FOREWORD

This manual contains the factory recommended procedures for maintaining and repairing the present Bellanca models, 17-30A, 17-31A, and 17-31ATC. Limited information pertinent to previous Bellanca models is also included, with the specific aircraft being identified by serial number. This can be found in the applicable system section.

New and updated information in the form of service letters and service manual revisions will be made available to all Bellanca Dealers on an as needed basis. Therefore, it is to the advantage of the Bellanca owner to utilize this current information and experience available from the factory-trained dealer service organization.

It is assumed that personnel utilizing this manual are qualified and experienced aircraft technicians, therefore simple and repetitive maintenance, and removal procedures have been omitted.

Maintenance procedures will include only Bellanca components with minor service information for vendor's items. Overhaul and repair instructions for these items shall be obtained from the respective manufacturer.

All correspondence concerning this manual, revisions, service letters, and additional technical information should be directed to the Bellanca Factory Service Department.

REVISIONS

I. TEMPORARY REVISION. This type of revision will be distributed at any time it is necessary to forward new servicing information to the field. This material should be inserted in the manual as soon as it is received. These revisions will include deletions and additions of material pertinent to different paragraphs of the service manual. When the temporary revision is received, review the manual and mark the affected paragraph with the code date of the latest revision for a ready reference.

II. PERMANENT REVISION. This type of revision will be distributed periodically and will supercede all previous temporary revisions. These revisions will be complete page replacements and must be inserted in the service manual with revised pages of the same page number.

III. IDENTIFICATION OF REVISED MATERIAL. Revised text and illustrations will be indicated by a black vertical line along the left hand margin of the page opposite the change. A line opposite the page number or section title and printing date will indicate that the text or illustration was unchanged, but the maerial was relocated to a different page. Newly added material will be identified by an arrow pointing toward either the text, text heading or illustration. When material is removed, an arrow will point away from the area from which the material was removed.

Symbols will indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation or the physical location of the material on the page will not be identified by symbols.

REVISION RECORD

This page is to be used as a record for all revisions as they become available for the Bellanca Viking Service Manual issued 10-73.

Revision Number	Issue Date	Page or Par. No.	Subject
1	9-79	SECTION VII	LANDING GEAR SYSTEM

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NOTES

SECTION I

AIRCRAFT DESCRIPTION AND SPECIFICATIONS

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TABLE I-1

AIRCRAFT SPECIFICATION AND PRINCIPLE DIMENSION

Model Designation	Super Viking 300A	Super Viking 300A	Turbo Super Viking 300A
Model Number	17-30A	17-31A	17-31ATC
F.A.A. Type Certificate	A18CE	A18CE	A18CE
Gross Weight	3325 lbs.	3325 lbs.	3325 lbs.
Empty Weight (Standard)	2050 lbs.	2080 lbs.	2160 lbs.
Engine	Continental IO-520K	Lycoming IO-540K1E5	Lycoming IO-540K1E5
Wing Span	34'2"	34'2"	34'2"
Wing Area	161.5 sq. ft.	161.5 sq. ft.	161.5 sq. ft.
Wing Loading	20.59 lbs.-sq. ft.	20.59 lbs.-sq. ft.	20.59 lbs.-sq. ft.
Fuselage Length	26'4"	26'4"	26'4"
Fuselage Width	3'9"	3'9"	3'9"
Tail Height	7'4"	7'4"	7'4"
Tail Span	12'2"	12'2"	12'2"
Wheel Tread Width	9'0"	9'0"	9'0"
Wheel Base	7'4"	7'4"	7'4"

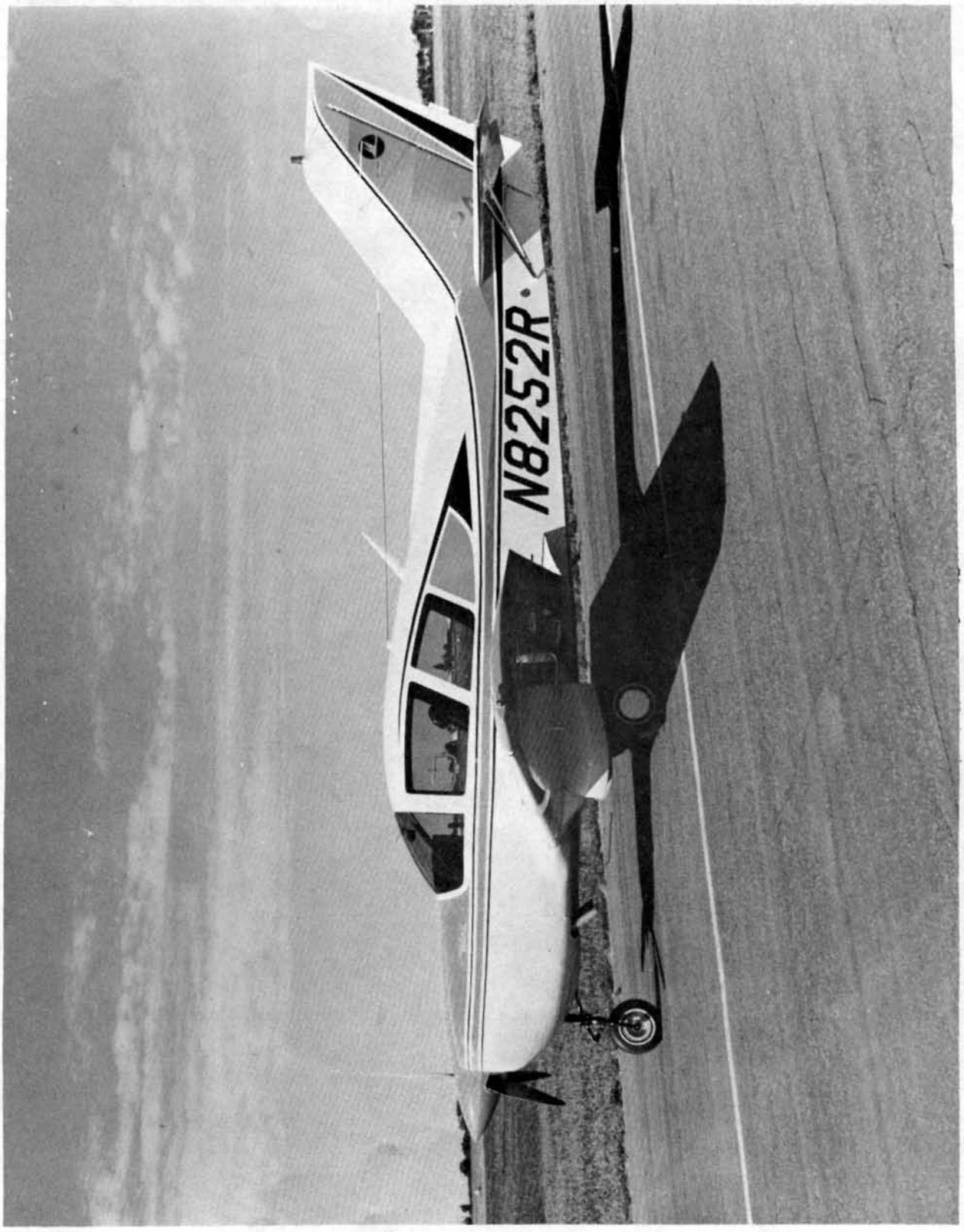

FIGURE 1-1 VIKING 300A

FIGURE 1-2 Viking 300A

SECTION I

AIRCRAFT DESCRIPTION AND SPECIFICATIONS

1- 1. GENERAL. This section presents a brief description of the aircraft, its systems and components. A table is provided listing aircraft specifications and principle dimensions.

1- 2. AIRCRAFT. The Bellanca Viking is a four place, single-engine, low wing monoplane, high performance airplane.

1- 3. WING. The wing is a full cantilever, laminar flow, low wing design of conventional wood construction utilizing Sitka spruce for for spars and ribs. The stressed-skin is mahogany plywood covered with a life-time Dacron fabric and finished with butyrate dope. The ailerons are controlled by direct mechanical linkage and are dynamically balanced. Wing flaps are electrically operated with three positions available. Both wing flaps and ailerons are of wood construction, covered with Dacron, and finished with butyrate dope.

1- 4. FUSELAGE. The fuselage frame is of welded tubular steel design. The external shape is achieved through the use of wood stringers attached to the metal frame and covered with a life-time Dacron fabric and finished with butyrate dope.

1- 5. EMPENNAGE. The rudder, elevator, horizontal and vertical stabilizer, are of the welded tubular steel design, covered with Dacron and finished with butyrate dope. The elevator trim tab is conventional sheetmetal construction. All movable control surfaces are statically and dynamically balanced. Control is accomplished by direct mechanical linkage.

1- 6. LANDING GEAR. The tricycle landing gear is retractable hydraulically. Shock loads are absorbed by air-oil and spring type oleo struts. Nose wheel steering consists of direct mechanical linkage to the rudder pedals.

1- 7. HYDRAULIC SYSTEM. The hydraulic system incorporates an electrically driven pump for raising and lowering the landing gear only.

1- 8. BRAKE SYSTEM. The brakes are the hydraulic single disc type installed on both main gear wheels. Braking action is accomplished by toe pressure on the respective rudder pedals. The brakes can be locked for parking. Dual toe-brakes may be installed as optional equipment.

1- 9. POWERPLANTS. The engine is a 300 H.P. fuel injected direct drive, wet sump, horizontally opposed six cylinder, and air cooled. Both Lycoming and Continental engines are available with a turbocharged Lycoming engine as optional equipment.

1-10. PROPELLERS. The propeller is an all metal, constant-speed type with two blades as standard equipment and three blades available as optional equipment.

1-11. FLIGHT CONTROLS. The flight controls are all conventional using direct mechanical linkages. The control wheel operates the ailerons and elevator and the rudder is operated by foot pedals. Duplicate controls are provided for the co-pilot. Elevator trim is manual with an electric drive available as an option.

1-12. FUEL SYSTEM. The fuel system consists of three interconnected, welded aluminum tanks in each wing, sediment bowl and strainer, an auxiliary electric pump, an engine driven pump, and selector valve. An optional auxiliary fuselage tank is available.

1-13. ELECTRICAL SYSTEM. The electrical system is 12 V.D.C. negative ground, consisting of an engine driven alternator, lead-acid battery, resettable type circuit breakers.

1-14. HEATING AND VENTILATING SYSTEM. Heated air for cabin and defroster is obtained directly from the engine exhaust muffler shroud. Fresh air is provided from four vents, one on each side of the instrument panel and one on each side of the rear cabin. The vents are adjustable in direction and volume. A set of louvered vents are located on top of the instrument panel for defrosting of the windshield.

1-15. OXYGEN SYSTEM. The optional oxygen system consists of one oxygen bottle, regulator, four outlets, face masks, and flow indicators.

1-16. LIGHTING SYSTEM. Exterior lights include standard navigation lights, rotating beacon, landing, and taxi lights. Other units such as strobe lights are available as optional equipment.

Interior lighting includes panel, console, and radio lights with each having a separate rheostat and a dome light.

1-17. RADIO. Provisions are provided for the installation of microphone, headset jacks, speaker, and ample space for various communication and navigational equipment.

1-18. INSTRUMENT AND AUTOPILOT. All instruments necessary for IFR flight and monitoring of engine performance and aircraft systems are provided.

A single-axis autopilot is standard equipment.

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SECTION II

HANDLING AND SERVICING

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TABLE II-1

SERVICE SPECIFICATIONS

Engine

Fuel - Aviation grade 100/130 octane minimum
Oil - Aviation grade

Lycoming		Continental	
Above 60°F	SAE 50	Above 40°F	SAE 50
30° to 90°F	SAE 40	Below 40°F	SAE 30
0° to 70°F	SAE 30		
Below 10°F	SAE 20		

Landing Gear

Hydraulic Fluid - MIL-H-5606A
Pressure Accumulator - 800-900 psi nitrogen
Landing Gear Shock Struts - Compressed air

	Nose	Main
Aircraft on Jacks	60 psi	35 psi
Aircraft on Landing Gear	100 psi	70 psi

Main Gear Tire Pressure - 55 psi compressed air
Nose Gear Tire Pressure - 35 psi compressed air

Lubrication Oil - Machine or engine oil
Lubrication Grease - General purpose grease
Wheel Bearing Grease - High temperature bearing grease

Oxygen - MIL-O-2710 1800 psi at 70°F

AVAILABLE WITH NEXT REVISION

FIGURE 2-1 ACCESS PANELS - TOP

AVAILABLE WITH NEXT REVISION

FIGURE 2-1 ACCESS PANELS - TOP

SECTION II

HANDLING AND SERVICING

2- 1. GENERAL. This section contains routine handling and servicing procedures. Information provided will aid the individual to location of various components, ground handling, routine service procedures, and lubrication. Refer to the appropriate section for repair or major servicing of a system or component.

2- 2. SERIAL NUMBER PLATE. The aircraft identification plate is located on the aft panel of the baggage compartment.

2- 3. ACCESS AND INSPECTION PROVISIONS. Access and inspection provisions for the aircraft are shown in Figure 2-1. The component to be serviced or inspected through the access is identified in the illustration.

2- 4. TOWING. A tow bar is provided with the aircraft, which attaches to the lugs welded on the nose gear fork.

CAUTION

When towing with a vehicle, do not exceed normal turning limits, as damage to the strut will result.

Insure that sufficient tail clearance is maintained when towing over rough surface due to cushioning action of nose strut.

2- 5. JACKING. Jack the aircraft to service the landing gear and as specified for other service operations.

a. Place the jacks under the jack pads located on the forward spar, fuselage carry through.

b. Place a suitable stand approximately 16 inches high under the tail skid.

NOTE

The aircraft is tail heavy when resting on jacks and both front seats can be safely occupied if necessary.

c. Raise the jacks to desired height.

CAUTION

Be sure jacks and tail stand are secure to prevent accidental tipping or dropping of aircraft.

2- 6. MOORING. The aircraft should be properly moored to prevent movement under various weather conditions.

a. Head aircraft into wind if possible.

b. Attach tie-down chains to the retractable wing tie-down fittings and tail tie-down fitting.

c. Secure control wheel with the seat belt.

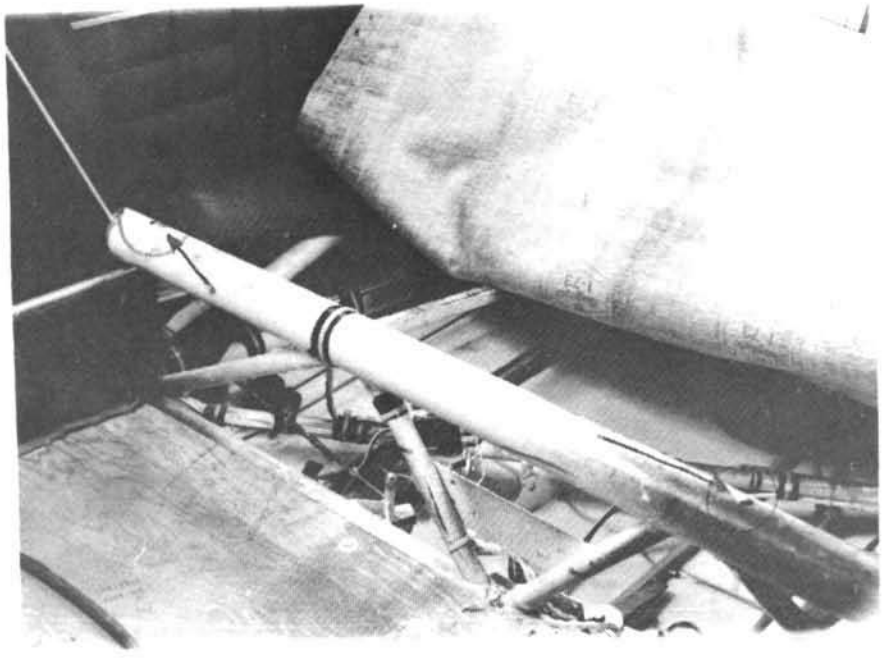
d. Install pitot tube cover.

NOTE

If severe weather is expected, the main gear should also be secured and control surface blocks installed on all moveable control surfaces.

2- 7. LEVELING. Provisions for leveling the aircraft for weight and balance purposes is provided on top of the rear spar carry through, and the right side of the front spar carry through.

LONGITUDINAL LEVELING



LATERAL LEVELING

FIGURE 2-2 LEVELING REFERENCE POINTS

a. Remove rear seat by unsnapping floor carpet and lifting out seat, forward part first.
b. Turn back floor carpet covering forward right spar carry through.
c. Use a level and the two aft lugs on the rear spar carry through for lateral leveling and the fore and aft lugs on the right side for longitudinal leveling. See Figure 2-2.

2- 8. WEIGHT AND BALANCE. The datum line is located on the wing leading edge at the #1 rib. Weighing procedures and calculations for finding the C.G. are described in the weight and balance section of the aircraft flight manual.

2- 9. EXTERNAL POWER RECEPTACLE. The power receptacle is located under the fuselage, aft of the right wing, and is connected directly to the battery leads. On earlier models, the power receptacle is located on the aft baggage close out panel.

2-10. FUEL SYSTEM.

2-11. FILLING FUEL TANKS. Observe all required precautions for ing gasoline. Each set of wing tanks and auxiliary fuselage tank must be filled through its respective filler neck. See Figure 2-1 for location.

2-12. DRAINING FUEL SYSTEM. A quick drain is provided for taking fuel samples. The control knob is located on the firewall with access through the rear access door on the top of the engine cowling.

The drain is located under the pilot's seat on the underside of the aircraft.

Each set of wing tanks has an internal wrenching drain plug for complete draining of these tanks.

The auxiliary fuselage tank has no readily accessible drain, however, the tank can be drained by removing the fuel inlet line to the engine, placing the fuel selector valve on "AUX" and turning on the auxiliary boost pump.

2-13. CLEANING FUEL STRAINER. A fuel strainer is located in the sediment bowl which is immediately forward of the quick drain outlet.

a. Turn fuel selector valve OFF.
b. Remove sediment bowl and screen.
c. If excess contimination is present, the fuel system should be completely drained and flushed.
d. Reinstall strainer, bowl, safety, and check for leaks.

2-14. ENGINE OIL SYSTEM.

2-15. SERVICING OIL SYSTEM. The oil level should be checked before each flight by using the dipstick. Oil changes are recommended every 50 hours of engine operation if a filter is installed and every 25 hours if only an oil screen is installed. At each oil change, the oil screen should be checked for contamination and cleaned, and the filter element replaced. A quick drain is provided for draining oil. It is recommended that the engine be warmed to operating temperature to insure complete draining of the oil.

2-16. RECOMMENDED ENGINE OIL LUBRICANTS. The engine manufacturer does not recommend oils by brand names. Use a quality brand aviation grade oil of proper viscosity. For further information on oils, consult the engine manufacturer's manual.

CAUTION

Do not introduce any trade additives to the basic lubricant.

See table 2-1 for proper grades.

2-17. ENGINE INTAKE AIR FILTER. It is important for long engine life, that the air filter be cleaned regularly with compressed air or replaced. The frequency of cleaning or replacement is determined primarily by aircraft operating conditions. If in doubt, follow engine manufacturers recommendations.

2-18. REMOVING AIR INTAKE FILTER (CONTINENTAL). The enclosed filter is located directly above the engine crankcase.

a. Remove safety wire and unscrew the four bolts securing the air filter box to the intake manifold.
b. Remove the sheet metal screws on the box to gain access to the filter element.
c. Inspect the spring loaded air bypass door for freedom of movement.

2-19. REMOVING AIR INTAKE FILTER (LYCOMING). The enclosed filter is located between the lower rear of the engine and the firewall.

a. Remove the four bolts securing the air filter box to the intake manifold.
b. Remove the four long bolts passing through the filter box to gain access to the filter element.
c. Inspect the spring loaded air bypass door for freedom of movement.

2-20. BATTERY The battery is located under the floor of the baggage compartment.

2-21. BATTERY SERVICING. Check the battery every 50 hours or 30 days for proper electrolyte level even with horizontal baffles by adding only distilled water. If any corrosion is present, it should be neutralized with a solution of water and bicarbonate of soda (baking soda) and cleaned with a wire brush. Rinse thoroughly with clean water. Cable connections can be coated with petrolatum (vaseline petroleum jelly) to help prevent further corrosion.

CAUTION

Do not over fill the cell with distilled water as the excess acid solution will overflow during normal charging causing severe corrosion.

Do not allow the bicarbonate of soda solution to come in contact with the electrolyte.

Remove the ground cable first and replace it last if battery is to be removed.

2-22. BRAKE SYSTEM. The hydraulic reservoir is incorporated in the master cylinder with one located on both of the pilot's rudder pedals. Spongy brake pedal action is most often a result of low fluid level.

2-23. SERVICING THE BRAKE SYSTEM. The reservoir may be filled by two methods using only MIL-H-5606A hydraulic fluid.

Pressure method:

a. Connect the pressure bleeder to the bleeder valve located on the wheel brake cylinder.
b. Loosen the bleeder valve 1/2 to 1 rotation.
c. Fill with fluid until overflow is noted through the air vent located on top of the master brake cylinder, then tighten the bleeder valve.

NOTE

Pressure method is also used to bleed brakes.

Non-Pressure Method:
a. Remove the filler cap screw located on top of the master brake cylinder.
b. Fill with MIL-H-5606A fluid until full.
c. Replace filler cap screw.

CAUTION

Use only MIL-H-5606A hydraulic fluid. (Red in color).

2-24. HYDRAULIC SYSTEM (LANDING GEAR). The hydraulic reservoir, an integral part of the power pack, and the pressure accumulator are located between the two front seats and under the floor board.

2-25. SERVICING HYDRAULIC RESERVOIR. A dipstick is provided for checking the fluid level and is located under the appropriately marked access flap to the right of the fuel selector. Fill through the dipstick tube with MIL-H-5606A fluid to the proper level as indicated on the dipstick. Total capacity is approximately 18 ounces.

2-26. SERVICING PRESSURE ACCUMULATOR.
a. Place aircraft on jacks.
b. Remove the right seat by removing forward seat stop and sliding seat forward and up.
c. Unsnap floor carpet and remove plywood panel.
d. Fill the accumulator with nitrogen to 900 psi.

CAUTION

It is strongly recommended that the aircraft be placed on jacks whenever any maintenance is performed on the landing gear including pressurization of the accumulator.

2-27. OXYGEN SYSTEM. The oxygen bottle is located behind the aft close out panel of the baggage compartment. The filler valve, pressure gauge, and shut-off valve are readily accessible through the baggage compartment door.

2-28. FILLING OXYGEN BOTTLE. Fill the system through the filler valve with aviator's breathing oxygen MIL-O-2710 in accordance with the recommended pressures. The shut-off valve must be opened.

Temperature	Pressure
40° F	1770 psi
70° F	1800 psi
80°	1975 psi

CAUTION

Use clean tools when servicing oxygen system. Oils and greases in contact with oxygen is extremely hazardous.

2-29. OLEO STRUTS. The main gear and nose struts are of the air oil and spring type. An air filler valve is located on the upper side of the strut assembly. There is no provision for replenishing the strut with hydraulic fluid without disassembly. If leakage is evident, the strut must be disassembled. See Section VII.

2-30. SERVICING OLEO STRUTS. The oleo struts may be filled with compressed air while the aircraft is on jacks or resting on the landing gear. Fill to the recommedned pressure.

	NOSE	MAIN
AIRCRAFT ON JACKS	60 psi	35 psi
AIRCRAFT ON LANDING GEAR	100 psi	70 psi

CAUTION

Over serviced main gear struts will prevent the gear from retracting into the gear wells.

2-31. TIRE INFLATION PRESSURE. Fill tires with compressed air.

Nose Tire - 35 psi Main Tire - 55 psi

2-32. VACUUM FILTER. The vacuum filter is located under the instrument panel and attached to the firewall. Inspect periodically for condition by removing the bottom cap and dropping out filter element. Change the filter element if dirty or should vacuum pressure drop below 4.6" of mercury.

2-33. LUBRICATION INSTRUCTION. Proper lubrication procedures have a great effect on prolonging the service life of the aircraft and reducing the frequency of extensive and expensive repairs. To insure the best possible results from the application of lubricants, the following precautions should be observed.

a. Use recommended lubricant.
b. Check item to be lubricated for evidence of excessive wear and replace if necessary.
c. Remove excess lubricants to prevent accumulation of dust and dirt which can cause excessive wear.

2-34. CLEANING.

2-35. CLEANING EXTERIOR SURFACE. Wash with mild soap and water. Void the use of harsh abrasives or detergents. Remove grease and oil with Stoddard solvent. The aircraft may be waxed using a good quality automotive wax.

NOTE

Ice may be removed from wings using a 50-50 solution of isopropyl alcohol and water, but keep solution away from Plexiglas.

2-36. CLEANING UPHOLSTERY AND CARPET. Use any commercial or household upholstery cleanser approved for nylon type material following the manufacturer's recommendations. For vinyl and plastics, use a mild soap and water.

2-37. CLEANING POWER PLANT AND LANDING GEAR. Wash down with a commercial engine solvent or kerosene base type solvent.

2-38. CLEANING PLEXIGLAS. The windshield and side windows should be cleaned with a cleanser approved for plastics. If dust or dirt is present, rinse with water prior to cleaning.

NOTE

Avoid the use of gasoline, benzine, alcohol, acetone, carbon tetrachloride, or anti-ice fluid as damage to the Plexiglas will result. Never rub the Plexiglas with a dry cloth as scratching will result.

2-39. STORAGE OF AIRCRAFT. Aircraft placed in non-operational storage for long periods of time should be given a thorough cleaning. Approximately every ten days the propeller should be pulled through several revolutions to reactivate the oil film to reduce the possibility of corrosion.

CAUTION

Check that all engine switches and controls are OFF prior to rotating propeller.

Every 30 days the engine should be flown or run up to operating temperatures to reduce excessive moisture buildup in the engine.

Keep fuel tanks full to prevent accumulation of moisture due to condensation.

SECTION III

INSPECTION

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AIRCRAFT INSPECTION REPORT

BELLANCA *Aircraft Corporation*

INV. NO.

NAME _____ ADDRESS _____

A/C MAKE / MODEL _____ S/N _____

ENG / MAKE / MODEL _____ S/N _____ S/N _____

√ 25/hr. *50/Hr. 100/hr Periodic TACH READS = _____

INSPECTION (INDICATE WHETHER AIRWORTHY OR NOT BY CHECKING APPROPRIATE BLOCK)

FUSELAGE — HULL GROUP	Yes	No
A. FUSELAGE STRUCTURE		
B. FABRIC SKIN		
C. EXTERNAL BRACING		
D. CONTROL MECHANISM		
E. ELECTRICAL SYSTEM		
F. HYDRAULIC SYSTEM		
G. FUEL SYST. TANKS		
H. EMERGENCY EXITS		
I. CARGO COMPARTMENT		
J. EMER. CRASH BEACON		

CABIN — COCKPIT GROUP	Yes	No
A. FUEL SYSTEM—TANKS		
B. ELECTRICAL SYSTEM		
* C. BATTERY		
D. HYDRAULIC SYSTEM		
E. INSTRUMENTS		
F. FLIGHT-ENG. CONTROLS		
* G. SEATS		
* H. SAFETY BELTS		
I. HEATER & VENTS		
* J. WINDOWS		
* K. WINDSHIELD		
L. FIRST AID KIT		
M. SURVIVAL KIT		
N. PLACARDS		

ENGINE NACELLE GROUP	Yes	No
A. FUEL SYSTEM		
√* B. OIL SYSTEM TANKS		
* C. IGN. ELECT. SYSTEM		
√ D. EXHAUST STACKS/MAN		
E. COOLING SYSTEM		
√* F. ENG. CONTROLS		
* G. POWER PLANT-GEN'L.		
H. HEATERS VENTILATION		
* I. MOUNT & FITTINGS		
J. ACCESSORIES		
√* K. COWLING		
L. TURBO SYSTEM		
Waste Gates		
Turbines		
M. COMPRESSION TEST		
1/80- 2/80- 3/80- 4/80- 5/80- 6/80-		

LANDING HEAR GROUP	Yes	No
A. MAIN LANDING GEAR		
B. TAIL NOSE GEAR		
C. RETRACT MECHANISM		
D. LAND. GEAR ATT. FITTINGS		
E. ELECTRICAL SYSTEM		
F. HYDRAULIC SYST.		
G. WHEELS, BRAKES		
H. STRUTS & FITTINGS		
I. WHEEL & GEAR FAIRINGS		
* J. TIRES		

WING CTR SCTN GROUP	Yes	No
A. FIXED SURFACES		
B. MOVABLE SURFACES		
C. FABRIC, SKIN		
D. EXTERN. BRACING		
E. WING ATT. FITTINGS		
F. FLIGHT CONTROL MECH.		
G. FUEL SYST. TANKS		
H. ELECTRICAL SYSTEM		
I. HYDRAULIC SYSTEM		
J. FABRIC TEST		

EMPENAGE GROUP	Yes	No
A. FIXED SURFACES		
B. MOVABLE SURFACES		
C. FABRIC, SKIN		
D. EXTERNAL BRACING		
E. ATTACH FITTINGS		
F. FLIGHT CONTROL MECH.		
G. ELECTRICAL SYSTEM		
H. HYDRAULIC SYSTEM		

PROPELLER GROUP	Yes	No
* A. PROPELLER BLADES		
B. PROPELLER HUBS		
C. CONTROL MECHANISM		
D. ATTACHMENTS		
E. ACCESSORIES		
* F. SPINNER & BRACKETS		

RADIO GROUP (Installation)	Yes	No
A. RECEIVER		
B. TRANSMITTER		
C. ANTENNAS INSULATORS		
D. BONDING/SHIELDING		
E. ADF RECVR. LOOPS		
F. AUXIL. POWER UNIT/PLUG		
G. ELECTRONIC DEVICES		

MISCL. GROUP	Yes	No
A. REGISTRATION		
B. AIR-WORTHY CERT'		
C. WEIGHT/BALANCE		
D. LIMITS/FLIGHT MANUAL		
E. RADIO LICENSE		
F. SER. LETTERS CHECKED		

S. L. COMPLIANCE RECORD | N | S/N | DATE

S. L. NO.	SUBJECT	METHOD OF COMPLIANCE	BY	NO.

SIGNATURE	CERTIFICATE NO. and RATING	DATE

SECTION III

INSPECTION

3- 1. INTRODUCTION. This section provides instructions for conducting inspections. These inspections are described in paragraphs 3-3 and 3-4. Repair or replacement instructions for those components found to be unserviceable at inspection may be found in the section covering the applicable aircraft system.

CAUTION

When working on engines, ground the magneto primary circuit before performing any operation.

3-2. RECOMMENDED LUBRICANTS. Refer to Recommended Lubricants, Section II, for lubrication servicing instructions.

3- 3. INSPECTION REQUIREMENTS. The required inspection procedures are listed on Table III-I which is a copy of the recommended inspection form. Perform engine run up for operational check of systems and limits, prior to inspection. The inspection procedure is broken down into major groups. Each item within a group which requires frequency inspection is so indicated. If an item is not entirely accessible, or must be removed, refer to the applicable section of this manual for instructions on how to gain access or remove the item. When performing inspections, use forms furnished by the Bellanca factory Service Department available through the Bellanca dealers.

3- 4. INSPECTION SUPPLEMENTAL REQUIREMENTS. To avoid repetition throughout the inspection procedure, and as a safeguard in case necessary instructions have been omitted, general points to be checked are listed below.

a. Movable parts for binding, excessive wear, proper adjustment, correct travel, cracked fittings, deformation, defective bearings, corrosion, cleanliness.
b. Metal parts for security of attachment, cracks, metal distortion, corrosion, condition of paint.
c. Fluid lines and hose for leaks, cracks, dents, kinks, obstructions, deterioration.
d. Wiring for security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration, and corroded terminals.
e. Bolts in critical areas for correct torque.
f. Filters, screens, and fluids for cleanliness and replacement at specified intervals.

3- 5. OVERLIMITS INSPECTION. If the aircraft has been operated so that any of its components have exceeded their maximum operational limits, check with the appropriate manufacturers.

3- 6. SPECIAL INSPECTIONS. The special inspections given in the following paragraphs, supplement the scheduled inspections as outlined in the Inspection Report, Table III-I, to include inspection of items which are required to be examined at intervals not compatible with airframe inspection intervals. Typical of this type are:

a. Inspection is required because of special conditions or incidents that arise, and because of these conditions or incidents, an immediate inspection would be required to insure further safe flight.

b. Inspection of airframe or components on a calender basis. This type of inspection could often be accomplished during the nearest scheduled inspection.

c. Specific definitive inspection on engines based strictly upon engine operating time.

d. Those inspections not completely covered in other sections of this manual, but outlined in the Inspection Report, must be explained in more detail to give a clearer and more complete inspection.

3- 7. INSPECTION REPORT. Both the annual and the 100 hour inspections are complete inspections of the aircraft identical in scope. Inspections must be accomplished by persons authorized by the F.A.A.

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SECTION IV

FUSELAGE

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SECTION IV

FUSELAGE

4- 1. ENGINE COWL REMOVAL AND INSTALLATION.

a. Unscrew all screws along the rear edge and side of top cowl.
b. Remove cowl.
c. Unscrew all screws along the rear edge and lower cowl.
d. Remove the cabin air intake hose and two engine air intake hoses. (Lycoming installation only).
e. Remove cowl.
f. Install cowl using the reverse procedures for removal.

NOTE

Placing aircraft on jacks and retracting the landing gear permits easier removal and installation of bottom cowl.

4- 2. CABIN DOOR REMOVAL AND INSTALLATION.

a. Open door fully until doorstop engages.
b. Remove clevis bolt that fastens the doorstop lever to the door frame.
c. Remove clevis bolts at the top and bottom hinges.
d. Slide door off hinges.
e. Install cabin door using the reverse procedures for removing door.

4- 3. CABIN DOOR LATCH REMOVAL AND INSTALLATION.

a. Remove screws securing armrest to gain access to set screw securing door locking handle.
b. Remove window frame and door panel.
c. Remove upper access panel.
d. Remove wire at upper latch.
e. Remove screws securing upper latch.
f. Remove nuts securing linkage rod and wire secured to the lower latch assembly.
g. Remove screws securing lower latch assembly.
h. Remove screws securing door handle assembly.
i. Install using reverse procedures for removal.

4- 4. CABIN DOOR LATCH ADJUSTMENTS.

a. Loosen screws which secure the lower door catch and adjust position as desired.
b. Loosen screws which secure upper latch assembly and adjust for proper position.

4- 5. INSTALLING CABIN DOOR RUBBER SEAL.

a. Apply #8001-3M yellow weatherstrip adhesive only to inside edge of door.
b. Apply flat rudder strip 1/8" x 1/2" starting 3" below the upper hinge around the top stopping one foot after the top door pin.
c. Apply one foot V-shaped seal starting on the bottom at the forward corner and working aft.
d. Apply adhesive over seals just installed.
e. Apply V-shaped seal around entire door.

4- 6. BAGGAGE DOOR REMOVAL AND INSTALLATION.

a. Open door and remove the spring doorstop.
b. Remove door hinge screws starting from the bottom.
c. Hold door until it can be fully removed.
d. Install baggage door using the reverse procedures for removing the door.

4- 7. FRONT SEATS REMOVAL AND INSTALLATION.

a. Remove the seat stop screw located in both inner seat tracks.
b. Pull seat adjust knob, sliding seat forward and up.
c. Install front seats using the reverse procedures for removing seats.

4- 8. REAR SEAT REMOVAL AND INSTALLATION.

a. Unsnap rear floor carpet.
b. Lift lower seat cushion up and out.
c. Unscrew two screws located next to the outboard baggage tie down rings.
d. Slip cushion up and out.

4- 9. SIDE WINDOWS REMOVAL AND INSTALLATION.

a. Remove inner window frame.
b. Remove retainer strips and screws.
c. Apply pressure near the edge of the window and force it out of frame making certain that the edge does not damage the fabric covering the outside window frame.
d. Install, checking that window fits into frame without any binding. File off any tight spots encountered.
e. Apply masking tape around outside of window area to eliminate excessive cleanup after installation.

NOTE

Leave protective paper on window until work is completed.

f. Clean the surfaces of the window and frame. They must be free of grease or oil film.
g. Prepare sealing compound; five parts 3M sealing base compound (EC1375B) and one part 3M accelerator compound (EC1B75A), mixing the two thoroughly.
h. Spread the compound evenly to the routed area of the window at least 1/16 inch thick.
i. Fit the window into place.
j. Hold the window in a slight curved position and install the retainer strips and screws.
k. Remove excess compound on inside frame and replace inner window frame.
l. Allow compound to set up for two hours before removing excessive sealer around the outside of the window.
m. Allow approximately five hours before removing the masking tape and protective paper. If compound smears on window, wait until completely cured before removing.

4-10. WINDSHIELD REMOVAL AND INSTALLATION.

a. Remove outer rim or fairing strip.
b. Remove all screws and pull windshield back and slightly upward until the front portion clears the wraparound cowl.
c. Remove all caulking compound and poly foam strips located at the bottom edge of the wraparound.

d. Center new windshield on wood frame until all screw holes are aligned. Use of masking tape around the edge for marking purposes aids in fitting.
e. Grind windshield as required for proper fit.
f. Install new strip of 1/4 inch X 1 inch poly foam in bottom edge of wraparound.
g. Apply automotive bedding and glazing type caulking compound around all of frame that is in contact with the windshield.
h. Install windshield and align screw holes.
i. Insert screws starting at the top center and work down the sides.
j. Install outer rim or fairing strip.

4-11. CABIN UPHOLSTERY.

4-12. CABIN FLOORING. All of the cabin floor panels are readily removable for inspection or servicing purposes. Unsnap carpet and remove appropriate screws securing the individual panels.

4-13. CABIN SIDE PANELS. All of the cabin side panels are removable with each side consisting of one piece.
a. Remove window frames.
b. Remove screws along edge of panel.

4-14. HEADLINER REMOVAL AND INSTALLATION. If the headliner is to be removed, it is recommended that the individual have previous upholstery experience.
a. Remove trim tab handle, indicator plate speaker grill, etc.
b. Remove front trim panel, top side panels, and screws around aft baggage close out panel.
c. Remove staples and nails securing front and side of headliner.
d. Cut all necessary nylon tie down and straps.
e. Install headliner using the reverse procdures for removal of headliner.

INTENTIONALLY

LEFT

BLANK

SECTION V

WINGS AND EMPENNAGE

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INTENTIONALLY

LEFT

BLANK

SECTION V

WINGS AND EMPENNAGE

5- 1. WING CONSTRUCTION. The wings are of conventional wood construction using Sitka spruce for the spars and ribs, and covered with mahogany plywood. The entire wood is dipped into a wood sealer. A lifetime Dacron #70, cover is doped on over the plywood for permenant protection. The finish is built up in the following order:

a. Three cross coats clear nitrate dope.
b. Three cross coats tinted butyrate dope.
c. Two cross coats aluminum butyrate dope.
d. Two cross coats white butyrate dope.
e. Two cross coats finish butyrate dope.

5- 2. WING REMOVAL. Several persons (4) are required to remove or install wings.

a. Place aircraft on jacks.
b. Remove all seats and floor panels.
c. Disconnect four hydraulic lines from the gear power pack located under the front seats. These lines (two per wing) lead out to the main gear retract cylinders.
d. Disconnect electrical harness at butt splices.
e. Disconnect aileron cables and push-pull rods at the bell-cranks located under the rear seat.
f. Disconnect pitot hose (left wing) and cabin air intake hoses.
g. Disconnect flap cables.

NOTE

The following steps are performed outside of cabin.

h. Remove wing root fairings.
i. Disconnect fuel lines.
j. Disconnect hydraulic brake lines.
k. Support wing at leading and trailing edges, and wing tip.
l. Remove wing bolts (4 per wing).
m. Pull wing approximately 4 inches away from fuselage and disconnect fuel return lines (one per wing).

NOTE

The main gear in the down position may be used to support the wing and aid in moving.

n. Support wings properly to prevent damage to skin.

5- 3. WING INSTALLATION. Installation of wings is the reversal of removing them with the additional precautions:
a. Insert all lines, wires, and cables into fuselage.
b. Connect fuel return lines.
c. Perfect alignment of wing fittings is required prior to inserting the wing bolts. DO NOT FORCE bolts into place. Recheck alignment if necessary.
d. Thread on nuts until flush with spar straps and tighten to next castellation required to align hole for cotter pin. DO NOT TIGHTEN beyond this point.

5- 4. WING ADJUSTMENTS. No provision is provided for adjusting the rigging of the wing.

5- 5. STABILIZER DESCRIPTION. The horizontal and vertical stabilizer are constructed of welded 4130 steel tubing and covered with #70 Dacron. The finishing process is identical to the wings. The vertical stabilizer is an integral part of the fuselage and can not be removed by normal means.

5- 6. HORIZONTAL STABILIZER REMOVAL AND INSTALLATION.

a. Release tension on elevator cables.
b. Remove inspection plates located on vertical fin and inspection panel on the aft bottom side of fuselage.
c. Remove strut nuts at fuselage.
d. Remove bolts (four) directly above strut fitting which is secure to the leading edge of the fuselage.
e. Remove trim tab actuator lever.
f. Remove two through bolts securing the trailing edge.
g. Remove the stabilizer and elevators as one unit using care not to bend the stabilizer struts.
h. Install a brace between the strut and the leading edge to prevent movement of the strut from its original position.
i. Install the stabilizer using the reverse procdures for removal.

5- 7. RIGGING HORIZONTAL STABILIZER. Dihedral is 0° and adjustment is obtained with the forward strut. Angle of incidence is fixe There is no wash in or wash out, adjustment is obtained with the aft strut.

a. Remove bottom rear seat to gain access to laterial leveling lugs.
b. Using bubble protractor and straight edge measure, dihedral at the trailing edge of the stabilizer and the aircraft leveling lugs as a reference.
c. Adjust dihedral by turning stop nuts on the bottom forward strut until 0° dihedral is achieved.
d. Using bubble protractor and straight edge, measure the angle of incidence from the trailing and leading edge between the inboard two rib sections and the second outboard rib section.
e. Adjustment is accomplished with the aft strut until there is no wash in or wash out. (The two surfaces must be parallel).

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SECTION VI

FLIGHT CONTROLS

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TABLE VI-1

FLIGHT CONTROL SPECIFICATIONS

	RIGHT	LEFT	UP	DOWN	CABLE TENSION
Aileron			20°	20°	19 lbs. ±2
Elevator			22°	15°	Up 30 lbs. ±2 Down 34 lbs. ±2
Trim Tab			7°	34-1/2°	Not Applicable
Rudder	22°	22°			Fixed
Flaps	45°	44°			Not Applicable

NOTE

Angular tolerance for flaps ±2°, all others ±1°.

SECTION VI

FLIGHT CONTROLS

6- 1. AILERON CONTROL SYSTEM. The ailerons are of wood construction and are actuated by the rotational movement of the dual control wheel which is connected by chains, cables, and push-pull rods. See Figure 6-1.

6- 2. REMOVAL AND INSTALLATION AILERON CONTROL SURFACE.

a. Remove fabric patch on inboard top and bottom end of aileron and remove bolt connecting actuator arm.
b. Remove two bottom inspection plates and remove the three hinge bolts. (Lower flap by hand to facilitate removal of inboard bolt.)
c. Install aileron control surface using reverse procedures for removal. Be certain to safety all nuts.

6- 3. RIGGING AILERONS.

NOTE

A template is required to determine neutral position. The drawing to construct the template is available through the factory. Drawing #SK234789-2005 aileron rigging template.

a. Secure the control wheels in the neutral position with a straight edge taped across the wheels.
b. Remove rear bottom seat.
c. Measure length of cable between the two bellcranks for 35 11/16" ± 1/16" from CL of fork holes. Adjust if necessary using the turnbuckle.

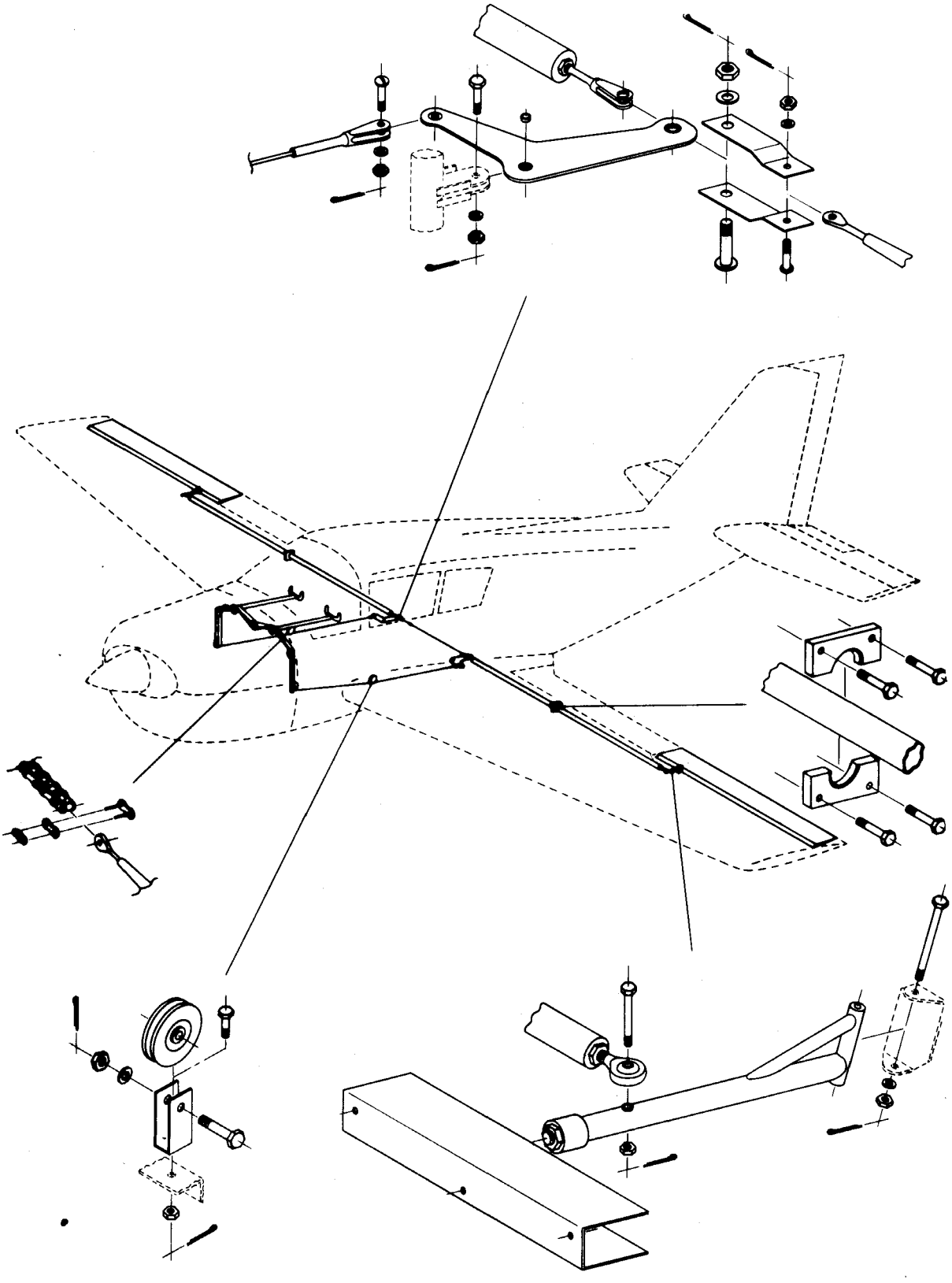

FIGURE 6-1 AILERON SYSTEM

d. Measure cable tension between bellcranks for 19 lbs. ±2 Adjust if necessary using the two turnbuckles under the instrument panel attaching the control cable to the chain. Make certain that the distance from the CL of bolt hole attaching the cable to the right hand bellcrank and the steel cross member (perpendicular to cable) is 7-3/16" ± 1/16" when the control wheel is in the neutral position. See Figure 6-2.

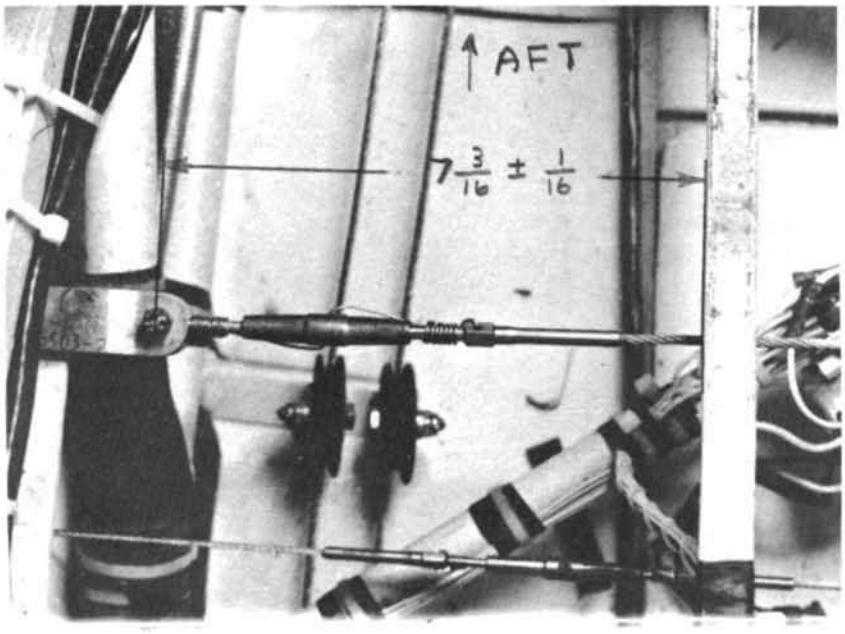

FIGURE 6-2 BELLCRANK NEUTRAL POSITION

e. Adjust the push-pull rod end fitting which connects to the outboard aileron actuator lever until the ailerons are in the neutral position.
f. Adjust aileron angular travel 20° up and down, with the stop limit bolts located on the pilots yoke under the instrument panel.

NOTE

If the measurements given in procedures (a) through (d) are not correct, procedures (e) and (f) will not be possible.

6- 4. ELEVATOR CONTROL SYSTEM. The elevators are constructed of tubular steel and are activated by the fore and aft movement of either control wheel which is connected to the control surface by cables. See Figure 6-3.

6- 5. REMOVAL AND INSTALLATION ELEVATOR CONTROL SURFACE.

a. Remove trim tab actuator lever.
b. Remove two through bolts connecting both elevator halves to the bellcrank.
c. Remove the "S" tape by softening the dope with acetone.
d. Remove two hinge bolts from each elevator. (Use of two screwdrivers is recommended).
e. Install using the reverse procedure for removal.
f. A new "S" tape must be doped on after installation.

6- 6. RIGGING ELEVATOR.

NOTE

A template is required to determine neutral position. The drawing to construct the template is available through the factory. Drawing #SK234789-2006 elevator rigging template.

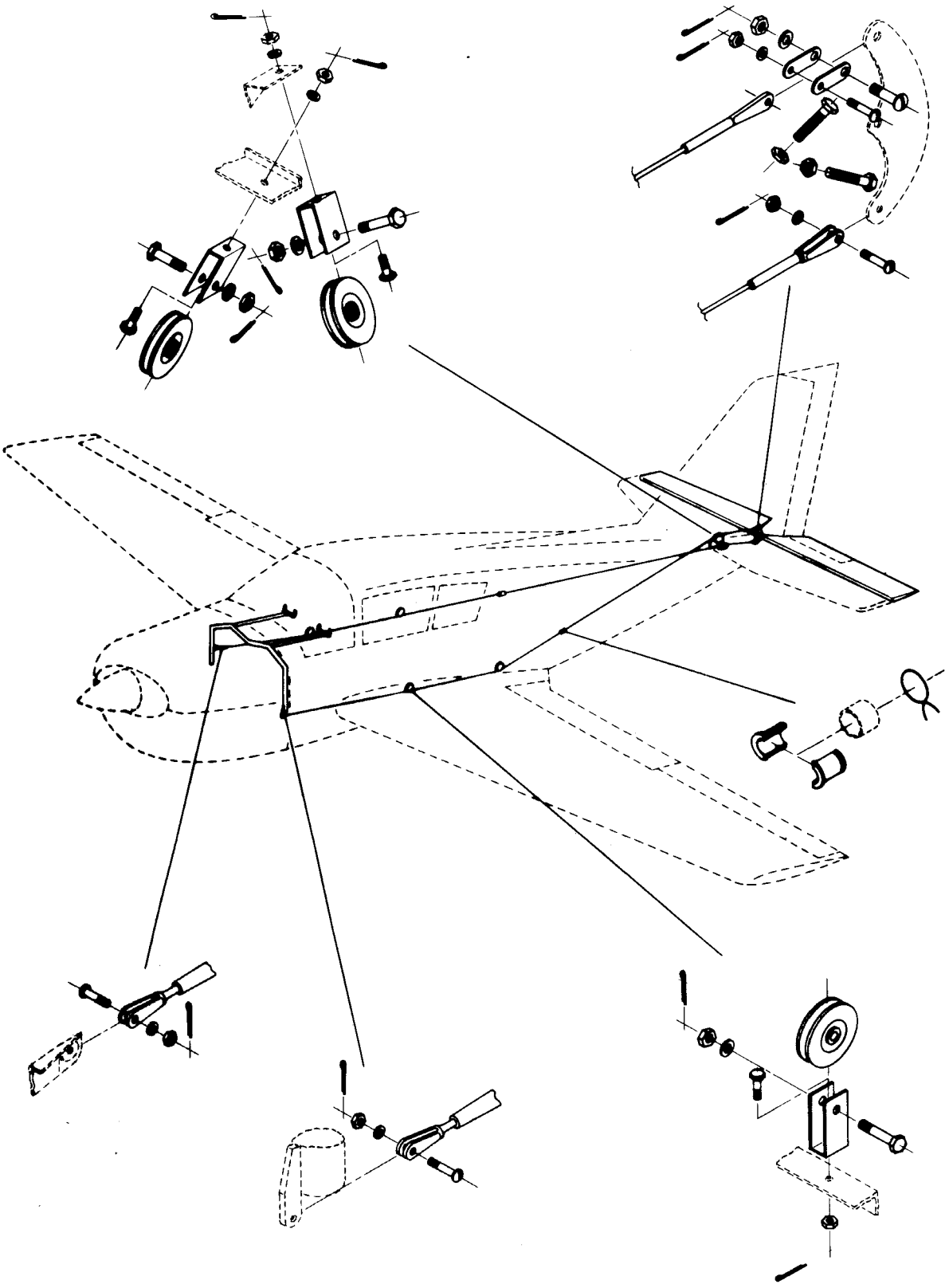

FIGURE 6-3 ELEVATOR SYSTEM

a. Secure the elevator in the neutral position.
b. Use a bubble protractor and set angular travel 22° up and 15° down with stop limit bolts located next to the bellcrank.
c. Using the turnbuckle on the down cable, located on the lower right side of the control yoke, adjust the yoke for a minimum of 1/4" clearance between the aileron sprocket and the firewall when the elevator control surface is full down.
d. Set the control yoke down stop limit bolt located near the upper left side of the yoke for a minimum of 1/8" clearance with the elevator at rest in the full down position.
e. Adjust both the up and down turnbuckles for proper cable tension, up cable 30 pounds and down cable 34 pounds with the elevator trim spring installed. (Neutral trim).
f. Pull the pilot's control yoke until resistance is felt indicating that the elevator is full up and set the up stop limit bolt for a minimum of 1/8" clearance. Repeat this step using the copilot's yoke to set the other up stop limit bolt located on the copilot's side.
g. Insure that adequate clearance exists between the back of the instrument panel and the yoke when in the full up position.

6- 7. RUDDER CONTROL SYSTEM. The rudder is constructed of tubular steel and is actuated by the fore and aft movement of either the pilot's or copilot's rudder pedals which are connected to the control surface by cables. See Figure 6-4.

6- 8. REMOVAL AND INSTALLATION RUDDER SURFACE.

a. Remove control cables from rudder bellcrank.
b. Remove nuts from the three hinge bolts using two screwdrivers.

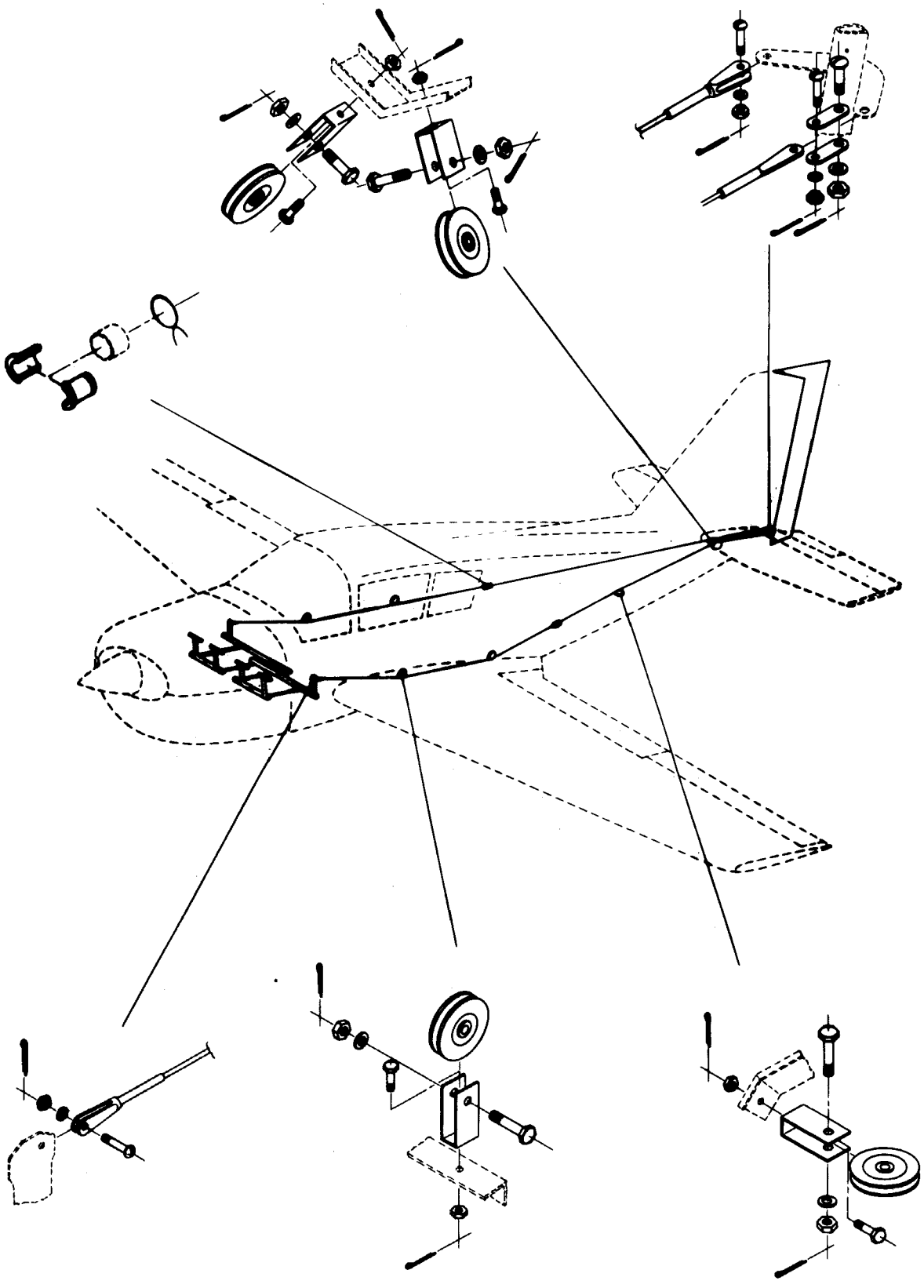

FIGURE 6-5 RUDDER SYSTEM

c. Remove the "S" tape by softening the dope with acetone.
d. L ft rudder up to remove.
e. To install rudder, insert the upper and lower hinge bolts into rudder and hang in place, then install the middle bolt.
f. Install using the reverse procedures for removal
g. A new "S" tape must be doped on after installation.

6- 9. RIGGING RUDDER.

a. Raise nose of aircraft to allow for easy movement of rudder pedals.
b. Secure the rudder pedals in the neutral position.
c. Adjust the rudder surface for neutral position which is streamlined with the vertical stabilizer using the turnbuckle connected to the rudder bellcrank.
d. Check angular travel, 22° left and right. No adjustment provision is provided. Rudder tension is fixed by two springs which are attached to the outboard two pedals.

6-10. ELEVATOR TRIM CONTROL SYSTEM. The all metal elevator trim tab is located on the left elevator and is actuated by an overhead hand crank, or an optional electric trim motor located in the aft fuselage. The two are connected to the actuator screw by a torque tube. The trim tab indicator is located in the handcrank assembly. Incorporated with the trim system is a bungee or spring which increases the force required to obtain full up elevator providing the pilot with better elevator feel. See Figure 6-6 and 6-7.

6-11. REMOVAL AND INSTALLATION ELEVATOR TRIM TAB.

a. Disconnect trim tab actuator rod.
b. Remove two bolts securing inboard hinge.
c. Slide tab inboard and out.
d. Install using reverse procedure for removal.

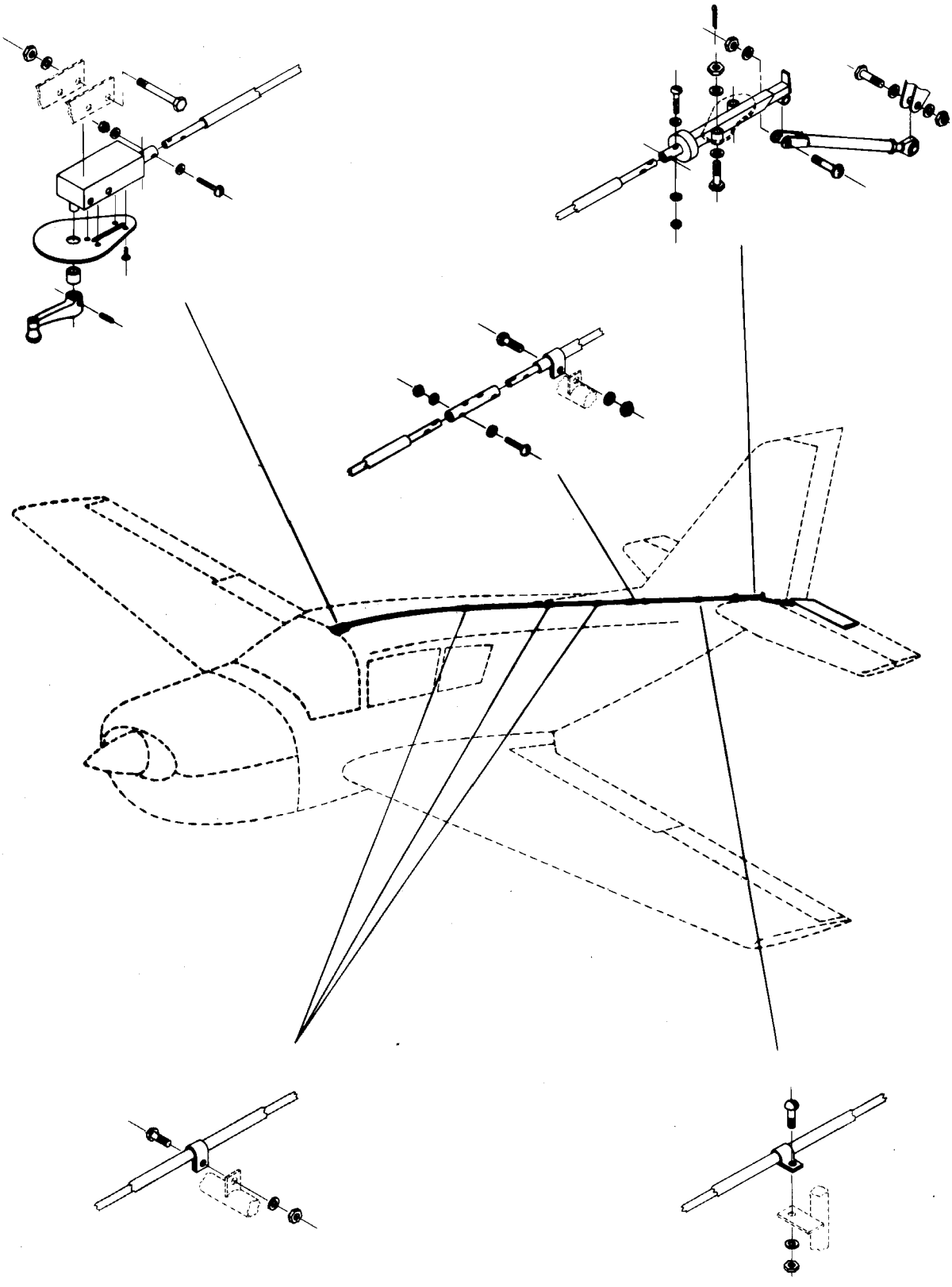

FIGURE 6-6 ELEVATOR TRIM SYSTEM

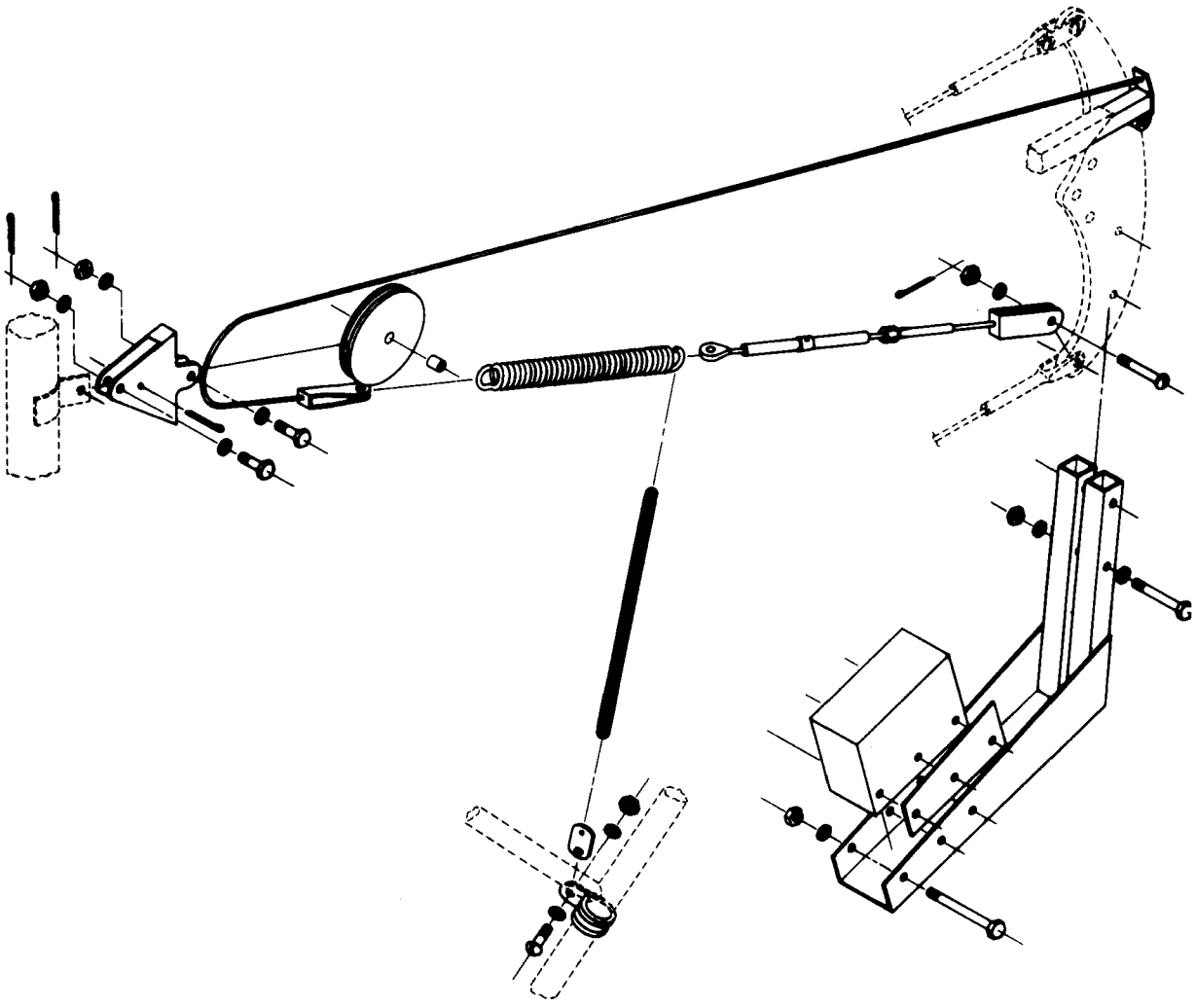

FIGURE 6-7 ELEVATOR TRIM BUNGEE SYSTEM

6-12. RIGGING ELEVATOR TRIM TAB.

a. Secure the elevator in the neutral position using the elevator jig template.
b. Position the manual trim handle 4-3/4 turns aft of full forward (approximately neutral position on indicator plate.)
c. Adjust actuator rod so that the tab is streamlined with the elevator surface in the neutral position.
d. Run the trim full forward and aft, checking for proper angular travel of 7° up and 34-1/2° down.
e. To increase angular travel decrease shim thickness between the tab surface and the control horn.

6-13. RIGGING ELEVATOR TRIM BUNGEE SYSTEM.

a. Remove access panel located on the bottom aft fuselage.
b. Place elevator surface approximately 10° above neutral position.
c. Set elevator trim to full aft.
d. Adjust turnbuckle attached to spring, until spring begins to take tension.
e. Safety turnbuckle and insure connection of the smaller tension spring.

6-14. REMOVAL AND INSTALLATION ELECTRIC TRIM SERVO MOTOR.

a. Remove aft close out panel in baggage compartment.
b. Disconnect electrical plug on aft side of servo unit.
c. Remove four bolts attaching servo plate to airframe.
d. Install using same procedures for removal in addition:

1. Prior to tightening the 2 lower bolts, set chain tension for approximately 1/4" to 1/2" side play and tighten two upper bolts.
2. Check that the horizontal bracket and the vertical servo plate are perpendicular to each other.

6-15. TROUBLE-SHOOTING ELECTRIC TRIM SERVO. The electric servo unit is an Edo-Aire Mitchell product. If the following procedures do not result in proper operation, the manufacturer should be consulted.

a. Motor fails to operate in either direction.

1. Check for popped circuit breaker.
2. Check for voltages and ground at control wheel switch and connector plug located on back of servo.
3. Check for operation of electrical disconnect switch.

b. Motor fails to shut-off or operate in both directions.

1. Replace control wheel switch.

c. Motor operates but does not engage.

1. Clutch slipping, consult manufacturer.

6-16. FLAP SYSTEM. The flaps are of wood construction and are actuated electrically by a powered jack screw and cable arrangement, providing full up, one-half and full down flap position. See Figure 6-8. Access to the powered jack screw, limit switches and relays is through the floor boards in front of the rear seat.

6-17. REMOVAL AND INSTALLATION OF FLAP SURFACES.

a. Disconnect the cable from the flap actuator lever.
b. Remove the three hinge bolts while holding the flap securely.
c. Lower flap to release the tension on the flap retract spring and remove spring.
d. Install using the reverse procedures for removal, with particular attention to the security and alignment of the inboard hinge fittings.

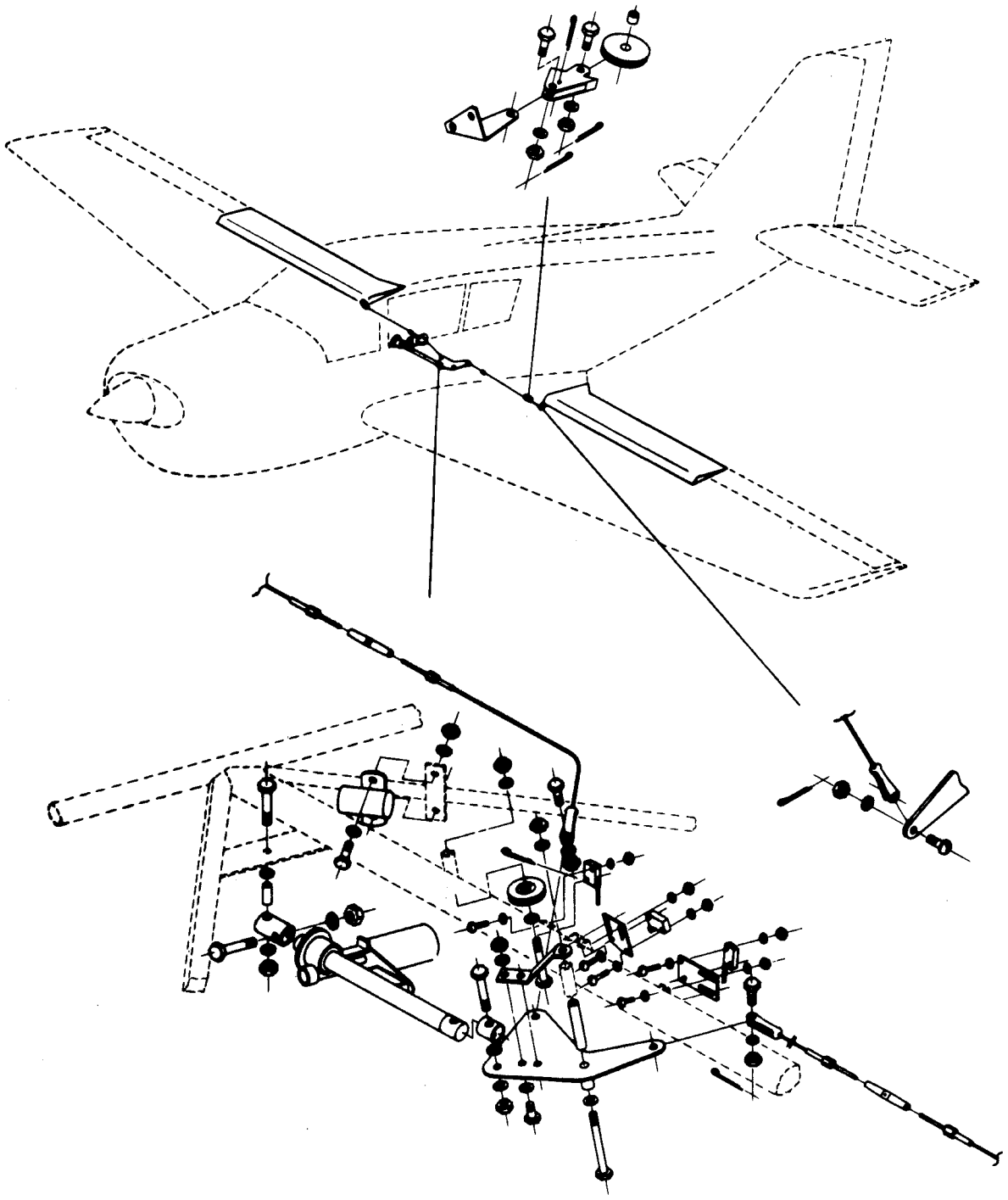

FIGURE 6-8 FLAP SYSTEM

6-18. RIGGING FLAP SHIM INSTALLATION. The flap "up" limit is set by wood shims contacting both ends of the flap leading edge. If the flaps are replaced or recovered, shim adjustment may be necessary for proper "up" position.

CAUTION

Correct flap position is required for proper stall characteristics.

a. Install inboard shim so that the trailing edge of the flap is 1/8" below the trailing edge of the wing fairing on the right wing and 1/8" above the trailing edge of the wing fairing on the left wing.
b. Adjust the outboard shims so that contact is made with both outboard and inboard shims.

6-19. REMOVAL AND INSTALLATION FLAP MOTOR SERVO UNIT.

a. Remove the rear seat and floorboards.
b. Remove two bolts securing each end of jack screw.
c. Remove electrical wire connection.
d. Install using the reverse procedures for removal.

6-20. RIGGING FLAPS AND LIMIT SWITCHES. Flap travel is controlled by three limit switches contacting the bellcrank which is connected to the flap jack screw. The "up" position is controlled by the left switch, 1/2" "down" position is controlled by the middle switch and the "down" position, by the right switch. See Figure 6-9.

a. Remove rear seat and floor boards.
b. Position jack screw full up (bottomed out).
c. Adjust turnbuckles to take up lack in cables.
d. Adjust "down" and 1/2 switch in approximate position.

e. Adjust "up" switch so that 1/8" to 1/4" clearance remains on jack screw. The switch must not allow jack screw to bottom out.
f. If cables have been disconnected, they must be stretched by placing flaps full "down" with the jack screw and applying up pressure on the inboard trailing edge.
g. Adjust the "down" switch so that the right hand flap stops approximately at 45° from the full "up" position. Use a bubble protractor to determine angular travel. Fine adjustment, 10, is made with the turnbuckle resulting with the "down" limit of 45°.
h. Adjust middle switch so that the right hand flap stops at 22-1/2° going from "up" to 1/2" "down" only. No setting is made going from "down" to 1/2" "up" position. DO NOT adjust 1/2 position with the turnbuckle. Insure that switch is mounted low enough to bellcrank so that a light downward pressure on the bellcrank does not cause the flaps to cycle.
i. Adjust the roller tab on middle switch so that contact is made with the bellcrank as the flaps go from "down" to 1/2 "up" and side clearance exists between the roller and bellcrank after stopping.
j. Adjust the left hand flap for 44° full down with the turnbuckle.
k. Cycle flaps several times for proper operation and safety all turnbuckles.

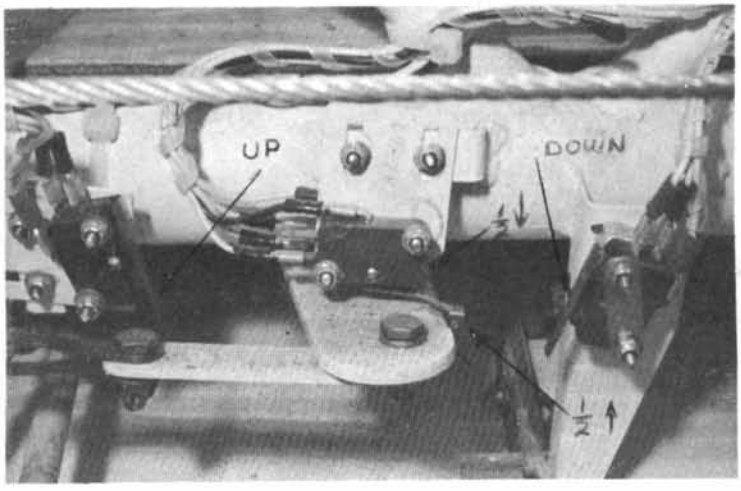

FIGURE 6-9 FLAP LIMIT SWITCHES

6-21. FLAP SYSTEM TROUBLESHOOTING.

1. Flaps do not move, motor can not be energized.

Probable Cause	Solution
a. Circuit breaker "popped" out.	a. Reset circuit breaker.
b. Switch relay defective.	b. *Replace switch relay.
c. Power solenoid defective.	c. Replace power solenoid.
d. Motor defective.	d. Replace motor.

*Switch relay is identical to the landing gear "press-to-test" relay and switch relay. Replace one with another to determine if relay is defective.

2. Circuit breaker "pops" out when flap switch position is changed.

Probable Cause	Solution
a. Jack screw bottomed out in full up or down position.	a. Manually turn jack screw and readjust or replace limit switch.
b. Short in circuit.	b. Disconnect motor, relays, limit switches one at a time is isolate defective item or circuit.

3. Flaps do not stop in correct or corresponding switch position or cycle when placed in 1/2 position.

Probable Cause	Solution
a. Defective limit switch.	a. Replace switch.
b. 1/2 limit switch not adjusted properly.	b. Adjust switch.
c. Limit switch not adjusted properly.	c. Adjust switch properly.

4. Limit switch damaged by excessive bellcrank travel.

Probable Cause	Solution
a. Motor brake solenoid defective.	a. Replace solenoid.
b. Defective limit switch.	b. Replace. switch.

5. Flaps are drooped in the full "up" position. (Flaps are in contact with stop shims.)

Probable Cause	Solution
a. Flap hinge bent.	a. Replace hinge.

NOTE

This is usually caused by not installing external flap gust locks during strong winds.

SECTION VII

LANDING GEAR SYSTEM

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INTENTIONALLY

LEFT

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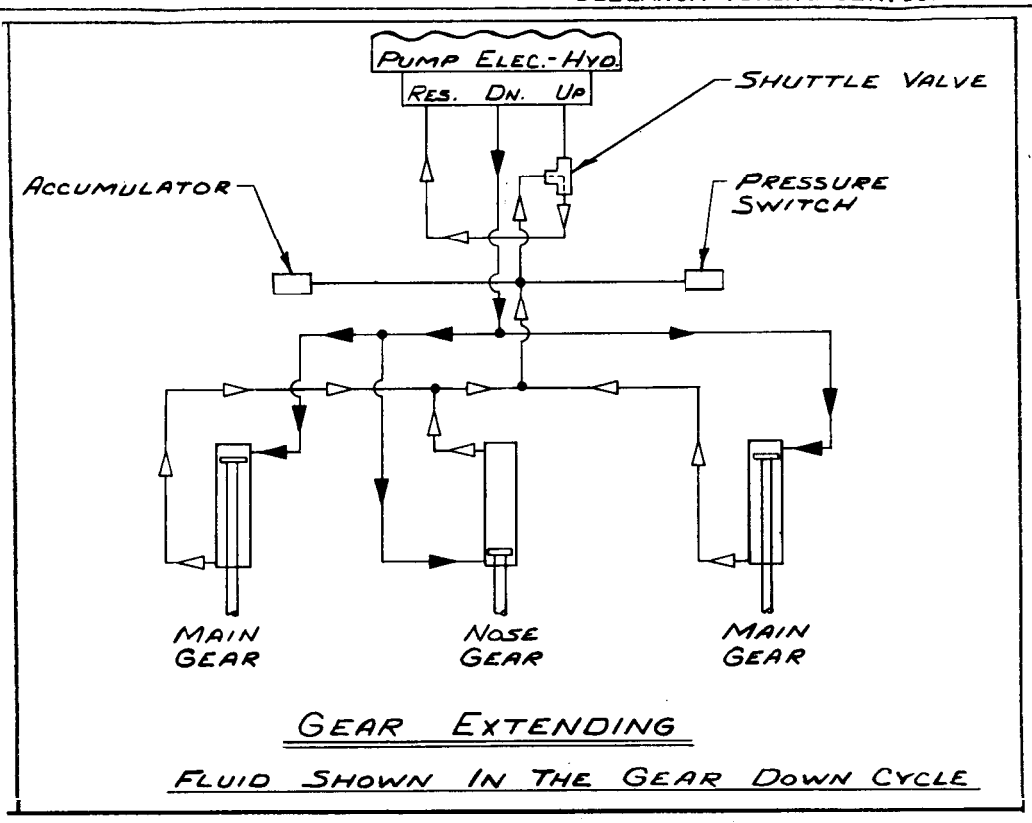
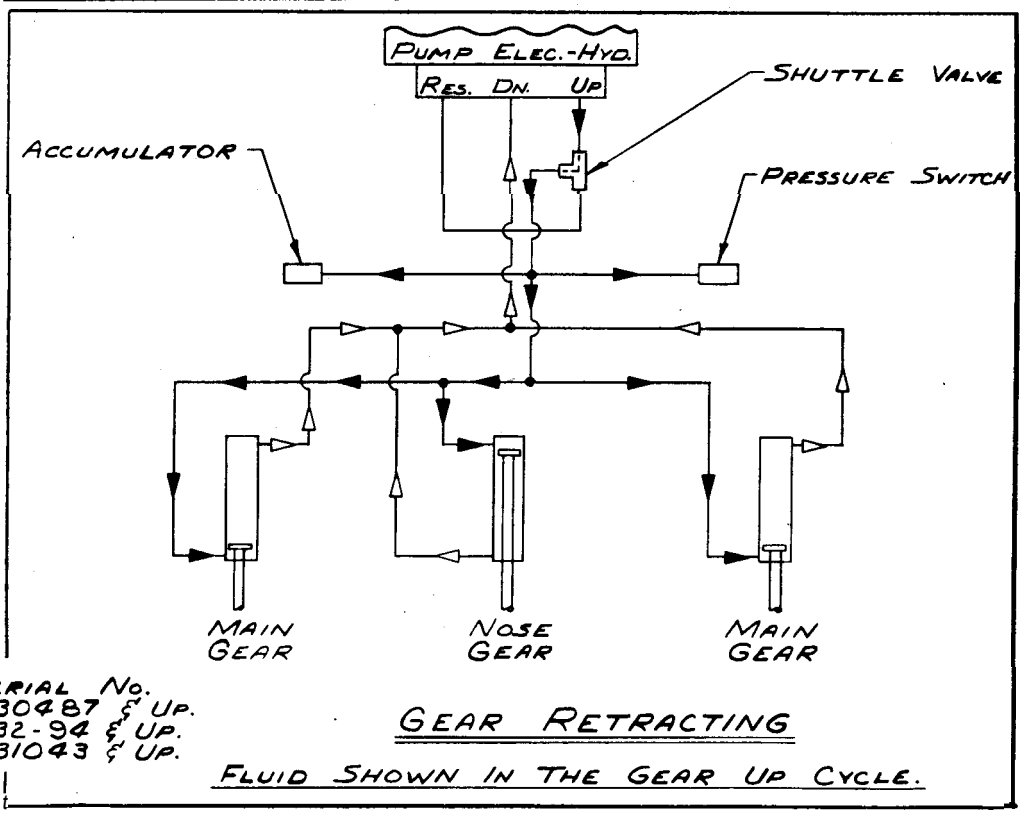
TABLE VII-1

LANDING GEAR SPECIFICATIONS

Auto-Axtion Trip Speed	95-100 MPH IAS
Landing Gear Warning Horn	12" to 14" M.P. at 3000' MSL
Gear Retraction Limit	12-17 seconds
Hydraulic Pressure Shut-Off Switch	1300-1500 psi
Accumulator	800-900 psi nitrogen
Nose Gear	
Overcenter Down Lock	1/4" to 5/16"
Down Limit Switch	on centerline
Shock Strut Pressure	60 psi on jacks 100 psi on landing gear
Shock Strut Hydraulic Fluid	15 oz. MIL-H-5606A
Tire Pressure	35 psi
Main Gear	
Overcenter Down Lock	1/4" to 5/16"
Down Limit Switch	Left on center Right 5/32" overcenter
Shock Strut Pressure	35 psi on jacks 70 psi on landing gear
Shock Strut Hydraulic Fluid	14 oz. MIL-H-5606A
Tire Pressure	55 psi





EFFECTIVE SERIAL NO.
17-30A : 73-30487 & UP.
17-31A : 73-32-94 & UP.
17-31ATC : 73-31043 & UP.

FIGURE 7-1A LANDING GEAR HYDRAULIC SYSTEM SCHEMATIC

SECTION VII

LANDING GEAR SYSTEM

NOTE

Place aircraft on jacks prior to performing any maintenance to landing gear system.

7-1. LANDING GEAR DESCRIPTION. The retractable, tricycle landing gear is hydraulically actuated by an electrically driven, reversable hydraulic pump. The power pack, which includes the motor, pump, and reservoir. are located under the front seat along with the limit switches, accumulator, and hydraulic pressure switch. See Figure 7-1A.

7-2. RETRACTION CYCLE. As the gear switch is placed in the "up" position, the power pack develops hydraulic pressure on the "up" side of the gear actuating cylinders and vents the hydraulic fluid on the "down" side back to the reservoir. When the gear is fully retracted, hydraulic pressure continues to build up to 1400 psi at which time the pressure switch shuts off the power pack. A zero-leakage shuttle valve in the power pack prevents any pressure bleed off eliminating any need for mechanical up locks. The accumulator prevents the power pack from frequent cycling should minor leakage occur.

NOTE

Gear will retract only if, 1) the ground safety "squat" switch located on the right main strut, is depressed, and either; 2) the throttle control is in the full open position, or; 3) the indicated airspeed is greater than 105 MPH.

7- 3. EXTENSION CYCLE. As the gear switch is placed in the "down" position, the power pack develops hydraulic pressure on the "down" side of the gear actuating cylinders, and vents the hydraulic fluid on the "up" side back to the reservoir. The power pack continues to run until the gear is full down, and all three "down" limit switches, one on each drag strut, are depressed by the overcenter drag strut. The overcenter position is the "down" lock, there is no hydraulic pressure once the power pack is shut off.

7- 4. AUTO-AXTION OPERATION. The auto-axtion is a pilot backup device designed to lower the landing gear automatically, regardless of gear switch position, if; 1) the air speed falls below 95-105 MPH and; 2) the throttle is NOT full open, The master switch must be ON in order to have electrical power to the hydraulic power pack. The landing gear will come back up automatically if the gear switch is left in the "up" position and either the air speed is increased above 105 MPH or the throttle is positioned to full open. The air pressure sensing switch is located under the instrument panel on the upper left side of the firewall and is connected to the pitot static system. Adjustment to the switch is not recommended.

NOTE

The auto-axtion is a backup device only. If a landing is anticipated, the gear switch should be in the "down" position.

7- 5. LANDING GEAR INDICATORS AND SAFETY DEVICES.

Warning Horn - The horn sounds whenever the gear is not down and locked and the throttle is positioned approximately 1/2" from full off (12" to 14" manifold pressure). The horn become intennittent after the initial 5 seconds so as not to be confused with the stall warning horn. The horn interrupter, a vacuum tube type relay is located behind the instrument panel below the pilots yoke.

Transit Light - The red light above the gear down indicator lights illuminates whenever the relay for the power pack is energized or the gear is not in the same position as the gear switch.

Gear Down Lights - The three green lights, one for each gear, illuminates whenever the respective gear micro switch is depressed by the strut being in the' overcenter locked position.

Press-to-Test Lights - The three green "down" lights and the red transit light may be checked with the push button switch next to the indicator lights. The relay is located behind the instrument panel, inboard the gear horn interrupter relay.

Emergency Extension Lever - The lever is located under the fuel selector valve. When the lever is depressed down and to the right, it mechanically dumps the hydraulic pressure on the "up" side of the hydraulic gear cylinders and allows the landing gear to free - fall to the down and locked position.

Ground Safety "Squat" Switch - The squat switch is located on the right main gear. When depressed by the weight of the aircraft resting on the landing gear, the power pack can not be energized.

7- 6. STATIC CABLES. The static cable is located on each main gear and causes the strut to compress approximately 4" during the retraction cycle. The gear will not retract if the cables are not in position or if the struts are over pressurized. CABLES 20" pi&-TO PIN.

7- 7. REMOVAL AND INSTALLATION OF MAIN GEAR.

a. Place aircraft on jacks.
b. Disconnect wheel cover actuating linkage if installed.
c. Disconnect static cable at strut.
d. Disconnect kick down spring at bottom of strut.
e. Disconnect actuating cylinder at drag strut.
f. Disconnect hydraulic brake line at brake assembly.
g. Disconnect drag link'bolt at bottom of strut.
h. Remove main pivot bolt at top of strut.
i. Install using the same procedures for removal.

7- 8. REMOVAL AND INSTALLATION NOSE GEAR.

a. Place aircraft on jacks.
b. Disconnect steering rods.
c. Disconnect actuating cylinder at top of strut.
d. Disconnect kick down spring at top of strut.
e. Disconnect drag link at bottom of strut.
f. Remove main pivot bolt at top of strut.
g. Install using reverse procedures for removal.

7- 9. RIGGING MAIN GEAR DRAG STRUTS.

a. Place aircraft on jacks.
b. Disconnect actuating cylinder rod end fitting at drag strut.
c. Adjust kick down spring end fittings so that the drag strut is overcenter 1/4" to 5/16" when the spring is fully extended. See Figure 7-1.
d. Adjust rod end fittings on actuator cylinder so that cylinder is .010" to .015" short of bottoming out when drag strut is fully extended.

NOTE

Any adjust ment made to overcenter position of drag strut, will require an adjustment to the "down" limit switch.

CAUTION

Threads on all end fittings must extend into fitting beyond inspection hole and the locking nut secure.

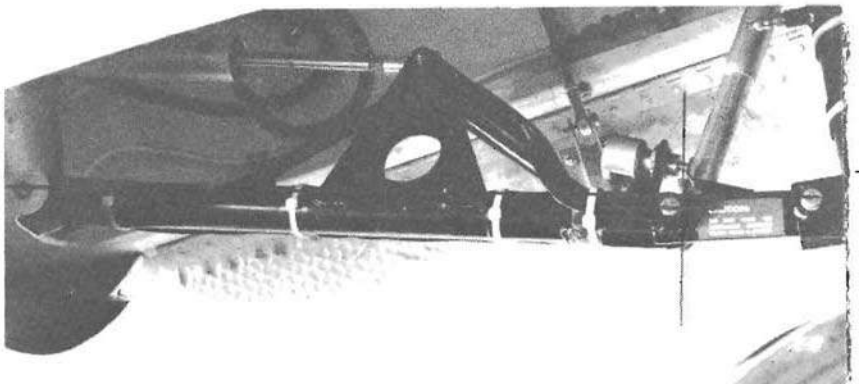


FIGURE 7-1 OVERCENTER REFERENCE

7-10. RIGGING NOSE GEAR DRAG STRUT.

a. Place aircraft on jacks.
b. Disconnect the actuating cylinder rod end fitting at top of strut.
c. Adjust kick down spring end fittings so that when spring is fully extended the drag strut is 1/4" to 5/16" overcenter. See Figure 7-1.
d. Adjust rod end fittings on actuating cylinder so that when installed the cylinder is just short of bottoming out (1/32" to 1/16") and the overcenter measurement is still 1/4" to [redacted]. 5/16".

7-11. ADJUSTING NOSE AND MAIN GEAR DOWN LIMIT SWITCH.

a. Place aircraft on jacks.
b. Adjust right gear limit switch so that switch clicks 1/8" to 5/32" past the overcenter distance on the drag strut. See Figure 7-1 for overcenter reference.
c. Adjust the left gear and nose gear limit switch so that switch clicks when the drag strut is on center line.

NOTE

The switch must click at the proper distance overcenter when moving the drag links in the DOWN direction only.

7-12. ADJUSTING "SQUAT" SWITCH. Located at scissors of right main gear only.

a. Place aircraft on jacks.
b. With main strut fully extended, adjust switch so that contact plunger is bottomed out by the scissors.

7-13. ADJUSTING NOSE WHEEL STEERING.

a. Place aircraft on jacks.
b. Secure the rudder pedals in neutral position. The rudder should be streamlined with the vertical fin.
c. Adjust the steering rod end fittings to align nose wheel. Alignment is by sight only. Stand 5 to 10 feet in front of aircraft in line with rudder and vertical fin.

7-14. NOSE WHEEL SHIMMY ADJUSTMENT. If nose wheel shimmy is experienced or if excessive rudder pedal pressure is required to steer aircraft, adjust nose wheel steering collar located at the lower end of the upper strut assembly.

a. Remove two bolts securing collar halves and adjust friction by changing washer thickness between collar.
b. Replace lining if excessive wear is evident. Apply light machine oil to new lining.

7-15. ADJUSTING CLAM SHELL WHEEL DOORS.

a. Place aircraft on jacks.
b. Adjust set screws contacting the door linkage rods so that the fork on the torque tube is aligned to receive the pin on the drag strut.
c. Adjust the linkage rod end fittings so that the doors can not be easily pried open.

CAUTION

Prior to cycling gear, insure that adequate clearance exists between the doors and the static cable pulleys. Insure that the static cable is inside the door.

7-16. SHOCK STRUTS. The shock struts are air-oil and spring type. The air assures proper strut extension prior to landing. The hydraulic fluid absorbs and dampens the shock loads upon landing and the spring carries normal taxi loads. To replenish the strut with hydraulic fluid or replace "0" rings, strut disassembly is necessary. See Figure 7-2 and 7-3.

7-17. REPLACING FLUID AND SEAL, MAIN GEAR SHOCK STRUT.

NOTE

Upper strut assembly and piston need not be removed from aircraft.

a. Place aircraft on jacks.
b. Release strut air pressure.
c. Remove brake line fitting.
d. Remove static cable.
e. Remove lower scissors attach bolt.
f. Remove lower strut assembly.
g. Remove snap ring and retainers and wiper seal.
h. Install new "0" ring.
i. Fill lower strut assembly with 14 ounces of clean 5606 red hydraulic fluid and insert into the upper strut assembly.
j. Install new wiper seal and replace retainer(s) and snap ring.
k. Connect scissors, static cable, and brake line.
1. Inflate strut with compressed air to 35 psi.
m. Bleed brake system.

NOTE

If excessive side play is noted between the upper and lower strut assembly, contact factory for strut overhaul instructions.

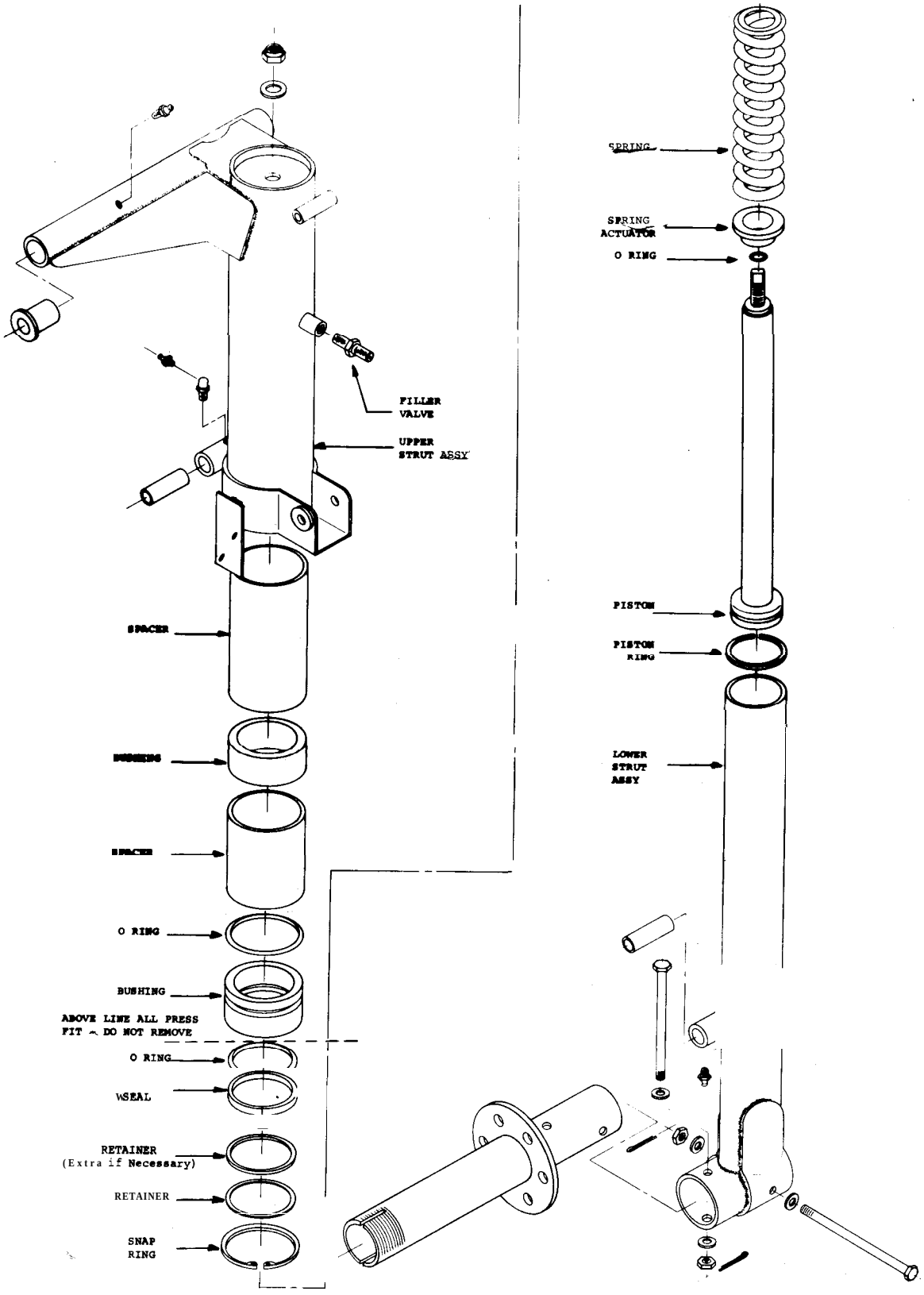


Fig. 7-2 **Main Gear Assy.**

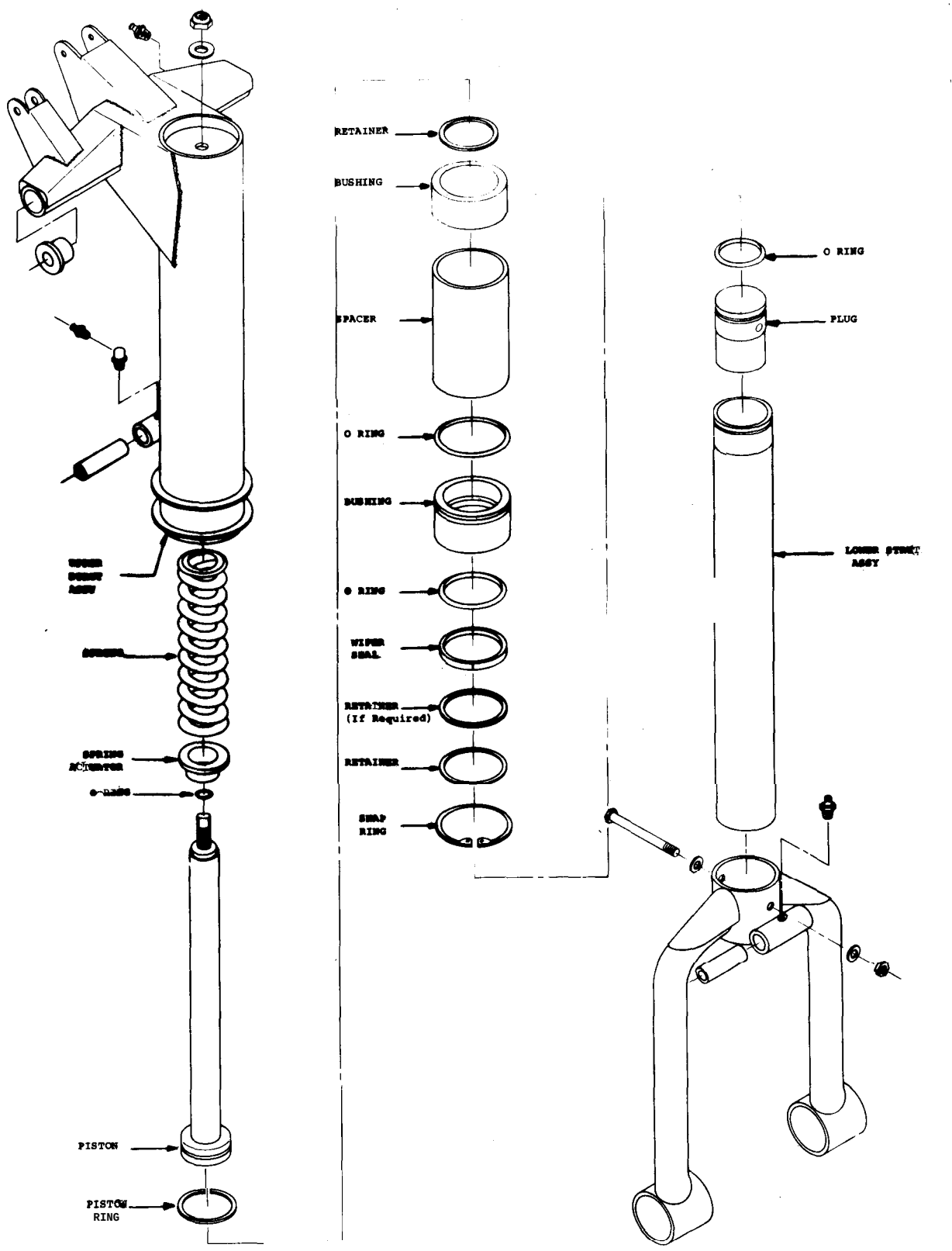


Fig. 7-3 Nose Gear Assy.

7-18. REPLACING FLUID AND SEALS, NOSE GEAR STRUT.

NOTE

Upper strut assembly and piston need not be removed from aircraft.

a. Place aircraft on jacks.
b. Release strut air pressure.
c. Remove lower scissor attach bolt.
d. Remove snap ring.
e. Remove lower strut assembly.
f. Remove retainer ring at top of lower strut.
g. Replace "O" rings and install bushings, spacer, retainers, and snap ring in proper sequence.

NOTE

If excessive side play is noted between the upper and lower strut assembly, replace both strut bushings.

h. Fill lower strut assembly with 15 ounces of clean 5606 red hydraulic fluid and insert into the upper strut assembly.
i. Install new wiper seal and replace retainer(s) and snap ring.
j. Replace scissors and bolt.
k. Inflate strut with compressed air to 60 psi.

7-19. WHEEL ALIGNMENT. The main gear wheels should be aligned with the longitudinal axis of the aircraft with the aircraft resting on the landing gear, for maximum tire wear. Adjust wheel alignment with different spacer thicknesses between the strut scissor linkage.

7-20. HYDRAULIC POWER PACK. The power pack is located under the front seats and consists of, 1) reversable electric motor; 2) reservoir, and; 3) sequencing and check valves. No field repair or adjustment to system is recommended.

7-21. POWER PACK RELAYS. Two power solenoid relays, one for each direction of the landing gear, are located under the front seat to the left of the power pack. A switch relay for the solenoid relays is located behind the instrument panel outboard of the gear warning horn interrupter relay.

NOTE

The press-to-test relay and the gear switch relay are interchangeable. One may be checked against the other to determine the faulty relay.

7-22. REMOVAL AND INSTALLATION OF POWER PACK.

a. Place aircraft on jacks with gear in the down position.
b. Remove front seats.
c. Disconnect hydraulic lines connecting the power pack to the aircraft system.
d. Disconnect electrical wires (note location for reinstallation) connecting power pack to aircraft.
e. Remove three bolts securing the power pack mounting bracket to the aircraft.
f. Lift out power pack unit.
g. Install using the reverse procedures for removal.

7-23. BRAKE SYSTEM. The brakes are self-adjusting, hydraulic-disc type operated off the rudder pedals. Toe brakes on the copilot's rudder pedals are optional.

7-24. MASTER BRAKE CYLINDER ADJUSTMENTS.

a. Adjust master cylinder end fittings so the two threads show between fork fitting.
b. Adjust slave cylinders (copilot's side) so that the end fitting is bottomed out.

7-24. TROUBLESHOOTING LANDING GEAR SYSTEM.

1. Gear will not retract, power pack motor does not run.

Probable Cause	Solution
a. Power pack circuit breaker out.	a. Reset circuit breaker.
b. Broken squat switch or loose wire.	b. Replace switch or connect wire.
c. Low strut air pressure, strut not extending for enough to contact squat switch.	c. Service strut.
d. Defective auto-axtion gear override switch on throttle.	d. Replace switch.
e. Defective solenoid relay.	e. Replace switch.
f. Defective gear switch relay.	f. *Replace switch.
g. Defective power pack motor.	g. Replace or repair motor.

*Switch relay and press-to-test relay are interchangeable. Replace one with the other to determine if defective.

2. Gear will not retract, power pack motor runs.

Probable Cause	Solution
a. Dump valve defective or in open position.	a. Close valve or replace power pack.
b. Defective static cables.	b. Replace satic cables.
c. Broken hydraulic line.	c. Repair a replace line.

3. Gear retracts, but does not stay up power pack cycles. (1 to 2 times per hour is normal).

Probable Cause	Solution
a. External leak in system (lines and actuating cylinders).	a. Find and repair leak.
b. Internal leak in actuating cylinder.	b. Replace seals or cylinder.
c. Leaking shuttle valve (external and separate from POWER pack).	c. Replace seals or valve.
d. Leaking dump valve.	d. Replace seals or dump valve.
e. Loss of accumulator pressure.	e. Service accumulator.
f. Internal leak in power pack.	f. Replace power pack.

4. Gear retracts, but circuit breaker pops.

Probable Cause	Solution
a. Pressure switch defective.	a. *Replace switch.

*Check pressure switch operation by installing a gauge, 0 to 1500 psi, to "up" side. Switch should open between 1300 to 1500 psi.

5. Nose gear retracts, but main gear only partially retracts.

Probable Cause	Solution
a. Broken static cable.	a. Replace static cable.
b. Excessive air pressure in main gear struts.	b. Service struts.

6. Strut loses air pressure, no visible hydraulic leak.

Probable Cause	Solution
a. Defective inflation valve.	a. Replace valve.
b. Leaking "0" ring at top of piston stem.	b. *Replace "0" ring.

*When replacing "0" ring, the piston must not turn as the nut is tightened on the new "0" ring will be damaged.

INTENTIONALLY

LEFT

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7-25. EARLIER VIKING GEAR SYSTEM INFORMATION. Bellanca airplanes (s/n 30123 through 30230 model 17-30), (s/n 32-1 through 32-13 model. 17-31), and (s/n 31001 through 31003 model 17-31TC) have an electric -hydraulic system for landing gear operation. This system consists of an electric motor driving a hydraulic pump and three landing retraction cylinders. The pump and motor are combined with a reservoir to form a power pack. A lever switch on the instrument panel controls the operation of the power pack. Limit switches control the limits of the gear travel. These switches are connected in parallel so that all switches must be actuated before an indication is given that the gear is in its proper position.

When the panel lever is placed in the up position, the motor starts to force fluid to the up side of all the landing gear cylinders. (Since all the lines are connected together, the gear with the least resistance will retract first.) As the gears come up, they will depress their respective limit switches. When all three switches are depressed the motor will stop and the red "All Unlocked" light will go off. The pump is internally valved to maintain the up pressure. If a cylinder is leaking (internally or externally) the motor will restart as soon as any gear opens a limit switch. If the limit switches are not properly adjusted, the motor may fail to stop and cause the circuit breaker to open or the gears may not be snug in the wheel wells after retraction. For a condition where the gear is not snug in the wheel well, pull on each wheel with the gear in the up position, to determine which limit switch needs adjusting. If the motor fails to start when the wheel is given a sharp pull, the limit switch needs adjusting. In the case of the motor failing to stop, readjust each limit switch starting with the nose wheel until the motor operates properly. Care should be taken not to adjust the gear too snug, as a steep turn in flight will cause the motor to operate.

Gear down operation differs from gear up in that the pump is not internally valved to maintain down pressure. To maintain down pressure, the system is provided with a check valve and a solenoid valve. The solenoid valve must operate to retract the gear. If the solenoid valve fails to function the down pressure is maintained and the gear cannot retract. The down limit switch should be adjusted to start the motor if the retraction strut breaks overcenter. This overcenter adjustment should be 1/16". Overcenter travel can be measured by stretching a string between the centerline of the pivot bolts.

Electric hydraulic gear retraction and extension on model 17-30 (s/n 30241 through 30262), model 17-31 (s/n 32-14), model 17-30A (s/n 30263 through 30324), model 17-31A (32-15 through 32-34), model 17-31ATC (s/n 31004 through 31012) works and is rigged similar to the serials previously described except there is no hydraulic down lock, but over-center travel was increased to .25". This system has greater operating reliability and gear down switch rigging does not have to be as precise as the previous system. The feature is retained that if the contacts are opened on any of the three down limit switches, the motor is energized and the gear is pumped down. Because of the lack of down pressure, caution should be exercised not to bump the retraction link over center when the airplane power is off. A third system, now in use, and similar to the second system, uses a hydraulically operated pressure switch to end the up cycle. This system completely eliminates up rigging of the gear retraction.

Emergency extension of the landing gear is provided by a dump valve which relieves the pressure from the up side back to the reservoir. No bleeding of the system is necessary after using the emergency extension.

Should a leak develop at a cylinder causing a loss of fluid to a point affecting gear operation, the system should be bled. Fluid can be checked or added to the reservoir by removing the screw at the forward right corner of the reservoir, Do not remove the screw labeled "vent" that is adjacent to, but higher than, the filler screw. A plastic squeeze bottle with a short hose works very well to add fluid.

Most Bellanca models with the electric-hydraulic retraction feature "auto-axtion" automatic gear extension which will lower the gear for landing if the pilot fails to do so.

The automatic gear extend system consists of a pressure switch connected to the pitot system. When speed falls below a predetermined amount (95 to 115 mph, depending on serial) and the gear switch has not been moved to the down position, the pressure switch will energize the gear extend system and extend the gear automatically. If the automatic mode has been used, the red "unlocked-all" light will remain on when the gear is down and locked, as a warning that the gear speed is below the automatic extend speed if the gear motor circuit breaker has popped, and shows that automatic action was called for. The automatic extend cannot occur; however, unless power is supplied to the motor. Position of this circuit breaker and unusual indicator light patterns should be a part of the routine cockpit check.

Means has been provided to override the automatic system so the gear can be retracted after take-off at speeds below the automatic extend speed. Earlier serials feature a momentary "on" button located below the gear switch. When the button is held in, the system is being overridden. On later serials, the automatic system is overridden when the throttle is in the full open position.

A safety "squat" switch was also installed, beginning with serials 30281, 32-31, and 31008. This switch is located on the right main gear and will prevent operation of the retraction system until the weight is off of the gear and the gear is fully extended. This serves to prevent inadvertent gear retraction on the ground.

Landing Gear Rigging Procedure

Nose Gear Adjustment:
Disconnect nose gear steering rods from nose gear and set nose gear and rudder on the center line of fuselage. Tape a bar or stick across all four rudder pedals, then adjust nose gear sterring rods to fit nose gear, checking to be sure the nose gear wheel is still aligned with the center line. If this checks, insert bolts back in steering rods.

Check rudder for alignment and rudder pedals for alignment. If rudder or rudder pedals do not line up, adjustments on the rudder cable turnbuckles may be made.

Bleeding Procedure:
Place aircraft on jacks, remove top cowl and remove plug from the firewall reservoir. Raise both front seats and remove the center cover between the seats, then remove the 1/8" plug located on the top of the power pack cover. Use two wrenches, one to hold the base plug and one to remove the 1/8" pipe plug. Loosen the hydraulic line fitting running from the firewall reservoir to the firewall (this should be loosened at the firewall and not at the reservoir), and service the hydraulic power pack located under the front seat, by filling the firewall reservoir. the 1/8" plug on the top of the hydraulic power pack should be removed to ascertain when the power pack is full with fluid being run through the firewall reservoir until it comes out the top of the hydraulic power pack. Insert the 1/8" plug and fill the firewall reservoir to the mark indicated on the side of the reservoir. The line that was loosened previously should now be tightened and the reservoir plug reinstalled.

With the gear lever in the neutral position and the gear in the down and locked position, loosen the down line connection on all cylinders. Place the gear selector handle in the up position and slowly pump the emergency gear handle several times until air is expelled from the cylinders, and then tighten all lines.

Now raise the gear to the full up and locked position with the hand pump until the selector handle returns to the neutral position. With the gear in the up position loosen the up lines at the hydraulic cylinders. The weight of the gear coming down will expell the air from the cylinders. Pump the gear handle slowly several times, as this will expell the air from the lines themselves. After taking each gear through this cycle, tighten each line as a gear is bled. To check the gear to be sure that all lines and cylinders are free from air, put the gear in-the up position and obtain a red light on the gear indicator. Then apply down pressure to the nose gear by pulling down on the gear. If the gear is solid and does not come down any, the system is usually free of air. If the nose gear can be pulled down any, the system has not been purged of all the air and it will be necessary to repeat the above bleeding procedure. After the gear is bled and is satisfactory, then check the fire-wall reservoir and power pack and if fluid level is low, service as previously mentioned.

If landing gears bleed down in flight, place aircraft on the jacks and remove the up gear lines completely from the hydraulic cylinders. Then place gear handle in the down position and pump the gear handle until the gear selector handle returns to the neutral position or fluid comes from a cylinder or one of the lines. If fluid comes from a cylinder, this indicates an internal "O" ring is out in the cylinder. If fluid comes from a line, this indicates an "O" ring seal is out in the hydraulic power pack itself, and the power pack' should be replaced. The seal on the power pack lid should not be broken or removed as to do so will void the warranty on the power pack.

SECTION VII

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SECTION VII

LANDING GEAR SYSTEM

7-1. INTRODUCTION. This section contains a description of the landing gear, landing gear cycles, and landing gear indicators and safety devices. Service procedures for the landing gear and brake system are included. Specifications that apply to the landing gear system are contained in Table 7-1.

7-2. DESCRIPTION. The retractable, tricycle landing gear is hydraulically actuated by an electrically driven, reversible hydraulic pump. The power pack, which includes the motor, pump and reservoir is located under the front seat along with the accumulator, and hydraulic pressure switch.

7-3. RETRACTION CYCLE. When the gear switch is placed in the UP position, the power pack develops hydraulic pressure on the up side of the actuating cylinders and vents hydraulic fluid on the down side back to the reservoir.

a. Aircraft Serial Numbers 30325, 32-35, and 31013 and above. When the gear is fully retracted, hydraulic pressure continues to build up to 1450 psi at which time the pressure switch shuts off the power pack. A zero-leakage shuttle valve in the power pack prevents any pressure bleed off eliminating any need for mechanical up locks. The accumulator prevents the power pack from frequent cycling should minor leakage occur.

b. Aircraft Serial Numbers 30324, 32-34, and 31012 and below. When the gear is fully retracted the power pack continues to run until all of the three up limit switches, one located on each drag strut, are contacted. When the last up limit switch is contacted the power pack shuts off.

NOTE

The landing gear will not retract unless the ground safety SQUAT switch, located on the right main strut, is depressed, and either the throttle control is in the full open position or the indicated airspeed is above 110 to 115 mph.

7-4. RETRACTION CYCLE HYDRAULIC PRESSURES. Figure 7-1 shows the system pressures during the four phases of the retraction cycle. The first phase is the retraction of of the nose gear. The hydraulic pressure must build to 350 psi to overcome the overcenter spring downlocks for both the nose and the main gear. At that point, the system pressure drops back to 300 psi as the nose gear retracts and falls to approximately 200 psi at the end of the nose gear cycle.

The second phase of the retraction cycle is the retraction of the main gear. As noted above, the downlock spring is overcome at approximately 350 psi, however, to retract further requires higher pressures. The main gear retracts through the first 45 degrees of motion somewhat slowly, as the pressure builds from the initial 350 psi to approximately 800 psi. The last 45 degrees of motion occur rapidly at a pressure of between 800 and 900 psi. Due to small differences in the forces required, the two main gear wheels normally retract slightly out of phase with each other.

The third phase of the retraction cycle is the closing of the nose gear doors for those aircraft so equipped. This phase begins when the pressure exceeds 800 psi. Thus, the second and third phases overlap somewhat with the nose gear doors starting to close before the main gear is fully retracted. The nominal door closing cycle pressure is approximately 900 psi to 1000 psi, therefore, most of the cycle occurs after the main gear is fully retracted.

During the final phase of the retraction cycle, the system pressure builds up to 1450 psi and the power pack shuts off. The pilot operated check valve closes and holds the up pressure. If the system pressure drops below 1200 psi, the pressure switch cycles the power pack to rebuild the up pressure.

The return fluid pressure in the down lines is less than 10 psi throughout the retraction cycle.

7-5. EXTENSION CYCLE. When the gear switch is placed in the DOWN position, the power pack develops hydraulic pressure on the down side of the actuating cylinders, and vents hydraulic fluid on the up side back to the reservoir. The power pack continues to run until all of the three limit switches, one located on each drag strut, are depressed by the overcenter drag struts. When the last down limit switch is contacted the power pack shuts off.

Table 7-1. Landing Gear Specifications

Auto-Axtion Trip Speed	95-100 mph IAS
Landing Gear Warning Horn	12" to 14" at 3000 MSL
Gear Retraction Limit	12-17 seconds
Hydraulic Pressure Shutoff Switch	1300-1500 psi
Accumulator Pressure	800-900 psi nitrogen
Nose Gear	
Overcenter Down Lock	1/4" to 5/16" overcenter
Down Limit Switch	1/8" to 5/32" overcenter
Shock Strut Hydraulic Fluid	15 oz. MIL-H-5606A
Tire Pressure	35 psi
Shock Strut Pressure	60 psi on jacks 100 psi on gear
Lubricant	
Wheel Bearings	MIL-G-81322
Grease Fittings	MIL-G-81322
Main Gear	
Overcenter Down Lock	1/4" to 5/16" overcenter
Shock Strut Hydraulic Fluid	14 oz. MIL-H-5606A
Hydraulic Brake Fluid	MIL-H-5606A
Tire Pressure	55 psi
Shock Strut Pressure	35 psi on jacks 70 psi on landing gear
Lubricate	
Wheel Bearings	MIL-G-81322
Grease Fittings	MIL-G-81322
Down Limit Switches	
(Aircraft Serial Numbers 30281, 32-31 and 31008 and below).	
Left Main	1/8" to 5/32" overcenter
Right Main	1/8" to 5/32" overcenter
(Aircraft Serial Numbers 30282, 32-32 and 31009 through Aircraft Serial Numbers 74-30616, 74-32-129 and 74-31076).	
Left Main	1/8" to 5/32" overcenter
Right Main	As close to full overcenter travel of 1/4" to 5/16" as possible (see paragraph 7-29).
(Aircraft Serial Numbers 74-30617, 74-32-130 and 74-31077 and above)	1/8" to 5/32" overcenter
Left Main	1/8" to 5/32" overcenter
Right Main	

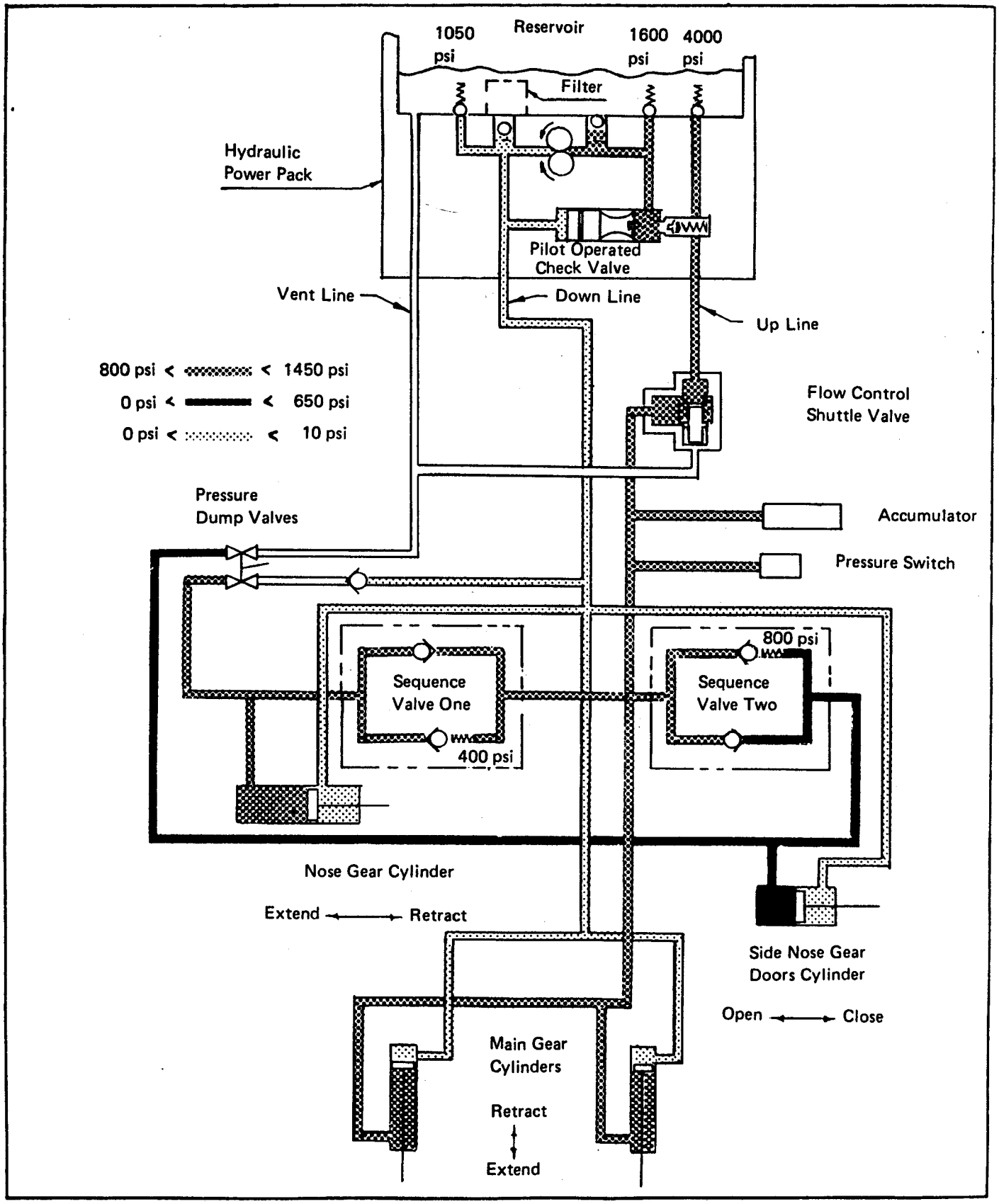


Figure 7-1. Hydraulic Pressures During Landing Gear Retraction. Aircraft Serial Numbers 79-30906 and above. (Sheet 1 of 2)

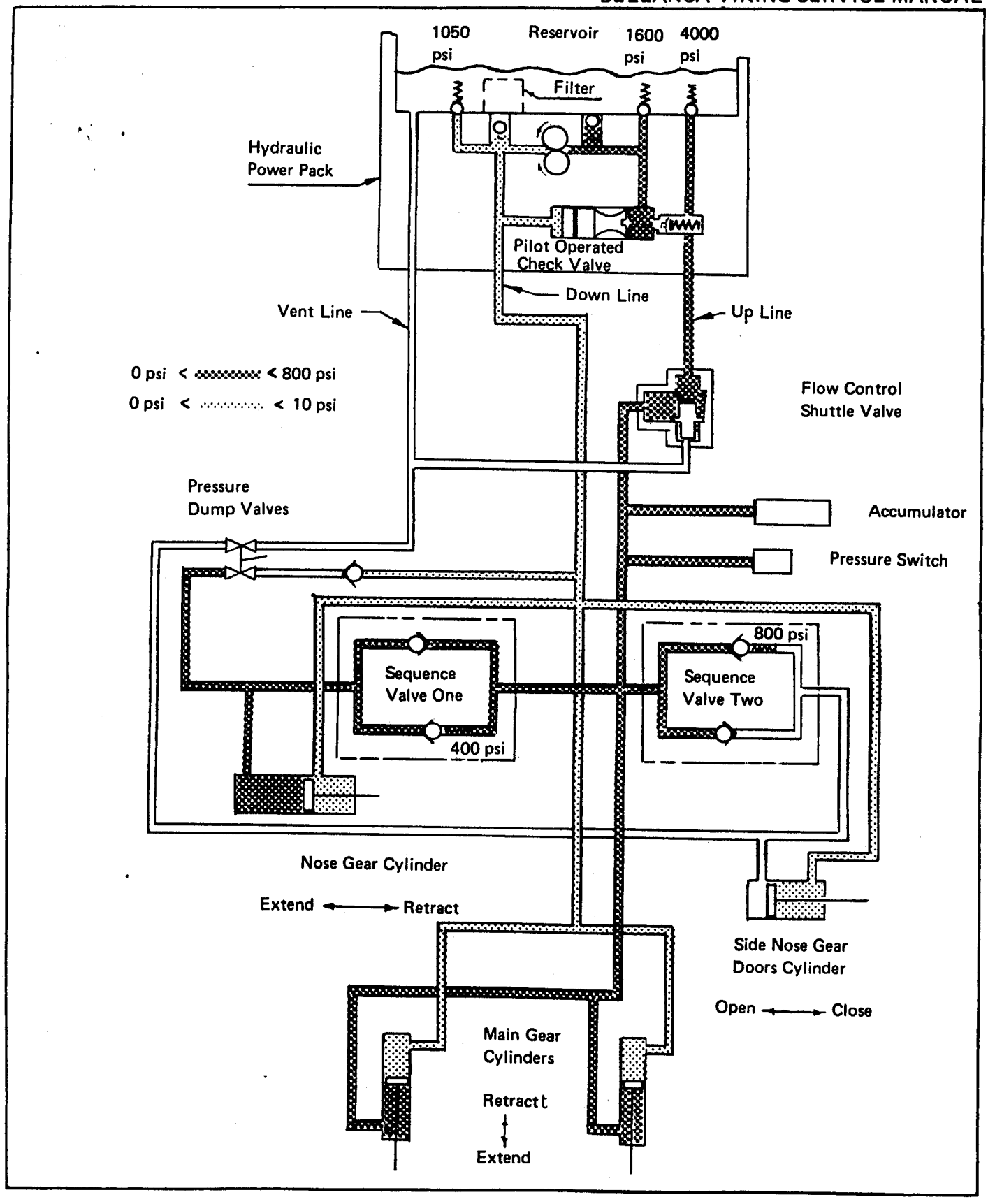


Figure 7-1. Hydraulic Pressures During Landing Gear Retraction. Aircraft Serial Numbers 79-30906 and above.(Sheet 2 of 2)

a. Aircraft Serial Numbers 30413, 32-54, and 31029 and above. The overcenter position is the down lock. There is no hydraulic pressure once the power pack shuts off.

b. Aircraft Serial Numbers 30412, 32-53, and 31028 and below. A solenoid valve is connected in parallel with the motor in the power pack. When the power pack shuts off, the solenoid valve closes and locks hydraulic fluid under pressure in the down side of the actuating cylinders and lines.

7-6. EXTENSION CYCLE HYDRAULIC PRESSURES. Figure 7-2 shows the system pressures during the four phases of the extension cycle. The first phase of the extension cycle is the extension of the main gear. During this portion of the cycle, the main gear basically free falls and the hydraulic power pack pump is free running without generating any appreciable pressure. As the main gear falls, it pressurizes the return fluid in the up lines to approximately 1000 psi for the first few seconds and 250 psi for most of the main gear extension cycle. This back pressure tends to hold the free flow check valve in sequence valve two closed, and retards the doors (for those aircraft so equipped) from opening until the main gear is fully down. This back pressure also holds the flow control shuttle valve in its open position so that flow returns to the pump through the pilot operated check valve. The hydraulic power pack pump must generate enough pressure in the down lines (50-70 psi) to hold this check valve open against the back pressure or the main gear would remain hydraulically locked.

The second phase of the extenison cycle is the opening of the nose gear doors (for those aircraft so equipped). The pump down pressure is approximately 30 psi during this part of the cycle with the return flow pressure starting at approximately 50 psi and dropping to 10 psi near the end of the cycle. The return flow pressure drops low enough that the flow control shuttle valve will return to its normal position, and return flow will be directly to the reservoir.

On Aircraft Serial numbers 79-30906 and above, during the third phase of the extension cycle, the hydraulic power pack pump must build up approximately 400 psi to open the 400 psi pressure relief valve in sequencing valve one. This pause, while the pressure builds, allows the return flow pressure to drop to less than 10 psi and if the flow control valve has not returned to its normal position during the door cycle, it does so at this time. The pump holds the 400 psi during the nose gear cycle until the overcenter switch shuts off the power pack.

The final phase of the down cycle is the pressure equalization throughout the system. The pressure in the down lines drops to approximately 50 psi in 20 seconds and drops to zero during the next hour. The pressure on the up side of the nose gear cylinder between the cylinder and sequence valve one is 400 psi at the end of the cycle this pressure drops to approximately 140 psi when the cylinder rebounds slightly. The cylinder rebound is about 1/32 inch, and results in no movement at the gear leg due to the free play in the rod ends and leakages. This residual pressure is bled off through the leakage in the sequence valves.

7-7. EMERGENCY EXTENSION CYCLE.(Aircraft Serial Numbers 79-30906, and above). The emergency extension procedure is simply to dump the hydraulic pressure holding the gear up (at a low airspeed). The gear then free falls and locks. The main gear free falls first and pressurizes the up lines to approximately 250 psi during their cycle. This is enough to retard the nose gear extension. As the main gear is free falling, the doors which are dumped separately, are opening at essentially zero pressure. After the main gear is down, the nose gear free falls and also acts as a hydraulic pump. The nose gear pressurizes the up pressure line between the nose gear cylinder and sequence valve one to approximately 150 psi. The down pressure line remains at essentially zero pressure throughout the cycle.

The nose gear extension spring overcomes the aerodynamic drag of the forward gear door and the tire to ensure that the nose gear will free fall and lock during an emergency extension.

7-8. AUTO-AXTION OPERATION. The auto-axtion is a pilot backup device designed to lower the landing gear automatically regardless of the position of the landing gear switch. If the airspeed falls below 95-105 mph and the throttle is not full open, the landing gear will be extended automatically.

NOTE

The master switch must be ON in order to have electrical power to the hydraulic power pack.

The landing gear will be retracted automatically if the gear switch is left in the UP position and either the airspeed is increased above 110-115 mph or the throttle is positioned to full open. The air pressure sensing switch is located under the instrument panel on the upper left side of the fire wall and is connected to the pitot static system. Adjustment to the switch is not recommended.

CAUTION

The auto-axtion is a backup device only. If a landing is anticipated, the landing gear switch should be in the DOWN position.

7-9. LANDING GEAR INDICATORS AND SAFETY DEVICES.

a. Warning Horn. The warning horn sounds whenever the gear is not down and locked and the throttle is positioned at approximately 12 to 14 inches manifold pressure. The sound of the horn becomes intermittent after the initial 5 seconds so as not to be confused with the stall warning horn. The horn interrupter is a vacuum tube type relay and is located behind the instrument panel near the pilot's yoke.

b. UNSAFE Transit Light. The red light above the three gear down indicator lights illuminates whenever the relay for the power pack is energized, or the landing gear is not in the same position as the landing gear switch.

c. Landing Gear Down Lights. The three green indicator lights, one for each of the three gears, illuminate whenever the respective gear micro switch is depressed by the strut being in the overcenter locked position.

d. Press-to-Test. The red UNSAFE indicator light and the three green gear down indicator lights can be checked with the PRESS-TO-TEST switch located on the instrument panel. When the switch is depressed, all four indicator lights should illuminate simultaneously. When the switch is released it will return automatically to the out position and the lights will go out. The press-to-test relay is located behind the instrument panel, inboard of the landing gear horn interrupter. On Aircraft Serial Numbers 79-30906 and above the press-to-test relay was replaced with a diode pack.

NOTE

On Aircraft Serial Numbers 30514, 32-104 and 31046 and below, the indicator lights have an individual press-to-test feature. Each lampholder must be depressed to illuminate the light on this type press-to-test feature. When released, the light will go out.

e. Emergency Extension Lever. The emergency extension lever is located under the fuel selector handle. When the lever is moved to the down position, it mechanically dumps hydraulic pressure in the up side of the landing gear actuating cylinders, allowing the landing gear to free fall to the down and locked position. The landing gear switch should be in the DOWN position before the emergency extension lever is moved down and locked. The dump lever must be manually returned to the up position before the landing gear can be retracted.

f. Squat Switch. The squat switch (on Aircraft Serial Numbers 30281, 32-31 and 31008 and above) is a ground safety switch, and is located on the right main gear. With the weight of the aircraft resting on the landing gear, the power pack cannot be energized.

7-10. STATIC CABLES. A static cable is located on each main gear, and causes the landing strut to compress approximately 4 inches during the retraction cycle. The gear WILL NOT FULLY RETRACT if the cables are not in position, or if the struts are over pressurized.

7-11. REMOVAL OF NOSE GEAR ACTUATING CYLINDER AND DRAG STRUTS.

a. On Aircraft Serial Numbers 79-30906 and above, disconnect the nose gear emergency extension spring using the following procedures (see Figure 7-3).

(1) Attach a cable to the forward end of the emergency extension spring (17) and pull forward on the cable with sufficient force to stretch the spring enough to allow the turnbuckle (18) to be connected to the left upper strut bracket (19).

(2) While holding the cable with spring tension relieved, disconnect the turnbuckle from the left upper strut bracket (19).

(3) Slowly relieve the force being exerted on the cable and remove the cable.

NOTE

Depending on the serial number of the aircraft on which maintenance is performed, refer to Figure 7-3 or Figure 7-8 for identification of parts and perform the following procedures to complete removal of the nose gear actuating cylinder and drag struts.

b. Place the aircraft on jacks and partially retract the landing gear.

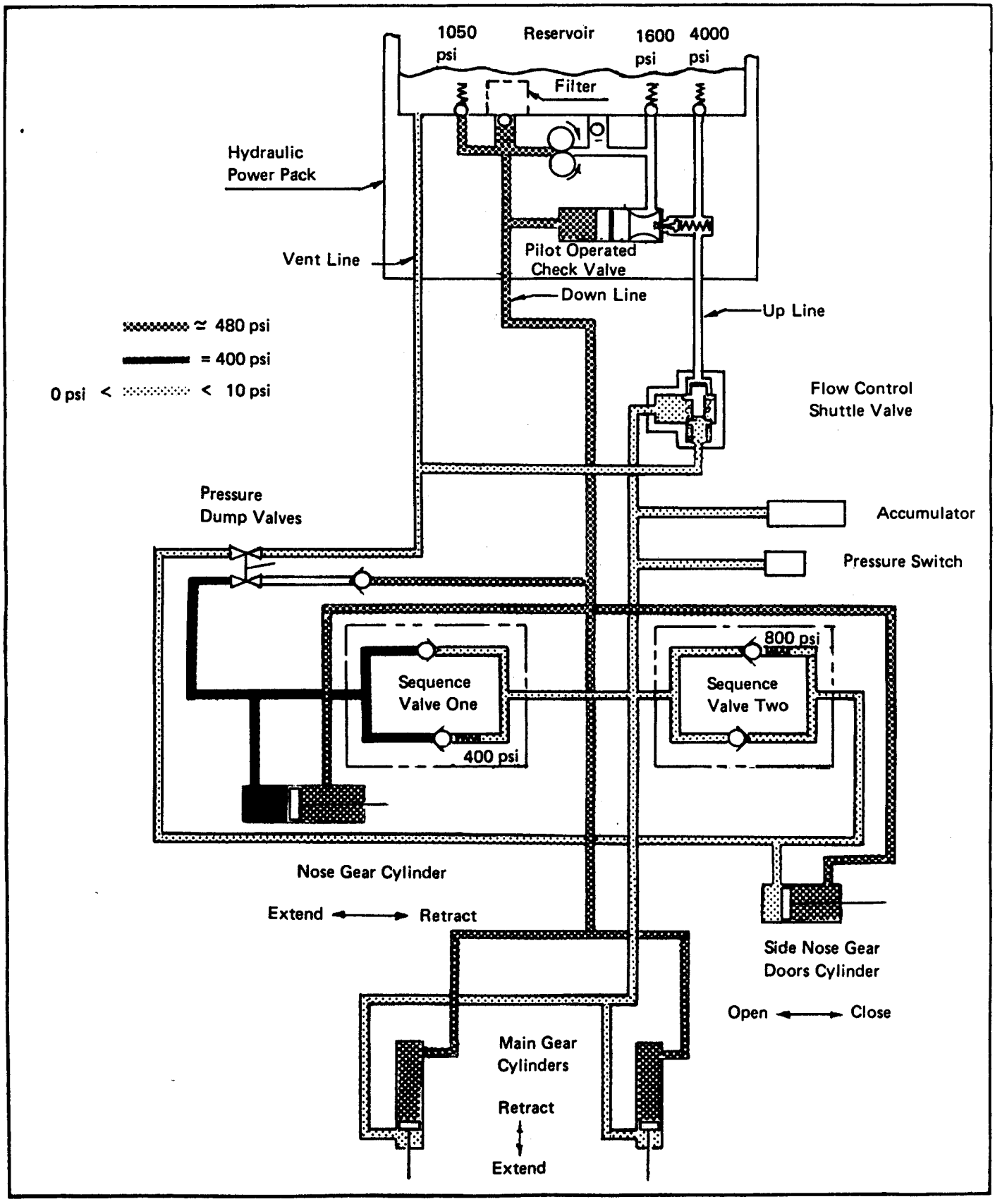


Figure 7-2. Hydraulic Pressures During Landing Gear Extension. Aircraft Serial Numbers 79-30906 and above.(Sheet 1 of 2)

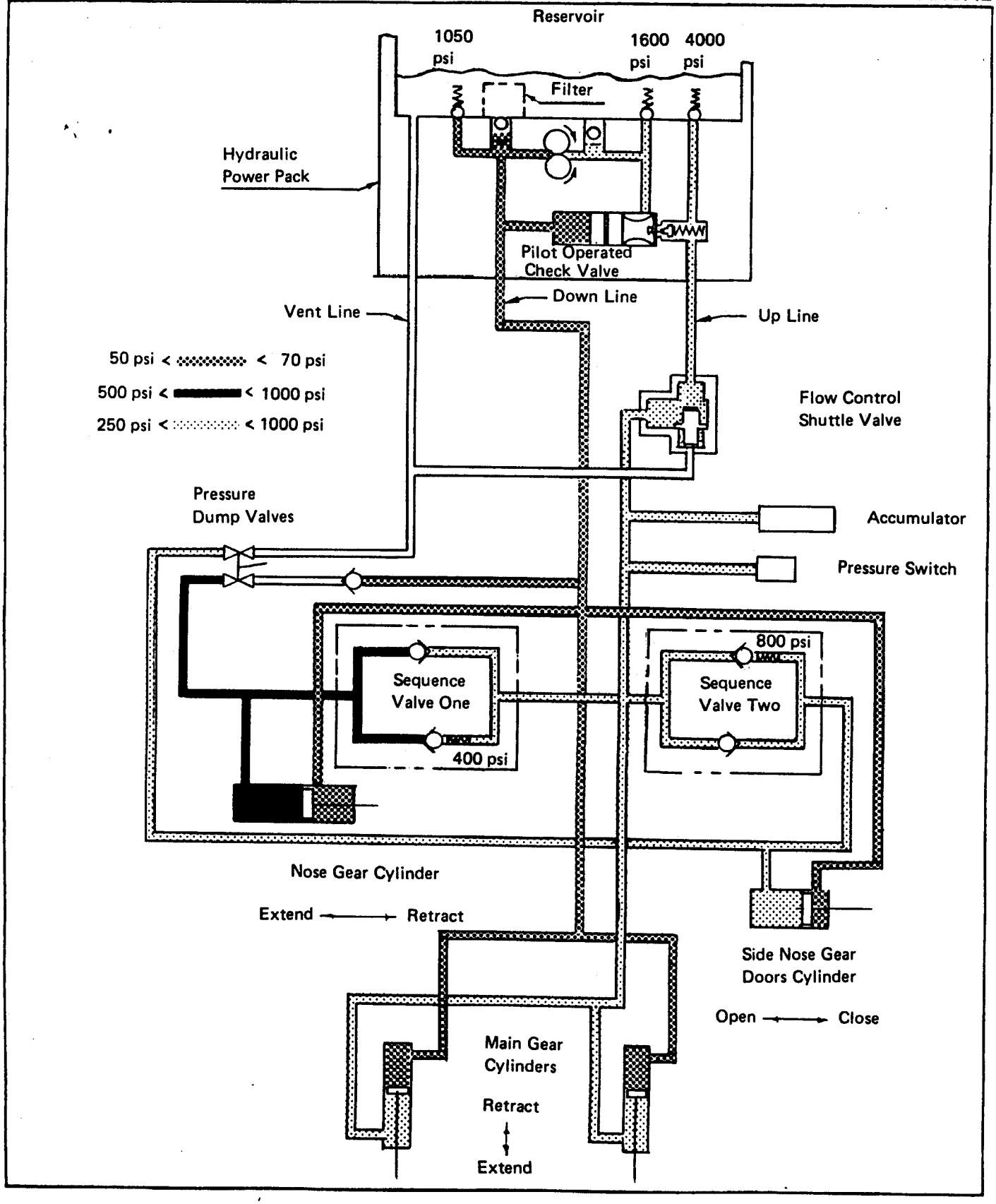
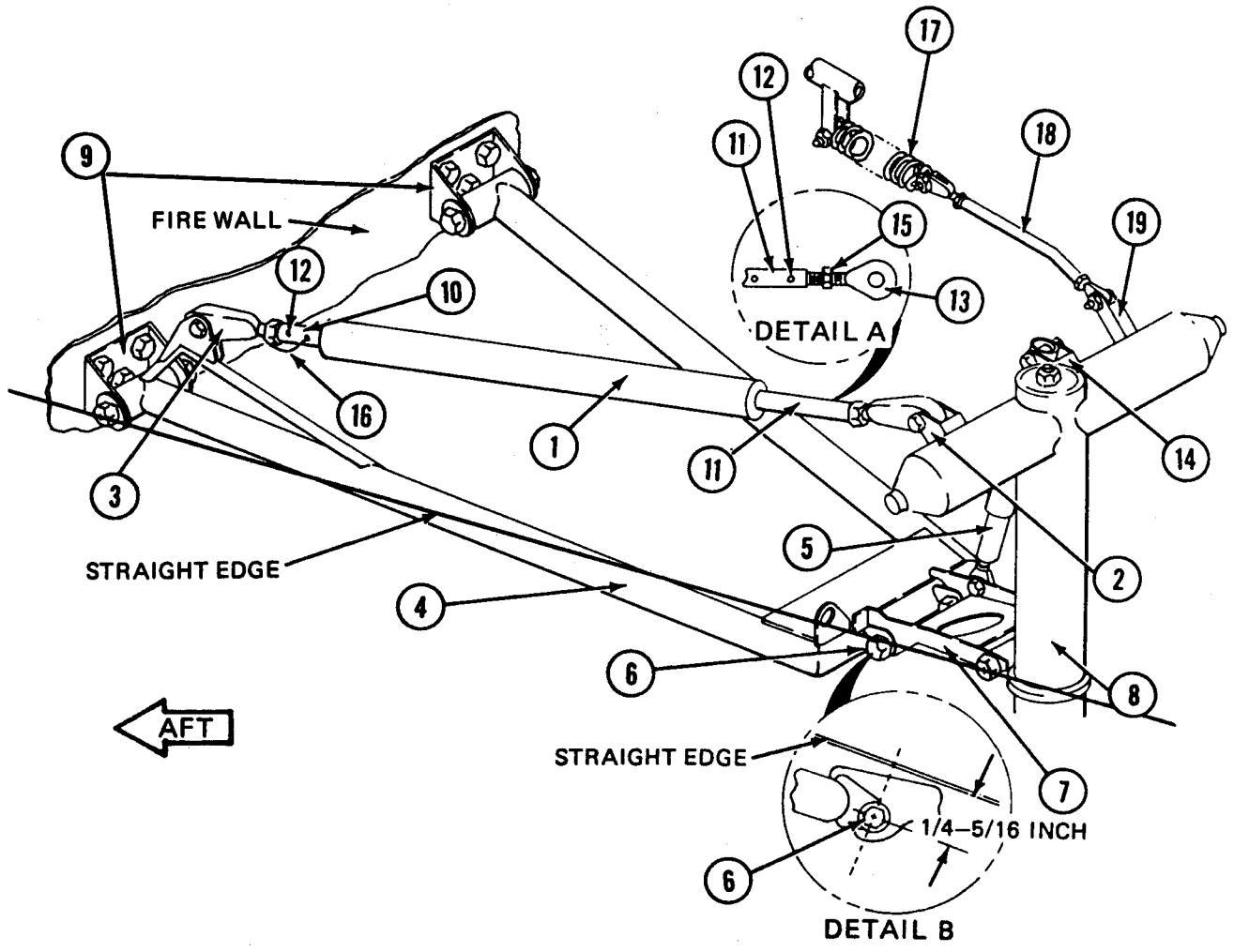


Figure 7-2. Hydraulic Pressures During Landing Gear Extension. Aircraft Serial Numbers 79-30906 and above.(Sheet 2 of 2)



1 Actuating Cylinder
2 Right Upper Strut Bracket
3 Rod End Bearing
4 Upper Drag Strut
5 Extension Spring Assembly
6 Drag Strut Connecting Bolt
7 Lower Drag Strut
8 Nose Gear Assembly Upper Strut
9 Fire Wall Bracket
10 End Plug
11 Shaft
12 Witness Hole
13 Rod End Bearing
14 Center Upper Strut Bracket
15 Jam Nut
16 Safety Wire
17 Nose Gear Emergency Extension Spring
18 Turnbuckle
19 Left Upper Strut Bracket

Figure 7-3. Nose Gear Actuating Cylinder, Drag Struts, and Nose Gear Extension Spring, Aircraft Serial Numbers 79-30906 and above.

NOTE

On Aircraft Serial Number 76-30797 through Aircraft Serial Number 78-30905 the aft end of the nose gear door actuator rods will be disconnected when the top attaching bolt for the extension spring assembly is removed.

c. Remove the bolt attaching the forward end of the actuating cylinder (1) to the right upper strut bracket (2). Manually move, and hold, the nose gear in a position to permit removal of the bolt without binding.

CAUTION

Do not allow the nose gear to free fall to the down position.

d. Lower the landing gear to the full down position using the landing gear selector switch.

e. Disconnect the hydraulic hoses from the actuating cylinder (1).

f. Remove the bolt attaching the aft rod end bearing (3) on the actuating cylinder (1) to the upper drag strut (4), and remove the actuating cylinder.

NOTE

If the extension spring assembly and drag struts require removal, proceed with the following procedures.

g. Remove the attaching bolts at each end of the extension spring assembly (5) and remove the extension spring assembly.

h. Remove the drag strut connecting bolt (6).

i. Remove the lower drag strut (7) by removing the bolt attaching the lower drag strut to the nose gear upper strut (8).

j. Remove the upper drag strut (4) by removing the two bolts attaching the upper drag strut to the fire wall brackets (9).

7-12. NOSE GEAR ACTUATING CYLINDER.

a. On Aircraft Serial Numbers 78-30905 and below, and 32-15,31004 and above, perform the following procedures to disassemble and repair the nose gear actuating cylinder or replace O-rings (see Figure 7-4).

CAUTION

Observe and follow the instructions on the placard on cylinder barrel which states, CYLINDER IS SPRING LOADED - USE CAUTION DURING DISASSEMBLY.

(1) Remove the two hydraulic fittings from the barrel (6, Figure 7-4).

(2) Remove the safety wire from the check nut (2) and shaft (14).

(3) Loosen the check nut (2) and remove the rod end bearing (1) from the shaft (14).

(4) Apply enough force to the end plug (20) to relieve spring pressure against the retaining ring (3) and remove the retaining ring (3).

(5) Carefully release the force against the end plug (20) from the barrel (6).

(6) If spring pressure did not push the end plug (20) off the shaft (14), pull the end plug (20) off the shaft (14).

(7) Remove the spring (19).

(8) Remove the retaining ring (3) and remove the rod end bearing (1), check nut (2) end plug (4), and O-ring (5) from the barrel (6) as an assembly.

NOTE

It is not necessary to disassembly the end plug and rod end bearing assembly if only the O-ring is to be replaced.

(9) Remove the O-ring (5) from the end plug (4).

(10) Remove the shaft (14), spacer (16), piston (10) and lock cap as an assembly.

(11) Remove the lock cap (8) and piston (10) from the shaft (14).

(12) Remove the back-up ring (22) and O-rings (21 and 5) from the end plug (20).

(13) Remove the lock ring (13), back-up ring (12), and O-ring (11) from the shaft (14).

(14) Remove the O-ring (5), and back-up ring (9) from the piston (10).

(15) Inspect all component parts for damage. Particularly, inspect the interior surface of the barrel (6) along which the piston (10) travels, and the O-rings (5) on the piston (10) and end plugs (4 and 20) make contact. The interior surface of the barrel (6) must be smooth. Scores or grooves inside the barrel will allow leakage.

(16) Reassemble the actuating cylinder by reversing disassembly procedures, and perform the following additional procedures during reassembly.

(a) Thoroughly clean all grooves in which O-rings are installed.

CAUTION

Do not use a wire brush or abrasive material for cleaning.

(b) Discard all O-rings and replace with new O-rings.

(c) When the O-ring (11) and back-up ring (12) are installed, do not install them over the threaded end of the shaft (14).

(d) When the piston (10) and lock cap (8) are installed on the shaft (14), use a center punch and stake the cap and shaft in four places (see Figure 7-4, Detail A).

(e) Lubricate the O-rings and surfaces on the inside of the barrel that will make contact with the O-rings, with the same type hydraulic fluid that is used in the system. (see Table 7-1), before assembling components inside the barrel.

b. On Aircraft Serial Numbers 79-30906 and above, perform the following procedures to disassemble and repair the nose gear actuating cylinder or replace O-rings (see Figure 7-5).

(1) Remove the two hydraulic fittings from the barrel (6).

(2) Remove the safety wire from the check nut (2) and shaft (13).

(3) Loosen the check nut (2) and remove the rod end bearing (1) from the shaft (13).

(4) Remove the retaining ring (3) and end plug (16).

(5) Remove the retaining ring (3) and remove the rod end bearing (1), check nut (2), end plug (4), and O-ring (5) as on assembly.

NOTE

It is not necessary to disassemble the end plug and rod end bearing assembly if only the O-ring is to be replaced.

(6) Remove the O-ring (5) from the end plug (4).

(7) Remove the shaft (13), piston (9), and lock cap (7) as an assembly.

(8) Remove the back-up ring (14) and O-rings (15 and 5) from the end plug (16).

(9) Remove the lock cap (7) and piston (9) from the shaft (13).

(10) Remove the lock ring (10), back-up ring (11) and O-ring (12) from the shaft (13).

(11) Remove the O-ring (5) and back-up ring (8) from the piston (9).

(12) Inspect all component parts for damage. Particularly, inspect the interior surface of the barrel (6) along which the piston (9) travels and the O-rings (5) on the piston (9) and end plugs (4 and 16) make contact. The interior surface of the barrel must be smooth. Scores or grooves inside the barrel will allow leakage.

(13) Reassemble the actuating cylinder by reversing disassembly procedures, and perform the following additional procedures during reassembly.

(a) Discard the O-rings and replace with new O-rings.

(b) Thoroughly clean all grooves in which O-rings are installed.

CAUTION

Do not use a wire brush or abrasive material for cleaning.

1. Rod End Bearing
2. Check Nut
3. Retaining Ring
4. End Plug
5. O-ring
6. Barrel
7. Placard
8. Lock Cap
9. Back-up Ring
10. Piston
11. O-ring
12. Back-up Ring
13. Lock Ring
14. Shaft
15. Spring Pin
16. Spacer
17. Bushing
18. Sleeve
19. Spring
20. End Plug
21. O-ring

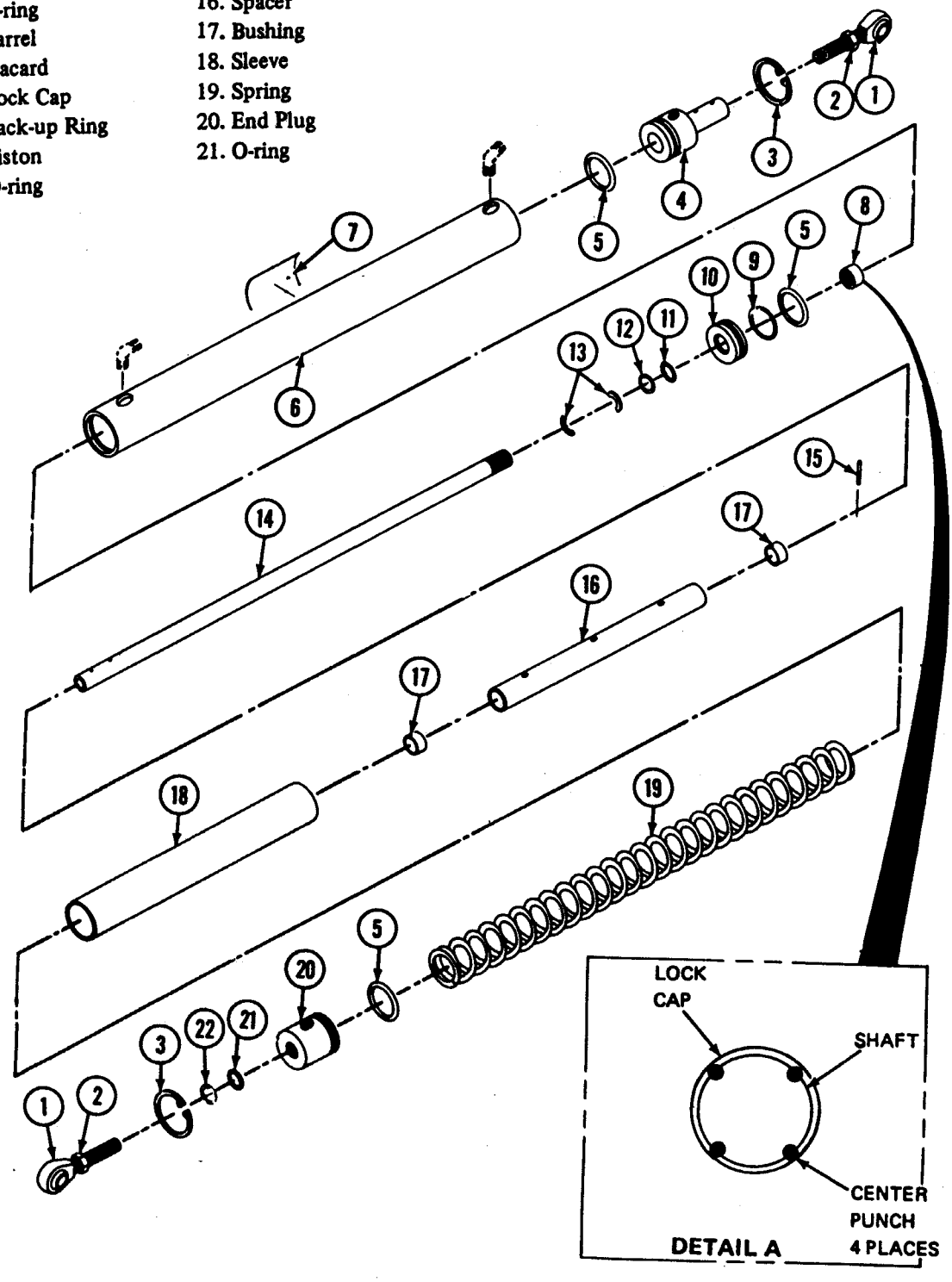


Figure 7-4. Nose Gear Actuating Cylinder Aircraft Serial Numbers 78-30905 and below, and 32-15, 31004 and above.

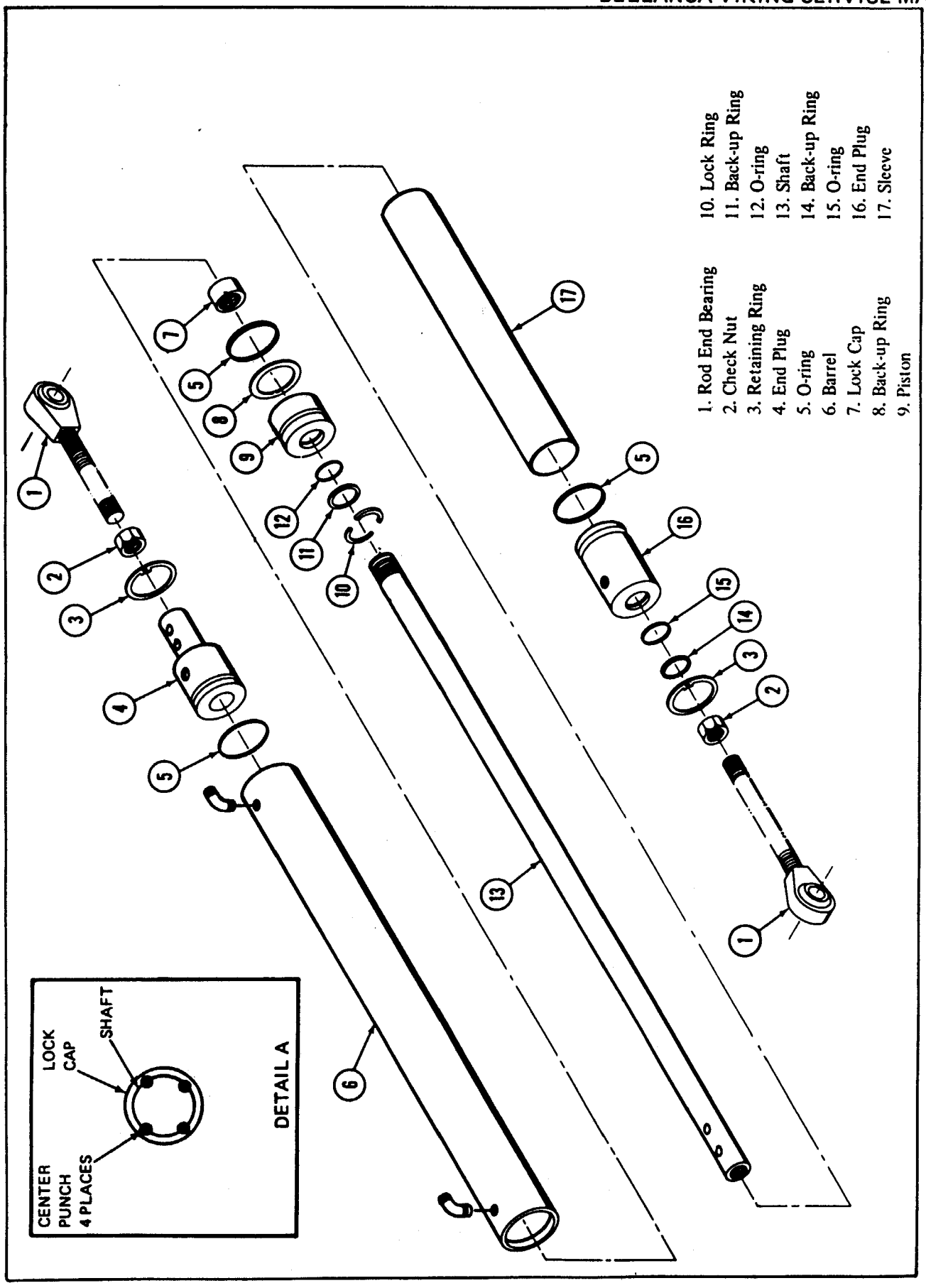
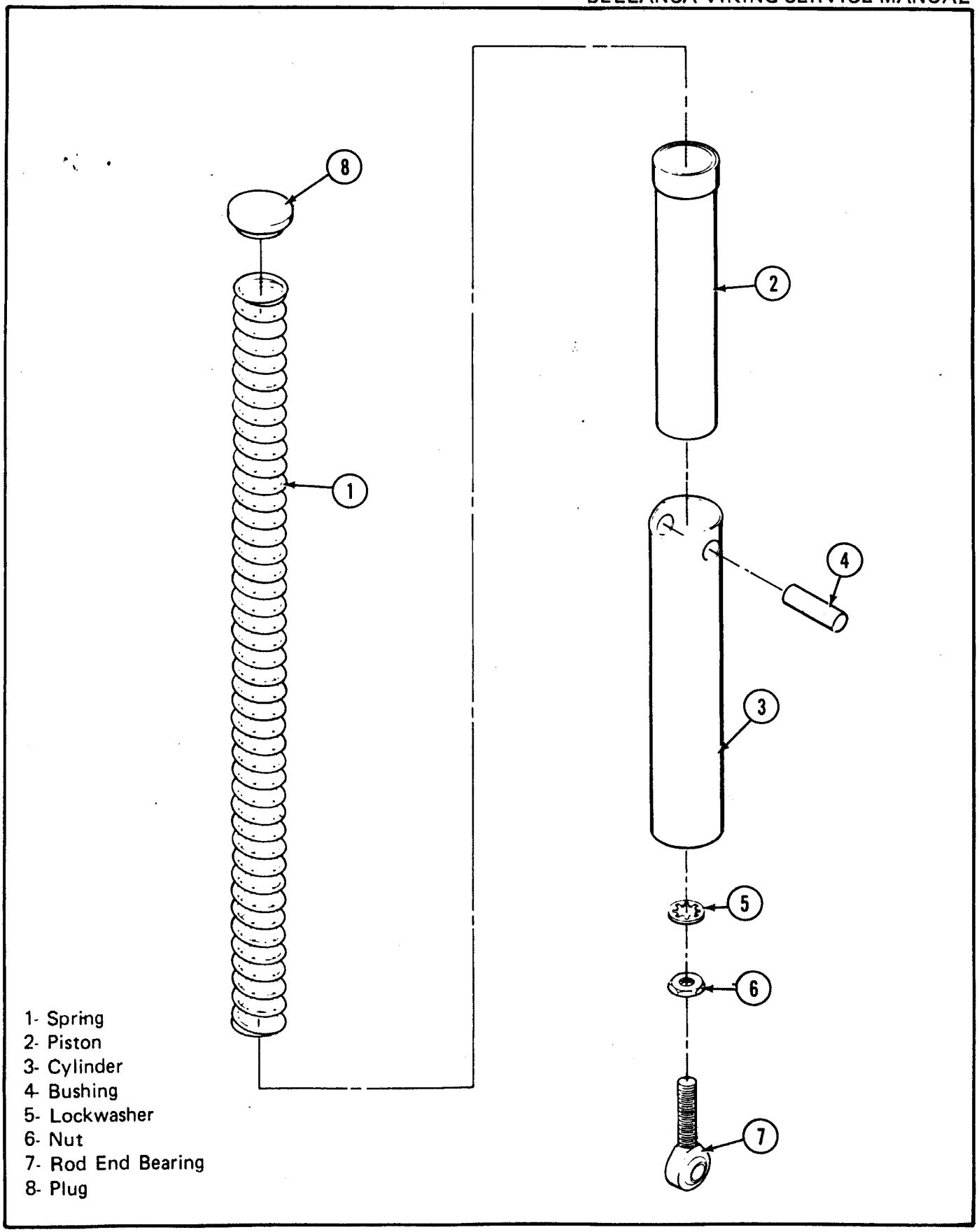


Figure 7-5. Nose Gear Actuating Cylinder. Aircraft Serial Numbers 79-30906 and above.



1- Spring
2- Piston
3- Cylinder
4- Bushing
5- Lockwasher
6- Nut
7- Rod End Bearing
8- Plug

Figure 7-6. Nose Gear Extension Spring Assembly, Aircraft Serial Numbers 78-30905 and below, and 32-15, 31004 and above.

(c) When the O-ring (12) and back-up ring (11) are installed, do not install them over the threaded end of the shaft.

(d) When the piston (9) and lock cap (7) are installed on the shaft (13), use a center punch and stake the cap and shaft in four places (see Figure 7-5, Detail A).

(e) Lubricate the O-rings and surfaces on the inside of the barrel that will make contact with the O-rings, with the same type hydraulic fluid that is used in the system (see Table 7-1), before assembling components inside the barrel.

7-13. NOSE GEAR EXTENSION SPRING ASSEMBLY. On Aircraft Serial Numbers 78-30905 and below, and 32-15, 31004 and above, refer to Figure 7-6, and on Aircraft Serial Numbers 79-30906 and above refer to Figure 7-7 and perform the following procedures to disassemble and repair or replace components of the extension spring assembly.

a. Remove the plug (8).

b. Remove the bushing (4) and spring (1).

c. Loosen the nut (6) and remove the rod end bearing (7) from the piston (2). Remove the lockwasher (5).

d. Remove the piston (2) from the cylinder (3).

e. Clean and inspect all component parts for damage or excessive wear, and replace parts as necessary.

f. Use a new lockwasher and reassemble the extension spring assembly by reversing disassembly procedures.

7-14. NOSE GEAR ACTUATING CYLINDER AND DRAG STRUT INSTALLATION AND ADJUSTMENT. On Aircraft Serial Numbers 78-30905 and below, and 32-15, 31004 and above, refer to Figure 7-8, and on Aircraft Serial Numbers 79-30906 and above refer to Figure 7-3 for identification of parts and perform the following procedures.

a. Install the upper drag strut (4) on the firewall brackets (9).

b. Install the lower drag strut (7) on the nose gear assembly upper strut (8).

c. Connect the upper and lower drag struts by installing the drag strut connecting bolt (6).

d. Check to see that the rod end bearing (3), on the aft end of the actuating cylinder, is turned into the end plug (10) far enough so that threads are visible through the witness hole.

e. Install the bolt connecting the aft end of the actuating cylinder (1) to the upper drag strut (4).

f. Connect the hydraulic lines to the actutating cylinder (1).

g. Turn the rod end bearing on the forward end of the actuating cylinder into the shaft (1) for enough so that threads are visible through the witness hole (12, see Detail A).

h. With the nose gear fully extended, align the forward rod end bearing (13) with the right upper strut bracket (2) to permit inserting the connecting bolt, then remove the bolt.

i. Turn the forward rod end bearing (13) into the shaft 1/8 to 5/16 inch (see Detail A).

NOTE

This will ensure that the actuating piston does not bottom out against the end plug.

j. Extend the shaft (11) of the actuating cylinder (1) approximately 1 inch by operating the landing gear switch.

k. Manually rotate the nose gear to align the forward rod end bearing with the nose gear right upper strut bracket (2) and install the connecting bolt.

l. Connect the upper end of the extension spring assembly (5) to the center bracket on the nose gear upper strut (14).

m. With the extension spring assembly extended until it is bottomed out, adjust the extension spring assembly end bearing so that the drag struts are overcenter 1/4 to 5/16 inch.

n. Check the overcenter travel as follows.

(1) Align a straightedge with the center of the bolt connecting the upper drag strut to the firewall bracket and the center of the bolt connecting the lower drag strut to the nose gear upper strut (see Detail B).

(2) Measure the distance between the straightedge and the center of the drag strut connecting bolt (see Detail B). The distance must be 1/4 to 5/16 inch.

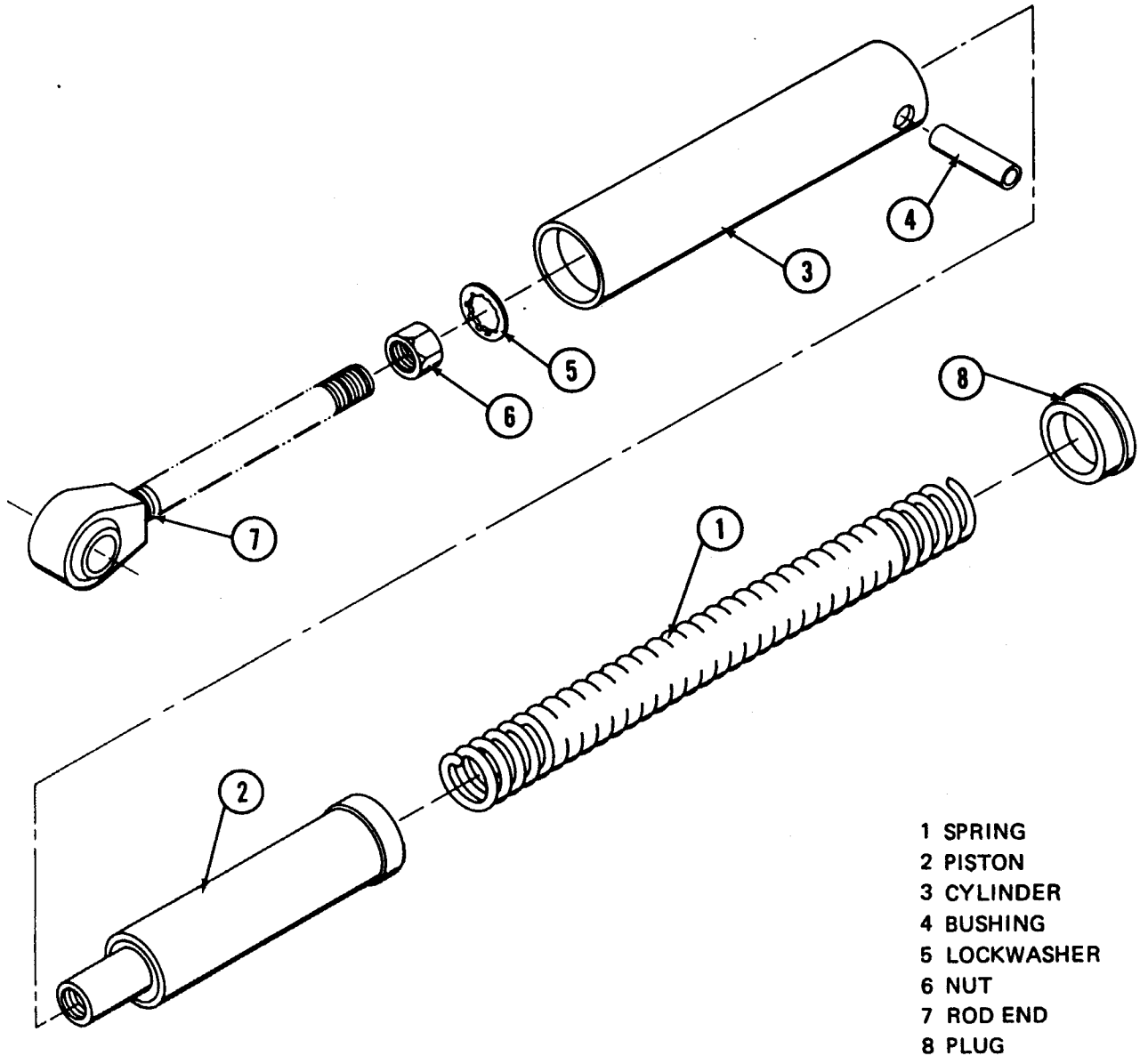
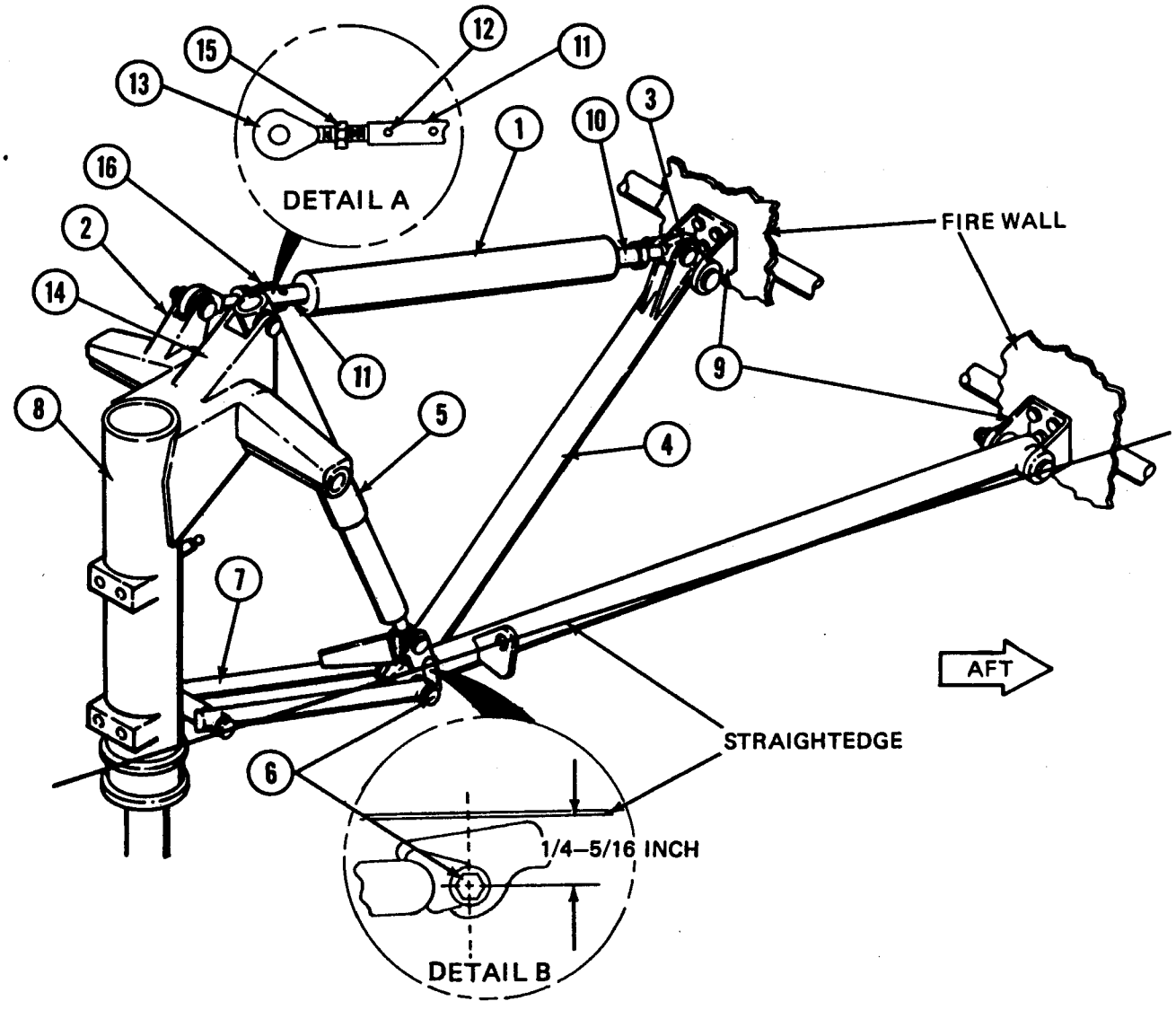


Figure 7-7. Nose Gear Extension Spring Assembly, Aircraft Serial Numbers 79-30906 and above.



1 Actuating Cylinder
2 Right Upper Strut Bracket
3 Rod End Bearing
4 Upper Drag Strut
5 Extension Spring Assembly
6 Drag Strut Connecting Bolt
7 Lower Drag Strut
8 Nose Gear Assembly Upper Strut
9 Fire Wall Bracket
10 End Plug
11 Shaft
12 Witness Hole
13 Rod End Bearing
14 Center Upper Strut Bracket
15 Jam Nut
16 Safety Wire

Figure 7-8. Nose Gear Actuating Cylinder, Drag Struts, and Extension Spring Assembly, Aircraft Serial Numbers 78-30905 and below, and 32-15, 31004 and above.

WARNING

It is extremely important that the overcenter travel be accurately adjusted. Adjusting the overcenter travel to a greater distance than 5/16 inch does not provide a more positive gear down condition.

o. Use a gauge to check the tire pressure. Inflate or deflate the tire as necessary to attain the nose gear tire pressure specified in Table 7-1.

p. Raise the landing gear to the UP position.

q. Use a fish scale or equivalent device to pull the wheel away from the top of the wheel well. The force required should be approximately 50 pounds. If adjustment is required, extend the rod end bearing (13, see Detail A) to increase the force required, and retract the rod end bearing to decrease the force required.

CAUTION

The limitations given in step i. above must not be exceeded.

r. Lower the landing gear to the down and locked position.

s. Check to see that the jam nuts (15) are tight against the end plug (10) and shaft (11) and safety wire (16) both jam nuts.

t. Check all attaching hardware and install cotter pins in castellated nuts.

u. On Aircraft Serial Numbers 79-30906 and above refer to Figure 7-3 and perform the following procedures.

NOTE

The aircraft should be removed from the jacks before performing these procedures.

(1) Attach a cable to the forward end of the emergency extension spring (17) and pull forward on the cable with sufficient force to stretch the spring enough to allow the turnbuckle (18) to be connected to the left upper strut bracket (19).

(2) Connect the turnbuckle (18) to the left upper strut bracket (19), and remove the cable.

7-15. REMOVAL AND INSTALLATION OF NOSE GEAR.

a. Remove the engine cowling.

b. On Aircraft Serial Numbers 79-30906 and above, refer to paragraph 7-11 and disconnect the nose gear emergency extension spring.

c. Place the aircraft on jacks.

d. On Aircraft Serial Numbers 75-30796 and below, and 32-15, 31004 and above disconnect the steering rods from the swivels (16, Figure 7-9).

e. On Aircraft Serial Numbers 76-30797 through Aircraft Serial Numbers 78-30905 disconnect the steering rods from the torque tube (34, Figure 7-10).

f. On Aircraft Serial Numbers 79-30906 and above, perform the following procedures.

(1) Disconnect the steering rods from the torque tube (10, Figure 7-11).

(2) Remove the bolts attaching the nose gear door links (9, Figure 7-12) to the upper strut.

g. Refer to paragraph 7-11 and disconnect the actuating cylinder, extension spring assembly, and lower drag strut from the nose gear upper strut.

h. On Aircraft Serial Numbers 78-30905 and below and 32-15, 31004 and above, remove the pivot bolt (2, Figures 7-9 and 7-10).

i. On Aircraft Serial Numbers 79-30906 and above, remove the two pivot bolts (47, Figure 7-11).

j. Reinstall the nose gear by reversing removal procedures.

7-16. REMOVAL AND DISASSEMBLY OF THE NOSE WHEEL (Figure 7-13).

a. Removal

(1) Remove the nuts (1), washers (2), and spacers (3).

(2) Remove the bolt (4), axle (5), and remove wheel assembly (6) and spacer (7) from the fork (8).

b. Disassembly

(1) Deflate the tire completely by depressing the valve core. Remove the valve core to insure that the tire is completely deflated.

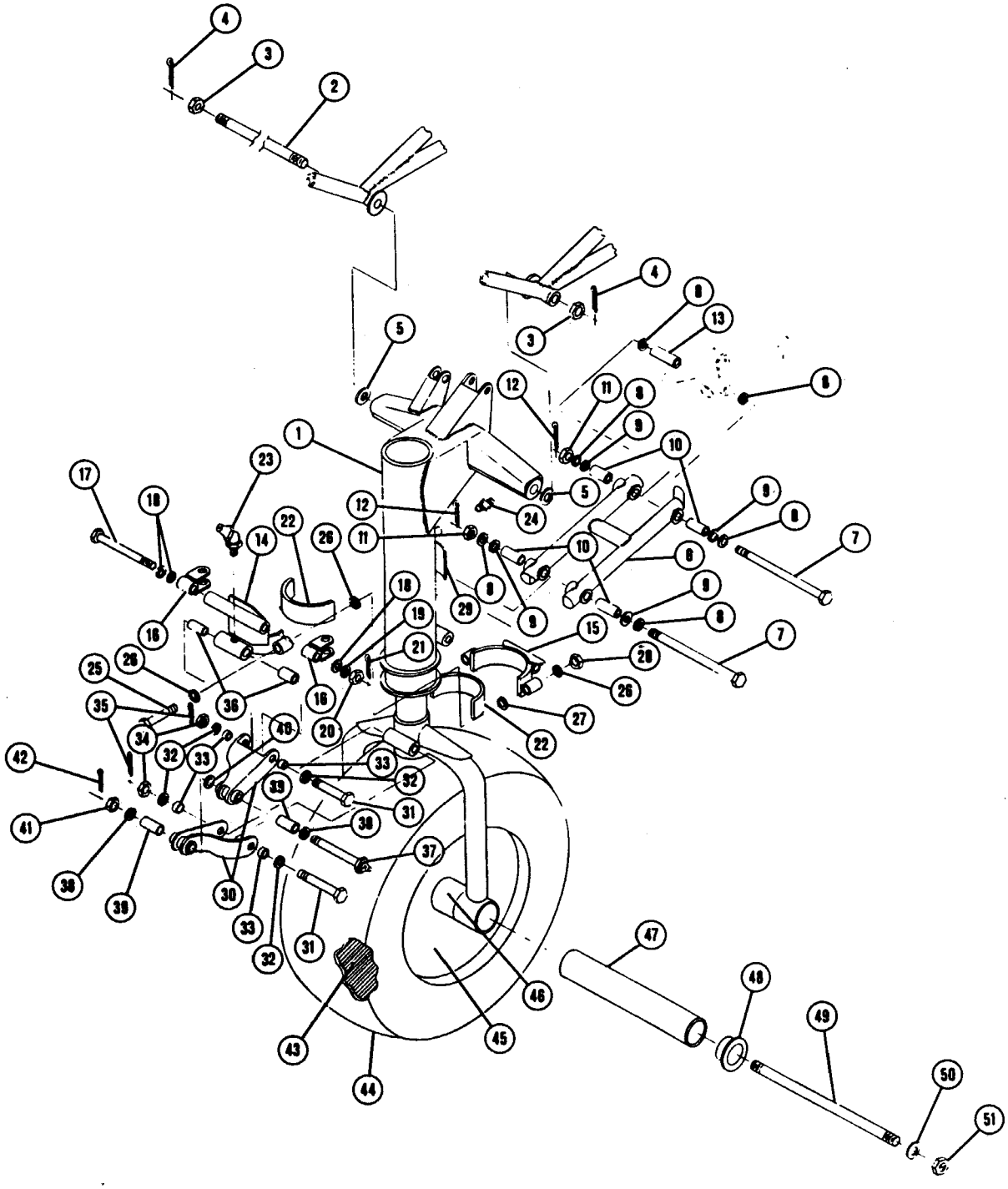


Figure 7-9. Nose Gear Installation, Aircraft Serial Numbers 75-30796 and below, and 32-15, 31004 and above.

Legend for Figure 7-9

1. Nose Gear Assembly
2. Bolt
3. Nut
4. Cotter Pin
5. Washer
6. Lower Drag Strut
7. Bolt
8. Washer
9. Washer
10. Bushing
11. Nut
12. Cotter Pin
13. Bushing
14. Front Steering Collar
15. Rear Steering Collar
16. Swivel
17. Bolt
18. Washer
19. Washer
20. Nut
21. Cotter Pin
22. Brake Lining
23. Grease Fitting
24. Tank Valve
25. Bolt
26. Washer
27. Washer
28. Nut
29. Placard
30. Scissors Assembly
31. Bolt
32. Washer
33. Bushing
34. Nut
35. Cotter Pin
36. Bushing
37. Bolt
38. Washer
39. Bushing
40. Washer
41. Nut
42. Cotter Pin
43. Tube
44. Tire
45. Wheel Assembly
46. Spacer
47. Axle
48. Spacer
49. Bolt
50. Washer
51. Nut

Legend for Figure 7-10

1. Nose Gear Assembly
2. Bolt
3. Nut
4. Cotter Pin
5. Washer
6. Tank Valve
7. Drag Strut, Lower
8. Bolt
9. Washer
10. Washer
11. Nut
12. Cotter Pin
13. Bushing
14. Bushing
15. Steering Collar Assembly
16. Brake Lining
17. Bolt
18. Washer
19. Washer
20. Nut
21. Placard
22. Fitting, Lubricator
23. Nutcracker Assembly
24. Bolt
25. Washer
26. Nut
27. Cotter Pin
28. Bolt
29. Washer
30. Washer
31. Bushing
32. Bushing
33. Bushing
34. Torque Tube Assembly
35. Bushing
36. Link
37. Bushing
38. Bolt
39. Bolt
40. Nut
41. Washer
42. Cotter Pin
43. Axle
44. Spacer
45. Bolt
46. Washer
47. Nut
48. Tube
49. Tire
50. Wheel Assembly
51. Spacer

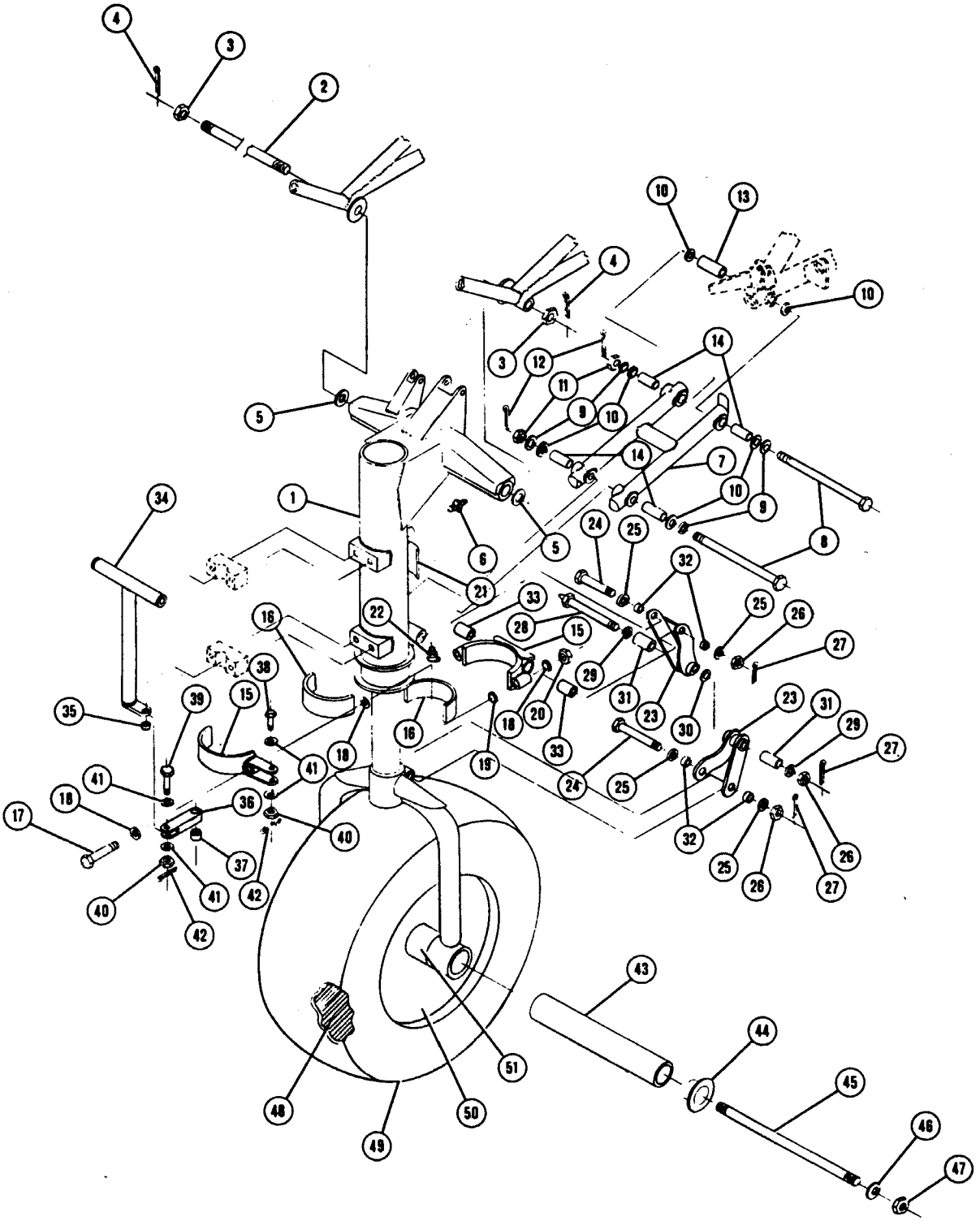


Figure 7-10. Nose Gear Installation, Aircraft Serial Numbers 76-30797 through Serial Numbers 78-30905.

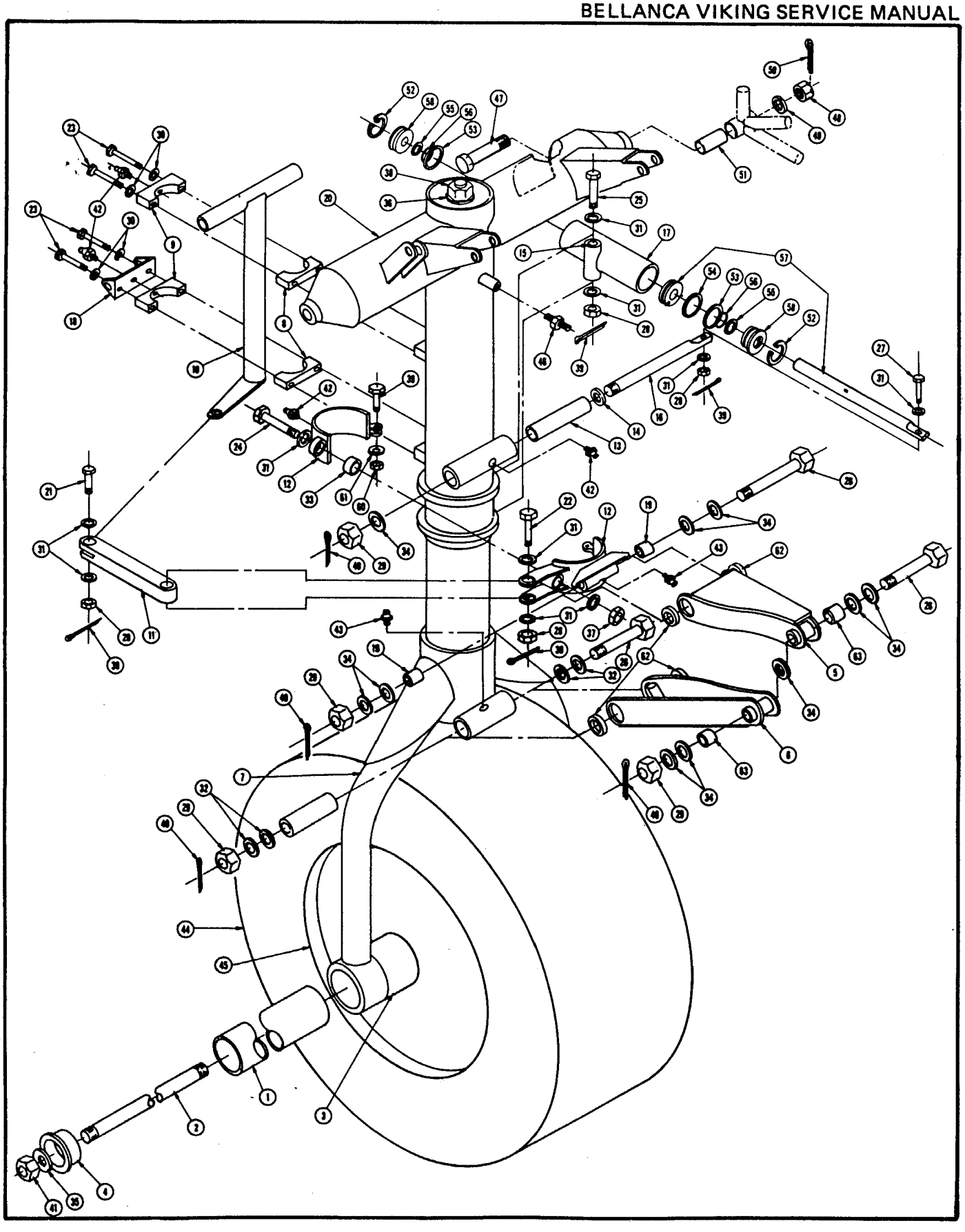


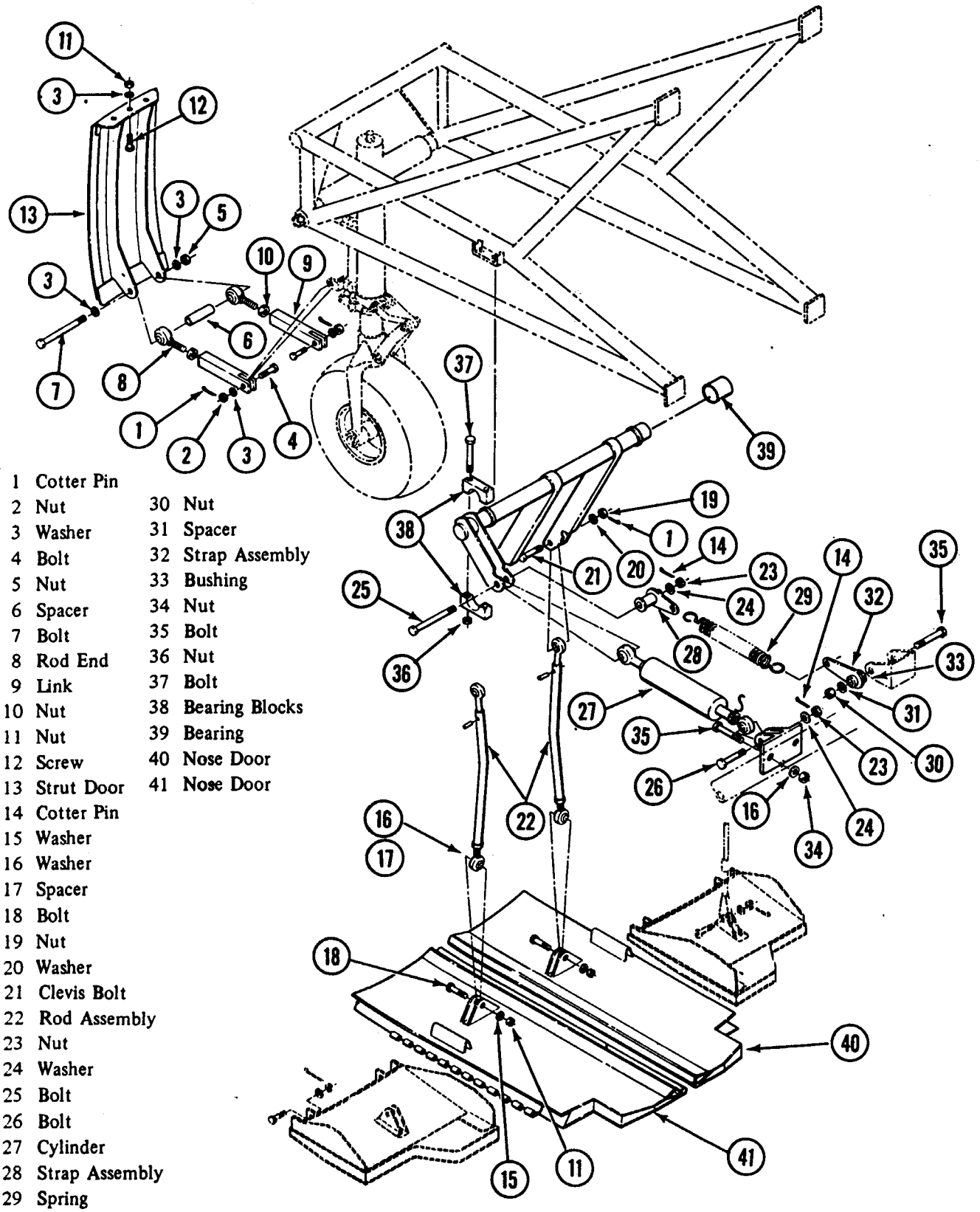
Figure 7-11. Nose Gear Installation, Aircraft Serial Numbers 79-30906 and above.

Legend for Figure 7-11

1. Axle
2. Bolt
3. Spacer
4. Plug
5. Scissors
6. Scissors
7. Lower Leg Assembly
8. Bearing
9. Bearing
10. Torque Tube
11. Steering Link
12. Steering Collar
13. Bushing
14. Washer
15. Bushing
16. Bolt
17. Shimmy Dampener
18. Bracket
19. Bushing
20. Upper Leg Assembly
21. Bolt
22. Bolt
23. Bolt
24. Bolt
25. Bolt
26. Bolt
27. Bolt
28. Nut
29. Nut
30. Washer
31. Washer
32. Washer
33. Spacer
34. Washer
35. Washer
36. Washer
37. Nut
38. Nut
39. Cotter Pin
40. Cotter Pin
41. Nut
42. Grease Fitting
43. Grease Fitting
44. Tire
45. Wheel
46. Valve
47. Bolt
48. Nut
49. Washer
50. Cotter Pin
51. Bushing
52. Snap Ring
53. Packing
54. Packing
55. Packing
56. Back-up Ring
57. Piston Assembly
58. End Plug
59. Clevis Bolt
60. Nut
61. Washer
62. Bushing
63. Bushing

Legend for Figure 7-12

1. Cotter Pin
2. Nut
3. Washer
4. Bolt
5. Nut
6. Spacer
7. Bolt
8. Rod End
9. Link
10. Nut
11. Nut
12. Screw
13. Strut Door
14. Cotter Pin
15. Washer
16. Washer
17. Spacer
18. Bolt
19. Nut
20. Washer
21. Clevis Bolt
22. Rod Assembly
23. Nut
24. Washer
25. Bolt
26. Bolt
27. Cylinder
28. Strap Assembly
29. Spring
30. Nut
31. Spacer
32. Strap Assembly
33. Bushing
34. Nut
35. Bolt
36. Nut
37. Bolt
38. Bearing Block
39. Grease Fitting
40. Nose Door
41. Nose Door



1 Cotter Pin
2 Nut
3 Washer
4 Bolt
5 Nut
6 Spacer
7 Bolt
8 Rod End
9 Link
10 Nut
11 Nut
12 Screw
13 Strut Door
14 Cotter Pin
15 Washer
16 Washer
17 Spacer
18 Bolt
19 Nut
20 Washer
21 Clevis Bolt
22 Rod Assembly
23 Nut
24 Washer
25 Bolt
26 Bolt
27 Cylinder
28 Strap Assembly
29 Spring
30 Nut
31 Spacer
32 Strap Assembly
33 Bushing
34 Nut
35 Bolt
36 Nut
37 Bolt
38 Bearing Blocks
39 Bearing
40 Nose Door
41 Nose Door

Figure 7-12. Nose Gear Door Installation, Aircraft Serial Numbers 79-30906 and above.

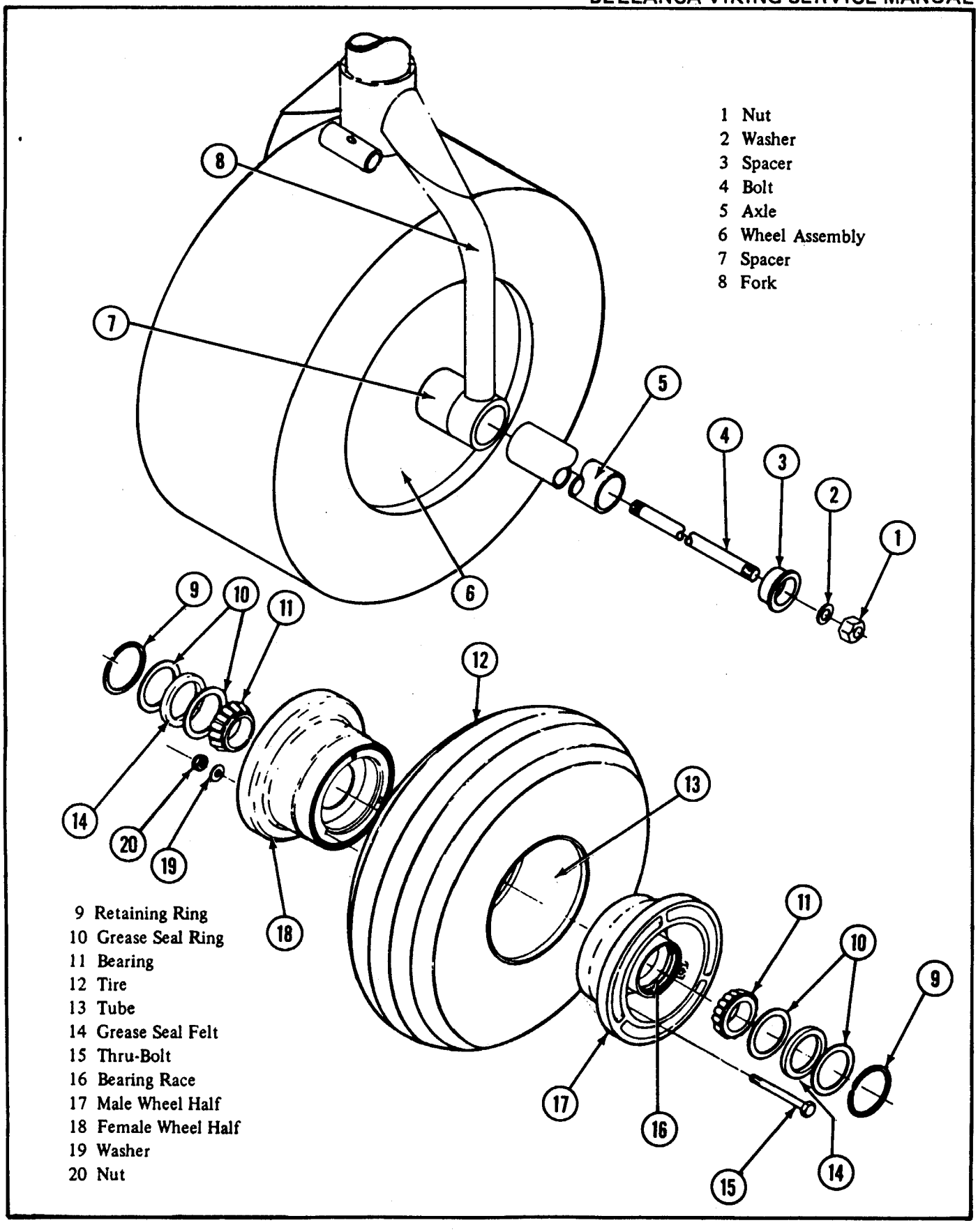


Figure 7-13. Removal and Disassembly of the Nose Wheel

WARNING

Personal injury can result from attempting to separate the wheel halves if the tire is not completely deflated.

(2) Remove the thru-bolts and separate the wheel halves.

(3) Remove the tire and tube.

(4) Remove the retaining rings, grease seals, and bearing cones.

(5) Do not remove the bearing races from the wheel halves unless replacement is necessary.

NOTE

If either the bearing cone or bearing race requires replacement, replace both the bearing cone and bearing race as a set.

c. Servicing

(1) Wash the bearing cones in solvent to remove the old grease and dry the cones thoroughly.

WARNING

If compressed air is used to dry the bearing cones, do not allow the rollers to spin.

(2) Wipe the old grease from the bearing races and wheel halves.

(3) Repack the wheel bearings with the type grease indicated in Table 7-1.

(4) Apply an ample coating of the same type grease used to pack the bearing cones to the bearing races.

d. Reassembly.

(1) Reinstall the bearing cones, grease seals, and retaining rings.

(2) Align the balance mark on the tube with the balance mark on the tire and place the tube inside the tire.

NOTE

Balance marks on both the tire and tube are usually paint dots.

(3) Place the tire and tube on the wheel half with the valve stem through the hole in the wheel half.

(4) Align the other wheel half and install the thru-bolts. Torque the thru-bolts to the value marked on the wheel.

(5) Install the valve core and inflate the tire to seat the tire beads.

(6) Use a tire gauge, and adjust the tire pressure to the correct pressure (see Table 7-1).

e. Installation. Reinstall the nose wheel by reversing removal procedures.

7-17. REPLACING FLUID AND SEALS, NOSE GEAR STRUT. Refer to the following figures as indicated for identification of parts, depending on the serial number of the aircraft on which maintenance is being performed. Aircraft Serial Numbers 75-30976 and below and 32-15,31004 and above, see Figure 7-14. Aircraft Serial Numbers 76-30797 through Aircraft Serial Numbers 78-30905, see Figure 7-15. Aircraft Serial Numbers 79-30906 and above, see Figure 7-16.

NOTE

The following procedures can be performed without removing the upper strut assembly from the aircraft.

a. Disassembly

(1) Place the aircraft on jacks.

(2) Release air pressure from the strut.

(3) Remove the bolt attaching the lower end of the scissors to the fork assembly.

(4) Remove the retaining ring from the bottom of the upper strut, and remove the lower strut assembly.

(5) Remove the retainer ring at the top of the lower strut assembly, and remove bushings, spacer, O-rings, wiper seal, retainers and retaining ring from the strut assembly.

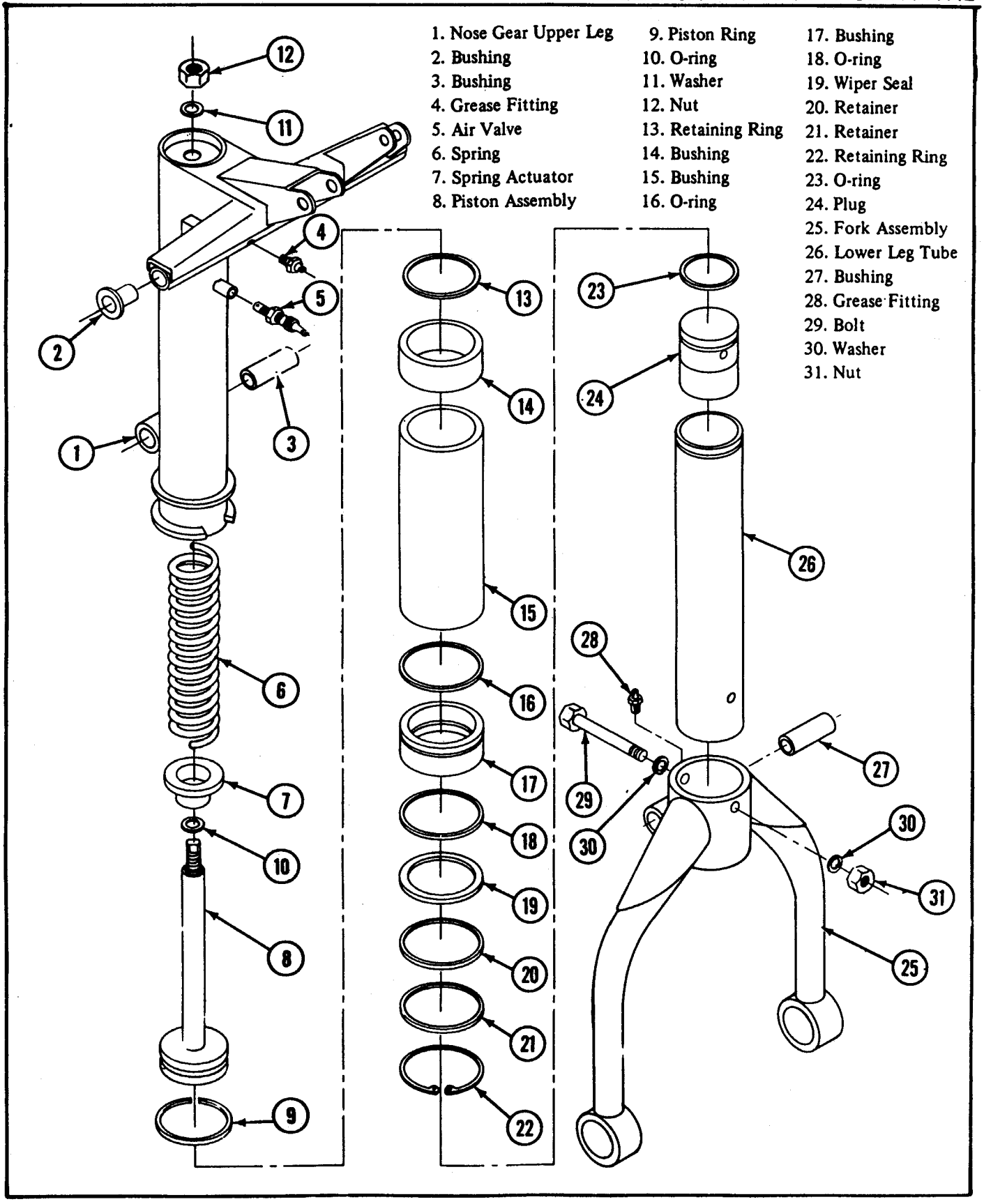


Figure 7-14. Nose Gear Strut, Aircraft Serial Numbers 75-30796 and below, and 32-15, 31004 and above.

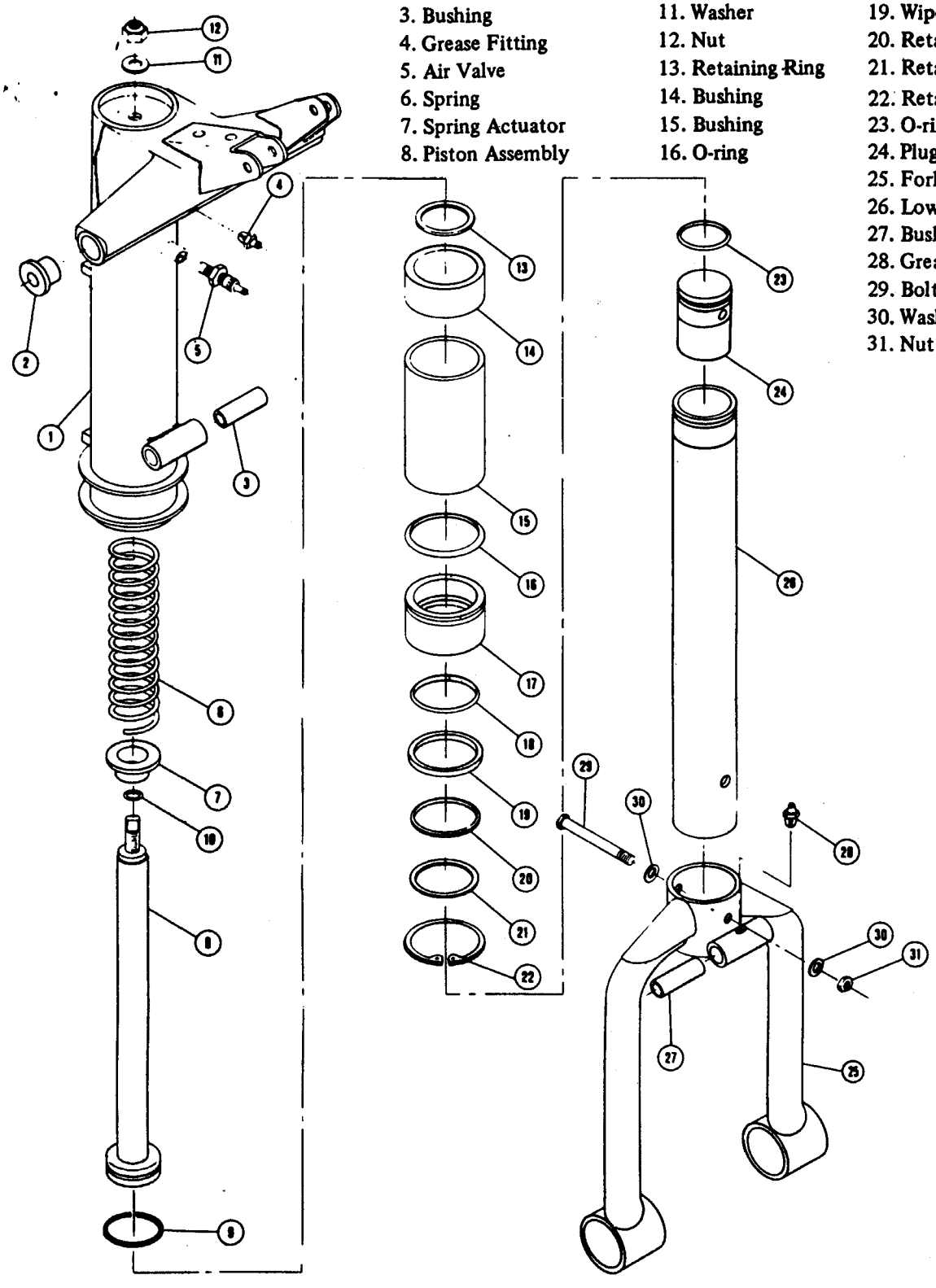


Figure 7-15. Nose Gear Strut, Aircraft Serial Numbers 76-30797 through Serial Numbers 78-30905

1. Nose Gear Upper Leg
2. Air Valve
3. Washer
4. Nut
5. Spring
6. Spring Actuator
7. O-ring
8. Piston Assembly
9. Retaining Ring
10. Bushing
11. Bushing
12. O-ring
13. Bushing
14. O-ring
15. Wiper Seal
16. Retainer
17. Retainer
18. Retaining Ring
19. O-ring
20. Plug
21. Lower Leg Tube
22. Fork Assembly
23. Bolt
24. Washer
25. Nut
26. Grease Fitting
27. Piston Ring

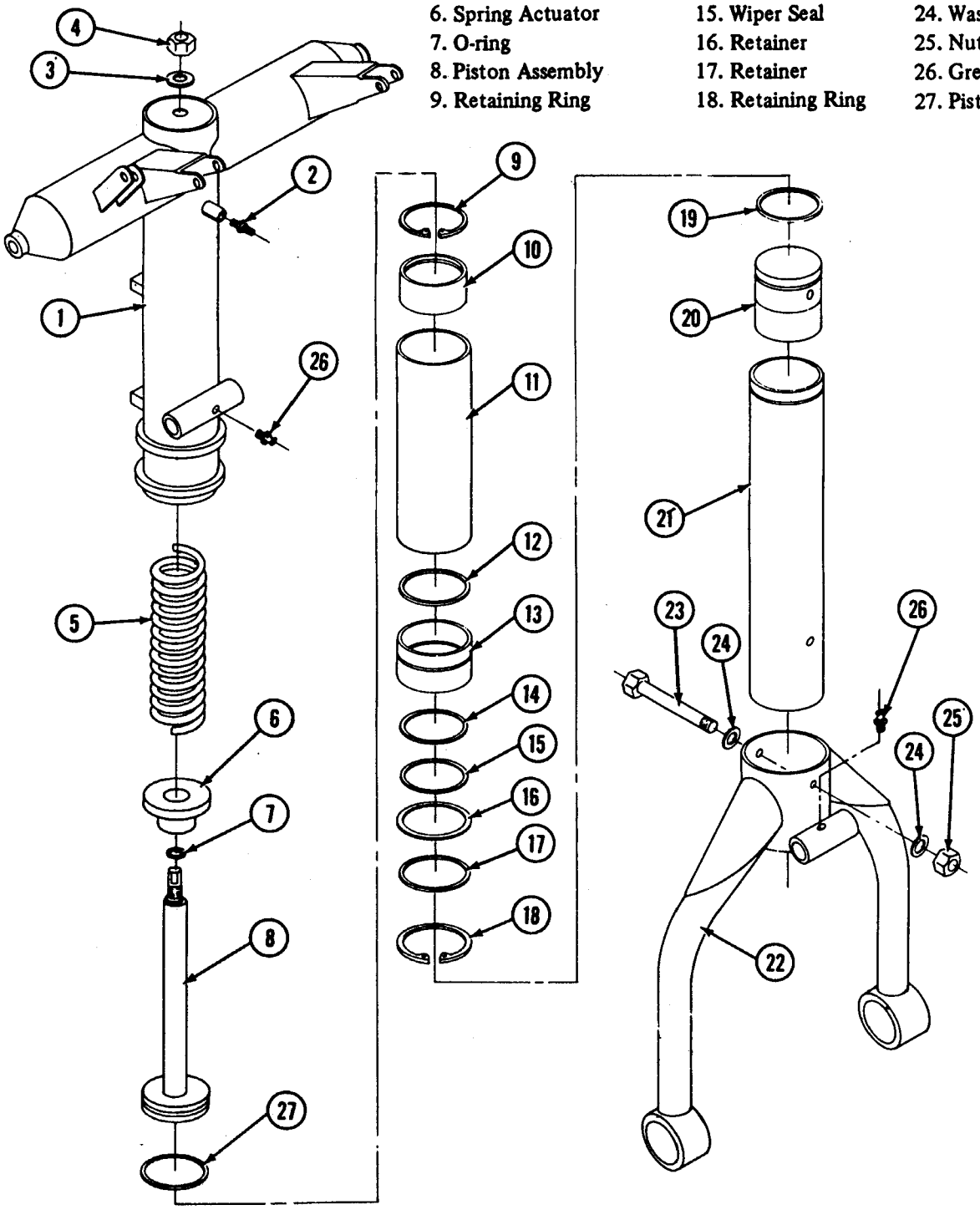


Figure 7-16. Nose Gear Strut, Aircraft Serial Numbers 79-30906 and above.

(6) Remove the bolt attaching the lower leg tube of the lower strut assembly to the fork assebmly, and remove the lower leg tube.

(7) Remove the plug and O-ring from the lower leg tube.

NOTE

If maintenance or replacement of parts inside the nose gear upper leg assembly is necessary, perform to following procedures.

(8) Remove the nut and washer on top of the upper strut assembly and remove the piston, spring, and spring actuator.

(9) Do not remove the piston ring from the piston unless replacement is necessary.

b. Reassembly.

(1) If parts inside the upper leg assembly were removed, use a new O-ring and reinstall the parts by reversing disassembly procedures.

NOTE

Refer to the figure that is applicable to the serial number of the aircraft being serviced, and arrange the component parts in the sequence shown in the figure.

(2) Install a new O-ring on the plug.

(3) Lubricate the O-ring and plug with the same type hydraulic fluid that will be used in the strut (see Table 7-1).

(4) Align the hole in the plug with the holes in the lower leg tube and install the plug in the tube. Ensure that the holes are properly aligned when installation of the plug is completed.

(5) Insert the lower leg tube, with plug installed, into the fork assembly.

(6) Align the holes in the lower leg tube with the holes in the fork assembly and install the attaching bolt.

(7) Use a new wiper seal and O-rings, and starting with the retaining ring that fits in the groove near the bottom of the upper strut assembly, assemble the retaining ring, retainers, wiper seal, bushings, and spacer on the lower leg tube in the sequence shown in the figure pertaining to the aircraft being serviced.

(8) Install the retaining ring in the groove near the top of the lower leg tube.

(9) Lubricate the O-rings, wiper seal, bushings, and spacer with the same type hydraulic fluid that will be used in the strut (see Table 7-1).

(10) Fill the lower strut with the amount of type of hydraulic fluid indicated in Table 7-1, and insert the lower strut assembly into the upper strut assembly.

(11) Position the retaining ring in the groove near the bottom of the upper strut assembly. Ensure that the retaining ring is seated firmly in the groove.

NOTE

If excessive side play is noted between the upper and lower strut assemblies, replace both upper strut bushings.

(12) Reinstall the bolt attaching the lower end of the scissors to the fork assembly.

(13) Refer to Table 7-1 for the specified air pressure and pressurize the strut.

(14) Remove the aircraft from jacks.

7-18. NOSE WHEEL SHIMMY ADJUSTMENT.

a. On Aircraft Serial Numbers 75-30796 and below, and 32-15, 31004 and above, if nose wheel shimmy is experienced or excessive rudder pedal pressure is required to steer the aircraft, refer to Figure 7-9 and perform the following procedures.

(1) Remove the bolts securing the two steering collar halves (14 and 15).

(2) Check the brake lining (22) for excessive wear and replace if necessary.

(3) If brake lining is replaced, apply a light coating of machine oil to the new lining.

NOTE

If shimmy was experienced, perform a taxi test after replacing brake lining to see if shimmy still persists.

(4) If shimmy persists, remove a washer (26) from between the collar halves (14 and 15) on each side.

(5) Perform a taxi test, at high speed if necessary, to see if shimmy condition has been corrected.

(6) If excessive rudder pedal pressure is required to steer the aircraft, add a washer (26) between the collar halves (14 and 15) on each side and check for shimmy as above.

b. On Aircraft Serial Numbers 76-30797 through Aircraft Serial Numbers 78-30905 if nose wheel shimmy is experienced or excessive rudder pedal pressure is required to steer the aircraft, refer to Figure 7-10 for identification of parts and perform procedures in steps (1) through (6) above.

c. On Aircraft Serial Numbers 79-30906 and above, if shimmy is experienced it is an indication that the O-ring on the piston assembly inside the shimmy dampener is damaged or loss of fluid. If there is loss of fluid, it indicates failure of one or both of the end O-rings. Refer to Figure 7-11 and perform the following procedures if either of the above conditions exist.

(1) Remove the bolts (27) and (25) attaching the piston assembly (57) and shimmy dampener housing (17) to the upper leg of the nose gear strut, and remove the shimmy dampener.

(2) Remove the snap rings in each end of the housing, and remove the plugs, O-rings, and piston assembly.

(3) Discard all O-rings. Clean the remaining components, particularly the grooves in which O-rings will be seated.

(4) Inspect the interior surface of the housing. The surface must be smooth.

(5) Use new O-rings and install the O-rings, end plug, and snap ring in the housing in the opposite end of the housing from which the rod of the piston assembly protrudes.

(6) Place the partially assembled shimmy dampner in a vise or similar holder with the open end up.

(7) Install the O-ring in the groove in the piston and insert the piston assembly into the housing. Push the piston assembly into the housing until it bottoms against the end plug.

(8) Refer to Table 7-1 for the type of hydraulic fluid to be used, and fill the housing with hydraulic fluid leaving only enough space to install the end plug and snap ring.

(9) Install the end plug and snap ring and reinstall the shimmy dampener on the upper leg of the nose wheel shock strut.

7-19. ADJUSTING NOSE WHEEL STEERING.

a. Place the aircraft on jacks.

b. Secure the rudder pedals in neutral position. The rudder pedals should be aligned and the rudder should be streamlined with the vertical fin.

c. Adjust the steering rod end fittings to align the nose wheel with the center line of the fuselage. Stand five to ten feet in front of the aircraft and visually align the nose wheel.

d. Remove the aircraft from the jacks. With rudder pedals still secured in the neutral position, the aircraft should roll straight either forward or backward.

NOTE

A taxi check can be performed to see if the nose wheel steering is properly adjusted. However, if the taxi test is performed with improperly inflated tires, on an uneven surface, or in gusty or strong crosswinds, the taxi test may not be conclusive.

7-20. NOSE GEAR DOOR ADJUSTMENT.

a. On Aircraft Serial Numbers 76-30797 through 78-30905 refer to Figure 7-17 and perform the following procedures to adjust the nose gear doors.

1. Upper Door Assembly
2. Bolt
3. Bushing
4. Washer
5. Nut
6. Cotter Pin
7. Bolt
8. Washer
9. Nut
10. Cotter Pin
11. Actuator Rod
12. Nut
13. Bearing
14. Placard
15. Bolt
16. Washer
17. Washer
18. Bushing
19. Nut
20. Cotter Pin
21. Lower Door Assembly
22. Spring
23. Bracket
24. Screw
25. Bolt
26. Washer
27. Fitting
28. Bearing
29. Bearing
30. Hinge
31. Screw
32. Washer
33. Nut

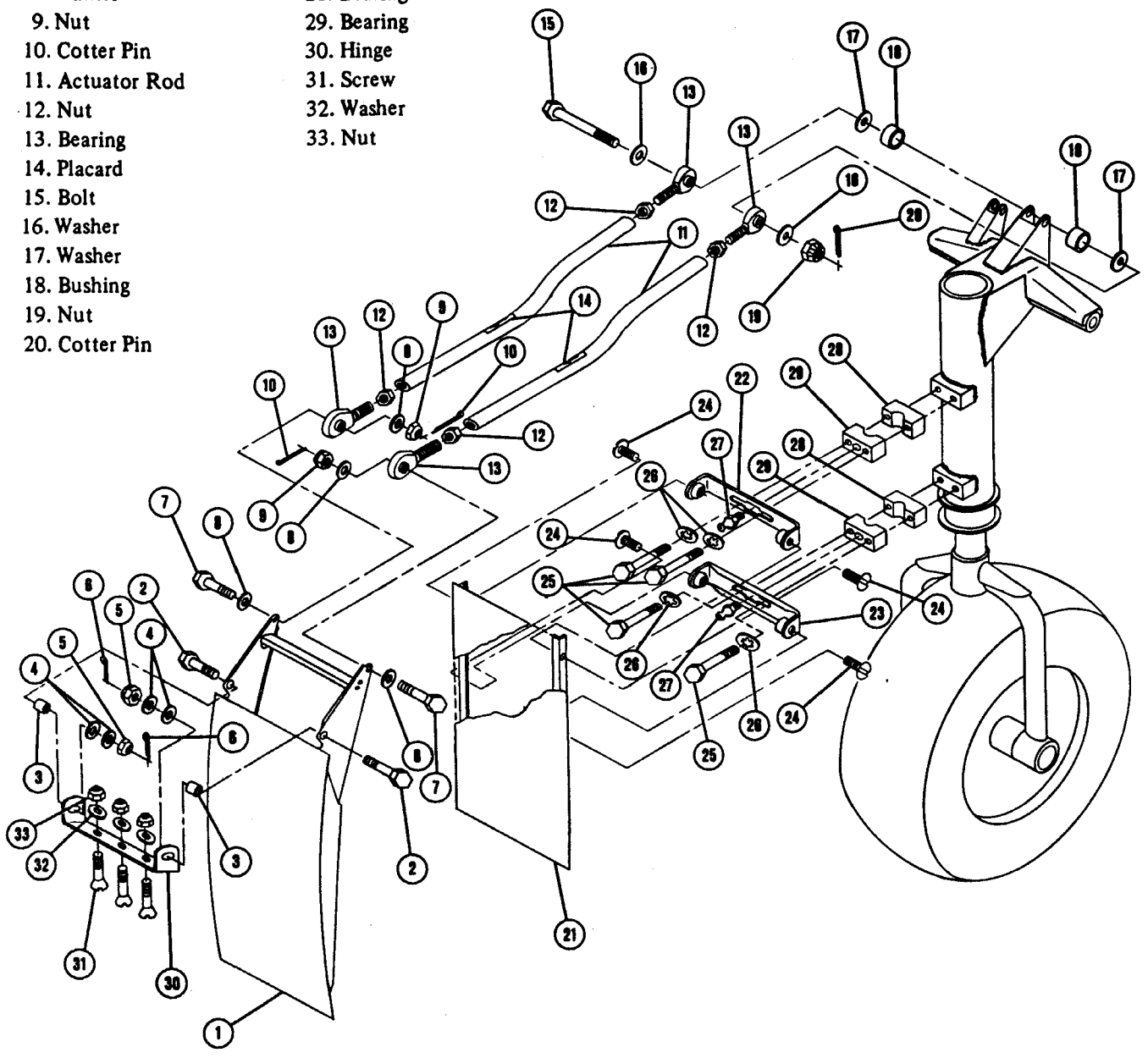


Figure 7-17. Nose Gear Door Installation, Aircraft Serial Number 76-30797 through Serial Numbers 78-30905.

NOTE

The lower door assembly is rigidly connected to two brackets mounted on the upper leg of the nose gear strut. Slight lateral adjustments can be made by loosening the bracket mounting bolts and sliding the brackets laterally to the desired position.

(1) Disconnect the forwafd rod end bearings from the upper door assembly.

(2) Loosen the jam nuts and turn the rod end bearings in or out of the actuator rods as necessary to attain the desired adjustment.

CAUTION

If the actuator rods are lengthened, to doors will close more tightly when the gear is retracted. Adjustments should be made in small increments to avoid damage to the door, cowl or actuating mechanism when the gear is retracted.

(3) Reconnect the rod end bearings to the upper door assembly. Place the aircraft on jacks and perform a gear retraction check.

(4) The doors should be flush with the cowling when the gear is fully retracted. The upper door assembly must overlap the lower door assembly a minimum of 1/8 inch when the gear is fully retracted.

NOTE

In order to keep approximately the same number of threads visible on both ends of the actuator rods, it might be desirable to make adjustments to the nose gear door at the aft end of the actuator rods. Perform the following procedures to adjust the actuator rods at the aft end.

(5) Disconnect the forward rod end bearings from the upper door assembly.

(6) Loosen the jam nuts on the aft rod end bearings, and turn the actuator rods onto or off the rod end bearings as necessary to attain the desired adjustment.

(7) Reconnect the forward rod end bearings and perform a gear retraction check.

CAUTION

If the actuator rods have been completely removed, when reinstalled they must be oriented fore and aft in the same position as when removed.

b. On Aircraft Serial Numbers 79-30906 and above, refer to Figure 7-12 and perform the following procedures to adjust the nose gear doors.

(1) Disconnect the rod end bearings from the nose strut door assembly. Loosen the jam nuts and turn the rod end bearings in or out of the links as necessary to attain the desired adjustment.

CAUTION

Turning the rod end bearings in will make the door close more tightly when the gear is retracted. Adjustments should be made in small increments to avoid damage to the door cowl or actuating mechanism when the gear is retracted.

(2) Place the aircraft on jacks.

(3) Disconnect the rod end bearings from the two nose gear doors. Loosen the jam nuts and turn the rod end bearings in or out of the rod assemblies as necessary to attain the desired adjustments. Observe the CAUTION above when making adjustments.

NOTE

When both door actuating rods are disconnected, one door at a time can be closed manually and aligned with its associated rod end bearing to ascertain the approximate adjustment that must be made.

(4) When adjustments have been made, perform a gear retraction check. Make as many adjustments as necessary to attain the desired fit of the doors when the gear is retracted.

NOTE

Simultaneous adjustment of the doors can be made with the rear rod end bearing on the door actuating cylinder (27, Figure 7-12).

7-21. NOSE GEAR DOOR ACTUATING CYLINDER. (Figure 7-18). On Aircraft Serial Number 79-30906 and above, perform the following procedures to disassemble and repair the nose gear door actuating cylinder or replace O-rings.

a. Remove the two hydraulic fittings from the barrel (6).

b. Remove the retaining ring (3) and remove the rod end bearing (1), check nut (2), end plug (4), and O-ring (5) as an assembly.

NOTE

It is not necessary to disassemble the end plug and rod end bearing assembly if only the O-ring is to be replaced.

c. Remove the O-ring (5) from the end plug (4).

d. Remove the safety wire from the roll pin (19) and remove the roll pin (19) and rod end bearing (1).

e. Remove the retaining ring (3) and end plug (16).

f. Remove the shaft (13) piston (9), and lock cap (7) as an assembly.

g. Remove the back-up ring (14) and O-rings (5 and 15) from the end plug (16).

h. Remove the lock cap (7) and piston (9) from the shaft (13).

i. Remove the lock ring (10), back-up ring (11), and O-ring (12) from the shaft (13).

j. Remove the O-ring (5) and back-up ring (8) from the piston (9).

k. Inspect all component parts for damage. Particularly, inspect the interior surface of the barrel (6) along which the piston (9) travels and the O-rings (5) on the piston (9) and end plugs (4 and 16) make contact. The interior of the barrel must be smooth. Scores or grooves inside the barrel will allow leakage.

l. Reassemble the actuating cylinder by reversing disassembly procedures, and perform the following additonal procedures.

(1) Discard the O-rings and replace with new O-rings.

(2) Thoroughly clean all grooves in which O-rings are installed.

CAUTION

Do not use a wire brush or abrasive material for cleaning.

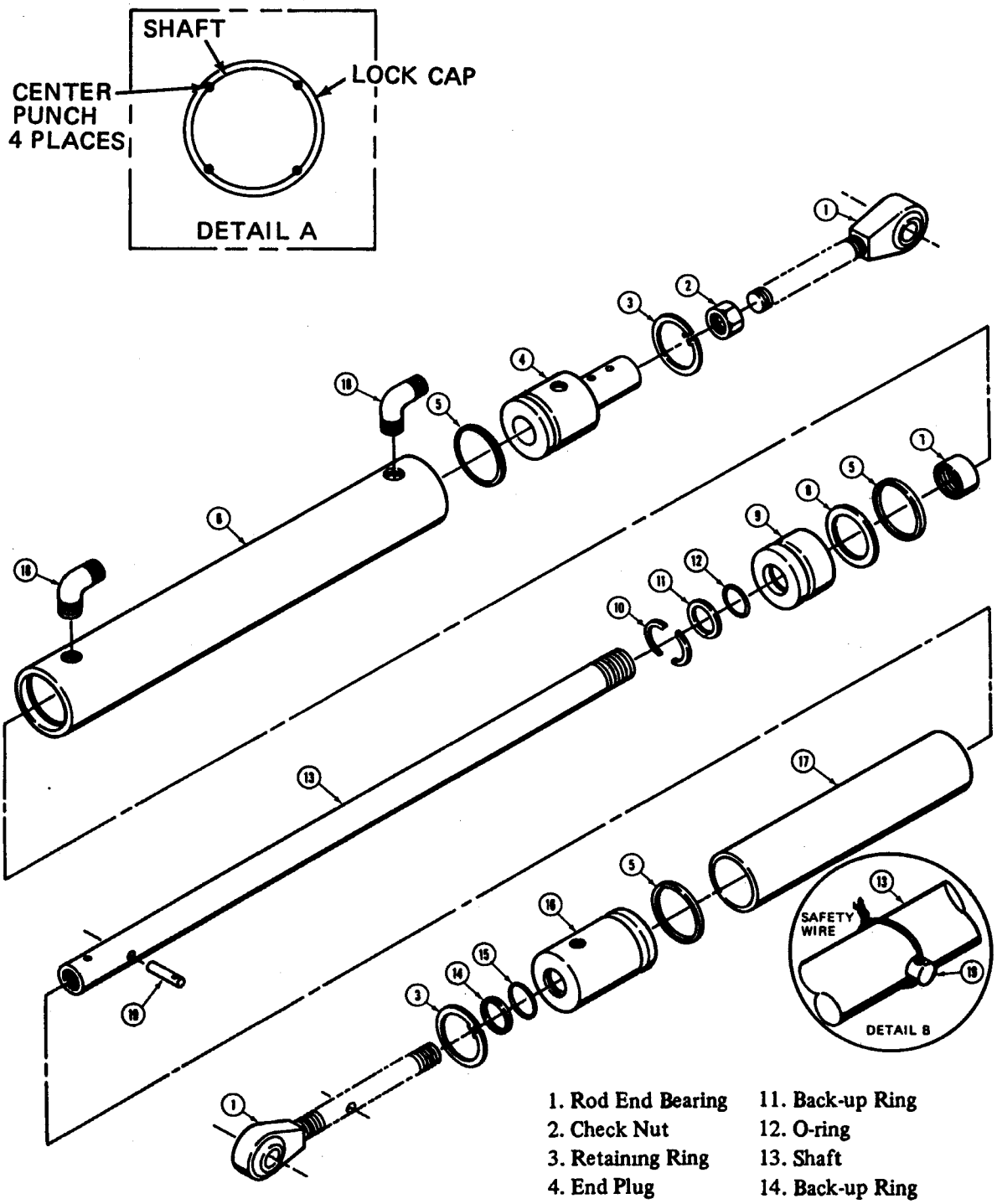
(3) When the O-ring (12) and back-up ring (11) are installed, do not install them over the threaded end of the shaft.

(4) When the piston (9) and lock cap (7) are installed on the shaft (13), use a center punch and stake the cap and shaft in four places (see Figure 7-18, Detail A).

(5) Lubricate the O-rings and surfaces on the inside of the barrel that will make contact with the O-rings with the same type hydraulic fluid that will be used in the system (see Table 7-1), before assembling components inside the barrel.

(6) Check to see that the check nut (2) is tight and properly safetied to end plug (4).

(7) Ensure that the roll pin (19) is properly safetied to the shaft (see Figure 7-18, Detail B).



1. Rod End Bearing
2. Check Nut
3. Retaining Ring
4. End Plug
5. O-ring
6. Barrel
7. Lock Cap
8. Back-up Ring
9. Piston
10. Lock Ring
11. Back-up Ring
12. O-ring
13. Shaft
14. Back-up Ring
15. O-ring
16. End Plug
17. Sleeve
18. Hydraulic Fitting
19. Roll Pin

Figure 7-18. Nose Gear Door Actuating Cylinder, Aircraft Serial Numbers 79-30906 and above.

7-22. REMOVAL AND DISASSEMBLY OF MAIN LANDING WHEEL (Figure 7-19).

a. Removal

(1) Place the aircraft on jacks.

(2) Disconnect the brake line.

(3) Remove the hub cap, cotter pin, and wheel nut.

(4) Remove the bolts attaching the back plate (22, Figure 7-20) and remove the back plate.

(5) Remove the wheel and tire assembly and spacer (6 and 7, Figure 7-19).

b. Disassembly. (Figure 7-20).

(1) Deflate the tire completely by depressing the valve core. Remove the valve core to insure that the tire is completely deflated.

WARNING

Personal injury can result from attempting to separate the wheel halves if the tire is not completely deflated.

(2) Remove the thru-bolts and separate the wheel halves.

(3) Remove the tire, tube, and disc brake.

(4) Remove the retaining rings, grease seals, and bearing cones.

(5) Do not remove the bearing races from the wheel halves unless replacement is necessary.

NOTE

If either the bearing cone or bearing race requires replacement, replace both the bearing cone and bearing race as a set.

c. Servicing.

(1) Wash the bearing cones in solvent to remove the old grease and dry the cones thoroughly.

WARNING

If compressed air is used to dry the bearing cones, do not allow the rollers to spin.

(2) Wipe the old grease from the bearing races and wheel halves.

(3) Repack the wheel bearings with the type grease indicated in Table 7-1.

(4) Apply an ample coating of the same type grease used to pack the bearing cones to the bearing races.

d. Reassembly.

(1) Reinstall the bearing cones, grease seals, and retaining rings.

(2) Align the balance mark on the tube with the balance mark on the tire and place the tube inside the tire.

NOTE

Balance marks on both the tire and tube are usually paint dots.

(3) Place the tire and tube on the wheel half with the valve stem through the hole in the wheel half.

(4) Align the other wheel half and install the thru-bolts. Torque the thru-bolts to the value marked on the wheel.

(5) Install the valve core and inflate the tire to seat the tire beads.

(6) Use a tire gauge, and adjust the tire pressure to the correct pressure (see Table 7-1).

e. Installation. Reinstall the wheel and tire assembly by reversing removal procedures.

7-23. REMOVAL AND INSTALLATION OF MAIN GEAR. (Figure 7-21).

a. Disconnect static cable at bracket near the trailing edge of the wing.

b. Place the aircraft on jacks.

1- Screw
2- Washer
3- Hub Cap
4- Cotter Pin
5- Wheel Nut
6- Wheel And Tire Assembly
7- Spacer
8- Main Landing Gear Strut

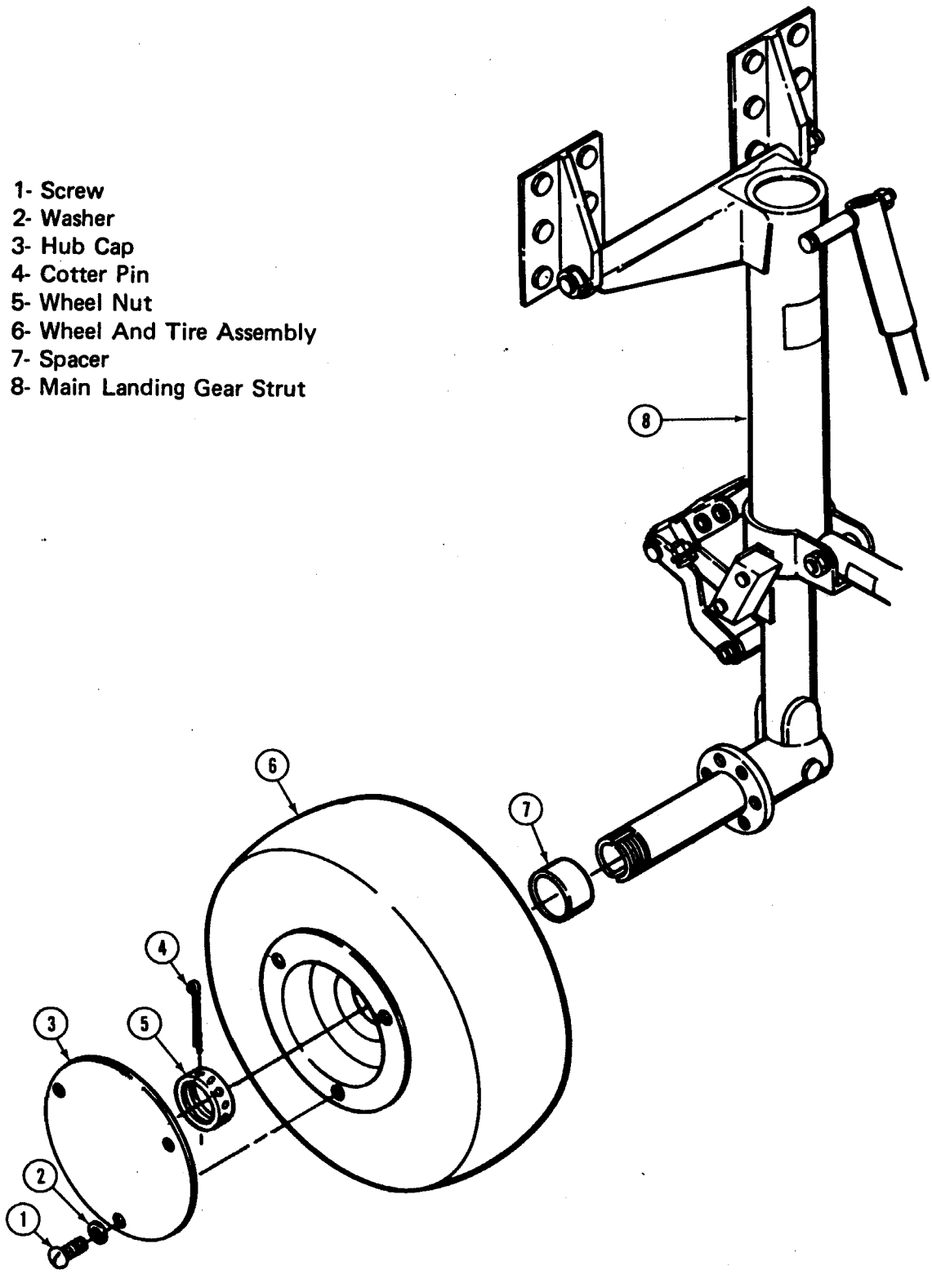
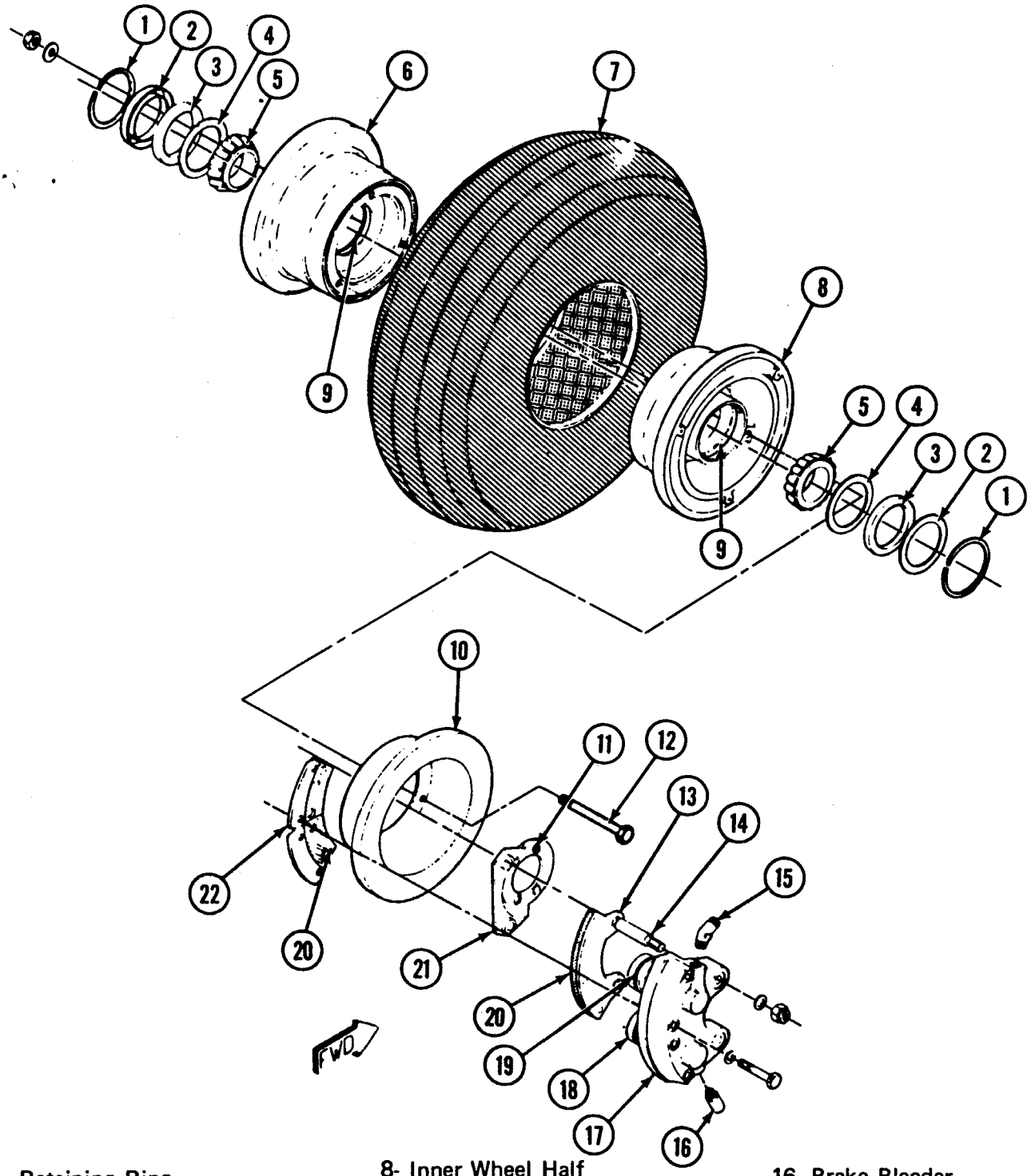
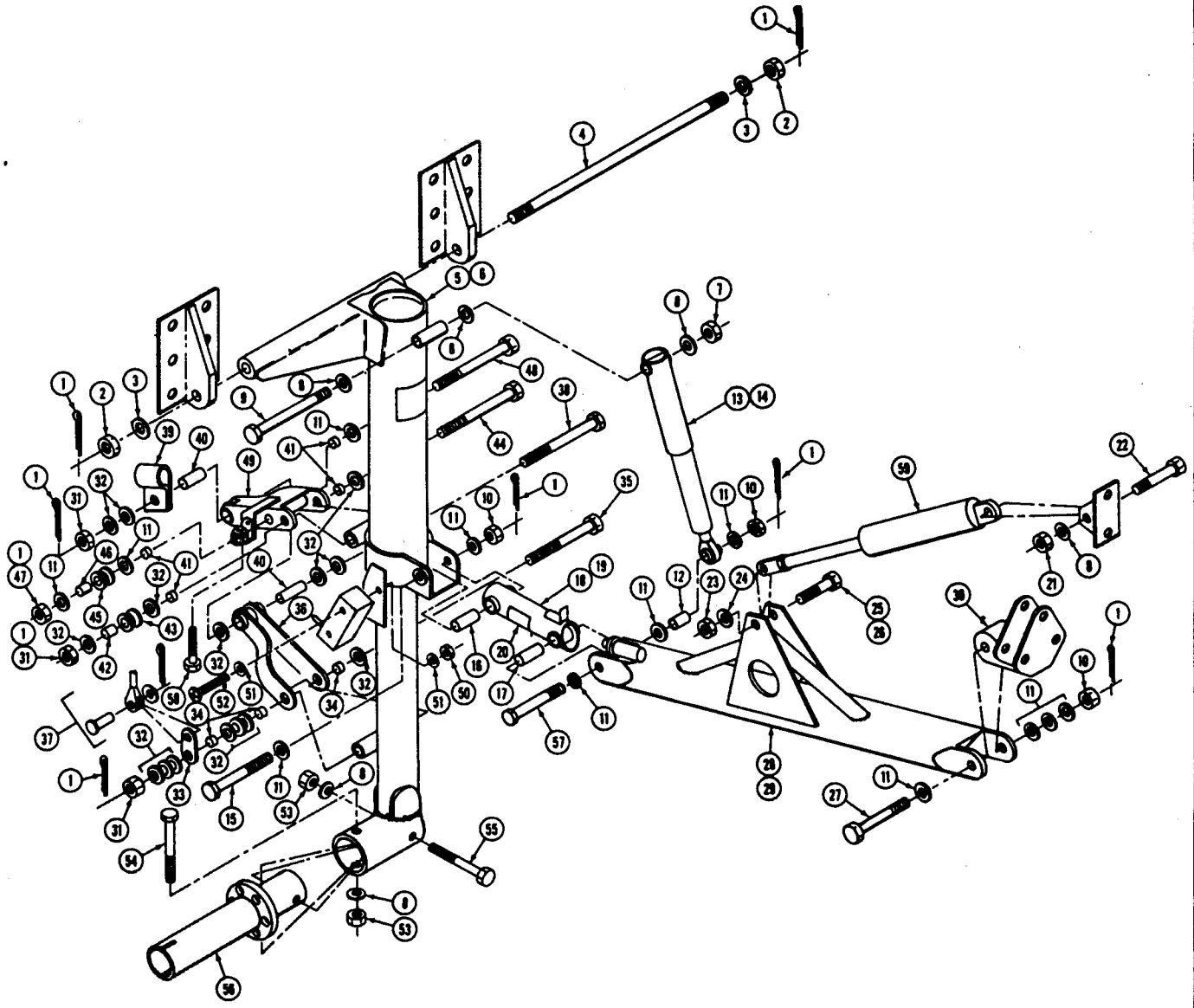


Figure 7-19. Wheel and Tire Assembly.



1- Retaining Ring
2- Grease Seal Ring
3- Grease Seal Felt
4- Grease Seal Ring
5- Bearing Cone
6- Outer Wheel Half
7- Tire And Tube
8- Inner Wheel Half
9- Bearing Race
10- Brake Disc
11- Bushing
12- Thru-Bolt
13- Pressure Plate
14- Anchor Bolt
15- Hydraulic Fitting
16- Brake Bleeder
17- Brake Cylinder
18- Brake Piston
19- O-Ring
20- Brake Lining
21- Torque Plate
22- Back Plate

Figure 7-20. Main Landing Wheel and Brake.



1. Cotter Pin
2. Nut
3. Washer
4. Bolt
5. Main Landing Gear Assembly
6. Main Landing Gear Assembly
7. Nut
8. Washer
9. Bolt
10. Nut
11. Washer
12. Bushing
13. Extension Spring Assembly
14. Extension Spring Assembly
15. Bolt
16. Bushing
17. Bushing
18. Drag Strut
19. Drag Strut
20. Placard
21. Nut
22. Bolt
23. Nut
24. Washer
25. Bolt
26. Bolt
27. Bolt
28. Drag Strut
29. Drag Strut
30. Spar Fitting
31. Nut
32. Washer
33. Bracket
34. Bushing
35. Bolt
36. Scissors
37. Static Cable
38. Bolt
39. Clamp
40. Bushing
41. Bushing
42. Bushing
43. Pulley
44. Bolt
45. Pulley
46. Bushing
47. Nut
48. Bolt
49. Scissors
50. Nut
51. Washer
52. Screw
53. Nut
54. Bolt
55. Bolt
56. Axle Assembly
57. Bolt
58. Bolt
59. Cylinder Assembly

Figure 7-21. Main Landing Gear Assembly.

d. Disconnect the actuating cylinder from the upper drag strut.

e. Disconnect the extension spring assembly (13) from the upper leg of the main gear strut (5).

f. Disconnect the lower drag strut (18) from the lower bracket on the upper leg of the main gear strut.

g. Disconnect the brake line from the hydraulic fitting on the brake assembly. (15, Figure 7-10).

h. Support the main gear assembly and remove the pivot bolt to disconnect the gear assembly from the aircraft.

i. Reinstall the main gear assembly by reversing removal procedures.

7-24. REPLACING FLUID AND SEALS, MAIN GEAR SHOCKS STRUT (see Figure 7-22).

a. Disassembly.

(1) Place the aircraft on jacks.

(2) Remove main gear in accordance with paragraph 7-23.

(3) Release strut air pressure.

(4) Disconnect brake line.

(5) Remove lower scissors attaching bolt and static cable.

(6) Remove the lower strut assembly.

(7) Remove the bushing,wiper seal, retainers, and retaining ring from the upper strut assembly.

NOTE

If maintenance or replacement of parts inside the upper strut is necessary, perfrom the following procedures.

(8) Remove the nut and washer on top of the upper strut assembly and remove the piston, spring, and spring actuator. If the upper leg bushings (8 and 11, Figure 7-22) need removal they must be pulled out as they are press fit.

(9) Do not remove the piston ring from the piston unless replacement is necessary.

b. Reassembly.

(1) If parts inside the upper strut assembly were removed, use a new O-ring and reinstall the parts by reversing disassembly procedures.

(2) Install new O-rings on the bushing.

(3) Lubricate the O-rings, bushing, and wiper seal with the same type hydraulic fluid that will be used in the strut (see Table 7-1).

(4) Use a new wiper seal, and assemble the retaining ring, retainers, wiper seal, and bushing into the upper strut assembly in the order shown in Figure 7-22. Position the retaining ring in the groove near the bottom of the upper strut assembly. Ensure that the retaining ring is seated firmly in the groove.

(5) Fill the lower strut assembly with the amount and type of hydraulic fluid indicated in Table 7-1, and insert the lower strut assembly into the upper strut assembly.

(6) Reconnect the lower end of the scissors and static cable.

(7) Reconnect the brake line.

(8) Refer to Table 7-1 for the specified air pressure and pressurize the strut.

(9) Bleed the brake system.

7-25. MAIN GEAR ACTUATING CYLINDER. (Figure 7-23).

a. Removal.

(1) Place the aircraft on jacks.

(2) Disconnect the hydraulic lines.

(3) Remove the bolts attaching the actuating cylinder to the upper drag strut and mounting bracket.

b. Disassembly.

(1) Remove the two hydraulic fittings from the cylinder barrel.

(2) Remove the retaining ring (1) and remove the pivot plug (2), bushing (3), and O-ring (4) as an assembly.

(3) Remove the retaining ring (1) and remove the clevis (17), shaft (12), piston (8) and attached components from the cylinder barrel as an assembly.

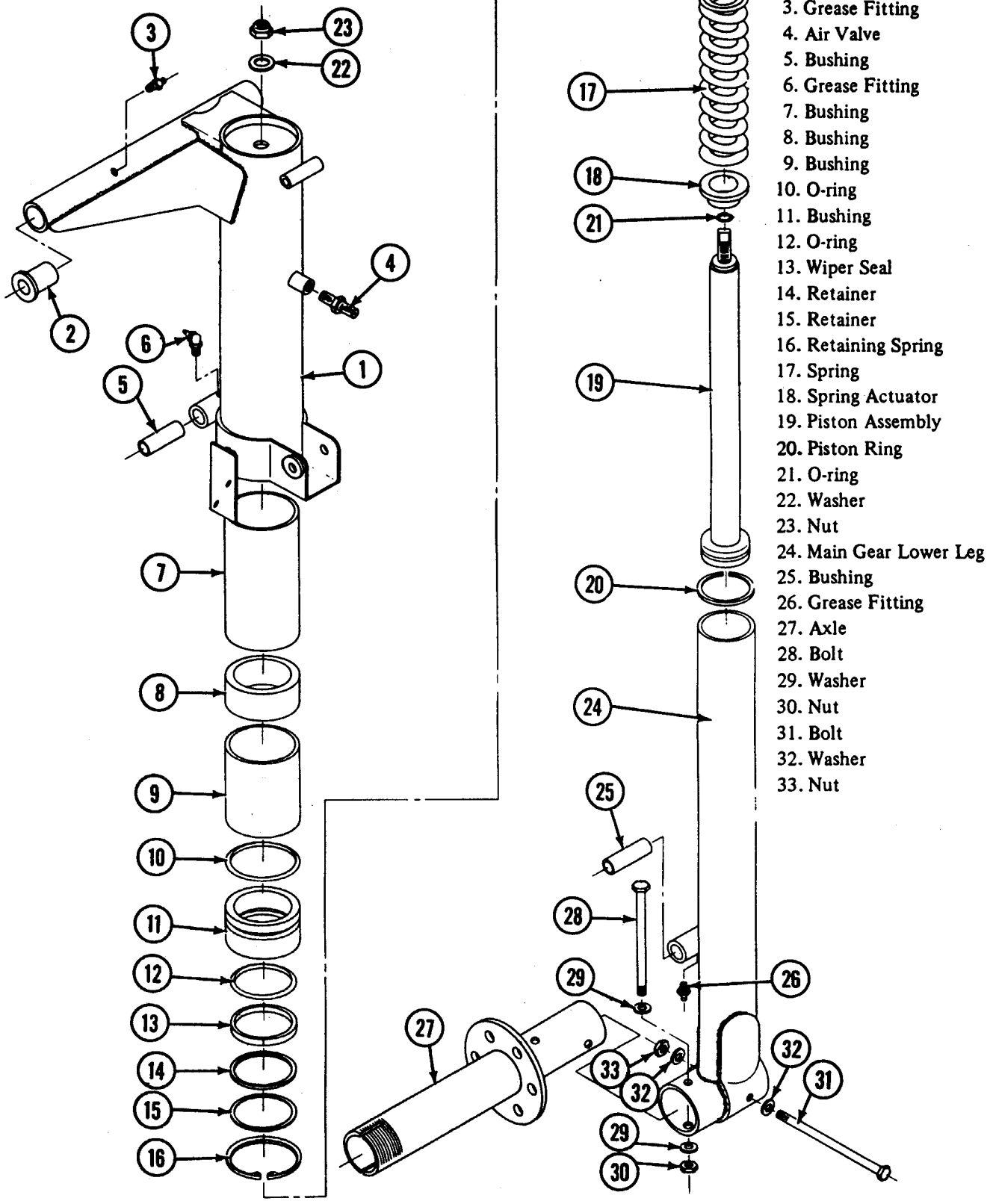


Figure 7-22. Main Gear Shock Strut.

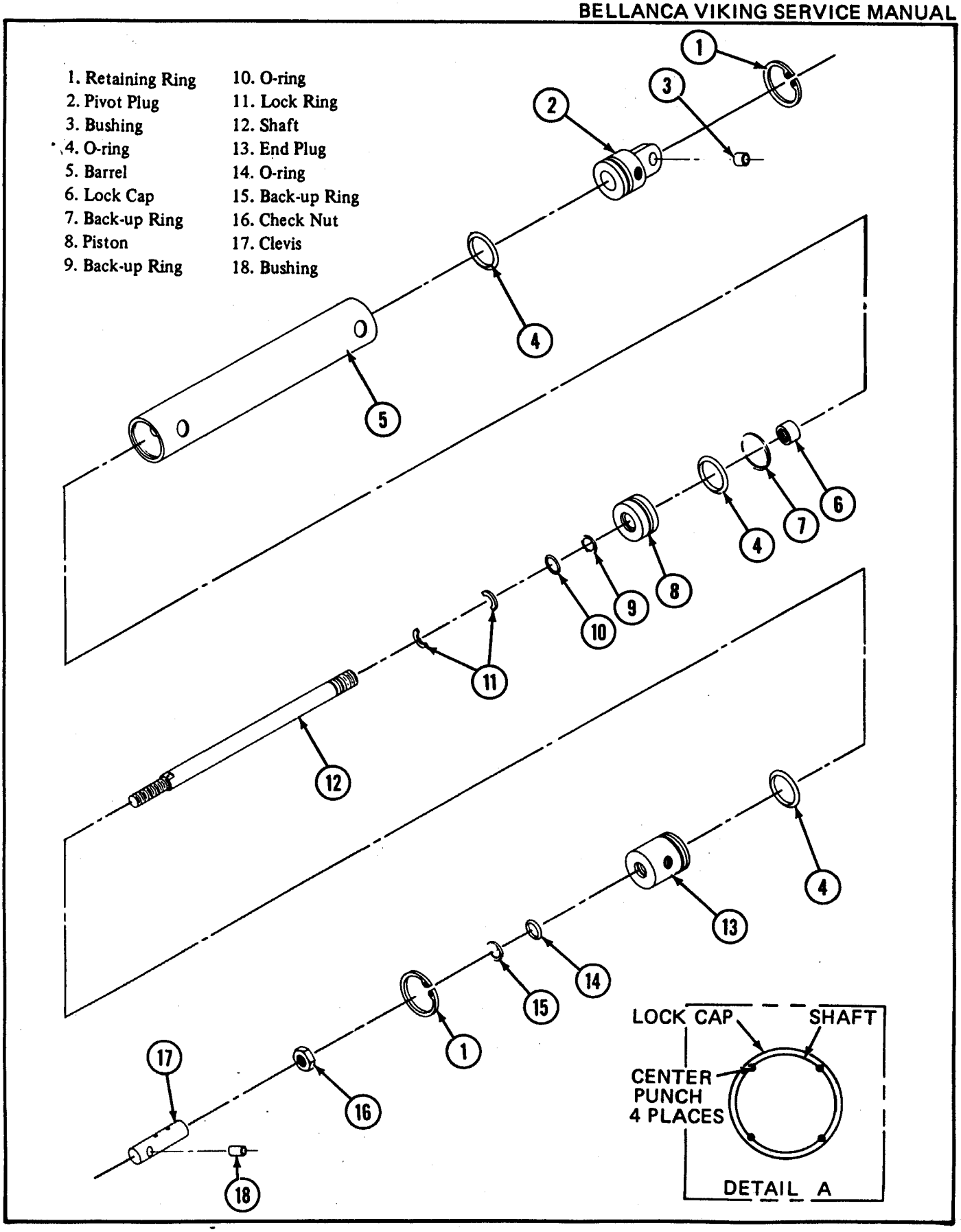


Figure 7-23. Main Gear Actuating Cylinder.

(4) Remove the safety wire from the clevis (17) and check nut (16). Loosen the check nut and remove the clevis.

(5) Remove the check nut (16) and end plug (13).

(6) Remove the lock cap (6) and piston (8) from the shaft (12).

(7) Remove the lock ring (11), O-ring (10), and back-up ring (9) from the shaft (12).

(8) Do not remove the bushings (3 and 18) unless replacement is necessary.

(9) Discard all O-rings.

c. Inspection and Cleaning.

(1) Inspect all component parts for damage or excessive wear. Particularly, inspect the interior surface of the barrel (5), along which the piston (8) travels and the O-rings (4) on the piston (8), end plug (13), and pivot plug (2) make contact. The interior surface of the barrel must be smooth. Scores or grooves inside the cylinder will allow leakage.

(2) Thoroughly clean all grooves in which O-rings are installed.

CAUTION

Do not use a wire brush or abrasive material for cleaning.

d. Reassembly and Installation. Reassemble and install the actuating cylinder by reversing disassembly and removal procedures, and perform the following additional procedures.

(1) When the back-up ring (9) and O-ring (10) are installed on the shaft (12), install them over the smaller diameter threaded end of the shaft (12).

CAUTION

Ensure that the O-ring and back-up ring are not damaged by the threads during installation.

(2) When the piston (8) and lock cap (6) are installed on the shaft (12), use a center punch and stake the cap and shaft in four places (see Figure 7-23, Detail A).

(3) Lubricate the O-rings and surfaces on the inside of the barrel that will make contact with the O-rings, with the same type hydraulic fluid that will be used in the system (see Table 7-1), before assembling components inside the barrel.

7-26. MAIN GEAR EXTENSION SPRING ASSEMBLY.

a. On Aircraft Serial Numbers 78-30905 and below, and 32-15, 31004 and above, refer to Figure 7-24 and perform the following procedures to disassemble and repair or replace components of the extension spring assembly.

(1) Remove the plug (8).

(2) Remove the bushing (4) and spring (1).

(3) Loosen the nut (6) and remove the rod end bearing (7) from the piston (2). Remove the lockwasher (5).

(4) Remove the piston (2) from the cylinder (3).

(5) Clean and inspect all component parts for damage or excessive wear, and replace parts as necessary.

(6) Use a new lockwasher and reassemble the extension spring assembly by reversing disassembly procedures.

b. On Aircraft Serial Numbers 79-30906 and above, refer to Figure 7-25 and perform the following procedures to disassemble and repair or replace components of the extension spring assembly.

(1) Remove the plug (9).

(2) Remove the bushing (4) and spring (3).

(3) Loosen the nut (6) and remove the rod end bearing (5) from the piston (2). Remove the lockwasher (7).

(4) Remove the piston (2) from the cylinder (1).

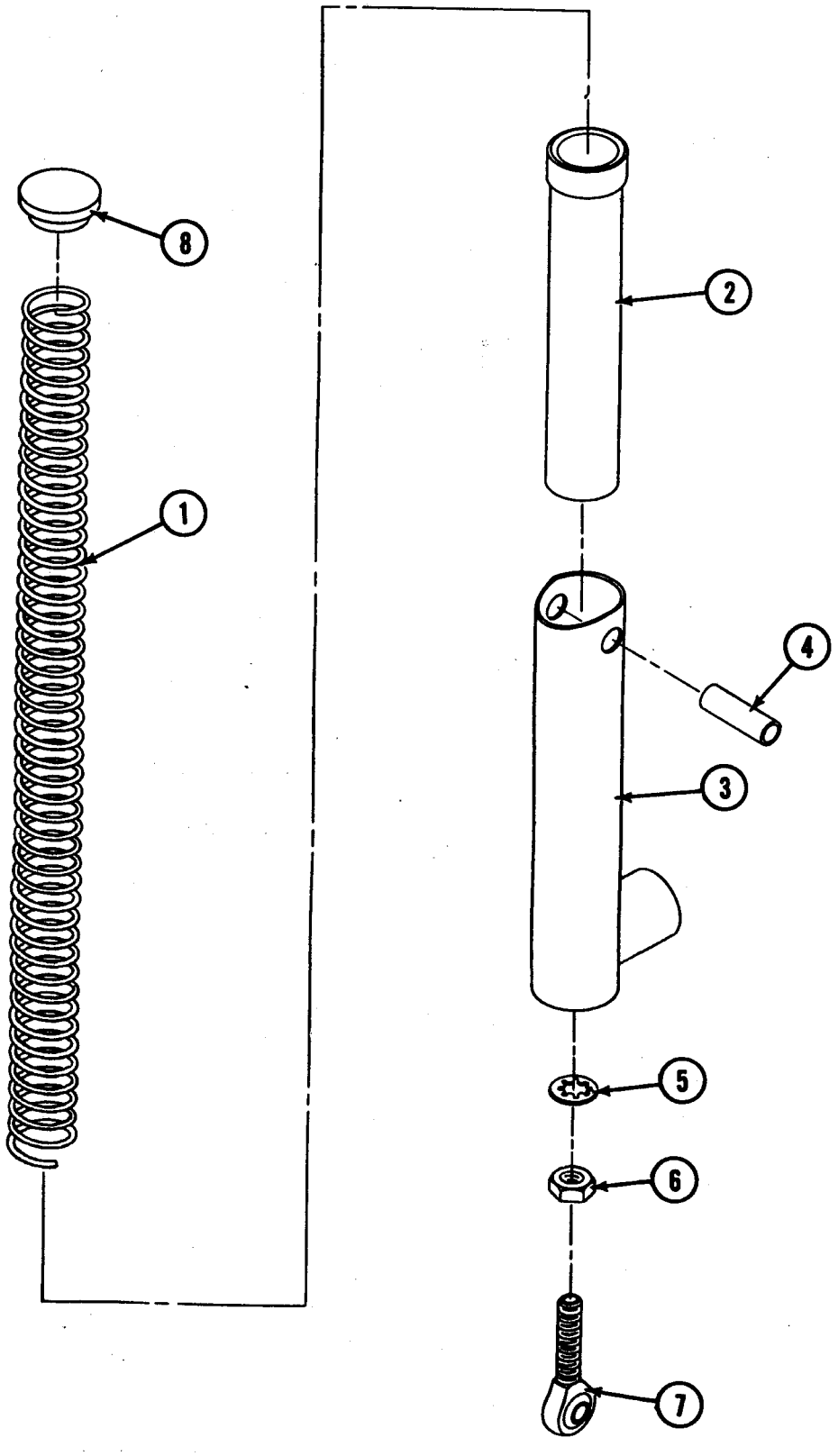
(5) Clean and inspect all component parts for damage or excessive wear, and replace parts as necessary.

(6) Use a new lockwasher and reassemble the extension spring assembly by reversing disassembly procedures.

7-27. RIGGING MAIN GEAR DRAG STRUTS (Figure 7-26).

a. Place the aircraft on jacks.

b. Disconnect the actuating cylinder rod end fitting (2) from the upper drag strut (4).



1- Spring
2- Piston
3- Cylinder
4- Bushing
5- Lockwasher
6- Nut
7- Rod End Cap
8- Plug

Figure 7-24. Main Gear Extension Spring Assembly, Aircraft Serial Numbers 78-30905 and below, and 32-15, 31004 and above.

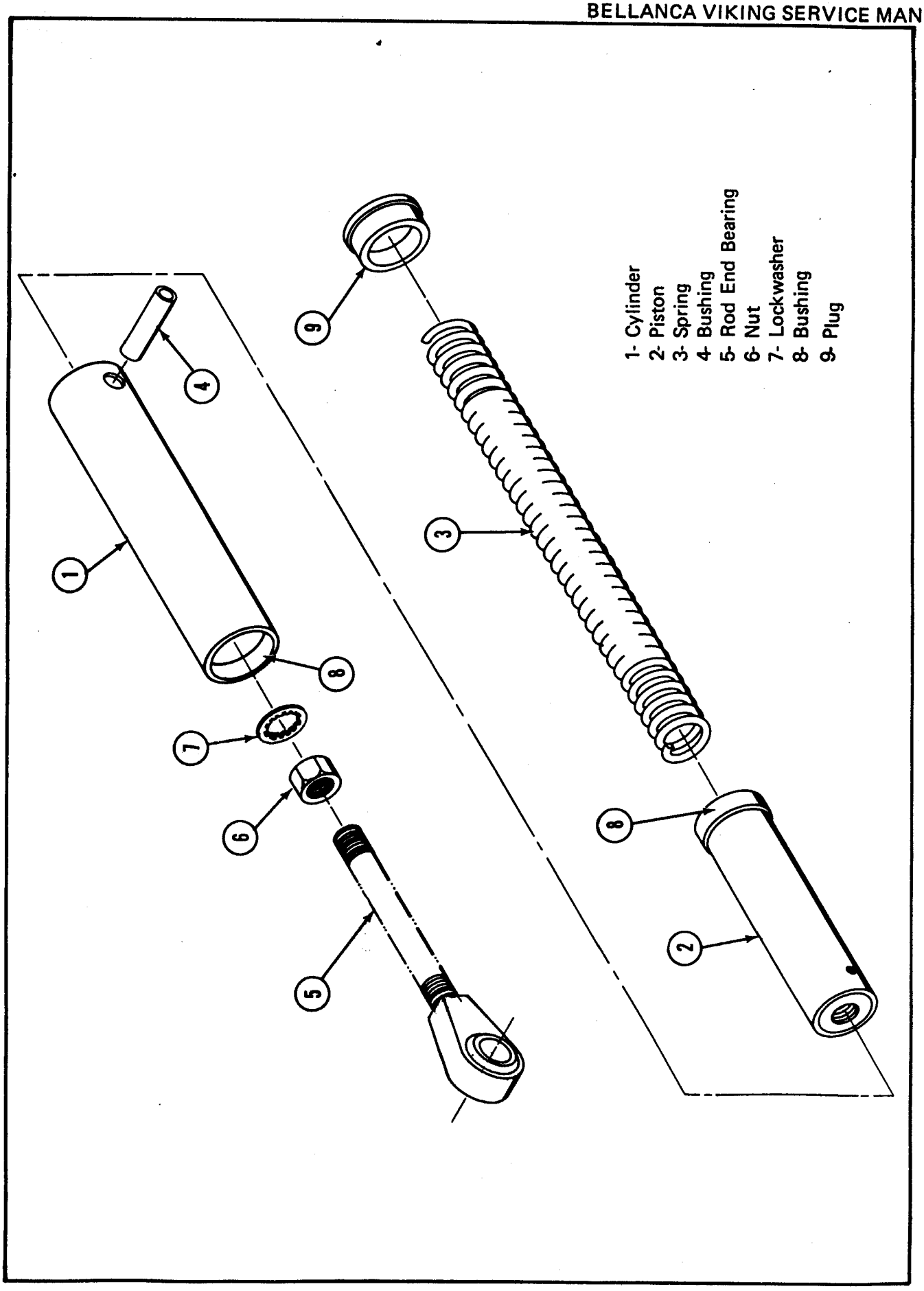


Figure 7-25. Main Gear Extension Spring Assembly, Aircraft Serial Numbers 79-30906 and above.

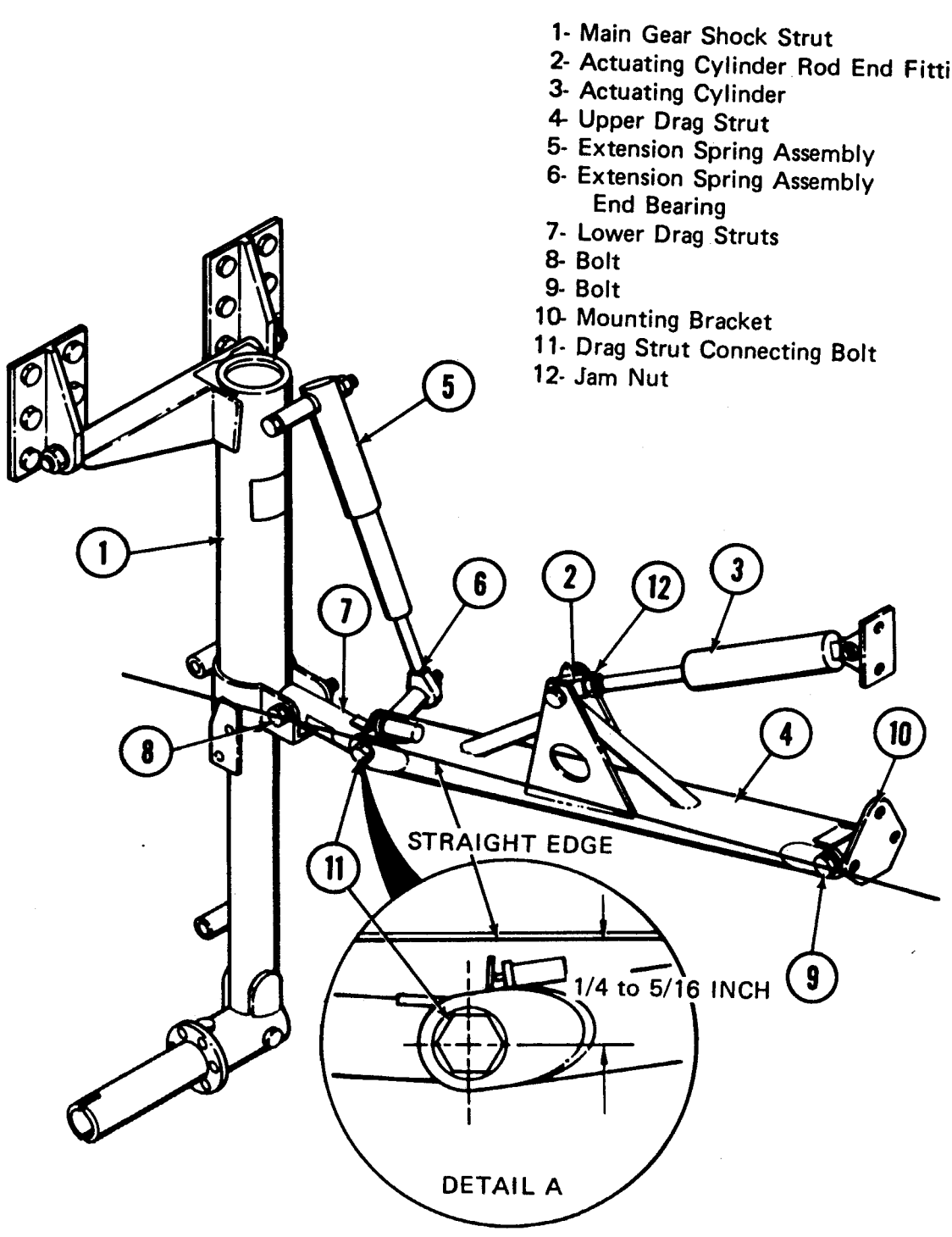


Figure 7-26. Rigging Main Gear Drag Struts.

c. With the extension spring assembly (5) extended until it is bottomed out, adjust the extension spring assembly end bearing (6) so that the drag struts (4 and 7) are overcenter 1/4 to 5/16 inch.

d. Check the overcenter travel as follows:

(1) Align a straightedge with the center of the bolt (8), attaching the lower drag strut (7) to the main gear shock strut strut (1), and the center of the bolt (9) attaching the upper drag strut (4) to the mounting bracket (10).

(2) Measure the distance between the straightedge and the center of the drag strut connecting bolt (11). The distance must be 1/4 to 5/16 inch (see Detail A).

WARNING

It is extremely important that the overcenter travel be accurately adjusted. Adjusting the overcenter travel to a greater distance than 5/16 inch does not provide a more positive gear down condition.

e. Reconnect the actuating cylinder rod end fitting (2) to the upper drag strut (4). Check to see that threads are visible through the witness hole in the rod end fitting, and that the jam nut is safety wired.

f. Ensure that the nut on the extension spring assembly end bearing is tight.

7-28. ADJUSTING MAIN GEAR DOORS (Figure 7-27).

a. Place the aircraft on jacks.

b. Adjust the screws (2) that contact the door linkage rod end bearings (3) so that the fork on the lever assembly (1) is aligned to receive the pin on the door catch (47).

c. Adjust the rod end fittings (30) on the rods (32) so that the doors close as tightly as possible when the gear is retracted.

CAUTION

Prior to cycling the gear, check to see that the static cable is properly routed and will clear the doors when the gear is retracted.

d. Retract the gear and check door closure. Readjust as necessary to attain the desired fit.

7-29. ADJUSTING NOSE GEAR AND MAIN GEAR DOWN LIMIT SWITCHES (Figures 7-28 and 7-29).

a. On Aircraft Serial Numbers 74-30617, 74-32-130 and 74-31077 and above, perform the following procedures to adjust the limit switches.

(1) Place the aircraft on jacks.

(2) Partially retract the gear.

CAUTION

Raise the gear only enough to move the drag strut connecting bolt slightly above a center line between the upper drag strut mounting bolt and the lower drag strut mounting bolt.

(3) Support the wheel or shock strut in a manner that will allow gradual and precise lowering of the wheel.

NOTE

A scissors jack or equivalent will will be suitable for this purpose.

(4) Move the emergency extension lever to the down position.

(5) Lower the wheel being supported until the center of the drag strut connecting bolt is 1/8 to 5/32 overcenter (see Figure 7-28 or 7-29, Detail A).

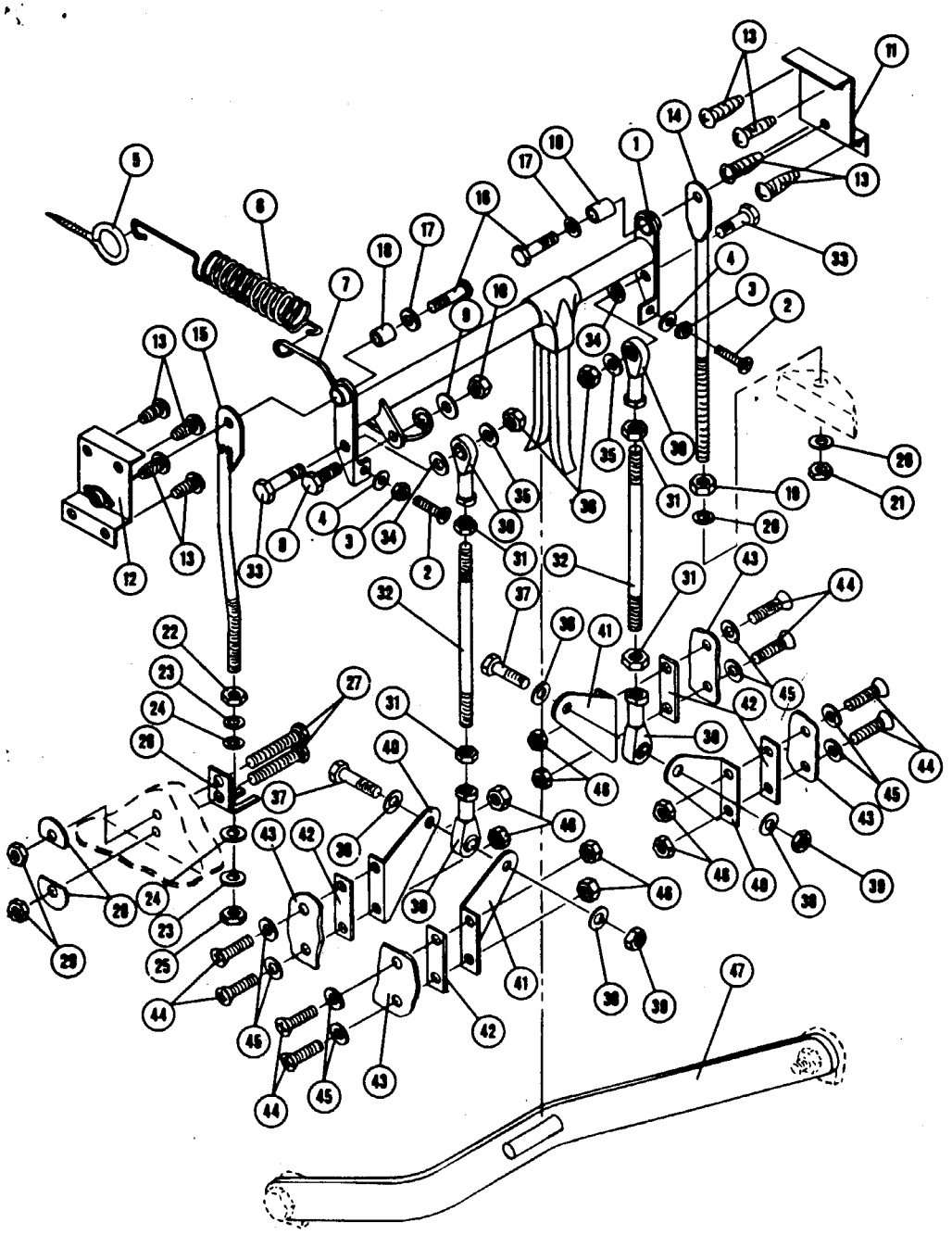
(6) Loosen the lock nuts on the limit switch (see Figure 7-28 or 7-29, Detail B).

(7) Move the limit switch in the direction to depress the plunger. When the limit switch clicks the switch is in the correct position.

NOTE

The locknut closest to the limit switch should be positioned so that when the limit switch clicks the locknut contacts the mounting bracket immediately thereafter.

(8) Hold the limit switch in position against the mounting bracket and tighten the other locknut.



1. Lever Assembly
2. Screw
3. Nut
4. Star Washer
4. Eye Bolt
6. Spring
7. Spring Linkage
8. Bolt
9. Washer
10. Nut
11. Bracket
12. Bracket
13. Screw
14. Compression Rod
15. Compression Rod
16. Bolt
17. Washer
18. Bushing
19. Nut
20. Washer
21. Nut
22. Nut
23. Washer
24. Star Washer
25. Nut
26. Bracket
27. Bolt
28. Washer
29. Nut
30. Bearing
31. Nut
32. Link Rod
33. Bolt
34. Washer
35. Washer
36. Nut
37. Bolt
38. Washer
39. Nut
40. Bracket
41. Bracket
42. Spacer
43. Door
44. Screw
45. Trim Washer
46. Nut
47. Door Catch

Figure 7-32. Brake System

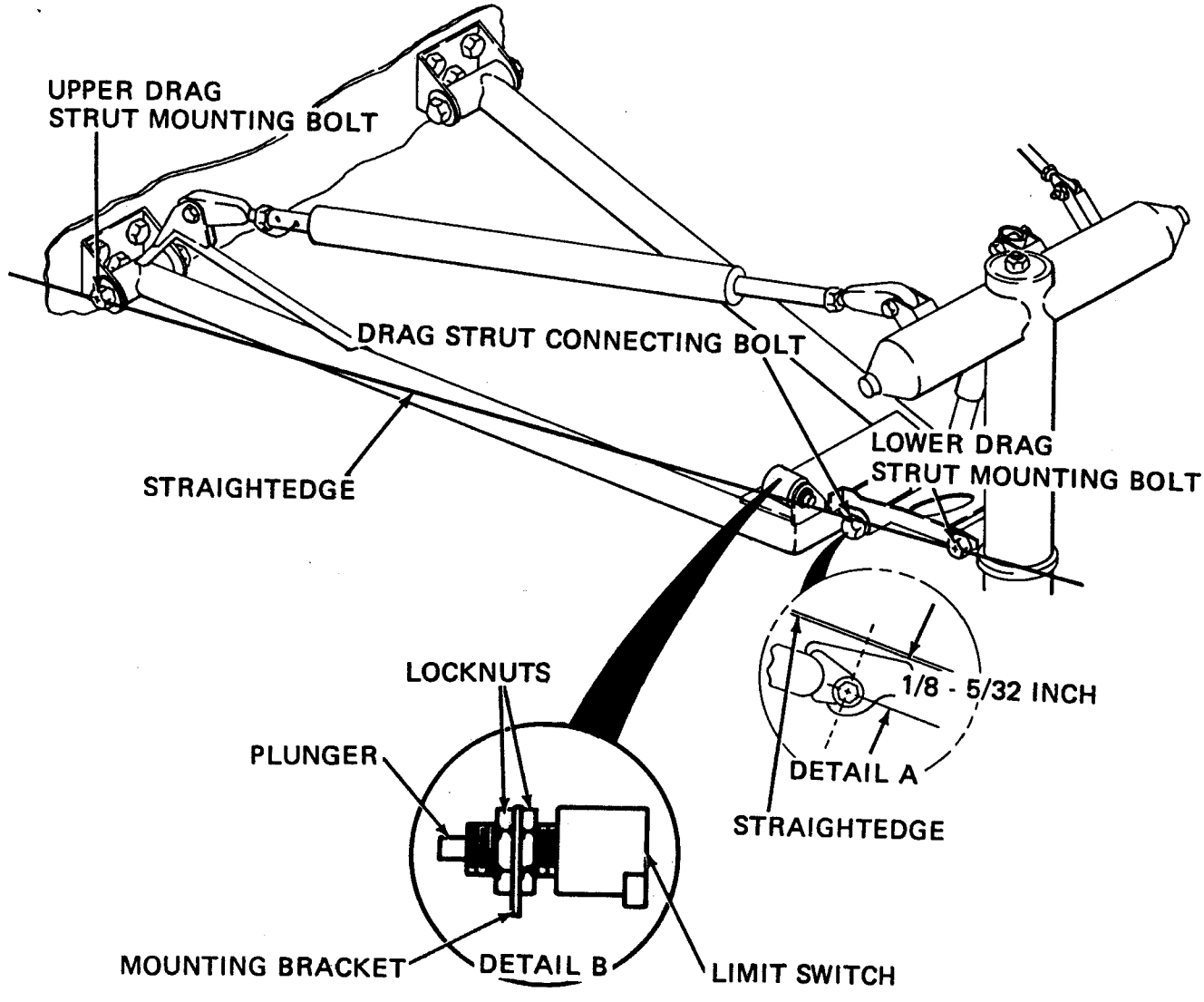


Figure 7-28. Nose Gear Limit Switch Adjustment.

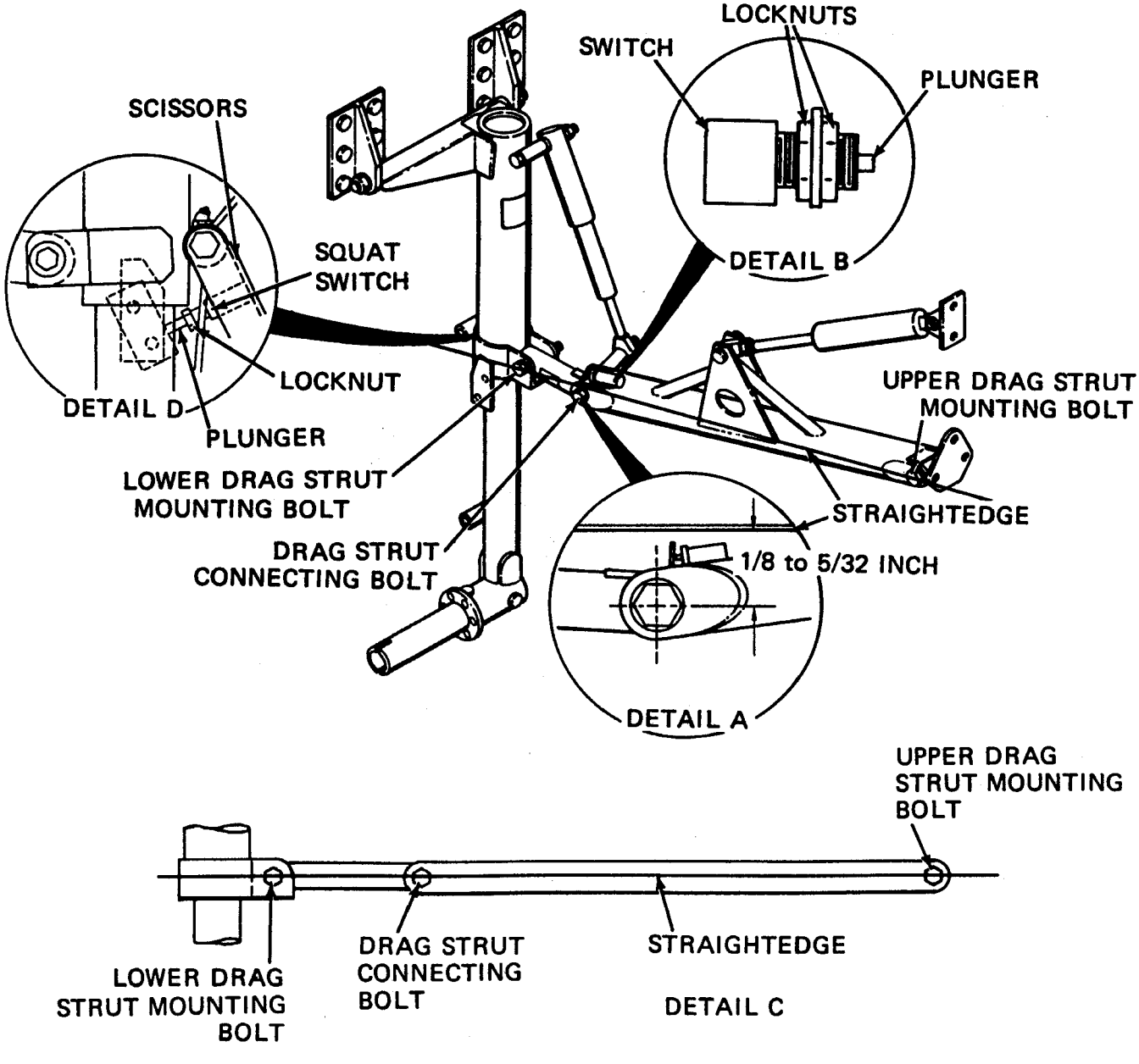


Figure 7-29. Main Gear Limit Switch.

(9) Repeat the above procedures and adjust the limit switches on the other two gears.

b. On Aircraft Serial Numbers 30282, 32-32 and 31009 through Aircraft Serial Numbers 74-30616, 74-32-129 and 74-31076, perform the following procedures to adjust the limit switches.

(1) Perform the procedures in paragraph 7-29 a. above to adjust the limit switches on the nose gear and left main gear.

(2) Perform the following procedures to adjust the limit switch on the right main gear.

(a) When the right main gear is being gradually lowered (as in paragraph 7-29 a. above), continue lowering the gear until the gear approaches its full overcenter travel of 1/4 to 5/16 inch.

(b) Adjust the limit switch to actuate as close to the full overcenter travel as possible, using the procedures in paragraph 7-29 a. above.

CAUTION

When the limit switch is actuated, further switch travel is limited. Adjusting the switch to actuate too far from the full overcenter travel will cause the switch to be damaged, when the gear is fully extended.

(c) Check actuation of the switch during the retraction cycle. As the gear is raised from the fully extended position, the switch should actuate before the drag struts pass through the centerline as shown on Figure 7-29, Detail C.

c. On Aircraft Serial Numbers 30281, 32-31 and 31008 and below, adjust all three limit switches using the procedures in paragraph 7-29 a. above.

7-30. ADJUSTING THE SQUAT SWITCH. The squat switch is located at the scissors on the right main gear.

a. Place the aircraft on jacks.

b. With the main strut fully extended, adjust the squat switch so that the plunger is fully depressed (see Figure 7-29, Detail D).

7-31. HYDRAULIC SYSTEM (Figures 7-30 and 7-31). The power pack is located under the right front seat and consists of a reversible electric motor, reservoir, sequencing valves, and check valves. No field repair or adjustment is recommended.

a. Servicing.

(1) With the gear down and the aircraft resting on the ground, the hydraulic fluid level in the reservoir should be at the FULL mark on the dipstick (61).

(2) If the hydraulic fluid level is low, fill the reservoir. thru the dipstick opening. Refer to Table 7-1 for the type of hydraulic fluid to be used.

b. Power Pack Relays. Two power solenoid relays are located under the front seat to the left of the power pack. One relay is for the up cycle of the landing gear and the other is for the down cycle. A switch relay for the solenoid relays is located behind the instrument panel, outboard of the gear warning horn interrupter relay.

NOTE

On Aircraft Serial Number 78-30905 and below, the press-to-test relay and gear switch relay are interchangeable. One may be checked against the other to determine the faulty relay.

c. Removal and Installation of the Power Pack.

(1) Place the aircraft on jacks with the gear in the down position.

(2) Remove the right front seat.

(3) Disconnect hydraulic lines connecting the power pack to the aircraft hydraulic system.

(4) Tag or mark electrical wires, and disconnect electrical wires connecting the power pack to the aircraft wiring system.

(5) Remove the bolts securing the power pack mounting bracket to the aircraft, and remove the power pack.

(6) Install a new or factory overhauled power pack by reversing removal procedures.

d. Accumulator. Perform the following procedures to replace a ruptured diaphragm in the accumulator.

(1) Remove the valve cap and depress the valve core to release pressure inside the accumulator.

(2) Remove the valve core to ensure that all pressure has been released.

(3) Unscrew and remove the top of the accumulator.

(4) Remove the diaphragm.

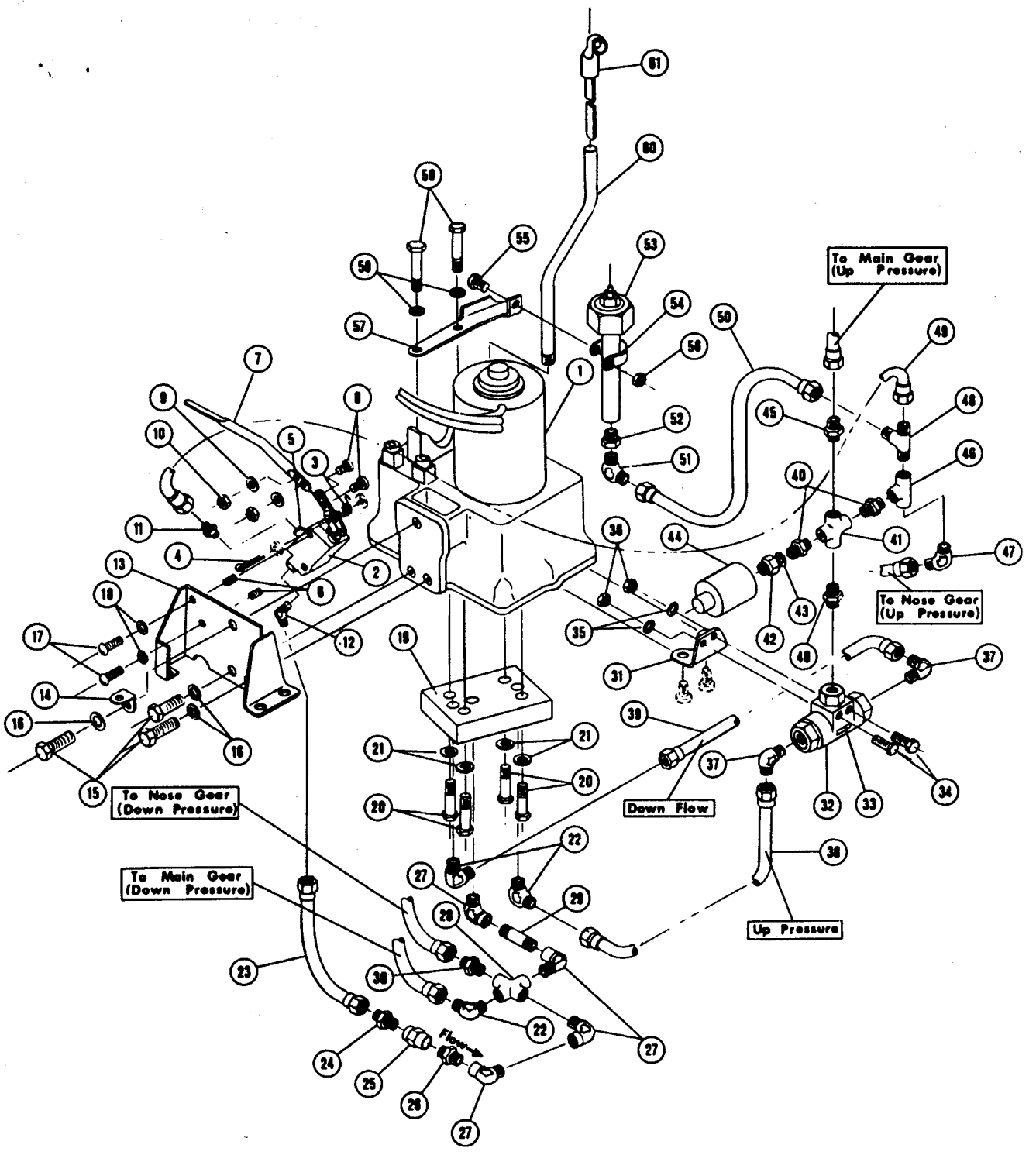


Figure 7-30. Hydraulic System, Aircraft Serial Numbers 78-30905 and below, and 32-15, 31004 and above. (Sheet 1 of 2).

Legend for Figure 7-30

(Sheet 1 of 2)

1. Power Pak
2. Valve Assembly
3. Spring
4. Cotter Pin
5. Placard
6. Insert
7. Lever
8. Screw
9. Washer
10. Nut
11. Nipple
12. Elbow
13. Bracket
14. Clip
15. Bolt
16. Washer
17. Screw
18. Washer
19. Adaptor Body
20. Bolt
21. Washer
22. Elbow
23. Metal Line
24. Nipple
25. Coupling
26. Check Valve
27. Elbow
28. Cross
29. Nipple
30. Nipple
31. Bracket
32. Shuttle Valve Assembly
33. Placard
34. Bolt
35. Washer
36. Nut
37. Elbow
38. Metal Line
39. Metal LIne
40. Nipple
41. Cross
42. Union
43. O-ring
44. Pressure Switch
45. Nipple
46. Tee
47. Elbow
48. Tee
49. Metal Line
50. Metal Line
51. Elbow
52. Bushing
53. Accumulator
54. Clamp
55. Screw
56. Nut
57. Bracket
58. Bolt
59. Washer
60. Tube
61. Stick

Legend for Figure 7-30

(Sheet 2 of 2)

1. Metal Line
2. Metal Line
3. Metal Line
4. Metal Line
5. Metal Line
6. Nipple
7. Tee
8. Nipple
9. Clamp
10. Clamp
11. Elbow
12. Hose
13. Clamp
14. Nipple
15. Clamp
16. Elbow
17. Elbow
18. Hose
19. Hose
20. Elbow
21. Washer
22. Nut
23. Clamp
24. Bolt
25. Washer
26. Nut

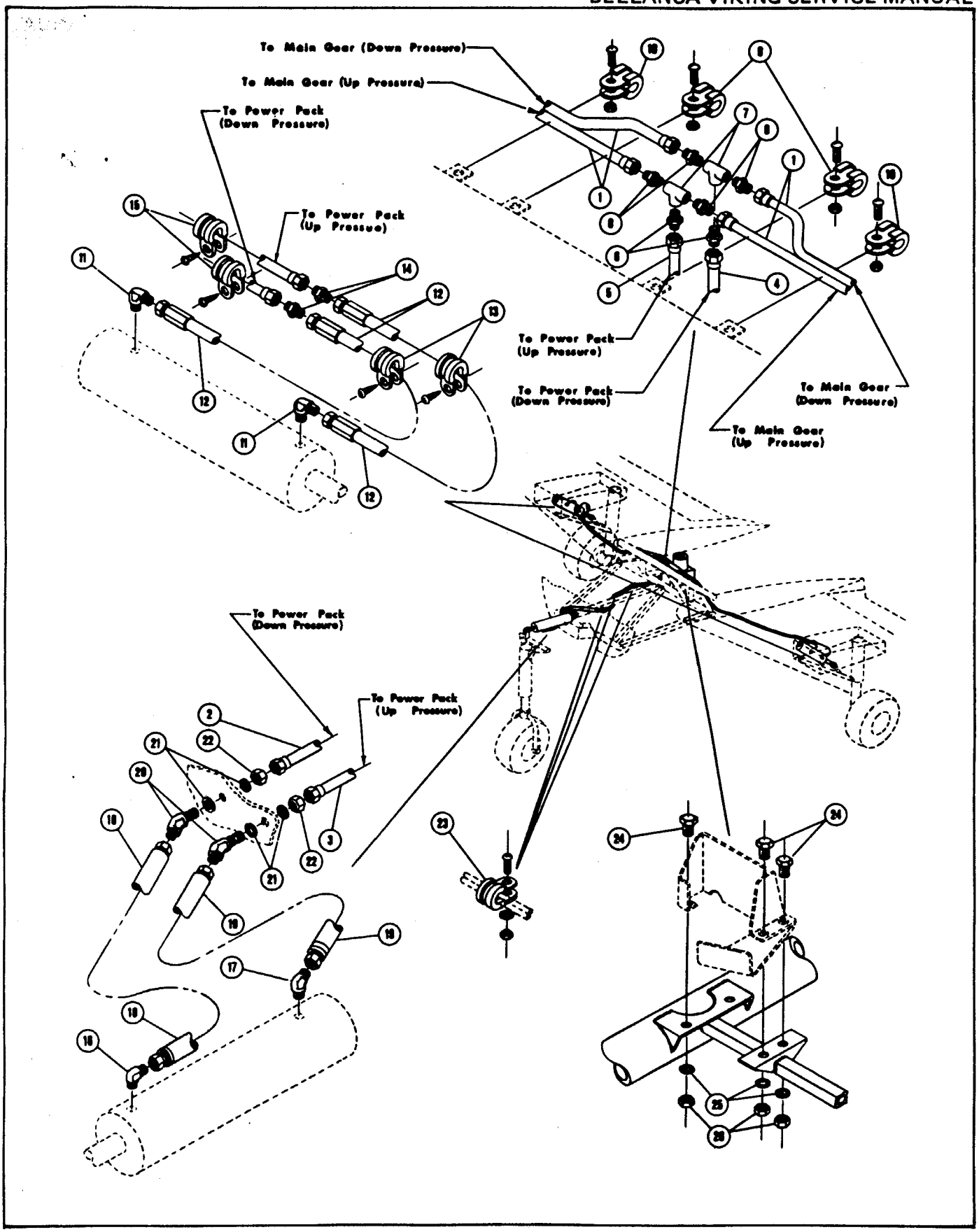


Figure 7-30. Hydraulic System, Aircraft Serial Numbers 78-30905 and below, and 32-15, 31004 and above. (Sheet 2 of 2).

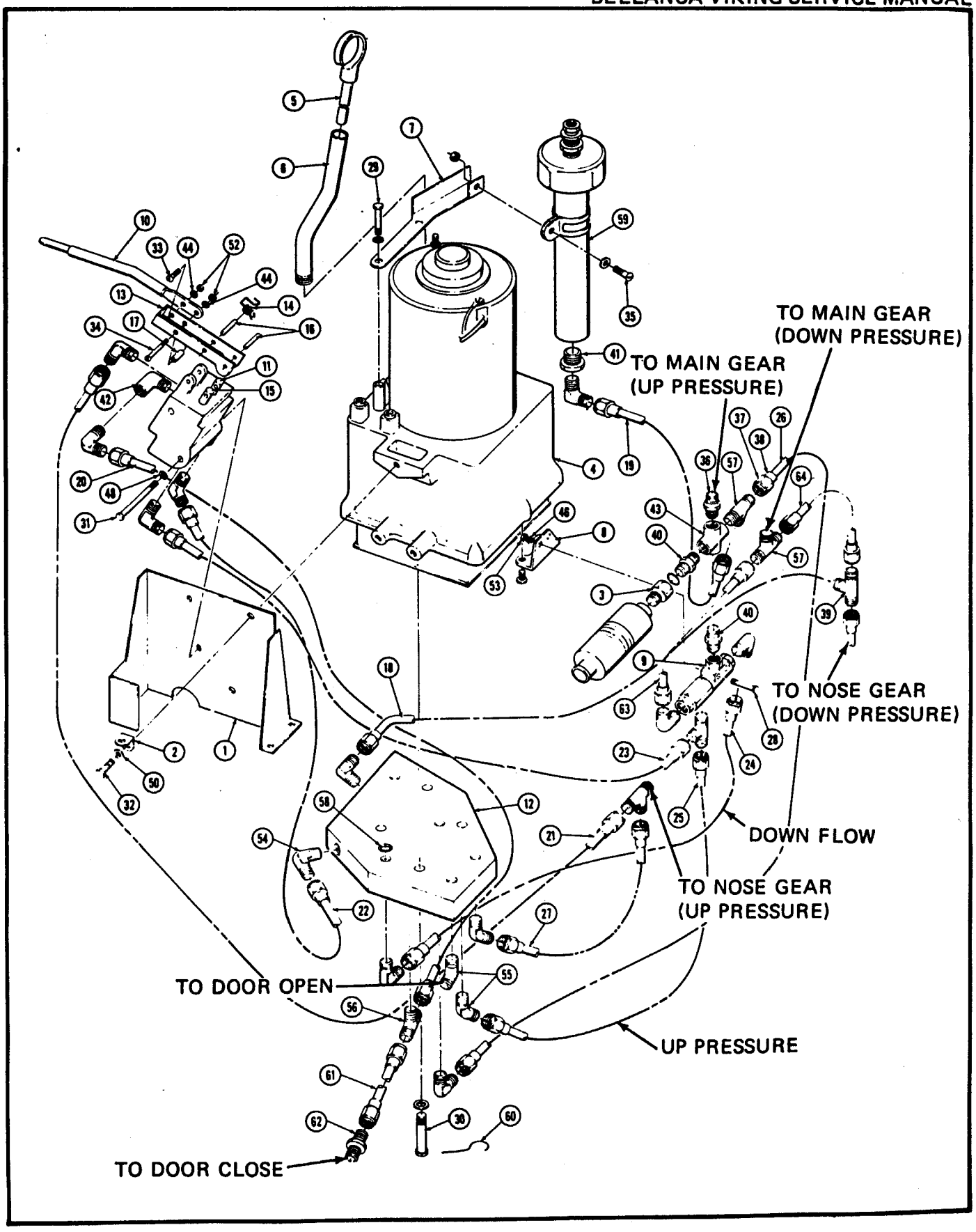


Figure 7-31. Hydraulic System, Aircraft Serial Numbers 79-30906 and above. (Sheet 1 of 2).

Legend for Figure 7-31

(Sheet 1 of 2)

1. Bracket
2. Clip
3. Union
4. Hydraulic Pump
5. Stick Assembly
6. Tube
7. Bracket
8. Bracket
9. Shuttle Valve
10. Lever
11. Dump Valve
12. Manifold Assembly
13. Bracket
14. Spring
15. Dump Valve
16. Pin
17. Bushing
18. Line
19. Line
20. Line
21. Line
22. Line
23. Line
24. Line
25. Line
26. Line
27. Line
28. Bolt
29. Bolt
30. Bolt
31. Bolt
32. Bolt
33. Screw
34. Screw
35. Screw
36. Nipple
37. Nut
38. Sleeve
39. Tee
40. Nipple
41. Bushing
42. Elbow
43. Cross
44. Washer
45. Washer
46. Washer
47. Washer
48. Washer
49. Washer
50. Washer
51. Washer
52. Nut
53. Nut
54. Elbow
55. Elbow
56. Tee
57. Tee
58. O-ring
59. Accumulator
60. Safety Wire
61. Line
62. Union
63. Line
64. Line

Legend for Figure 7-31

(Sheet 2 of 2)

1. Metal Line
2. Metal Line
3. Metal Line
4. Metal Line
5. Metal Line
6. Nipple
7. Tee
8. Nipple
9. Clamp
10. Clamp
11. Elbow
12. Hose
13. Clamp
14. Nipple
15. Clamp
16. Elbow
17. Elbow
18. Hose
19. Hose
20. Elbow
21. Washer
22. Nut
23. Clamp
24. Bolt
25. Washer
26. Nut
27. Hose
28. Hose
29. Elbow
30. Nose Gear Door Actuating Cylinder

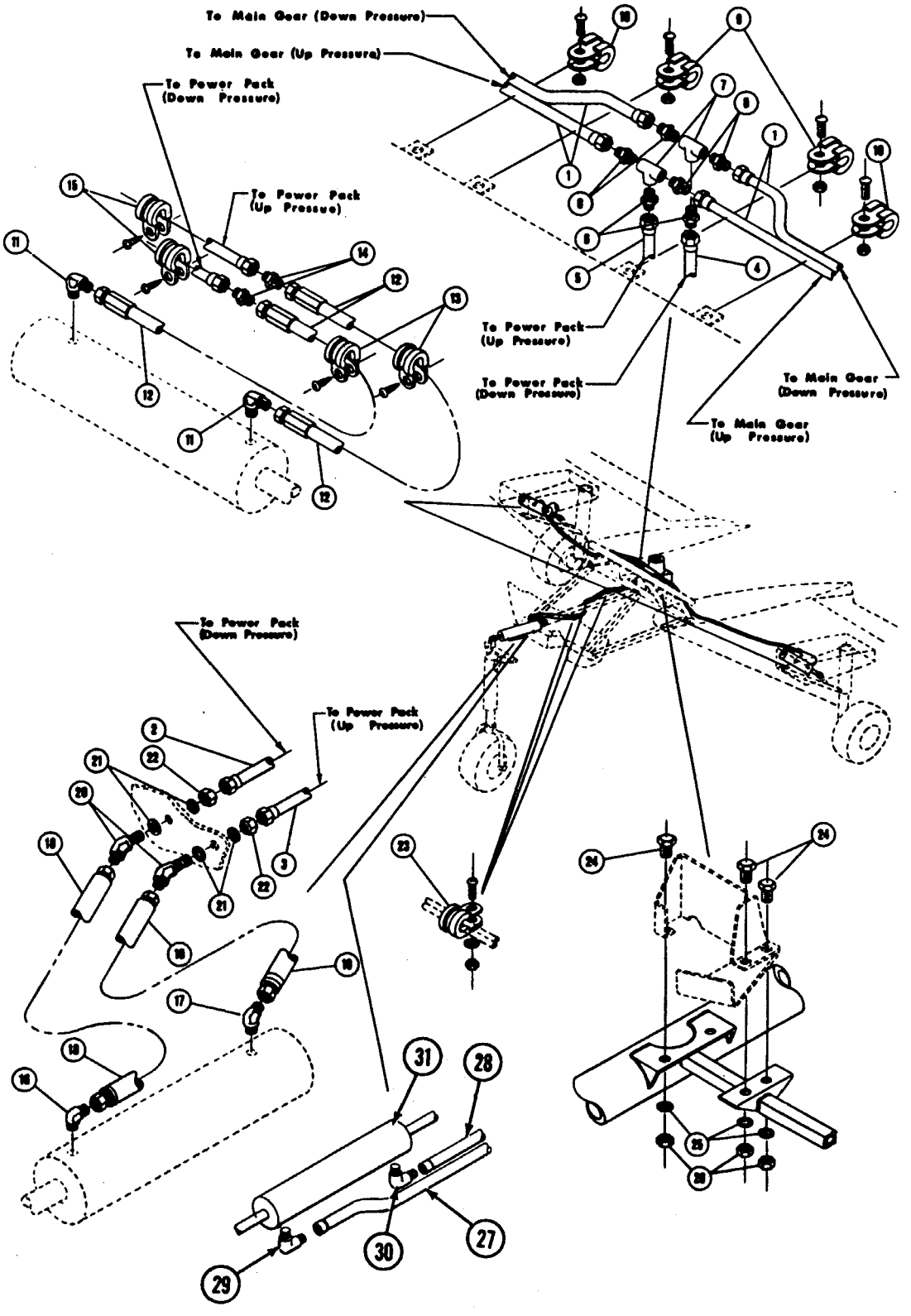


Figure 7-31. Hydraulic System, Aircraft Serial Numbers 79-30906 and above. (Sheet 2 of 2).

(5) Install a new diaphragm and reinstall the top of the accumulator.

(6) Install the valve core and charge the accumulator with nitrogen. Refer to Table 7-1 for the recommended pressure for charging the accumulator.

NOTE

A special gauge will be required to check the high pressure in the accumulator.

7-32. BRAKE SYSTEM. (Figures 7-32 and 7-33). The brake system consists of a reservoir, a master cylinder for each brake pedal, and lines connecting each master cylinder to its corresponding wheel brake cylinder. The brake assembly is a self-adjusting single disc type. A handle is mounted on the instrument panel for setting the parking brakes. Brakes for the copilot's position are optional equipment.

a. Master Brake Cylinder Adjustment. Perform the following procedures to adjust the master brake cylinders.

NOTE

Ensure that brake pedal casting does not interfere with cylinder shaft when depressing brake pedal.

(1) Adjust the master cylinder end fittings so that two threads are showing between the fork fitting.

(2) Adjust the master cylinders on the copilot's side so that the end fitting is bottomed out.

b. Replacing Brake Lining. The brake linings should be replaced when they are worn to a minimum thickness 3/32 inch.

NOTE

The shank end of a 3/32 inch drill bit held against the end of the brake linings is an excellent tool for checking brake lining wear.

(1) Removal of Wheel Brakes. The wheel brake assemblies are a floating type and can be removed after diconnecting the brake line and removing the back plate (22, Figure 7-20).

NOTE

The brake disc can be removed after wheel removal and disassembly.

Refer to paragraph 7-22 for procedures to remove and disassemble the main landing wheels. Perform the following procedures to replace the brake lining.

(a) Disconnect the brake line at the hydraulic fitting (15, Figure 7-20).

(b) Use Figure 7-20 as a guide and disassemble the brake.

(2) Brake Installation.

(a) Replace the O-rings with new O-rings.

(b) After the new linings have been installed on the back plate and pressure plate, use Figure 7-20 as a guide and reassemble the brake.

NOTE

Reassemble and install the wheel and tire assembly, if removed.

(c) Reconnect the brake line.

c. Bleeding the Brake System. The brake system must be bled after any maintenance is performed on the system that will allow air to enter the system.

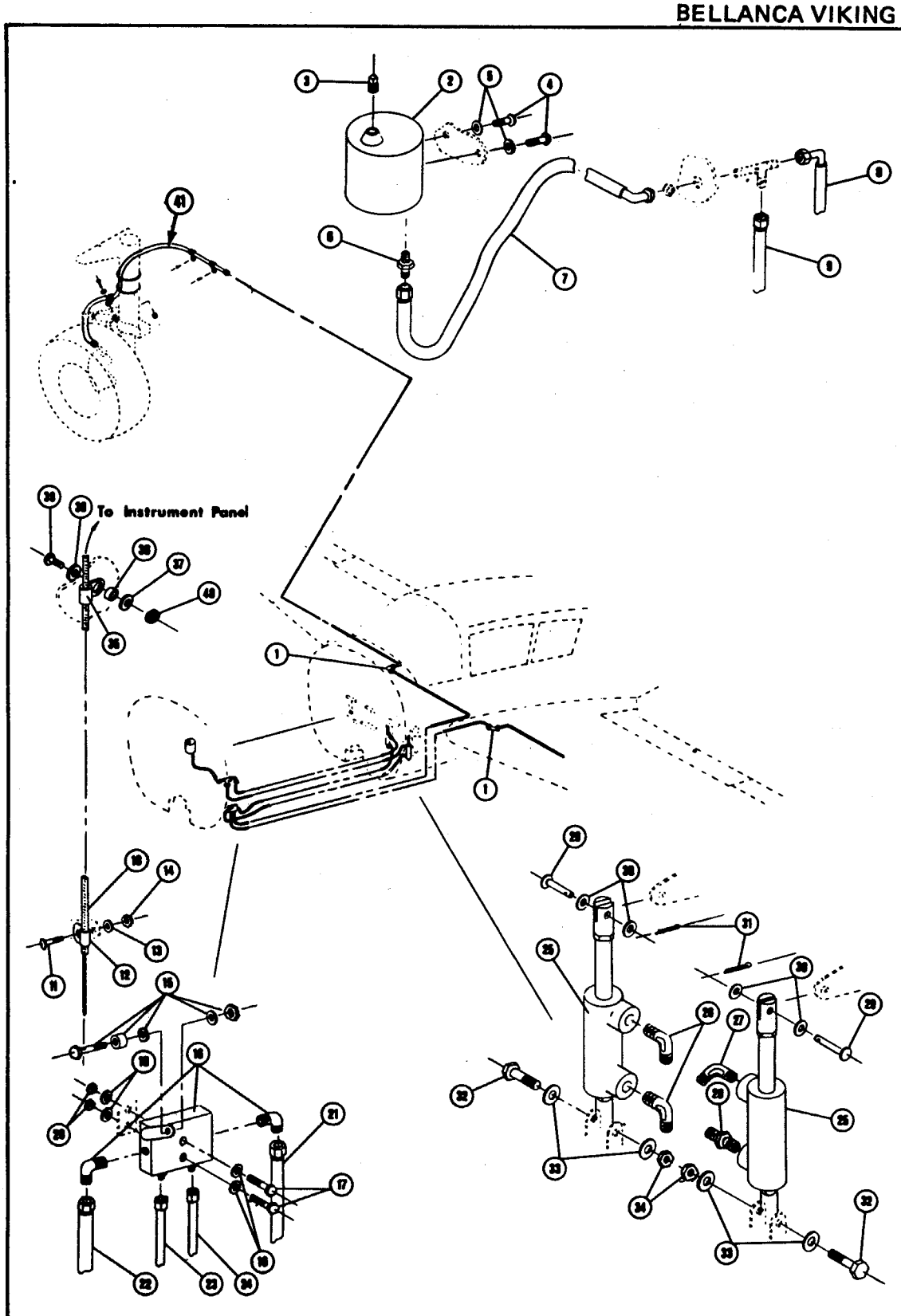
NOTE

If the brake pedal feels spongy when the brakes are applied, this indicates the probability of air in the system, and the brakes should be bled.

(1) Remove the protective cover from the bleeder (16, Figure 7-20).

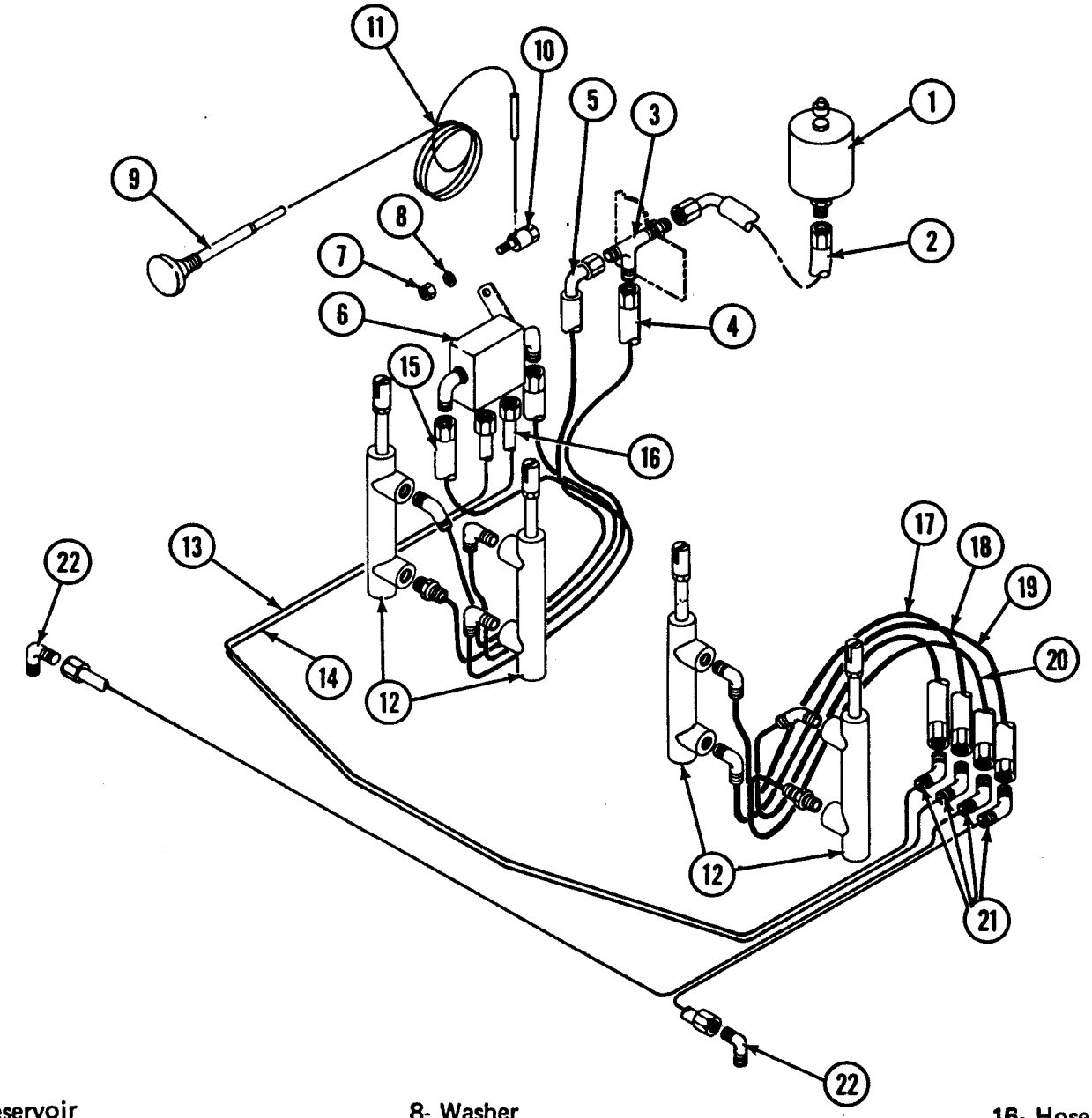
(2) Connect a bleeder hose to the bleeder valve. Submerge the free end of the hose in a jar containing enough brake fluid to cover the end of the hose.

(3) Check the fluid level in the brake reservoir, and add fluid if necessary.



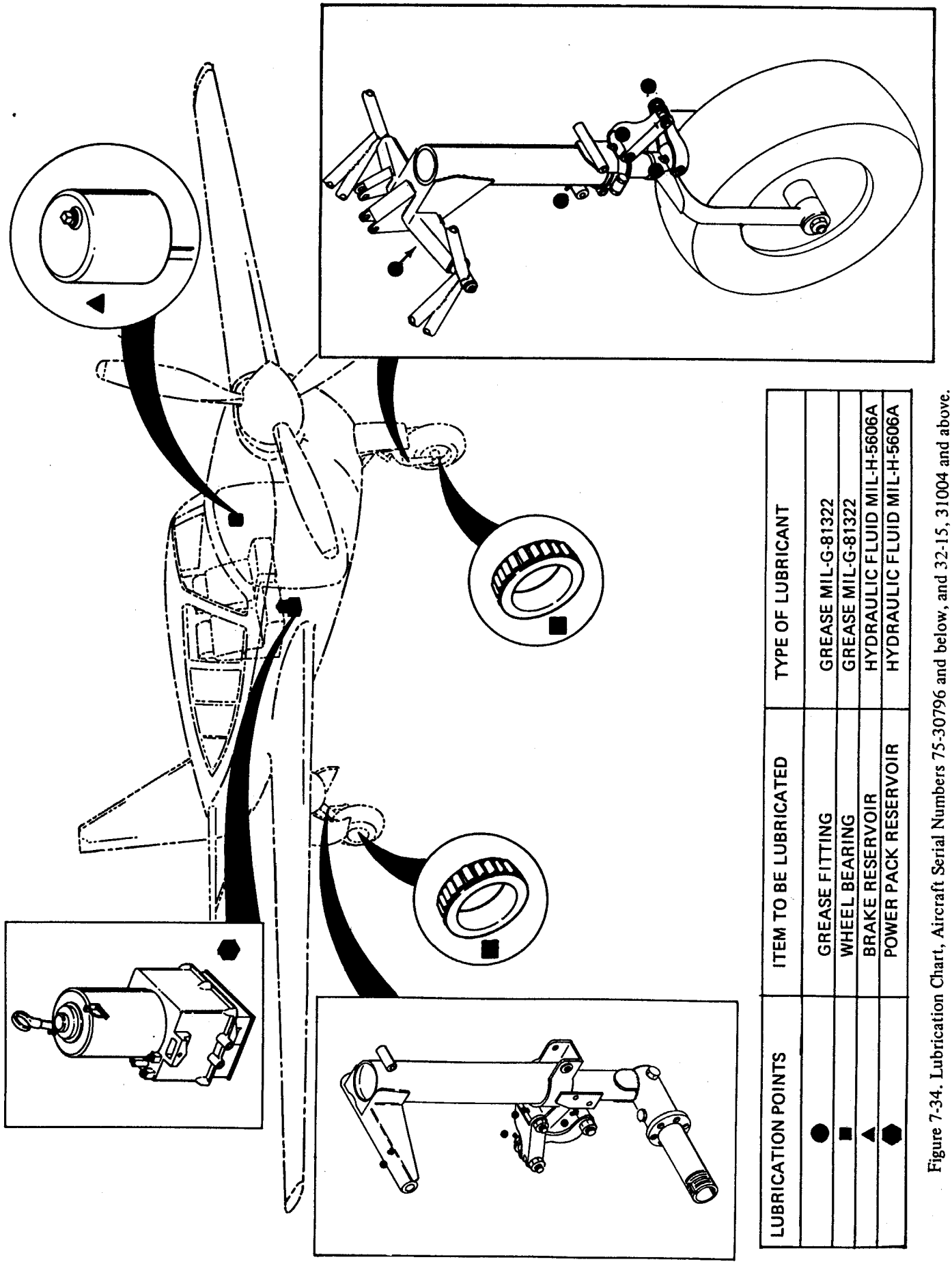
1. Elbow
2. Reservoir
3. Plug
4. Screw
5. Washer
6. Nipple
7. Hose
8. Hose
9. Hose
10. Control Cable
11. Screw
12. Clamp
13. Washer
14. Nut
15. Connector Fitting
16. Valve
17. Bolt
18. Washer
19. Washer
20. Nut
21. Hose
22. Hose
23. Line
24. Line
25. Master Cylinder
26. Elbow
27. Elbow
28. Nipple
29. Flat Pin
30. Washer
31. Cotter Pin
32. Bolt
33. Washer
34. Nut
35. Clamp
36. Bushing
37. Washer
38. Washer
39. Screw
40. Stop Nut
41. Hose

Figure 7-32. Brake System



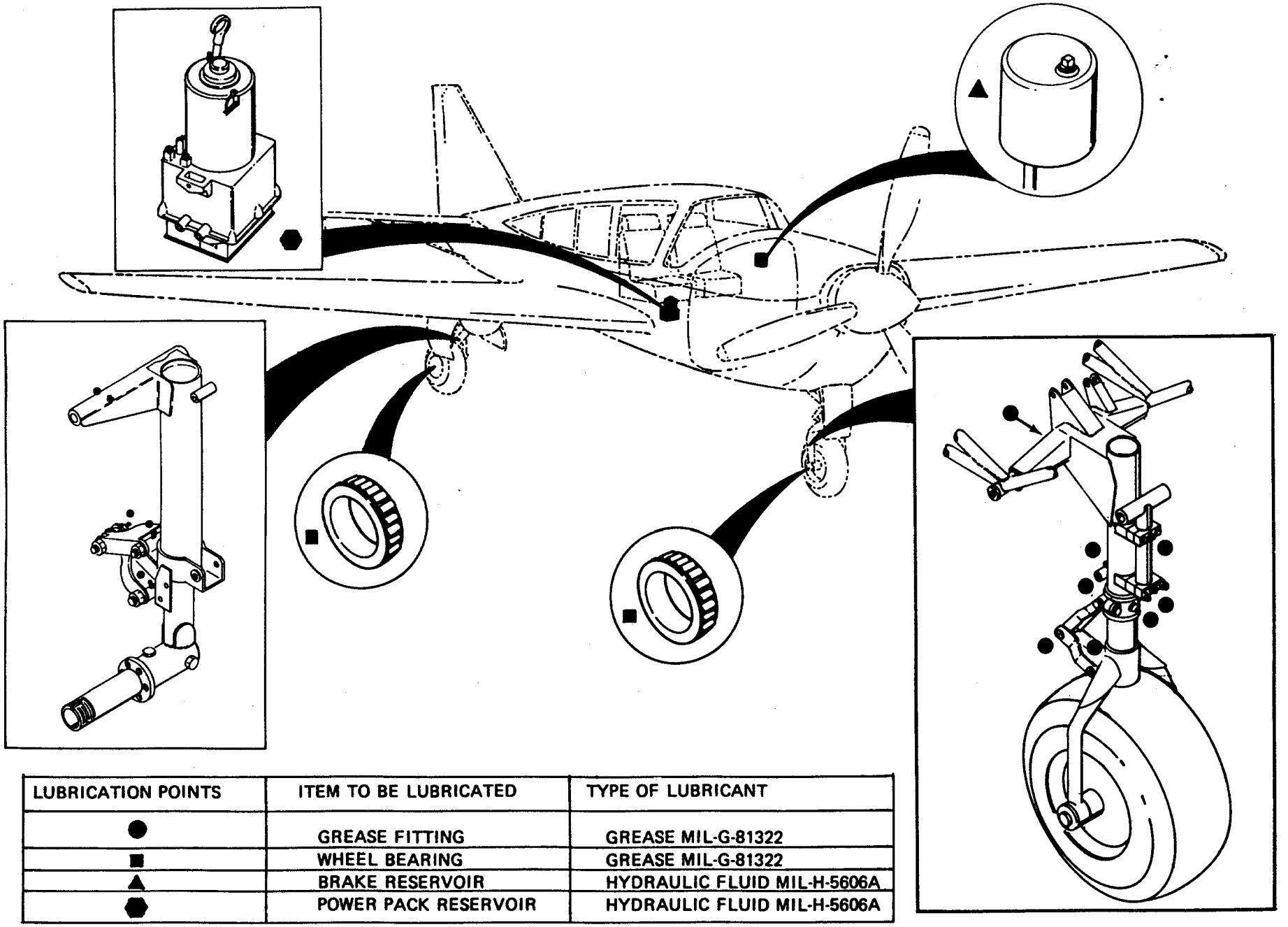
1- Reservoir
2- Hose
3- Tee
4- Hose
5- Hose
6- Valve
7- Nut
8- Washer
9- Parking Brake Handle
10- Connector Fitting
11- Control Cable
12- Master Cylinder
13- Line
14- Line
15- Hose
16- Hose
17- Hose
18- Hose
19- Hose
20- Hose
21- Elbow
22- Elbow

Figure 7-33. Brake System



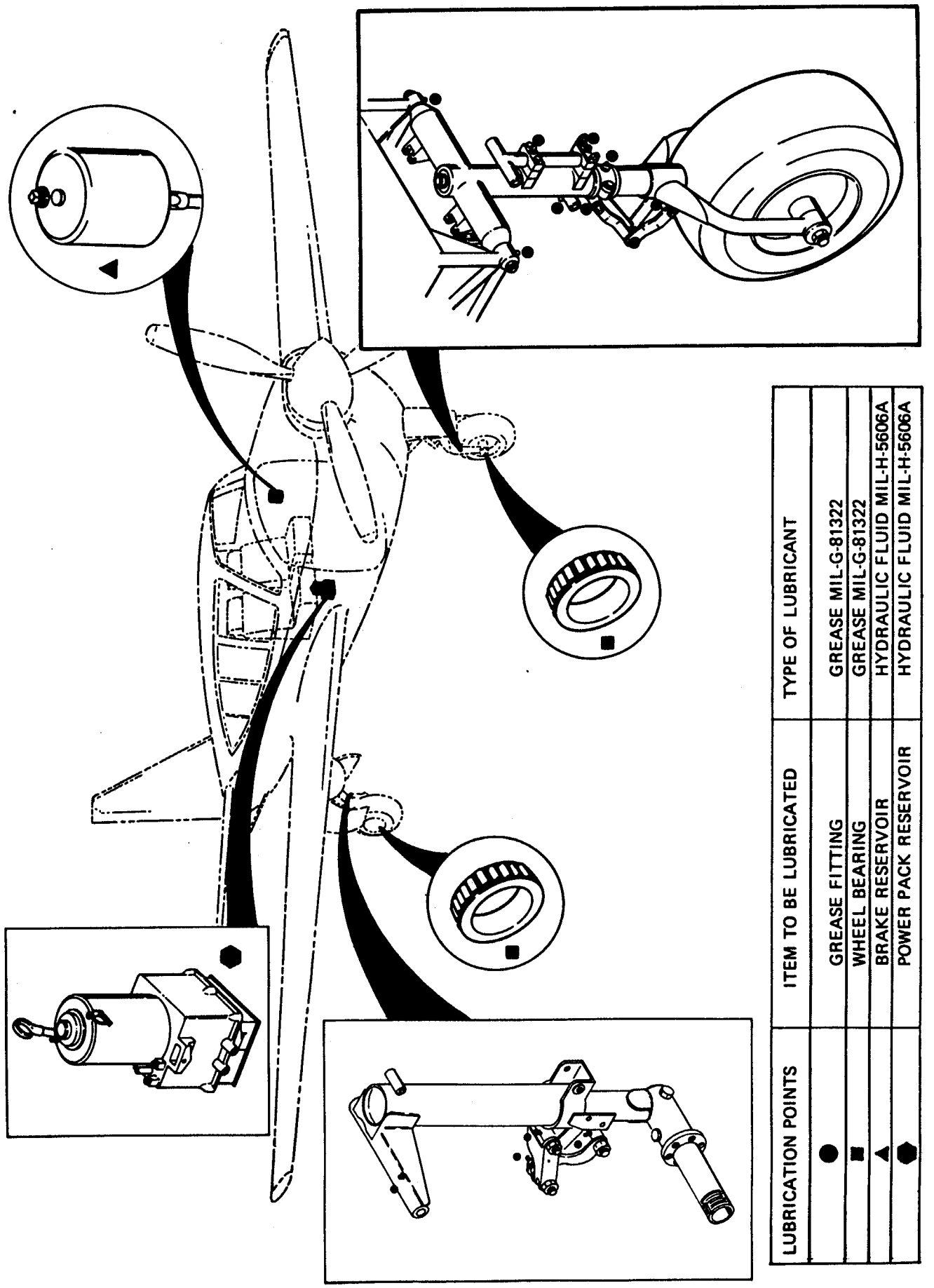
LUBRICATION POINTS	ITEM TO BE LUBRICATED	TYPE OF LUBRICANT
●	GREASE FITTING	GREASE MIL-G-81322
■	WHEEL BEARING	GREASE MIL-G-81322
▲	BRAKE RESERVOIR	HYDRAULIC FLUID MIL-H-5606A
⬢	POWER PACK RESERVOIR	HYDRAULIC FLUID MIL-H-5606A

Figure 7-34. Lubrication Chart, Aircraft Serial Numbers 75-30796 and below, and 32-15, 31004 and above.



LUBRICATION POINTS	ITEM TO BE LUBRICATED	TYPE OF LUBRICANT
●	GREASE FITTING	GREASE MIL-G-81322
■	WHEEL BEARING	GREASE MIL-G-81322
▲	BRAKE RESERVOIR	HYDRAULIC FLUID MIL-H-5606A
⬢	POWER PACK RESERVOIR	HYDRAULIC FLUID MIL-H-5606A

Figure 7-35. Lubrication Chart, Aircraft Serial Numbers 76-30797 through Serial Numbers 78-30905.



LUBRICATION POINTS	ITEM TO BE LUBRICATED	TYPE OF LUBRICANT
●	GREASE FITTING	GREASE MIL-G-81322
■	WHEEL BEARING	GREASE MIL-G-81322
▲	BRAKE RESERVOIR	HYDRAULIC FLUID MIL-H-5606A
⬢	POWER PACK RESERVOIR	HYDRAULIC FLUID MIL-H-5606A

Figure 7-36. Lubrication Chart, Aircraft Serial Numbers 79-30906 and above.

(4) Open the bleeder valve approximately 1/2 turn and operate the brake pedal slowly. Observe the end of the bleeder hose in the jar. Air bubbles should be expelled from the end of the hose.

(5) When air bubbles cease to emerge from the hose, close the bleeder valve.

NOTE

The reservoir must have an ample supply of fluid at all times during the bleeding process. If the reservoir is allowed to run dry, air will be introduced into the system through the reservoir.

(6) When bleeding is completed, remove the bleeder hose and install the protective cover.

(7) Check the fluid level in the brake reservoir and replenish as necessary.

7-33. TROUBLESHOOTING. Troubleshooting is the application of a definite procedure, in a logical sequence, to locate and eliminate the cause of trouble in a particular system or unit. Always look first for the obvious causes of trouble. Check first the items most easily and inexpensively corrected, then proceed to the more difficult, time-consuming and expensive items. An electrical wiring diagram for the landing gear system (Figure 7-37) is included to be used in conjunction with the trouble-shooting guide to identify and isolate malfunctions.

Table 7-2. Troubleshooting Guide

TROUBLE	PROBABLE CAUSE	SOLUTION
1. Gear will not retract. Power pack motor does not run.	1. Throttle not fully forward	1. Throttle must be full forward to complete landing gear circuit.
	2. Power pack circuit breaker out.	2. Reset circuit breaker.
	3. Auto-Axtion Switch not properly adjusted or defective.	3. Align, adjust, or replace switch, as necessary.
	4. Broken squat switch or no power to squat switch	4. Replace switch or repair wiring.
	5. Low strut air pressure, squat switch not activated when weight of aircraft is off gear.	5. Service strut.
	6. Defective solenoid relay.	6. Replace relay.
	7. Defective gear switch relay.	7. Replace defective switch or relay as necessary.
	8. Defective power pack	8. Replace power pack, or contact Bellanca Aircraft Corporation for information on repair facilities.
2. Gear will not retract. Power pack motor runs.	1. Dump valve in open position	1. Close or replace valve.
	2. Pump inoperative or defective	2. Check pump output pressure with a pressure gauge connected at any convenient location in the gear up hydraulic circuit.

Table 7-2. Troubleshooting Guide (continued)

TROUBLE	PROBABLE CAUSE	SOLUTION
3. Gear retracts, but does not stay up. Power pack cycles. (one to two times per hour is normal).	1. External leak in system lines or actuating cylinders. 2. Internal leak in actuating cylinders. Cylinders can be isolated by disconnecting and plugging both cylinder hydraulic lines 3. Internal leak in shuttle valve 4. Internal leak in dump valve 5. Internal leak in power pack	1. Locate and repair leak. 2. Replace seals or cylinders. 3. Replace seals on valve 4. Repair or replace dump valve 5. Replace power pack
4. Nose gear retracts, but main gear only partially retracts.	1. Broken static cable 2. Excessive air pressure in main struts	1. Replace static cable 2. Service struts
5. Strut loses air pressure. Visible hydraulic leak	1. Defective inflation valve 2. Leaking O-ring at top of piston stem † When replacing O-ring, the piston must not turn as the nut is tightened or the new O-ring will be damaged.	1. Replace valve † 2. Replace O-ring
6. Nose gear contacts and pushes past nose gear side doors during extension cycle. Doors do not fully open prior to pump shutting off.	1. Sequence valve one defective, remains in open position.	1. Contact Bellanca Aircraft Corporation (special tools are required to correct this malfunction)
7. Nose gear is in the extended position and cannot be retracted.	1. Sequence valve one defective, remains in closed position.	1. Contact Bellanca Aircraft Corporation (special tools are required to correct this malfunction)
8. Nose gear is in the retracted position and cannot be extended using normal procedures.	1. Sequence valve one defective, remains in closed position	1. Contact Bellanca Aircraft Corporation (special tools are required to correct this malfunction)
9. Nose gear side doors close before the nose gear retracts.	1. Sequence valve two defective, Remains in open position	1. Contact Bellanca Aircraft Corporation (special tools are required to correct this malfunction)
10. Nose gear doors are in open position and will not close.	1. Sequence valve two defective, remains in closed position	1. Contact Bellanca Aircraft Corporation (special tools are required to correct this malfunction)
11. Nose gear is in the up position and doors are closed. The nose gear doors will not open.	1. Sequence valve two defective, remains in closed position.	1. Contact Bellanca Aircraft Corporation (special tools are required to correct this malfunction)

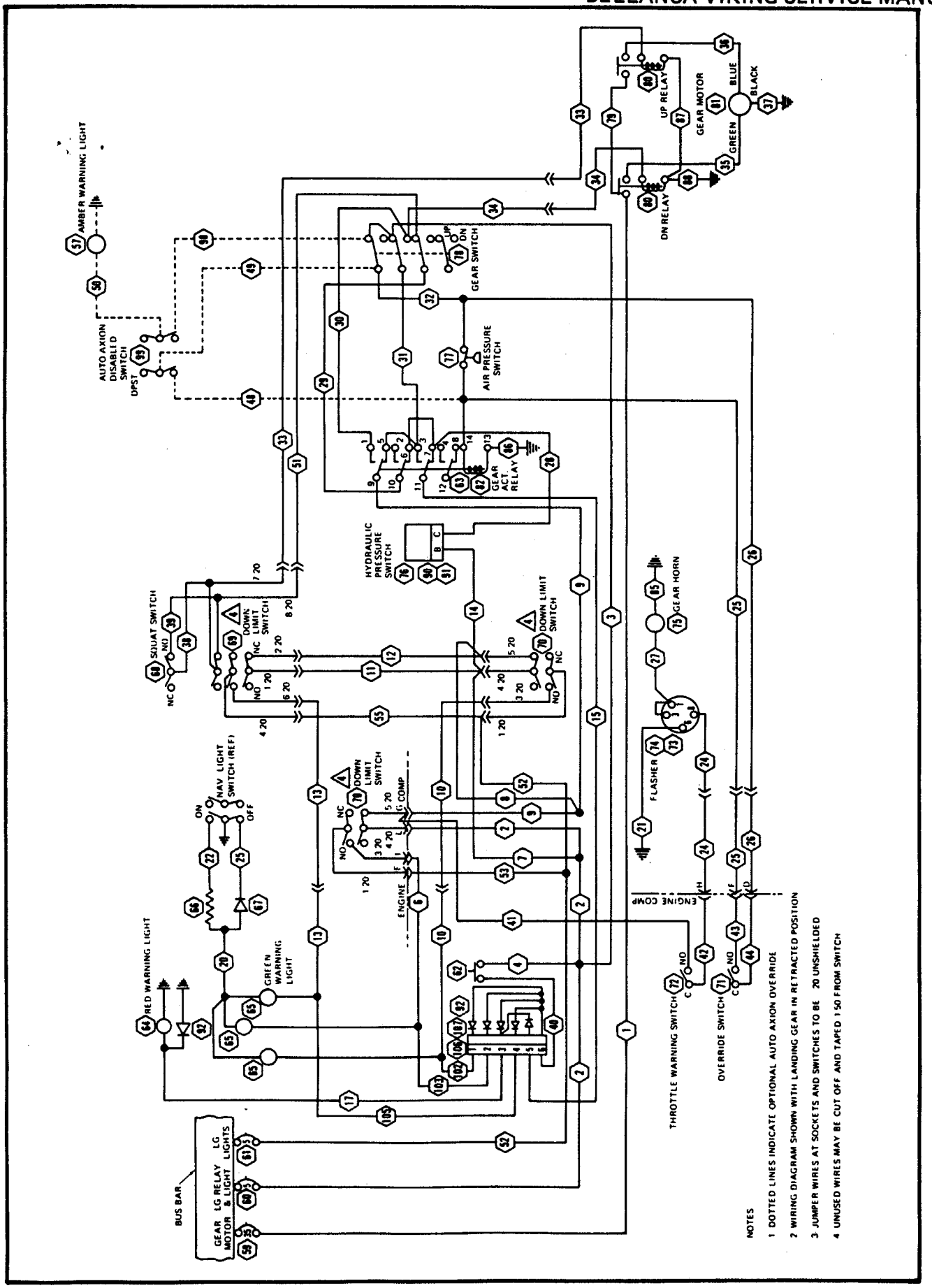


Figure 7-37. Landing Gear System Electrical Wiring Diagram.

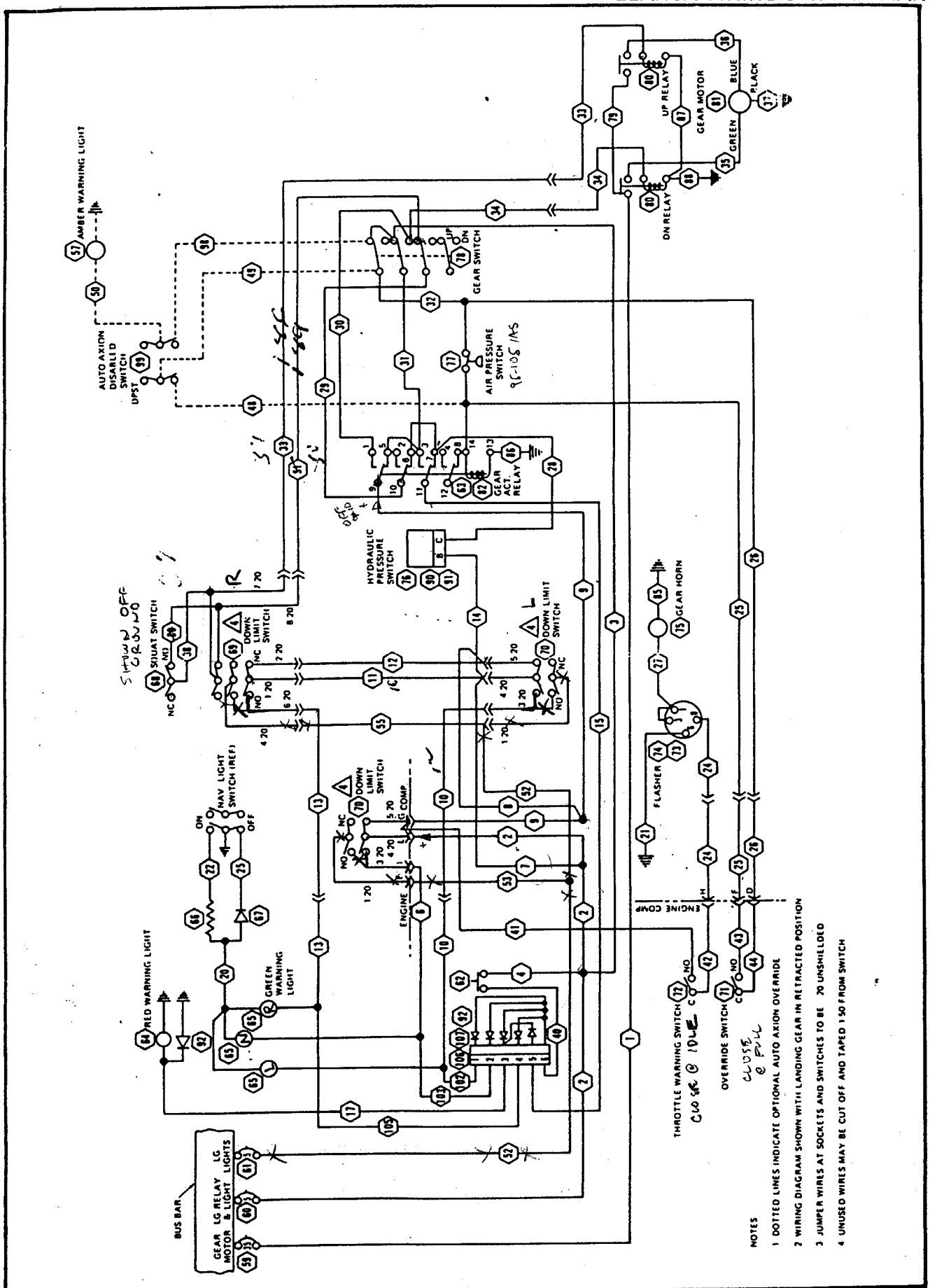


Figure 7-37. Landing Gear System Electrical Wiring Diagram.

Legend for Figure 7-37

1 Wire
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25 Wire
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35
36
37
38
39
40
41
42
43
44
48
49
50
51

52 Wire
53 Wire
55 Wire
57 Amber Light
59 Circuit Breaker
60 Circuit Breaker
61 Circuit Breaker
62 Switch
63 Relay
64 Red Light
65 Green Light
66 Resistor
67 Diode
68 Switch
69 Switch
70 Switch
71 Switch
72 Switch
73 Socket
74 Flasher
75 Horn
76 Switch
77 Switch
78 Switch

79 Strap
80 Relay
81 Gear Motor
82 Socket
83 Wire
84 Wire
85 Wire
86 Wire
87 Wire
88 Wire
90 Adapter
91 Connector
92 Diode
98 Wire
99 Switch
102 Wire
103 Wire
105 Wire
106 Connector
107 Connector

SECTION VIII

POWERPLANT

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TABLE VIII-1

ENGINE SPECIFICATIONS

	Continental IO-520K	Lycoming IO-540K1E5
FAA Type Certificate	E5CE	1E4
T/O H.P.	300 HP	300 HP
Maximum Continuous H.P.	285 HP	300 HP
Maximum T/O RPM	2850 RPM	2700 RPM
Maximum Continuous RPM.	2700 RPM	2700 RPM
Maximum Manifold Pressure	29.5" Hg	29.5" Hg
Minimum Fuel Octane Rating.	100/130	110/130
Firing Order.	1-6-3-2-5-4	1-4-5-2-3-6
Compression Ratio	8.5:1	8.7:1
Idle RPM	650 ± 25 RPM	525 ± 25 RPM
Ignition Timing	22° BTC	20° BTC
Oil Sump Capacity	12 qts.	12 qts.
Oil Temperature		
Normal	75° - 225° F	75° - 225° F
Maximum	240° F	245° F
Oil Pressure		
Minimum.	10 psi	25 psi
Normal	30-60 psi	60-90 psi
Maximum.	100 psi	100 psi
Cylinder Head Temperature		
Normal	250° - 460° F	250° - 475° F
Maximum.	460° F	475° F

SECTION VIII

POWERPLANT

8- 1. POWERPLANT. The Viking is equipped with a normal aspirated Continental engine as standard equipment. Optional, is the normal aspirated Lycoming or the turbocharged Lycoming. The turbocharged engine is covered in Section VIII-A. Only information necessary for installation and routine servicing will be covered. Trouble-shooting procedures should be obtained from the manufacturers of the component causing the malfunction.

8- 2. ENGINE REMOVAL. The sequence and location of items to be removed and/or disconnected is left to the discretion of the mechanic.

a. Install suitable tail support.
b. Remove engine cowl and drain oil
c. Starter cables (2).
d. Vacuum hoses (2).
e. Tack drive cable.
f. Throttle linkage.
g. Mixture linkage.
h. Oil temperature wire.
i. Oil cooler lines (2 - Lycoming).
j. Oil pressure line.
k. EGT and CHT wires.
l. Electrical wires at throttle arm micro switch.
m. Fuel supply, pressure, and return lines.
n. Manifold pressure line.
o. Propeller governor linkage.
p. Magneto "P" leads.
q. Alternator wires.
r. Hot air hose.
s. Attach 1/2 ton hoist to engine lift eyelet.
t. Remove engine mounting bolts and raise engine.

8- 3. ENGINE INSTALLATION.

a. Lower engine in alignment with engine mount and insert mounting bolts.
b. Torque mounting bolts 40-42 ft.-lbs.
c. Connect all lines and wires listed in 8-2.
d. Check for fuel leaks using auxiliary fuel pump.
e. Check for proper operation of all engine controls.
f. Ground run engine, checking for leaks, proper operation indications, and limits.
g. Install engine cowl.

8- 4. IDLE ADJUSTMENTS. (Continental) See Figure 8-1. Idle adjustments are made with a conventional spring load screw located on the throttle lever.

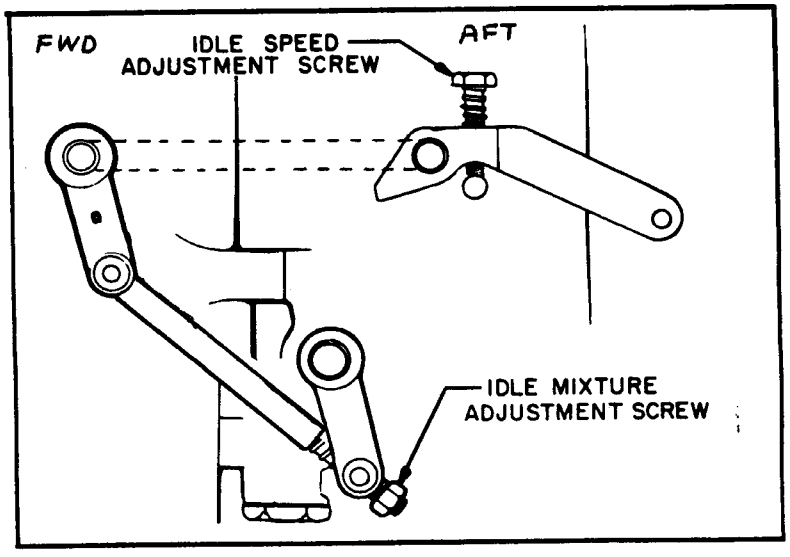

FIGURE 8-1 IDLE ADJUSTMENT POINTS
IO-520-K CONTINENTAL

Mixture Adjustments:

a. Idle engine 625 RPM to 675 RPM.
b. Adjust idle mixture screw to obtain a slight and momentary rise in idle RPM as the mixture control is moved toward idle cut-off. (Back nut off to lean, tighten to richen).

Idle Speed Adjustments:

a. Set mixture control to full rich.
b. Adjust idle speed screw for 625-675 RPM.

8- 5. IDLE ADJUSTMENTS. (Lycoming)

Mixture Adjustments:

a. Idle engine 500-550 RPM.
b. Adjust spurred wheel located on right side of throttle body to obtain a slight and momentary rise in idle RPM as the mixture control is moved toward idle cut-off.

Idle Speed Adjustments:

a. Set mixture control to full rich.
b. Adjust idle speed screw on the throttle arm for 500-550 RPM.

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SECTION VIII-A

ENGINE TURBOCHARGER

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TABLE VIIIA-1

TURBOCHARGERS SPECIFICATIONS

Oil Check Valve	
Closes	Below 25-27 psi
Normal Turbocharger Oil Pressure	40-60 psi
Oil Flow to Turbocharger at	
800-1000 Engine RPM.	1-2 Qts. Per Minute
Oil Pressure Switch	26-28 psi
Manifold Pressure Relief Valve.	.30.25-32.25" Hg
Turbocharger Shaft Radial Play.	.017 to .028"
Turbocharger Shaft Axial Play	.004 to .009"
Recommended Overhaul Time	1000 Hrs.
Filter Element Cleaning Internal.	At each engine oil change.

SECTION VIII-A

ENGINE TURBOCHARGER

8A- 1. POWERPLANT. The turbocharged Lycoming engine is identical to the normally aspirated Lycoming engine, except for the addition of the turbocharging system.

8A- 2. TURBOCHARGING CONCEPT. The objective of turbocharging is the ability to maintain high engine power output at altitudes well above sea level (in excess of 20,000' MSL). It is NOT designed to increase power output above that of a normal aspirated engine at low altitude.

Engine manifold pressure is maintained at altitude by two centrifugal compressors, turbine driven by the engine exhaust gases.

8A- 3. TURBOCHARGER OPERATION. See Figure 8A-1. Under nonturbo-charged condition ambient air enters the inlet, flows through the one way flapper valve to the air filter and to fuel control servo. The wast-gate would be in the open position allowing the exhaust gas to bypass the turbine.

As the pilot closes the waste-gate, exhaust gas is routed to the turbine. Inlet air enters the compressor and is discharged under pressure. The high pressure air closes the flapper valve resulting with air flow to the air filter and fuel control servo.

To maintain manifold pressure as the aircraft climbs to altitude, the waste-gate is further closed until all the exhaust gas is routed to the turbine for maximum compressor RPM.

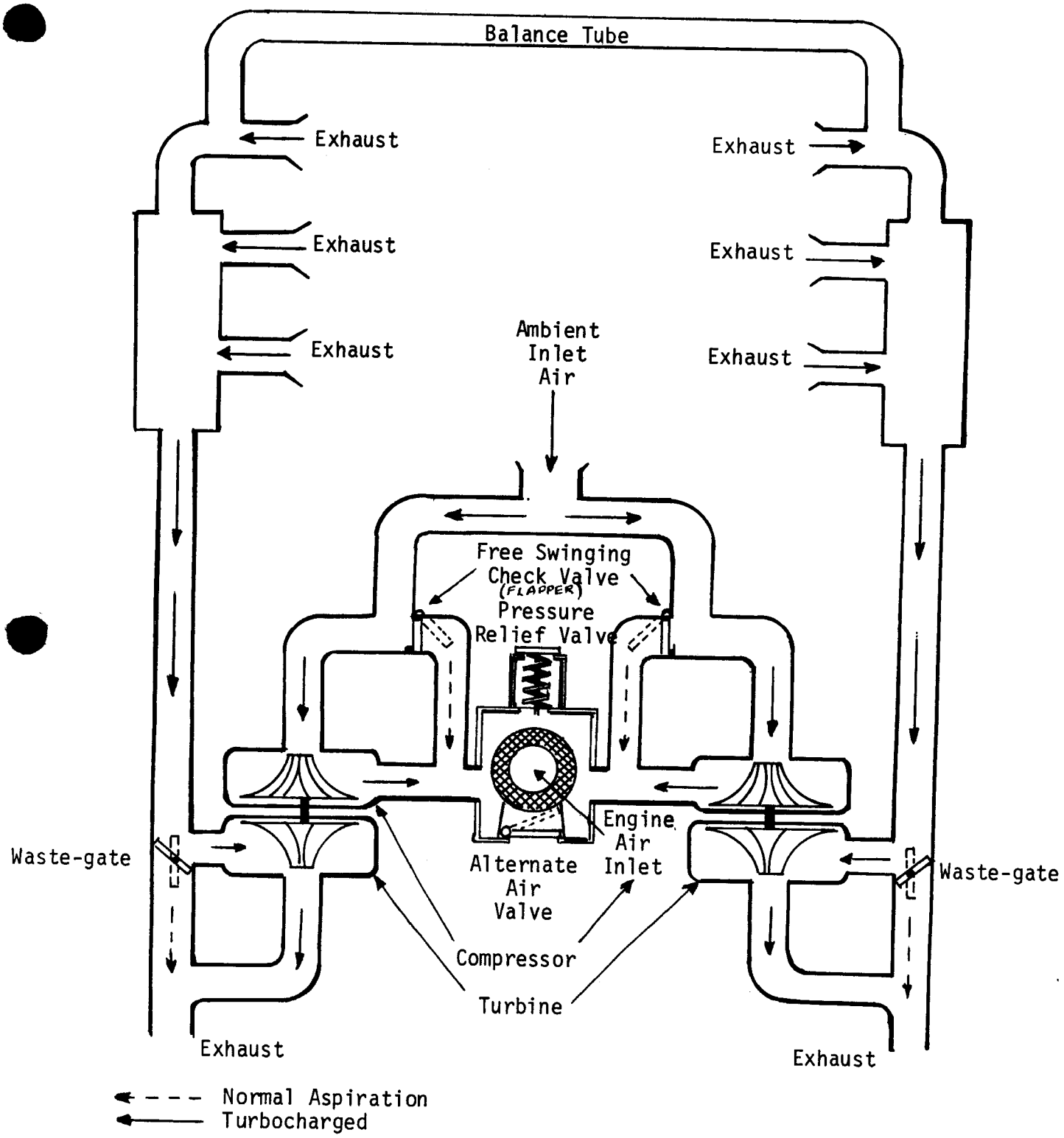

FIGURE 8A-1. Induction Air and Exhaust Gas Flow Schematic.

NOTE

Throttle must be opened fully prior to closing turbo waste-gates.

To prevent engine damage due to over-boosting, the manifold pressure, a pressure relief valve installed on the air filter box, will dump excess pressure overboard.

8A- 4. LUBRICATION SYSTEM. High pressure oil is taken off a T-fitting on the engine oil pressure gauge line and routed through a check valve, oil filter, low pressure switch, and to the turbocharger bearings. Oil is returned to the engine by the engine scavenger pump.

8A- 5. OIL CHECK VALVE. The check valve is mounted to the top of the turbo oil filter. The valve is factory set to close when oil pressure drops below 25-27 psi preventing any leakage from the turbo oil seals after engine shutdown.

The valve also serves as a metering orifice to reduce oil flow and pressure to the turbo. Field adjustment to the check valve is NOT recommended.

8A- 6. OIL FILTER. The oil filter is located on the right hand engine mount and consists of a reuseable filter element. It is recommended that the element be cleaned at each engine oil change.

8A- 7. OIL PRESSURE SWITCH. The oil pressure switch is mounted to the bottom of the oil filter. The switch will activate the turbo low pressure warning light on the instrument panel when the oil pressure drops below 26 to 28 psi. It is normal for the light to occasionally illuminate at low engine idle speed. The pressure switch is not adjustable.

8A- 8. MANIFOLD PRESSURE RELIEF VALVE. The relief valve is located on top of the air filter box. This valve is factory set and is NOT to be adjusted.

8A- 9. WASTE-GATE ADJUSTMENTS. The waste-gates are controlled by the vernier type push-pull control located next to the mixture control on the instrument panel. Rigging adjustments are made at the actuator arm on the waste-gate valve. Adjust so that both waste-gates are fully closed at the same time. Cycle for freedom of movement and correct position when fully closed and opened.

8A-10. TURBO REMOVAL AND INSTALLATION.

a. Remove ducting clamps.
b. Remove oil inlet and return lines.
c. Remove mounting bolts attaching turbo to mounting bracket.
d. Remove turbo.
e. Install using the reverse procedure for removal being certain to position gaskets correctly.

8A-11. ENGINE REMOVAL AND INSTALLATION. Follow the same procedures given for removal of normal aspirated engine in addition to:

a. Remove turbochargers and ducting.
b. Remove turbocharger mounting brackets.

8A-12. ROUTINE SERVICE AND INSPECTION. Whenever routine service of the engine is performed (25, 50, and 100 hour inspections) inspect the turbocharger installation as follows:

a. Inspect all air inlet ducting and compressor discharge ducting for worn spots, loose clamps, or leaks.
b. Inspect engine air inlet system for cracks, loose clamps, and screws.
c. Inspect waste-gate housing, exhaust ducting, and exhaust stacks for signs of leaks or cracks. Check all clamps for tightness.
d. Carefully check all turbo support brackets, struts, etc., for breakage, sagging, or wear.
e. Check all oil lines, fuel lines and fittings for wear, leakage, heat damage or fatigue.
f. Check and actuate spring loaded alternate air valve.
g. Actuate waste-gate control, and examine control for any pending sign of breakage.
h. Inspect injector system for signs of fuel dye indicating leaks.

NOTE

If dye stains are present, check for loose connections and proper installation of air bleed nozzle shrouds.

i. Clean turbocharger oil filter with solvent or gasoline every oil change. An overnight soaking in carburetor cleaner may be necessary if heavy sludging is evident. (This is usually due to mixing detergent with non-detergent oils.)
j. Run up engines, check all instruments for smooth, steady response.

8A-13. TROUBLE-SHOOTING.

Trouble In Flight or Ground Run-up.

1. Loss of, reduction of, or fluctuation of manifold pressure while turbocharging.	
Possible Cause	Solution
a. Malfunctioning manifold pressure gauge due to faulty gauge or possible oil in MAP reference line or gate.	a. Repair or replace gauge. NOTE: If the engine changes power level or the airspeed changes, then actual change in MAP has occurred due to one of the reasons listed below:

Possible Cause	Solution
b. Turbocharger inlet duct blocked.	b. Check ducting and remove obstruction.
c. Turbocompressor discharge duct ruptured or disconnected.	c. Connect or replace ducting.
d. Severe rupture on exhaust stacks causing waste-gate to be ineffective.	d. Replace defective part.
e. Turbocharger rotor jammed.	e. Replace turbocharger.
f. Ruptured manifold gauge line or fitting.	f. Repair leak.
g. Broken waste-gate control.	g. Replace control cable.
h. Air inlet check valve not fully sealing or blocked partly open.	h. Inspect, repair or replace as needed.
2. Loss or reduction of fuel pressure when turbocharging.	
a. Out of fuel.	a. Refuel.
b. Partial fuel vapor lock at high altitude due to hot fuel and high power settings.	b. Turn on boost pump and/or reduce power.
c. Malfunctioning fuel pressure.	c. Turn on boost pump and/or reduce power.
d. Ruptured fuel line or leaking fitting or pump shaft seal.	d. Shut off fuel shut-off valve, full rich mixture until fuel forward of firewall is consumed by engine. Secure engine.
e. Ruptured boost pressure reference line to fuel pressure regulating valve.	e. Continue operation until next landing if engine is smooth; otherwise, return engine to naturally aspirated power. Ground check fuel system.

Possible Cause	Solution
3. Turbocharger oil pressure warning light on.	
a. Low engine speed: i.e. idle RPM.	a. This is normal.
b. Low engine oil pressure.	b. Take necessary measures to restore engine oil pressure.
c. Clogged turbocharger oil filter.	c. Clean and replace turbocharger oil filter. NOTE: Clogging can occur very rapidly if detergent and non-detergent oils are mixed indiscriminately.
d. Shorted oil pressure warning switch.	d. Replace switch.
e. Ruptured turbocharger oil supply line or leaking fitting.	e. Replace oil supply line. Tighten or replace faulty fitting.
f. Malfunctioning turbocharger oil pressure check valve.	f. Replace oil pressure check valve. NOTE: To check valve, install a pressure gauge at the turbocharger inlet. Normal pressure should be 40 to 60 psi for an engine gallery pressure of 60 to 80 psi. Disconnect turbo oil drain line and measure oil flow into a container. Flow at 40 to 60 psi inlet pressure should be 1 to 2 quarts per minute per turbo with engine idle 800-1000 RPM.
4. Engine runs hot (500° or more) when turbocharging or naturally aspirated.	
a. May be due to extreme hot weather.	a. Reduce power.
b. Cracked or loose cylinder cooling air baffles.	b. Repair or replace as required.
c. During climb.	c. Reduce power or increase Indicated Airspeed.
d. Over-boost or RPM too high.	d. Reduce MAP or RPM.
e. Fuel mixture too lean during hot weather.	e. Enrichen mixture.

Possible Cause	Solution
f. Mistimed ignition, either retarded or preignition.	f. Check ignition timing, adjust as necessary.
g. Detonation due to too low octane fuel or item "f' above.	g. Fuel mixture set too lean or fuel octane too low. Check mixture and fuel grade.
h. Faulty cylinder head temperature gauge.	h. Replace instrument.
i. Defective oil cooling system.	i. Inspect and repair as required.
j. Combinations of above.	j. Systematically eliminate by above steps.

5. Airplane performance is reduced from normal.	
a. May be due to hot weather.	a. Speed for the turbo Viking will be reduced 2 to 4 mph for 10°F rise in temperature above standard day. This is because turbochargers, like turbines, are heat sensitive as to performance.
b. Tired engine or out of tune.	b. Repair engine as required.
c. Airplane may have additional drag due to radio antenna, sagging gear or flaps, out of rig, etc.	c. Inspect airframe and repair as necessary.

6. Fuel consumption is higher than normal.	
a. Mixture set too rich.	a. Develop proper leaning technique.
b. Leak in fuel system.	b. Locate and repair leak.
c. Prolonged high power at full rich mixture.	c. Reduce power and lean for fuel economy.
d. Hot weather.	d. Hot weather will naturally increase fuel consumption 2 to 4 GPH depending on power, leaning and temperature of the air. This is due to less dense air for the same MAP. Also, it has been found from tests that slightly richer mixture should be used for extremely warm weather to maintain a lower head temperature. This will insure good engine life.

Trouble Ground Inspection of Ground Run-up

1. Oil leaking out of engine inlet drain. Note: Care should be taken to make sure oil is from inside engine inlet drain, not on the outside from some other point on engine.	
Possible Cause	Solution
a. Oil sump or intake valve guide leaking into induction system.	a. Repair or replace sump or valve guide.
b. Failed turbocharger bearings and compressor seal.	b. Replace turbocharger. NOTE: The turbocharger seal will have to be in very poor condition to permit oil to pass the compressor impeller seal.
	c. Reroute for clear flow or remove obstruction from line.

2. Noisy turbocharger rotating assembly.	
a. Damaged bearings.	a. Replace unit.
b. Rotating unit rubbing housing as a result of "a" above, distorted housings, dirt accumulation on impeller, carbon build-up on turbine or foreign object damage.	b. Replace unit. NOTE: Allowable shaft radial play is .017 to .028 inch due to semi-floating bearings. Allowable shaft axial play is .004 to .009 inch.

3. Oil leaking out of exhaust stack after engine shutdown.	
a. Oil check valve not seating properly.	a. Remove and clean check valve with solvent, replace if defective.

INTENTIONALLY

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SECTION IX

FUEL SYSTEM

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TABLE IX-1

FUEL SYSTEM SPECIFICATIONS

Fuel Quantity	
Wing Fuel Total (3 Cells Per Wing)	68 Gallons
Wing Fuel Useable	60 Gallons
Wing Fuel Unuseable	8 Gallons
Auxiliary Fuel Total	15 Gallons
Auxiliary Fuel Useable	15 Gallons
Minimum Octane Rating	100/130
Fuel Pressure (Lycoming)	20-26 psi

SECTION IX

FUEL SYSTEM

9- 1. FUEL SYSTEM DESCRIPTION. The fuel system consists of three interconnected aluminum cells in each wing and an optional auxiliary aluminum tank installed aft of the rear seat. Fuel flows to the selector valve, strainer/drain, electric auxiliary pump, engine driven pump, and fuel control unit. An engine fuel return line routes the excess fuel back to the tank supplying the engine via the fuel selector. See Figure 9-1 for schematic of fuel system.

9- 2. FUEL QUANTITY INDICATORS. Fuel quantity is measured by separate capacitance type gauge in each wing tank and a float type system in the fuselage tank.

9- 3. CAPACITANCE FUEL GAUGE SYSTEM. A capacitance transmitting probe is located in the middle and inboard wing tanks. The probes are connected to a gauge control monitor which is mounted on the fuselage under the leading edge wing root fairing.

9- 4. INBOARD WING FUEL QUANTITY PROBE, REMOVAL AND INSTALLATION.

a. Remove access cover on top of wing near wing root.
b. Remove safety wire, electrical connections, then probe.
c. Install using reverse procedures for removal.

9- 5. MIDDLE WING FUEL QUANTITY PROBE, REMOVAL AND INSTALLATION.

a. Remove triangular access cover under the wheel well on the outboard rib.
b. Remove electrical wires to triangular access cover mounted on the fuel tank, then remove access cover.
c. Use a flashlight and mirror to determine proper installation prior to probe removal.
d. Cut safety wire and slide probe out.
e. Install using the reverse procedures for removal.

9- 6. CALIBRATION OF FUEL SYSTEM. The capacitance fuel gauge system is set at the factory. If the indicator appears to be reading erroneously, one of the system components may need replacement. If a replacement is made, the system must be recalibrated as follows:

Simulator Method (Fuel Quantity Simulator, SK789-6005-20 Required)

a. Remove the leading edge fairing for access to the control monitor.
b. Tail the airplane down until it rests on the main wheels and tail skid.
c. Disconnect the main fuel feed line from the engine driven fuel pump.
d. Drain fuel with fuel boost pump until tank to be calibrated is empty.

CAUTION

Do not allow the hose to touch any live electrical terminal.

e. Leval aircraft with leveling points.
f. Measure in four gallons of fuel by weight at 6 lbs./gal.
g. Locate the two adjusting pots on the control monitor, marked "E" and "F".
h. Check the empty "E" pot first. Turn screw until the needle on panel instrument reads "E" (top of red arc).

i. Plug simulator into connector plug and adjust the full "F" pot by turning screw, until needle reads three quarter full.
j. Disconnect simulator and recheck empty reading. If "E" requires readjustment, reconnect the simulator and recheck three quarter full. Repeat until both settings are satisfactory.
k. After "E" adjustments are complete, measure 7-1/2 gallons of fuel and check the 1/4 indication.
l. Measure in another 7-1/2 gallons of fuel and check the 1/2 indication.
m. Measure in another 7-1/2 gallons of fuel and check the 3/4 indication.

Alternate Method of Calibration (Fuel Quantity Simulator Not Required)

a. Perform steps (a) through (h) described in Simulator Method.
b. Measure in 22-1/2 gallons of fuel by weight at 6 lbs./gal. in 7-1/2 gallon increments checking 1/4, 1/2, and 3/4 indicators. If 3/4 reading is correct at 22.5 gal., calibration is completed. If not, connect, proceed to step (c).
c. Adjust "F" for 3/4, then drain tank completely, add 4 gallons and check empty. If empty reading is correct, calibration is completed. If not correct, proceed to step (d).
d. Adjust "E" for empty, then fill tank with 22-1/2 gallons and recheck 3/4 reading. Repeat steps (c) and (d) until correct.

NOTE

Rechecking both empty and 3/4 settings is required anytime either the "E" or "F" pot is adjusted.

9- 7. TROUBLESHOOTING THE CAPACITANCE FUEL SYSTEM.

Problem #1 - Gauge Needle Reads Below Empty

a. Check electrical power to fuel gauge at pin #2 on fuel gauge plug; volgage should be 12 volts DC.

b. Check voltage at meter input pin. This is pin "C" on the right side and pin "D" on the left side. At empty, voltage should be approximately 1/2 volt DC. At full, voltage should be approximately 4-1/2 volts DC.

c. Check continuity of meter input wire from pin #1 on control monitor to pi "C" or "D". The control monitor is located under the wing leading edge fairing.

d. Remove nylon plug from control monitor and check continutiy between pin 10 and ground, pin 12 and ground, and between pins 10 and 12 there should be no continuity between these points. If continuity exists between pin 10 and ground, check all connections of probe wire harness to be sure shielding is not touching main wire. If continuity exists between pin 12 and ground, check fastening of wire in wheel well area for possible grounding.

Problem #2 - Unable to adjust Empty and 3/4 Readings on Gauge Prior to Filling Tanks During Calibration Procedure

a. Replace control monitor and recalibrate system.

Problem #3 - Gauge Fluctuates in Flight

a. Check electrical plug behind gauge for loose connections.

b. Check for intermittent or loose connections at probes.

c. Replace fuel gauge and check operation.

Problem #4 - When Filling Tanks, Fuel Indication on Gauge Rises and Then Decreases

a. Check inboard probe for loose connections or shorting of wires.

b. Replace inboard probe.

Problem #5 - Gauge Will Not Indicate Over 1/2 With Tanks Full of Fuel

a. Check outboard probe for loose connections or shorting of wires.

b. Replace control monitor and recalibrate system.

9- 8. FUEL CELLS. The three interconnected aluminum fuel cells are located in the central and inboard sections of the wings. The inboard cell of each wing is readily removable. Should the two outer cells of each wing require removal, it is recommended that the necessary materials, blueprints, and instructions be obtained from the factory.

9- 9. REMOVAL AND INSTALLATION OF INBOARD CELL. A plywood panel located on the upper side next to the wing root serves as an access to the inboard fuel cells. This panel, fastened with screws, can be seen through the fabric surface of each wing.

a. Mark the panel outline by tracing a line over the faint outline of the panel as seen through the fabric.
b. Draw lines about an inch on each side of the scribed line.
c. Cut and remove a strip of fabric about two inches wide along the scribed lines to expose the panel fastening screws that are filled with wood filler.
d. Remove the wood filler and the wood screws.
e. Disconnect all fuel lines, two large diameter lines at the bottom of the tank, and one small diameter line at the top center of the tank.
f. Disconnect electrical wires at fuel probe.
g. Remove wood filler strips located around the front and back of tank.
h. Remove reducer plug located at top of tank on inboard side if necessary to clear butt rib.

9-10. AUXILIARY FUEL PUMP REMOVAL AND INSTALLATION. The pump is located uner the pilots seat.

a. Remove pilot's seat and panel under seat.
b. Disconnect fuel lines and electrical wires connected to pump.
c. Loosen strap securing pump to aircraft and remove unit.
d. Install using the reverse procedures for removal.

9-11. FUEL SELECTOR REMOVAL AND INSTALLATION. The selector valve is located between the pilot and copilot seats under the floor boards.

a. Remove the carpet, floorboards, and the access cover underneath the fuselage immediately aft of the nose gear wheel well.
b. Disconnect fuel lines to selector valve.
c. Remove pin securing the selector shaft to the selector valve. (Located at bottom of rod).
d. Remove 3 bolts securing the valve to the support bracket and lower unit out through the access hole.
e. Install using the reverse procedures for removal.

9-12. ADJUSTING FUEL SELECTOR INDICATOR LIGHTS. As the fuel selector is positioned from one tank to another a light on the instrument panel will illuminate indicating the tank that is presently being used. This is accomplished by cams located on the fuel selector shaft and a set of three micro-switches.

a. Remove plastic dress panel covering the fuel selector shaft.
b. Adjust micro-switches for proper position in relation to the cams located on the rod.

9-13. AUXILIARY FUEL TANK. The optional aluminum auxiliary tank is located between the baggage compartment and the rear seat. Fuel quantity is measured by a float type indicator and is accessible at the top of the tank. The fuel filler neck is located on the right side of the fuselage just aft of the rear seat.

9-14. AUXILIARY FUEL TANK REMOVAL AND INSTALLATION.

a. Remove rear seat.
b. Remove filler neck from outside aircraft.
c. Remove bolts securing the three tank hold down straps.
d. Remove electrical wires to fuel float indicator.
e. Remove fuel line and vent line.
f. Slide tank forward and out.
g. Install using the reverse procedures for removal. Replace sealing compound around filler neck.

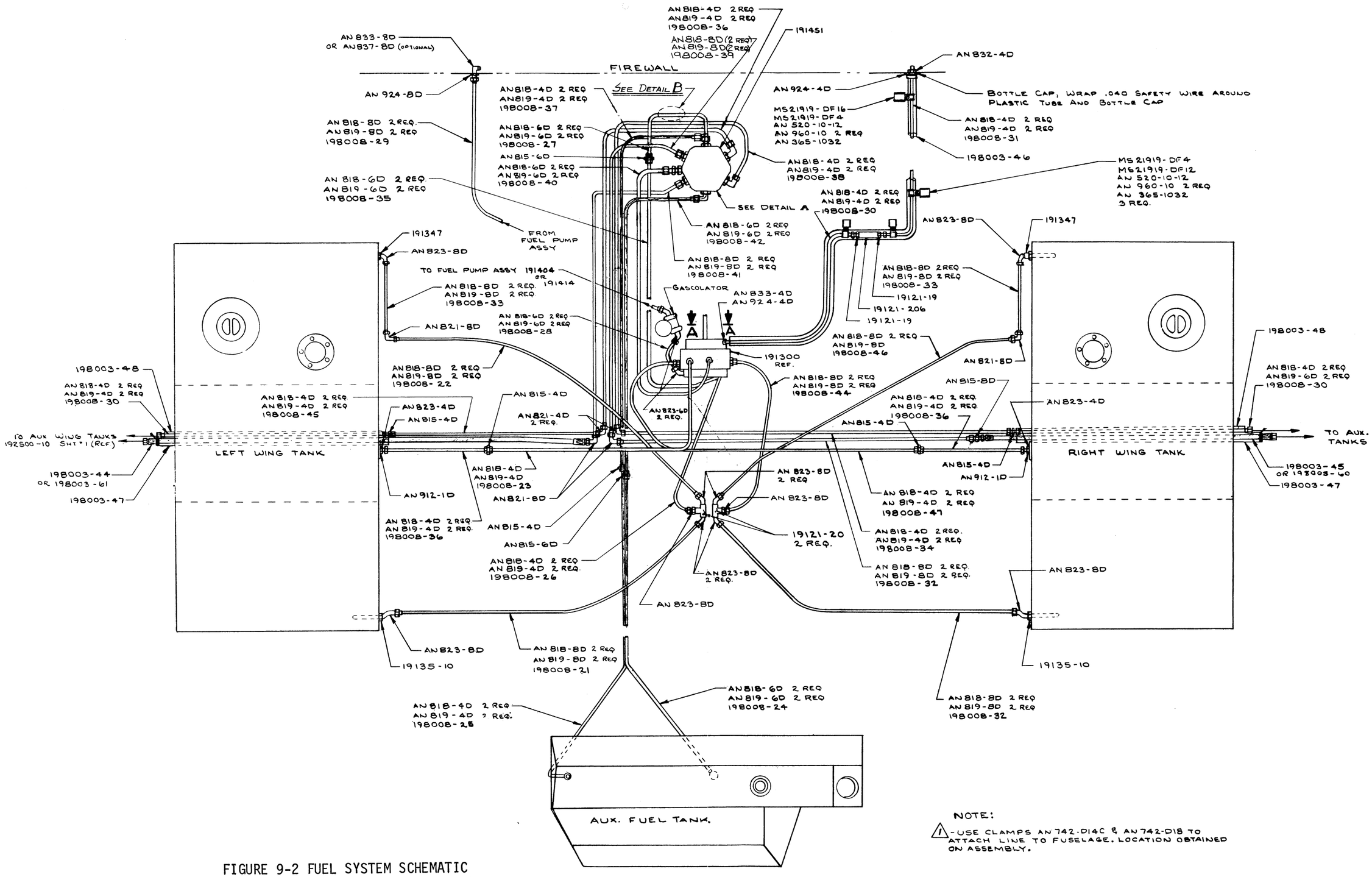


FIGURE 9-2 FUEL SYSTEM SCHEMATIC
(Prior to 73 series serial number)

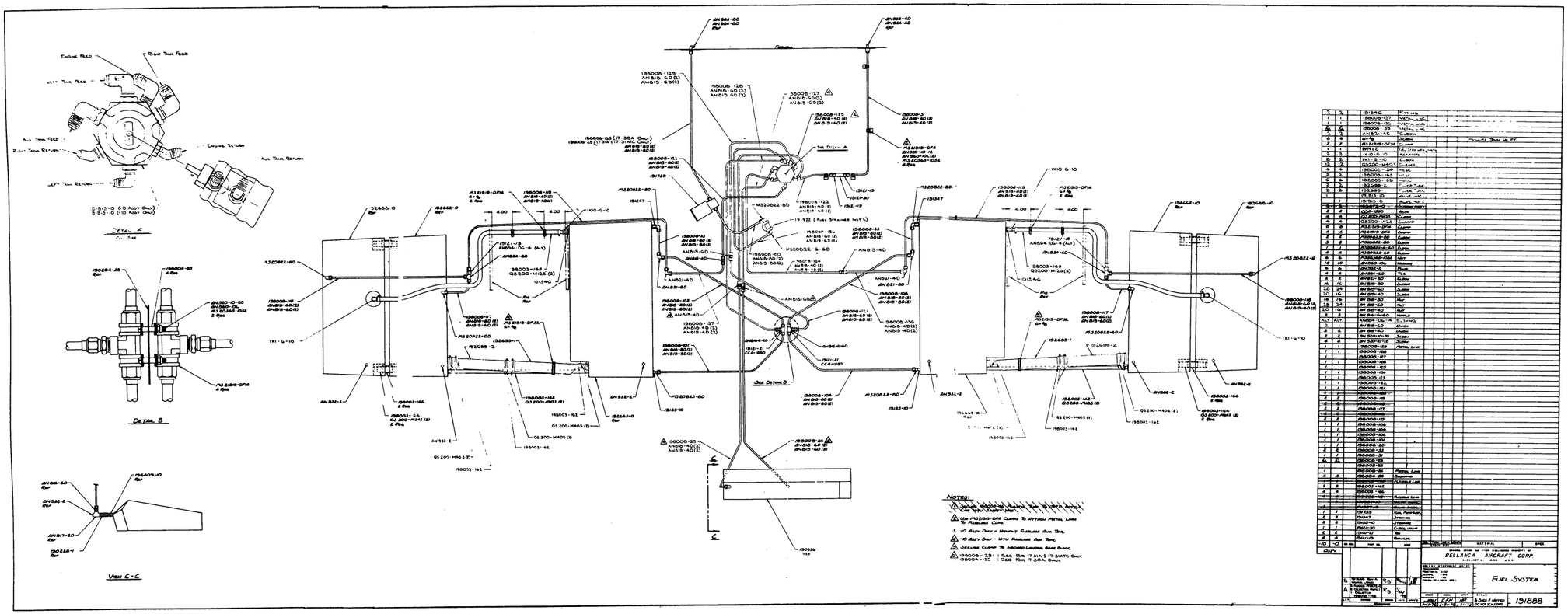


FIGURE 9-1 FUEL SYSTEM SCHEMATIC
(73 series serial number
and up)

SECTION X

ELECTRICAL SYSTEM

TABLE OF CONTENTS

ELECTRICAL SYSTEM

TABEL OF CONTENTS (CONTINUED)

TABLE X-1

ELECTRICAL SYSTEM SPECIFICATIONS

System Voltage	12 V.D.C.
Ground	Negative Ground
Alternator Rating	.60 amps.
Voltage Regulator	13.5 - 14.0 V.D.C.
Overvoltage Relay	16.0 - 16.5 V.D.C.
Battery Rating	35 ampere/hour

INTENTIONALLY

LEFT

BLANK

SECTION X

ELECTRICAL SYSTEM

10- 1. ELECTRICAL SYSTEM DESCRIPTION. The electrical system is 12 V.D.C., single wire, negative ground type. A 12 V.D.C. lead-acid battery supplies power for starting and emergency use should the alternator fail in flight. The engine driven alternator is the normal power source during flight. All electrical circuits are protected by resettable circuit breakers in easy reach of the pilot.

10- 2. BATTERY. The battery is a 12 V., lead-acid, rechargable, and is located under the baggage compartment floor. The battery solenoid is located adjacent to the battery box and is activated by the master switch.

10- 3. ALTERNATOR. The alternator is engine driven and self-excited, and controlled by a remote voltage regulator.

Lycoming Installation
Located on the lower R.H. front of the engine and is belt driven from the pulley on the starter ring gear behind the propeller.

Continental Installation
Located on the L.H. side of the engine accessory section and is belt driven off the engine timing pulley.

10- 4. ALTERNATOR BELT INSTALLATION. Should the belt require replacement, the following procedures must be followed to prevent premature failure of the new belt.

a. Install the belt so that the direction of rotation agrees with the direction of the arrow printed on the belt. (Determined by the angle of the splice)
b. Using a torque wrench on the pulley retaining nut, set the belt tension by measuring the torque required to make the pulley slip in a clockwise direction. DO NOT over-tighten the drive belt.

Belt Width	Slip Torque New Belt	Slip Torque Used Belt
3/8"	11 to 13 Ft.-Lbs.	7 to 9 Ft.-Lbs.
1/2"	13 to 15 Ft.-Lbs.	9 to 11 Ft.-Lbs.

10- 5. VOLTAGE REGULATOR. The regulator is fully transistorized and is adjustable. The normal acceptable voltage range should be 13.5 to 14.0 V.D.C. Location is on the upper L.H. engine mount.

10- 6. OVER VOLTAGE RELAY. The over voltage relay prevents excessive voltage from damaging the avionics installed on the aircraft by dropping the alternator off the line. The relay is factory set for 16.0 to 16.5 V. and is not adjustable. Should the relay drop the alternator off the line due to a momentary over voltage, cycle the master switch to reset the relay and alternator. The relay is located on the upper left firewall.

10- 7. AMMETER. The ammeter is located on the L.H. instrument panel with the shunt mounted behind the side panel forward of the main door.

10- 8. ALTERNATOR WARNING LIGHT. The light is located adjacent to to the ammeter. A relay located behind the L.H. instrument panel causes the light to illuminate should the alternator output go to zero due to mechanical failure. Electrical failure will be indicated only by the ammeter.

10- 9. EXTERNAL POWER RECEPTACLE. The optional external power receptacle is located on the aft baggage close out panel and is connected directly with the aircraft battery. To power the aircraft with an external source (12 V.D.C. only) the master switch must be turned ON. On 1974 series the power receptacle is located under the fuselage behind the right wing.

10-10. CIRCUIT BREAKERS. All electrical circuits are protected by resettable circuit breakers located on the lower R.H. instrument. The alternator and cabin dome light circuit breakers are of the push-pull type allowing the respective circuits to be positively disabled if desired.

10-11. STARTER. The electric engine starter is the direct cranking type with provisions for inspecting the commutator and brushes. The starter solenoid is located on the upper R.H. firewall and is activated by the magneto ignition switch.

10-12. TROUBLESHOOTING. Troubleshooting and repair methods of the individual electrical components is not covered in this manual, consult the respective manufacutrers for proper instructions.

10-13. ELECTRICAL SCHEMATICS. The schematics of the systems used in the Viking are included and should be consulted by the mechanic to assist with the normal troubleshooting procedures used with electrical systems. Included with each schematic is a listing which identifies the individual wires by number. The schematics included in the manual incorporate a new numbering system and is effective with all aircraft after the following numbers:

Aircraft Model	Serial Number
17-30A	74-30617
17-31A	74-32-130
17-31ATC	74-31072

Electrical Schematic Figure 10-1 and Table X-1 refer to previous aircraft.

INTENTIONALLY

LEFT

BLANK

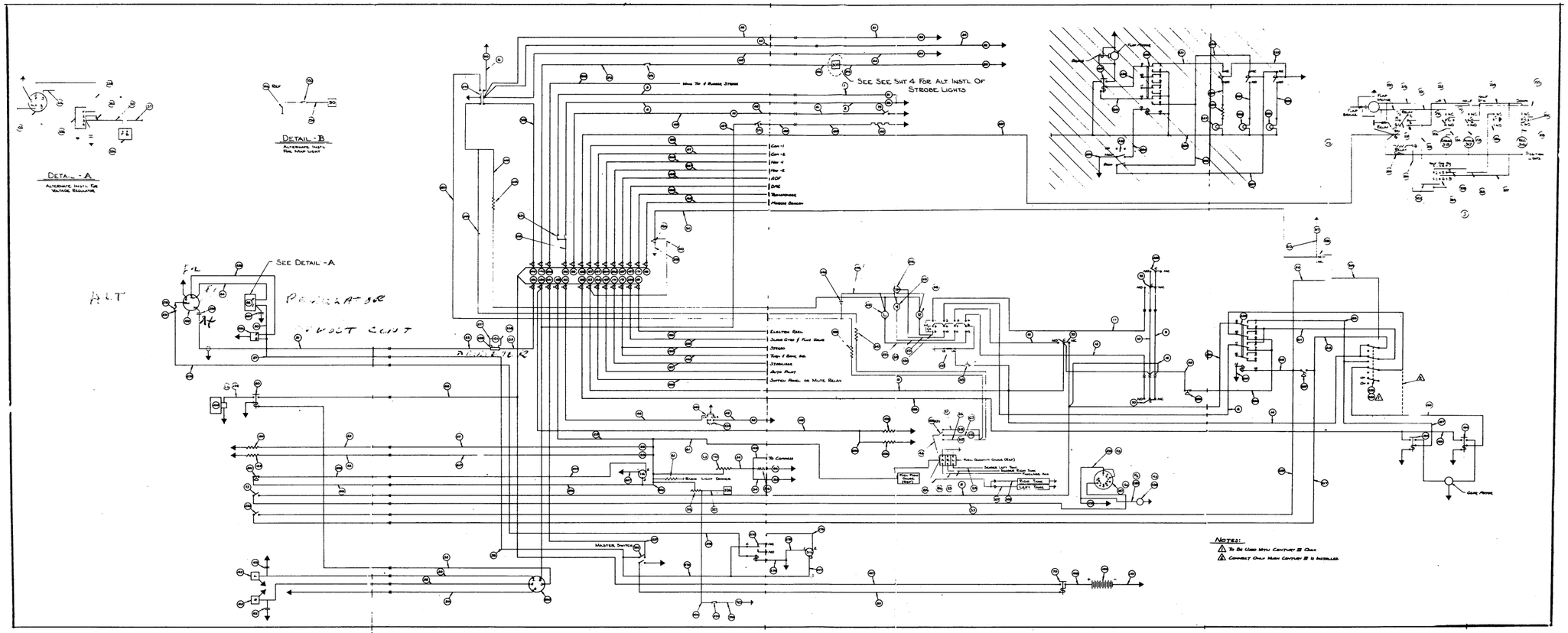


FIGURE 10-1 EARLIER VIKING ELECTRICAL SCHEMATICS

Effective S/N 30001 up to 74 series

NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
			STOCK SIZE					
1	334	RESISTOR					1802A TYPE 200 10HM 20 WATTS OHMITE	
1	333	WIRE					#12 UNSHIELDED	MIL-W-5086A
1	332	SWITCH					LTIGG58-IL-BL-RC-FN CARLING	
1	331	SWITCH					TIGG51-IL-BL-FN CARLING	
OPT	330	SWITCH					MSP-105D ELECTRONICS CENTER	
1	329	RESISTOR					68 OHM 1/2 WATT	
3	328	FUEL SELECTOR SWITCH					V3L-103-D8 MICRO SWITCH	
1	327	WIRE					#20 UNSHIELDED	MIL-W-16878D
7	326	POST LIGHT					A-8970-1-330 GRIMES MFG. CO.	
1	325	RELAY					KM11D POTTER & BRUMFIELD	
1	324	CIRCUIT BREAKER					111-203-101 WOOD ELECTRIC	
1	323	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	322	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	321	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	320	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	319	PRESS TO TEST SWITCH					30-1 GRAYHILL	
2	318	RHEOSTATS					0107 MODEL E OHMITE	
2	317	WARNING LIGHT AMBER					3SF4AAB4 SORENSON LIGHTED CONTROLS	
3	316	WARNING LIGHT RED					3SF4ARB4 SORENSON LIGHTED CONTROLS	
7	315	WARNING LIGHT GREEN					3SF4AGB4 SORENSON LIGHTED CONTROLS	
1	314	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	313	WIRE						
1	312	WIRE						
1	311	WIRE						
1	310	WIRE						
1	309	WIRE						
1	308	WIRE						
1	307	WIRE						
1	306	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	305	WIRE					#18 UNSHIELDED	MIL-W-5086A
1	304	MAP LIGHT					B 3555A GRIMES MFG. CO.	
OPT.	303	POWER SUPPLY					HDT3-14 WHELEN	
OPT.	302	POWER SUPPLY					HDT2-14 WHELEN	
OPT	301	POWER SUPPLY					HD-14 WHELEN	
1	300	POWER SUPPLY					HS-14 WHELEN	
1	299	CABLE				314	8770 BELDON, 3 CONDUCTOR SHIELDED	
1	298	CABLE				326	8770 BELDON, 3 CONDUCTOR SHIELDED	
OPT.	297	CABLE					8770 BELDON, 3 CONDUCTOR SHIELDED	
OPT.	296	CABLE					8770 BELDON, 3 CONDUCTOR SHIELDED	
1	295	CABLE					8770 BELDON, 3 CONDUCTOR SHIELDED	
OPT	294	WIRE					#14 SHIELDED	MIL-C-7078A
OPT.	293	WIRE					#14 SHIELDED	MIL-C-7078A
1	292	WIRE					#14 SHIELDED	MIL-C-7078A
A/R	291	SWITCH					TP-GK-51-IL-BL-FN CARLING	
2	290	FLAP CIRCUIT SWITCH					V3-1-D8 & JV-7 ACTUATOR MICRO SWITCH	
1	289	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	288	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	287	FLASHER & SOCKET					12-F90T & 9EB AMPERITE	
1	286	SWITCH					V3L-111-D8 MICRO-SWITCH	
1	285	WIRE					#18 UNSHIELDED	MIL-W-5086A
1	284	SWITCH					195607-10	
OPT.	283	RESISTOR					15 OHM 2 WATT	
ALT.	282	VOLTAGE REG.					1119519 DELCO REMY	
A/R	281	CAPACITOR					262-806 1.0 MFD. GENERAL CEMENT	
1	280	WIRE				54	#14 UNSHIELDED	MIL-W-5086A
1	279					98	#20 UNSHIELDED	MIL-W16878D TYPE D
1	278					48		
1	277					18		
1	276					18		
1	275					6		
1	274					6		
1	273	WIRE				18	#20 UNSHIELDED	MIL-W16878D TYPE B
1	272	FUSE					3AG 1/2 AMP LITTLEFUSE	
1	271	FUSE RETAINER					1501455 LITTLEFUSE	
1	270	RELAY					255 KM5D POTTER & BRUMFIELD 6 VOLT	
~~1~~	~~269~~	~~WARNING LIGHT~~					~~RED MS25041-2 SOCKET 330 MIN LAMP~~	

L.E.T.	CHANGE	DRAWN	DATE	APPV'D

L.E.T.	CHANGE	DRAWN	DATE	APPV'D
F	5-225 WAS 1 REQ. 4-234 WAS 1 REQ. 3-ADDED-291 THRU-334- 2-DELETED-227 -228,-229,-269 1-INC. DCN# 18, 19,20,21	RB	10/9/72	
E	2-225 P/N WAS BKS-5 14917 1-INC. DCN # 13, 14,15,16,17	RB	2/22/72	

NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC
			STOCK SIZE					
1	268	WIRE				54	#18 UNSHIELDED	MIL-W-5086A
1	267	WIRE				54	#18 UNSHIELDED	MIL-W-5086A
1	266	WIRE				54	#18 UNSHIELDED	MIL-W-5086A
1	265	WIRE				215	#14 SHIELDED	MIL-C-7078A
1	264	CIRCUIT BREAKER					AMP SIZE A/R FOR RADIOS (10 AMP MAX)	E.T.A. PRODUCTS CO.
1	263	CIRCUIT BREAKER					AMP SIZE A/R FOR RADIOS (10 AMP MAX)	E.T.A. PRODUCTS CO.
1	262	CIRCUIT BREAKER					112-210-101	WOOD ELECTRIC
1	261	CIRCUIT BREAKER					109-205-201 41-2-3M8-LINE (ALT) 48-700-858 (ALT)	WOOD ELECTRIC E.T.A. PRODUCTS CO.
1	260	WIRE				90	#20 UNSHIELDED	MIL-W-16878D (B)
1	259	SWITCH, PRESSURE					6607A-8-17 194375 (ALT)	CONSOLIDATED CONTROLS CORP.
1	258	SWITCH, SQUAT						MICRO SWITCH
1	257	SWITCH, PRESSURE					731-620	CONTROLS CO OF AMER.
AS REQ	256	FILTER					20-0520-10	HISONIC
2	255	STROBE LIGHT						WHELEN ENG. CO.
1	254	POWER SUPPLY						WHELEN STROBE
~~1~~	~~253~~	~~SOLENOID VALVE~~					~~HH20402~~	~~ALLIED~~
1	252	SWITCH OVERRIDE					196938-0	
~~2~~	~~251~~	~~WIRE~~						~~MIL-W-3861/5~~
~~1~~	~~250~~	~~WIRE~~					~~#8 UNSHIELDED~~	~~MIL-C-7078 A~~
~~AS REQ~~	~~249~~	~~GROMMET~~					~~#8C0257-1801 CORNING GLASS WORKS~~	~~MATERIAL~~
~~1~~	~~248~~	~~DIODE~~					~~IN 270~~	
1	247	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	246	WIRE						
1	245	WIRE						
1	244	WIRE						
1	243	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	242	WIRE					#20 UNSHIELDED	MIL-W-16878D
1	241	PRES. SWITCH					M1-1540	JOHN W. HOBBS
1	240	MAG SWITCH					10-357210-1A	BENDIX
1	239	STARTING VIBRATOR						
1	238	WIRE				58	#16 SHIELDED	MIL-C-7078
1	237	WIRE					#16 SHIELDED	MIL-C-7078
1	236	OVER VOLTAGE RELAY (24V)					X-16799	PRESTOLITE
1	235	CABLE ASSY. 253" LONG					#20 SHIELDED (2 REQD.) #20 SHIELDED (3 REQD.)	MIL-C-7078 A MIL-W-16878D
2	234	CARBON RESISTOR					86 OHM 1/2 WATT	
1	233	SWITCH GEAR					ZGG51-F3	CARLING
1	232	SWITCH GEAR					8855K44	CUTLER HAMMER
~~1~~	~~231~~	~~SWITCH PRESSURE~~					~~PSF-100A~~	~~FAIRCHILD CONTROLS~~
~~1~~	~~230~~	~~SWITCH OVERRIDE~~					~~30-1-RED~~	~~GRAYHILL~~
~~1~~	~~229~~	~~RED LIGHT~~					~~6037-001-804~~	~~STARK ELECTRONICS~~
~~2~~	~~228~~	~~AMBER LIGHT~~					~~6037-001-804~~	~~STARK ELECTRONICS~~
~~1~~	~~227~~	~~GREEN LIGHT~~					~~6037-001-804~~	~~STARK ELECTRONICS~~
1	226	SWITCH					195607-0	
3	225	RELAY					KHP-17D11 POTTER & BRUMFIELD	
1	224	WIRE				9	#16 UNSHIELDED	MIL-W-5086A
1	223					34		
1	222					13		
1	221					41		
1	220					8		
1	219					8	#16 UNSHIELDED	MIL-W-5086A
1	218					10	#20 UNSHIELDED	MIL-W-16878D
1	217					4		
1	216					10		
1	214					10		
1	213					14		
1	212					24		
1	211					10		
1	209					12	#20 UNSHIELDED	MIL-W-16878D
1	208					140	#16 UNSHIELDED	MIL-W-5086A
1	207	WIRE				135	#16 UNSHIELDED	MIL-W-5086A

L.E.T.	CHANGE	DRAWN	DATE	APPV'D
D	2-ADDED 262,263, 264,265,266, 267,268 1-INC. DCN 6,7, 8,9,10,11,12	JAH	7/30/71	
C	5-ADDED 256 4-DELETED 250 & 251 3-249 WAS 3 REQ. 2-252 WAS 1 REQ. 1-INC. DCNS 3,4,5	RB	1-14-70	1-23-70
B	(REDRAWN) (B1) DELETED -250 (B2) ADDED-249 THRU 252 (B3) INCORP. DCN#1 & 2	RB	5/13/69	

REVISIONS

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCES:
FRACTIONAL 11/32
DECIMAL .010
ANGULAR 1 1/2
FINISH: BELLANCA SPEC.

SCHEMATIC (TABULATION) OBSOLETE

DRAWN	CHECK	APPV'D
RB	JAH	
5-13-69	6-13-69	

SCALE

~~196793~~
SHT. 3 OF 4

SUPERSEDED BY 206120 JAH 4-20-73

TABLE X-1 EARLIER VIKING BILL OF MATERIALS

LET.	CHANGE	DRAWN	DATE	APPVD.	EFF. SER.
B	(B1) Incorp. DCN #1 (B2) -98 & -99 Was AC Spark Plug Co. (B3) -124 Was 362 DR (B4) -116 Was 1 Req (by Redrawn) (B5) -147 Was #18 Unshielded	RB	5/13/69	6-17-69	
C	1. Inc. DCN # 2, 3, 4, & 5 2. -135 Was E-T-A45-720-P, E.T.A Products Co. 3. -156 Was #12 Unshielded 4. -80 Was Callout As Part Of Engine	RB	6/4/70	6/5/70	
D	(1) Inc DCN # 6, 7, 9, 10, 11, 12 (2) -62 Lg. Was 65 (3) -63 Lg. Was 33 (4) -64 Lg. Was 69 (5) -137 & -139 Were 16 Ga. (6) -134 Was 45-710-P (7) -166 Was 45-702-P (8) -151 Was 45-710P (9) -75 Added P/N	JDW	7/30/71		
E	1- Inc DCN # 13, 14, 15, 16, 17 2- -76 P/N Was 2GK53 Carling	RB	10/2/72		
F	1- Deleted -28, -76, 117, 118, 119, 192 2- -140 Was E-T-A45-702-P 1 Req 3- Revised -89, 146, 147, -116, 193, 133 4- -81 Was 2 Req. 5- -131 Was 2 Req 6- -90 Was 1 Req. 7 Deleted -36, 37, 85, 86, 87, 97, 113, 143, 144, 148, 183, 134	RB	10/10/72		

NOTE:

1. - Use Terminals That Meet Mil Spec. Only.
2. - Parts No. 98-99-101-143 & 144, Are Gauges In 6 In 1 Unit Gauge. AC Spark Plug 1P-1588261
3. - Alterate For Part No. 127-128 & 129 Is No. 12 Wire

△4 - Optional Equipment

5. - No 22 Has Been Omitted From Number Series
6. - Butt Connectors, American Pamcor Inc. 34070, 34071 & 34072 Alternate For American Pamcor Connectors E.T.C. Incorporated, Cleveland, Ohio.

A.M.P	E.C.T.
34070	A-245X
34071	B-231X
34072	C-246X

7. - Shielded Wire MIL-C-7078A - Alternate MIL-W-76B
8. - Part Nos. -75 & -111 Comes Shipped As One Unit (P/N 164R)

△ - (Add) To Callout -89 △ Anti-Collision Light FL-42 or FL-12 Flite-Lites, Emco Eng. Co.

Note: When Anti-Collision Lights Are Installed On:

Bottom	Top	Both
Either Beacon or FL-12 4229 & Up	FL-42 4245 & Up	FL-12 4245 & Up

△ - Alternate For -122 Mag Filter Is #Z 948016-01 Bendix Radio Division

9. - MIL-W-5086A & MIL-W-7078 Are Acceptable Substitutes For MIL-W-76B

△10 - Locating Light Is Not Used

No. Reqd.	Part No.	Name	Length	Material	Material Spec.
1	206	Wire	124	#16 Unshielded	MIL-W-5086A
1	205	Wire	124	#16 Unshielded	MIL-W-5086A
1	204	Wire	113	#16 Unshielded	MIL-W-5086A
1	203	Wire	113	#16 Unshielded	MIL-W-5086A
1	201	Wire	170	#12 Unshielded	MIL-W-5086A
1	200	Wire	20	#16 Unshielded	MIL-W-5086A
1	198	Wire	90	#16 Unshielded	MIL-W-5086A
1	197	Wire	90	#16 Unshielded	MIL-W-5086A
1	196	D.P.D.T Switch		195607	Carling
1	195	T.P.D.T. Switch		88-59K44	Cutler Hammer
3	194	Relay (12 V)		70-111224	Prestolite
1	193	C.B. Switch		45-700-P20	E.T.A.
~~1~~	~~192~~	~~C.B. Switch~~		~~112-205-101~~	~~Wood Electric Co.~~
1	191	SP Switch		2 FA54	Carling
[illegible]	190	Wire	54		[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
4	178	Wire	18	#20 Shielded	MIL-C-7078A
2	177	Plug		AN3106-14S-2S or AN3108-14S-2S	
1	176	Compass Indicator			
1	175	Transmitter			
4	174	Wire	132	#20 Shielded	MIL-C-7078
1	173	Wire	132	#18 Shielded	MIL-C-7078A
1	172	Plug		AN3106-22-33 or AN3108-22-33	
1	171	5 Amp. Breaker		E.T.A.-45-705P	E.T.A. Products Co.
1	170	Inverter & Terminal Block		Type #12119-1-B	Bendix
~~2~~	~~169~~	~~Flite-Lite~~			
1	168	Wire	96	#18 Unshielded	MIL-W-5086A
1	167	SP Switch		2 FA54	Carling
1	166	Circuit Breaker		1 Amp For Mute Relay 44-100-P10 (3 Amp KMA-20)	E.T.A. Products Co.
1	165			MBT-12	Narco Fort Wash. Penn.
1	164	Saddle Type Socket		7AB-1	Cinch Jones
1	163	Miniture Plug		TT-15	E.S.Y. Sales
1	162	Wire	84	#18 Unshielded	MIL-W-5086A
1	161	Wire	60	#20 Unshielded	MIL-W-16878D Type B
1	160	Wire	60	#20 Unshielded	MIL-W-16878D Type B
1	159	Circuit Breaker		ETA-45-703P	E.T.A. Products Co.
2	158	Copper Strap			
3	157	Circuit Breaker		Amp. Size A/R For Radios (10 Amp Max)	E.T.A. Products Co.
1	156	Wire	104	#10 Unshielded	MIL-W-5086A
1	155	Wire	188	#20 Unshielded	MIL-W-16878D Type B
1	154	Circuit Breaker		E.T.A.-45-715-P	E.T.A. Products Co.
1	153 △4	Electric Reel Control Box			Benera Inc. Co.
1	152 △4	Electric Reel		MO-34-C	Benera Inc. Co.
1	151 △4	Circuit Breaker		45-700-P1	E.T.A. Products Co.
1	150 △4	Wire	150	#16 Unshielded	MIL-W-5086A
1	149	Wire	145	#20 Unshielded	MIL-W-16878D Type B
~~1~~	~~148~~	~~Switch~~		~~No 202~~	~~Switch Craft~~
1	147 △4	Wire	136	#14 Shielded	MIL-C-7078A
1	146	Wire	136	#14 Shielded	MIL-C-7078A
1	145 △4	Wire	13	#16 Unshielded	MIL-W-5086A
~~1~~	~~144~~	~~Main Fuel Gauge~~		~~5640180 Ass'y.~~	~~AC Spark Plug Co.~~
~~1~~	~~143~~	~~Aux. Fuel Gauge~~		~~GG-5649211 Ass'y.~~	~~AC Spark Plug Co.~~
1	142 △4	Wire	47	#20 Unshielded	MIL-W-16878D Type B
1	141 △4	Turn & Bank Indicator			
2	140	Circuit Breaker		45-700-P	E.T.A.
1	139 △4	Wire	54	#18 Unshielded	MIL-W-5086A
1	138 △4	Wire	54	#16 Unshielded	MIL-W-5086A
1	137 △4	Wire	54	#18 Unshielded	MIL-W-5086A
1	136	Circuit Breaker		109-260-101 109-250-101 (Alt)	Wood Electric
1	135	Circuit Breaker		109-35 Amp 45-700-P350	Wood Electric E.T.A. Products Co.
~~1~~	~~134~~	~~Circuit Breaker~~		~~44-100-P20~~	~~E.T.A. Products Co.~~
5	133	Circuit Breaker		E-T-A45-700-P5A	E.T.A. Products Co.
1	132	Circuit Breaker		E-T-A45-710-P	E.T.A. Products Co.
1	131 △4	S.P. Switch		2 FA54	Carling
1	130	Pitot			
1	129	Wire	212	#14 Shielded	MIL-C-7078A
1	128 △4	Wire	40	#14 Unshielded	MIL-W-5086A
1	127 △4	Wire	59	#14 Unshielded	MIL-W-5086A
1	126	Wire	40	#20 Unshielded	MIL-W-16878D Type B
1	125	Cyl. Hd. Temp Bulb		333 B	Stewart Warner
1	124	Oil Temp Bulb		362 DR	Stewart Warner
2	123	Magneto		Part of Engine	
2	122	Mag Filter		Z94B016-01	Bendix or Mitchell AK005
1	121	Starter Switch		9095	Cole
1	120	S.P.S.T. Switch		2FA54	Carling
~~1~~	~~119~~	~~Warning Light Green~~		~~MS-25041-3 Socket & 330 Miniture Lamp (Westinghouse or G.E.)~~	
~~1~~	~~118~~	~~Warning Light Green~~		~~MS-25041-3 Socket & 330 Miniture Lamp (Westinghouse or G.E.)~~	
~~1~~	~~117~~	~~Warning Light Green~~		~~MS-25041-3 Socket & 330 Miniture Lamp (Westinghouse or G.E.)~~	
1	116	Warning Light Red		MS-25041-2 Socket & 330 Miniture Lamp (Westinghouse or G.E.)	
1	115	Resisor		56 Ω, 2 Watt	
1	114	Resisor		15 Ω, 2 Watt	
~~1~~	~~113~~	~~Switches~~		~~203~~	~~Switchcraft~~
1	112 △4	SP Switch		2FA54	Carling
1	111	Stall Warning		164-R 14 Volt	Safe Flight Instr. Co.
1	110	Ground Cable			
1	109	Battery			
1	108	Hot Cable			
1	107	Wire		Dwg. 196527	
1	106 △4	Cigar Lighter △10		L140B	Casco
1	105	L.D. Gear Horn		PA 7733-12V	Delta
1	104	Starter		MZ 4206	Prestolite
1	103	Alternator		ALY-8403	Prestolite
1	101	Ammeter		1501751 Assy.	AC Spark Plug Co.
~~1~~	~~100~~	~~Mag Switch~~		~~3267A~~	~~P/N 10-357250-1 R. H. Decker Co or Bendix~~
1	99	Cyl. Hd. Temp Gauge		821039	Stewart Warner
1	98	Oil Temp Gauge		813137	Stewart Warner
~~1~~	~~97~~	~~Baggage Light~~		~~A-2200-12~~	~~Grimes~~
16	96	Instr. Light		2505 Socket	Cole Herse
1	95	Light		CM7 Series-T-1¾ Bi Pin Indicator Light 14 V.	
1	94	Wire		#20 Unshielded	MIL-W-16878D Type B
1	93	Aux Fuel Pump			
1	92	Landing Light			
1	91	Landing Light			
A/R	90	Cabin Light		B3550	Grimes
1	89	Beacon Light			
1	88	Voltage Reg.		VSF-7201 (Alt.) VSF-7202 or VSF-7203	Prestolite
~~2~~	~~87~~	~~Trans. Fuel Tank Main~~		~~GI-20069~~	~~AC Spark Plug Co.~~
~~1~~	~~86~~	~~Trans. Fuel Tank Aux~~		~~GI-20094~~	~~AC Spark Plug Co.~~
~~1~~	~~85~~ △4	~~Flasher Navg Light~~		~~330A 12 V~~	~~Navg. Div. Phillips Controls~~
1	84	Wt. Navg Light Red			
1	83	Tail Navg Light White			
[illegible]	82	Wt. Navg Light Green			
~~1~~	~~71~~	~~Up Limit Switch~~		~~Micro Switch~~	
3	70	Down Limit Switch		Micro Switch	
3	69	Wire	51	#12 Unshielded	MIL-W-5086A
1	68		13	#2 Unshielded	MIL-W-5086A
1	67		91	#20 Unshielded	MIL-W-16878D Type B
1	66		32	#16 Shielded	MIL-C-7078A
1	64		102	#8 Unshielded	MIL-W-5086A
1	63			#8 Unshielded	MIL-W-5086A
1	62			#8 Unshielded	MIL-W-5086A
1	61		33	#20 Unshielded	MIL-W-16878D Type B.
1	60		77	#18 Unshielded	MIL-W-5086A
~~1~~	~~59~~		~~38~~	~~#20 Unshielded~~	~~MIL-W-16878D Type B~~
1	58		59	#16 Unshielded	MIL-W-5086A
1	57		19	#16 Shielded	MIL-C-7078
1	56		38	#16 Unshielded	MIL-W-5086A
1	55		73	#16 Unshielded	MIL-W-5086A
1	54		78	#16 Shielded	MIL-C-7078A
1	53		50	#16 Class-D Type-1	LWC-202 Thermocouple
1	52		76	#16 Class-D Type-1	Lewis Engineering Co.
1	51		100	#8 Shielded	MIL-C-7078A
1	50		76	#16 Shielded	MIL-C-7078A
1	49		94	#18 Unshielded	MIL-W-5086A
1	48		59	#18 Unshielded	MIL-W-5086A
1	47		77	#18 Unshielded	MIL-W-5086A
1	46		91	#20 Unshielded	MIL-W-16878D Type B
1	45		30	#18 Unshielded	MIL-W-5086A
1	44		212	#20 Shielded	MIL-C-7078A
1	43		41	#18 Unshielded	MIL-W-5086A
1	42		36	#18 Shielded	MIL-C-7078A
1	41		91	#18 Shielded	MIL-C-7078A
1	40		37	#20 Shielded	MIL-W-16878D Type B
1	39		84	#20 Shielded	MIL-C-7078A
1	38		78	#20 Shielded	MIL-C-7078A
~~1~~	~~37~~		~~30~~	~~#20 Shielded~~	~~MIL-C-7078A~~
~~1~~	~~36~~		~~30~~	~~#20 Shielded~~	~~MIL-C-7078A~~
1	35		71	#20 Unshielded	MIL-W-16878D Type B
1	34		78	#20 Shielded	MIL-C-7078A
1	33		75	#20 Unshielded	MIL-W-16878D Type B
1	32		55		
~~1~~	~~31~~		~~62~~		
1	30		146		
1	29		59		
~~1~~	~~28~~		~~60~~		
1	27		102		
1	26		91		
1	25		45		
1	24		45		
1	23		254	#20 Unshielded	MIL-W-16878D Type B
1	21		212	#20 Unshielded	MIL-C-7078A
1	20		50	#20 Unshielded	MIL-W-16878D Type B
1	19		50		
~~1~~	~~18~~		~~11~~		
~~1~~	~~17~~		~~38~~		
1	16		35		
1	15		72		
1	14		35		
1	13		35		
1	12		114		
1	11		114		
1	10		154		
1	9		154		
1	8		14		
~~1~~	~~7~~		~~225~~	~~#20 Unshielded~~	~~MIL-W-16878D Type B~~
1	6		176	#18 Unshielded	MIL-W-5086A
1	5		108	#20 Unshielded	MIL-W-16878D Type B
1	4		40	#12 Unshielded	MIL-W-5086A
1	3		40	#12 Unshielded	MIL-W-5086A
1	2		115	#12 Shielded	MIL-C-7078A
1	1	Wire	110	#12 Shielded	MIL-C-7078A

Columns as printed at foot of form: No. Reqd. | Part No. | Zone | Name | Dia. | Thick | Width | Length | Material | Material Spec. | Cal. Wt. | Act.

TABLE X-1 (Continued)

NO. REQ.	PART NO.	NAME	STOCK SIZE DIA.	STOCK SIZE THICK	STOCK SIZE WIDTH	STOCK SIZE LENGTH	MATERIAL	SPEC.
	-100	WIRE					# 20 UNSHIELDED	MIL-W-16878
	-99							
	-98							
	-97							
	-96							
	-95							
	-94							
	-93							
	-92							
	-91							
	-90						# 20 UNSHIELDED	
	-89						# 10 UNSHIELDED	
	-88						# 10 UNSHIELDED	
	-87						# 10 UNSHIELDED	MIL-W-16878
	-86						# 16 UNSHIELDED	MIL-W-5086
	-85						# 16 UNSHIELDED	MIL-W-5086
	-84						# 20 UNSHIELDED	MIL-W-16878
	-83							
	-82							
	-81							
	-80							
	-79							
	-78							
	-77							
	-76							
	-75							
	-74							
	-72							
	-71							
	-70							
	-69							
	-68							
	-67							
	-66							
	-65							
	-64							
	-63							
	-62							
	-61							
	-60							
	-59							
	-58							
	-57							
	-56							
	-55							
	-54							
	-53							
	-52							
	-51	WIRE					# 20 UNSHIELDED	MIL-W-16878

NO. REQ.	PART NO.	NAME	STOCK SIZE DIA.	STOCK SIZE THICK	STOCK SIZE WIDTH	STOCK SIZE LENGTH	MATERIAL	SPEC.
	-50	WIRE					# 10 UNSHIELDED	MIL-W-16878
	-49						# 18 UNSHIELDED	MIL-W-5086
	-48						# 18 UNSHIELDED	MIL-W-5086
	-47						# 20 UNSHIELDED	MIL-W-16878
	-46							
	-45							
	-44							
	-43							
	-42							
	-41							
	-40							
	-39							
	-38							
	-37							
	-36							
	-35						# 20 UNSHIELDED	MIL-W-16878
	-34						# 16 SHIELDED	MIL-C-7078
	-33						# 20 UNSHIELDED	MIL-W-16878
	-32						# 20 UNSHIELDED	MIL-W-16878
	-31						# 20 UNSHIELDED	MIL-W-16878
	-30						# 18 UNSHIELDED	MIL-W-5086
	-29						# 20 UNSHIELDED	MIL-W-16878
	-28							
	-27							
	-25							
	-24							
	-23							
	-22							
	-21						# 20 UNSHIELDED	MIL-W-16878
	-20						# 16 SHIELDED	MIL-C-7078
	-19						# 16 SHIELDED	MIL-C-7078
	-18						# 16 SHIELDED	MIL-C-7078
	-17						# 20 UNSHIELDED	MIL-W-16878
	-16						# 16 SHIELDED	MIL-C-7078
	-15						# 16 SHIELDED	MIL-C-7078
	-14						# 6 UNSHIELDED	MIL-W-16878
	-13						# 6 SHIELDED	MIL-C-7078
	-12						# 6 SHIELDED	
	-11						# 6 SHIELDED	
	-10						# 16 SHIELDED	
	-9						# 18 SHIELDED	
	-8						# 20 SHIELDED	
	-7						# 20 SHIELDED	MIL-C-7078
	-6						# 16 UNSHIELDED	MIL-W-5086
	-5						# 18 SHIELDED	MIL-C-7078
	-4						# 20 SHIELDED	MIL-C-7078
	-3						# 20 SHIELDED	MIL-C-7078
	-2						# 16 UNSHIELDED	MIL-W-5086
	-1	WIRE					# 12 UNSHIELDED	MIL-W-5086

LET.	CHANGE	DRAWN	DATE	APPV'D
A	ECO 120 SHT 2-1 NEVER USED	LDU	8/10/73	WHS

REVISIONS

UNLESS OTHERWISE NOTED
TOLERANCES:
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-WIRE TABULATION, -1 THRU -100

DRAWN	CHECK	APPV'D	SCALE	
LDU 4-10-73	WHS 4-19-73	WHS 4-22-73	NONE	206120 SHT 2-1

NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH (STOCK SIZE)	MATERIAL	SPEC.
	-200	WIRE					# 20 UNSHIELDED	MIL-W-16878
	-199	WIRE					# 20 UNSHIELDED	MIL-W-16878
	-198	WIRE					# 20 UNSHIELDED	MIL-W-16878
	-197							
	-196							
	-195							
	-194						# 20 UNSHIELDED	MIL-W-16878
	-193						# 12 UNSHIELDED	MIL-W-5086
	-192							
	-191							
	-190						# 12 UNSHIELDED	MIL-W-5086
	-189	WIRE					# 20 UNSHIELDED	MIL-W-16878
	-188	WIRE					# 20 UNSHIELDED	MIL-W-16878
	-187						# 20 UNSHIELDED	MIL-W-16878
	-186						# 16 UNSHIELDED	MIL-W-5086
	-185						# 18 UNSHIELDED	
	-184							
	-183							
	-182							
	-181							
	-180							
	-179							
	-178							
	-177						# 18 UNSHIELDED	MIL-W-5086
	-176						# 20 UNSHIELDED	MIL-W-16878
	-175						# 20 UNSHIELDED	MIL-W-16878
	-174						# 14 SHIELDED	MIL-C-7078
	-173						# 14 SHIELDED	
	-172						# 14 SHIELDED	
	-171						# 12 SHIELDED	
	-170						# 12 SHIELDED	MIL-C-7078
	-169						# 12 UNSHIELDED	MIL-W-5086
	-168						# 12 UNSHIELDED	MIL-W-5086
	-167						# 12 UNSHIELDED	MIL-W-5086
	-166						# 20 SHIELDED	MIL-C-7078
	-165						# 20 SHIELDED	MIL-C-7078
	-164						# 20 SHIELDED	MIL-C-7078
	-163						# 20 UNSHIELDED	MIL-W-16878
	-162							
	-161							
	-160						# 20 UNSHIELDED	MIL-W-16878
	-159						# 18 UNSHIELDED	MIL-W-5086
	-158						# 20 UNSHIELDED	MIL-W-16878
	-157						# 18 UNSHIELDED	MIL-W-5086
	-156						# 20 UNSHIELDED	MIL-W-16878
	-155							
	-154							
	-153							
	-152							
	-151	WIRE					# 20 UNSHIELDED	MIL-W-16878

NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH (STOCK SIZE)	MATERIAL	SPEC.
	-150	WIRE					# 20 UNSHIELDED	MIL-W-16878
	-149						# 20 UNSHIELDED	MIL-W-16878
	-148						# 20 UNSHIELDED	MIL-W-16878
	-146						# 12 SHIELDED	MIL-C-7078
	-145						# 12 UNSHIELDED	MIL-W-5086
	-144						# 12 UNSHIELDED	MIL-W-5086
	-143						# 18 UNSHIELDED	MIL-W-5086
	-142						# 20 UNSHIELDED	MIL-W-16878
	-141					—	# 16 UNSHIELDED WW-15340	REVERE
	-140							
	-139							
	-138					—	# 16 UNSHIELDED WW-15340	REVERE
	-137						# 18 UNSHIELDED	MIL-W-5086
	-136						# 20 UNSHIELDED	MIL-W-16878
	-135						# 20 UNSHIELDED	MIL-W-16878
	-134						# 18 SHIELDED	MIL-C-7078
	-133						# 18 UNSHIELDED	MIL-W-5086
	-132						# 18 UNSHIELDED	
	-131						# 16 UNSHIELDED	
	-130						# 16 UNSHIELDED	MIL-W-5086
	-129						# 20 UNSHIELDED	MIL-W-16878
	-128						# 20 UNSHIELDED	MIL-W-16878
	-127						# 20 UNSHIELDED	MIL-W-16878
	-126						# 20 UNSHIELDED	MIL-W-16878
	-125						# 18 UNSHIELDED	MIL-W-5086
	-124							
	-123							
	-122							
	-121							
	-120							
	-119							
	-118							
	-117							
	-116							
	-115							
	-114							
	-113							
	-112						# 18 UNSHIELDED	MIL-W-5086
	-111						# 20 UNSHIELDED	MIL-W-16878
	-110							
	-109							
	-108							
	-107							
	-106							
	-105							
	-104						# 20 UNSHIELDED	MIL-W-16878
	-103						# 12 UNSHIELDED	MIL-W-5086
	-102						# 20 UNSHIELDED	MIL-W-16878
	-101	WIRE					# 20 UNSHIELDED	MIL-W-16878

LET.	CHANGE	DRAWN	DATE	APPV'D
C	2: DELETE -147 THRU -161 1: REV. WIRE -138 THRU -141	C_{FH}	8/31/73	LGW
B	ADDED -128 THRU -128 & ADDED -190 THRU -200	LOU	8/14/73	LGW
A	EO6120 SHT 2-2 NEWARK LABEL	LOU	5/16/73	WDS

REVISIONS

UNLESS OTHERWISE NOTED
TOLERANCES:
DECIMAL ± .010
ANGULAR ± 1/2°
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-WIRE TABULATION, -101 THRU -200

DRAWN	CHECK	APPV'D
LOU	WDS	
4-10-73	4-19-73	4-27-73

SCALE: NONE

206120
SHT 2-2

NO REQ	PART NO.	NAME	DIA. / THICK / WIDTH / LENGTH STOCK SIZE	MATERIAL	SPEC.

NO REQ	PART NO.	NAME	DIA. / THICK / WIDTH / LENGTH STOCK SIZE	MATERIAL	SPEC.
	-209	WIRE		# 20 UNSHIELDED	MIL-W-16878
	-208				
	-207				
	-206				
	-205				
	-204			# 20 UNSHIELDED	MIL-W-16878
	-203			8660 SHIELDING BELDEN CORP.	
	-202			# 20 UNSHIELDED	MIL-W-16878
	-201	WIRE		# 6 SHIELDED	MIL-C-7078

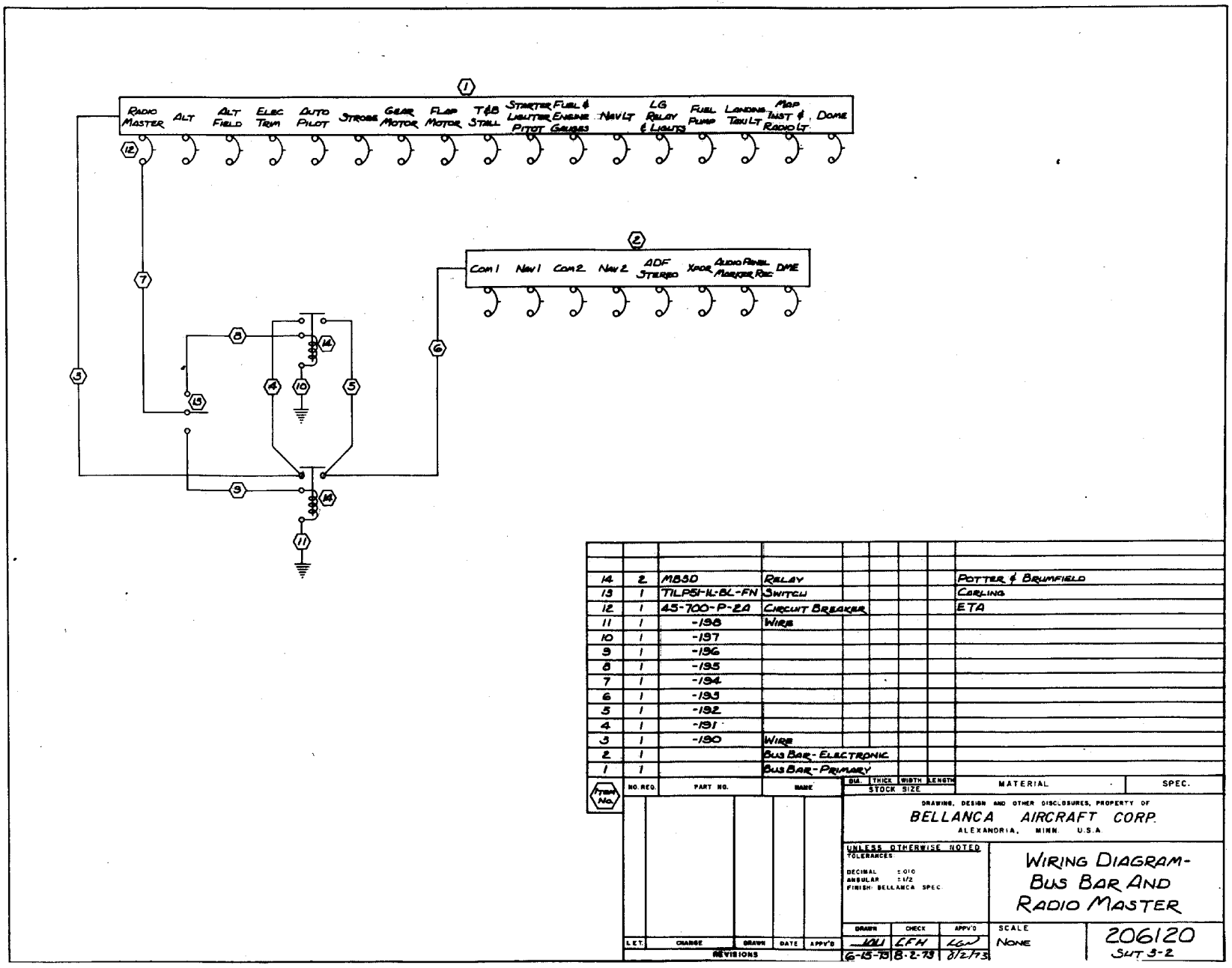
LET	CHANGE	DRAWN	DATE	APPR'D
REVISIONS				

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE SPECIFIED
TOLERANCES

WIRING DIAGRAM-
WIRE TABULATION,
-201 THRU -300

DRAWN	CHECK	APPR'D	SCALE	
JOU 8-2-73	EFH 9-6-73	LGH 9/6/73	NONE	206120 SHT 2-3



ITEM NO.	NO. REQ.	PART NO.	NAME	MATERIAL	SPEC.
14	2	MB3D	RELAY		POTTER & BRUMFIELD
13	1	TILP5I-IL-BL-FN	SWITCH		CARLING
12	1	45-700-P-2A	CIRCUIT BREAKER		ETA
11	1	-198	WIRE		
10	1	-197			
9	1	-196			
8	1	-195			
7	1	-194			
6	1	-193			
5	1	-192			
4	1	-191			
3	1	-190	WIRE		
2	1		BUS BAR - ELECTRONIC		
1	1		BUS BAR - PRIMARY		

STOCK SIZE: DIA. | THICK | WIDTH | LENGTH

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED TOLERANCES
DECIMAL ±.010
ANGULAR ±1/2°
FINISH: BELLANCA SPEC

WIRING DIAGRAM - BUS BAR AND RADIO MASTER

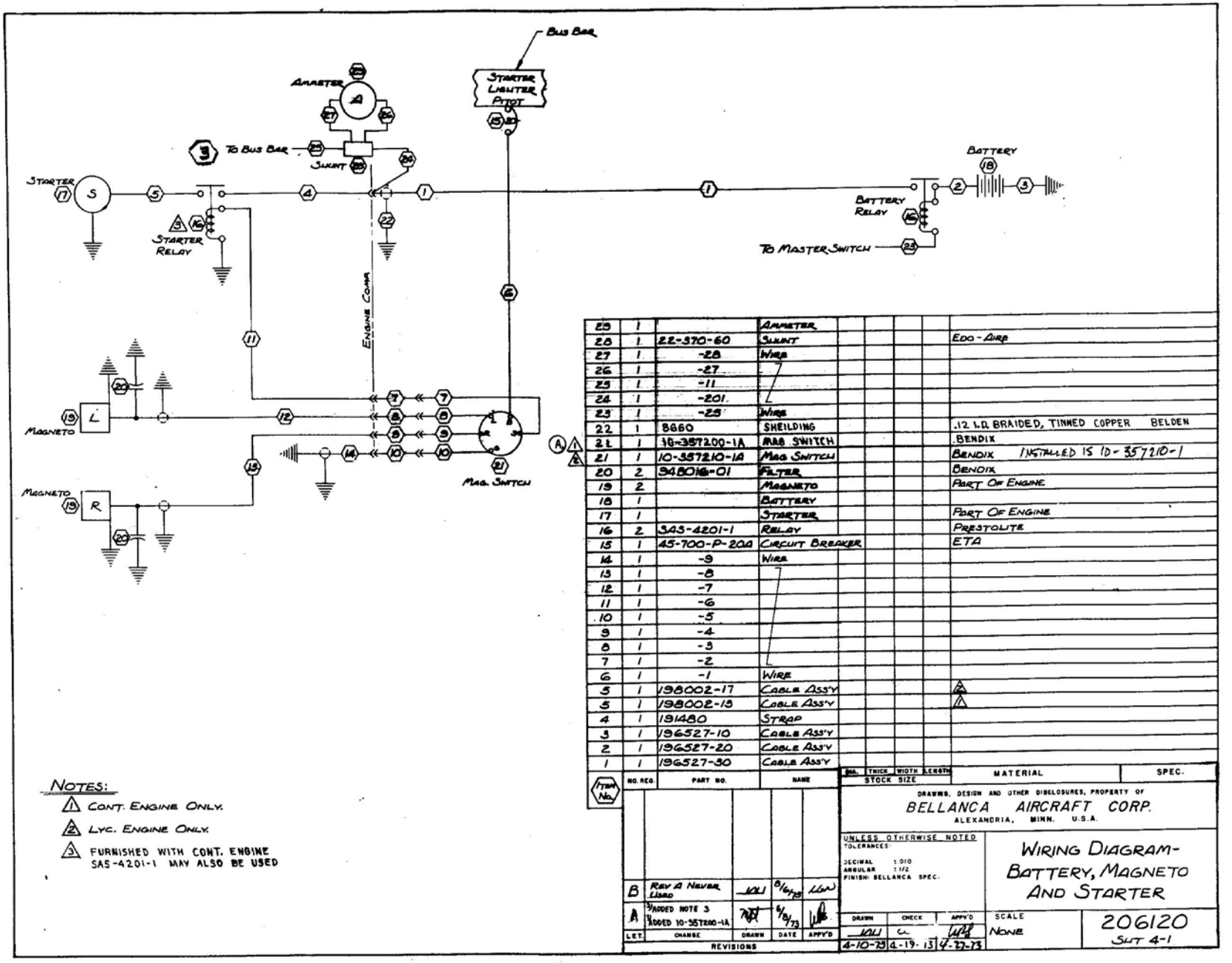
REVISIONS	L.E.T.	CHANGE	DRAWN	DATE	APP'D

DRAWN	CHECK	APP'D
JOU	LFH	LGW
6-15-73	8-2-73	8/2/73

SCALE: NONE

206120
SHT 3-2

FIGURE 10-2 BUS BAR AND RADIO MASTER SCHEMATIC Issued 10-73



ITEM No.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.	
29	1		AMMETER							
28	1	22-370-60	SHUNT							EDO-AIRE
27	1	-28	WIRE							
26	1	-27								
25	1	-11								
24	1	-201								
23	1	-25	WIRE							
22	1	8880	SHEILDING							.12 I.D. BRAIDED, TINNED COPPER BELDEN
21	1	10-357200-1A	MAG SWITCH							BENDIX
20	2	10-357210-1A	MAG SWITCH							BENDIX INSTALLED IS 10-357210-1
19	2	94801S-01	FILTER							BENDIX
18	1		MAGNETO							PART OF ENGINE
17	1		BATTERY							
16	2	SAS-4201-1	STARTER							PART OF ENGINE
15	1	45-700-P-20A	RELAY							PRESTOLITE
14	1	-9	CIRCUIT BREAKER							ETA
13	1	-8	WIRE							
12	1	-7								
11	1	-6								
10	1	-5								
9	1	-4								
8	1	-3								
7	1	-2								
6	1	-1	WIRE							
5	1	198002-17	CABLE ASS'Y							2
5	1	198002-15	CABLE ASS'Y							1
4	1	191480	STRAP							
3	1	196527-10	CABLE ASS'Y							
2	1	196527-20	CABLE ASS'Y							
1	1	196527-30	CABLE ASS'Y							

NOTES:

1. CONT. ENGINE ONLY.
2. LYC. ENGINE ONLY.
3. FURNISHED WITH CONT. ENGINE SAS-4201-1 MAY ALSO BE USED

LET.	CHANGE	DRAWN	DATE	APP'D
B	REV A NEVER ISSUED	JOU	8/6/73	LGW
A	3 ADDED NOTE 3 1 ADDED 10-357200-1A	JOU	6/8/73	LGW

REVISIONS

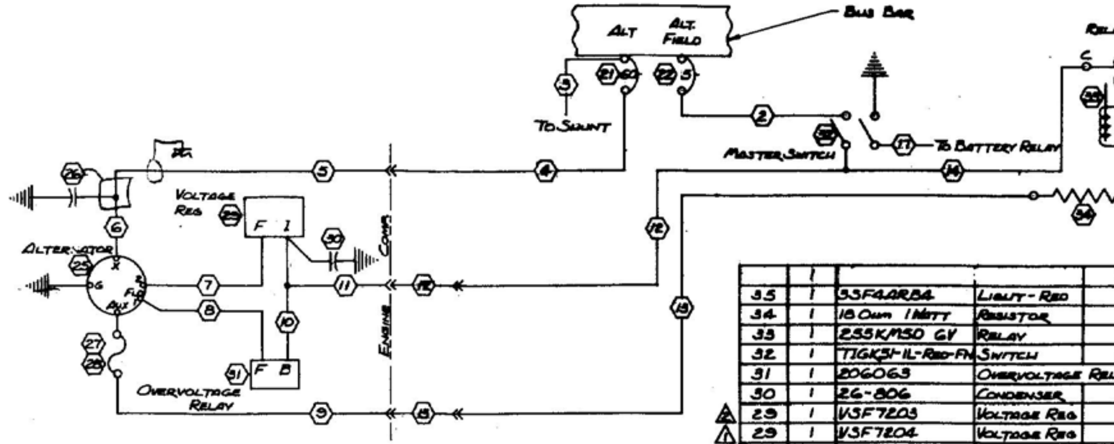
DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCES:
DECIMAL ± .010
ANGULAR ± 1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-
BATTERY, MAGNETO
AND STARTER

DRAWN	CHECK	APP'D	SCALE
JOU			NONE
4-10-73	4-19-73	4-22-73	

206120
SHT 4-1



Item No	No. Req.	Part No.	Name	Dia.	Thick	Width	Length	Material	Spec.
	1								
35	1	33F4ARB4	Light - Red					Sorenson Lighted Controls	
34	1	18 Ohm 1 Watt	Resistor						
33	1	255KM50 6V	Relay					Potter & Brumfield	
32	1	TIGK51-IL-Red-FN	Switch					Carling	
31	1	206063	Overvoltage Relay						
30	1	26-806	Condenser					GC Electronics (Alt AR-1 Sprague)	
△2 29	1	VSF7203	Voltage Reg					Prestolite (Alt VSF7201, VSF7202)	
△1 29	1	VSF7204	Voltage Reg					Prestolite (Alt VSF7201, VSF7202, VSF7203)	
28	1	3AG .1A	Fuse					Littelfuse	
27	1	1501455	Fuse Holder					Littelfuse	
26	1	20-0520-10	Filter					Hisonic	
△2 25	1	ALY8403	Alternator					Prestolite	
△1 25	1	ALY8411	Alternator					Prestolite	
22	1	109-205-101	Circuit Breaker					Wood Electric Co.	
21	1	109-260-101	Circuit Breaker					Wood Electric Co.	
	1								
	1								
	1								
17	1	-25	Wire						
16	1	-24							
15	1	-23							
14	1	-22							
13	1	-21							
12	1	-20							
11	1	-19							
10	1	-18							
9	1	-17							
8	1	-16							
7	1	-15							
6	1	-14							
5	1	-13							
4	1	-12							
3	1	-11							
2	1	-10	Wire						
1	1	196527-30	Cable Ass'y						

Stock Size: Dia. / Thick / Width / Length

Notes:

△1 Cont. Engine Only.

△2 Lyc. Engine Only.

Let.	Change	Drawn	Date	Appv'd
A	206120 Sht 5-1 Never Used	[illegible]	8/6/73	[illegible]

Revisions

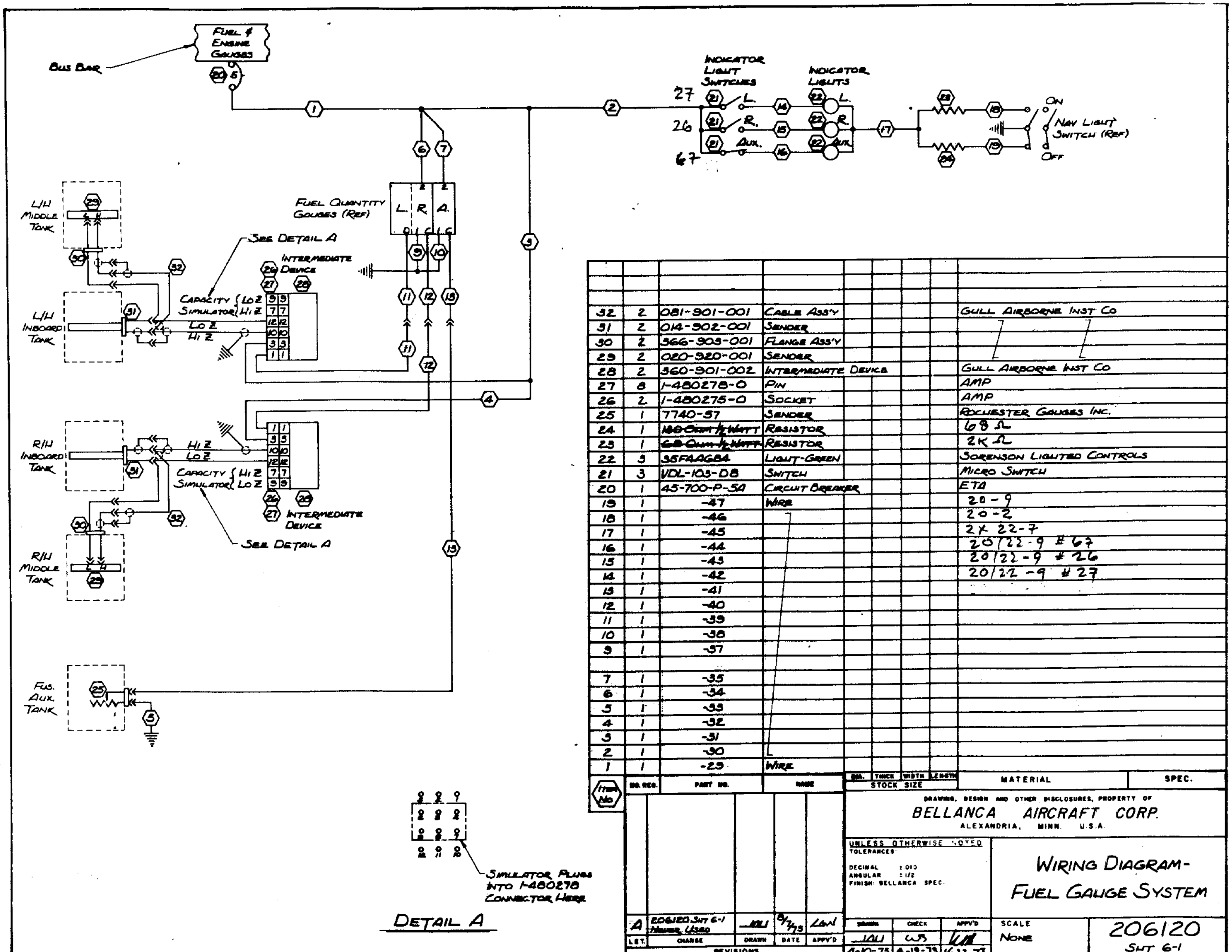
Drawing, design and other disclosures, property of
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

Unless otherwise noted
Tolerances
Decimal ± [illegible]
Angular ± 1/2
Finish: Bellanca Spec.

Wiring Diagram - Alternator

Drawn	Check	Appv'd	Scale	
[illegible]	[illegible]	[illegible]	None	206120 Sht 5-1
2-10-73	4-19-73	4-27-73		

FIGURE 10-4 ALTERNATOR SCHEMATIC



32	2	081-901-001	Cable Ass'y					Gull Airborne Inst Co
31	2	014-902-001	Sender					
30	2	366-903-001	Flange Ass'y					
29	2	020-920-001	Sender					
28	2	360-901-002	Intermediate Device					Gull Airborne Inst Co
27	8	1-480278-0	Pin					AMP
26	2	1-480275-0	Socket					AMP
25	1	7740-57	Sender					Rochester Gauges Inc.
24	1	~~180 Ohm ½ Watt~~	Resistor					68 Ω
23	1	~~68 Ohm ½ Watt~~	Resistor					2K Ω
22	3	35FAAGB4	Light-Green					Sorenson Lighted Controls
21	3	VDL-103-D8	Switch					Micro Switch
20	1	45-700-P-5A	Circuit Breaker					ETA
19	1	-47	Wire					20-9
18	1	-46						20-2
17	1	-45						2X 22-7
16	1	-44						20/22-9 #67
15	1	-43						20/22-9 #26
14	1	-42						20/22-9 #27
13	1	-41						
12	1	-40						
11	1	-39						
10	1	-38						
9	1	-37						
7	1	-35						
6	1	-34						
5	1	-33						
4	1	-32						
3	1	-31						
2	1	-30						
1	1	-29	Wire					
Item No	No. Req.	Part No.	Name	Dia.	Thick	Width	Length	Material / Spec.
				Stock Size				

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BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-FUEL GAUGE SYSTEM

Let.	Change	Drawn	Date	Appv'd
A	206120 Sht 6-1 Never Used	JAU	8/7/73	LAW

REVISIONS

Drawn	Check	Appv'd	Scale	
JAU	WB	LM	None	206120 Sht 6-1
4-10-73	4-19-73	4-22-73		

FIGURE 10-5 FUEL GAUGE SYSTEM SCHEMATIC

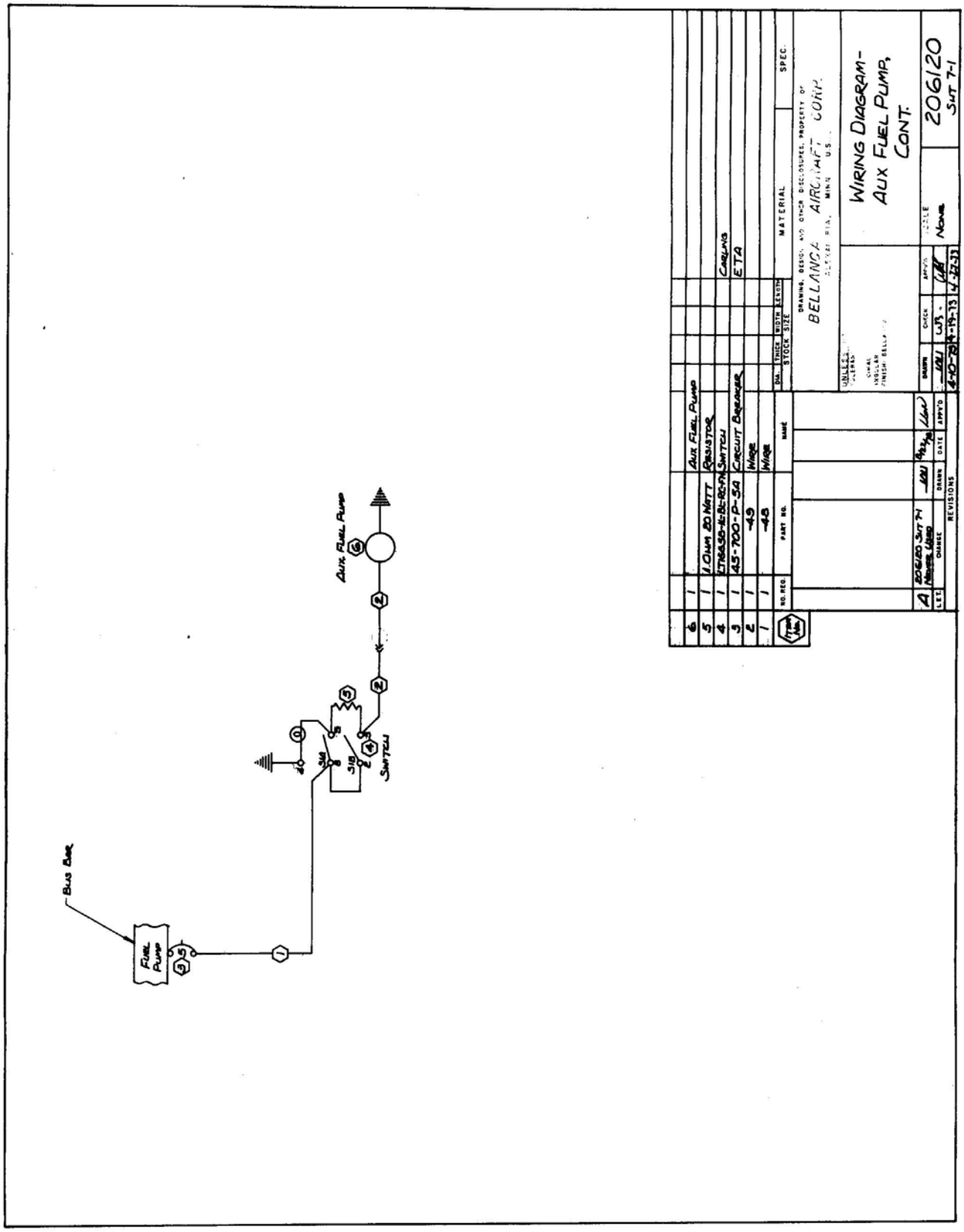
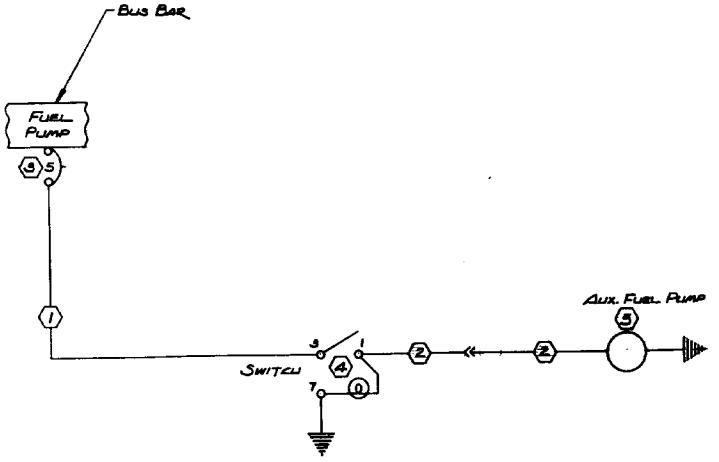


FIGURE 10-6 AUXILIARY FUEL PUMP SCHEMATIC (CONTINENTAL)



NO.	NO. REQ.	PART NO.	NAME
5	1		AUX FUEL PUMP
4	1	ETM6B8-4-BLRC-FN	SWITCH
3	1	45-700-P-5A	CIRCUIT BREAKER
2	1	-45	WIRE
1	1	-48	WIRE

CABLING ETA

STOCK SIZE: DIA. | THICK | WIDTH | LENGTH | MATERIAL | SPEC.

UNLESS OTHERWISE NOTED TOLERANCES
DECIMAL
ANGULAR
FINISH BELLANCA

WIRING DIAGRAM- AUX FUEL PUMP, LYC.

DRAWN	CHK'D	APP'VD	SCALE	
JAU 4-10-73	WS 4-19-73	4-27-73	NONE	206120 SHT 7-2

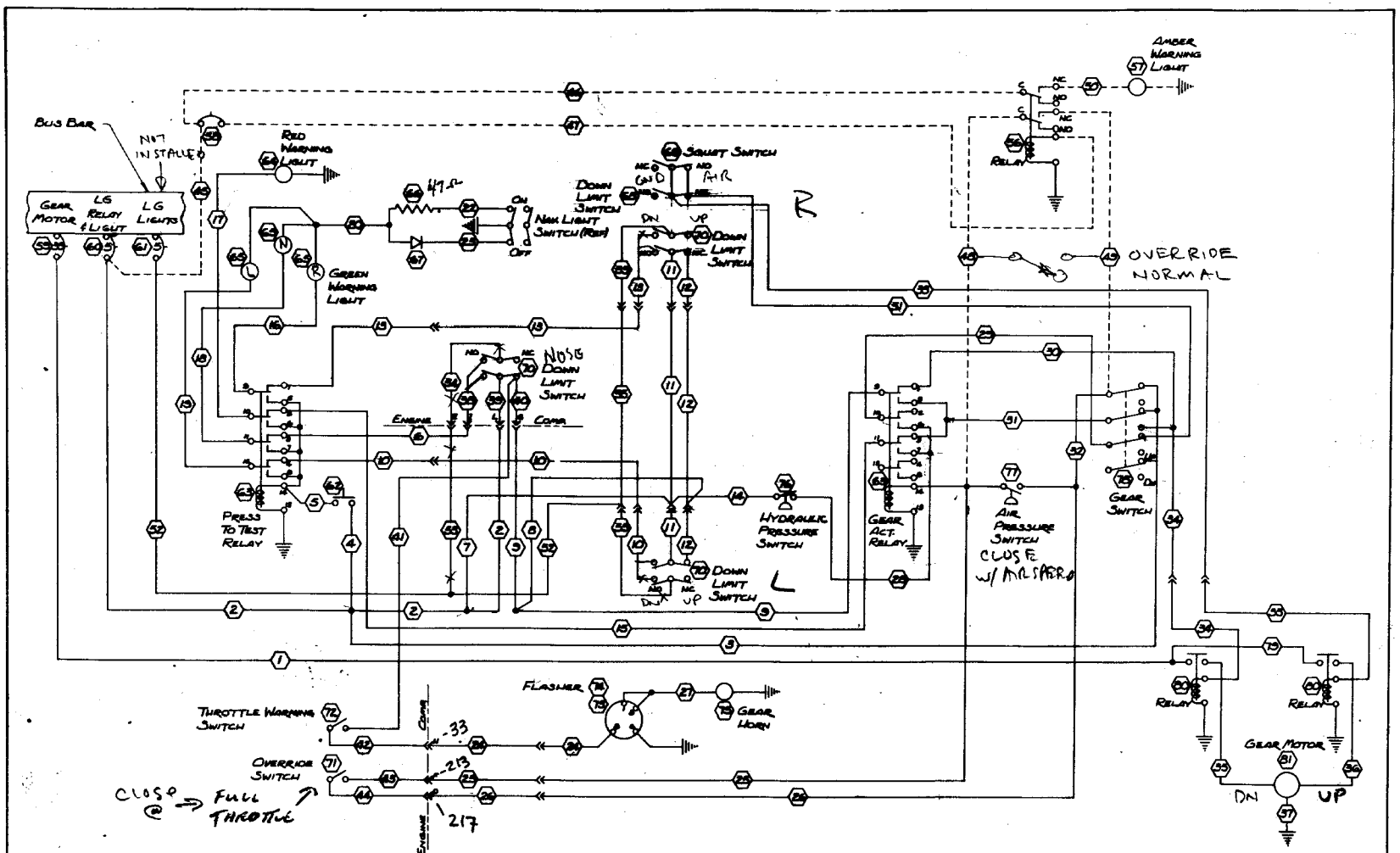
E.T.	CHANGE	DRAWN	APP'VD

REVISIONS

FIGURE 10-7 AUXILIARY FUEL PUMP SCHEMATIC (LYCOMING)

LIMIT SWITCHES SHOWN IN "UP" POSITION
SQUAT SWITCH SHOWN IN "AIR" POSITION
AIR PRESSURE SWITCH SHOWN WITHOUT PRESSURE
THROTTLE SWITCHES SHOWN IN MID (NOT CLOSED, NOT FULL) POSITION
CKT BKR (58) OVERRIDE SHOWN IN NORMAL POSITION

SQUAT ON GND = open Sw = CMN & NO



NOTES:

1 - DOTTED LINES INDICATE OPTIONAL AUTO AXION OVERRIDE.

SEE 206120 SHT 8-2-2 FOR B/M

NO. REQ.	PART NO.	NAME	DIA. / THICK / WIDTH / LENGTH STOCK SIZE	MATERIAL	SPEC.

L.E.T.	CHANGE	DRAWN	DATE	APP'D
REVISIONS				

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED TOLERANCES:
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC

DRAWN	CHECK	APP'D
JCW	CFH	LGW
8-20-73	9-6-73	9/6/73

WIRING DIAGRAM - LANDING GEAR SYSTEM

SCALE: NONE

206120 SHT 8-2-1

FIGURE 10-8 LANDING GEAR SYSTEM SCHEMATIC

ITEM No.	NO REQ	PART NO	NAME	DIA.	THICK	WIDTH	LENGTH	STOCK SIZE	MATERIAL
81	1		GEAR MOTOR						
80	2	SAS-4201-1	RELAY						PRESTOLITE
79	1	195609	STRAP						
78	1	8859KAA	SWITCH						CUTLER HAMMER
77	1	731-620	SWITCH						CONTROLS CO. OF AMERICA
76	1	66070-8-17	SWITCH						CONSOLIDATED CONTROLS CORP (ALT 194375)
75	1	PA7733-12V	HORN						DELTA
74	1	12F90T	FLASHER						AMPERITE
73	1	9EB	SOCKET						AMPERITE
72	1	196938-10	SWITCH						
71	1	196938-10	SWITCH						
70	3	1ENI-G	SWITCH						MICRO SWITCH (1CH1-G ALT)
68	2	BZ-2RS55	SWITCH						MICRO SWITCH
67	1	IN-645	DIODE						STARK
66	1		RESISTOR						47 OHM ½ WATT
65	3	3SF4AGBA	LIGHT-GREEN						SORENSON LIGHTED CONTROLS
64	1	3SF4ARBA	LIGHT-RED						SORENSON LIGHTED CONTROLS
63	2	KUP-17D11	RELAY						POTTER & BRUMFIELD
62	1	30-1	SWITCH						GRAYHILL
61	1	45-700-P-5A	CIRCUIT BREAKER						ETA
60	1	45-700-P-5A	CIRCUIT BREAKER						ETA
59	1	45-700-P-35A	CIRCUIT BREAKER						ETA
58	1	111-203-101	CIRCUIT BREAKER						WOOD ELECTRIC CO.
57	1	3SF4AABA	LIGHT-AMBER						SORENSON LIGHTED CONTROLS
56	1	KA 11D	RELAY						POTTER & BRUMFIELD
55	1	-209	WIRE						
54	1	-208	WIRE						
53	1	-207	WIRE						
52	1	-206	WIRE						
51	1	-189							
50	1	-102							
49	1	-101							
48	1	-100							
47	1	-33							
46	1	-98							
45	1	-97							
44	1	-96							
43	1	-95							
42	1	-94							
41	1	-93							
40	1	-92							
39	1	-90							
38	1	-89							
37	1	-88							
36	1	-87							
35	1	-86							
34	1	-85							
33	1	-84							
32	1	-83							
31	1	-82							
30	1	-81							
29	1	-80							
28	1	-79							
27	1	-78							
26	1	-77							
25	1	-76							
24	1	-75							
23	1	-47							
22	1	-46							
20	1	-72							
19	1	-71							
18	1	-70							
17	1	-69							
16	1	-68							
15	1	-67							
14	1	-66							
13	1	-63							
12	1	-62							
11	1	-61							
10	1	-60							
9	1	-59							
8	1	-58							
7	1	-57							
6	1	-55							
5	1	-54							
4	1	-53							
3	1	-52							
2	1	-51							
1	1	-50	WIRE						

LET	CHANGE	DRAWN	DATE	APPV'D
REVISIONS				

UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL
ANGULAR
FINISH BELLANCA SPEC.

WIRING DIAGRAM-LANDING GEAR SYSTEM, B/M

DRAWN	CHECK	APPV'D	SCALE	
JAU	CFN	LGW	None	206120
8-20-73	9-6-73	9/6/73		SHT 8-2-2

TABLE X-3 LANDING GEAR SYSTEM, BILL OF MATERIAL

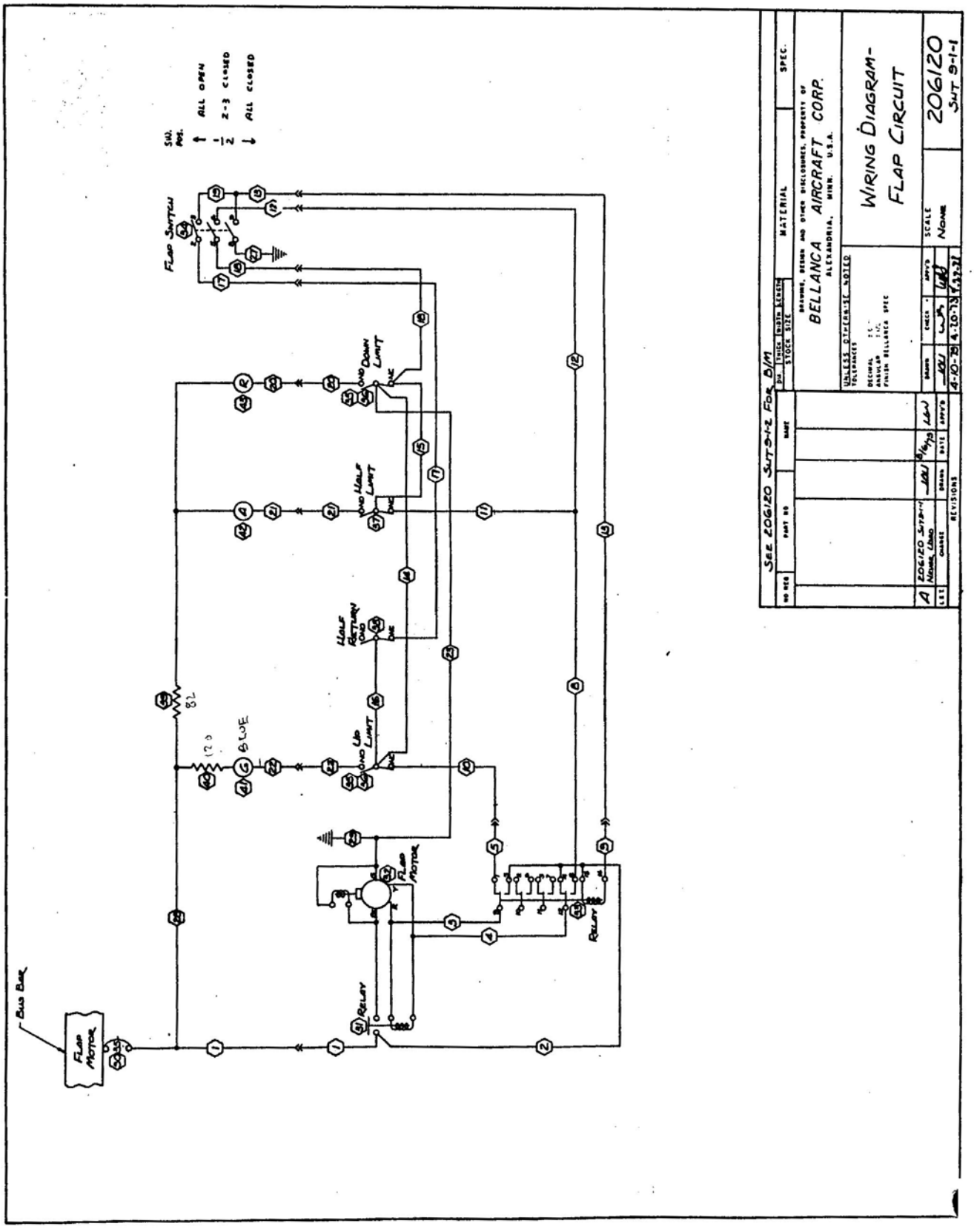


FIGURE 10-9 FLAP SYSTEM SCHEMATIC

TABLE X-4 FLAP SYSTEM, BILL OF MATERIAL

BLUE

ITEM No.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
43	1	33F4ARB4	LIGHT-RED					SORENSON LIGHTED CONTROLS	
42	1	33F4AAB4	LIGHT-AMBER					SORENSON LIGHTED CONTROLS	
41	1	33F4AGB4	LIGHT-GREEN					SORENSON LIGHTED CONTROLS	
40	1	120 OHM ½ WATT	RESISTOR						
39	1	68 OHM ½ WATT	RESISTOR						
38	1	V3L-111-D8	SWITCH					MICRO SWITCH	
37	1	V3L-103-D8	SWITCH						
36	2	JV-7	ACTUATOR						
35	2	V3-1-D8	SWITCH					MICRO SWITCH	
34	1	195607-10	SWITCH						
33	1	KHP-17D11	RELAY					POTTER & BRUMFIELD	
32	1		FLAP MOTOR						
31	1	SAS-4201-1	RELAY					PRESTOLITE	
30	1	43-700-P-35A	CIRCUIT BREAKER					ETA	
29	1	-131	WIRE						
28	1	-130							
27	1	-129							
23	1	-125							
22	1	-124							
21	1	-123							
20	1	-122							
19	1	-121							
18	1	-120							
17	1	-119							
16	1	-118							
15	1	-117							
14	1	-116							
13	1	-115							
12	1	-114							
11	1	-113							
10	1	-112							
9	1	-111							
8	1	-110							
5	1	-107							
4	1	-106							
3	1	-105							
2	1	-104							
1	1	-103	WIRE						

STOCK SIZE

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

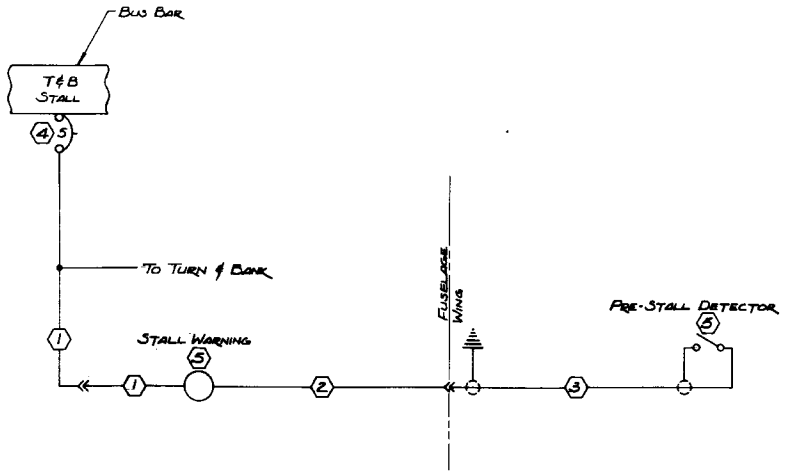
UNLESS OTHERWISE NOTED
TOLERANCES:
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-
FLAP CIRCUIT, B/M

DRAWN	CHECK	APPV'D	SCALE	
IAU	WB	[illegible]	NONE	206120 SHT 9-1-2
4-10-73	4-20-73	4-27-73		

REVISIONS

LET.	CHANGE	DRAWN	DATE	APPV'D
A	206120 SHT 9-1-2 [illegible]	IAU	8/6/73	LGW



ITEM NO.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
				STOCK SIZE					
5	1	164-R	STALL WARNING					SAFE FLIGHT INST. CORP.	
4	1	45-700-P-5A	CIRCUIT BREAKER					ETA	
3	1	-134	WIRE						
2	1	-133	WIRE						
1	1	-132	WIRE						

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL
ANGULAR
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-
STALL WARNING SYSTEM

LET.	CHANGE	DRAWN	DATE	APPV'D
A	REVISE STALL WARNING CALLOUT	CFH	8/31/73	LGN

REVISIONS

DRAWN	CHECK	APPV'D
JOU	WJS	WJS
4-10-73	4-19-73	4-27-73

SCALE NONE

206120
SHT 10-1

FIGURE 10-10 STALL WARNING SYSTEM SCHEMATIC

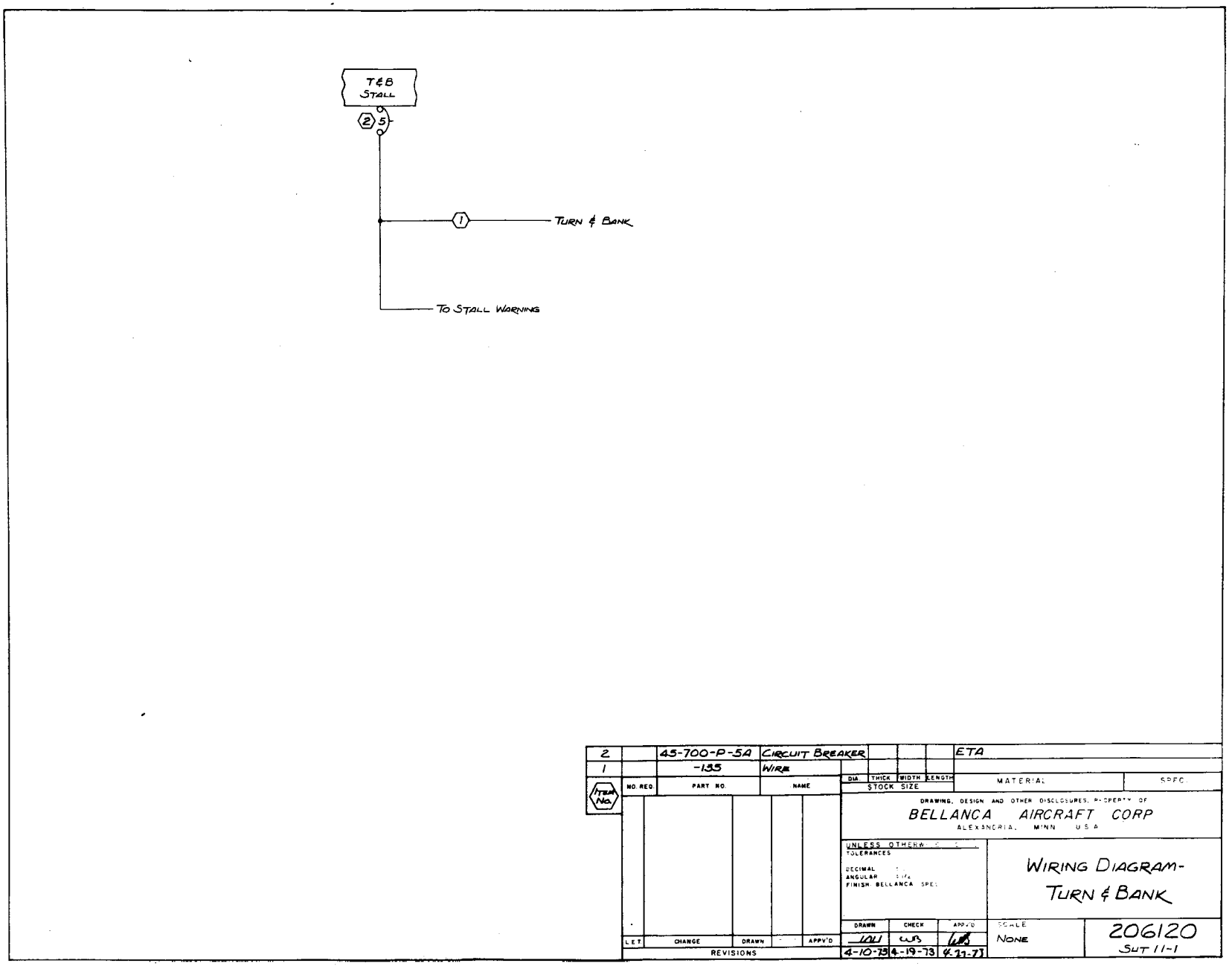


FIGURE 10-11 TURN AND BANK SYSTEM SCHEMATIC

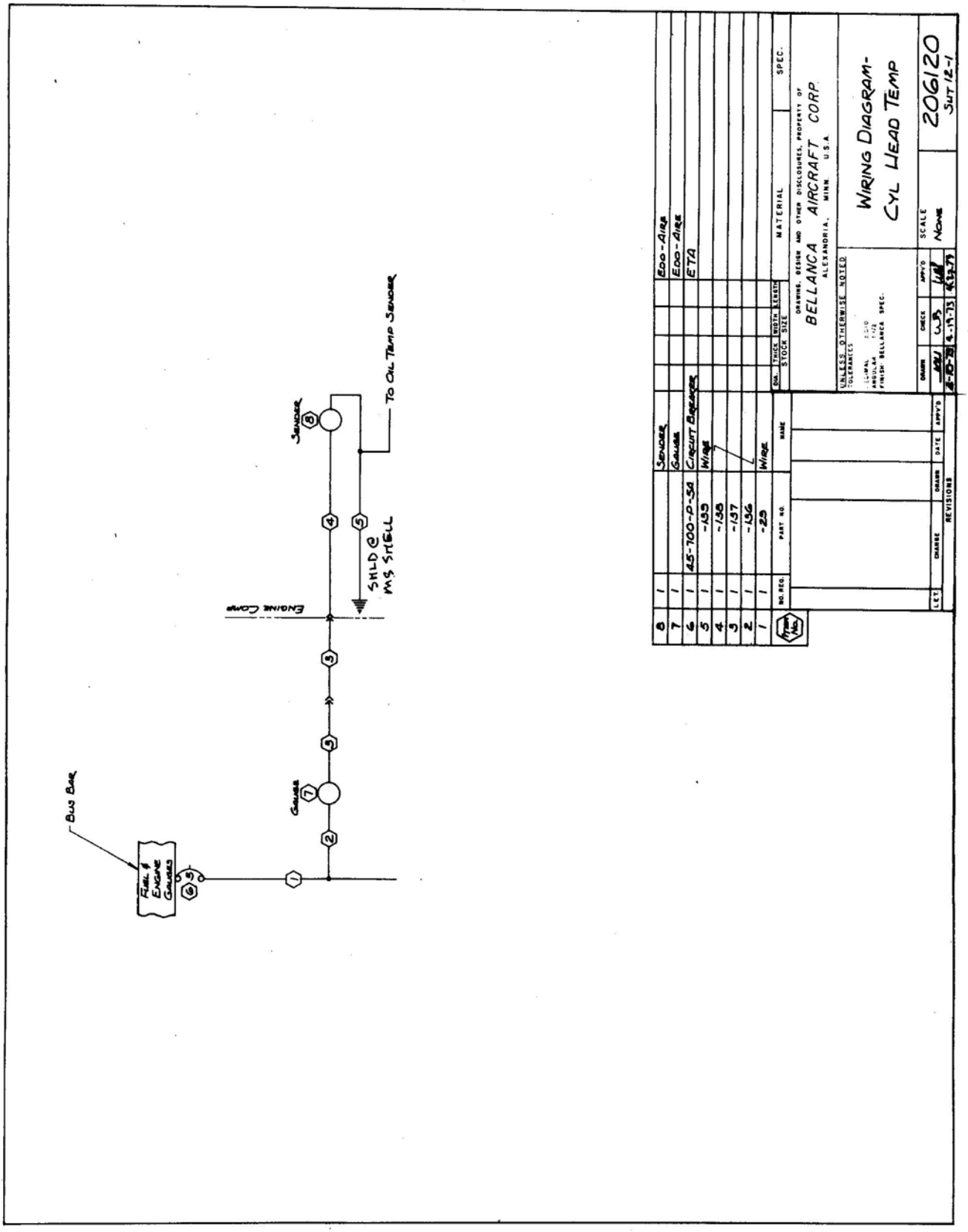
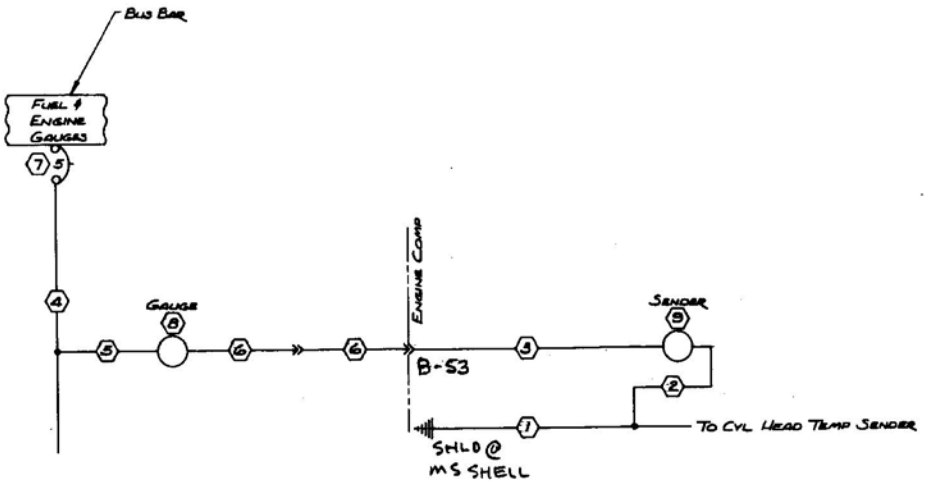


FIGURE 10-12 CYLINDER HEAD TEMPERATURE SCHEMATIC



ITEM NO.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
				STOCK SIZE					
9	1		SENDER					EDO-AIRE	
8	1		GAUGE					EDO-AIRE	
7	1	45-700-P-50	CIRCUIT BREAKER					ETA	
6	1	-143	WIRE						
5	1	-142							
4	1	-29							
3	1	-141							
2	1	-140							
1	1	-139	WIRE						

LET.	CHANGE	DRAWN	DATE	APPV'D
REVISIONS				

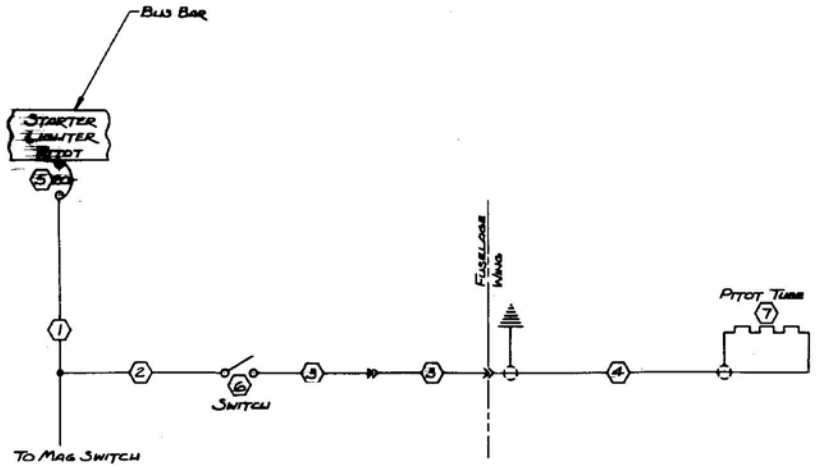
DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A

UNLESS OTHERWISE STED TOLERANCES:
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-
OIL TEMP.

DRAWN	CHECK	APPV'D	SCALE	
LDU	WB	WB	NONE	206120
4-10-73	4-19-73	4-22-73		SHT 13-1

FIGURE 10-13 OIL TEMPERATURE SCHEMATIC



ITEM No.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
7	1		PITOT TUBE						
6	1	T1GK51-IL-BL-FN	SWITCH					CARLING	
5	1	45-700-P-20A	CIRCUIT BREAKER					ETA	
4	1	-146	WIRE						
3	1	-145							
2	1	-144							
1	1	-1	WIRE						

STOCK SIZE

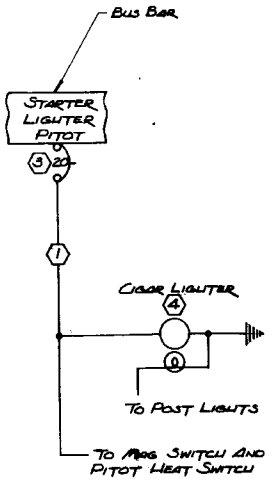
UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL ± .010
ANGULAR ± 1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-
HEATED PITOT

LET.	CHANGE	DRAWN	APPV'D
	REVISIONS		

DRAWN	CHECK	APPV'D	SCALE	
JDJ 4-10-73	WJS 4-19-73	4-22-73	NONE	206120 SHT 14-1

FIGURE 10-14 PITOT HEAT SCHEMATIC



ITEM NO.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
4	1	L-140B	CIGAR LIGHTER					CASCO	
3	1	45-700-P-20A	CIRCUIT BREAKER					ETA	
1	1	-1	WIRE						

STOCK SIZE

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN U.S.A.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
ANGULAR
FINISH BELLANCA SPEC.

WIRING DIAGRAM-
CIGAR LIGHTER

LET.	CHANGE	DRAWN	DATE	APPV'D
A	DELETE -147	CFN	8/30/73	LGN

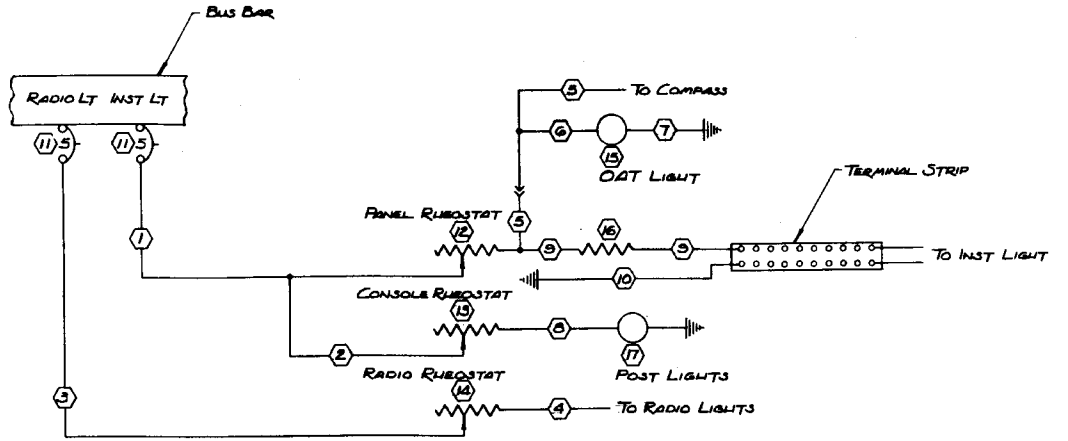
REVISIONS

DRAWN	CHECK	APPV'D
LGN	WJB	
4-10-73	4-19-73	4-23-73

SCALE NONE

206120
SHT 15-1

FIGURE 10-15 CIGAR LIGHTER SCHEMATIC



ITEM NO.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
17	A/R	A-8970-1-330	POST LIGHT					GRIMES MFG. CO.	
16	1		RESISTOR					4 OHM 10 WATT	
15	1	2310-14V	LIGHT					TYPE G, T-1¾ TUNG-SOL	
14	1	0105	RHEOSTAT					MODEL E, 8 OHM, 12½ WATT OHMITE	
13	1	0107	RHEOSTAT					MODEL E, 150 OHM, 12½ WATT OHMITE	
12	1	0144	RHEOSTAT					MODEL H, 8 OHM, 25 WATT OHMITE	
11	2	45-700-P-5A	CIRCUIT BREAKER					ETA	
10	1	-188	WIRE						
9	8	-187							
8	A/R	-134							
7	1	-205							
6	1	-133							
5	1	-152							
4	1	-151							
3	1	-150							
2	1	-149							
1	1	-148	WIRE						

STOCK SIZE

LET	CHANGE	DRAWN	APP'D

REVISIONS

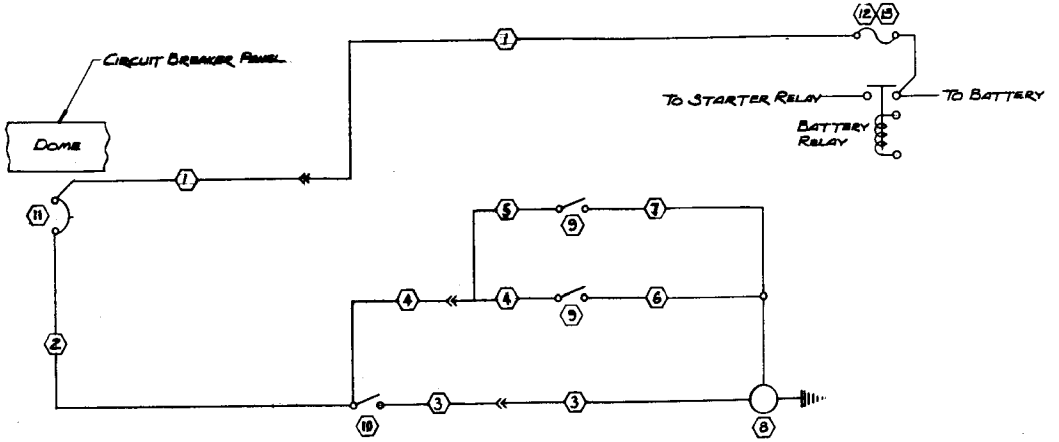
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCE
DECIMAL
ANGULAR
FINISH BELLANCA

WIRING DIAGRAM-
INST. AND
RADIO LIGHTS

DRAWN	CHECK	APP'D	SCALE	
JAW	CFH	LGW	NONE	206120 SHT 16-2
8-3-73	9-6-73	9/6/73		

FIGURE 10-16 INSTRUMENT AND RADIO LIGHTS SCHEMATIC



ITEM NO.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
				STOCK SIZE					
13	1	AGC 5	FUSE					LITTELFUSE	
12	1	150145	FUSE HOLDER					LITTELFUSE	
11	1	111-203-101	CIRCUIT BREAKER					WOOD ELECTRIC CO. INC.	
10	1	TIGKSI-IL-BL	SWITCH					CARLING	
9	2	1907	SWITCH					CIRCLE F MFG. CO.	
8	1	B3550	LIGHT					GRIMES MFG. CO.	
7		-199	WIRE						
6		-128	WIRE						
5		-127	WIRE						
4		-126	WIRE						
3		-158	WIRE						
2		-157	WIRE						
1		-202	WIRE						

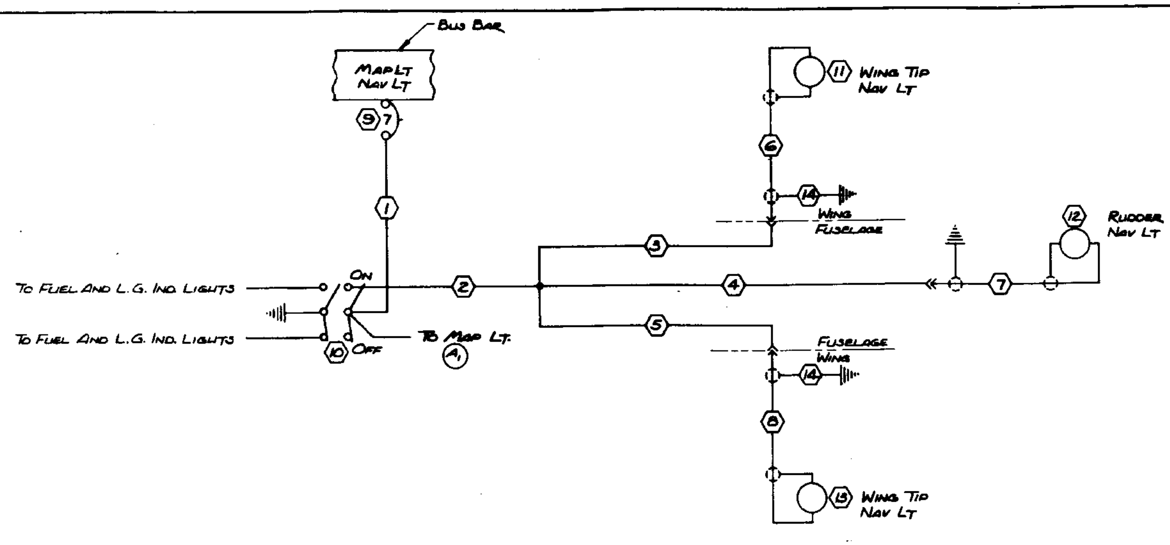
LET.	CHANGE	DRAWN	DATE	APPV'D
REVISIONS				

UNLESS OTHERWISE NOTED
TOLERANCES:
DECIMAL ± .010
ANGULAR ± 1/2°
FINISH: BELLANCA SPEC.

WIRING DIAGRAM - DOME LIGHT

DRAWN	CHECK	APPV'D	SCALE	
6/18/73	7-19-73	8/2/73	NONE DO NOT SCALE DWG.	206120 SHT. 17-2

FIGURE 10-17 DOME LIGHT SCHEMATIC



14	2	-203	WIRE						
13	1		NAV LT					WING TIP - RED	
12	1		NAV LT					RUDDER - WHITE	
11	1		NAV LT					WING TIP - GREEN	
10	1	TIGL61-1L-BL-FN	SWITCH					CARLING	
9	1	45-700-P-7A	CIRCUIT BREAKER					ETA	
8	1	-166	WIRE						
7	1	-165							
6	1	-164							
5	1	-163							
4	1	-162							
3	1	-161							
2	1	-160							
1	1	-159	WIRE						
ITEM NO.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
				STOCK SIZE					

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-
NAVIGATION LIGHTS

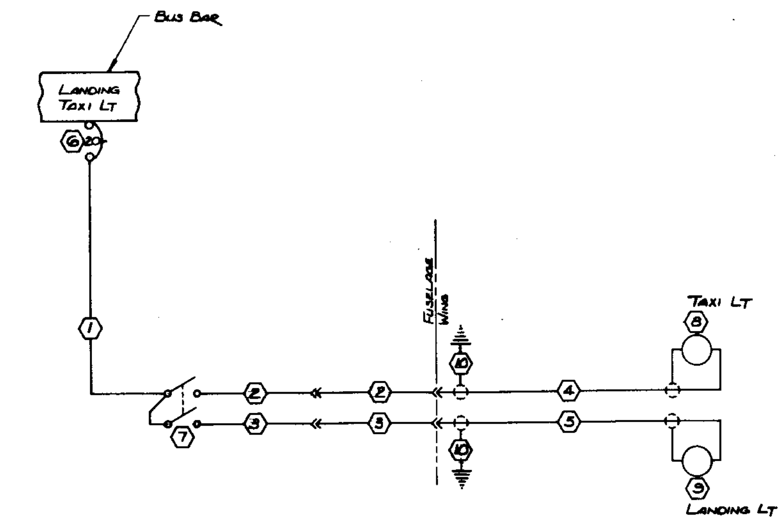
LET.	CHANGE	DRAWN	DATE	APPV'D
A	[illegible]	WU	8/19/73	LGN

REVISIONS

DRAWN	CHECK	APPV'D	SCALE	
WU	CJB	[illegible]	NONE	206120
4-10-73	4-19-73	4-27-73		SHT 18-1

10-36

FIGURE 10-18 NAVIGATION LIGHTS SCHEMATIC



Item No.	No. Req.	Part No.	Name		Notes
10	2	-203	Wire		
9	1		Landing Lt		
8	1		Taxi Lt		
7	1	TIGG51-1L-WR-FN	Switch		Carling
6	1	45-700-P-20A	Circuit Breaker		ETA
5	1	-171	Wire		
4	1	-170			
3	1	-169			
2	1	-168			
1	1	-167	Wire		

Dia.	Thick	Width	Length	Material	Spec.
Stock Size					

Drawing, design and other disclosures, property of BELLANCA AIRCRAFT CORP. Alexandria, Minn. U.S.A.

Unless otherwise noted tolerances: Decimal ±[illegible] Angular ±[illegible] Finish: Bellanca Spec.

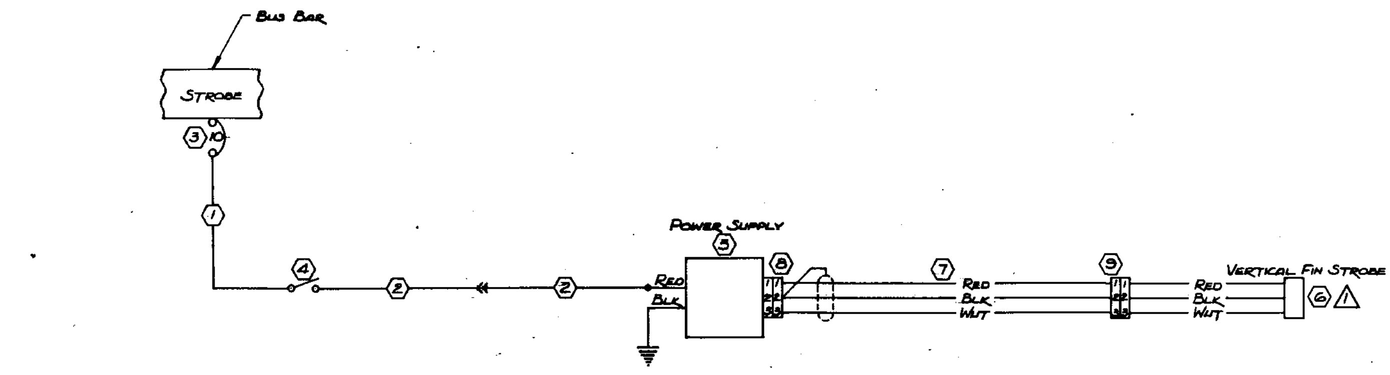
Wiring Diagram- Landing-Taxi Lights

Let.	Change	Drawn	Date	Appr'd
A	206120 Sht [illegible] [illegible]	[illegible]	[illegible]	[illegible]

Revisions

Drawn	Check	Appr'd	Scale	
[illegible]	[illegible]	[illegible]	None	206120 Sht 19-1
[illegible]	4-19-73	[illegible]		

FIGURE 10-19 LANDING, TAXI LIGHTS SCHEMATIC



Notes:

1. (△) Specify Red Lens Or Split Red/White Lens.

Item No.	No. Req.	Part No.	Name	Dia.	Thick	Width	Length	Material	Spec.
9	1	A442	AMP Conn & Sockets					Whelen	
8	1	A441	AMP Conn & Pins					Whelen	
7	1	8770	3 Cond. Cable					Belden	
6	1	A470	Strobe Head Assy					Whelen	
5	1	HS14	Power Supply					Whelen	
4	1	TIGK51-1L-BL-FN	Switch					Carling	
3	1	45-700-P-10A	Circuit Breaker					ETA	
2	1	-173	Wire						
1	1	-172	Wire						

Stock Size: Dia., Thick, Width, Length

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BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCES:
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

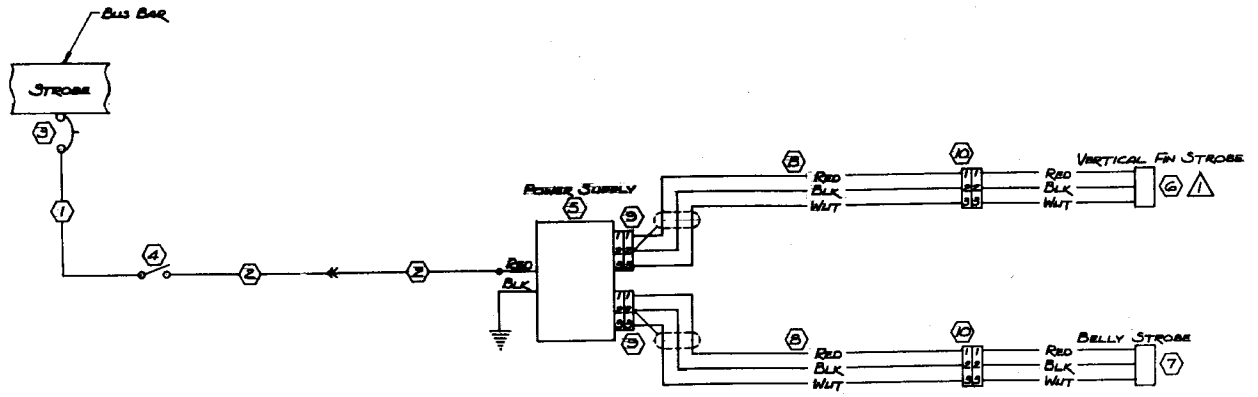
Wiring Diagram - Strobe Light, Single

Let.	Change	Drawn	Date	Appv'd
A	Dwg. No. Was 206120 Sht 20-1	JDJ	8/10/73	LGN

REVISIONS

Drawn	Check	Appv'd	Scale	Dwg. No.
JDJ 4-10-73	WB 4-19-73	WB 4-27-73	None	206120 Sht 20-1-1

FIGURE 10-20 STROBE LIGHT, (SINGLE) SCHEMATIC



ITEM No.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	STOCK SIZE	MATERIAL	SPEC.
10	2	A442	AMP CONN. & SOCKETS						WIELEN	
9	2	A441	AMP CONN. & PINS						WIELEN	
8	2	B770	3 COND. CABLE						BELDEN	
7	1	A450	STROBE HEAD ASS'Y						WIELEN	
6	1	A470	STROBE HEAD ASS'Y						WIELEN	
5	1	HD14	POWER SUPPLY						WIELEN	
4	1	TIGK5I-11-BL-FN	SWITCH						CARLING	
3	1	45-700-P-10A	CIRCUIT BREAKER						ETA	
2	1	-173	WIRE							
1	1	-172	WIRE							

NOTES:

⚠ SPECIFY RED LENS OR SPLIT RED/WHITE LENS.

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ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCES:
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM-
STROBE LIGHT,
DUAL

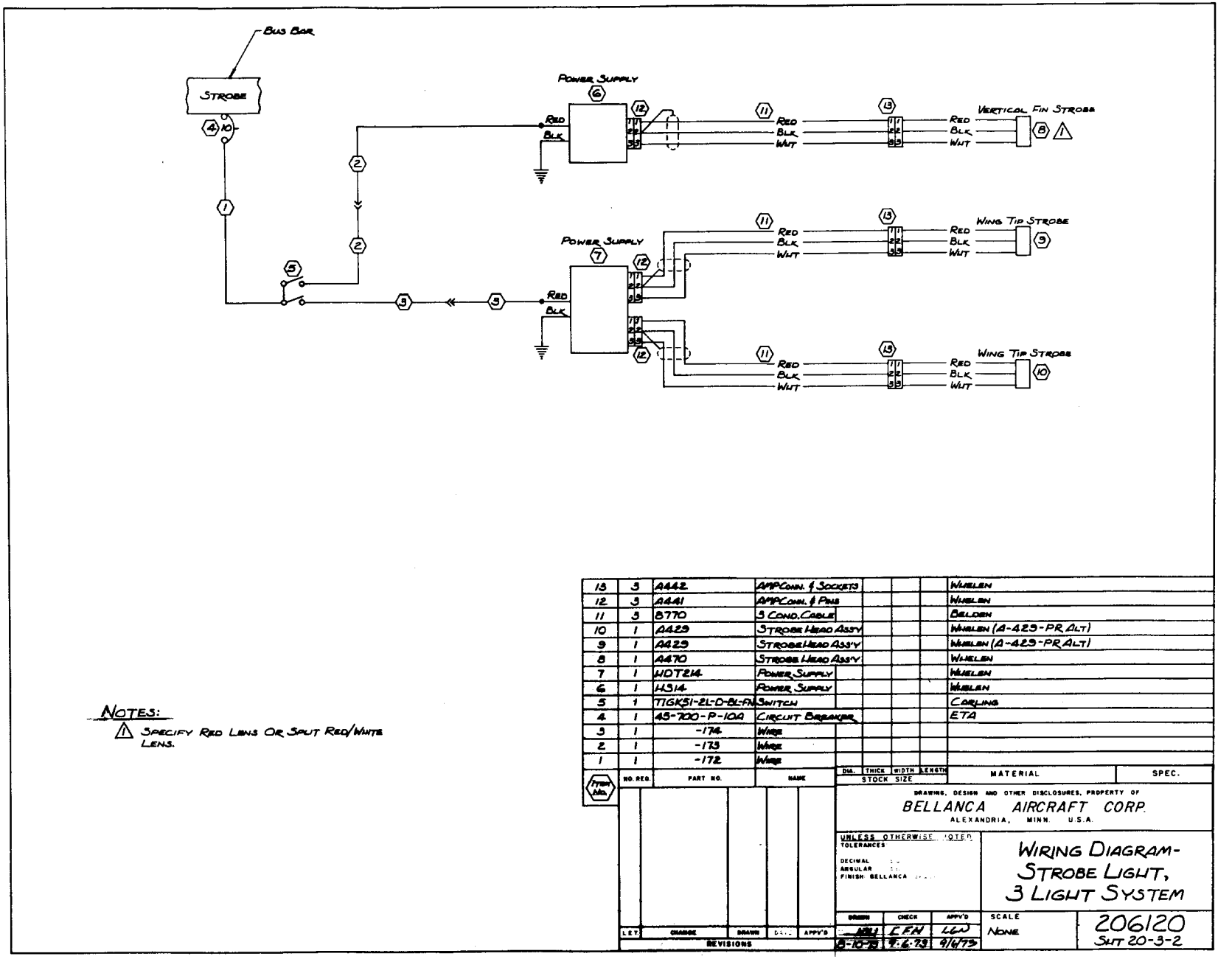
LET.	CHANGE	DRAWN	DATE	APPV'D
A	Chge. No. Was 206120 Sht 20-2	VDL	4-10-73	LGN

REVISIONS

DRAWN	CHECK	APPV'D	SCALE
VDL	WS		NONE
4-10-73	4-19-73	4-27-73	

206120
SHT 20-2-1

FIGURE 10-21 STROBE LIGHTS, (DUAL) SCHEMATIC



ITEM NO.	NO. REQ.	PART NO.	NAME	MATERIAL	SPEC.
13	3	A442	AMP CONN. & SOCKETS		WHELEN
12	3	A441	AMP CONN. & PINS		WHELEN
11	3	8770	3 COND. CABLE		BELDEN
10	1	A429	STROBE HEAD ASS'Y		WHELEN (A-429-PR ALT)
9	1	A429	STROBE HEAD ASS'Y		WHELEN (A-429-PR ALT)
8	1	A470	STROBE HEAD ASS'Y		WHELEN
7	1	HDT214	POWER SUPPLY		WHELEN
6	1	H314	POWER SUPPLY		WHELEN
5	1	T1GK51-2L-D-BL-FN	SWITCH		CARLING
4	1	45-700-P-10A	CIRCUIT BREAKER		ETA
3	1	-174	WIRE		
2	1	-173	WIRE		
1	1	-172	WIRE		

STOCK SIZE: DIA. | THICK | WIDTH | LENGTH

NOTES:

⚠ SPECIFY RED LENS OR SPLIT RED/WHITE LENS.

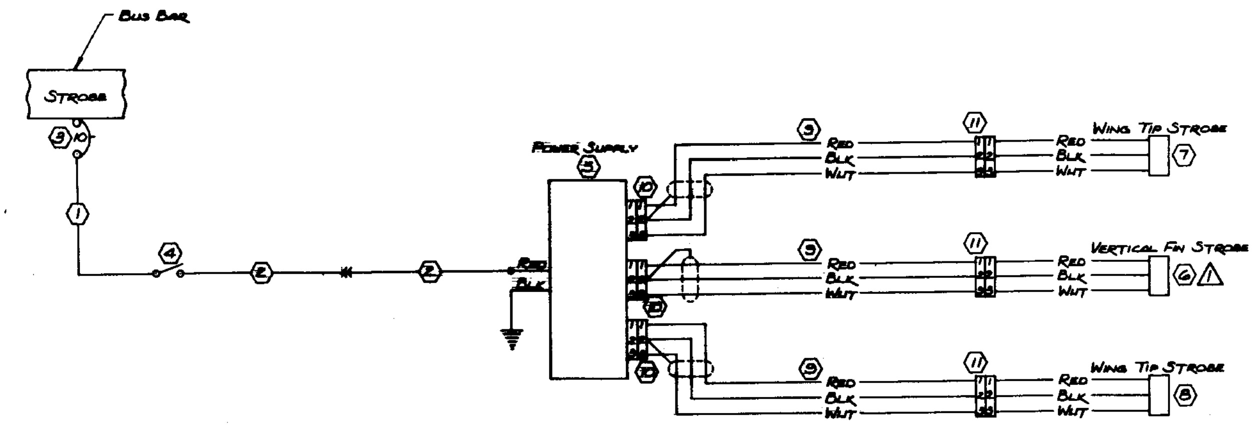
UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL
ANGULAR
FINISH BELLANCA

WIRING DIAGRAM-
STROBE LIGHT,
3 LIGHT SYSTEM

LET.	CHANGE	DRAWN	DATE	APP'D
REVISIONS				

DRAWN	CHECK	APP'D	SCALE	
~~ABW~~	CFN	LLW	NONE	206120
8-10-73	9-6-73	9/6/73		SHT 20-3-2

FIGURE 10-22 STROBE LIGHTS (3 LIGHTS) SCHEMATIC



NOTES:
⚠1 Specify Red Lens Or Split Red/White Lens.

Item No.	No. Req.	Part No.	Name	Dia.	Thick	Width	Length	Material	Spec.
11	3	A442	AMP Conn. & Sockets					Whelen	
10	3	A441	AMP Conn. 4 Pins					Whelen	
9	3	8770	3 Cond. Cable					Belden	
8	1	A429	Strobe Head Ass'y					Whelen (A429-PR Alt)	
7	1	A429	Strobe Head Ass'y					Whelen (A429-PG Alt)	
6	1	A470	Strobe Head Ass'y					Whelen	
5	1	HDT314	Power Supply					Whelen	
4	1	TIGK51-IL-BL-FN	Switch					Carling	
3	1	45-700-P-10A	Circuit Breaker					ETA	
2	1	-173	Wire						
1	1	-172	Wire						

(Dia., Thick, Width, Length: Stock Size)

Revisions

Let.	Change	Drawn	Date	Appr'd
A	Dwg. No. Was 206120 Sht 20-8	[illegible]	8/10/73	[illegible]

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BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

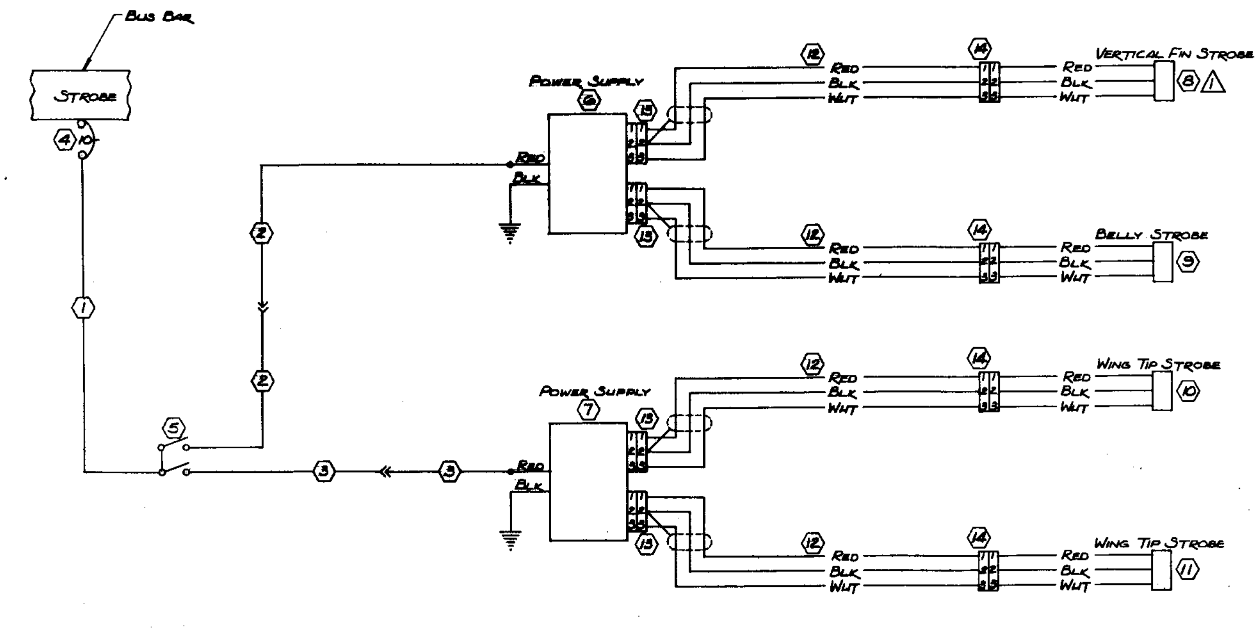
UNLESS OTHERWISE NOTED
TOLERANCES:
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM - STROBE LIGHT, 3 LIGHT SYSTEM

Drawn	Check	Appr'd	Scale
[illegible] 4-10-73	[illegible] 4-19-73	[illegible] 4-23-73	None

206120
SHT 20-3-1

FIGURE 10-23 STROBE LIGHTS (3 LIGHTS) SCHEMATIC



NOTES:

1. Specify Red Lens Or Split Red/White Lens.

Item No.	No. Req.	Part No.	Name	Dia.	Thick	Width	Length	Material	Spec.
14	4	A442	AMP Conn. & Sockets					Whelen	
13	4	A441	AMP Conn. & Pins					Whelen	
12	4	8770	3 Cond. Cable					Belden	
11	1	A429	Strobe Head Ass'y					Whelen (A429-PR Alt)	
10	1	A429	Strobe Head Ass'y					Whelen (A429-PG Alt)	
9	1	A450	Strobe Head Ass'y					Whelen	
8	1	A470	Strobe Head Ass'y					Whelen	
7	1	HDT214	Power Supply					Whelen	
6	1	HD14	Power Supply					Whelen	
5	1	TIGK51-2L-D-BL-FN	Switch					Carling	
4	1	45-700-P-10A	Circuit Breaker					ETA	
3	1	-174	Wire						
2	1	-173	Wire						
1	1	-172	Wire						

Stock Size: Dia. / Thick / Width / Length

REVISIONS

Let.	Change	Drawn	Date	Appv'd
A	E-Dwg. No. Was 206120 Sht 20-4. I-BM: Item 5 Was TIGK51-1L-BL-FN	[illegible]	[illegible] 73	[illegible]

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BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A

UNLESS OTHERWISE NOTED
TOLERANCES:
DECIMAL ± [illegible]
ANGULAR ± 1/2
FINISH: BELLANCA SPEC.

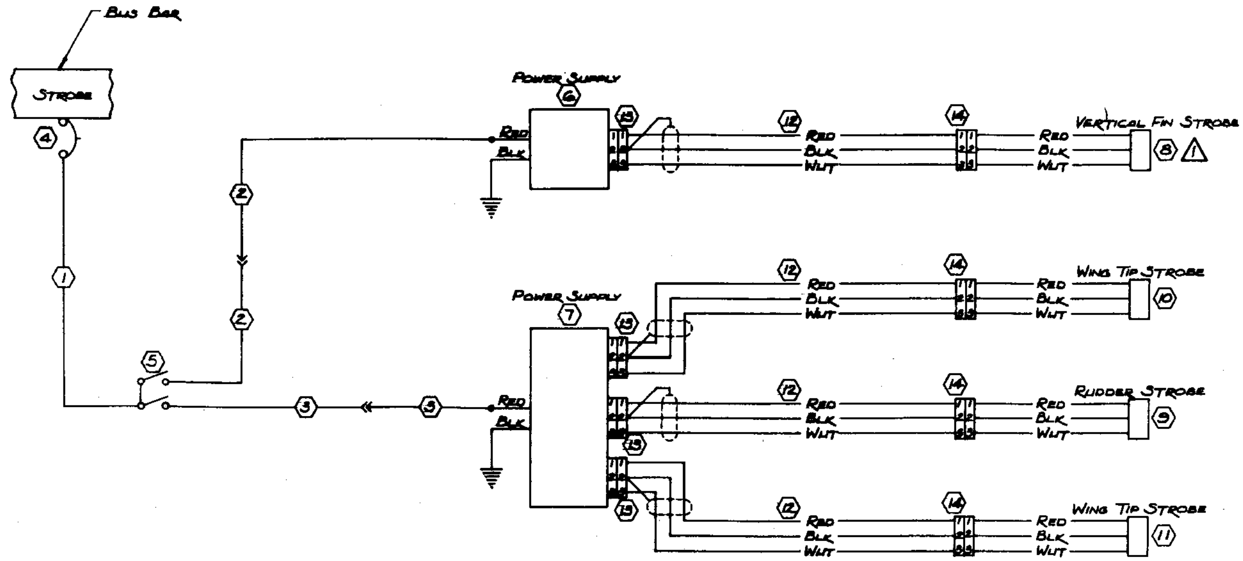
WIRING DIAGRAM-
STROBE LIGHT,
4 LIGHT SYSTEM

Drawn	Check	Appv'd	Scale
[illegible]	[illegible]	[illegible]	None
4-10-73	4-19-73	4-27-73	

206120
SHT 20-4-1

FIGURE 10-24 STROBE LIGHTS (4 LIGHTS) SCHEMATIC

Issued 10-73



NOTES:

1. Specify Red Lens Or Split Red/White Lens.

Item No.	No. Req.	Part No.	Name	Dia.	Thick	Width	Length	Material	Spec.
14	4	A442	AMP Conn. 4 Sockets					Whelen	
13	4	A441	AMP Conn. 4 Pins					Whelen	
12	4	8770	3 Cond. Cable					Belden	
11	1	A429	Strobe Head Ass'y					Whelen (A429-PR Alt)	
10	1	A429	Strobe Head Ass'y					Whelen (A429-PG Alt)	
9	1	A430	Strobe Head Ass'y					Whelen	
8	1	A470	Strobe Head Ass'y					Whelen	
7	1	HDT314	Power Supply					Whelen	
6	1	H314	Power Supply					Whelen	
5	1	TIGK51-2L-D-BL-FN	Switch					Carling	
4	1	45-700-P-10A	Circuit Breaker					ETA	
3	1	-174	Wire						
2	1	-173	Wire						
1	1	-172	Wire						

STOCK SIZE

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL ±.010
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

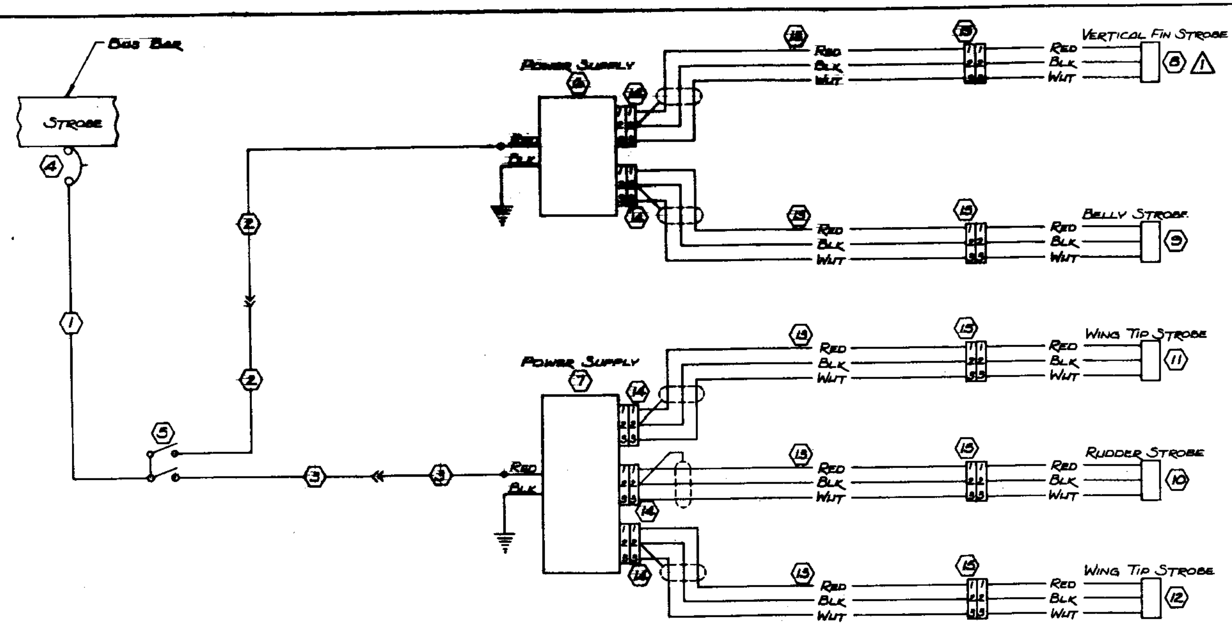
WIRING DIAGRAM-
STROBE LIGHT,
4 LIGHT SYSTEM

LET.	CHANGE	DRAWN	DATE	APPV'D
A	2- Dwg. No. Was 206120 Sht 20-2; 1-5 Item 5 Was TIGK51-1L-BL-FN	JAU	6/19/78	LGV

REVISIONS

DRAWN	CHECK	APPV'D	SCALE	
JAU	WB	WB	None	206120
4-10-73	4-19-73	4-27-73		SHT 20-4-2

FIGURE 10-25 STROBE LIGHTS (4 LIGHTS) SCHEMATIC



Item No.	No. Req.	Part No.	Name	Dia.	Thick	Width	Length	Material	Spec.
15	5	A442	AMP Conn. & Sockets					Whelen	
14	5	A441	AMP Conn. & Pins					Whelen	
13	5	8770	3 Cond. Cable					Belden	
12	1	A429	Strobe Head Ass'y					Whelen (A429-PR Alt)	
11	1	A429	Strobe Head Ass'y					Whelen (A429-PG Alt)	
10	1	A430	Strobe Head Ass'y					Whelen	
9	1	A450	Strobe Head Ass'y					Whelen	
8	1	A470	Strobe Head Ass'y					Whelen	
7	1	HDT314	Power Supply					Whelen	
6	1	HD14	Power Supply					Whelen	
5	1	TIGK51-2L-D-BL-FN	Switch					Carling	
4	1	45-700-P-10A	Circuit Breaker					ETA	
3	1	-174	Wire						
2	1	-173	Wire						
1	1	-172	Wire						

NOTES:

⚠ Specify Red Lens or Split Red/White Lens.

Let.	Change	Drawn	Date	Appv'd
A	2- Dwg. No. Was 206120 Sht 20-6. 1-BM: Item #5 Was TIGK51-1L-BL-FN	KOU	6/19/78	LGH

REVISIONS

Drawing, design and other disclosures, property of BELLANCA AIRCRAFT CORP. ALEXANDRIA, MINN. U.S.A

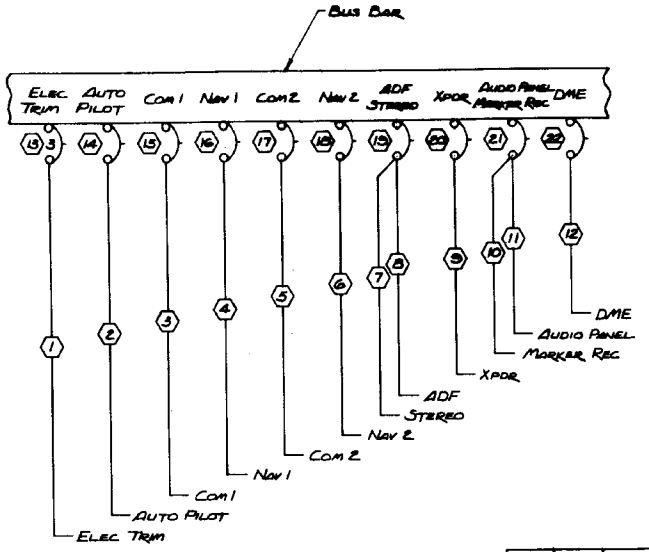
UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL
ANGULAR ±1/2
FINISH: BELLANCA SPEC.

WIRING DIAGRAM - STROBE LIGHT, 5 LIGHT SYSTEM

Drawn	Check	Appv'd	Scale
KOU	WB	[illegible]	None
4-10-78		4-27-78	

206120
SHT 20-5-1

FIGURE 10-26 STROBE LIGHTS (5 LIGHTS) SCHEMATIC



ITEM NO.	NO. REQ.	PART NO.	NAME
22	1	45-700-P ⚠	CIRCUIT BREAKER
21	1	45-700-P ⚠	
20	1	45-700-P ⚠	
19	1	45-700-P ⚠	
18	1	45-700-P ⚠	
17	1	45-700-P ⚠	
16	1	45-700-P ⚠	
15	1	45-700-P ⚠	
14	1	45-700-P ⚠	
13	1	45-700-P-32	CIRCUIT BREAKER
12	1	-186	WIRE
11	1	-185	
10	1	-184	
9	1	-183	
8	1	-182	
7	1	-181	
6	1	-180	
5	1	-179	
4	1	-178	
3	1	-177	
2	1	-176	
1	1	-175	WIRE

ETA

ETA

NOTES:
⚠ - CIRCUIT BREAKER SIZE TO BE DETERMINED BY EQUIPMENT INSTALLED.

DIA.	THICK	WIDTH	LENGTH	STOCK SIZE	MATERIAL	SPEC.

DRAWING, DESIGN AND OTHER DISCLOSURES, PROPERTY OF
BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINN. U.S.A.

UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL ± .010
ANGULAR ± 1/2
FINISH: BELLANCA SPEC.

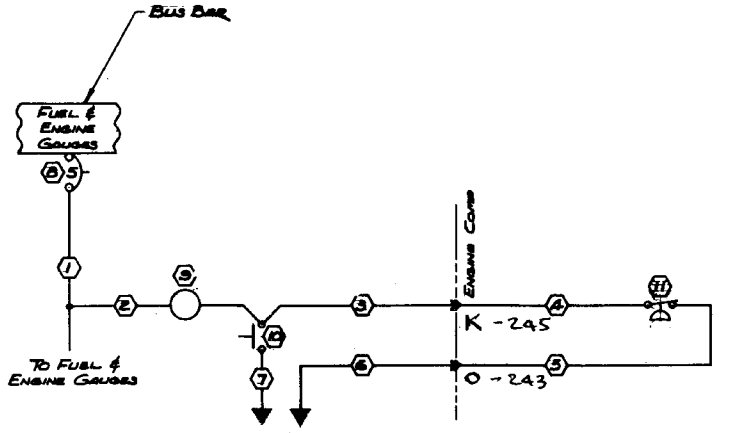
WIRING DIAGRAM-OPTIONAL AVIONICS AND EQUIPMENT

DRAWN	CHECK	APPV'D	SCALE	
KDL	WS	GAB	NONE	206120 SHT 21-1
4-10-73	4-19-73	4-27-73		

LET.	CHANGE	DRAW	DATE	APPV'D

REVISIONS

FIGURE 10-27 AVIONICS AND OPTIONAL EQUIPMENT SCHEMATIC



ITEM NO.	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH STOCK SIZE	MATERIAL	SPEC.
11	1	M4009-27	PRESSURE SWITCH					JOHN W. HOBBS CORP.	
10	1	30-1	SWITCH					GRAYHILL	
9	1	33F4ARBA	LIGHT-RED					SORENSON LIGHTED CONTROLS	
8	1	45-700-P-5A	CIRCUIT BREAKER					ETA	
7	1	-109	WIRE						
6	1	-108							
5	1	-91							
4	1	-74							
3	1	-56							
2	1	-36							
1	1	-29	WIRE						

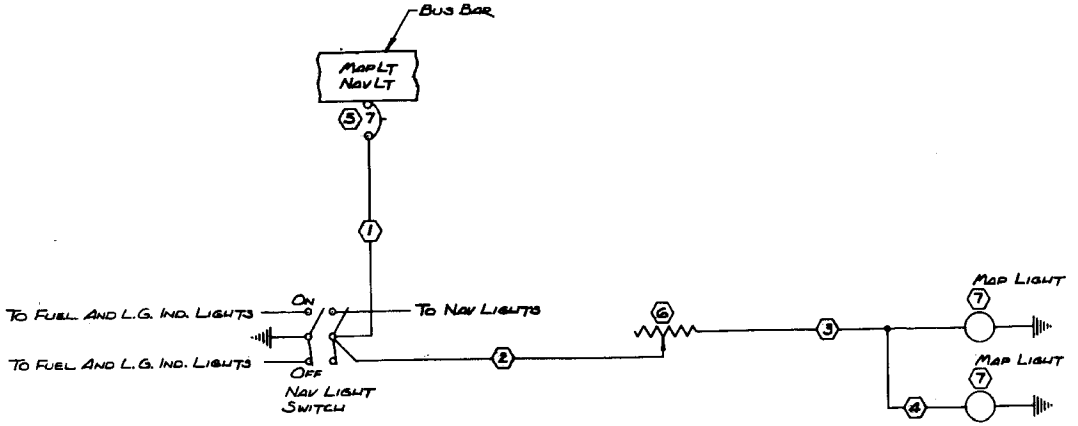
LET.	CHANGE	DRAWN	DATE	APP'D
REVISIONS				

UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL
ANGULAR
FINISH BELLANCA SPEC.

WIRING DIAGRAM-TURBO OIL LIGHT

DRAWN	CHECK	APP'D	SCALE	
JAU 8-2-73	LFN 9-6-73	LGN 9/6/73	NONE	206120 SHT 22-1

FIGURE 10-28 TURBO OIL LIGHT SCHEMATIC



ITEM NO	NO. REQ.	PART NO.	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	SPEC.
7	2	1847	MAP LIGHT					WEMAC	
6	1	0108	RHEOSTAT					MODEL E, 25 OHM, 12½ WATT OHMITE	
5	1	45-700-P-7A	CIRCUIT BREAKER					ETA	
4	1	-156	WIRE						
3	1	-155	WIRE						
2	1	-204	WIRE						
1	1	-159	WIRE						

STOCK SIZE

LET	CHANGE	DRAWN	DATE	APPV'D
REVISIONS				

UNLESS OTHERWISE NOTED
TOLERANCES
DECIMAL
ANGULAR
FINISH: BELLANCA SPEC.

DRAWN	CHECK	APPV'D
JOU	EFH	LAW
8-10-73	9-6-73	9/6/73

WIRING DIAGRAM-
MAP LIGHT

SCALE NONE

206120
SHT 29-1

FIGURE 10-29 MAP LIGHT SCHEMATIC

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SECTION XI

PROPELLER AND GOVERNOR

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TABLE XI-1

PROPELLER AND GOVERNOR SPECIFICATIONS

Hartzell - Lycoming Propeller Torque	60-70 ft.-lbs.
Hartzell - Continental Propeller Torque	80-90 ft.-lbs.
Spinner Back Plate Torque	20 ft.-lbs.
McCauley - Continental Propeller Torque	55-60 ft.-lbs.
Lycoming High RPM Stop	2700 RPM
Continental High RPM Stop	2850 RPM

SECTION XI

PROPELLER AND GOVERNOR

11- 1. GENERAL. Propellers approved for the Viking, both the Hartzell and McCauley, are of the constant speed type with two blades as standard equipment and three blades optional.

Propeller speed is controlled by the fly-weight type governor.

Trouble-shooting, repairs, and internal adjustments of either the propeller or the governor must be done in accordance with the applicable manufacturer's recommendations.

Check the F.A.A. Aircraft, Powerplant, and Propeller Type Certificate Data Sheet for installation approval of the various combinations of propellers, governors, and engines.

11- 2. REMOVAL AND INSTALLATION OF PROPELLER (LYCOMING).

a. Remove spinner.
b. Remove safety wire from propeller nuts.
c. Unscrew six nuts, moving propeller forward as the nuts are losened in sequence.
d. Install using the same procedures for removal in addition:
e. If starter ring gear was removed, install using the reference mark "0" stamped on the engine propeller flange and ring gear for correct alignment.
f. Check that propeller "0" ring is in proper position, replacing seal if damaged.
g. Torque propeller nuts 60-70 ft.-lbs.
h. Insure that the propeller mates properly with the engine flange.
i. Align the spinner to the backplate using the reference notes.

11- 3. REMOVAL AND INSTALLATION OF PROPELLER (CONTINENTAL).

Hartzell Propeller:

a. Remove spinner.
b. Remove safety wire from propeller studs.
c. Remove nuts and pull off propeller.
d. Install using the reverse procedures for removal in addition:
e. Install spinner back plate to propeller insuring that back plate is in proper position so that the spinner will be aligned with the back plate reference rank. Torque bolts to 20 ft.-lbs.
f. On three bladed propeller installations, the timing marks on the engine flange must be facing up and the index blade aligned with the #6 cylinder.
g. Check that the propeller "O" ring is in proper position, replace seal if damaged.
h. Insure that the propeller mates properly with the engine flange.
i. Torque propeller nuts 80-90 ft.-lbs.
j. Align the spinner to the back plate using the reference marks.

McCauley Propeller:

a. Remove spinner, spinner bulkhead, and spacer if applicable.
b. Remove nuts and pull off propeller and spinner back plate.
c. Install using the reverse procedure procedure for removal in addition:
d. Torque propeller nuts 55-60 ft.-lbs.
e. Install spinner bulkhead and spacer if needed to insure a tight fit with the spinner.
f. Install spinner.

11- 4. PROPELLER GOVERNOR. When trouble-shooting propeller governor combinations, it is recommended to replace the governor with one known to be in good working condition to determine whether the propeller or governor is at fault. Governor repairs are classified as major propeller repairs and must be accomplished only by certified personnel.

11- 5. REMOVAL AND INSTALLATION OF PROPELLER GOVERNOR.

a. Disconnect control linkage.
b. Remove mounting nuts and pullout governor.
c. Install using the reverse procedures for removal in addition:
d. Insure that the gasket is installed with the convex side of screen toward the governor.
e. Position governor on mounting studs, aligning governor splines with engine splines. Do not forece spline engagement. Rotate engine if necessary to engage.

11- 6. HIGH RPM STOP ADJUSTMENTS.

a. Loosen high speed screw jam nut next to prop governor control lever.
b. Turn stop screw in to decrease maximum RPM and out to increase. One revolution equals approximately 25 RPM.
c. Tighten stop screw jam nut.
d. Insure that control lever moves from stop to stop adjusting control linkage if necessary.
e. Run up engine and check propeller and governor operation.

SECTION XII

INSTRUMENTS AND AVIONICS

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SECTION XII

INSTRUMENTS AND AVIONICS

12- 1. GENERAL. This section describes typical instrument and avionic installations, and their respective operating systems. This information is to be used for general trouble-shooting. Problems with a specific instrument on avionic gear should be corrected by replacing the component on repairing the componoent by qualified personnel.

12- 2. INSTRUMENT ACCESS. Access to the instruments is possible underneath the instrument panel or by removing the top central glare shield which is secured by screws on the sides and front of the shield.

12- 3. INSTRUMENT REMOVAL AND INSTALLATION.

a. Remove top glare shield if necessary.
b. Disconnect lines or electrical wires.
c. Remove instrument mounting screws from front of instrument panel.
d. Remove instrument light bulb secured by two screws on top of instrument if installed. The electrical wires need not be cut.

12- 4. RADIO REMOVAL. Space for the radio stack is provided to the right of the flight instruments. Each radio is secured by an internal wrenching screw on the face of the unit. When a radio is removed, all electrical connections are disconnected automatically by means of a ribbon type plug secured to the rear of the radio and the mounting bracket.

12- 5. PITOT AND STATIC SYSTEMS. The pitot and static system includes the altimeter, air speed indicator, and vertical speed indicator. The static port is located on the pitot tube and the optional alternate static source back of the instrument panel attached to the alternate static source switch. See Figure 12-2 for System Schematic.

CAUTION

If pitot or static lines are to be blown out with compressed air, remove all lines from the instruments prior to introducing low pressure air to the system.

12- 6. VACUUM SYSTEM. The vacuum system includes the engine driven pump, muffler, regulator, filter, gauge, directional gyro, and artifical horizon. See Figure 12-3 for System Schematic.

12- 7. VACUUM REGULATOR. The regulator is located under the instrument panel mounted to the fire wall directly above the pilot's rudder pedals. An adjusting screw is provided for regulating vacuum pressure. Should adjustment be necessary, 4.8 to 5.0" Hg. is recommended.

NOTE

Prior to adjustment insure that the vacuum filter is clean and no air leaks are evident in the system.

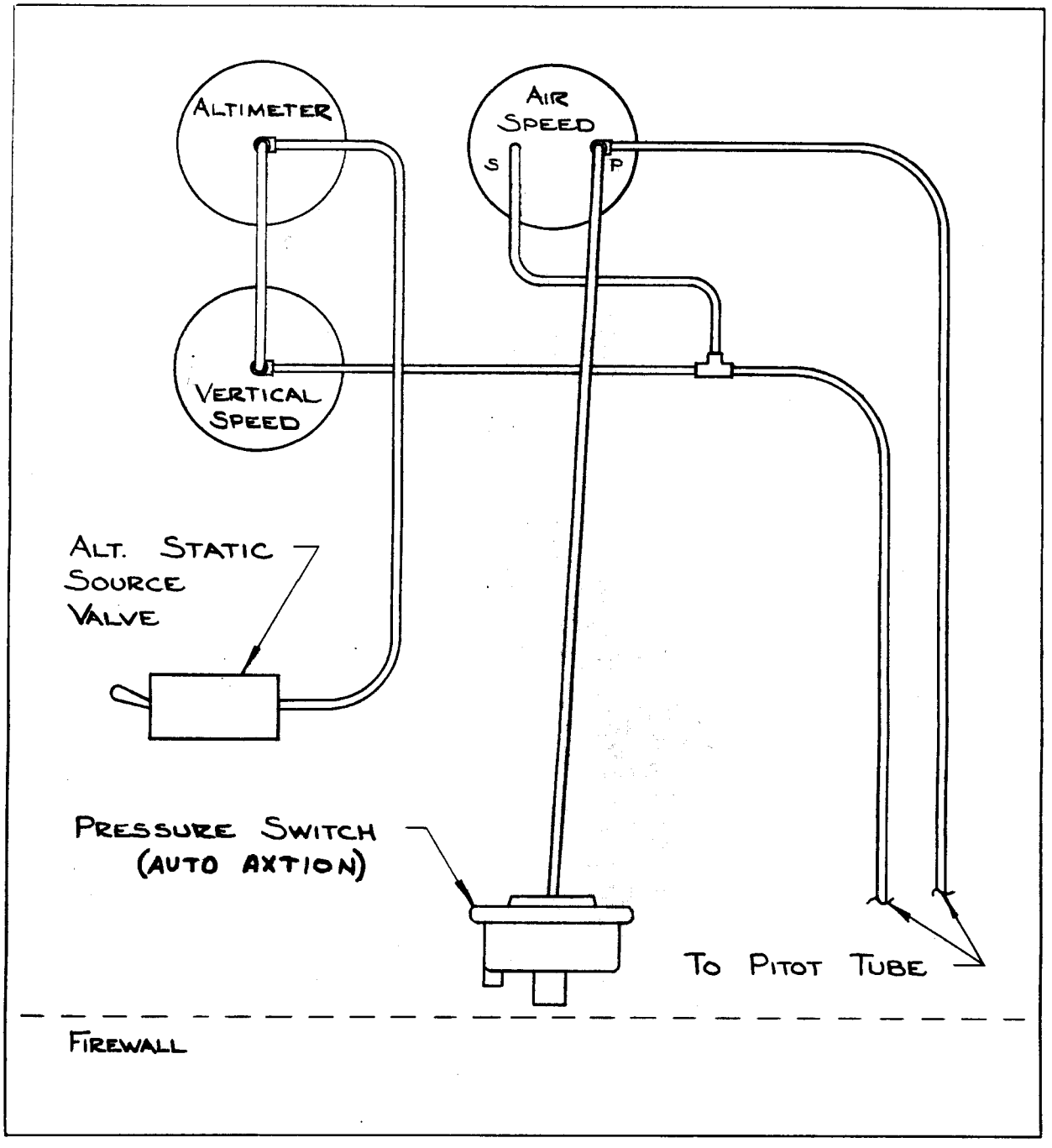

FIGURE 12-2 PITOT AND STATIC SYSTEM SCHEMATIC

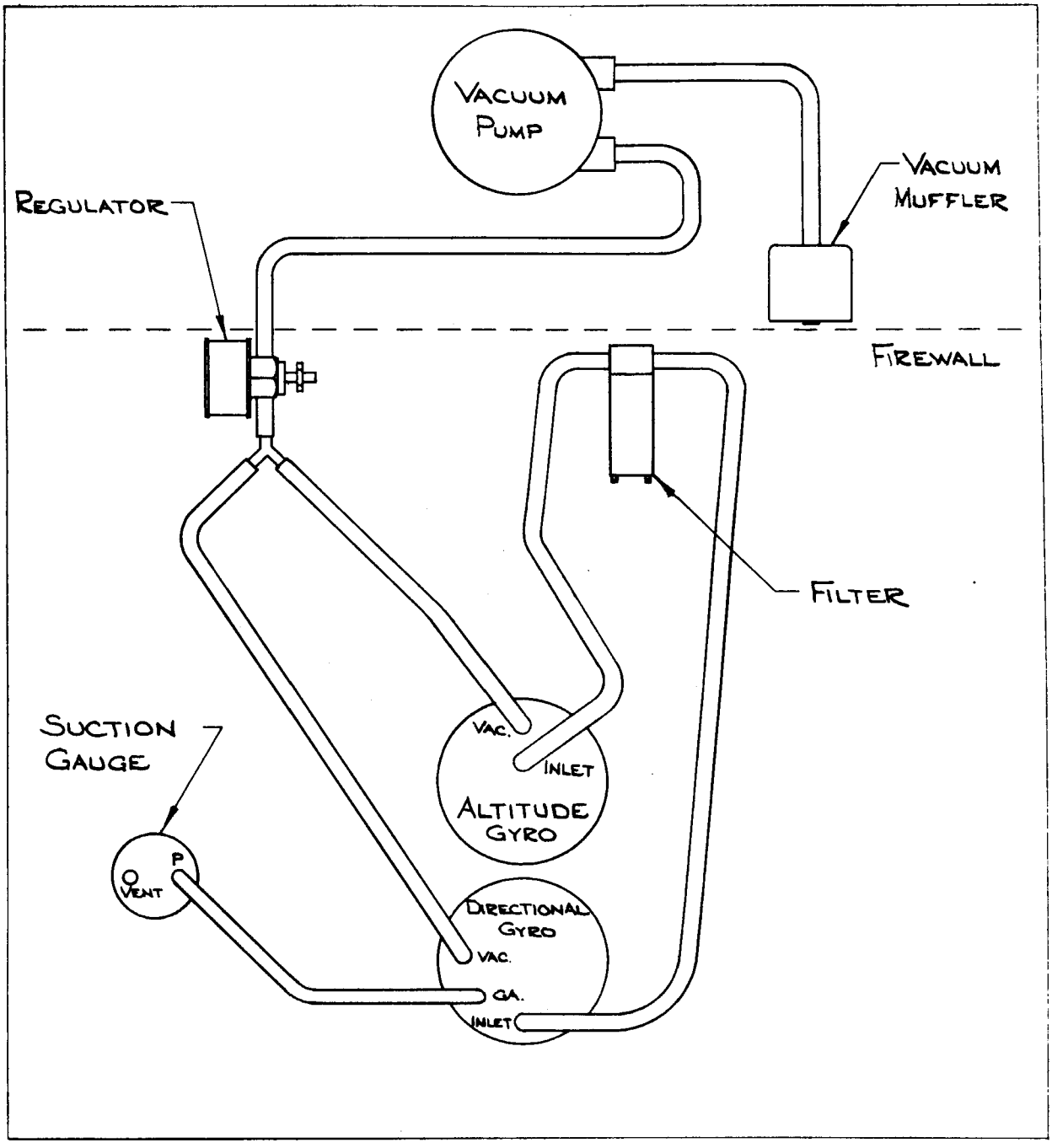

FIGURE 12-3 VACUUM SYSTEM SCHEMATIC

12- 8. VACUUM FILTER. The filter is located under the instrument panel mounted to the fire wall directly above the pilot's right rudder pedal. The element should be checked frequently and replaced when dirty.

12- 9. TURN COORDINATOR. The turn coordinator is an electrically operated, gyroscopic, roll turn rate indicator.

12-10. ENGINE INSTRUMENTS.

12-11. OIL PRESSURE GAUGE. The Bourdon tube type gauge is direct reading and operated by a pressure pickup line connected to the engine main oil gallery.

12-12. OIL TEMPERATURE GAUGE. The gauge is operated off the aircraft electrical system using a thermistor type sender unit which is inserted in the main oil gallery down stream of the oil cooler.

12-13. FUEL PRESSURE GAUGE. The Bourdon tube type gauge is direct reading and operated by a pressure pickup connected to the fuel control servo inlet.

12-14. FUEL FLOW GAUGE. The Bourdon tube-type gauge is direct reading and operated by the fuel pressure between the fuel control servo and the distributor valve. The gauge measures pressure to give an indirect reading for fuel flow.

12-15. MANIFOLD PRESSURE GAUGE. The Bourdon tube type gauge is direct reading and operated by a pressure pickup connected to the air intake manifold downstream of the fuel control servo.

12-16. TACHOMETER. The tachometer is mechanically driven at half crankshaft speed by a flexible shaft.

12-17. CYLINDER HEAD TEMPERATURE GAUGE. The CHT gauge is operated off the aircraft electrical system using a thermistor type sender unit which is inserted into the head of the #5 cylinder.

12-18. EXHAUST GAS TEMPERATURE GAUGE. The EGT gauge is electrically operated by a thermo couple probe which is inserted in the exhaust manifold of the #5 cylinder on the Lycoming and #1 cylinder on the Continental. The engine exhaust analyzer has a probe for each cylinder exhaust and a pilot operated selector switch to monitor any desired cylinder.

12-19. AIRCRAFT SYSTEM GAUGES. See the section covering the applicable system.

12-20. CLOCK. The clock is a spring wound 8 day type and is mounted in the center of the pilot's control wheel.

12-21. AUTOPILOTS. The Viking includes as standard equipment a Mitchell Century I autopilot which is a wing leveler receiving information from the turn coordinator. An optional omni tracker may be added to this system.

Other optional factory installed autopilots are the Mitchell Century II and III with various couplers.

NOTE

As these autopilots are complete Mitchell systems, no servicing or trouble-shooting is included in this manual. If problems arise with the autopilot system only, the manufacturer or an authorized repair station should be consulted to determine proper service action.

12-22. EMERGENCY LOCATOR BEACON. The factory installed ELT is located next to the battery under the baggage compartment. An external antenna is provided along with a switch on the pilots side console to manually activate the radio if desired.

Consult the manufacturer concerning replacement of the self contained battery.

12-23. STALL WARNING HORN. The horn is located under the pilot's seat and mounted next to the air vent. The transmitter switch is mounted on the leading edge of the left wing.

12-24. RADIO MASTER SWITCH. (74 series serial number and later). A radio master switch, located on the lower left instrument panel, controls the radio bus for all navigational and communication radios. Dual parallel relays are used to energize the radio bus and are mounted on the R.H. side of the radio stack support bracket.

NOTE

The battery master switch and the radio master switch must both be "ON" for radio operation.

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SECTION XIII

UTILITY SYSTEMS

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SECTION XIII

UTILITY SYSTEMS

13- 1. VENTILATION EXHAUST SYSTEM. Cabin air is continuously vented overboard through an opening in the top of the cabin. With 74 series aircraft the vent is located on the right side of the baggage compartment and vented overboard at the tail access panel.

13- 2. HEATING SYSTEM. The heat source is provided by a heat muff on the right exhaust manifold. 74 series aircraft and later are equipped with two heat muffs, one on each engine exhaust manifold, with the left muff supplying heat for the rear seat compartment and the right muff for the forward seat compartment. The warm air control valve is located on the lower left and right side of the firewall and are actuated by a push-pull knob located on the right side consoles, front and rear. (Rear with 74 series only.)

13- 3. VENTILATION INTAKE SYSTEM. Fresh air enters the cabin through air ducts mounted in the leading edge of the wing root and is controlled by four adjustable vents, two on the side of the instrument panel and two on the rear side consoles.

Cold fresh air can also enter through the heat ducting with the hot air shut off. This control knob is located on the forward right console with the control valve on the right lower firewall.

13- 4. DEFROSTING SYSTEM. The windshield can be defrosted with warm or cold air by the vents located on top of the instrument panel. The control knob is located on the right side console with the control valve mounted to the lower right firewall. In the full defrost position all air flows through the heat ducting and is directed to the windshield. 74 series aircraft, rear seat airflow would not be affected.)

13- 5. INTERIOR LIGHTING SYSTEM.

13- 6. DOME LIGHT. The light is located on top of the cabin with the switch on the pilot's console. A separate circuit breaker is provided and can be used to shut off the light should the switch fail. With 74 series aircraft the light will illuminate whenever the door is opened regardless of the position of the master switch. A fuse located next to the battery relay is provided to protect this circuit.

13- 7. MAP LIGHTS. Two directional lights are mounted overhead the forward seats and are controlled by a rheostat on the pilot's console. To replace bulbs, remove the lense.

13- 8. PANEL LIGHTS. The panel lights are mounted directly to the instruments and are controlled by a rheostat on the pilot's console. The bulbs on the flight instruments are replaceable from the aft side of the instrument panel. Only Edo-Aire bulb unit replacements can be used.

13- 9. CONSOLE LIGHTS. The post lights for the left and right consoles are controlled by a rheostat located on the pilot's console.

13-10. RADIO LIGHTS. The radio lights are mounted internally in the radio and are controlled by a rheostat located on the pilot's console.

13-11. AIRCRAFT SYSTEMS INDICATOR AND WARNING LIGHTS. See the section which covers the applicable system.

13-12. EXTERNAL LIGHTING SYSTEM.

13-13. NAVIGATION LIGHTS. The three lights, one mounted on each wing tip and the rudder surface are controlled by a switch on the pilot's console. When the navigation lights are on the three green landing gear indicator lights and the fuel tank indicator lights will be dimmed.

13-14. LANDING-TAXI LIGHTS. The two lights are mounted in the leading edge of the left wing. The control switch is on the pilot's console and is a three position type: first - OFF, second - taxi light, third - landing and taxi light.

13-15. STROBE LIGHTS. A combination of strobe lights are available for the tail and wing tips. The control switch is on the pilot's console. A split switch is used when wing and tail strobes are installed. The power pack(s) are mounted below the floor of the baggage compartment.

13-16. OXYGEN SYSTEM. The oxygen system is optional equipment on the nonturbocharged Vikings. It consists of a cylinder, regulator, pressure gauge, distributor manifold, and face masks. To service or use the system, the valve on the cylinder must be fully opened. See Section II for proper servicing procedures. Oxygen flow is noted by the presence of a green band in the flow indicator on the face mask line.

13-17. OXYGEN CYLINDER. The cylinder is located aft of the baggage compartment and is available in the 48 cu. ft. or 63 cu. ft. size.

13-18. OXYGEN CYLINDER REMOVAL AND INSTALLATION.

CAUTION

Oil or grease in contact with high pressure oxygen is extremely flammable.

a. Remove aft close out panel of baggage compartment.
b. Disconnect all oxygen lines from regulator.
c. Remove mounting clamp(s), while holding cylinder securely. Do not allow cylinder to fall or rest on bottom of fuselage as the fabric may be damaged.
d. Remove bottle through baggage compartment
e. Install using the same procedures for removal.
f. Check for leaks using soap bubbles.

13-19. REGULATOR. The regulator is mounted on the top of the cylinder with two types available. The standard regulator, model 2800B reduces the high pressure for comfortable breathing and is not compensated for altitude.

The optional model 2900B, is altitude compensated and will not feed oxygen below approximately 7000' MSL. Field adjustment cannot be made. The regulator must be replaced if problems develop.

13-20. REGULATOR REMOVAL AND INSTALLATION.

a. Gain access through opening provided for access to the cylinder valve.
b. Remove all lines to regulator.
c. Remove nut securing regulator to cylinder stem.
d. Install using the reverse procedures for removal.

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SECTION XIV

AIRFRAME REPAIRS

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SECTION XIV

AIRFRAME REPAIRS

14- 1. GENERAL. Because of the various types of accidents that can occur and the extent of the damage, it is impossible to list step by step procedures for repairs. It is strongly recommended that a qualified mechanic or repair station be consulted to determine the proper course of action.

14- 2. STRUCTURAL REPAIR OR REPLACEMENT. Only an experienced individual can accurately estimate the cost of making a repair involving wood or steel tubing. All components and/or sections of the wing, fuselage, and control surfaces are available from the factory. In many cases, the replacement method is the most practical and economical. In all cases, repairs must be made by factory approved methods or conform to the Federal Aviation Regulation, Part 43.13-1.

NOTE

When consulting the factory concerning repair information or replacement parts, the aircraft serial number must be known.

14- 3. FABRIC. The fabric covering the fuselage and wings is aviation grade Dacron cloth #70 or #250. The blanket method is used at the factory with the fabric being doped directly to the plywood surface of the wing with nitrate dope. Aluminum and all color finishing coats are acetate butyrate dope for both the fuselage and the wing.

If the aircraft or a component is to be recovered, it is recommended that the old covering be used as a pattern for location of inspection holes, tapes, patches, etc.

In all cases involving fabric repairs or recovering, it must be accomplished by approved methods or conform to the Federal Aviation Regulation, Part 43.13-1.