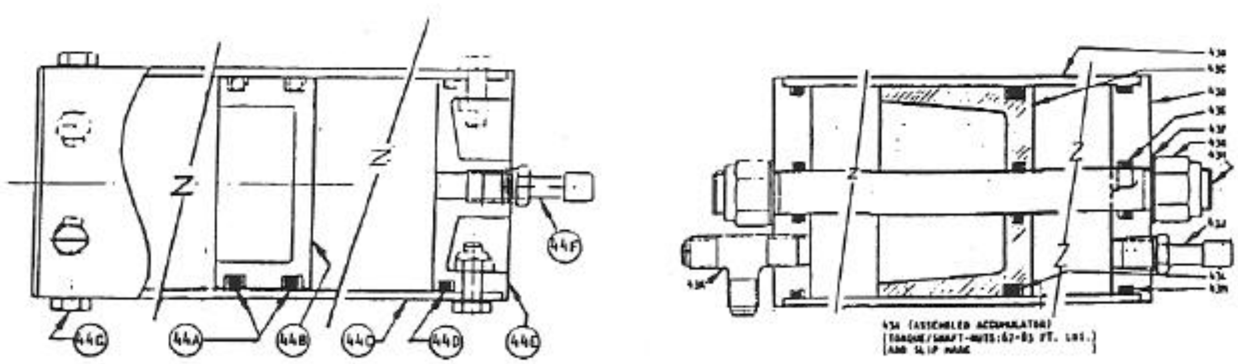


Fig. 4.9 Accumulator

4.2 Hydraulic System (Cont.)

8. Hydraulic Pressure Drop Fault Isolation

The inability of the hydraulic system to hold pressure is normally the result of an external leak or an internal bypass. Internal bypasses normally occur in actuators, selector valves, or check valves, and occasionally in the pump's internal relief valve.

The following procedures may be used to isolate the fault:

1. Look. An external fluid leak will cause hydraulic pressure to bleed down.
2. Listen. A rapid internal pressure bypass can often be heard (especially with the aid of a stethoscope). Check each actuator, selector valve, and check valve.
3. Isolate. Take component(s) out of the system one at a time to identify or eliminate it as the cause of the pressure drop. Isolate it, then pressurize the system to check.
    1. Isolate the flaps by placing the flap selector in the intermediate "closed" position.
    2. Jack aircraft. Isolate the landing gear by placing the landing gear selector in the intermediate "closed" position. (Each landing gear actuator can be individually isolated by removing and capping both the "up" and "down" lines.)
    3. Insure that uneven trim handle return springs are not allowing the trim selector valve to bleed system pressure. (Capping the trim selector lines will confirm.)
    4. Inspect check valves for proper operation. (Sometimes cleaning will rectify.)
    5. Isolate the electric hydraulic pump and pressurize system with the hand pump.

4.3 Electrical System

Refer to model comparison chart for differences in batteries, voltage, and method of power generation. Schematics of the various systems are shown on the following pages.

1. Battery Compartment

A variety of options are available for battery locations. Contact Aerofab for details.

LA4 series: The battery is located in either the nose, inside the front right side of the baggage compartment, or under the right cabin floor just ahead of the baggage compartment.

Model 250: The battery compartment is located on the top fuselage skin, just behind the right wing.

2. Relays

LA4 series: Master and starter relays are normally located on the right inside fuselage side skin, behind the baggage compartment entrance. (Various locations on older models.)

Model 250: The master and starter relays are located in the flap actuator compartment directly ahead of the battery compartment behind the right wing.

3. Ammeter

The ammeter does not indicate battery discharge, but displays the load (in amperes) placed on the generating system. With all electrical equipment turned off (except the master) the ammeter indicates the amount of charging current demanded by the battery. This amount varies depending on the percentage of charge in the battery at the time. As the battery is charged, the amount of current displayed on the ammeter will decrease. The current reading on the ammeter will reveal immediately whether or not the alternator system is operating normally. (A low volt light or alternator inop light is installed on some models). Shunts for the Model 250 are normally located in the aft cabin, on the left side of the aft cabin bulkhead, above the baggage compartment door.

4. Warning Circuits

Warning circuits include landing gear position lights, low voltage light, flap position lights, and a stall warning horn.

Red and green landing gear lights are located just below the instrument panel in proximity to the landing gear selector handle. The gear downlock switches control the green gear-down light, and the gear uplock switches control the red gear-up light.
NOTE: All three gear switches (nose and mains) must be engaged to close the circuit.

The flap indicator lights are amber for the flap up, and white for flap down. The stall warning horn has a high frequency continuous tone that sounds when airspeed drops to less than 10 mph IAS above stall speed.

5. Charging Circuit

Due to the numerous charging systems used over the years, individual systems are not covered by this manual. Refer to the component manufacturer's service information for specific inspection, maintenance, and overhaul instructions.

Electrical schematics for various aircraft models can be found on pages 4-9 / 4-12.

4.3 Electrical System (Cont.)

6. External Power

An external power receptacle permits the use of auxiliary power for cold starting or when performing maintenance which requires significant electrical power (ie. landing gear retraction tests). A reverse polarity protection system is used, in which a silicon junction diode is connected in series with the coil in the external power contactor, so that if the ground power source is inadvertently connected with reverse polarity, the external power contactor will not close. This feature protects the diodes in the alternator and other semi-conductor devices from possible damage from reverse polarity. The external power receptacle is located above the leading edge of the right wing.

Note: The aircraft battery switch must be turned on for the external power system to operate.

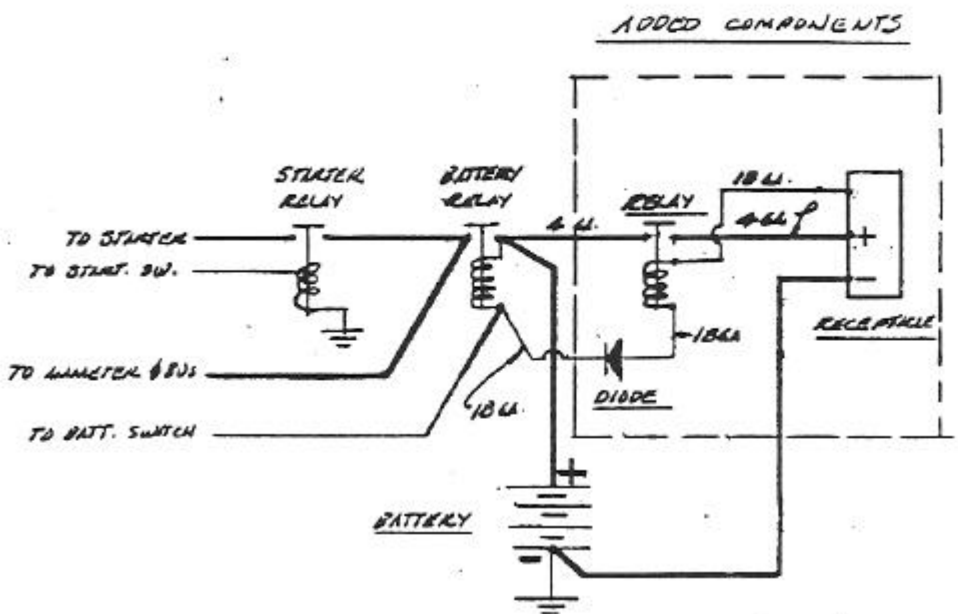
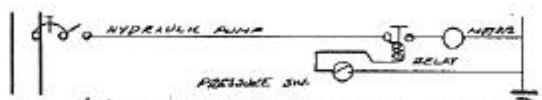
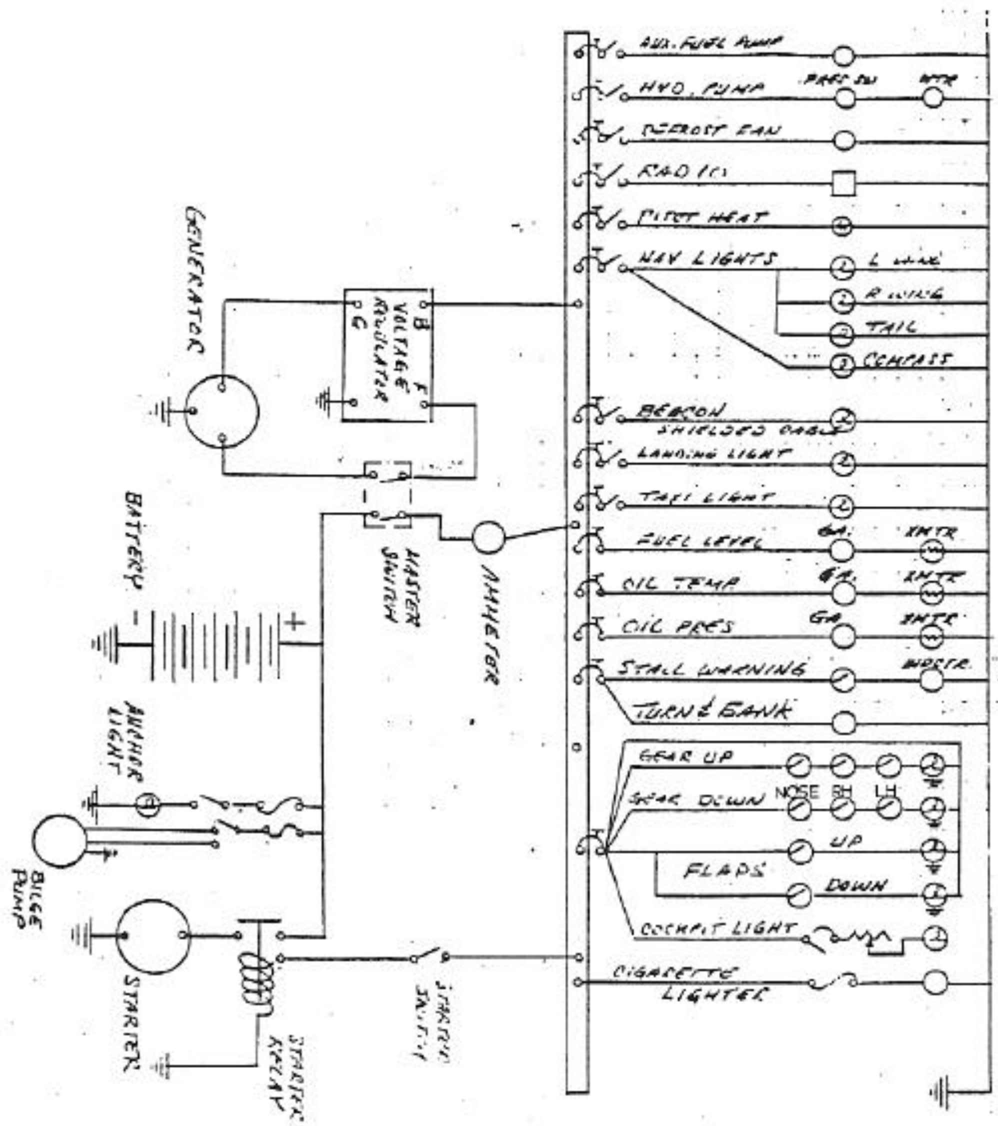


Fig. 4.9a External Power System

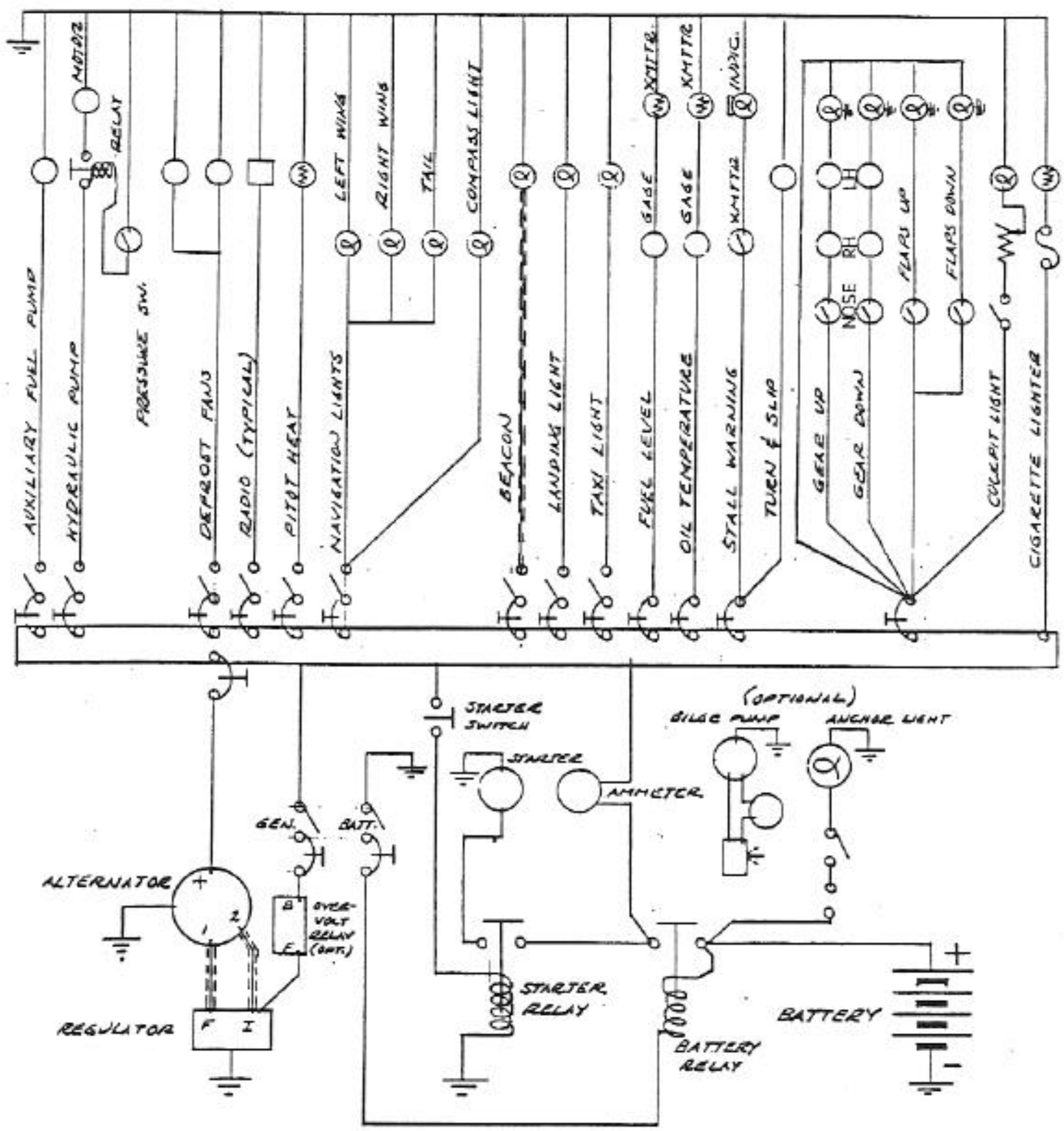


Hyd relay added on S/N 376 and Sub.



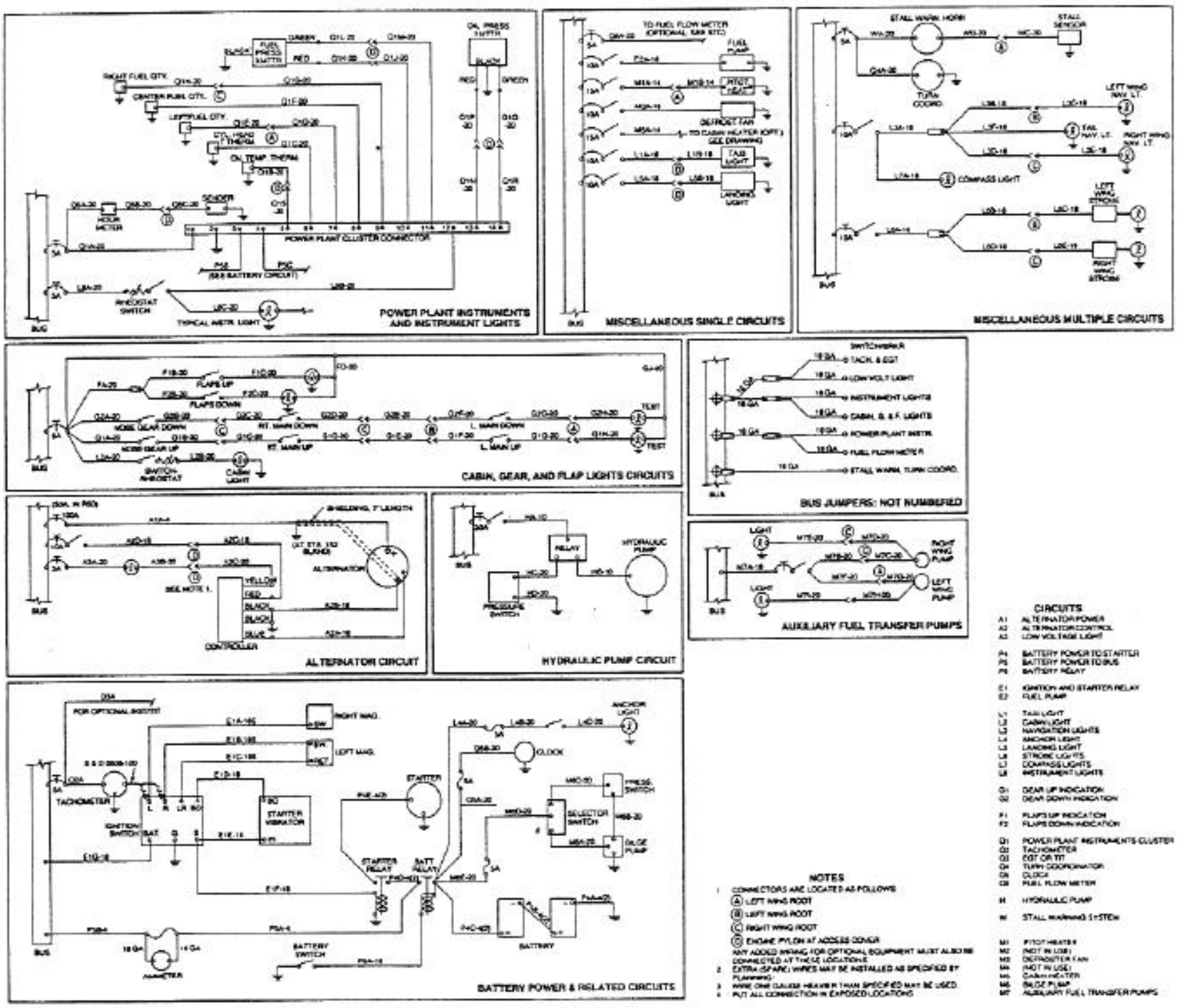
Note 1: Alternator and over-voltage regulator added on s/n 376 and sub. (See Fig. 4.11)
Note 2: See figure 4.13 for additional voltage regulator installations

Fig. 4.10 Typical LA4 Wiring Diagram (s/n 263 thru 499)



Note 1: See figure 4.13 for additional voltage regulator installations

Fig. 4.11 Typical LA4 Series Wiring Diagram (s/n 500 and sub.)



Note 1: See figure 4.13 for additional voltage regulator installations

Note 2: Early Model 250's were manufactured with 12 vdc systems.
Later Model 250's were manufactured with 24 vdc systems, with either (2) 12v batteries, or (1) 24v battery.

Fig. 4.12 Typical 250 Series Wiring Diagram

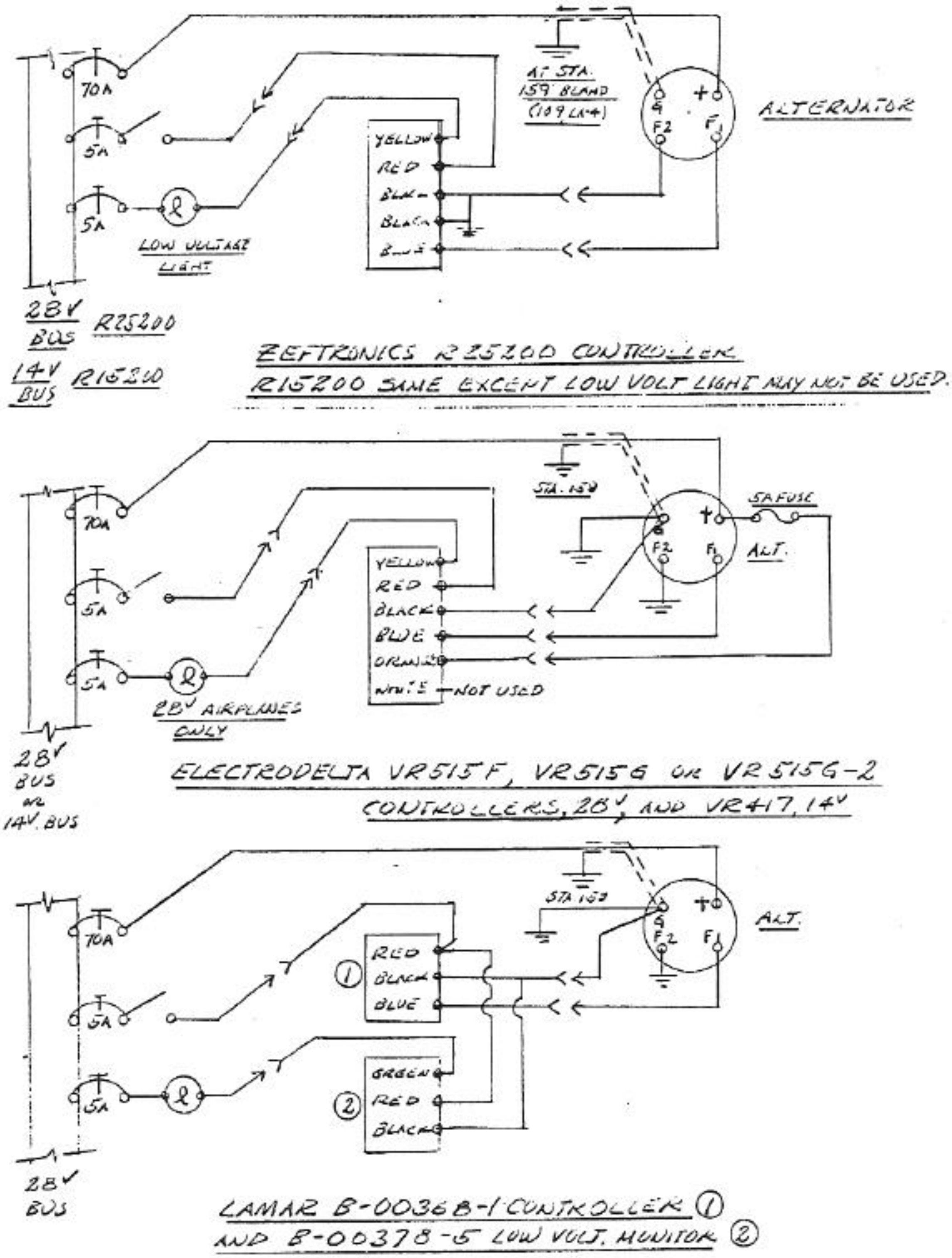


Fig. 4.13 Alternate Voltage Regulator Wiring Diagrams

4.4 Fuel System

1. General

The engine is supplied by fuel from the main tank, through the use of an engine driven fuel pump and limited use of an electric boost pump. The outlet from the main fuel tank to the electric boost pump incorporates a finger strainer. It may be removed for inspection and cleaning (after draining the tank) by disconnecting the line from the outlet and unscrewing the elbow fitting from the outlet plate. The adjacent smaller outlet is the sump drain.

2. Main Tank

The main tank is a rubber bladder fuel cell of 40 gallons usable capacity. The fuel bladder is enclosed in a sealed cavity in the center hull. The cavity is sealed, vented, and drained. (The main tank cavity drain is located on the left side of the fuselage, below the wing.) Access to the cavity and the fuel cell is achieved by removal of the bottom plate in the filler neck scupper. (This bottom plate also carries the auxiliary fuel supply fittings where transferred fuel from the auxiliary tanks enter the main cell.) The fuel cell should be handled, stored or repaired in accordance with Uniroyal (formerly U.S. Rubber Co.) "Field Service Instructions for Bladder Type Fuel & Oil Cells".

3. Auxiliary Fuel Tanks

One aluminum auxiliary tank of 7 gallons usable capacity is located inside each wing sponson (on some models). Fuel transfer is accomplished through the use of an electric transfer pump located in each wing above the sponson. Fuel is transferred from a strainer in the bottom of the float tank and enters the main tank through fittings mounted to the bottom of the fuel scupper bottom plate. These auxiliary tanks are not part of the direct fuel supply to the engine; their contents can be used only by transferring them into the main tank. Fuel sump valves are located at the bottom aft of each auxiliary tank and in the aft bottom portion of the wing (behind the wheel well).

4. Wing Tanks

One wet wing tank of 17 gallons usable capacity each is located in the inboard leading edge of each wing (on some models). Fuel is transfered by gravity to the main tank, through a finger strainer, and check valve(s). A fuel sump valve is located in the bottom inboard corner of the fuel tank.

5. Venting

The main tank and wing tanks are vented together in a cross located on the aft cabin wall, then vented through the left side of the fuselage (under the wing) under a scooped vent. Auxiliary tanks are vented out the top of each float.

6. Fuel Filter

The fuel filter element, located mid-way up on the forward side of the engine mount, or on the left side of the hull sta 162, requires routine replacement or cleaning.

7. Fuel Shut-Off Valve

The fuel shut-off control is mounted in the aft cabin wall, right cabin overhead, or left cabin side wall (under the canopy door), depending on model. The fuel shut-off valve is located on the aft cabin wall or on the left fuselage side wall (behind the baggage compartment), depending on model.

8. Finger Strainers

Strainers in the main tank, wing tanks, and aux. floats should be checked regularly for obstructions.

9. Quick Drain Valves

Quick drain valves should be checked regularly for obstructions. Leaking valves must be replaced.

4.4 Fuel System (cont.)

10. Main Fuel Tank Bladder Removal

CAUTION: Observe all normal precautions when working with aviation fuel.

1. Defuel the main (40 gal.) tank.
2. Remove baggage compartment.
3. Remove fuel line and drain line from fittings at the sump assembly. (Fig. 4.14)
4. Remove fuel and drain fittings from sump assembly. (Fig. 4.14)
5. Remove sump plate from bottom of tank. (Two bolts which hold the sump assy. together.)
6. Remove filler-neck assembly from fuel scupper.
   The filler neck is welded to a plate which supports and seals the filler opening of the bladder to the skin of the scupper assembly. This filler neck assembly is held in place with 9 (or 18) bolts. It will be necessary to remove some of the sealant from around the bolt heads to facilitate removal. After removal of the bolts, the filler neck assembly can be turned and lifted out of the hole.

   NOTE: the fuel qty sender is attached to the base of the assembly on Model 250 and later model LA4 series aircraft. Previous models have a fuel qty sender mounted to the back wall of the main fuel tank (which must be removed prior to removal of the bladder).
7. When the filler neck assembly has been removed, it will be possible to reach into the tank to remove the upper half of the sump.
8. On the forward wall of the fuel bladder, at the top center, is the air vent (which allows air to enter the tank as fuel is drawn down). This vent is an "AN" bulkhead fitting with a large washer and nut holding the bladder securely to the fuel cell wall (and aft cabin bulkhead). The sealant around the nut may need to be removed to allow the nut to turn freely. (Use care not to damage the bladder.)
9. Now the bladder should be ready to be unsnapped and removed from the cell.
10. To remove the bladder from the cell, it is folded down and pulled up through the filler neck assembly hole. Talcum powder may be used on the exterior of the bladder to facilitate removal through the filler neck opening.
11. Accomplish reassembly by reverse procedure. Refer to Section 7.3 for approved sealants.
    NOTE: No sealant is used on the sump fitting at the bottom of the tank. (Fig. 4.14)

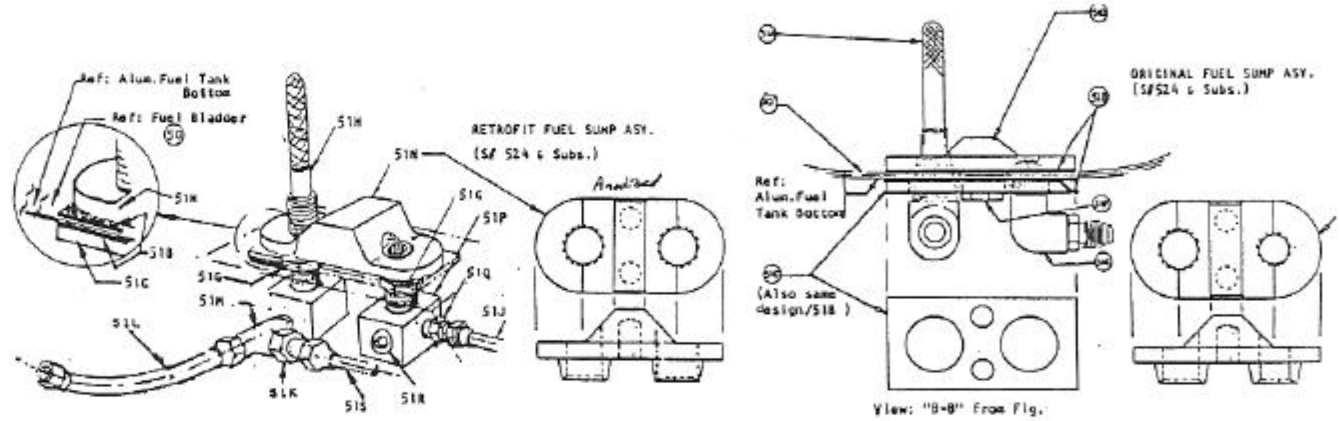
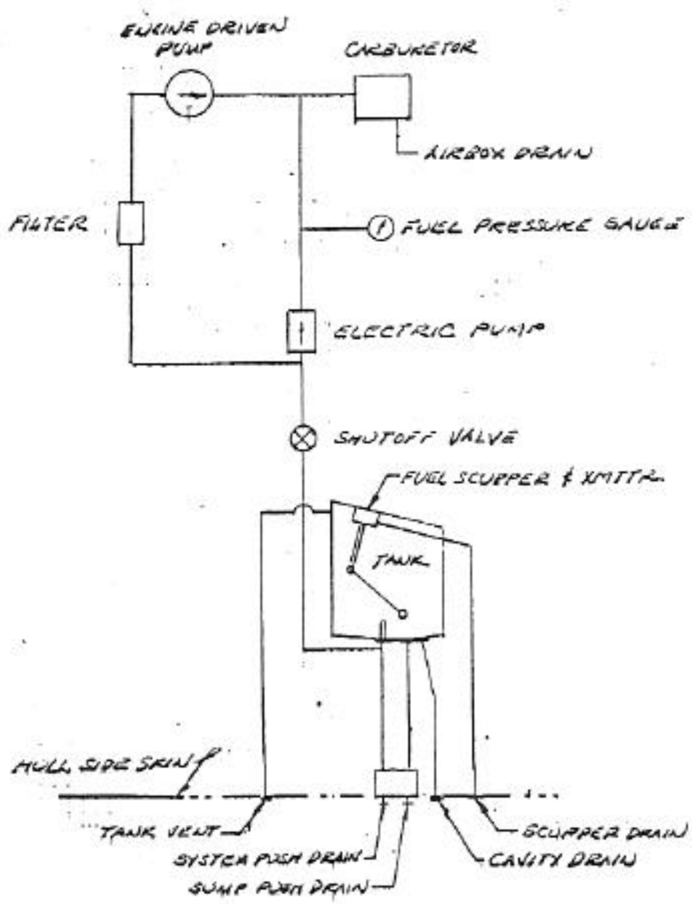


Fig. 4.14 Fuel Sump Assembly



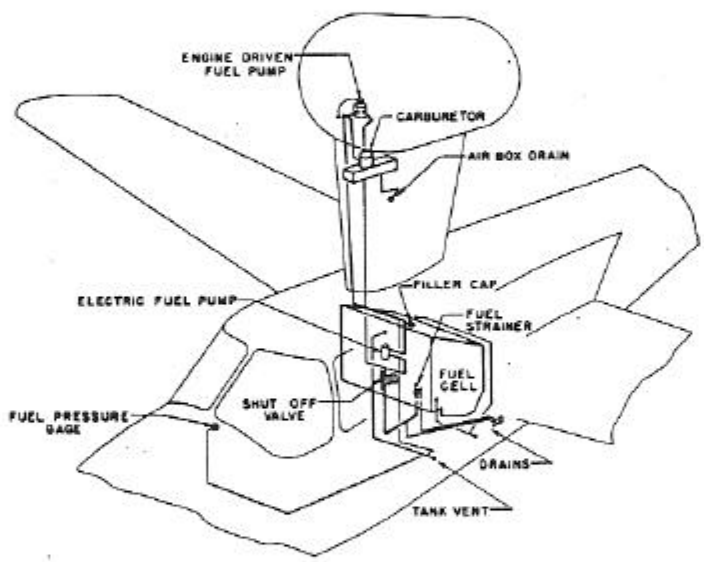


Fig. 4.15 Fuel System (LA4)

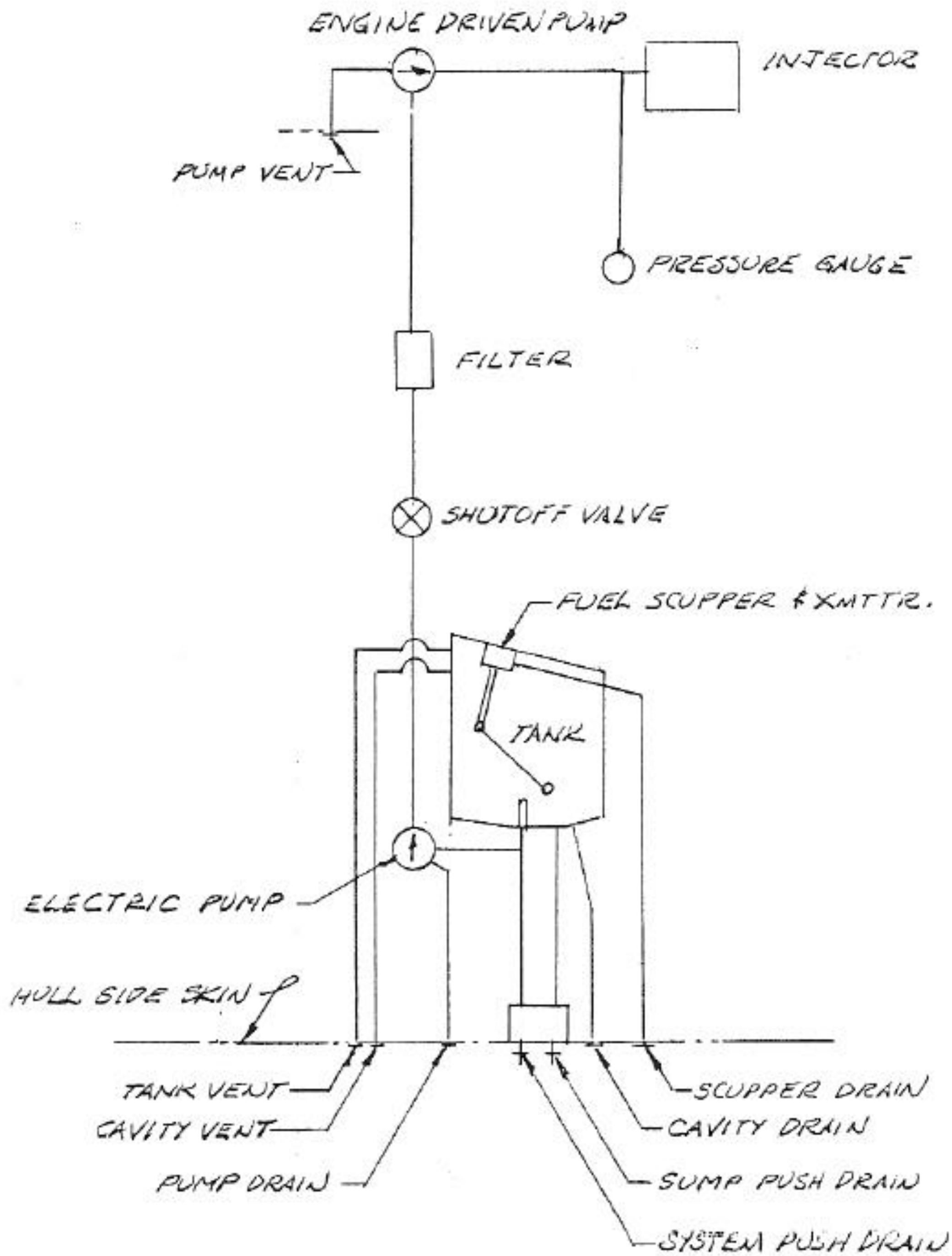


Fig. 4.16 Fuel System (LA4-200)

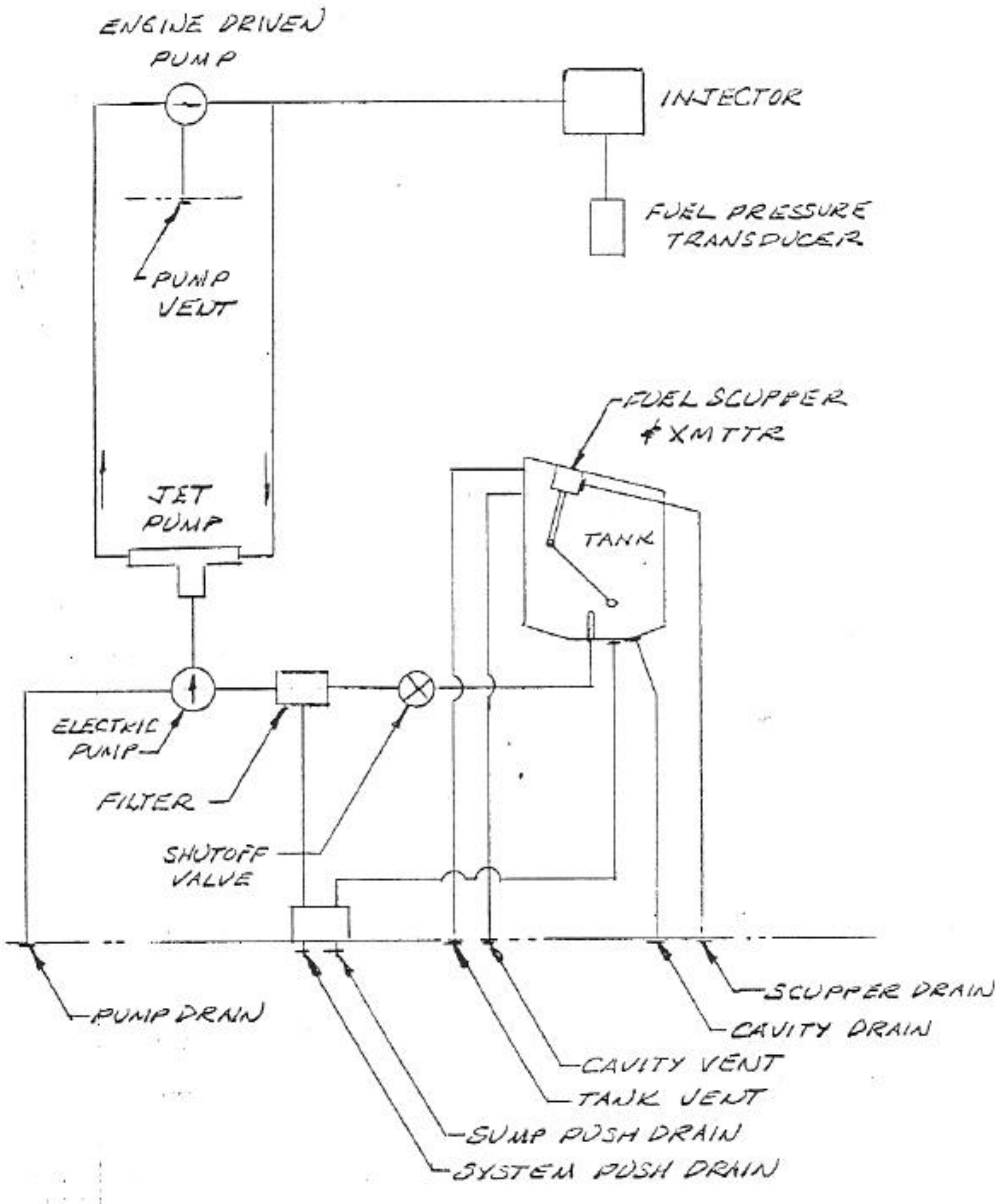


Fig. 4.17 Fuel System (Model 250 Turbo)

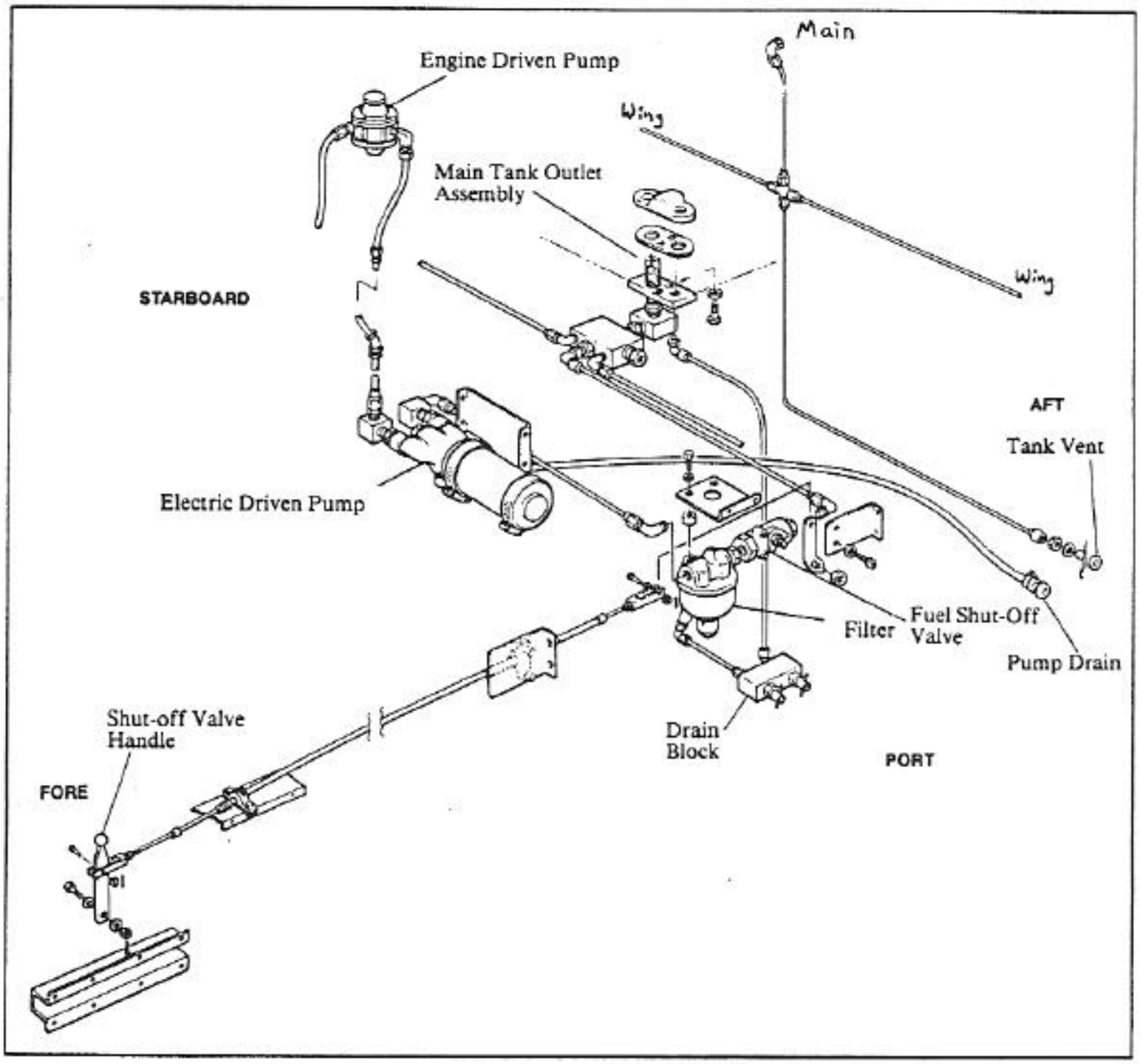


Fig. 4.18 Fuel System (Model 260)

4.5 Vacuum System

1. General

The aircraft is equipped with an engine-driven dry air vacuum pump which supplies suction to drive instruments such as the artificial horizon, the directional gyro, and in some cases the autopilot. The air passes through several filters before entering the instruments. A vacuum regulator valve is used to maintain the correct operating vacuum throughout the entire engine power range. Ground idle RPM settings generally will not provide adequate vacuum to operate the instruments efficiently. See figure 14.19 for a schematic representation of the vacuum system.

2. System Maintenance

The only preventive maintenance required for the vacuum system is to change the filters and adjust regulator pressure in accordance with the manufacturer's recommendations.

NOTE: The need for recurring regulator adjustments may be the result of a failing pump or system leaks. The cause of low vacuum pressure should be identified.

Care should be taken to protect the pump when cleaning the engine compartment. This can be accomplished by wrapping a clean protective covering around the pump housing and the air inlet.

3. Pump Servicing

The dry air pump requires no servicing. The internal parts are self-lubricating and require NO ADDITIONAL lubrication.

4. Pump Removal and Replacement

To remove the vacuum pump first remove the vacuum hose and then loosen the four nuts holding the pump to the engine. Install by reversing the procedure. Check spline engagement by turning propeller by hand and confirm pump shaft is turning. Change vacuum filters and check vacuum regulator adjustment every time the pump is replaced. Refer to pump manufacturer's manual.

5. Vacuum Regulator

The vacuum regulator is a spring-controlled diaphragm valve used to regulate vacuum for the aircraft pneumatic instrument system. The vacuum regulator is located forward of the instrument panel directly above the pitot-static drains.

6. Regulator Adjustment

1. Install a calibrated vacuum gauge using a T-fitting into the system upstream of the regulator.
2. Operate the engine at a minimum of 1700 RPM. If the vacuum regulator is not set at 5.0 in. Hg. (± .5") , then turn the adjustment knob until the proper vacuum is met. Turn the knob clockwise to increase the vacuum, counterclockwise to decrease the vacuum.

7. Filters

All filters, except for the vacuum regulator filter are pleated paper design. The vacuum regulator filter is a foam-garter design. All filters should be replaced as specified below:

1. Vacuum regulator filter every 100 hours or annually.
2. Instrument filters every 500 hours.
3. All filters on condition. All filters require routine inspection to determine the condition of the element and the security of the filter in the system.
4. All filters changed when a new pump is installed.

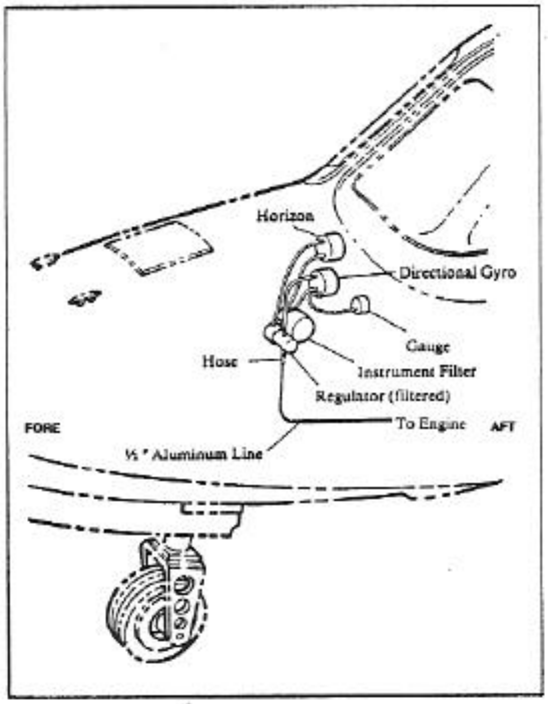


Fig. 4.19 Vacuum System

4.6 Pitot-Static System

The pitot-static system supplies dynamic (pitot) pressure to the airspeed indicator only, and atmospheric (static) pressure to the air-speed, altimeter and vertical speed instruments.

The pitot static blade is mounted on the under surface of the left wing, outboard of the wing float. It is heated, and the blade can get hot enough to burn the skin. The lines from the blade to the drain fittings in the cabin are nylon tubing with flare-type fittings. The lines from the drains to the instruments are aluminum tubing and neoprene hose.

The drain caps should be removed at annual inspection or if the instruments appear to be acting improperly.

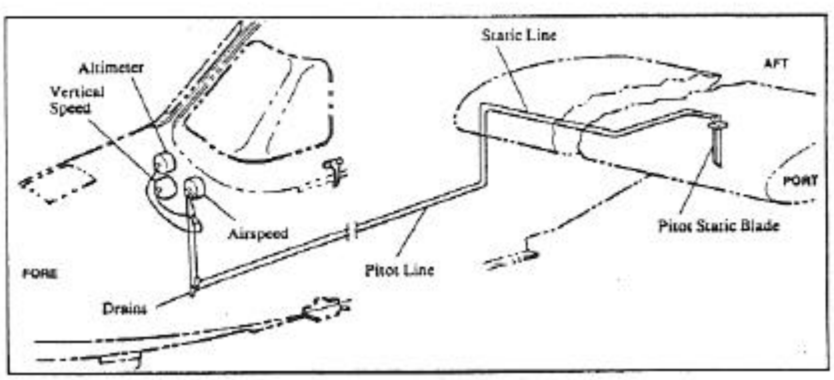


Fig. 4.20 Pitot-Static System

4.7 Control System

1. General

The primary flight controls consist of a dual wheel control operating the elevator and ailerons through a yoke mounted forward of the instrument panel, and dual rudder pedals. For single-pilot operation, the right hand control shaft may be removed. Secondary flight controls consist of hydraulically actuated flaps, a hydraulically actuated longitudinal trim surface independent of the elevator, and an electrically operated rudder trim tab.

Gust locks are provided for the control yoke shaft and the rudder pedals. Pins with placarded flags fit into the control shaft through the shaft busing on the pilot's side, and through the right rudder pedal arm on the pilot's side. The ailerons, elevators and rudder are thus secured.

The stall warning system consists of a detector in the leading edge of the left wing, connected to a horn (and light, on earlier models) in the cockpit.

Maximum allowable idler (bellcrank) side-play is 1/32". AN960 washers may be used as shims.

2. Elevator Control System

The elevators are all-metal stressed skin construction. Stainless steel piano hinges attach the elevators to the stabilizer. Push rods and bellcranks link the elevators to the control yoke. Two steel springs under the instrument panel provide artificial counterbalancing forces in the control yoke. Fig. 14.21 provides a schematic illustration of the elevator control system.

The first and last pushrods in the elevator system have one adjustable end each, and the elevator up and down stops are adjustable. The stops are accessible by removing the center section of the floorboards in the cabin.

Elevator Travel:

Model 250	up	25 degrees	(+ 2 degree, -1 degree)
	down	27 degrees	(± 1 degree)
LA4 series	up	26 degrees	(± 1 degree)
	down	23 degrees	(± 1 degree)

Elevator Free-Play:

Model 250 and LA4 series:	1/2"	max. total deflection (at trailing edge)

On Model 250 aircraft, the final elevator pushrod incorporates a balance weight bolted inside the upper part of the tube. If any additions are made to these elevators, a check must be checked as shown below to determine that the maximum allowable elevator imbalance is not exceeded. Maximum weight at the elevator trailing edge is: 3 lbs 14 oz. (This check must be made with the control rod disconnected.)

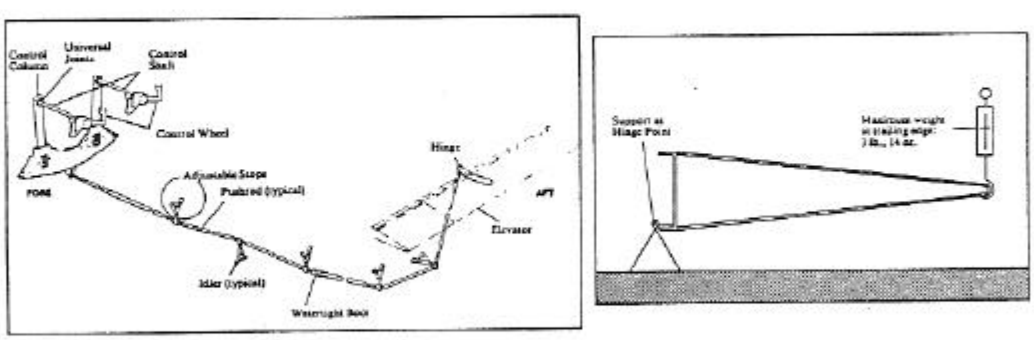


Fig. 4.21 Elevator Control System

4.7 Control System (Cont.)

3. Rudder Control System

The air rudder is made of all-metal, stressed skin construction. Stainless steel piano hinges attach the rudder to the vertical stabilizer. Push rods and bellcranks link the rudder to the rudder pedals. There is a balance weight attached to and extending from the port (LH) side of the rudder (Model 250). An electrically actuated trim tab is attached to the trailing edge of the rudder and a retractable water rudder is bolted to the lower edge of the air rudder. Fig. 4.22 provides a schematic representation of the rudder control system.

The pushrods from the pedal assembly to the bellcrank, and the final pushrod, are adjustable. The adjustable rudder stops are accessible by removing the forward floorboard in the cabin.

Rudder Travel:

Model 250:	left	20 degrees (± 1 degree)
	right	29 degrees (± 1 degree)
LA4 series:	left	25 degrees (± 1 degree)
	right	25 degrees (± 1 degree)

Rudder Free-Play:

Model 250 and LA4 series:	1/2"	max. total deflection (at trailing edge)

On Model 250 aircraft, the rudder incorporates a balance weight on the left side of the rudder. If any additions are made to the rudder, a check must be checked as shown below to determine that the maximum allowable rudder imbalance is not exceeded. Maximum weight at a point 20" aft of the rudder hinge line is: 2 lbs 11 oz. This check must be made with the balance weight and the water rudder installed on the rudder, and the rudder removed from the aircraft.

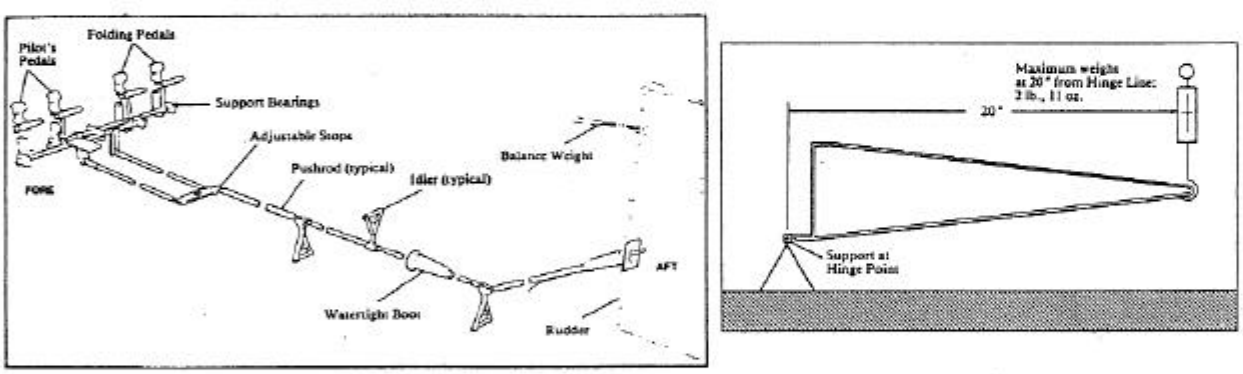


Fig. 4.22 Rudder Control System

4.7 Control System (Cont.)

4. Aileron Control System

The ailerons are made of all-metal stressed skin construction. Stainless steel piano hinges attach the ailerons to the wings. Ailerons are connected to the control column by means of pushrods in the wings, which are connected to a cable and pulley system in the hull. Fig. 4.23 provides a schematic representation of the aileron control system.

The aileron travel stops are located on the left-hand column of the control column assembly. A yoke bolted to the connecting fitting on the column has provisions for two screws, which can be adjusted to contact a stop bushing bolted to the fixed part of the column. Occasionally it is necessary to remove the adjustment screws completely, in order to achieve proper travels of one or both surfaces. This is permissible and as sometimes done during factory rigging.

If the hull has been damaged in the control column area, or if any change or adjustment is made in the stops, a check must be made to insure clearance between the aileron stop assembly, control column, and any fixed structure or equipment, through the entire range of travels of the elevator and aileron controls. A minimum clearance of 1/8" is required.

The connecting pushrod in the hull, the first pushrod in the wing, and the final pushrod at the aileron are adjustable. The cables are adjustable at their aft ends for cable tension, which is 25 ± 3 lbs.

Aileron Travel:

Model 250 and LA4 series:	up	29 degrees (+ 2 degrees, -1 degree)
	down	15 degrees (+ 2 degrees, -1 degree)

Aileron neutral position:

Model 250:	place a straightedge along the bottom of the control wheels, then rig both ailerons up 5/8" (± 1/8") from the wing trailing edge - outboard of the aileron.
LA4 series:	place a straightedge along the bottom surface of the wings and ailerons.

Aileron Free-Play:

Model 250 and LA4 series:	9/16"	max. total deflection (at trailing edge)

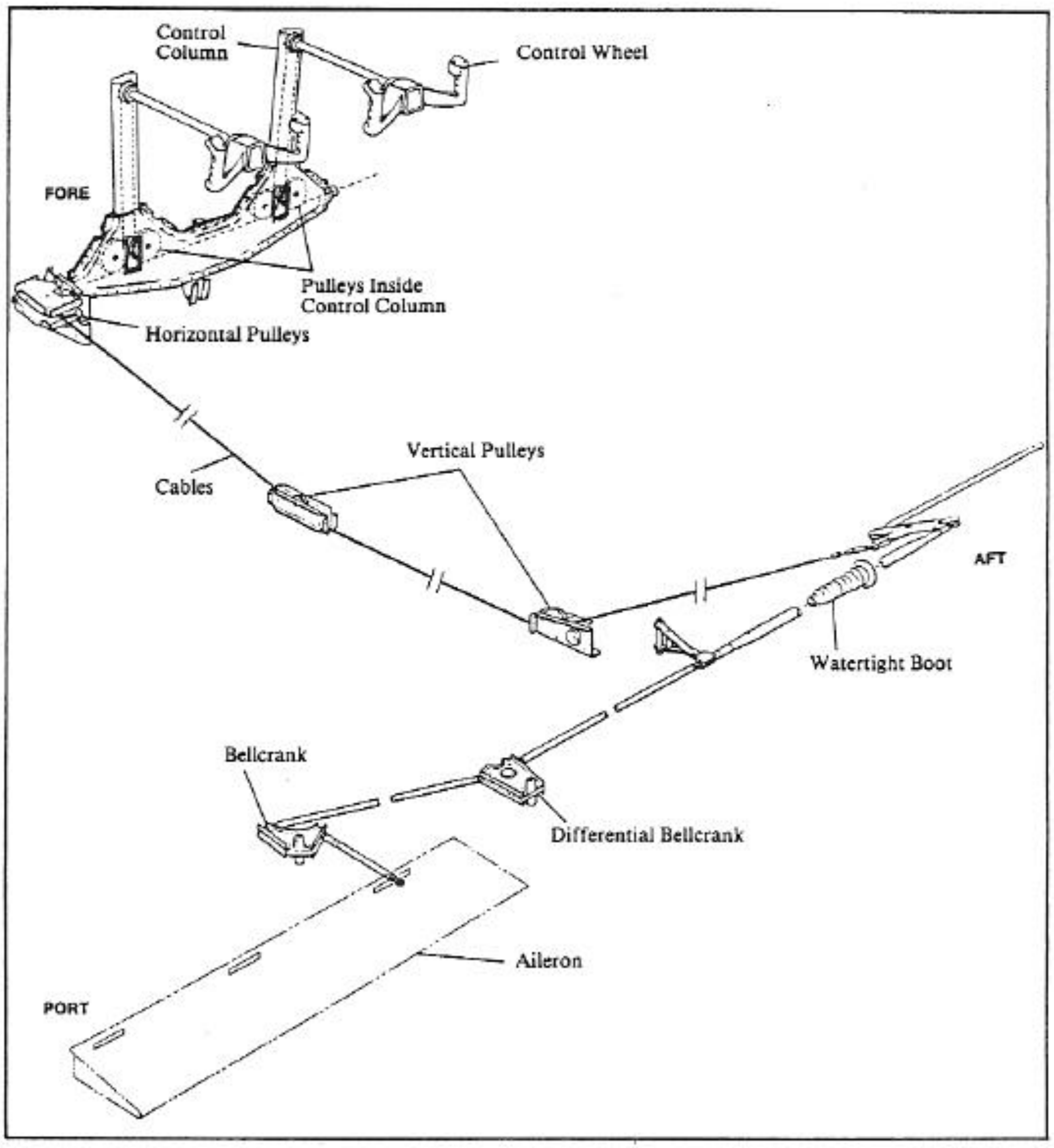


Fig. 4.23 Aileron Control System

4.7 Control Systems (Cont.)

5. Flap Control System

The flap system is hydraulically actuated (see Hydraulic System section) through an arm from the actuator to a torque tube running through the hull. The torque tube links the two flaps for simultaneous operation by external arms and pushrods on the left and right sides of the hull. Access to the mechanism is through covers on the top of the hull just aft of the engine pylon.

A bracket adjacent to the actuator arm inside the hull supports two switches (normally open) that signal the flap position. The flaps are either full up or full down; there is no intermediate position.

Flap Travel:

Model 250 & LA 4 series:	Flap neutral	parallel to the bottom surface of the wing at wing sta. 39.75
	Flaps Up	1/2 to 1 degree below neutral.
	Flaps Down	20 degrees (± 1 degree)

Flap Free-Play:

Model 250 & LA 4 series:	Flaps Up	0.0" max. total deflection (at t.e.)
	Flaps Down	1/2" max. total deflection (at t.e.)

Flap rigging is accomplished by setting the flaps Up position. This position can be set by adjustment of the rod ends on the hydraulic actuator and the pushrods. Flap travel is built into the actuator and is factory pre-set. There are no stops external to the hydraulic actuator.

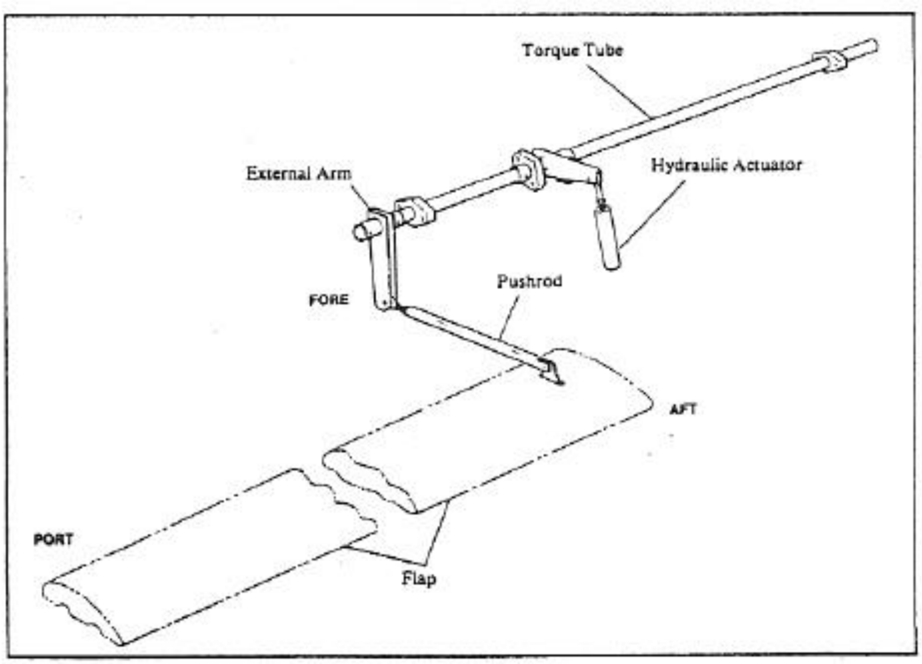


Fig. 4.24 Flap Control System

4.7 Control Systems (Cont.)

6. Longitudinal Trim System

The longitudinal trim surfaces are mounted on both sides of the horizontal stabilizer and outboard of the elevators. (The Model 250 has only one trim surface, mounted outboard of the left elevator). Longitudinal trim is hydraulically actuated and is completely independent of the elevator. Cockpit indication of trim surface position is provided by mechanical linkage of the trim surface to the indicator arm in the cockpit, through a 1/16" diameter cable housed in nylon tubing. The Model 250 system is shown in Fig. 4.25 and the LA4 series system is shown in Fig. 4.26.

Trim Surface Travel:

Model 250 & LA4 series:	up	36 degree (+ 2 degree, -1 degree)
	down	24 degree (+ 2 degree, -1 degree)
Total travel:	preset	at the factory, within the actuator.

Trim Tab Free-Play:

Model 250 & LA4 series:	3/4"	max. total deflection (at trailing edge)

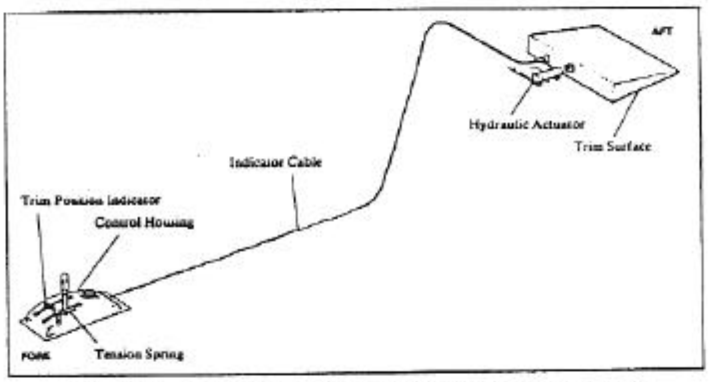


Fig. 4.25 Longitudinal Trim Control System (Model 250)

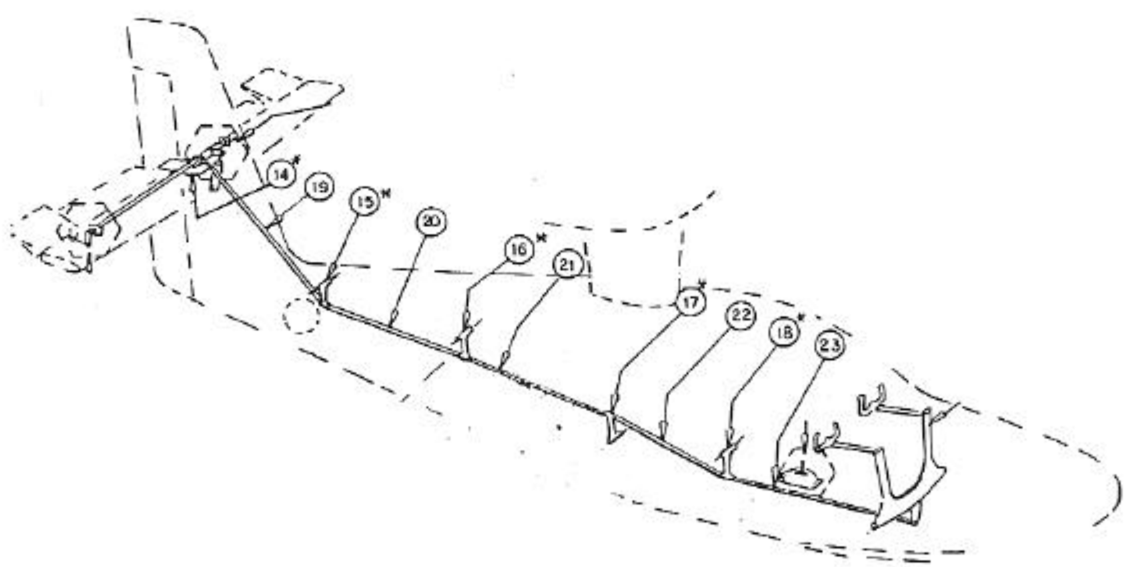


Fig. 4.26 Longitudinal Trim Control System (LA4 Series)

4.7 Control Systems (Cont.)

7. Rudder Trim

A fixed trim tab located on the rudder trailing edge can be adjusted manually as required. A electric trim tab is available as optional equipment on the LA4 series but is required equipment on the Model 250. Electric rudder trim systems have an indicator and operating switch mounted on the longitudinal trim control housing or instrument panel. The trim actuator on the rudder is not repairable, and must be replaced in the event of internal failure. The trim indicator and actuator are calibrated as a matched pair at the factory.

Electric trim tab free-play should not exceed 1/8" (at trailing edge).

8. Aileron Trim

A ground-adjustable tab is provided on each aileron. It may be bent as required to achieve lateral trim. Electric aileron trim is available as optional equipment.

Electric trim tab free-play should not exceed 1/8" (at trailing edge).

9. Water Rudder Control

The water rudder is pivot-mounted to the bottom of the air rudder, and is raised and lowered by a cable connected to an operating handle on the cockpit floor, just forward of the trim control housing. The system is "locked" in place by over-center action. The cable is of the same construction as the longitudinal trim indicator cable. (The cable should be inspected carefully where it leaves the vertical stabilizer and enters the rudder.)

Rigging is accomplished by adjusting the length of the cable (at the bottom of the operating handle under the cockpit floor) so that the water rudder is fully retracted into the air rudder when the water rudder handle is up and "locked" in place.

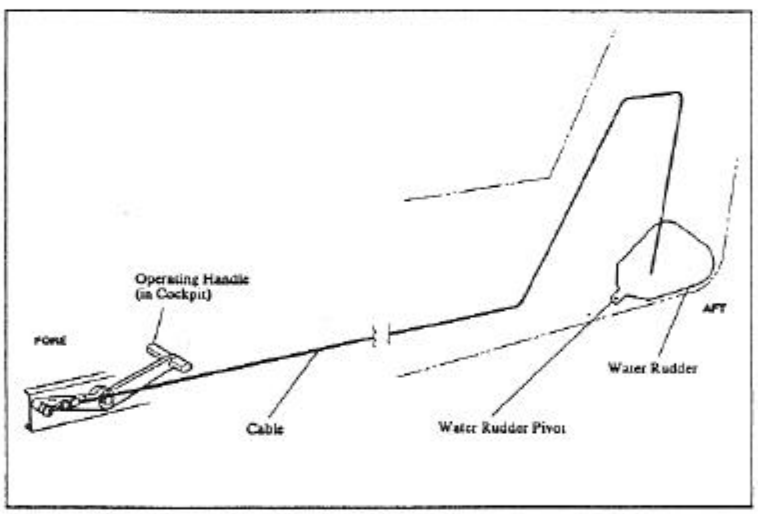


Fig. 4.27 Water Rudder System

4.7 Control Systems (Cont.)

10. Removal and Installation of Control Column (LA4 series)

1. Remove seats and floor boards.
2. Disconnect aileron cables from bellcrank in flap compartment.
3. Remove (6) pulleys inside aircraft hull.
4. Remove two forward screws in splice of elevator forward push rod and then screw pushrod out from rod end bearing at control column.

   NOTE: Counter number of turns for reassembly.
5. Remove control springs from right side of column.
6. Remove AN3 bolts (4) through control wheel shafts (2) (mark shaft and universal joints for alignment for reassembly).
7. Remove 2-3202-73 gusset from center of web aft of control column.
8. Remove AN3 bolts (3 per side) from column bearing blocks.

   NOTE: If any shims are installed at blocks, note for reassembly.
9. Remove control column assembly.

   NOTE: *Care must be taken that chain does not jump teeth on sprocket.*

For installation, reverse disassembly procedure.

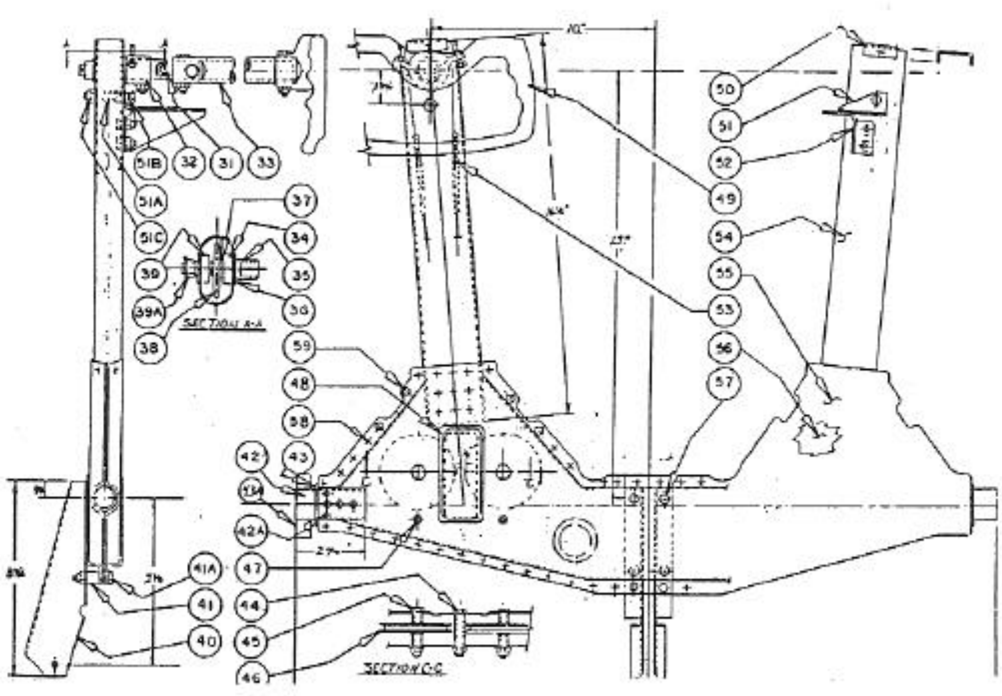


Fig. 4.28 Control Column (LA4 series)

4.7 Control Systems (Cont.)

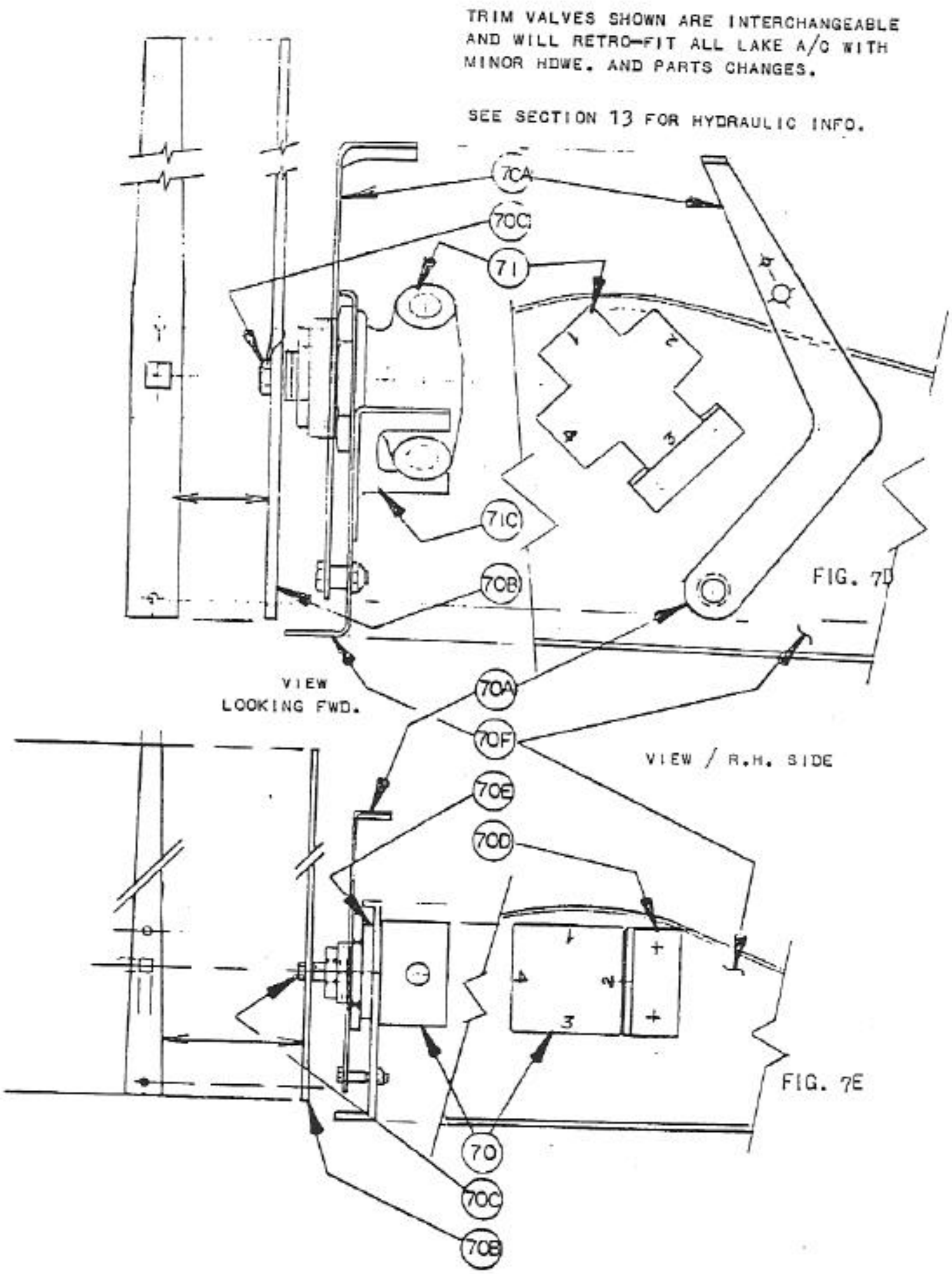


Fig. 4.29 Trim Control Installation

SECTION 5

LANDING GEAR

5.0 General

The landing gear consists of two retractable main gear assemblies mounted on trunnions in the wings, and a single nose gear assembly mounted to the walls of the wheel well in the bow. The main gear wheel assemblies are attached to the gear leg through a trailing beam suspension. The nose gear assembly is free to castor. The main gear have no doors. The nose gear has doors to maintain the hull bottom shape, and retracts to expose the well in the bow which is not water-tight. Retraction and extension of the gear assemblies is powered by individual hydraulic actuators controlled by the gear lever in the cockpit (see section 4.2). Positive up and down mechanical locking is provided. Position switches operated by the up and down locking latches are connected in series to the cockpit indicator lights (see section 4.3), which illuminate only when all three gears are locked either up or down.

5.1 Main Gear Disassembly

With the airplane supported on jacks, the main gear may be readily disassembled except for removal of the strut weld assembly and the trunnion. The trunnion must be moved forward before the strut can be removed. This requires factory kit K-141, which provides parts and a drawing for cutting a hole in the wing leading edge, then installing a cover after the trunnion is replaced. Reassemble in reverse order.

The trailing beam pivot tube and the strut welded assembly are heat treated. No welding should be done on these parts.

Main Gear Free-Play Limits:

Trunnion	1/4"	at the bottom of the leg	rock the gear leg for and aft
Trailing Beam	9/16"	at aft edge of tire	rock the wheel assy. side to side
Axle	No play allowed in the trailing beam		rock the wheel in all directions
Down Lock	- - -	Must not be able to unlock by rocking the gear with the aircraft on jacks and the hydraulic pressure bled to zero.	

The right main gear assembly is shown below. The left-hand assembly is an exact opposite.

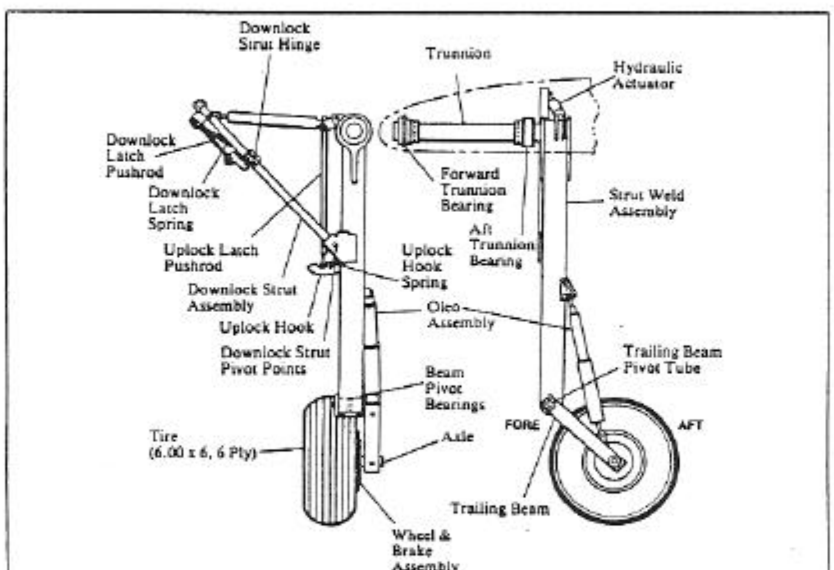


Fig. 5.1 Main Gear Assembly

5.1 Main Gear Disassembly (cont.)

Main Gear Oleo Disassembly:

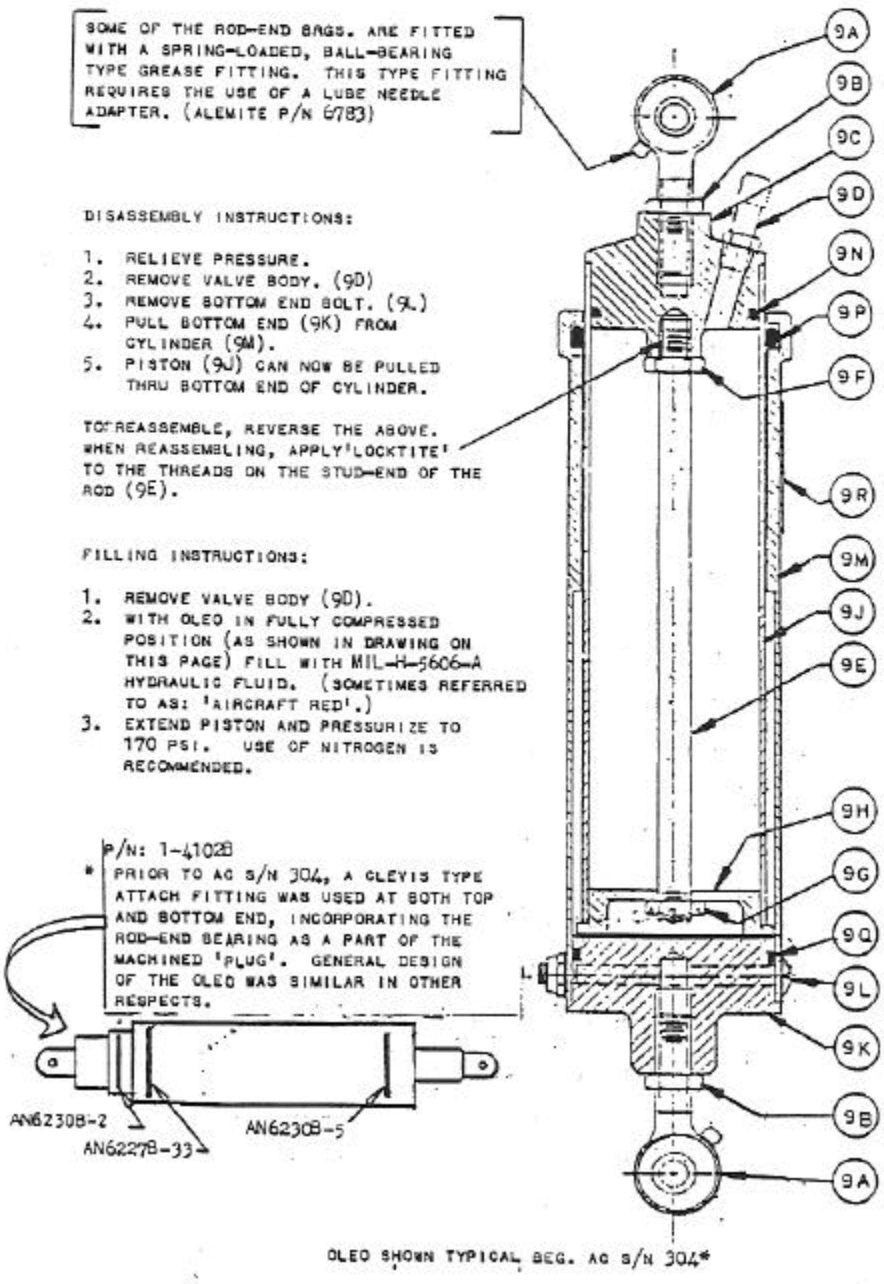


Fig. 5.2 Main Gear Oleo

5.2 Nose Gear Assembly

The nose gear assembly is installed in the nose gear well through the use of trunnion pins slid into pivot blocks mounted on each side of the wheel well. (Fig. 5.3)

The nose gear strut is a self-contained air-oil (oleo) cylinder which is filled and pressurized through a valve near its top. The nose gear assembly must be removed from the aircraft before disassembling the oleo assembly.

The nose wheel is free-swiveling through 25 degrees left and right, with fixed stops limiting the travel. Towing the airplane by the nose wheel can result in damage to the stops or to the scissors assembly if this angular travel is exceeded.

1. Nose Gear Free Play Limits:

Trunnion	3/8"	side to side play measured at the bottom of the tire
Downlock	---	Should not be able to unlock the downlock by pushing the tire aft with hydraulic pressure removed and the aircraft jacked.

2. Nose Gear Removal:

1. Jack the aircraft.
2. Bleed hydraulic pressure to zero.
3. Disconnect and plug hydraulic lines to actuator. Cap actuator fittings.
4. Disconnect wires to position switches.
5. Disconnect door actuators from doors.
6. Remove bolt from upper end of downlock strut.
7. Retract N/G pivot tubes.
8. Before disassembling the oleo strut, release all pressure from the strut. The oil can be dumped by removing the air valve.

3. Nose Gear Oleo Disassembly

To rebuild the nose landing gear Oleo strut follow the procedures below:

1. Remove valve core from strut valve and drain old fluid into a waste oil containers.
2. Remove cotter key and AN320-6 nut from bolt at upper end of casting.
3. Remove piston assembly from cylinder.
4. Disassemble plunger assembly from piston by removing retainer ring at adapter assembly, and pulling on exposed threads of plunger bolt.
5. Remove socket and plug anchor bolt from bottom of piston and tap out plug with a long soft punch. NOTE: Index plunger to piston before removal.
6. Clean all parts in mineral spirits and dry with shop air.
7. Replace all O-rings and packings. Soak in hydraulic fluid before assembly. Reassemble in reverse order of disassembly.
   NOTE: As an aid to reassemble, two small .025" notches may be filed on opposing sides at the end of the 2-4405-31 bolt, to accommodate .020" safety when pulling the bolt through the upper bore of cylinder.
8. During these procedures make sure that AN320-6 nut does not bottom out on 2-4405-31 bolt. If bottoming occurs, one of three conditions may exist:
   1. Bolt is stretched.
   2. P/N 2-4405-29 sleeve has been peened to render it shorter than standard length.
   3. P/N 2-4406-7 plunger has a concave bottom.

5.2 Nose Gear Assembly (Cont.)

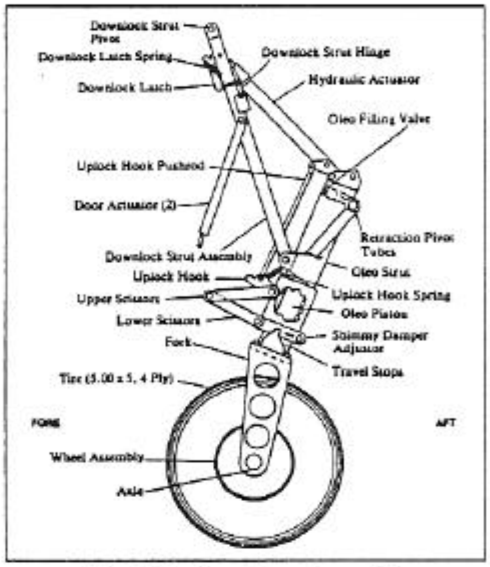
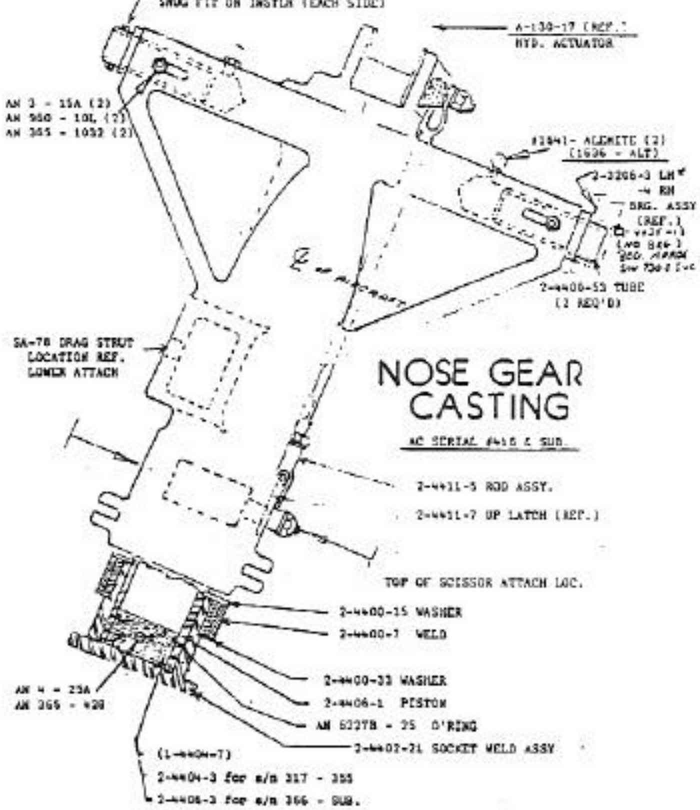


Fig. 5.3 Nose Gear Assembly



NOTE: DRWG. FOR PARTS REFERENCE ONLY, NOT DRAWN TO SCALE.

Fig. 5.4 Nose Gear Trunnion Assembly

5.2 Nose Gear Assembly (Cont.)

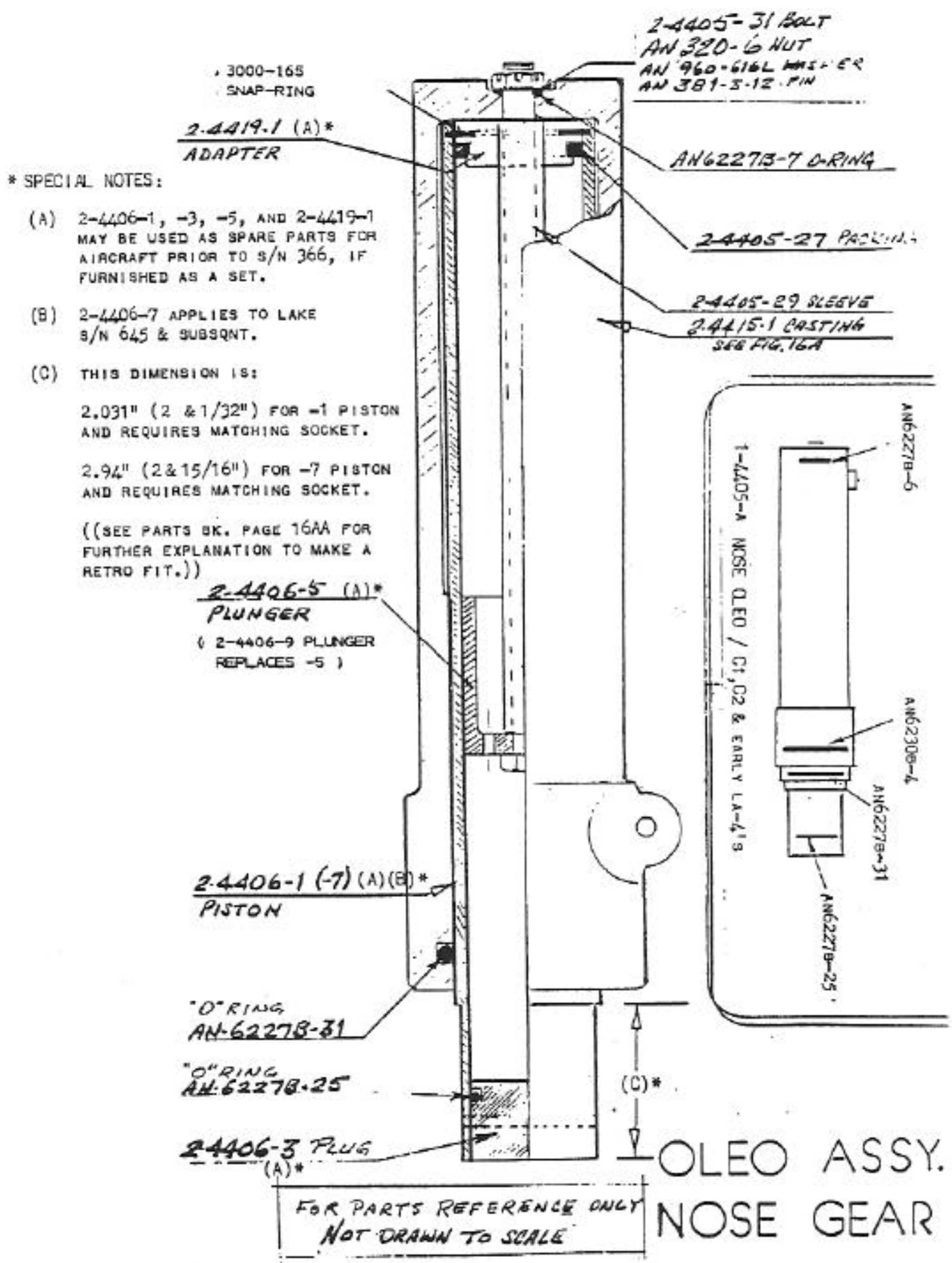


Fig. 5.5a Nose Gear Oleo Assembly

5.2 Nose Gear Assembly (Cont.)

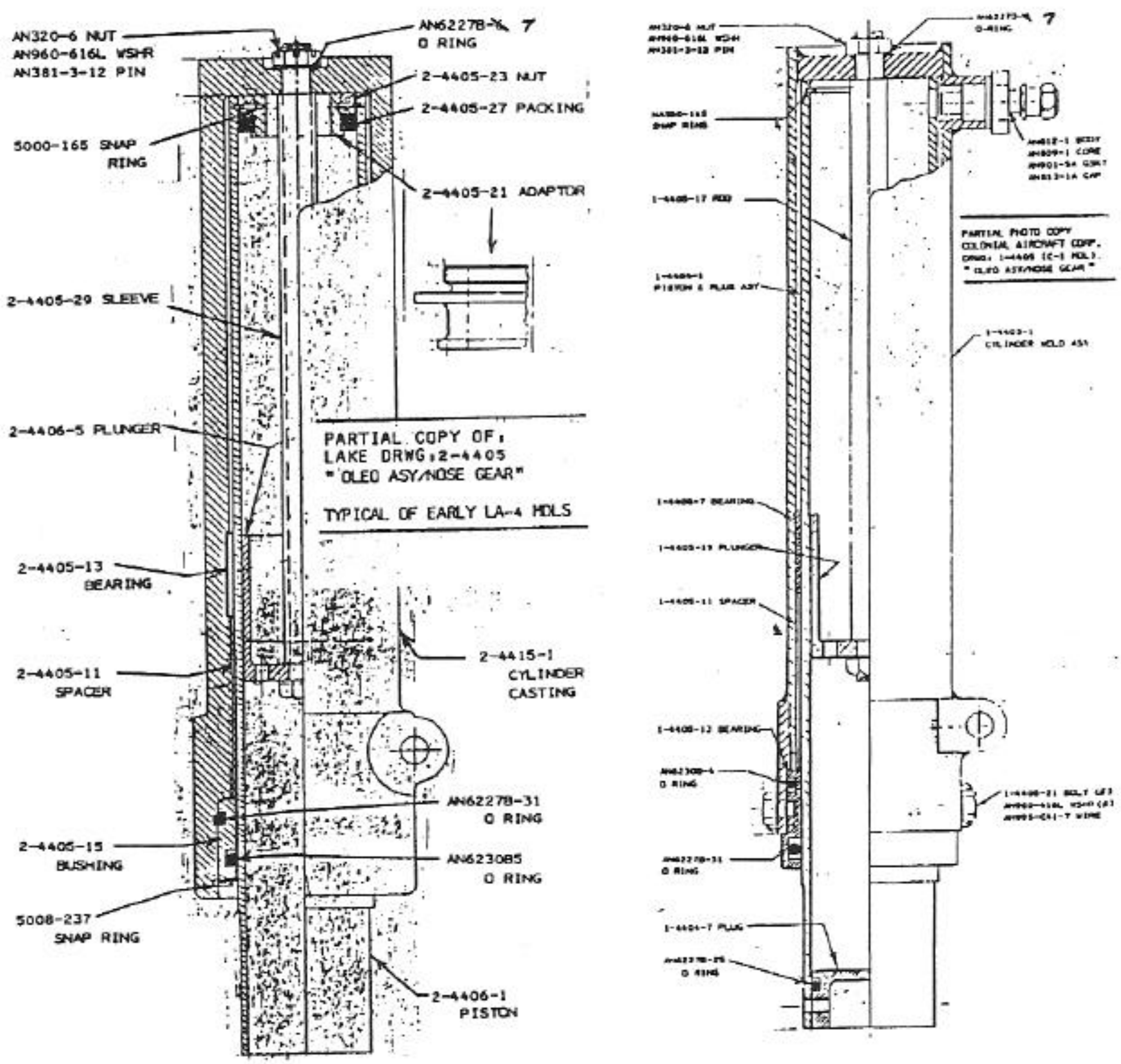


Fig. 5.5b Nose Gear Oleo Assembly

5.2 Nose Gear Assembly (Cont.)

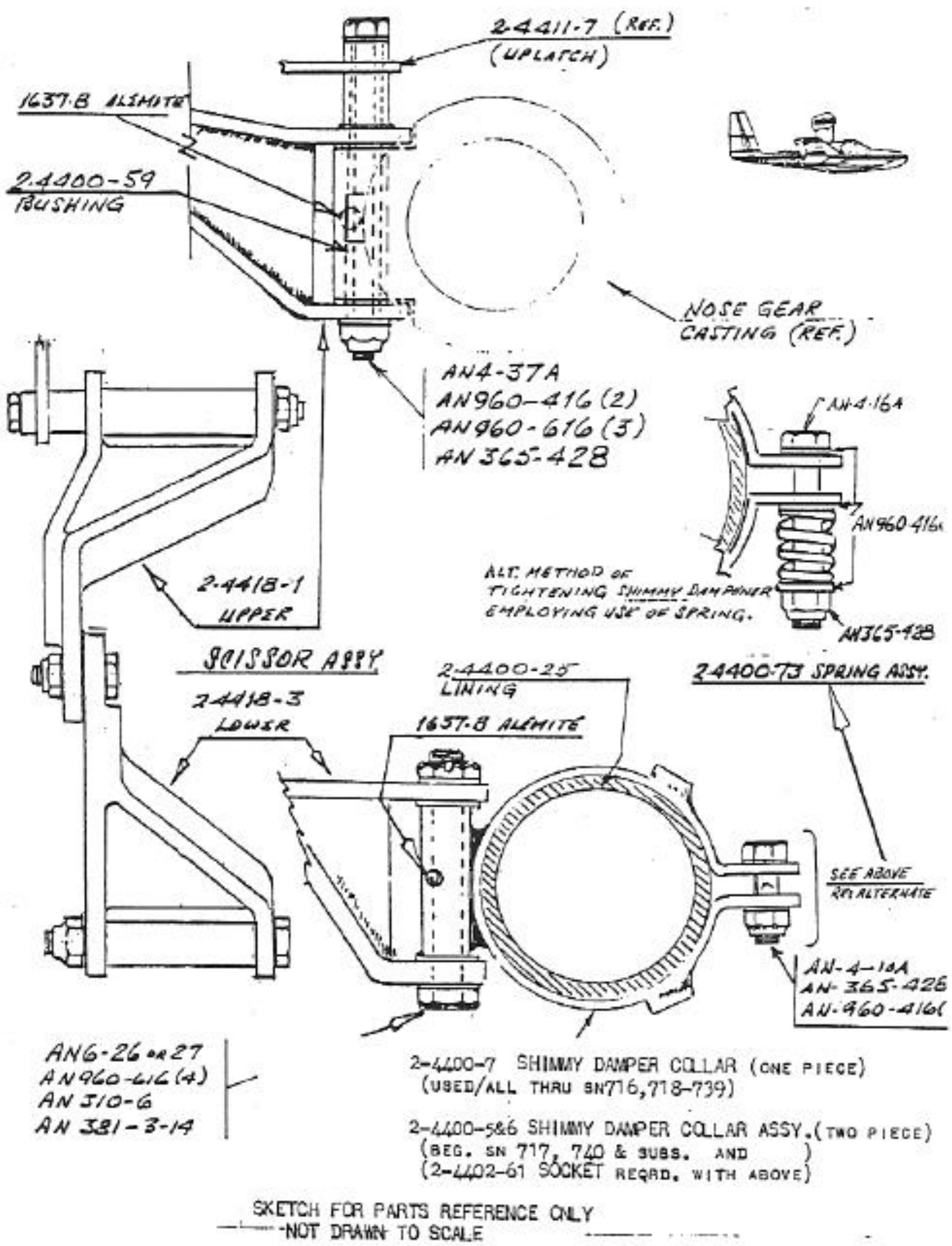


Fig. 5.6 Shimmy Damper / Scissor Assembly

5.2 Nose Gear Assembly (Cont.)

4. Nose Gear Rigging Procedure (Down)

1. With the actuating cylinder (59) retracted under pressure, the fitting (51) should apply enough force at the bolt (47) so that the upper strut (46) and the lower strut (42) come together, and the latch (43) engages the strut flanges.
2. With hydraulic pressure up (approx. 1200 psi), disengage by hand the latch (43), and pull the struts forward to separate the strut flanges by about 1/8".
3. If the struts cannot be pulled open by a reasonable hand force, the fitting (51) is pulling downward too hard on the bolt (47). Disconnect the fitting from the bolt and turn it out on the actuating cylinder shaft, to decrease the force on the bolt.
4. Go back to step 2., then release the struts. The flanges of the struts should snap back together, and the latch (43) should engage the flanges.
5. If the struts do not come together and the latch does not engage, increase the downward force on the bolt (47) by turning the fitting (51) in.
6. The downlock switch should then be adjusted, in or out as required, so that it is actuated by the paddle on the latch (43), but does not hold the latch away from full engagement with the strut flanges.

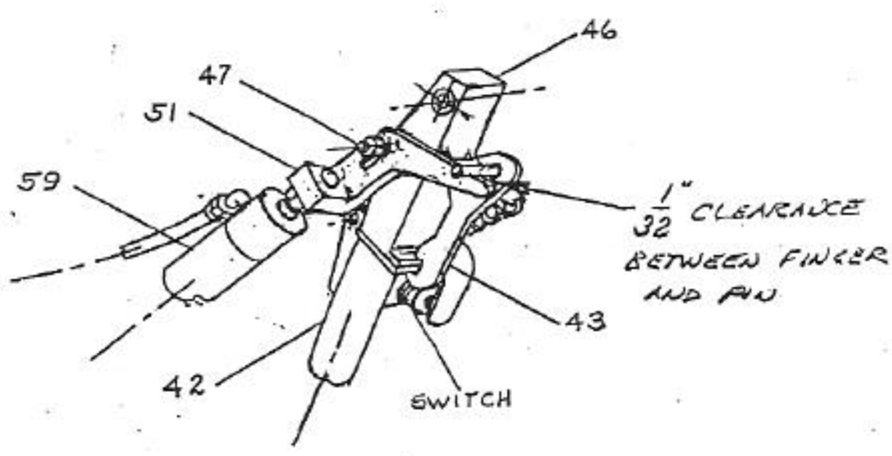


Fig. 5.7 Nose Gear Rigging (Down)

5.2 Nose Gear Assembly (Cont.)

4. Nose Gear Rigging Procedure (Up)

1. With the actuating cylinder (59; See Gear-Down Figure), fully extended and hydraulic pressure at about 1200 psi, the uplatch (29) should fully engage the uplock U-bolt.

2. If latch engagement appears correct, disengage it by hand from the U-bolt, then release. The latch should re-engage with the U-bolt.

3. If the latch does not re-engage the U-bolt because of up or down misalignment, the U-bolt should be adjusted up or down to line up with the slot in the latch.

4. If the latch is being held away from full engagement of the U-bolt by the rod (37), turn the clevis (35) in enough to permit full engagement with the clevis bolt (32) just contacting the end of the slot in the hook (29).

5. If the latch is fully engaged with the U-bolt, and the clevis bolt (32) is not contacting the slot in the latch, turn the clevis out until contact is just made.

6. The switch should then be adjusted in or out as required, so that it is actuated by the point of the latch but does not hold the latch away from full engagement with the U-bolt.

GEAR-UP POSITION (AIRPLANE ON JACKS)

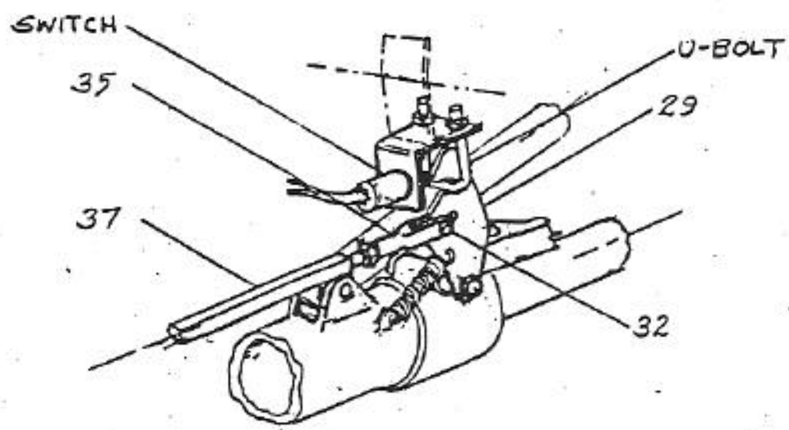


Fig. 5.8 Nose Gear Rigging (Up)

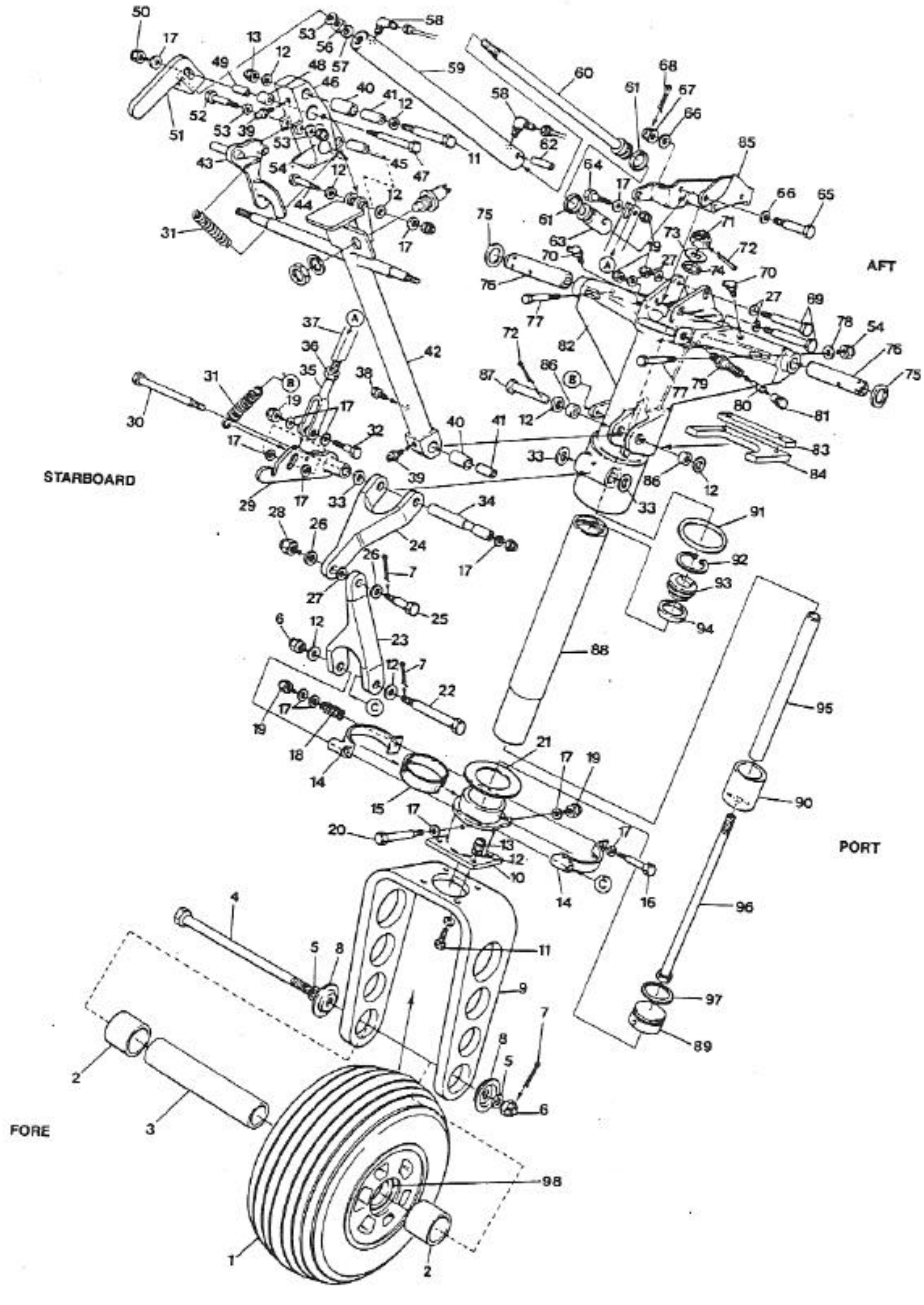


Fig. 5.9 Nose Gear Assembly

5.2 Nose Gear Assembly (Cont.)

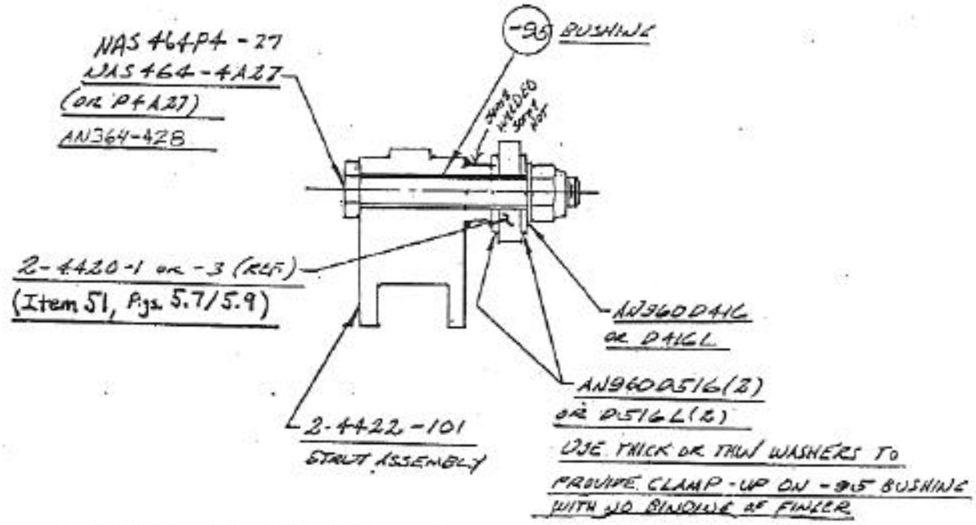


Fig. 5.10 Nose Gear Unlock Finger Guide Bolt Installation (Ref. Fig. 5.7, Item 47)

NEW PART: 2-7753-081 w/Hardware described below.
OLD PART: 2-7753-65
INSTALLATION: PLEASE NOTE THE SEQUENCE OF NUTS, WASHERS, FILLER, AS SHOWN ON THE DRAWING BELOW. IF found necessary to achieve proper adjustment of the switch, the aft nut may be left off and AN960-816L washers used as required to shim the switch.

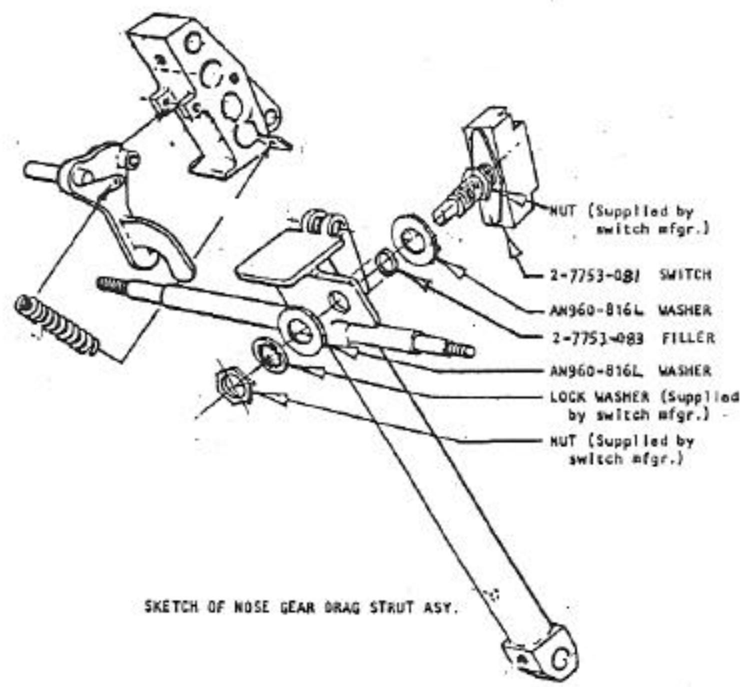
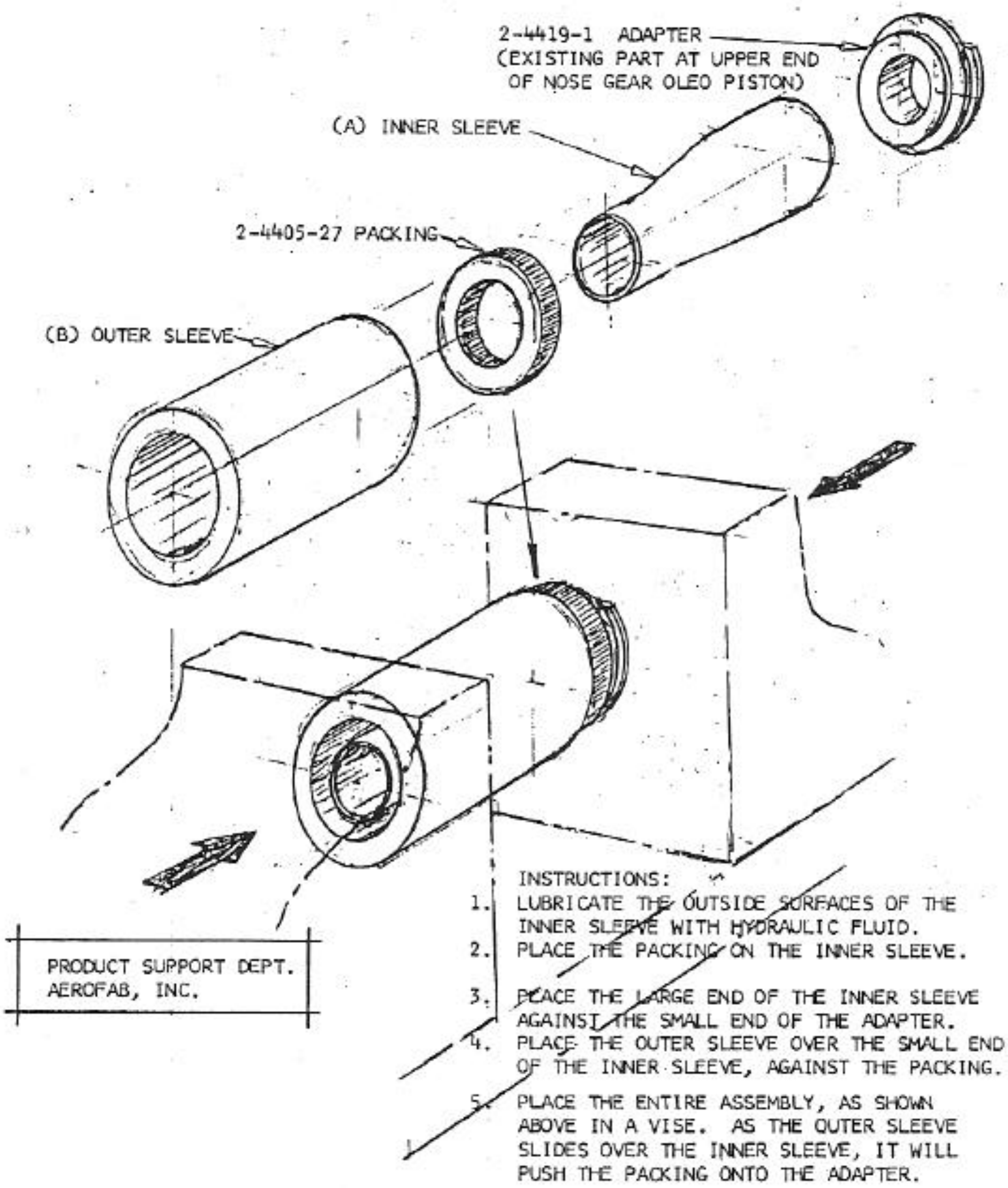


Fig. 5.11 Nose Gear Down Switch Installation

5.3 Landing Gear Retraction Test

A suitable power source can be connected to preserve aircraft battery performance.

1. Jack the aircraft in accordance with Section 2.2.
2. Service the hydraulic system in accordance with Section 2.9.
3. Lubricate the landing gear system in accordance with Section 2.15
4. Verify that each landing gear up-lock and down-lock is properly adjusted in accordance with Section 5.
5. Turn on aircraft power, turn on hydraulic pump, and place the landing gear selector in the "Down" position. Check for the green gear down light in the cockpit and check for positive down-lock at each landing gear. Check landing gear for condition, security, and routing of hydraulic lines.
6. Turn the nose wheel all the way to one side. (To ensure that the nose wheel and fork will not hang up during retraction.)
7. Place the landing gear selector in the "Up" position. Check for red gear up light in the cockpit and check for positive up-lock at each landing gear. (Nose gear up-lock must be verified through the bow compartment.) Check landing gear for condition, security, and routing of hydraulic lines. Check nose gear doors for fit (max. gap between doors is 1/4").
8. Ensure that hydraulic pressure is 1000-1200 psi. Turn off hydraulic pump.
9. Place the landing gear selector in the "Down" position. Check for the green gear down light.
   NOTE: The landing gear should extend and lock unassisted by either hydraulic pump.
10. Before proceeding with step 11, repeat steps 6-9, with the nose wheel turned all the way to the opposite side.
11. Bleed off any residual hydraulic pressure.
12. Place the landing gear selector in the "Up" position. Using the emergency hand pump, pump the landing gear to the up and locked position. Check for the red gear up light.
13. Turn on the hydraulic pump and place the landing gear selector in the "Down" position. Check for the green gear down-light and full system pressure (1000-1200 psi). Turn off power, disconnect external power.
14. Remove the aircraft from jacks.



Note: Installation Tool may be purchased through Aerofab.

Fig. 5.12 Nose Oleo "Bang Eliminator" Installation

SECTION 6

ENGINE SECTION

6.0 General

This part describes the engine section of the airplane, which consists of all of the components in the pylon and cowling, plus the power plant controls.

Maintenance of the engine and its accessories, and the propeller and its accessories, are not covered. Refer to the manufacturer's service information for these item. The engine section is shown on the following page, with component identification given below.

1. Engine
2. Propeller
3. Spinner
4. Starter
5. Alternator
6. Alternator cooling hose
7. Exhaust manifolds L/R
8. Propeller governor
9. Inspection cover (R.H. side)
10. Pylon aft fairing
11. Injector
12. Air Inlet assembly
13. Pylon aft frame
14. Pylon side panel
15. Mixture control cable
16. Throttle control cable
17. Tachometer cable
18. Oil drains L/R
19. Engine mount assemblies
20. Crankcase breather lower hose
21. Crankcase breather oil separator
22. Crankcase breather upper hose
23. Oil cooling radiator
24. Pylon forward fairing
25. Firewall
26. Firewall sealant (all openings)
27. Forward cowl fairing, lower
28. Forward cowl fairing, upper
29. Oil cooler hoses
30. Oil pressure line (to cockpit)
31. Oil filter
32. Magnetos
33. Vacuum pump
34. Oil filler cap
35. Baffles assembly
36. Fuel flow divider
37. Engine hoisting lugs
38. Intentionally left blank
39. Access door
40. Access door
41. Engine mount weldement
42. Aft cowl frame
43. Cowl top panel
44. Aft frame attachment fitting
45. Engine mount attaching bolts (inside cabin)

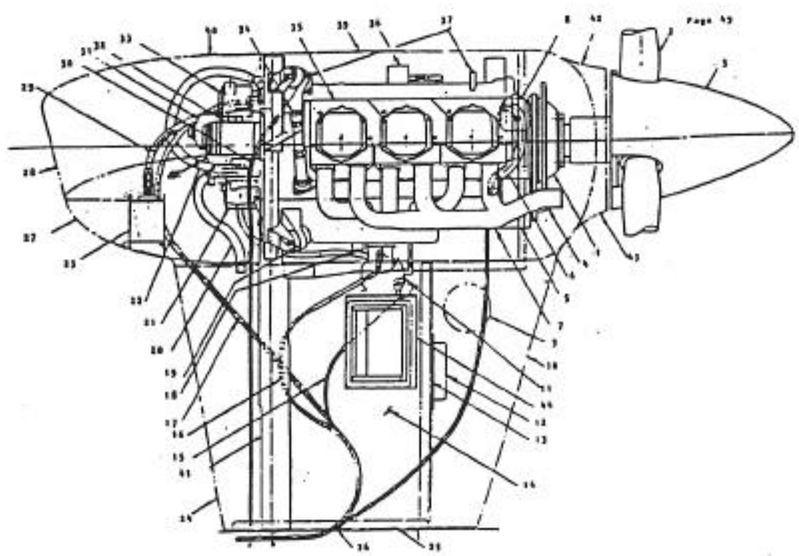


Fig. 6.1 Engine Section (Model 250)

6.1 Inspection Access

1. Hinged doors on the left and right sides of the center portion of the cowling give access for inspection of the cylinders, baffles, exhaust and intake manifolds, engine mount pads, and the oil dipstick and filler neck.

2. A hinged forward cowl (or a panel on the top forward cowl on Model 250) provides for inspection of the accessory section. (A hinged panel on the top center cowl of some models allows for inspection of the fuel flow divider).

3. An inspection covers in the pylon side skins or on the right rear pylon fairing gives access to the throttle and mixture controls at the injector (depending on aircraft model).

4. Removal of the inlet air scoop permits removal and inspection of the air filter and the air inlet box. (The upper forward cowling must be removed to service the air filter on the Model 250 Turbo.)

6.2 Maintenance Access

If access in greater depth than given in 6.1 is required, the following parts are removable.

1. The forward and aft pylon fairings may be removed to provide access to the fuel filter (LA4 series), breather jar (model 250), and various lines, cables, and wires.

2. The right-hand pylon side panel may be removed, providing access to the injector, for removal of the air inlet assembly, and access to the engine control cables. (The left-hand panel is riveted in place.) If both panels are riveted in place, contact the factory for a pylon side panel upgrade kit which allows installation of nutplates during reassembly.

CAUTION: DO NOT RUN ENGINE WITH EITHER SIDE PANEL REMOVED

3. On LA4 series aircraft, further disassembly is an extensive process and will require removal of screws and rivets.

4. On Model 250 aircraft:

   a. The upper forward cowling can be removed without disconnecting any lines. (On some early model 250's, the oil cooler lines will need to be disconnected.)

   b. The entire forward cowl can be removed after disconnecting the hoses to the oil coolers (or disconnecting the radiator from its brackets, leaving the oil hoses connected) and pushing the crankcase breather hose and the fuel pump drain hose up into the cowl. This gives complete access to the components in the accessory section.

   c. The upper aft cowling may be removed, providing access to the propeller hub, governor, the alternator and belt, and the starter.

   d. The lower aft cowling may then be removed for additional access to the propeller end of the engine.

6.3 Engine Removal

If it is necessary to remove the engine from the pylon assembly, proceed as follows:

1. Install a suitable tail stand. (The aircraft center of gravity will change with the engine removed, and stepping on the aft fuselage will cause the aircraft to tip back on its tail.) Once the engine is removed, temporary ballast can be installed as required to allow removal of the tail stand so the aircraft can be moved.
2. LA4 series: Remove forward cowl from its hinge point. Remove aft cowling (EP's).
   Model 250: Accomplish all steps described under 6.2, Maintenance Access & open the side doors.
3. Disconnect all fuel, oil, control and electrical lines from the engine, including the grounding strap.
4. Remove spinner and propeller. (Primarily for ease of handling and to avoid propeller damage.)
5. Remove the screws (or rivets) from forward edge of the top panel of the cowl and from the bottom of the aft cowl frames. The top panel and aft frame may then be removed.
6. Attach a hoist (with two hooks) to the two hoisting lugs on the engine. The hoist should be of at least one-half ton capacity. Remove some of the weight from the engine with the hoist.
   CAUTION: DO NOT LIFT THE AIRPLANE BY THE ENGINE HOISTING LUGS.
7. Remove the four bolts holding the engine to the mount.
8. With the engine weight supported by the hoist, move the engine aft to allow the accessories to clear the engine mount ring. The engine may then be lifted clear of the structure.
9. Reassembly follows the reverse procedure. Refer to section 6.6 for torque values.

6.4 Engine and Pylon Assembly Removal

It is also possible to remove the entire engine section from the airplane, as follows:

1. Install a suitable tail stand to prevent the aircraft from tipping on its tail.
2. Remove the forward and aft pylon fairings.
3. Disconnect and free up all lines, wiring and controls that pass through the firewall on the top of the hull. The disconnect should be made at the closest point in the engine section above the hull top. (Removal of the right pylon side panel will help facilitate this process.)
4. Attach a hoist to the engine hoisting lugs as in section 6.3, using the cowl top door for access.
5. With the engine section's weight supported by the hoist, remove all screws from the bottom edges of the pylon side panels.
6. Remove pylon side struts or flying wires at the engine mount.
   CAUTION: Insure that the length of the flying wires does not change, as this will affect the position of the powerplant assembly.
7. Remove the bolts from the pylon aft bottom attachment fitting.
8. Remove engine mount attaching bolts. (Behind rear upholstery panel in cabin and through flap actuator compartment.)
9. The engine pylon assembly may now be lifted clear of the airplane. Use caution not to damage wiring, cables, hoses, and tubing which are still attached to the airframe as the engine pylon assembly is removed.
10. Reinstall the pylon side panel prior to setting the pylon assembly down completely.
11. Reassembly follows the reverse procedures. Refer to section 6.6 for torque values.

6.5 Engine Mount

The engine mount is a steel weldment which is heat-treated after welding. No welding is allowed on this part. The strap fitting attaching the pylon aft frame to the hull is also a heat-treated part, and the same precaution should be observed. Consult the factory in the event of any damage to these parts.

The engine mount should be cleaned, thoroughly inspected, minor corrosion repairs made, and repainted whenever the engine is removed.

6.6 Engine Section Torque Values

Standard torque values should be used unless otherwise noted below.

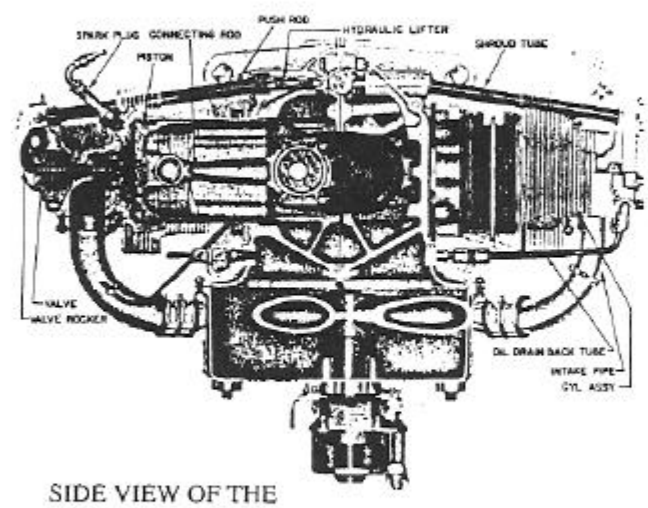
Lower engine mount/pylon attach	100-140 in-lb
Engine shock mounts (Lord)	270-300 in-lb
Propeller spinner bulkhead	22 ft-lb
Propeller attach (1/2" bolts)	60-70 ft-lb
Propeller attach (9/16" bolts)	90 ft-lb
Turbo clamps	57 in-lb
Pylon tie-rods (flying wires)	75 in-lb

6.7 Lycoming Flyer - Key Reprints

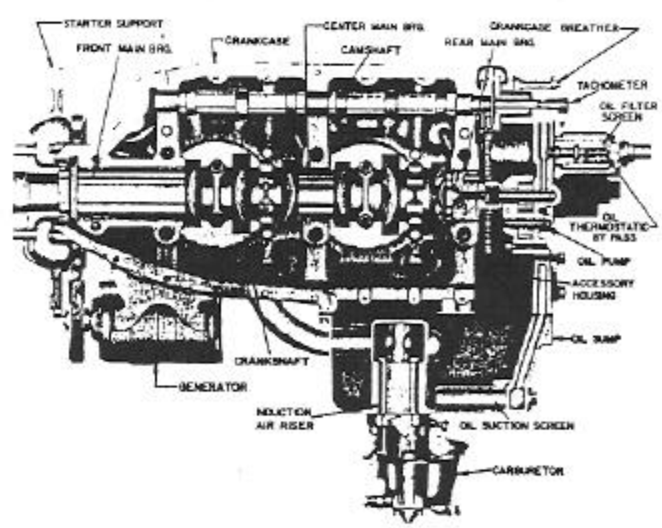
The following information was reprinted from the Lycoming Flyer Key Reprints with permission from Textron Lycoming. Copies of the complete Key Reprints can be obtained from Textron Lycoming.

Cut-Away Of A Four Cylinder Power Plant

FRONT VIEW OF A FOUR CYLINDER TEXTRON LYCOMING POWER PLANT.



SIDE VIEW OF THE FOUR CYLINDER ENGINE.



6.7 Lycoming Flyer - Key Reprints (Cont.)

Oil and Filter Change Recommendations

It has often been said that regular doses of clean, fresh oil provide the least expensive maintenance an owner can give an engine. Textron Lycoming Service Bulletin No. 480 makes these specific recommendations for oil changes under normal operating conditions:

A. Fifty-hour interval oil change and filter replacement for all engines using a full-flow oil filtration system.

B. Twenty-five hour interval oil change and screen cleaning for all engines employing a pressure screen system.

C. Even if the aircraft is flown only a few hours, a total of four months maximum between changes for both systems listed under "A" and "B."

The Exhaust Gas Temperature (EGT) And Fuel Management

Since so many operators of our engines frequently ask us about the use of an exhaust gas temperature with our powerplants, perhaps we should examine the system, and also see how it relates to fuel management.

One of the better publications describing the EGT that we have seen was put out by Alcor Inc., P. O. Box 792222 of San Antonio, Texas 78279-2222. This excellent booklet is titled, "EGT and Combustion Analysis In A Nutshell", and is available free to interested operators.

An EGT system is not a complex or expensive item to install. The more economical kit consists basically of the gage, wiring, and probe (see illustration). The system generates its own electricity to operate the instrument.

"EGT Probe and Gage"

INSTALLATION INFORMATION

The mechanic must carefully follow the installation instructions concerning placing the probe in the exhaust stack. If it is closer than 1 1/2 inches to the cylinder head, probe life will be limited, or if too far down toward the end of the exhaust stack, the response on the gage will be slow. Should there be doubt concerning in which stack a single probe is to be installed, that information may be available from the airframe dealer's service department. The operator might desire the more expensive installation of probes in all cylinders, therefore the accompanying gage will generally have a selector switch for individual readings on all cylinder exhaust stacks. Again, it is most important that the installation instructions are carefully followed in order to get reliable readings.

INTERPRETING THE SYSTEM

Most of the EGT manufacturers have standardized on gage increment markings of 25ø F (see illustration). A few EGT manufacturers will go further and show the temperature range on the gage as 1200° F to 1700° F.

The simple gage shown in the illustration is quite satisfactory for the less complex engines. An advantage of the EGT over the cylinder head temperature gage is one of an almost immediate response to manual movement of the mixture control, as long as it is not a rapid movement of the control. Remember that the peak or point of maximum needle deflection of the EGT gage is the basic reference for fuel management. If an operator has experimented with the EGT at the engine manufacturer's recommended cruise power, he observes that gradual leaning does result in peak EGT. The location of peak EGT on the gage will also vary with different power settings, changes in altitude, and change in ambient temperature.

From peak EGT, either increasing or decreasing the fuel flow causes a decrease in EGT. When richer than peak EGT cooling occurs because there is excess fuel, and when leaner than peak, cooling occurs because there is excess air.

Peak EGT with a float-type carbureted engine is frequently a vague point because of less efficient distribution (than fuel injection) to the individual cylinders by this type of metering device. As a result, float-type carbureted engines tend to operate smoother at +25° to +50° F on the rich side of peak EGT. Whereas, the fuel injected engines at 250 H.P. and higher will provide a more precise peak, and therefore the EGT system is likewise a more precise method of fuel management with fuel injection.

DEFINITION OF PEAK EGT

A simple definition of peak EGT is given us by engineering as - the chemically correct mixture of fuel and air which gives 100% utilization of all the fuel and all the air. Remember, we said earlier that at mixtures leaner than peak EGT there is excess air, and at richer mixtures, excess fuel. Operation at peak EGT, particularly on long flights,

6.7 Lycoming Flyer - Key Reprints (Cont.)

can be an advantage not only for purposes of increased range, but there is less likelihood of spark plug fouling as well.

Don't be surprised to see variations in temperature between individual cylinders where there is a probe for every cylinder. It is fairly typical to see an average 100° F variation with fuel injection, and as much as 200° F variation with a float-type carburetor. The latter (carburetor) variation tends to be greater because fuel/air distribution is not as good as with fuel injection. In cold outside air temperature flight conditions, the mixture distribution is poorer for both fuel injected and carbureted engines. However, with the float-type carburetor operating in below freezing ambient temperatures, the fuel/air distribution is definitely worsened, resulting in noticeable variations in temperature between individual exhaust stacks.

It is also important to understand that leaning to roughness at the engine manufacturers recommended cruise power is not an indication of detonation, but indicates normal characteristics of distribution to the individual cylinders. The roughness indicates that the leanest cylinder has become so lean it is beginning to miss. This is typical of an engine with a float-type carburetor. Damage to an engine from leaning does not occur at the manufacturers recommended cruise power, but takes place at higher than cruise power.

As far as the pilot is concerned, operating on the lean side of peak EGT can only be accomplished with fuel injected engines of at least 250 HP or higher because the fuel flows in the lower horsepower engines are so small. It isn't possible with float type carburetors because of the fuel/air distribution problem. In any case, **leaning past the peak is not recommended.**

LIMITATIONS OF POWER AT PEAK EGT

Textron Lycoming allows leaning to peak EGT at 75% power and below on our direct drive normally aspirated engines. We limit operation at peak EGT on our geared, supercharged powerplants at 65% power or below. With Lycoming turbocharged engines, where the EGT gage is used to interpret turbine inlet temperature (TIT), the maximum allowable TIT specified in the POH should not be exceeded when attempting to find a peak temperature by manual leaning. Where a cylinder head temperature is also available, the operator should always cross-check the head temperature as a routine procedure when leaning, and remember that whenever CHT reaches the maximum before reaching peak EGT, then CHT rather than EGT should dictate the limit of allowable leaning.

BEST ECONOMY MIXTURE

Best Economy Mixture as it relates to the EGT system begins at peak. For all practical purposes with Lycoming engines, peak EGT is right at the edge of Best Economy mixture, and is our only practical point of reference in the Best Economy Mixture range. At the manufacturers recommended cruise power, peak EGT causes a slight loss of horsepower usually reflected in two or three miles per hour of airspeed. If the pilot attempts to go leaner than peak EGT (with fuel injection only), the power decreases rapidly as fuel flow decreases.

BEST POWER MIXTURE

Best Power Mixture, or sometimes termed Maximum Power Range, as depicted on the EGT gage, is in the range of plus 100° F on the rich side of peak. Best Power Mixture will provide fastest indicated airspeed for a cruise power setting, although it is generally not considered a practical economic mixture for cruise purposes. However, Best Power Mixture generally provides a safe amount of fuel for a power setting higher than the engine manufacturers recommended cruise, except that needed for takeoff power.

Again we repeat that maximum leaning (peak EGT) does not damage an engine at the engine manufacturers recommended cruise power. Damage is caused by maximum leaning at higher than recommended cruise power where the manuals do not spell it out or allow it, and when the aircraft does not have a complete set of reliable engine instruments to protect the powerplants. Excessive leaning under the latter high power conditions can cause detonation and/or preignition and possible engine failure.

If we were to sum up the major advantages of an EGT to the operator, they are as follows:

1. Saves fuel - an economy aid.

2. Aids proper mixture control - more precise fuel management.

3. Helps increase range.

4. Detects some types of engine troubles.

5. Aids peak engine performance at cruise.

6. Helps prevent spark plug fouling.

7. Fits any General Aviation piston aircraft engine.

Although use of the EGT has the advantages listed above, from a pilot's point of view there are also some possible disadvantages. Poor mixture distribution to the cylinders (particularly in carbureted engines) is the primary reason for these disadvantages. The EGT probe is to be installed in the leanest cylinder, but this changes with altitude and power setting, therefore making it very difficult, or perhaps impossible, to choose a best cylinder for probe installation. Without an EGT installation the pilot can easily lean using the leanest cylinder of a carbureted engine by simply leaning to find engine roughness from the first indication of "lean misfire", and then richening the mixture to smooth engine operation.

The pilot must also realize that even with a fuel injected engine there will be variations in fuel flow. Utilizing an EGT with probes in each exhaust stack (sometimes called a

6.7 Lycoming Flyer - Key Reprints (Cont.)

combustion analyzer) will show these variations. Trying to interpret the variations in temperature shown for each cylinder has caused some pilots to suspect problems with there engine when it has been operating normally. Sometimes too much knowledge can be a problem.

Finally, the EGT system must be in perfect working order to give accurate readings. The probes in the exhaust system will deteriorate with age and continuous use. This often causes the gage to read a temperature that is not accurate, and therefore a peak reading that is not reached soon enough. This results in overleaning to the lean side of peak where operation is not recommended. Frequent maintenance to insure that temperature probes are in good condition will reduce the possibility of inaccuracies, but the pilot cannot determine the accuracy of this rather critical reading during operation.

The exhaust gas temperature system, when well maintained and thoroughly understood, can be an aid in proper leaning at cruise power with fuel injected powerplants. It is hoped that this information will help the operators of Lycoming engines achieve the best possible engine efficiency through use of the EGT system.

Basic Power Sequence (Governed Engines)

TO INCREASE POWER - first, enrich mixture, increase RPM, then follow with throttle.

TO DECREASE POWER - first, reduce throttle, reduce RPM, and then adjust mixture.

INCREASING POWER - enrich mixture first to ensure protecting the engine against damage from higher power when previously leaned out for a lower power setting.

Next, increase RPM because in some models the engine and propeller would have undesirable pressure and stresses with a high manifold pressure and lower RPM.

Then, follow with the appropriate manifold pressure now that the mixture and RPM have been correctly set to accommodate the increased throttle.

DECREASING POWER - Most models of our engines require the basic procedure for decrease of power by retarding throttle, followed by RPM. However, we do have an exception in several older models of our geared normally aspirated powerplants, such as the GO-480 and GO-435 series. In the climb configuration, we recommended full throttle throughout the climb for internal fuel cooling with RPM reductions initially to 3000 RPM and then 2750 RPM for prolonged climb.

Turbocharged and Supercharged engines require carefu application of the basic power sequences as outlined in the beginning. It is also possible to create an overboos condition on these engines by going to takeoff manifol pressure at cruise RPM, such as might take place in a unexpected go-around. The stresses and pressures on prop and engine would create a threat to both.

Suggestions On Engine Starts

An important part of the engine starting procedure is the priming technique involved. Of course, the pilot's operating handbook will specify the steps in starting a specific mode engine. However, some of the pilot handbooks may no explain why certain procedures are used in the starting process.

Priming can be best accomplished with an engin priming system, as opposed to use of the throttle. The primer pumps extra fuel directly into the cylinder intake por or induction system. Some float-type and pressur carburetors also provide a supplemental source of priming Lycoming engines of more than 118 HP have a throttl pump which can be used for priming under moderat ambient temperature conditions while turning the engin with the starter.

Pilots should, however, be advised that excessive throttl priming can cause flooding of the carburetor and airbox, an result in a fire in the induction system or on the outsid where the fuel drains overboard. If the operator floods th engine by pumping the throttle and has a fire, it is possibl to handle such a fire in the early stages by continuing to tur the engine with the starter, thereby sucking the fire back int the engine. Furthermore, if there is any fire on the outside o the engine, if the engine starts there is a good chance it wil blow out the external fire.

Flooding of the engine without a fire, the operato should open the throttle full and close the mixture; (se Operator's Handbook on mixture) and turn the engine ove several times with the starter to clear it; then begin agai with a normal start routine.

Most Lycoming fuel injected engines are simply prime by turning the fuel boost pump on, opening the mixtur briefly to full rich, and cracking the throttle. Any pumping of the throttle is ineffective until the engine begins to fire.

FUEL CONTAMINATION—Water (says the FAA) i the principal contamination of aviation fuel. For a saf flight, carefully drain fuel sumps at each preflight.

6.7 Lycoming Flyer - Key Reprints (Cont.)

Leaning Textron Lycoming Engines

A direct reprint of Service Instruction 1094D

Revision "D" to Service Instruction No. 1094 supersedes all previous recommendations and should be used for engine leaning during normal flight operations. ALL LEANING RECOMMENDATIONS ARE BASED ON CALIBRATED INSTRUMENTATION.

Textron Lycoming strongly recommends that all engine instrumentation be calibrated annually. All instrumentation for manifold pressure, engine RPM, oil temperature, cylinder head temperature, exhaust gas temperature, and turbine inlet temperature in the aircraft should be included in this annual calibration.

Regardless of the fuel metering device, fuel management of normally aspirated engines is primarily dependant on the instrumentation available. The method is the same for both fixed and controllable pitch propellers.

Textron Lycoming recommendations for leaning turbocharged engines in this Service Instruction refers to Textron Lycoming supplied turbocharged engines. For aftermarket turbocharger installations, contact the STC holder for proper leaning instructions.

CHT (cylinder head temperature) and TIT (turbine inlet temperature) probes are required for leaning turbocharged engines. Refer to latest edition of Service Instruction No. 1422 for proper TIT probe locations and depth.

A. GENERAL RULES

1. Without exception, observe the red-line temperature limits during takeoff, climb and high performance cruise power operation.

(a) Cylinder head temperature - maximum limit listed in the Textron Lycoming Operator's Manual.

(b) Oil temperature limit - maximum limit listed in the Textron Lycoming Operator's Manual.

(c) TIT - maximum allowable limit specified in the Textron Lycoming Operator's Manual.

2. Whenever mixture is adjusted, rich or lean, it should be done slowly.

3. ALWAYS RETURN MIXTURE SLOWLY TO FULL RICH BEFORE INCREASING POWER SETTING.

4. At all times, caution must be taken not to shock cool the cylinders. The maximum recommended temperature change should not exceed 50°F per minute.

B. LEANING THE NORMALLY ASPIRATED ENGINES

1. Use full rich mixture during takeoff or climb. Careful observation of engine temperature instruments should be practiced to ensure limits specified in Textron Lycoming operator's manual are never exceeded. Refer to the aircraft POH (pilot's operating handbook) or AFM (aircraft flight manual) for more specific instructions.

2. For 5000 feet density altitude and above, or high ambient temperatures, roughness or reduction of power may occur at full rich mixture. The mixture may be adjusted to obtain smooth engine operation. For fixed pitch propeller, lean to maximum RPM at full throttle prior to takeoff where airports are 5000 feet density altitude or higher. Limit operation at full throttle on the ground to a minimum. For direct-drive, normally aspirated engines with a prop governor, but without fuel flow or EGT, set throttle at full power and lean mixture at maximum RPM with smooth operation of the engine as a deciding factor.

3. For cruise powers where best power mixture is allowed, slowly lean the mixture from full rich to maximum power. Best power mixture operation provides the most miles per hour for a given power setting. For engines equipped with fixed pitch propellers, gradually lean the mixture until either the tachometer or the airspeed indicator reading peaks. For engines equipped with controllable pitch propellers, lean until a slight increase of airspeed is noted.

4. For a given power setting, best economy mixture provides the most miles per gallon. Slowly lean the mixture until engine operation becomes rough or until engine power rapidly diminishes as noted by an undesirable decrease in airspeed. When either condition occurs, enrich the mixture sufficiently to obtain an evenly firing engine or to regain most of the lost airspeed or engine RPM. Some engine power and airspeed must be sacrificed to gain a best economy mixture setting.

NOTE

When leaned, engine roughness is caused by misfiring duê to a lean fuel-air mixture which will not support combustion. Roughness is eliminated by enriching slightly until the engine is smooth.

5. The exhaust gas temperature (EGT) offers little improvement in leaning the float-type carburetor over the procedures outlined above because of imperfect mixture distribution. However, if the EGT probe is installed, lean the mixture to 100°F on the rich side of peak EGT for best power operation. For best economy cruise, operate at peak EGT. If roughness is encountered, enrich the mixture slightly for smooth engine operation.

6. When installing an EGT probe, the probe must be installed in the leanest cylinder. Contact the airframe or kit manufacturer for the correct location. In experimental or custom applications, multiple probe instrumentation is required and several power settings should be checked in order to determine the leanest cylinder for the specific application.

6.7 Lycoming Flyer - Key Reprints (Cont.)

7. During normal operation, maintain the following recommended temperature limits:

(a) Cylinder head temperature - limit listed in the Textron Lycoming Operator's Manual.

(b) Oil temperature - limit listed in the Textron Lycoming Operator's Manual.

8. For maximum service life, maintain the following recommended limits for continuous cruise operation:

(a) Engine power setting - 65% of rated or less.

(b) Cylinder head temperatures - 400°F. or below.

(c) Oil temperature - 165°F. - 220°F.

C. LEANING THE TURBOCHARGED TEXTRON LYCOMING POWERPLANT.

1. The cylinder head temperature (CHT) and turbine inlet temperature (TIT) gages are required instruments for leaning with turbocharging by Textron Lycoming. EGT probes on individual cylinders should not be used for leaning.

2. During manual leaning, the maximum allowable TIT for a particular engine must not be exceeded. Check the POH/AFM or the Textron Lycoming Operator's Manual to determine these temperatures and fuel flow limits.

3. Maintaining engine temperature limits may require adjustments to fuel flow, cowl flaps, or airspeed for cooling.

4. All normal takeoffs, with turbocharged powerplants, must be at full rich mixture regardless of airport elevation.

5. If manual leaning of the mixture is permitted at takeoff, climb power, or high performance cruise, it will be specified in the POH/AFM and will list required ranges for fuel flow, power settings, and temperature limitations.

6. Leaning to best economy mixture.

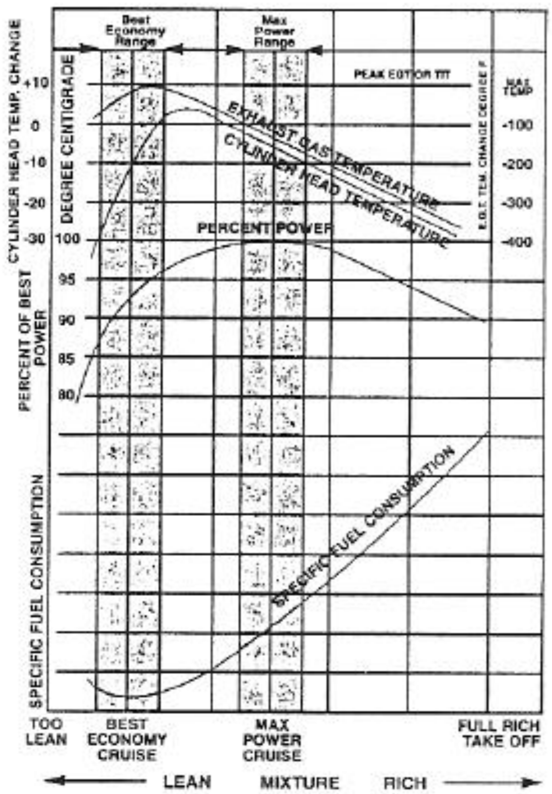
(a) Set manifold pressure and RPM for the desired cruise power setting per the aircraft POH/AFM.

(b) Lean slowly in small steps, while monitoring instrumentation, to peak TIT or maximum allowable TIT, whichever occurs first.

7. Leaning to best power mixture.

Before leaning to best power mixture, it is necessary to establish a TIT reference point. This is accomplished as follows:

(a) Set manifold pressure and RPM for the highest cruise power setting where leaning to best economy is permitted per the aircraft POH/AFM.



THIS REPRESENTATIVE DIAGRAM SHOWS THE EFFECT OF LEANING ON: CYLINDER HEAD TEMPERATURE, EXHAUST GAS TEMPERATURE OR TIT, ENGINE POWER, AND SPECIFIC FUEL CONSUMPTION FOR A CONSTANT ENGINE RPM AND MANIFOLD PRESSURE.

NOTE

TEXTRON LYCOMING DOES NOT RECOMMEND OPERATING ON THE LEAN SIDE OF PEAK EGT.

(b) Lean slowly in small steps until peak TIT or maximum allowable is reached. Record peak TIT as a reference point.

(c) Deduct 125°F. from this reference and thus establish the TIT temperature for best power mixture operation.

(d) Return the mixture to full rich and adjust manifold pressure and RPM for the desired cruise conditions.

(e) Lean mixture to the TIT temperature for best power mixture operation established in step (C).

8. During normal operation, maintain the following limits:

(a) Engine power setting - rating listed in the Textron Lycoming Operator's Manual.

6.7 Lycoming Flyer - Key Reprints (Cont.)

(b) Cylinder head temperature - limit listed in the Textron Lycoming Operator's Manual.

(c) Oil temperature - limit listed in the Textron Lycoming Operator's Manual.

(d) Turbine inlet temperature - limit listed in the Textron Lycoming Operator's Manual.

9. For maximum service life, maintain the following recommended limits for continuous operation.

(a) Engine power setting - 65% of rated or less.

(b) Cylinder head temperatures - 400°F. or below.

(c) Oil temperature - 165°F. - 220°F.

(d) Turbine inlet temperature - maintain 100°F. on rich side of maximum allowable.

D. LEANING THE SUPERCHARGED TEXTRON LYCOMING POWERPLANTS.

1. All takeoffs with supercharged powerplants must be at full rich mixture regardless of the airport elevation.

2. If manual leaning of the mixture is permitted at climb power, it will be specified in the POH/AFM and will list required ranges for fuel flow, power settings, and temperature limitations.

3. Recommended standard cruise power for the supercharged engine is 65%. At 65% power or less, this type of engine may be leaned as desired as long as the engine operates smoothly, and temperatures and pressures are within manufacturer's prescribed limit.

4. The exhaust gas temperature (EGT) gage is a helpful instrument for leaning the supercharged engine at cruise power with a manual mixture control.

An Explanation Of Power Settings

A letter received here at the factory asked a question we have heard quite often:

"Is it a fact, or is it fiction, that engines with constant speed props should not use power settings where inches of mercury exceed RPM in hundreds? I am referring of course to non-turbocharged engines in general ."

The answer to this question is easily found in cruise power charts of the airframe Pilot's Operating Handbook. Whatever the combinations of RPM and MP listed in the charts — they have been flight tested and approved by the airframe and powerplant engineers. Therefore, if there are power settings such as 2100 RPM and 24" MP in the power chart, they are approved for use.

The confusion over so-called "squared" power settings (i. e. 2400 x 24" MP), appears to have been a carry-over from some models of the old radial engines which were vulnerable to excessive bearing wear where a MP higher than "squared" was used. More pressure on the bearings with the higher than "squared" MP was the cause of their problem. However, changes in design, metals, and lubricants permit changes in operation in the more modern flat opposed powerplants.

Let's look at the power charts in a couple of the Pilot's Operating Handbooks of two different aircraft manufacturers, but where both are using the four cylinder 200 HP Lycoming engine.

Cessna's Model 177 RG, using the Lycoming IO-360-A1B6D, in the cruise range at 6,000 feet, lists a cruise power setting range at that altitude of anywhere from 2100 RPM to 2500 RPM with variations all the way from 18" MP to 24" MP. They list a recommended Power setting for 66% power at 2100 RPM at 24" MP.

The Piper Arrow, powered by the Lycoming IO-360-C series engine, lists the following cruise power settings at 6,000 feet in their chart at 65% power at full throttle (about 23" MP) x 2100 RPM.

The complete chart for 65% power is shown as follows:

Altitude	2100 RPM	2400 RPM
SL	25.9 MP	22.9 MP
1,000	25.6 MP	22.7 MP
2,000	25.4 MP	22.5 MP
3,000	25.1 MP	22.2 MP
4,000	24.8 MP	22.0 MP
5,000	F. T. MP	21.7 MP
6,000	F. T. MP	21.5 MP

After studying the power chart, the pilot would undoubtedly then ask what combination of RPM and MP would be best to use at cruise. We recommend the pilot try the various combinations offered by the power chart over a five-minute period when flying in smooth air, and use the listed RPM and MP combination which gave the least vibration and the lowest noise level.

In addition to the quieter and smoother consideration, lower RPM means lower friction hp. This reduced loss of horsepower due to friction also translates to slightly improved fuel economy.

6.7 Lycoming Flyer - Key Reprints (Cont.)

Cam and Tappet Wear

The lobes of the camshaft and the tappets that they continually operate against have always been subject to wear. Someone recently stated that in recent years there has been an unacceptable rise in the occurrence of spalling tappets and worn cam lobes. Is this a factual statement? Perhaps it may help if we take a look at one or two of the causes of wear on these parts. From this we may reach a conclusion about why this statement could possibly be true today.

Corrosion is a known cause of tappet and cam lobe wear. The engines of aircraft that are not flown regularly may be extremely vulnerable to corrosion. When the film of oil drains from the interior parts of the engine after it has been run, those parts become prey to the chemical changes that are caused by moisture, acids, and oxygen. Tappets from engines which have not been operated for long periods have been closely examined. Under a microscope, it is not unusual to find microscopic pits on the face of the tappet. This is the beginning of trouble. Starting with these very tiny pits, tiny particles of rust also affect the cam lobes. Once started, the process is not likely to stop until the wear reaches a point where these parts are doing an unacceptable job.

Some people might question the assertion that engines can attract unusually large amounts of moisture: brief operating periods, low engine oil operating temperatures, and condensation all contribute. It might be very surprising to take an engine which has flown 15 to 25 hours over the course of four to six months and drain the oil into a clear container. The amount of water which settles to the bottom is likely to be more than one would expect. Also remember that combustion causes acids to collect in the oil. When these are not removed by regular oil changes, the acids, as well as the moisture, will promote the growth of microscopic pitting which eventually leads to excessively worn tappets and cam lobes.

Another factor in the unacceptable rise of tappet spalling in general aviation engines may be the product that is put into many of those engines at overhaul. To reduce the costs of overhaul, there is an increasing tendency to put reground camshafts and tappets into these engines. Although camshafts may be reground, there is a very strict limit on the amount of grinding which can be tolerated. Grind too much and the hardened surface of the cam lobe is gone. After this kind of grinding, the cam may look great, but it will be wearing on the soft metal which was once protected by a hardened surface. Textron Lycoming does not recommend the use of reground tappets under any circumstances, but many engines overhauled in the field today come back to the owner with reground tappets and camshaft. In some cases at least, these items are nothing more than good looking junk.

Because of the high percentage of refurbished used parts that go into many overhauls, and the many airplanes that sit for long periods without being flown, there could be more tappet spalling today than in the past. These are some of the reasons why the statement that there has been an unacceptable rise in spalled tappets and worn cam lobes in recent years might just be true. Ask about the parts which are going into your overhaul. It may be less expensive to pay for new parts at the time of overhaul than it is to pay for replacing worn out parts before your engine has reached its expected TBO.

SAFETY NOTES

In an attempt to reduce the cost of flying, some operators have resorted to methods of operation which are considered to be unsafe. Textron Lycoming makes the following recommendations regarding these practices:

1. Do not advance timing—set timing in accordance with the Engine Operator's Manual for the specific engine model.

2. Do not use a hotter spark plug for low power cruise - unless it is approved for the specific engine as listed in Lycoming Service Instruction No. 1042.

3. Do not abbreviate the warm-up of a turbocharged engine—follow the instructions of the manual pertaining to oil temperatures, otherwise an overboost or erratic power condition will result.

4. Do not use automotive oils in aircraft engines - they will cause engine damage or possible failure.

5. Do not use automotive fuel in aviation engines. Quality of automotive fuel varies widely and additives may result in deterioration of fuel system components. The engine manufacturers contend that use of auto fuel in an aircraft induces unnecessary risk.

SECTION 7

AIRFRAME SECTION

7.0 General

The airframe is of conventional metal stressed-skin construction, using mechanical fasteners. Repairs to these amphibious aircraft should only be made in accordance with this manual.

7.1 Airworthiness Limitations

1. **Inspection Intervals**

   (Refer to Section 3 "Inspection")

2. **Overhaul Intervals and Life-Limited Parts**

   (Refer to Section 3.2 "Overhaul Intervals and Life-Limited Parts", and Section 7.1.4 Non-Repairable Items)

3. **Repairable Items**

   1. Unless otherwise specified in this manual, structure may be repaired in accordance with AC43.13-1b "Acceptable Methods and Practices: Aircraft Inspection and Repair".
   2. To avoid degradation of aerodynamic performance, skin patches on the wing forward of the main beam, on the hull bottom, and on the vertical and horizontal tail surfaces, should be flush with the existing skin.
   3. Special Equipment - When repair of the fuselage, wings, control surfaces, and stabilizers involve removal or replacement of significant portions of material (such as multiple skins), it is recommended that fixtures be used to insure that aerodynamic characteristics conform to the Type Design. Record the use of such equipment in the aircraft maintenance records.

      Test Apparatus - Inspection of these types of repairs shall include the use of contour templates, transits, and jigs necessary to verify that aerodynamic characteristics conform to the Type Design. Record the use of such apparatus in the aircraft maintenance records.
   4. All repairs must be performed in accordance with the applicable manufacturer's manuals. Items not covered in manufacturer's manuals or FAA approved data are considered unrepairable.

4. **Non-Repairable Items:**

   1. Wing attach fittings.
   2. Wing spar doublers and wing spar cap angles where loss of material thickness exceeds 10% of the original material thickness.
   3. Wings, which require repairs resulting in replacement of the wing's main spar cap Angle, repairs to the hull carry through structure, can only be performed by Personnel authorized by the factory, in a jig conforming to type design specifications. Which has been approved in writing by the factory or type certificate holder.

7.2 Water-Tight Areas

The hull is divided into water-tight compartments as follows:

1 & 2. The left and right bow compartments outboard of the nose gear well, and forward of the instrument panel.

3. The main hull (cabin), from the bow compartments back to a water-tight compartment behind the baggage compartment.

4. The fuel cell cavity.
5. The aft hull compartment, from the water-tight bulkhead to the tail bulkhead.
6. The left and right sponsons.

Additionally, foam flotation material is provided (on some models) in the nose wheel compartment, the main hull, and wings.

Water-tight areas must be kept well sealed. The most common cause of leakage, other than obvious skin damage, is loose or missing rivets. These rivets should be replaced using sealant. (Pop rivets are not allowed below waterline.) The most common causes of water in the aft hull is failure to properly seal the inspection covers on the sides of the hull near the aft end, or a compromise in the rudder pushrod boot in the back of the vertical stabilizer.

Leak Tests

Seaworthiness is part of airworthiness. Water inside the aircraft affects aircraft weight and balance, which in turn can render the aircraft unsafe for operation. If the source of a leak is not obvious, water can be placed inside the watertight areas while the outside is observed. Water must be drained and drain plugs reinstalled prior to releasing the aircraft to service. (This includes on-water leak tests.) Leak tests provide an opportunity to test hull web weep hole, bilge pump, and aft hull drain systems.

Bow Compartments - Water can be added through the bow compartment lockers (if installed) or through the drain plug.

Main Hull - Water can be added with the floorboards removed, or through holes in the floorboards at the rudder pedals. Deflating the nose strut will improve results in the forward portion of the main hull. (Be aware of aircraft C.G. when adding water.) Although much more complex, the most effective leak test of the main hull is performed with the aircraft on the water and the floorboards and baggage compartment removed (normally performed on a beach). NOTE: the aircraft is not airworthy if the floorboards and/or baggage compartment are removed.

Aft Hull - Water can be added through one of the access covers in the side skin. Checking the aft hull in this manner should be done first with the airplane on all three wheels, then with the nose up and supported, so that the tail tie-down ring is on the ground. (Be aware of aircraft C.G. and the extra weight in the aft hull when adding water and tipping the aircraft on its tail.)

Sponsons - Water can be added through the drain plug.

Other sources of leaks include: aileron boots, engine firewall, heater duct, cabin door seals, the complex junction of skins at the bottom aft portion of the nose wheel well, and also, missing drain plugs.

7.3 Approved Sealants and Methods of Use

1. **Fuel Cell Area -** All joints and seams on the inside of fuel cavities are to be treated in the following manner:
   1. Remove all chips, burrs and foreign matter from cavity.
   2. Thoroughly clean joint areas with an oil free solvent such as Methyl-Ethyl-Ketone, toluene or equivalent.
   3. Apply brush coat of PR-1221 A protective coating, using short, overlapping strokes. Coating is to extend 1/4" minimum beyond joint or rivet line. (#776 or CS 3201 Alternates.)
   4. A second coat may be applied after first coat is firm to the touch.
   5. In fuel cavities where a bladder type tank is used, vinyl taping of joints, rivet bucktails and corners may be used.
   6. EP-711 or equivalent sealant may be used as a fillet seal over areas impossible to protect properly with either tape or brush sealer. If used in integral fuel cavities (no bladder) the fillet sealant shall be protected with brush on-sealant as in paragraphs 1.3 & 1.4 above.

7. Materials:

- Bostic 920, 3m 5200 or equivalent (non-fuel applications only)
- PR-1221A, PR-1221B, P1422A, PR1422 - Products Research & Chemicals
- #776 Sealant (Brushable) - Minnesota Mining & Mfg. Company
- CS 3204 A & CS3205 CS3205 - Chemical Seal Corporation
- CS 3201 A (Brushable) - Chemical Seal Corporation
- EP-711 & EP-911 - Coast Proseal & Mfg. Co.

2. **Water Tight Faying Surfaces:** All water tight faying surface joints, rivet holes, and lines of rivets are to be sealed in the following manner:

1. Remove all chips, burrs and foreign matter from surfaces.
2. Thoroughly clean joint surfaces with oil-free solvents as in 1.2 above.
3. Apply a bead of seam sealing paste to one of the surfaces to be joined. Bostic 920, 776, PR-1221A & CS3201 sealant may be brushed on. Aircraft hull bottom may have in addition, a coating of EC 1814 or Bostic 920 brushed on at seams inside of hull after riveting.
4. Install rivets or other fasteners as required.
5. Materials - Same as above Par. 7.3.1.7.

3. **Fillet or Gap Filling Type Seals**

1. All joints, corners and gaps which cannot be completely sealed, and which must be watertight, are to be sealed with either EP-711 or equivalent sealant. Use cleaning procedures as outlined on sheet 1.
2. Materials - Same as above Par. 7.3.1.7.

CAUTION: Ventilate areas - avoid inhaling fumes from solvents and coatings.

4. **Recommended Shelf Lives**

Follow sealant manufacturer's recommended shelf life.

7.4 Corrosion Protection

All metal components of the airframe are protected against corrosion with strictly controlled multiple special processes. These special process specifications are part of the Type Design.

Steel - Detail parts have either an iron phosphate, ZRC, or Par-Al-Ketone coating; one or more coats of primer; and in some cases, a special enamel topcoat.
Aluminum - Detail parts undergo an alodine conversion coating and one or more coats or primer.

The primer in both cases may be either zinc chromate or epoxy strontium chromate type. For maximum service life, all repairs should be made with materials having an equivalent level of corrosion protection. Whenever possible, it is recommended that genuine factory parts be used in place of repairs.

Additional corrosion protection can be obtained through the use of aftermarket fogging systems such as Corrosion-X, LPS, and ACF-50. The factory does not recommend or prohibit these systems. Contact the system manufacturer for information.

Maximum corrosion prevention is obtained through aggressive preventive maintenance. Lubrication intervals should be adjusted according to the amount of salt water operations, and the aircraft should be thoroughly washed and the interior hull rinsed after each salt water immersion. Electrical connections and grounds should be inspected and cleaned regularly, and reassembled with Dow Corning #4.

7.5 Hull Weep Holes

The hull frames are provided with weep holes at their lowest points, to permit full drainage of all bays in the hull. It is important to keep these weep holes open, and to keep the hull free from debris that might cause any blockage of free water flow.

7.6 Wing Removal

1. The hull must be securely supported on a cradle high enough for the main gear to clear the floor.
2. Place jack under opposite wing to keep aircraft from tipping when the weight of the other wing is removed. A tail stand should be used for additional support.
3. Bleed hydraulic pressure to zero. Disconnect battery.
4. De-fuel wing tank as required.
5. Disconnect the pitot/static, hydraulic, and brake lines, and the electrical wiring, at the wing root. (Fig. 7.1 "A"). Raise the gear leg to evacuate fluid from the lines. Cap fluid lines inside of wing. Remove bulkhead fitting nuts from wing root, but do not cap lines until the wing is removed.
6. Disconnect flap push rod from the actuator arm, then unbolt the actuator arm from the torque shaft. (Fig. 7.1 "F") (Use care not to allow the flap to fall down against the hull side skin.) Remove flap.
7. Disconnect the aileron push rod from the bellcrank inside the hull, then free the push rod boot from the push rod. (Aileron may be removed or taped to neutral position to prevent damage.)
8. Remove the wing top closure angle and any wing root fairings at the hull side. (These are normally installed with rivets with steel stems.)
9. Remove sponson.
10. Support the wing near the tip.
11. Remove the rear wing fitting bolt and install a suitable drift. (Fig. 7.1 "E")
12. Remove the (12) main beam bolts. (Fig. 7.1 "A, B, C, D".) (This is most easily accomplished with an air ratchet, and may require rocking of the wings to facilitate removal.)
13. Retract the gear, and wire the up-lock hook in place. (Fluid line caps will need to be loosened.)
14. Remove the drift in the aft wing attach fitting.
15. The wing may now be slid outboard to clear the fittings. Weight of each wing, including the main gear, is approximately 280 pounds, with the majority of the weight inboard.
16. The wing may be placed on saw horses or in a wing holding fixture with the wing's weight supported along wing rib rivet lines.
17. Cap fluid lines at fuselage.

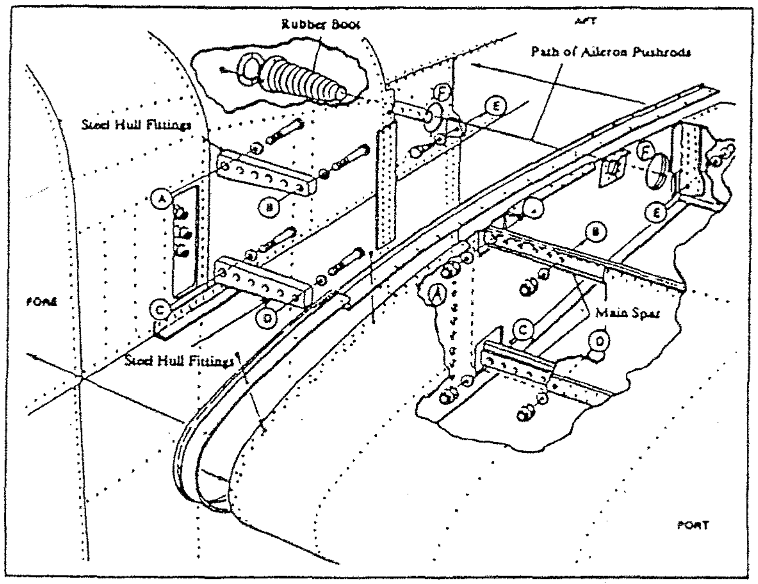


Fig. 7.1 Wing Attach Area

7.7 Wing Installation

Installation of the wing follows the reverse of the removal procedure, with the following additional considerations.

1. A tapered pin driven into one hole in the upper main fitting, and one into the lower main fitting, will assist in alignment and make installation of the bolts much easier. (These tapered pins can be made from the old wing attach bolts.)
2. Reinstall the wing using new wing attach bolts (wing attach bolts may not be re-used). Do not substitute different bolts for the wing main beam attachment, as the factory-installed bolts are special high shear strength bolts. Torque wing bolts: 3/8" = 95-110 in-lb, 7/16" = 270-300 in-lb.
3. Steel washers are used against the wing attach fitting and Service Bulletin B-79 kit doubler.
4. Check flap and aileron controls for proper travel. (NOTE: pay particular attention to the aileron push rod boots to insure they do not limit travel of the push rods.)
5. Perform gear retraction tests, leak tests, and functional tests on all wing electrical circuits. (CAUTION: Verify down-lock safeties are removed prior retracting landing gear.)
6. Perform pitot-static system leak checks as required.
7. Make the required maintenance record entries.

7.8 Wing Spar Doubler Removal:

1. Remove wing in accordance with section 7.7 of this manual.
2. Lay wing upside down on a secure surface per Par. 7.6.16.
3. Remove the M/G side strut at its upper attach point and secure it out of the way. Secure the gear in the down position by tying the gear to one of the wing tie-downs.
4. Remove leading edge wing tank (if installed). If leading edge tank is not installed, an additional inspection hole may be added per section 7.11.
5. Remove rivets from doubler, insuring that the entire rivet shank is removed. (Use caution to prevent elongating the holes.)
6. Remove the structural screws (or bolts) from the upper side load fitting (2-1623/1626-1 and 2) fitting.
7. Remove the doubler by pulling it out through the wing attach fitting holes in the root rib.

7.9 Wing Spar Doubler Installation:

Installation of the doubler follows the reverse of the removal procedure, with the following additional considerations.

1. Use the removed doubler as a drill template for drilling the holes in the new doubler.
2. Install new inspection hole and cover
3. Clean and inspect spar in accordance with Service Bulletin B-79.
4. Ensure that the spar cap angle and doubler mating surfaces are properly prepped and primed before reassembly.

7.10 Wing Spar Cap Angle Replacement:

Replacement of the wing spar and spar cap angle may only be performed by the factory or a facility approved by the factory to perform this repair.

7.11 Installation of Additional Wing Leading Edge Inspection Holes:

Installation of additional access covers in the wings may be required to facilitate field repairs, and may be accomplished as follows:

Out to wing station 61.25"

1. Location of inspection hole shall be centered between ribs, 5.0" (± 1/2") forward of the main spar, on the underside of the wing.
2. Install 2-1600-127 doubler and 2-1600-129 cover per figure 7.2.

Outboard of wing station 85"

1. Location of inspection hole shall be centered between ribs, 5" (+- 1/2") forward of the main spar, on the underside of the wing.
2. A 4.344" hole is required.
3. Install S4-6-064 doubler with (12) AN470-AD4 rivets.
4. Install S4-6 cover into the doubler.

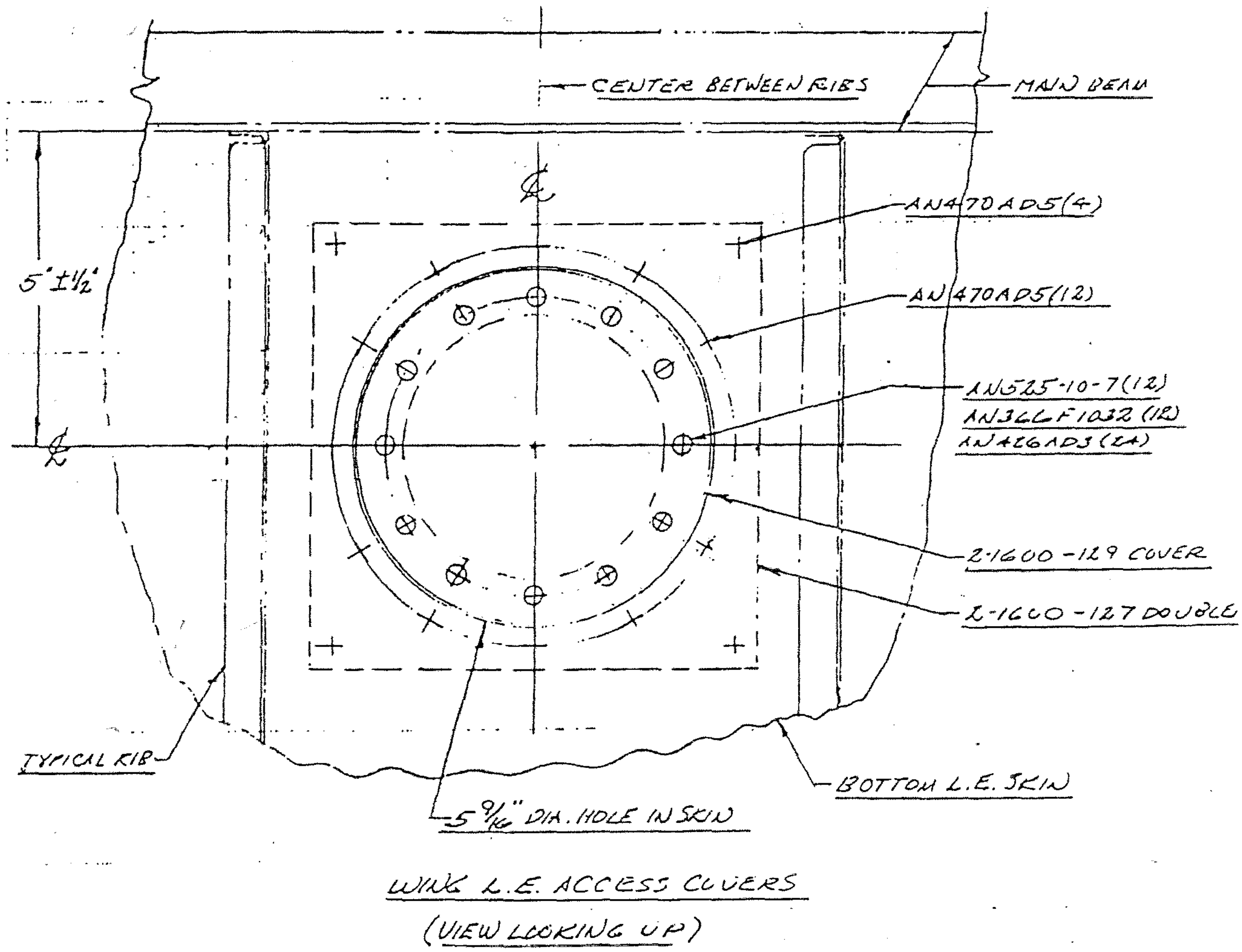


Fig. 7.2 Wing Inspection Cover Installation

7.12 Horizontal Stabilizer Removal

The LA4 series have a two-piece stabilizer, and the Model 250 has a one-piece stabilizer.

1. Remove upper fin. (Model 250 only)
2. Disconnect elevator pushrod from elevator horn.
3. Disconnect hydraulic lines to trim actuator.
4. Disconnect trim indicator cable at trim surface.
5. Remove screws from closure angle on underside of stabilizer. (Model 250 only)
6. Remove bolts from forward and aft beam fittings.
7. The stabilizer may now be lifted from the vertical tail.

Re-installation follows the above procedure in reverse. The control surfaces may be removed, if desired, by pulling the hinge pins.

APPENDIX "A"

INSPECTION FORM

LAKE AIRCRAFT INSPECTION FORM

Aircraft Owner: ____________	Date: ____________	AFM O
Aircraft Model: ____________	Tach / Hobbs: ____________	Wt. & Bal. O
Aircraft Reg. #: ____________	TAT: ____________	Air. Cert. O
Aircraft S/N#: ____________	TSN / TSMOH: ____________	Registration O
ELT Info: ____________	Battery Due: ____________	Airframe Log O
VFR Cert. Due: ____________	IFR Cert Due: ____________	Engine Log O

NOTES: ______________________________

GROUND RUN	INSPECTION			
	50	100	500	Engine O/H
NOTE: Refer to the Aircraft Flight Manual for limits and gauge range markings.				
Hydraulic Pressure ____________	O	O	O	O
Alternator inop/low volt light operation.	O	O	O	O
Fuel Pressure (boost pump) ________ p.s.i. (Refer to Flight Manual)	O	O	O	O
Start-up oil pressure. ________ p.s.i.	O	O	O	O
Engine Start Operations ____________	O	O	O	O
Run up engine @ 1200 RPM until oil temperature reaches 140 degrees F.	O	O	O	O
Check avionics and instruments for operation, lighting, and security.	O	O	O	O
Check speaker for operation.	O	O	O	O
Idle oil pressure. ________ (20 p.s.i. min.)	O	O	O	O
Idle fuel pressure. ________ (Refer to Flight Manual)	O	O	O	O
Magneto Drop: L/H ________, R/H ________ @ 1800 RPM.	O	O	O	O
Cycle propeller control and check propeller governor operation.	O	O	O	O
Suction ____________ In Hg. (4-6 normal) Vacuum instrument operation.	O	O	O	O
Alternator output (no load) ________ (full load) ________	O	O	O	O
Maximum Static RPM (Tach)____________ rpm	O	O	O	O
Maximum Static RPM (Strobed)____________ rpm		O	O	O
Manifold Pressure at MAX RPM. ____________ "Hg.	O	O	O	O
EGT/TIT indication ____________ Deg.	O	O	O	O
CHT indication ____________ Deg.	O	O	O	O
Oil Temp. ________ Deg. Oil Pressure ________ psi	O	O	O	O
Check carburetor heat ________ rpm drop.	O	O	O	O
Check for general running conditions, noises, and vibrations.	O	O	O	O
Engine cool down at 1000 rpm.	O	O	O	O
OAT indication ________	O	O	O	O
Magnetic compass operation and fluid level. Compass card condition and completion.	O	O	O	O
Braking action and parking brakes.	O	O	O	O
Check magneto grounding by momentarily turning the ignition switch off, then on again quickly.	O	O	O	O
Check idle speed and mixture, (0 - 25 RPM rise @ 700 RPM).	O	O	O	O
Check all documentation: AD's, SB's, AFM, Supplements, Wt. & Bal., Reg., Air Cert., etc.	O	O	O	O

ENGINE / PYLON	50	100	500	Engine O/H
Check engine and accessory data plates against aircraft paperwork and the applicable Type Certificate Data Sheets.		O	O	O
Drain engine oil. Reinstall drain plug and safety as required.	O	O	O	O
Compression check in accordance with Lycoming specs: #1 ______/80, #3 ______/80, #5 ______/80, #2 ______/80, #4 ______/80 #6 ______/80.		O	O	O
Remove oil filter and/or screen, and check for contaminants.	O	O	O	O
Drain engine breather can. Check breather system for proper installation, security, condition, and lack of obstruction. Insure whistle slot in breather can assembly, or slit in hose, is installed and free of obstructions.	O	O	O	O
Install new oil filter and/or replace screen gasket. Service engine with Lycomings recommended type and quantity of oil. Safety as required.	O	O	O	O
Clean, inspect, gap, and test spark plugs. (gap .015 - .018") Rotate plugs upon reinstallation.		O	O	O
Inspect ignition harness for security, chafing, burns, and general condition.	O	O	O	O
Inspect condition of magneto distributor block and points. Adjust or replace as necessary.		O	O	O
Check magneto to engine timing in accordance with engine data plate.		O	O	O
Inspect exhaust system for leaks, cracks, corrosion, security, hardware, and condition of gaskets.	O	O	O	O
Inspect carburetor heat system for security, leaks, and general condition.	O	O	O	O
Inspect intake pipes for security, leaks, hardware, and general condition.	O	O	O	O
Remove air filter, check condition of air box, clean or replace air filter element as necessary.		O	O	O
Inspect engine baffles, cowl frames, and cowling for fit, cracks, security, gaskets and seals, and general condition.	O	O	O	O
Inspect cowl hinges and latches for security, wear, proper operation, and general condition.	O	O	O	O
Inspect fuel and oil lines and fittings for security, routing, chafing, leaks, age, and general condition.	O	O	O	O
Inspect oil cooler(s) for security, condition, and leaks.	O	O	O	O
Replace fuel and oil hoses. Flush fuel and oil lines and oil coolers to purge contaminants. (5 years max.)			O	O
Inspect fuel filter. Clean or replace filter as necessary. Safety assembly.		O	O	O
Clean and inspect carburetor/injector finger screen.		O	O	O
Inspect carburetor/injector servo for security, rigging, leaks, hardware, and general condition.	O	O	O	O
Overhaul or replace carburetor/injector servo.				O
Clean and inspect fuel injector nozzles.		O	O	O
Inspect condition of engine shock mounts per maintenance manual. Check prop blade tip clearance. Check bolt torque.		O	O	O
Remove and inspect condition of engine shock mount bolts.			O	O
Inspect engine mount for attachment security, corrosion, cracks, distortion, damage, and general condition.		O	O	O
Inspect engine pylon for security, cracks, corrosion, distortion, general condition, and installation of structural screws.	O	O	O	O
Inspect pylon side struts for security, cracks, damage, and general condition.	O	O	O	O
Inspect engine for the source of any leaks.	O	O	O	O
Inspect engine missing, loose, damaged, or improperly installed hardware. (Note: loose hardware can damage the prop.)	O	O	O	O
Inspect cylinders for security, damage, leaks, overheating, and general condition.	O	O	O	O
Inspect propeller governor for leaks, security, and condition of cable end.	O	O	O	O
Overhaul or replace propeller governor and replace cable end.				O
Inspect starter and wiring for security and general condition.	O	O	O	O
Overhaul or replace starter			O	O
Inspect alternator, brackets, belt(s), and wiring for security and condition. Belt tension.		O	O	O
Overhaul or replace alternator.			O	O
Inspect vacuum pump for security and condition.		O	O	O
Overhaul of replace vacuum pump. (Replace all vacuum filters)			O	O
Inspect tachometer cable for chafing, security, and condition.		O	O	O
Wash engine. CAUTION: DO NOT CONTAMINATE VACUUM PUMP OR MAGS WITH FLUID.		O	O	O
Inspect all engine controls for proper travel, routing, security, and safeties. Lubricate.	O	O	O	O
Replace all engine control cables.				O
Inspect turbocharger mount for corrosion, damage, and security of installation.		O	O	O
Inspect turbocharger for security of attachment and evidence of oil or exhaust leaks.	O	O	O	O
Inspect turbocharger control units for security of attachment, and evidence of leakage. Lubricate waste gate with "Mouse Milk".	O	O	O	O
Inspect for unapproved repairs, alterations, and parts, in accordance with the Lake Maintennace Manual.		O	O	O

PROPELLER	50	100	500	Engine O/H
Inspect propeller for damage, cracks, nicks, and oil or grease leaks.	O	O	O	O
Remove minor nicks and dress blade as necessary. Paint as required.	O	O	O	O
Check spinner and spinner backplate for installation approval, security, cracks, damage, and condition.		O	O	O
Check blades for looseness in hub, and check propeller blade track (.125" max. difference)		O	O	O
Lubricate propeller.		O	O	O
Perform propeller dynamic balance.			O	O

LANDING GEAR	50	100	500	Engine O/H
Place aircraft on jacks and bleed hydraulic pressure to zero.		O	O	
Inspect main gear play: Move gear back and forth in the retract-extend motion. Check for play and freedom of movement of all bearings of gear and drag strut assy. Move gear fore and aft to check play in the trunnion.		O	O	
Inspect main gear assembly for proper installation, damage, security, safeties, chafing, and general condition.	O	O	O	
Inspect main gear drag strut for security, wear, damage, corrosion, and downlock adjustment.		O	O	
Check main gear trailing beams and axles for looseness, corrosion, damage, and ease of movement.		O	O	
Inspect inside of main gear trunnions and gear legs for evidence of corrosion per service bulletin B-76.		O	O	
Check wheels for corrosion, cracks, and general condition.		O	O	
Check tires for wear, dry-rot, general condition, and proper inflation.	O	O	O	
Check wheel bearings for corrosion, damage, and wear. Pack with a waterproof grease.	O	O	O	
Check nose gear doors and hinges for damage, fit, rigging, and security. (Max. gap between doors .250")		O	O	
Inspect nose gear play: Pull nose wheel for and aft and side to side. (Downlock should not disengage when the wheel is pushed aft.) Check for play and freedom of movement of all bearings of gear and drag strut.		O	O	
Check nose gear axle, fork, trunnion assy, drag strut, and actuator for security, damage, and condition.	O	O	O	
Check nose gear scissors and shimmy damper assembly for wear, damage, and general condition.	O	O	O	
Check shimmy damper adjustment (15-25 lbs. pull measured at a 90 deg. angle to the axle at O.D. of tire.)		O	O	
Check nose gear retraction when wheel is at full turning radius (wheel can not hang up when gear is retracted).		O	O	
Check clearance between drag struts unlock studs and gear actuator fingers. (.25" +/- .005").		O	O	
Check landing gear retraction with electric pump, check operation of gear position lights. IMPORTANT: With full hyd. pressure (1000 to 1250 psi) landing gear should extend and lock unassisted by pump.		O	O	
Inspect gear actuators for operation, leakage, security, cracks in the piston threads, and general condition.	O	O	O	
Inspect actuator hoses for corrosion, security, leaks, age, chafing, routing, and general condition.	O	O	O	
Ensure gear is down and locked and hydraulic pressure is applied. Remove aircraft from jacks.		O	O	
Check main and nose gear oleos for security, damage, leaks, and general condition. Service oleos as required. Main gear oleo to 3-4 inches loaded / 170 psi unloaded. Nose gear oleo to 100 psi unloaded.	O	O	O	
Lubricate landing gear system.	O	O	O	
Inspect for unapproved repairs, alterations, and parts, in accordance with the Lake Maintennace Manual.		O	O	

WINGS	50	100	500	Engine O/H
Remove all inspection covers.		O	O	
Inspect for unapproved repairs, alterations, and parts, in accordance with the Lake Maintennace Manual.		O	O	
Inspect hoses, lines, and wiring for routing, chafing, damage, leaks, and general condition.		O	O	
Inspect all wing attach hardware for corrosion, torque, and condition.		O	O	
Inspect all wing attach fittings for security, wear, corrosion, damage, and condition of sealant at fuselage.		O	O	
Inspect wing spar, spar doublers, and cap angles in accordance with service bulletin B-79.		O	O	
Inspect aft beam for damage, distortion, corrosion, and general condition.		O	O	
Inspect all bellcranks, push rods, and rod ends, for damage, wear, security, and general condition. Lubricate.		O	O	
Inspect all skins and ribs for proper installation, damage, distortion, corrosion, and loose/missing rivets.	O	O	O	
Inspect lifting rings for damage, distortion, corrosion, security, and general condition.		O	O	
Check flaps for damage, chafing, corrosion, rigging, proper operation, security, and condition.	O	O	O	
Inspect flap actuating rods, hangers, and bearings for wear, damage, corrosion, security, and condition. Lube.	O	O	O	
Inspect ailerons for damage, corrosion, rigging, proper operation, security, and general condition.	O	O	O	
Inspect aileron hinges for wear, damage, corrosion, security, general condition. Lubricate.	O	O	O	
Inspect floats and attachments for damage, (float) leaks, drain plug, and general condition.	O	O	O	
Inspect wing tips for general condition and security. Rock wing fore and aft to check for looseness at wing attach points.		O	O	
Install inspection covers. Seal water-tight covers on floats.		O	O	

CABIN and FUSELAGE	50	100	500	Engine O/H
Check navigation and compass lights.	O	O	O	
Check strobe or rotating beacon.	O	O	O	
Check landing and taxi lights.	O	O	O	
Check defroster motor.	O	O	O	
Check pitot heat.	O	O	O	
Check stall warning horn.	O	O	O	
Check cockpit, avionics, and instrument lights.	O	O	O	
Check cabin heater for proper installation and operation, damage, leaks, and general condition.	O	O	O	
Inspect all fuselage skins for cracks, damage, corrosion, proper installation, and general condition.		O	O	
Inspect for unapproved repairs, alterations, and parts, in accordance with the Lake Maintennace Manual.		O	O	
Check all doors for latching and locking operations. Check all windows, sealant, and moulding for condition.	O	O	O	
Check safety belts and inertia reels for proper installation, security, proper operation, and general condition.	O	O	O	
Remove and inspect seats, seat tracks, side panels, baggage box, floor boards, and attaching hardware.		O	O	
Inspect autopilot system for proper installation, rigging, security, and operation.		O	O	
Remove battery and service per battery manufacturer's specs. Reinstall battery.	O	O	O	
Inspect battery box and vent for leaks, obstructions, general condition, acid-proof paint, and security of the battery.	O	O	O	
Inspect battery and relays for proper installation, condition of wiring, electrical connection, and grounds.	O	O	O	
Inspect control pushrods and bellcranks for installation, damage, wear, chafing, and condition. Lubricate.		O	O	
Inspect elevator and rudder stops for damage, installation, security, and adjustment.		O	O	
Inspect aileron pulleys, cables, and turnbuckles for routing, condition, and safeties. Lubricate pivot points.		O	O	
Inspect trim valve assembly for installation, leaks, security, condition of spring, and proper operation.		O	O	
Inspect trim indicator system for security, wear, damage, rigging, and proper operation.		O	O	
Inspect water rudder cable for security, wear, damage, rigging, and proper operation.		O	O	
Inspect aft hull drain system for security, wear, damage, rigging, and proper operation.		O	O	
Inspect hull bottom skins (in/out) for cracks, dents, holes, loose/missing rivets, corrosion, and general condition.		O	O	
Inspect hull webs for cracks, buckles, dents, loose/missing rivets, and general condition. (Pay particular attention to the outboard ends and the bottom of the center "V".)		O	O	
Inspect hull brackets that run fore and aft between hull webs, for buckles, dents, and cracks.		O	O	
Inspect fuselage side and top skins (in/out) and vertical channels for cracks, corrosion, damage, and general condition. (Pay particular attention to the area where the side and bottom skins meet, and where wing attach fittings exit.)		O	O	
Inspect main hull watertight bulkhead for damage, sealing, and condition of control rod boots.		O	O	
Inspect rudder and elevator control rods, where they pass through the main watertight bulkhead for corrosion.			O	
Inspect aft cabin bulkhead and channels for cracks, damage, corrosion, and condition.		O	O	
Inspect inboard portion wing attach fittings for security, damage, corrosion, slip marks, and condition.		O	O	
Inspect pylon side strut attachments for damage, security, condition, and slip marks.		O	O	
Inspect control column for security, binding, bearing wear and condition. Inspect elevator rod end bearing at the bottom of the column for security and wear. Lubricate.		O	O	
Inspect rudder pedal assembly for installation, wear, damage, security, binding, and proper operation.		O	O	
Inspect brake master cylinders and parking brake valve for installation, leaks, security, and operation.		O	O	
Inspect gear and flap valve assemblies for installation, leakage, security, stops, and proper operation.		O	O	
Inspect hydraulic reservoir for leaks, damage, and security. Service with fluid as required.	O	O	O	
Inspect accumulator for security, leaks, and pre-charge (300-400 psi)		O	O	
Inspect hyd. hand pump for leaks, wear, cracks, security, and proper operation. (0-1250 psi in 60 strokes max.)		O	O	
Check hydraulic pressure switch for security, leaks, and proper operation. (1100-1250 psi max, 850-1000 min)	O	O	O	
Inspect electric hydraulic pump for leaks, security, and proper operation.	O	O	O	
Perform electric hydraulic pump de-sludge and check brushes in motor.			O	
Check hydraulic system's ability to hold pressure of at least 1000 psi for at least one hour.		O	O	
Clean or replace hydraulic filter as required.		O	O	
Inspect security, routing, chafing, wear, age, and condition of wires, hoses, lines, and cables.		O	O	
Inspect pitot-static drains for security and proper operation.		O	O	
Inspect U-joints, and balance springs on control yoke.		O	O	
Inspect instruments, gauges, avionics, and equipment for mounting, security, damage, markings, and condition.		O	O	
Inspect inside of tee fitting and filter at low point of manifold pressure line (L.H. side ahead of instrument panel).		O	O	
Replace vacuum filters as required.		O	O	
Clean inside of hull, insure that bulkhead weep holes, bellcranks, and controls are clear.		O	O	
Perform hull leak test. Test bilge pump operation in both automatic and manual mode.		O	O	

FUEL SYSTEM	50	100	500	Engine O/H
Sump all fuel tanks and lines to drain water and inspect for evidence of fuel contamination.	O	O	O	O
Inspect wing fuel tanks for contamination, leakage, general condition, and placards. Replace cap seals.		O	O	O
Inspect fuel quantity indication system(s) for proper operation and calibration.		O	O	
Inspect fuel tank area for damage, leaks, corrosion, and general condition.		O	O	
Inspect fuel lines and hoses for condition, security, routing, chafing, age, and leakage.		O	O	O
Inspect all fuel vents for security and obstructions.		O	O	
Inspect boost pump and fuel tank witness drains for operation, leaks, condition, security, and slope of drain line.		O	O	
Overhaul or replace fuel boost pump.			O	O
Clean or replace fuel filter as required. Safety fuel bowl.		O	O	O
Check fuel shut-off valve for operation, positive shut-off, leaks, and security.		O	O	O
Inspect fuel scupper for security, condition of sealant, and placard.		O	O	
Inspect fuel scupper drain for obstructions and general condition.		O	O	
Check aux fuel (floats) transfer system for operation, lights, leaks, contamination, and fuel flow into main tank.		O	O	
Inspect fuel bladder for security, contamination, leaks, and general condition.		O	O	
Inspect all fuel quick drains for leaks, security, obstructions, and operation.		O	O	
Reinstall floorboards, baggage compartment, side panels, seat tracks, and seats.		O	O	

EMPENNAGE	50	100	500	Engine O/H
Remove all exterior inspection covers. Inspect all ribs, control pushrods and bellcranks for proper installation, security, and wear. Lubricate moving points.		O	O	
Inspect trim and flap actuators for proper installation, damage, leaks, and general condition.		O	O	
Inspect vertical stab., horizontal stab., fairings, and dorsal fin, for damage, security, and condition.	O	O	O	
Inspect gap seals between horizontal and vertical stabilzers for security and condition.	O	O	O	
Inspect trim tabs & indicator cable, rudder, and elevator, for wear, damage, security, condition, and rigging. Lube		O	O	
Inspect rudder drain boot and tube for security, sealant, and condition.		O	O	
Inspect water rudder for security, rigging, condition, and operation. Check routing and condition of cable.		O	O	
Reinstall access covers. Seal watertight covrs with a waterproof sealant (e.g. silicone).		O	O	

RADIO	50	100	500	Engine O/H
Check radio and electronic equipment for improper installation and insecure mounting.		O	O	
Check wiring and conduits for improper mounting, insecure mounting and obvious defects.		O	O	
Check bonding and shielding for improper installation and poor condition.		O	O	
Check antennas, including trailing antenna for poor condition, insecure mounting and improper operation.		O	O	
Inspect ELT in accordance with FAR 91.		O	O	

GENERAL	50	100	500	Engine O/H
Inspect any miscellaneous installations not covered herein for installation, security, operation, condition, and approvals.		O	O	
Check all exterior and interior placards.		O	O	
Check seat and seat belt installations for security, operation, and proper installation.	O	O	O	
Confirm all inspection covers installed and sealed as required.	O	O	O	
Lubricate and install all drain plugs.	O	O	O	
Lubricate aircraft.	O	O	O	
Confirm all FAA required documents are returned to aircraft.	O	O	O	O
Perform pre-flight inspection.	O	O	O	O
Adjust density controller I.A.W. Textron Lycoming SL 1187L or latest revision.		O	O	O
Strobe propeller for tachometer calibration.		O	O	O
Perform "Ground Run" sequence for final systems operational check.	O	O	O	O
Perform engine, fuel, and hydraulic system leak checks.	O	O	O	O
Clean interior and wash exterior.		O	O	
Return to service paperwork completed in accordance with FAR Part 43.	O	O	O	O

Aircraft Registration # **Inspector Name** **Date**