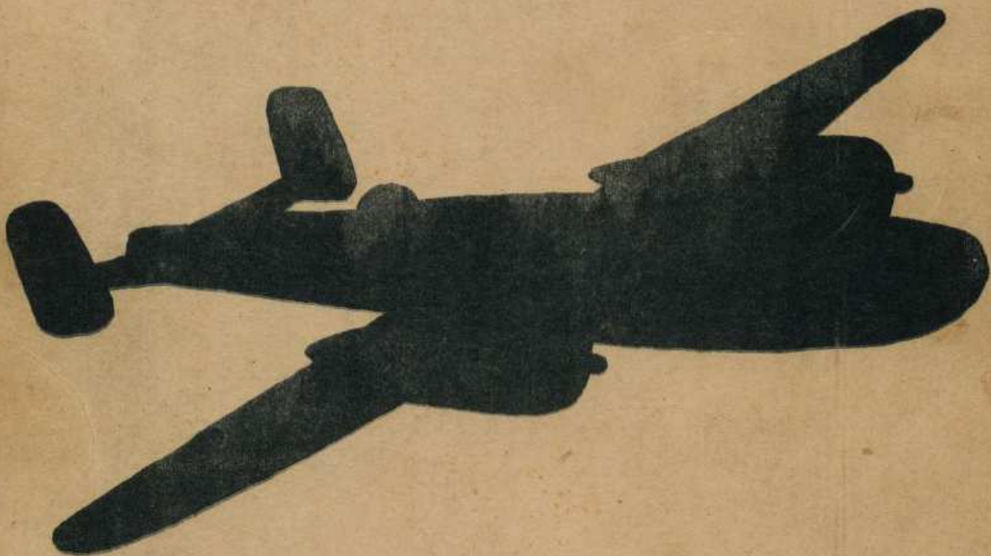
# TURNER FIELD

F.A.F. LAUGIER Robert
21° Détachement
1945

# ESCADRILLE FRANCAISE
# ECOLE DE TERRE



01-60GB-1

# EQUIPEMENT AERONAUTIQUE
# DE L'AVION B-25 (AT-24)

RESTRICTED

# SECTION I
# DESCRIPTION

## 1. GENERAL.

The North American B-25C and B-25D Medium Bombardment Airplanes are midwing land monoplanes powered by two Wright Cyclone R-2600-13 or -29 engines. Characteristic features are a tricycle landing gear and a double fin and rudder empennage. The airplane is equipped to carry bombs, and provisions may be made to carry a torpedo. The approximate over-all dimensions are:

| | |
|---|---|
| Span | 67 feet 6 inches |
| Length | 53 feet |
| Height | 15 feet 9 inches |

## 2. BLOCK NUMBERING SYSTEM.

To clarify the relationship between the various groups of serial numbers used on B-25C and B-25D airplanes, the following block numbering system has been adopted:

| *Block Numbers* | *Serial Numbers Included* |
|---|---|
| B-25C | AC41-12434 to 13038 |
| B-25C-1-NA | AC41-13039 to 13296 |
| B-25C-5-NA | AC42-53332 to 53493 |
| B-25C-10-NA | AC42-32223 to 32382 |
| B-25C-15-NA | AC42-32383 to 32532 |
| B-25C-20-NA | AC42-64502 to 64701 |
| B-25C-25-NA | AAF42-64702 to 64801 |
| B-25D | AC41-29648 to 29847 |
| B-25D-1-NA | AC41-29848 to 29947 |
| B-25D-5-NA | AC41-29948 to 30172 |
| B-25D-10-NA | AC41-30173 to 30352 |
| B-25D-15-NA | AC41-30353 to 30532 |
| B-25D-20-NA | AC41-30533 to 30847 |
| | AC42-87113 to 87137 |
| B-25D-25-NA | AC42-87138 to 87452 |
| B-25D-30-NA | AC42-87453 to 87612 |
| | AC43-3280 to 3619 |
| B-25D-35-NA | AC43-3620 to 3869 |

## 3. DUTIES OF CREW MEMBERS.

The pilot has the full responsibilities of flight operation of the airplane. In addition, on later airplanes, the pilot fires the fixed .50-caliber nose gun and may operate the bombing equipment. The copilot aids the pilot and operates the command radio. The navigator-bombardier navigates the airplane, operates the bombing equipment, and fires the flexible nose gun. The radio operator operates the liaison radio and the lower turret. The upper turret gunner also operates the camera and serves as tail observer. See figure 2 for fuselage arrangement.

## 4. FLIGHT CONTROLS.

*a.* GENERAL.—The rudders, elevators, and ailerons are controlled by duplicate cable systems so that the loss of any one control cable will not seriously cripple the airplane. The rudders and ailerons are equipped with combination booster and controllable trim tabs. The elevators have controllable trim tabs which are set for no boost. A bungee installed in the elevator control system reduces stick loads. A locking system affecting all of the control surfaces simultaneously is controlled by a handle on the floor in front of the pilot's control column.

*b.* AUTOMATIC FLIGHT CONTROL SYSTEMS.—B-25C and B-25D airplanes are equipped with either the automatic flight control equipment or the Sperry type A-3 automatic pilot. The Sperry type A-3 automatic pilot is installed in B-25C airplanes, serial Nos. AC41-12457, AC41-12459, AC41-12461, AC41-12463, AC41-12465, AC41-12467, AC41-12469, AC41-12471, AC41-12473, AC41-12475, AC41-12477, AC41-12479, AC41-12517, and subsequent blocks, and B-25D airplanes AC41-29848 and subsequent blocks. Automatic flight control equipment is installed in all other B-25C and B-25D airplanes.

(1) AUTOMATIC PILOT.—The automatic pilot consists of a turn gyro control unit, a bank-and-climb gyro control unit, a gyro control mount assembly, servo control units, and accessories. The automatic pilot provides complete automatic control for lateral, longitudinal, and directional motions of the airplane. It is an integral part of the pilot's instrument panel and continuously indicates the movements of the airplane, whether being flown by automatic or manual control.

**NOTE**

There may be certain minor differences between the appearance of the panel instruments, etc., in the airplane and in the illustrations in the Handbook. This is explained by the fact that the type A-3 (Sperry Gyroscope Co.) and type A-3A (Jack & Heintz) automatic pilots are interchangeable, and that either one may be installed, or portions of each may be installed in the same airplane.

(2) AUTOMATIC FLIGHT CONTROL EQUIPMENT.—The automatic flight control equipment units are located in the upper rear end of the bombardier's compartment and are accessible during flight. A pilot director indicator and telltale lights are mounted on the pilot's instrument panel. An attitude wheel is on the control pedestal and control switches are on the pedestal switch panel. Banking and banking motor

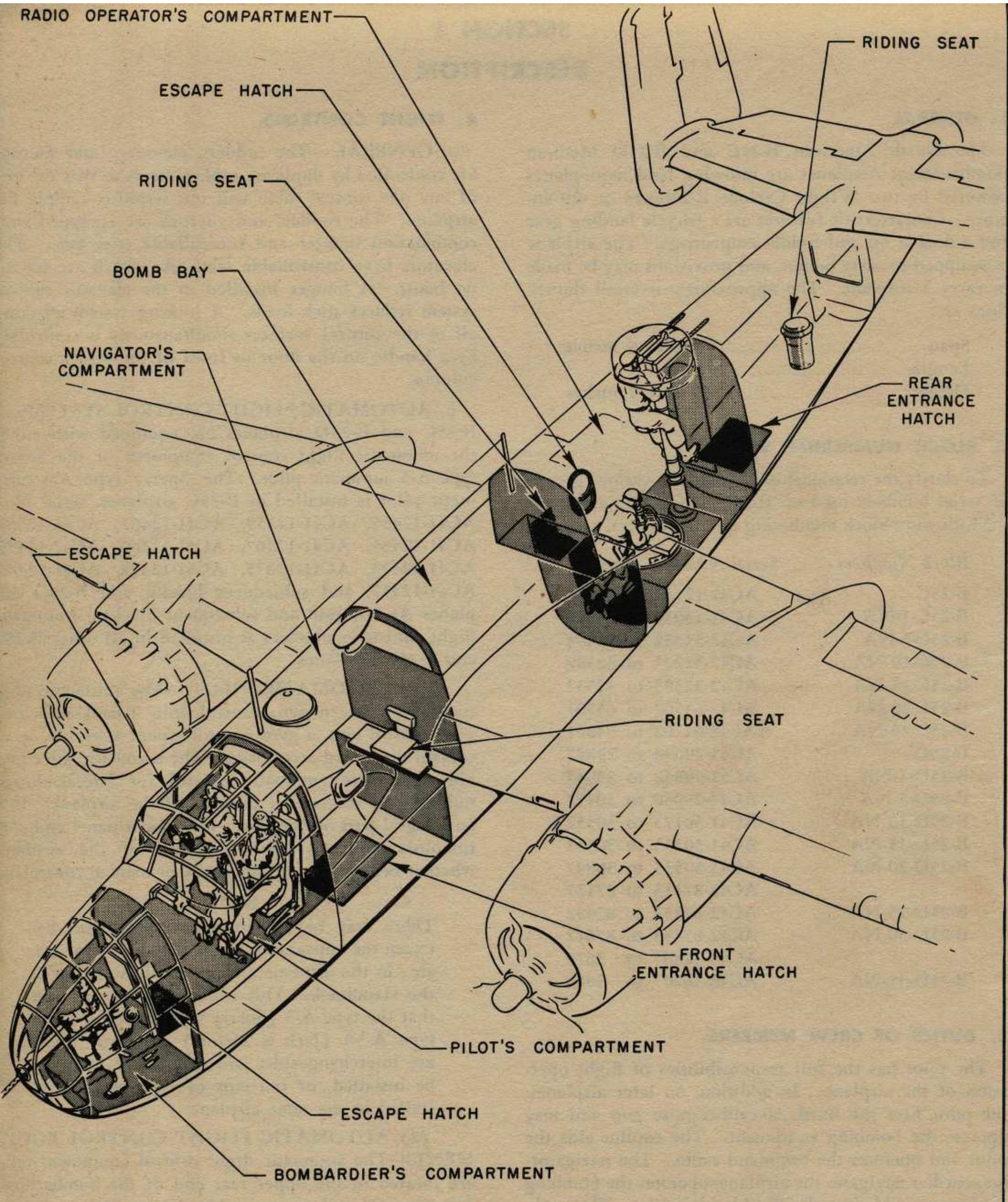



***Figure 2—Fuselage Arrangement***

precessing switch for the navigator. A signal light communication system is provided between the pilot's and bombardier's compartments. Metal padlocked doors are utilized to prevent access to the equipment.

### 5. LANDING GEAR.

*a.* GENERAL.—The landing gear is hydraulically operated. The main gear retracts into the engine nacelles, and the nose gear into the fuselage. Doors cover the gear openings in both the retracted and extended positions.

*b.* NOSE GEAR.—The swivel-type nose gear strut incorporates a centering device which operates when the strut is fully extended (wheel off ground). A hydraulic shimmy damper on the strut resists side loads occurring in taxying, taking off, and landing, thus preventing a sudden movement of the wheel. The nose wheel may be released from the shimmy damper for towing purposes.

### 6. WHEELS AND BRAKES.

The wheels are of the smooth-contour type. The nose wheel tire is equipped with a dual-seal inner tube for protection against a blow-out or puncture. The main wheels are equipped with dual multiple-disc hydraulic brakes. An air brake system is provided for use in the event of a complete hydraulic failure.

### 7. HYDRAULICS.

*a.* NORMAL.—A single high-pressure system operates the tricycle landing gear, wing flaps, engine cowl flaps, bomb bay doors, and brakes. (See figures 3, 4, and 5.) If one of the engine-driven hydraulic pumps fails, the other will provide sufficient pressure for the operation of the hydraulic system.

*b.* EMERGENCY.—An emergency hydraulic system, (figure 6), with hand-pump and selector valve located to the right of the pilot's seat, permits operation of the system even though both engine-driven pumps fail, or with the airplane on the ground and the engines inoperative. On B-25C-15-NA and B-25D-10-NA and subsequent blocks, a separate hydraulic system provides for the emergency lowering of the landing gear in the event of complete failure of the general system, with loss of fluid. Earlier airplanes are provided with an emergency mechanical lowering system. All airplanes are equipped with emergency mechanical systems for the operation of the wing flaps and bomb bay doors. A small reserve of fluid is retained under pressure in the accumulator for use if the engine pumps fail. This reserve is not adequate for completely raising or lowering the landing gear, but is sufficient for a one-way operation of the wing flaps, engine cowl flaps, or the bomb bay doors. The brake accumulator retains sufficient pressure for approximately three brake pedal applications (both wheels) even though both engine pumps should fail.

*a.* ENGINES.—The airplane is powered by two Wright R-2600-13 or -29 air-cooled, 14-cylinder engines. Low gear supercharger ratio is 7.06:1 and high gear ratio is 10.06:1. The propeller gear ratio is 16:9. Engine equipment includes a Holley carburetor incorporating an electric primer valve. Use fuel conforming to Specification No. AN-F-28, grade 100-130. Under certain conditions when the airplane is within the continental United States, Specification No. AN-F-26, grade 91 fuel should be used. Use oil conforming to Specification No. AN-VV-O-446, grade 1120.

*b.* ENGINE RATINGS.

| *Ratings* | *Brake HP* | *RPM* | *Blower* |
|---|---|---|---|
| Sea Level | 1500 | 2400 | Low |
| Take-off | 1700 | 2600 | Low |
| Normal | 1500 | 2400 at 6700 ft | Low |
| | 1350 | 2400 at 13,000 ft | High |
| Military | 1700 | 2600 at 5500 ft | Low |
| | 1450 | 2600 at 13,500 ft | High |

*c.* CARBURETOR AIR.—The carburetor air induction system control lever has two positions, "NORMAL" and "ICING." Each air scoop is equipped with a filter which may be replaced by a baffle when necessary.

**NOTE**

Unfortunately, the impression exists among some mechanics and pilots that the carburetor air filter causes a serious loss in airplane performance. The effect of installing a filter is merely equivalent to closing the throttle slightly. This means that for all altitudes less than critical, where manifold pressure limits prevent full throttle opening, the filter has no effect on engine power output or airplane performance. Manifold pressure affords the best indication of engine power, and at a given manifold pressure the engine will develop the same power regardless of whether or not a filter is installed. The only time that airplane performance would benefit from removal of the filter is when the throttle is full open and still more manifold pressure would be permissible. With the filter installed, only cold ram air passes through the filter element.

*d.* PROPELLER.—The Hamilton Standard Hydromatic, full-feathering propellers have a blade diameter of 12 feet 7 inches and are controlled by double-capacity governors which are set by means of levers on the pilot's control pedestal. The electrically driven feathering pumps are controlled by two push buttons on the control pedestal switch panel. Propeller pitch settings are 22 degrees low and 90 degrees high.

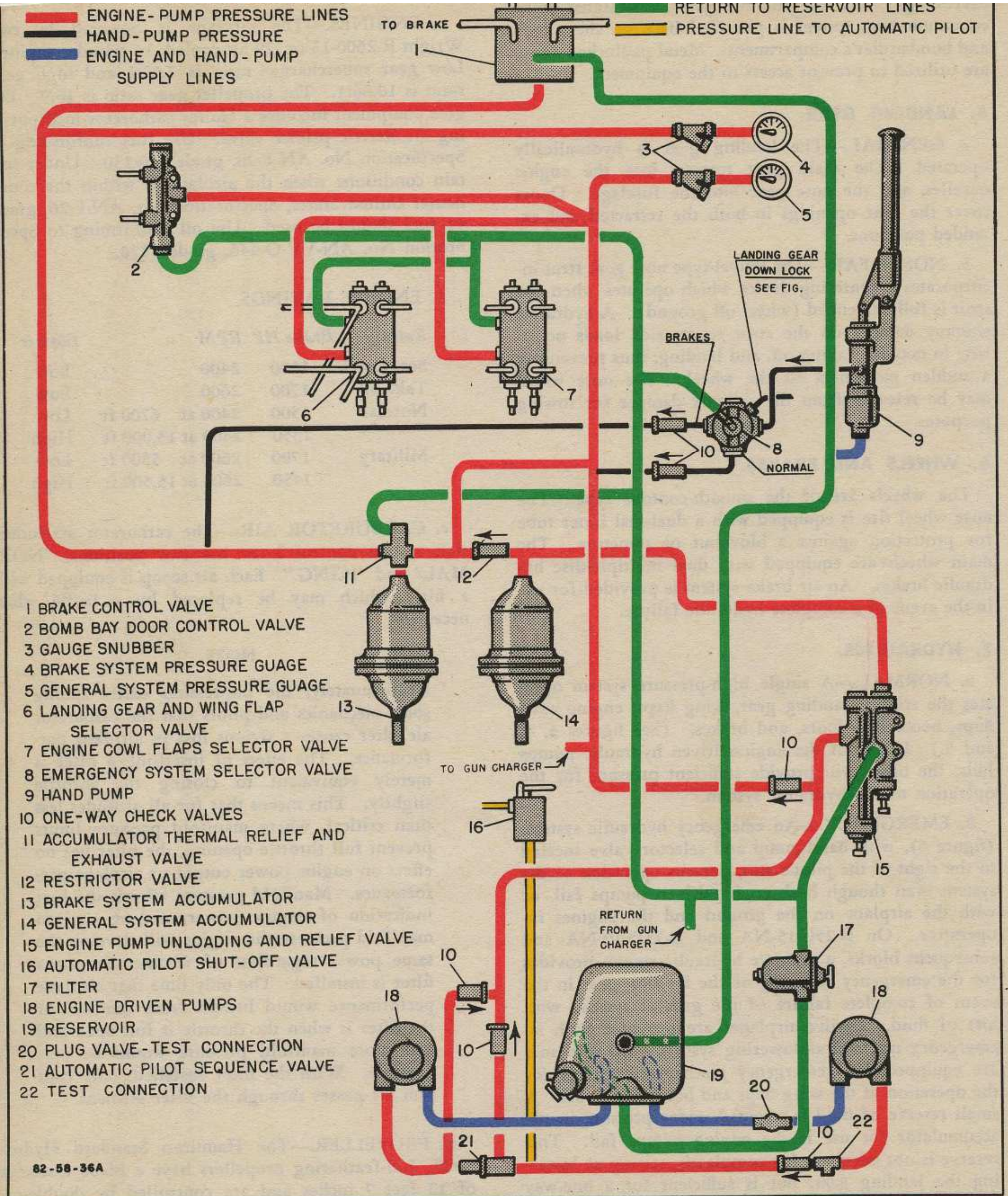



*Figure 3—Hydraulic Power System*

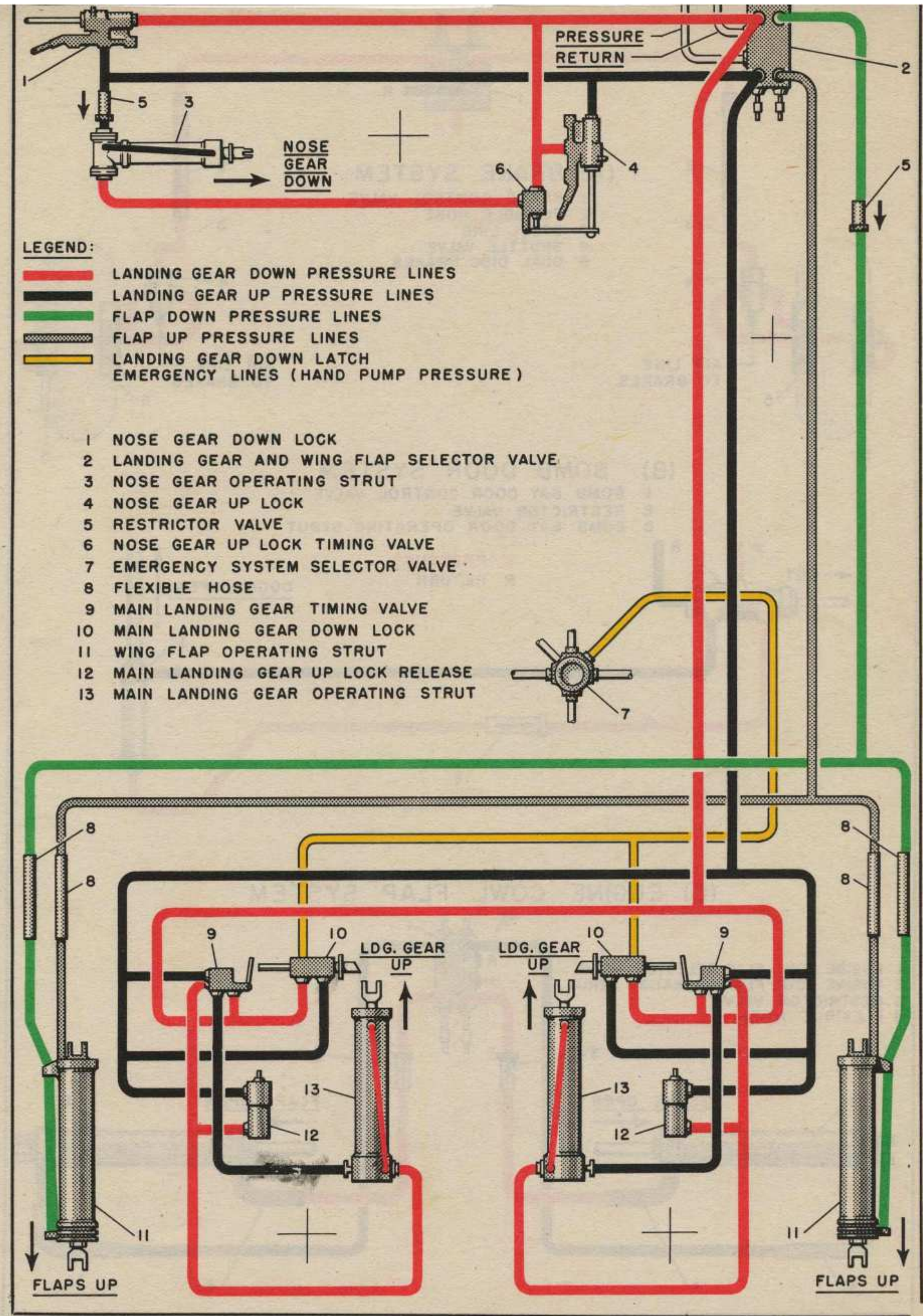



*Figure 4—Hydraulic System—Landing Gear and Wing Flaps*

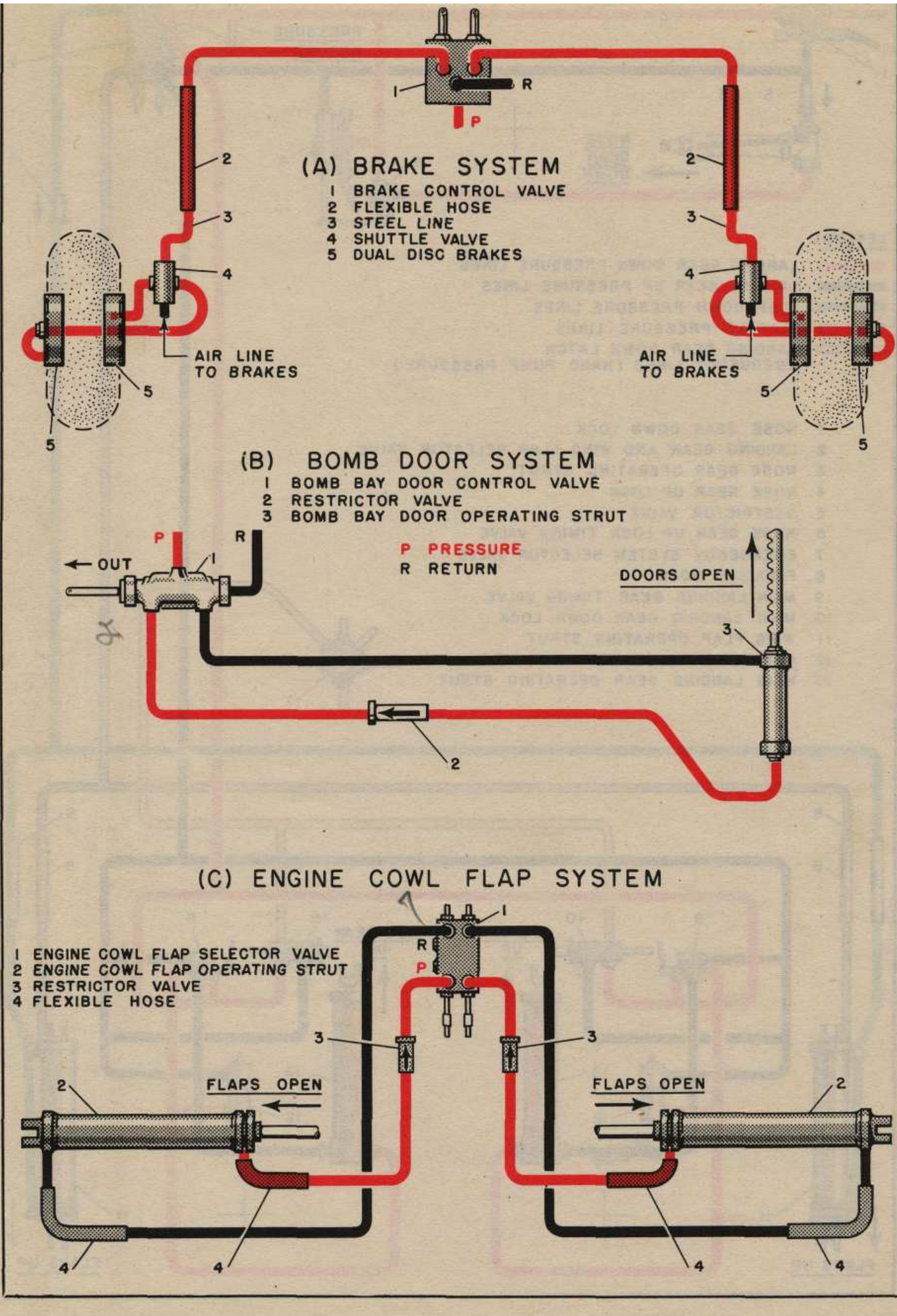



*Figure 5—Hydraulic System—Brake, Bomb Doors, and Cowl Flaps*

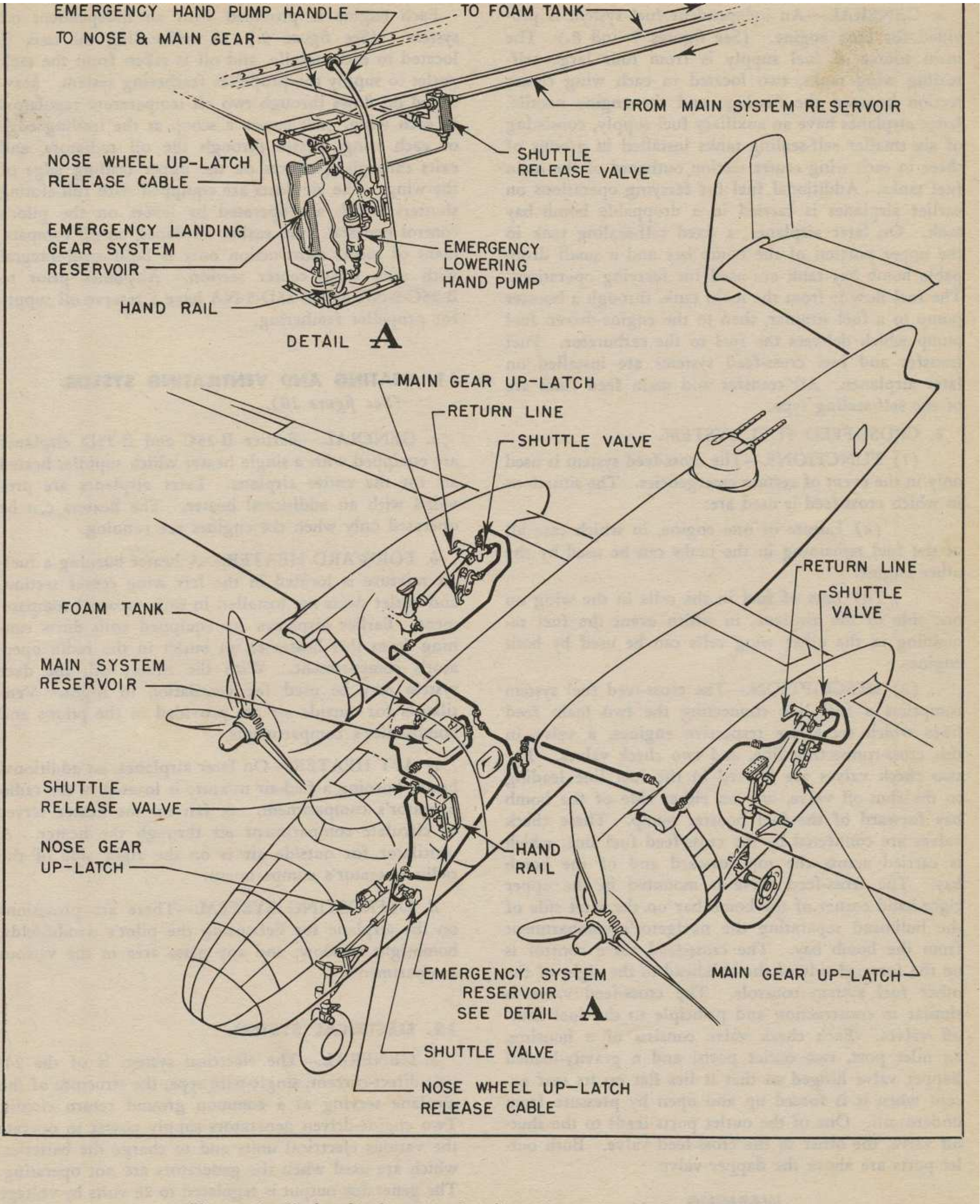



*Figure 6—Hydraulic System—Landing Gear Emergency Lowering*

*a.* GENERAL.—An independent fuel system is provided for each engine. (See figures 7 and 8.) The main source of fuel supply is from four large self-sealing wing tanks, two located in each wing center section between the fuselage and the engine nacelle. Later airplanes have an auxiliary fuel supply, consisting of six smaller self-sealing tanks installed in groups of three in each wing center section outboard of the main fuel tanks. Additional fuel for ferrying operations on earlier airplanes is carried in a droppable bomb bay tank. On later airplanes, a fixed self-sealing tank in the upper portion of the bomb bay and a small droppable bomb bay tank are used for ferrying operations. The fuel flow is from the main tank, through a booster pump to a fuel strainer, then to the engine-driven fuel pump which delivers the fuel to the carburetor. Fuel transfer and fuel cross-feed systems are installed on later airplanes. All transfer and main feed lines are of the self-sealing type.

*b.* CROSS-FEED FUEL SYSTEM.

(1) FUNCTIONS.—The cross-feed system is used only in the event of certain emergencies. The situations in which cross-feed is used are:

*(a)* Failure of one engine, in which case all of the fuel remaining in the tanks can be used by the other engine.

*(b)* Loss of fuel in the cells in the wing on one side of the airplane, in which event the fuel remaining in the other wing cells can be used by both engines.

(2) DESCRIPTION.—The cross-feed fuel system comprises a fuel line connecting the two main feed lines which serve the respective engines, a valve in this cross-connecting line, and two check valves. The two check valves are located in the fuel line leading to the shut-off valve, one on either side of the bomb bay forward of the fuel booster pump. These check valves are connected by the cross-feed fuel line, which is carried across the top forward end of the bomb bay. The cross-feed valve is mounted in the upper right-hand corner of the bomb bay on the after side of the bulkhead separating the navigator's compartment from the bomb bay. The cross-feed valve control is on the forward side of the bulkhead to the right of the other fuel system controls. The cross-feed valve is similar in construction and principle to the fuel shut-off valves. Each check valve consists of a housing, an inlet port, two outlet ports, and a gravity-loaded flapper valve hinged so that it lies flat on its seat except when it is forced up and open by pressure from underneath. One of the outlet ports leads to the shut-off valve, the other to the cross-feed valve. Both outlet ports are above the flapper valve.

**WARNING**

Do not allow one fuel tank to run completely dry before switching to another tank!

Each engine is provided with an independent oil system. (See figure 9.) A self-sealing oil tank is located in each nacelle, and oil is taken from the tank outlet to supply the propeller feathering system. Scavenged oil flows through two oil temperature regulators in each wing. Air enters a scoop at the leading edge of each wing, passes through the oil radiators, and exits through apertures on the upper trailing edge of the wing. The air ducts are equipped with full-closing shutters which are operated by levers on the pilot's control pedestal. On earlier airplanes, an oil compartment of metal construction only is built semi-integral with each wing center section. Airplanes prior to B-25C-5-NA and B-25D-5-NA have a reserve oil supply for propeller feathering.

## 11. HEATING AND VENTILATING SYSTEM.
*(See figure 10).*

*a.* GENERAL.—Earlier B-25C and B-25D airplanes are equipped with a single heater which supplies heated air for the entire airplane. Later airplanes are provided with an additional heater. The heaters can be operated only when the engines are running.

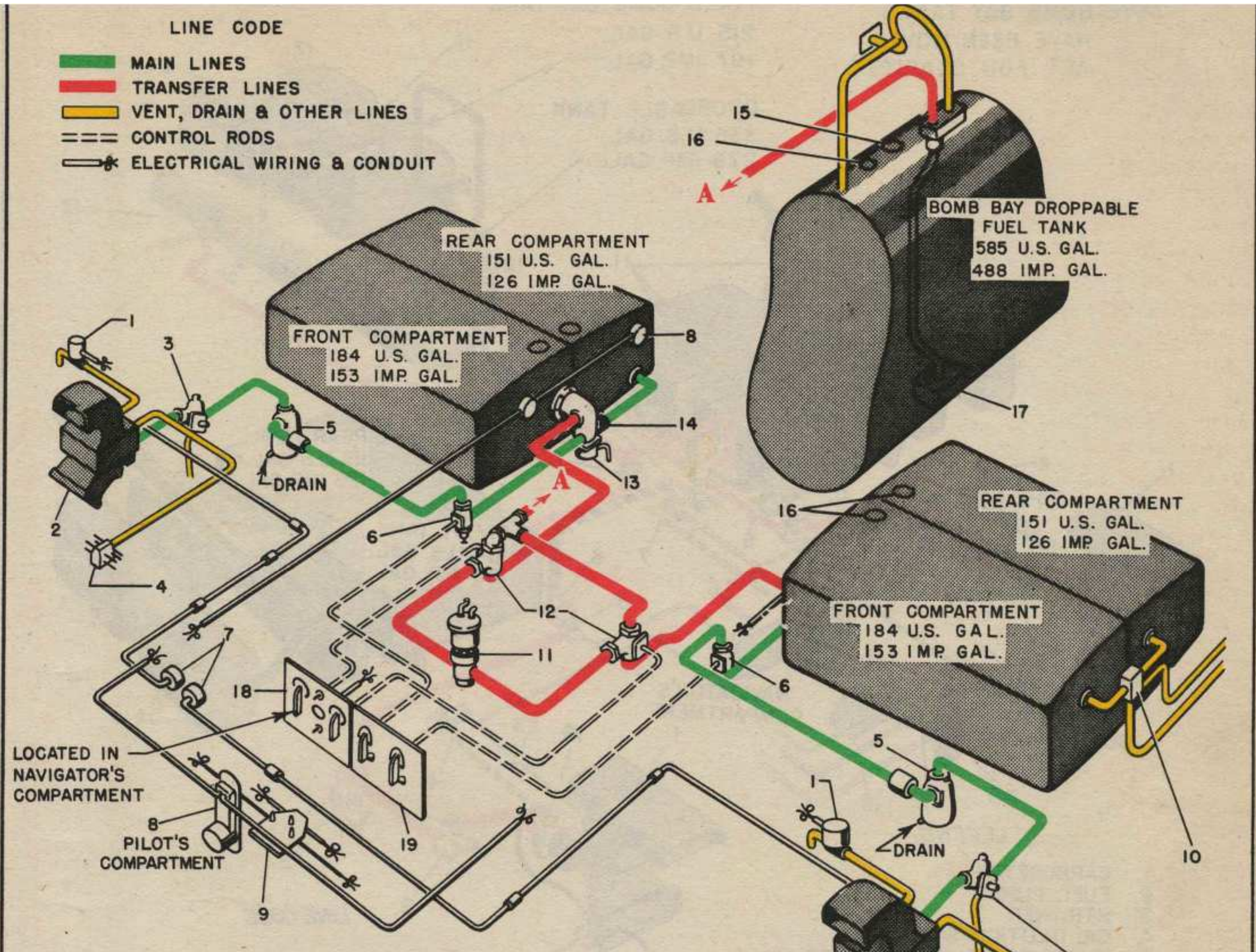
*b.* FORWARD HEATER.—A heater burning a fuel-air mixture is located in the left wing center section, and outlet ducts are installed in each forward compartment. Earlier airplanes are equipped with ducts running from this heater to an outlet in the radio operator's compartment. With the heater off, the duct system may be used for ventilation in flight. Ventilators for outside air are provided in the pilot's and bombardier's compartments.

*c.* AFT HEATER.—On later airplanes, an additional heater burning a fuel-air mixture is located in the radio operator's compartment. A fan on the heater serves to circulate compartment air through the heater. A ventilator for outside air is on the right side of the radio operator's compartment.

*d.* DEFROSTING SYSTEM.—There are provisions on the airplane for defrosting the pilot's windshields, bombsight window, and any glass area in the various compartments.

## 12. ELECTRICAL SYSTEM.

*a.* GENERAL.—The electrical system is of the 24-volt direct-current, single-wire type, the structure of the airplane serving as a common ground return circuit. Two engine-driven generators supply power to operate the various electrical units and to charge the batteries, which are used when the generators are not operating. The generator output is regulated to 28 volts by voltage regulators. Either battery, one installed inside each engine nacelle immediately aft of the fire wall, has sufficient capacity to operate the airplane's electrical system.

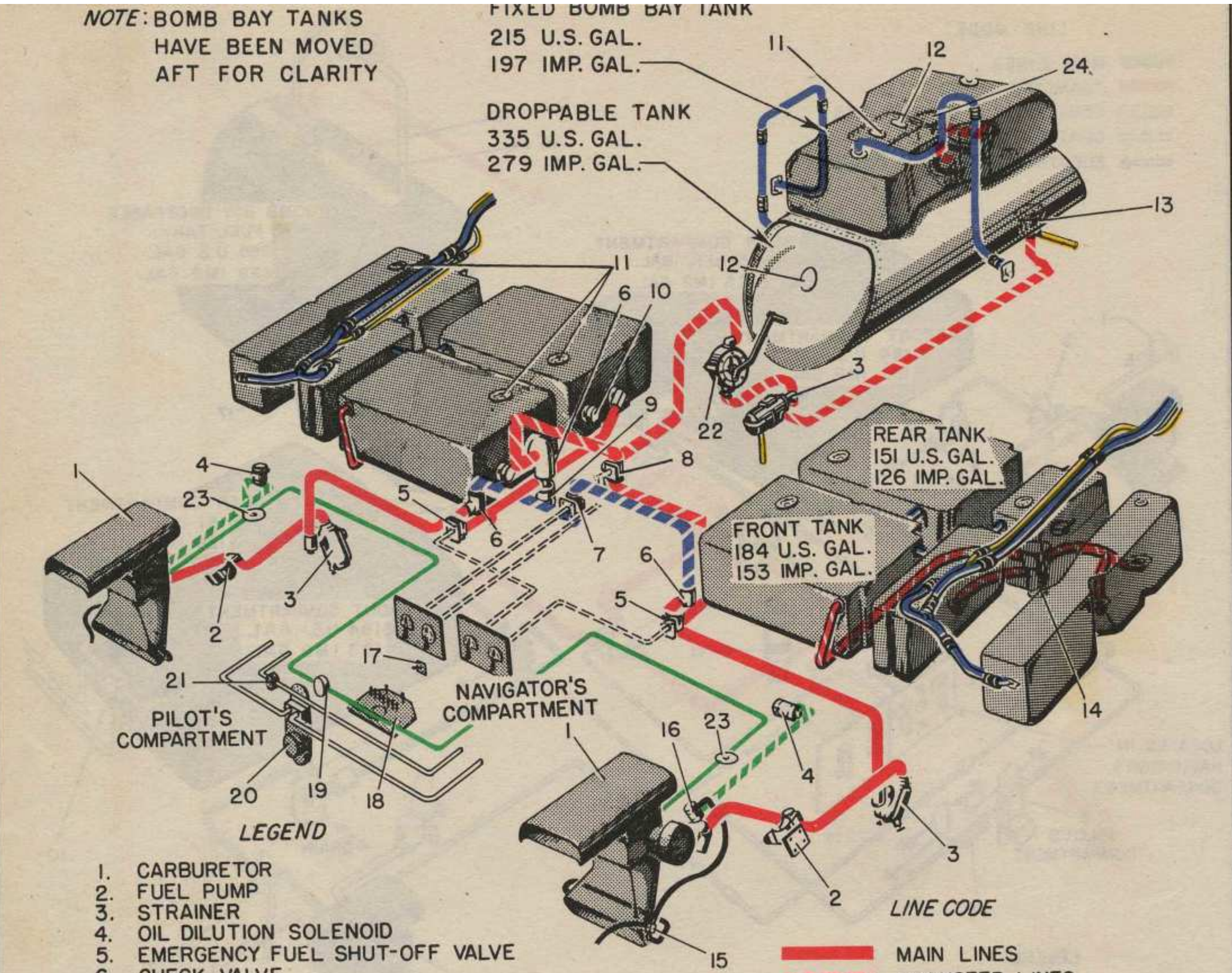



LEGEND

1. OIL DILUTION SOLENOID
2. CARBURETOR
3. FUEL PUMP
4. PRIMER DISTRIBUTOR
5. STRAINER
6. EMERGENCY FUEL SHUT-OFF VALVE
7. FUEL PRESSURE GAUGES
8. LIQUIDOMETER FUEL GAUGE UNITS
9. CONTROL PEDESTAL SWITCH PANEL
   BOOSTER PUMP SWITCHES
   PRIMER SWITCH
10. DRAIN AND VENT VALVE
11. TRANSFER PUMP
12. TRANSFER VALVE
13. BOOSTER PUMP
14. CHECK VALVE
15. FUEL GAUGE (FLOAT TYPE)
16. FILLER FLANGE
17. SUMP
18. FUEL TRANSFER CONTROLS
    PUMP SWITCH
    DIRECTIONAL FLOW SWITCH
    PUMP OPERATING LIGHT
19. EMERGENCY SHUT-OFF
    VALVE CONTROLS

NOTE:
FUEL CAPACITY ON SOME AIRPLANES IS 12 U.S. GAL. LESS / 10 IMP. GAL. LESS
FUEL TANKS AND HOSE ARE SELF SEALING

*Figure 7—Fuel System—Early Airplanes*




*LEGEND*

1. CARBURETOR
2. FUEL PUMP
3. STRAINER
4. OIL DILUTION SOLENOID
5. EMERGENCY FUEL SHUT-OFF VALVE
6. CHECK VALVE
7. CROSS-FEED SHUT-OFF VALVE
8. BOMB BAY TANK TRANSFER VALVE
9. BOOSTER PUMP
10. LIQUIDOMETER FUEL GAGE UNIT
11. FILLER CAP
12. BOMB BAY TANK FUEL GAGE
13. BOMB BAY TANK TRANSFER PUMP
14. AUXILIARY WING TANKS TRANSFER PUMP
15. PRIMER DISTRIBUTOR
16. PRIMER SOLENOID
17. BOMB BAY TANK TRANSFER PUMP SWITCH
18. CONTROL PEDESTAL SWITCH PANEL
    - BOOSTER PUMP SWITCHES
    - AUXILIARY TRANSFER PUMP SWITCHES
    - PRIMER SWITCH
    - FUEL PRESSURE GAGE
20. MAIN TANK SELECTIVE LIQUIDOMETER INDICATOR
21. AUXILIARY WING TANK LIQUIDOMETER INDICATOR
22. EMERGENCY TRANSFER HAND-PUMP
23. AN PRESSURE TRANSMITTER
24. AUTOMATIC SHUT-OFF VALVE

*LINE CODE*

- MAIN LINES
- TRANSFER LINES
- CROSS FEED LINES
- VENT LINES
- DRAIN LINES
- PRESSURE GAGE LINES
- OIL DILUTION LINES
- PRIMER LINES
- CONTROL RODS
- ELECTRICAL CONDUIT

*NOTE*

EACH SET OF THREE AUXILIARY TANKS HAS A TOTAL CAPACITY OF 152 U.S. GAL. (127 IMP. GAL.).

FUEL HOSES AND FUEL TANKS (EXCEPT BOMB BAY DROPPABLE TANK) ARE SELF-SEALING.

***Figure 8—Fuel System—Late Airplanes***

## NOMENCLATURE FOR FIGURE 14

1. Automatic Pilot Control Units and Oil Pressure Gage
2. Flight Indicator
3. Turn Indicator (Gyro)
4. Bank-and-Turn Indicator
5. Suction Gage
6. Rate-of-Climb Indicator
7. Airspeed Indicator
8. Altimeter
9. Static Pressure Selector Valve
10. Manifold Pressure Indicator
11. Tachometer Indicator
12. Oil Pressure Indicator
13. Oil Temperature Indicator
14. Fuel Pressure Indicator
15. Cylinder Temperature Indicator
16. Nose Wheel Position Indicator Lights
17. Free Air Temperature Indicator
18. Main Fuel Level Gage
19. Auxiliary Fuel Level Gage
20. Landing Gear and Wing Flap Position Indicator
21. Radio Compass Azimuth Indicator
22. Magnetic Compass
23. Remote Compass Indicator
24. Accelerometer
25. Pilot Director Indicator
26. Clock
27. Hydraulic System Pressure Gage
28. Brake System Pressure Gage

**NOTE**

The batteries are adequate only for a short period of direct use, and then only if they are in a properly charged condition, and all electrically operated equipment not essential is turned off to conserve battery power.

An external power socket is located on the right engine nacelle. An external power source is used in lieu of the airplane batteries for starting the engines and operating the electric system while the airplane is on the ground. An adapter for connecting the British type of external power supply is stowed in the external socket compartment.

*b.* FUSES AND LAMPS.—All fuses and lamps are replaceable during flight and are located as shown in the following table:

| *Location* | *Active and Spare Fuses* | *Spare Lamps* |
|---|---|---|
| Bombardier's Control and Instrument Panel | Bomb Equipment | Bomb Station Indicator |
| Instrument Distribution Box (upper rear end of bombardier's compartment) | Pilot's Instruments | |
| Pilot's Switch Panel | Engine Primers<br>Anti-icer Pump Motors<br>Free Air Temperature Indicators<br>Dome Lights<br>Cockpit Light<br>Pilot's Extension Light<br>Formation Lights<br>Recognition Lights<br>Passing Light<br>Turret Signal Light<br>Pitot Heater<br>Landing Lights<br>Propeller Feathering Switches<br>Pilot-Bombardier Signal<br>Carburetor Air Temperature Indicator<br>Warning Horn<br>Navigation Lights<br>Oil Dilution Solenoid | |

| Location | Active and Spare Fuses | Spare Lamps |
|---|---|---|
| Pilot's Instrument Panel | | Compass Bomb Release Signal |
| Navigator's Fuse (General Control) Panel | Inverters<br>Dome Lights<br>Fuel Booster Pumps<br>De-icer Distributor Valve Motor<br>Starter Engaging Solenoid<br>Cabin Heater<br>Fuel Level Indicator<br>Landing Gear and Wing Flap Indicator<br>Navigator's Extension Light | |

## 13. MISCELLANEOUS EQUIPMENT.

*a.* COVERS.—Weatherproof dust covers are provided for the forward part of each engine nacelle, for the transparent parts of the pilot's and bombardier's compartments, the upper turret, and the tail cone.

*b.* BLIND-FLYING HOOD.—A fabric hood is provided for enclosing the pilot's station for practice instrument flying. The hood may be fastened to the cockpit ceiling in such a way that the pilot may lift the sides or front to look out when he desires. The hood is stowed in a cloth bag under the left side of the navigator's chart table.

*c.* CURTAINS.—A heat and sound-insulating curtain is installed between the pilot's and the navigator's compartments. It is a three-piece curtain; the side pieces are normally left in position and the center section may be unhooked to permit access between compartments. The rear end of the bomb bay crawlway is provided with a curtain which may be opened or closed by a zipper fastener.

*d.* DATA CASES, HOLDERS, AND WRITING TABLES.—A flight report form holder, a cloth airplane flight manual holder, a check-list holder, and two map cases are provided in the pilot's compartment. A transparent bomb data book container and a map and data stowage box are provided for the bombardier. A navigation form box, a chart case, a sextant stowage holder, and a line-of-position computor stowage box are provided for the navigator. A data case is also provided for the radio operator. Folding tables are provided for bombardier, navigator, and radio operator. A cloth mooring and handling equipment stowage kit is at the right side of the navigator's compartment. A maintenance check-list holder is provided on the right rear side of the curtain between the pilot's and navigator's compartments. Ash trays are provided for the pilot, copilot, navigator, and radio operator.

*e.* SUNSHADES.—An adjustable sunshade and sun visor are provided for the pilot and copilot, and on some airplanes a special canopy is installed in the bombardier's compartment.

*f.* LADDER.—A service ladder is stowed on the right side of the aft compartment behind the camera position. It is secured to the side of the fuselage by three brackets and straps, and may be removed through the aft hatch.

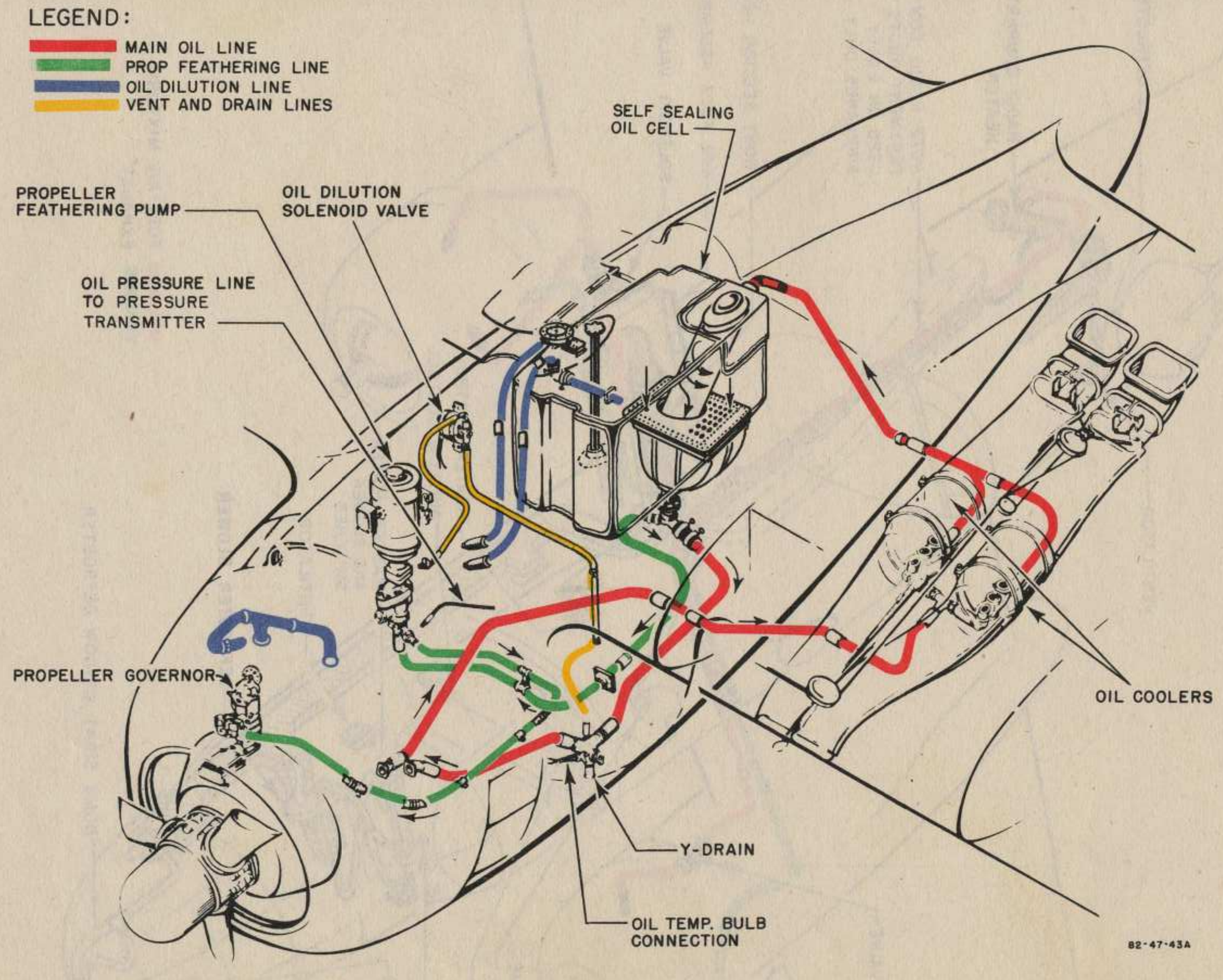



Figure 9—Oil System

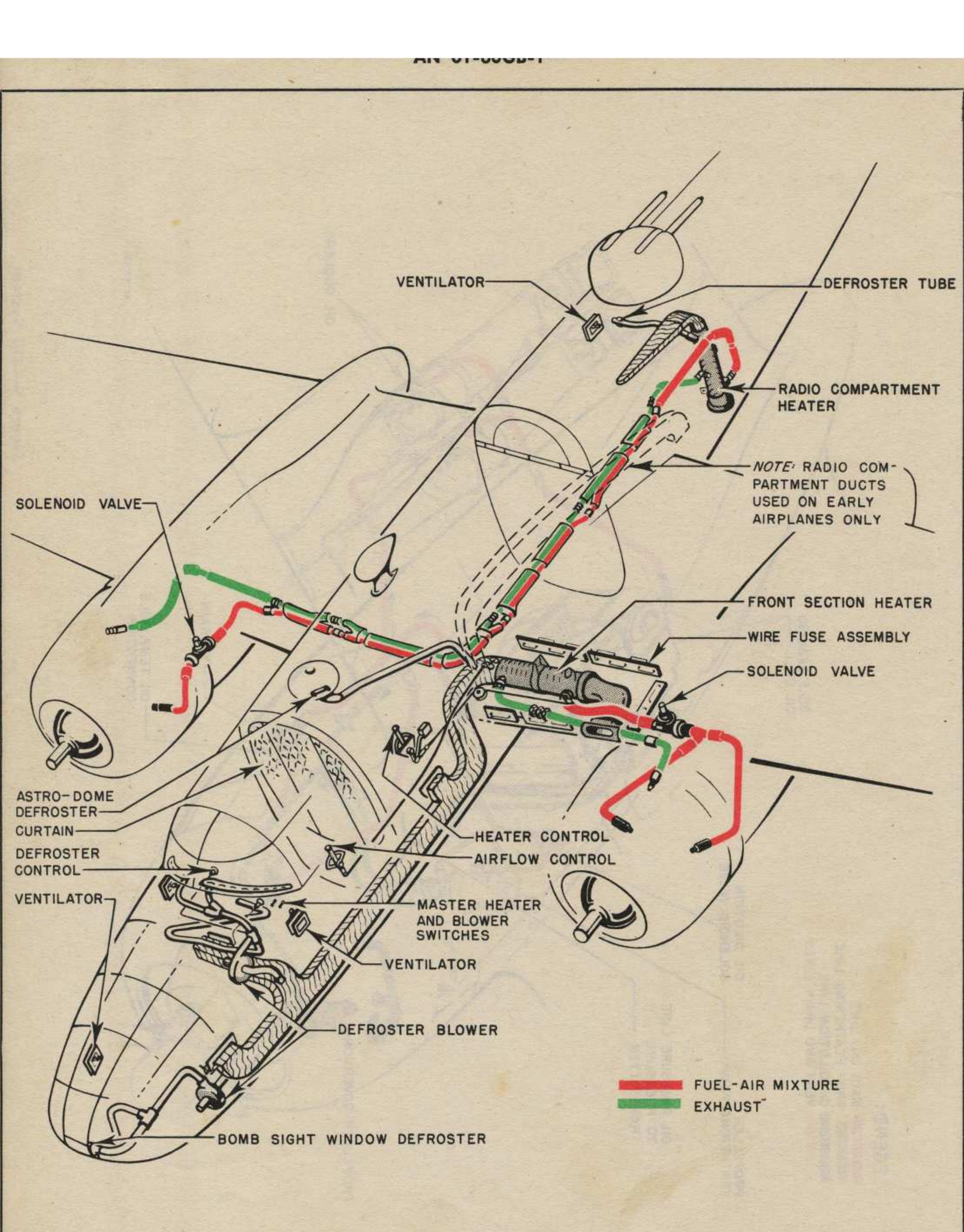



*Figure 10—Heating and Ventilating System*

# SECTION II
# PILOT'S OPERATING INSTRUCTIONS

**NOTE**

A pilot's check list in the pilot's compartment is available for a quick check of airplane operations.

## 1. FLIGHT RESTRICTIONS.

The following maneuvers are prohibited:

| | | |
|---|---|---|
| Loop | Immelmann | Vertical Bank |
| Spin | Inverted Flight | |
| Roll | Vertical Dive | |

## 2. BEFORE ENTERING PILOT'S COMPARTMENT.

Make sure that the airplane has been serviced and is ready for flight, particularly in regard to proper quantities of fuel, oil, hydraulic fluid, and oxygen.

*a.* Ascertain that the amount of fuel, oil, ammunition, and special equipment carried is suited to the mission to be performed and that allowable limits of weight and center of gravity are not exceeded. (See AN 01-1-40.)

*b.* See that airplane is headed into the wind.

*c.* Make certain nose gear towing pin is engaged (cap on).

*d.* Enter navigator's compartment and check the following:

(1) Switch "ON" the generator-disconnect, active inverter, and inverter emergency cut-out switches, located on the navigator's control panel.

(2) Make certain that the fuel cross-feed valve and bomb bay tank transfer valve are "OFF," and the fuel shut-off valves are "ON." These controls are located at the rear of the navigator's compartment.

(3) Check emergency brake air pressure (550 to 600 pounds per square inch).

(4) Check hydraulic and brake accumulator pressure gages for a minimum of 375 pounds per square inch.

(5) On earlier airplanes, see that emergency nose gear lowering mechanism operating pawl is "OFF."

## 3. ON ENTERING PILOT'S COMPARTMENT.

*a.* The following procedure should be carried out prior to all flights:

(1) Have radio operator make certain that wing flap emergency crank and main gear emergency lowering mechanism (early airplanes) are stowed.

(2) Have navigator make certain that bomb door emergency crank is stowed, and on earlier airplanes that nose gear emergency lowering crank is stowed.

(3) Have crew members unlock emergency ground escape hatches.

(4) See that ignition switches are "OFF."

(6) Unlock flight controls and check for free and proper movement, watching control surfaces for correct response.

(7) When glide bombing attachment is removed, have bombardier make certain the selector valve in the bombardier's compartment is safetied in the "ALTERNATE SOURCE" position.

(8) Have bombardier make sure that the bomb release handle is in the "DOORS CLOSED" position, the antisalvo guard is in place, and the bomb fusing switch is "SAFE."

(9) On later airplanes, see that the safety switch for fixed nose gun is in "SAFE."

(10) Set the altimeter to the correct barometric pressure. (See figure 14-8.)

(11) On later airplanes test gun sight illumination by operating rheostat control on pilot's instrument panel.

*b.* When night-flying is anticipated, the following additional check should be made (battery-disconnect switch "ON"):

(1) Test fluorescent instrument light by operating rheostat control on left side of control column.

(2) Test cockpit extension light on right-hand instrument subpanel, and adjustable focusing lights on either side of pilot's compartment.

(3) Test position lights by moving switches on pilot's switch panel to "BRIGHT" and "DIM."

(4) Test landing lights by operating switches on control pedestal switch panel.

**WARNING**

Do not leave the landing lights on when the airplane is on the ground, as the heat generated by the lamps will melt the Plexiglas lenses.

(5) Test cockpit lights by operating switch on pilot's switch panel.

(6) Test operation of recognition lights. Switches are located on control pedestal switch panel.

(7) Instruct crew members to check operation of lighting equipment in their respective compartments.

## 4. STARTING ENGINES.

*(See figure 15.)*

*a.* The sequence of operations listed below should be followed when starting the engines:

(1) Have ground personnel turn the propellers three to four revolutions by hand.

(2) Open throttles 3/4 inch (1000 to 1200 rpm).

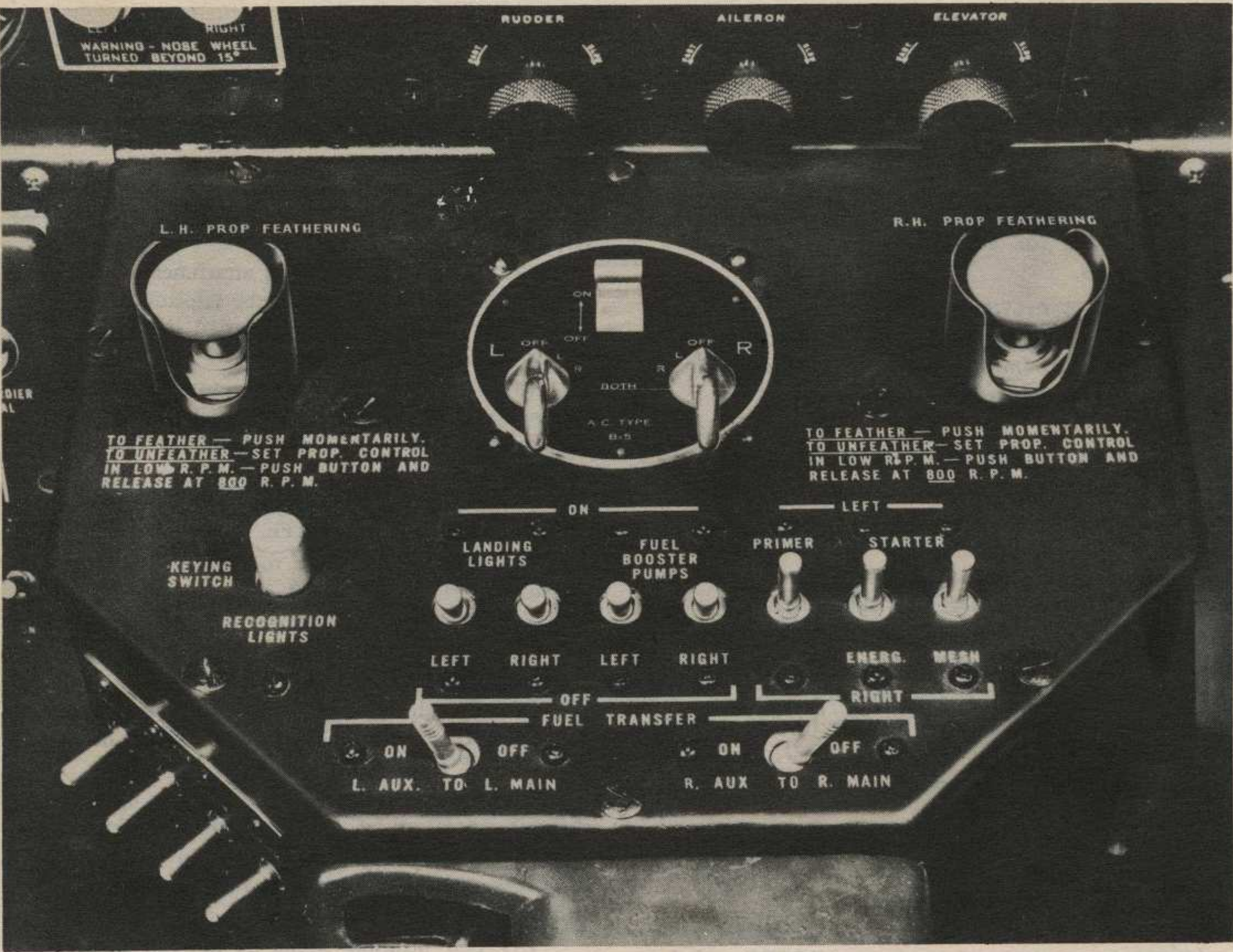



*Figure 15—Control Pedestal Switch Panel*

**NOTE**

No priming action or fuel discharge is accomplished by pumping the throttle.

(3) Move propeller controls to full "INCREASE RPM."

(4) Move mixture controls to "IDLE CUT-OFF."

(5) Make certain that the supercharger controls are locked in "LOW."

(6) Open cowl flaps; then place controls in neutral position.

**NOTE**

Always return the cowl flap controls to neutral position immediately after obtaining the desired position of the flaps. In this position, fluid will not be pumped overboard should a cowl flap line break.

(7) Move carburetor air controls to "NORMAL."

(9) Have navigator make certain fuel shut-off valve controls are "ON."

(10) On airplanes equipped with an engine fire extinguisher system, turn extinguisher selector valve handle to either "RIGHT MOTOR" or "LEFT MOTOR," according to the engine being started. By doing this, in case of fire when starting the engine, all that is necessary is to pull the handle.

(11) Turn "ON" the battery-disconnect switches, located on the pilot's switch panel *(See figure 16.)*

(12) Turn "ON" the fuel booster pump switches, located on the control pedestal switch panel. Check the fuel pressure gage for 4 to 5 pounds pressure.

(13) Turn "ON" the ignition safety switch, located on the pilot's control pedestal.

(14) Turn the ignition switch for the engine to be started first to the "BOTH" position.

(15) Press starter energizing switch on control pedestal switch panel to "LEFT" or "RIGHT," depend-


*Figure 16—Pilot's Switch Panel*

of 30 seconds. On airplanes equipped with Jack & Heintz starters, energize for a maximum of 10 seconds when using an external power supply (battery chart), or 20 seconds when using the airplane's batteries.

**NOTE**

Whenever possible, an external power supply should be used to start the engines. If external power is not available, use a portable energizer or handcrank. Do not use airplane's batteries to start engines except in an emergency.

(16) While energizing, prime engine 2 seconds.

(17) Check to see if propeller is clear.

(18) Press MESH switch to "LEFT" or "RIGHT," depending on which engine is being started first. Prime the engine intermittently while engaging until it fires evenly.

(19) As engine starts, move mixture control to "FULL RICH."

(20) Check oil pressure. If pressure is not up to 40 pounds within 30 seconds, stop engine, and investigate.

(21) Follow procedures (10), and (14), through (20) for starting other engine.

## 5. ENGINE WARM-UP.

Warm engine at 1200 rpm until oil temperature shows a definite increase and oil pressure remains steady when throttle is opened. Open oil cooler shutters at oil temperature of 40°C (104°F).

## 6. EMERGENCY TAKE-OFF.

Use oil dilution to obtain proper oil pressure at moderate power, and as soon as the engine will take the throttle, taxi out and take off. Apply throttle slowly but steadily.

**WARNING**

Overdilution may easily result in very low oil

## 7. ENGINE AND ACCESSORIES GROUND TEST.

*a.* After starting, engines should be warmed up and ground tested as follows:

(1) Turn booster pumps "OFF" and check for a fuel pressure of 6 to 7 pounds.

(2) Check propeller controls at 1600 rpm by pulling controls back to full "DECREASE RPM" and noting rpm drop of approximately 350 to 400 rpm. Return controls to full "INCREASE RPM."

(3) Check left and right magnetos at 2000 to 2100 rpm, maximum rpm drop 100. If rpm drop is greater, return switch to "BOTH," run engine to 40 inches Hg manifold pressure for a few seconds and then recheck at 2000 to 2100 rpm.

(4) At 700 rpm check "OFF" position of ignition switches.

(5) Check supercharger clutch operation: Set propeller to full "INCREASE RPM," engine speed to 1700 rpm, and supercharger to "HIGH" blower. Open throttle to 30 inches Hg maximum manifold pressure, and shift to "LOW" blower. Manifold pressure should show a sudden decrease of not less than 1½ inches Hg.

(6) Check operation of cowl flaps and wing flaps.

(7) At 1600 rpm, check voltage at 28-28.5, amperes 20-60 per generator, and suction 3.75-4.25 inches Hg.

(8) Check hydraulic pressure (800 to 1100 pounds per square inch).

(9) Check brake pressure (1000 to 1200 pounds per square inch).

(10) Check with crew members to see that entrance hatches are closed.

(11) Check automatic pilot as follows:

*(a)* See that automatic pilot vacuum gage reads 3 to 5 inches Hg.

*(b)* Check automatic pilot oil pressure gage for 90 to 100 pounds per square inch.

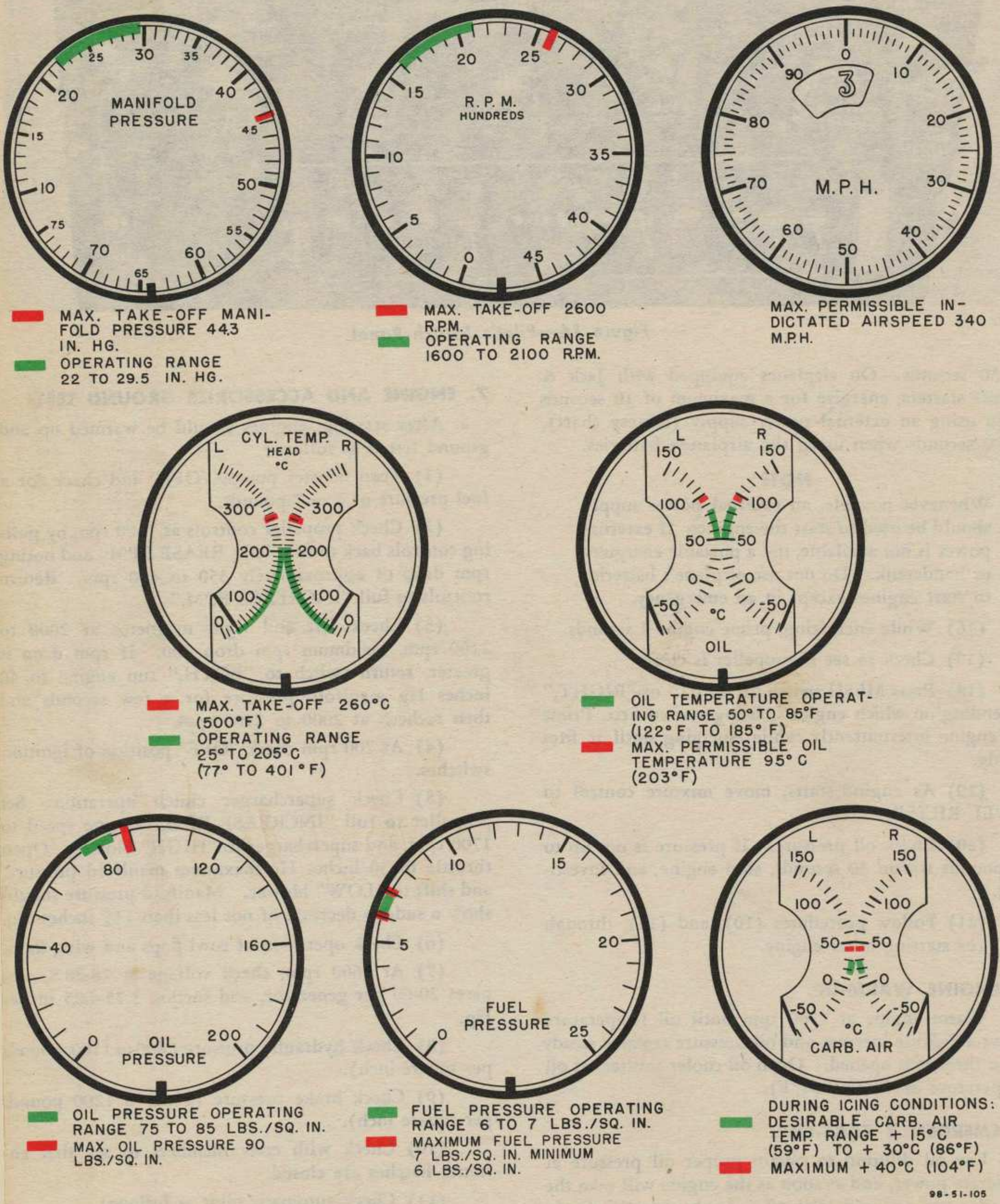
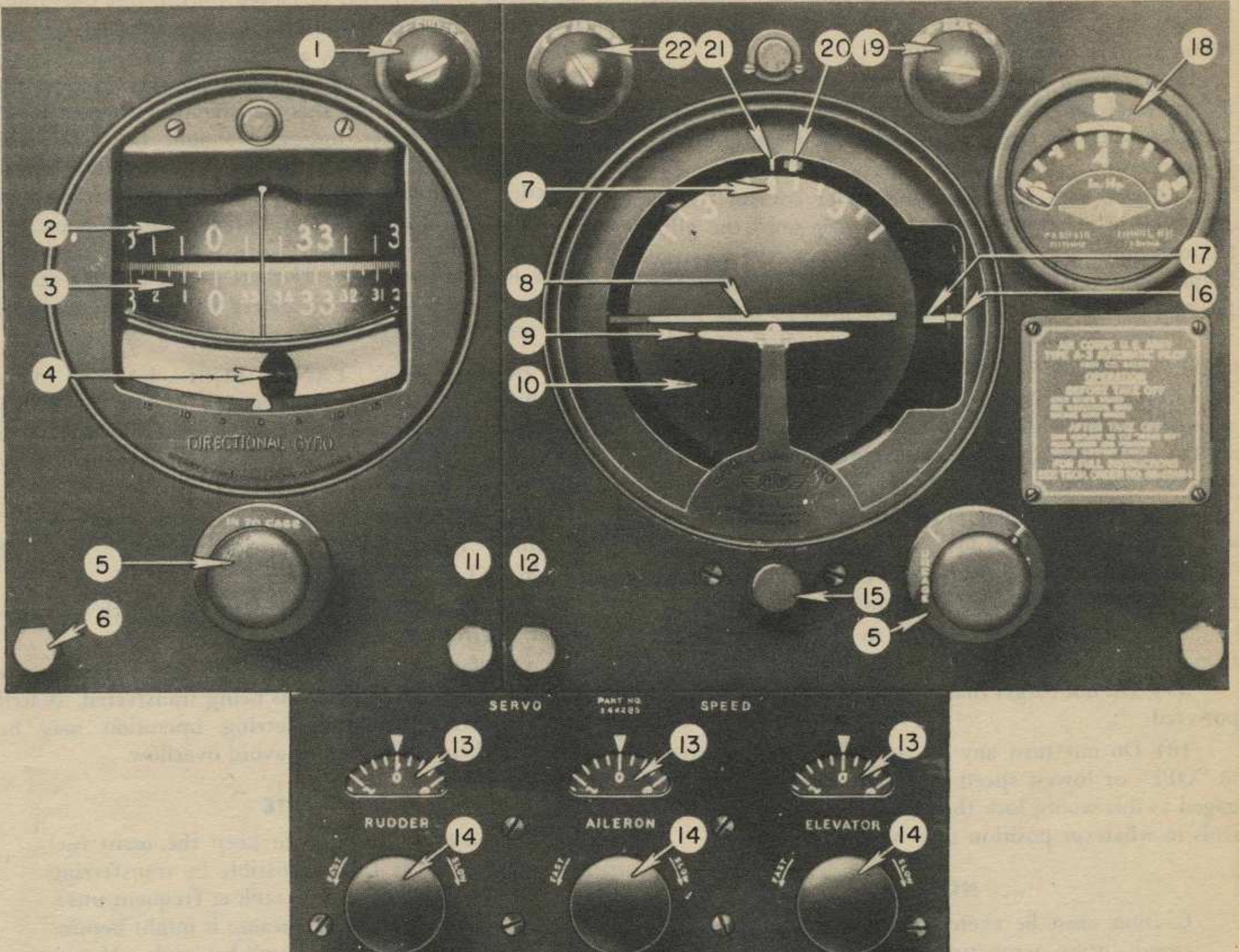



*Figure 17—Instrument Limitations*




1. Rudder Control Knob
2. Rudder Follow-up Card
3. Directional Gyro Card
4. Ball Bank Indicator
5. Caging Knobs
6. Installation Bolts
7. Banking Scale
8. Horizon Bar
9. Miniature Airplane
10. Horizon Dial
11. Directional Gyro Unit
12. Bank-and-Climb Gyro Unit
13. Valve Adjustment Reference Dials
14. Valve Adjustment Knobs
15. Miniature Airplane Adjustment Knob
16. Elevator Alignment Index
17. Elevator Follow-up Index
18. Suction Gage
19. Elevator Control Knob
20. Aileron Follow-up Index
21. Bank Index
22. Aileron Control Knob

***Figure 18—Automatic Pilot Control Units***

(7) Set servo speed valves for desired speed of control. Turn control to stop oscillation of corresponding control surface.

(8) Change course by slowly turning rudder knob. (See figure 18-1.) Set in bank with aileron knob if making a sharp turn.

(9) Set desired fore-and-aft attitude with elevator

**CAUTION**

Do not allow airplane to get too far out of trim.

*c.* RESTRICTED USE OF AUTOMATIC PILOT.—Since experience in flying airplanes equipped with automatic pilots has demonstrated that abrupt control re of sideslip or stall may result in a spin, the following restrictions in the use of the automatic pilot are hereby made effective for B-25 airplanes:

(1) Do not operate airplane by the automatic pilot in extremely turbulent air, when de-icer system is operating, or when the right engine is not delivering normal power output.

(2) Do not place airplane under control of the automatic pilot at any speed or attitude until the pilot has determined by manual operation that the existing flight conditions permit safe control by the automatic pilot, and in no case will automatic pilot be used when the airplane is flying at less than an indicated air speed of 40 mph above the stalling speed.

(3) Do not operate airplane under control of the automatic pilot without one rated pilot remaining "on watch" and maintaining a close check of the airplane and instruments.

(4) Do not engage automatic pilot when follow-up indices are not lined up.

(5) Do not make course and attitude changes with rapid knob movements. Turn slowly and smoothly.

(6) Do not allow airplane to get too far out of trim.

(7) Do not forget that automatic pilot can be overpowered.

(8) Do not turn any of the three speed controls to "OFF" or lowest speed when automatic pilot is engaged as this would lock the corresponding surface controls in whatever position they happened to be.

**NOTE**

Caution must be exercised to keep the gyros caged during acrobatics, or during maneuvers which would exceed the operating limits of the instruments. These limits are 50 degrees from the vertical for the bank-and-climb gyro control unit (figure 18-12) and 55 degrees for the directional gyro control unit (figure 18-11.) At all other times the gyros should be uncaged.

**WARNING**

At no time during flight should the operator manually control the automatic pilot over 15 degrees from the level flight position laterally, longitudinally, or directionally. If movements of more than the 15 degrees are desired, turn off the automatic pilot and manually operate the controls.

## 14. FUEL SYSTEM MANAGEMENT.

*a.* AUXILIARY FUEL — LATER AIRPLANES. — Fuel in the auxiliary cells must be transferred to the main fuel cells before it can be fed to the engine. To transfer fuel, start one or both of the auxiliary fuel cell transfer pumps by placing the switches on the control no valves to be opened or closed during this operation. Whenever the quantity of fuel in a main fuel cell has been reduced sufficiently, as shown on the liquidometer fuel level indicator, fuel should be transferred from the auxiliary cells. During this transfer the selector switch on the liquidometer indicator should be set to the front main cell to which the fuel is being transferred, in order to inform the pilot when to turn off the transfer pump. The transfer pump should not be kept running after the cell is full, since leaky filler caps may cause loss by overflow. If there is no leakage at the filler caps, fuel will be circulated back to the auxiliary fuel cells through the vent connections.

*b.* BOMB BAY TANK FUEL—LATER AIRPLANES.—Before the fuel carried in the bomb bay tank may be used, it is necessary to transfer the fuel to the left or right front main fuel cell. To transfer fuel, proceed as follows:

(1) Turn fuel transfer valve control from "OFF" to either "FUS TANK TO LEFT WING" or "FUS TANK TO RIGHT WING."

(2) Turn "ON" transfer pump switch on generator control panel.

(3) Set main liquidometer selector switch to the main fuel cell to which fuel is being transferred. Watch gage in order that transferring operation may be stopped when cell is full, to avoid overflow.

**NOTE**

It is usually desirable to keep the main fuel cells as nearly full as possible by transferring fuel from the bomb bay tank at frequent intervals. This is advisable because it might become necessary to salvo the bomb bay tank. If such a situation should arise, it would be desirable to have as much of the total fuel supply as possible in the self-sealing wing cells. No provision is made for transferring fuel from the wing cells back into the bomb bay tank.

(4) When transfer operations are finished, shut "OFF" transfer pump switch and place fuel transfer valve control in "OFF" position.

*c.* EMERGENCY FUEL TRANSFER—LATER AIRPLANES.—If bomb bay tank transfer pump fails, proceed as follows:

(1) Set transfer valve control to desired position and unstrap handle on pump at aft end of navigator's compartment.

(2) Move handle back and forth. This action draws fuel from the bomb bay tank and pumps it into whichever main cell has been selected.

(3) When transfer operation is completed, return handle to stowed position and strap in place. Return selector valve control handle to "OFF" position.

*d.* BOMB BAY FUEL TANK—EARLIER AIR-

## 8. HYDRAULIC SYSTEM.

### *a.* GENERAL HYDRAULIC SYSTEM.

(1) DESCRIPTION.—A single high-pressure hydraulic system operates the tricycle landing gear, wing flaps, engine cowl flaps, bomb bay doors, brakes, and turret gun chargers. Pressure for the system is supplied by two gear-type engine-driven pumps. Hydraulic fluid conforming to Spec. AN-VV-O-366 is used. The general system pressure of 1050 lbs./sq.in., and the brake system pressure of 1150 lbs./sq.in., are regulated by an unloading and relief valve. Two accumulators store pressure for the general system and for the brake system, and absorb any surging of pressures caused by fast operation of the system. A general system and a brake system pressure gage are located on the instrument panel and accumulator air gages are located above the accumulators. A hand-pump supplies pressure for emergency use, or when the airplane is on the ground with the engines inoperative.

(2) REMOVING AND DISASSEMBLING HYDRAULIC UNITS.—When removing a unit or line from the hydraulic system observe the following procedures:

*(a)* Exhaust the pressure from the system *(see Section III, Paragraph 2., h., (3), (a), 4, a.).*

*(b)* When necessary, drain the hydraulic system by removing the plug in the T fitting in the front of the nose wheel well.

*(c)* When disconnecting hydraulic lines, plug the ends to prevent loss of oil and to keep out foreign matter.

*(d)* Disassemble any unit in as clean a place as possible and with the proper tools.

(3) PRECAUTIONS WHEN REPLACING HYDRAULIC UNITS AND PARTS.

*(a)* Thoroughly clean all parts immediately after disassembly. Use naphtha diluent or kerosene on metal parts only and wipe the parts thoroughly dry with a clean lint-free cloth.

**NOTE**

Do not clean packing with naphtha or kerosene. Use a clean, dry, lint-free cloth. If necessary, wash in hydraulic fluid.

*(b)* Use only synthetic rubber packing conforming to Spec. AN-HH-P-114.

*(c)* Cover all parts with oil conforming to Spec. AN-VV-O-366 before reassembling.

*(d)* When repairing or replacing a part, disturb as little of the unit as possible. Before disassembling any unit, study all diagrams and drawings available.

(4) ASSEMBLING AND INSTALLING HYDRAULIC UNITS.—In assembling or installing a unit or line in the hydraulic system, the following should be noted:

*(a)* Make sure washers, retainers, and packings are the correct size, are facing the correct surface, and are assembled in the proper order.

*(b)* Do not apply too much pressure to retainers and heads which are seated on gaskets and washers. A firm, not tight, seating is all that is necessary. Nuts should be only tight enough to prevent leakage.

*(c)* Remove all plugs and clean lines thoroughly. Be sure all sleeves move freely around the line at flared ends. Check the inside of the flare for bends, cracks, or other imperfections.

*(d)* When installing lines, only the line fitting should be moved. Line fittings must fit perfectly, or there will be leakage at the connection. If necessary, apply a thin coating of thread lubricant conforming to Spec. AN-VV-P-236. Make sure excessive lubricant does not get inside of the line as it will plug lines or valves.

(5) HYDRAULIC TEST STAND.

*(a)* TEST CONNECTIONS.—Connections for testing the hydraulically operated equipment are on the outboard side of the right engine only, as described below.

*1.* The following is applicable only to B-25C, AC41-12434/13038, and B-25D, AC41-29648/847 Airplanes: The engine test connect block can be identified by the Parker plug valve at the "RETURN" port and the blue—yellow—blue marking on the connection tubes. This test connect block is also utilized when filling the general system with a test stand [*see (b) below*].

*2.* The following is applicable only to B-25C, AC41-13039 and subsequent, and B-25D, AC41-29848 and subsequent Airplanes: Engine pump suction and pressure flexible hose may be replaced by the test stand hose at the firewall self-sealing disconnect couplings. Backing off the large red hexagon nut seals the fluid at either end of the coupling. Free flow from the test stand is obtained by attaching the corresponding suction or pressure hose from the test stand equipped with an identical coupling half.

*(b)* HYDRAULIC TEST STAND CONSTRUCTION.—The test stand should be constructed as shown in figure 159. Connect tubing in such a way that hydraulic oil can be made to flow through the units mounted on the test

**NOMENCLATURE — HYDRAULIC TEST STAND CONSTRUCTION**

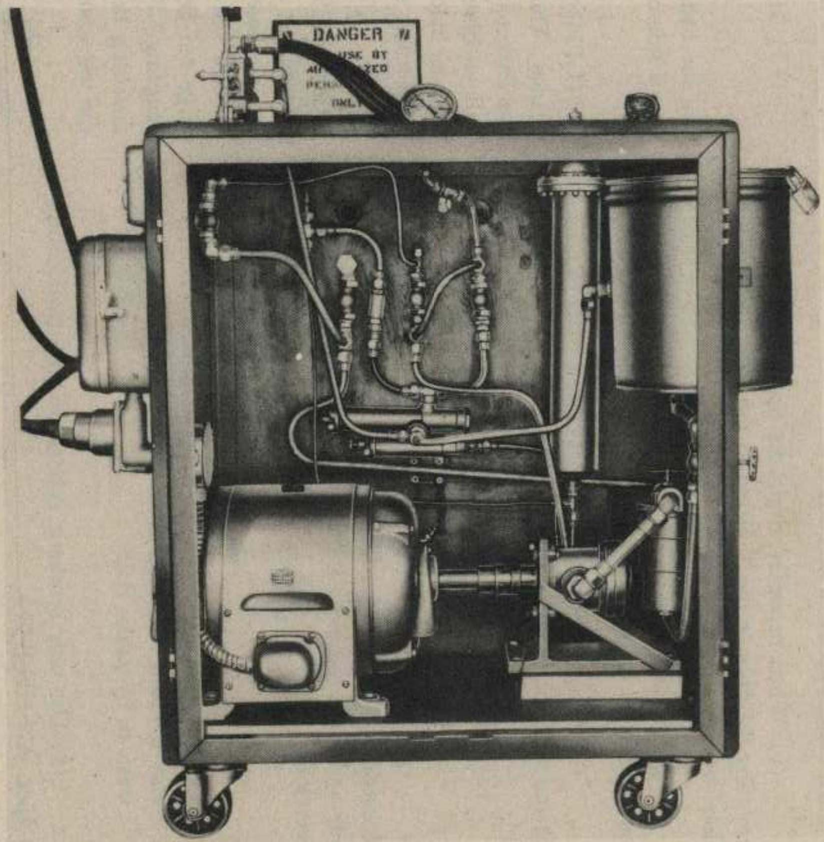
1. GLOBE VALVES
2. "CUNO" FLUID FILTER
3. PUMP (5 GAL./MIN. OUTPUT)
4. ELECTRIC MOTOR (5 H.P.)
5. PUMP UNLOADER & PRESSURE RELIEF VALVE (62-58074)
6. PRESSURE ACCUMULATOR (62-58376)
7. ONE-WAY CHECK VALVE (PARKER) TYPE 475
8. SELECTOR VALVE (62-58011)
9. PRESSURE GAGE SNUBBER
10. SYSTEM PRESSURE GAGE
11. ACCUMULATOR PRESSURE GAGE
12. RESERVOIR
13. STRAINER

**DETAIL A**

1. SELF-SEALING COUPLING (AEROQUIP) 106-12
2. SELF-SEALING COUPLING (AEROQUIP) 106-8

**DETAIL B**
**ENGINE TEST CONNECT BLOCK**

1. ENGINE MOUNT SUPPORT — RIGHT ENGINE — OUTBOARD
2. ENGINE MOUNT CONNECTIONS — FITTING (62A-58429-2)
3. "PARKER" PLUG VALVE (702-FO-12D)
4. PLUG RETURN LINE (AC895-B-73)
5. PLUG PRESSURE LINE
6. ONE-WAY CHECK VALVE (PARKER) 475-GT-8D



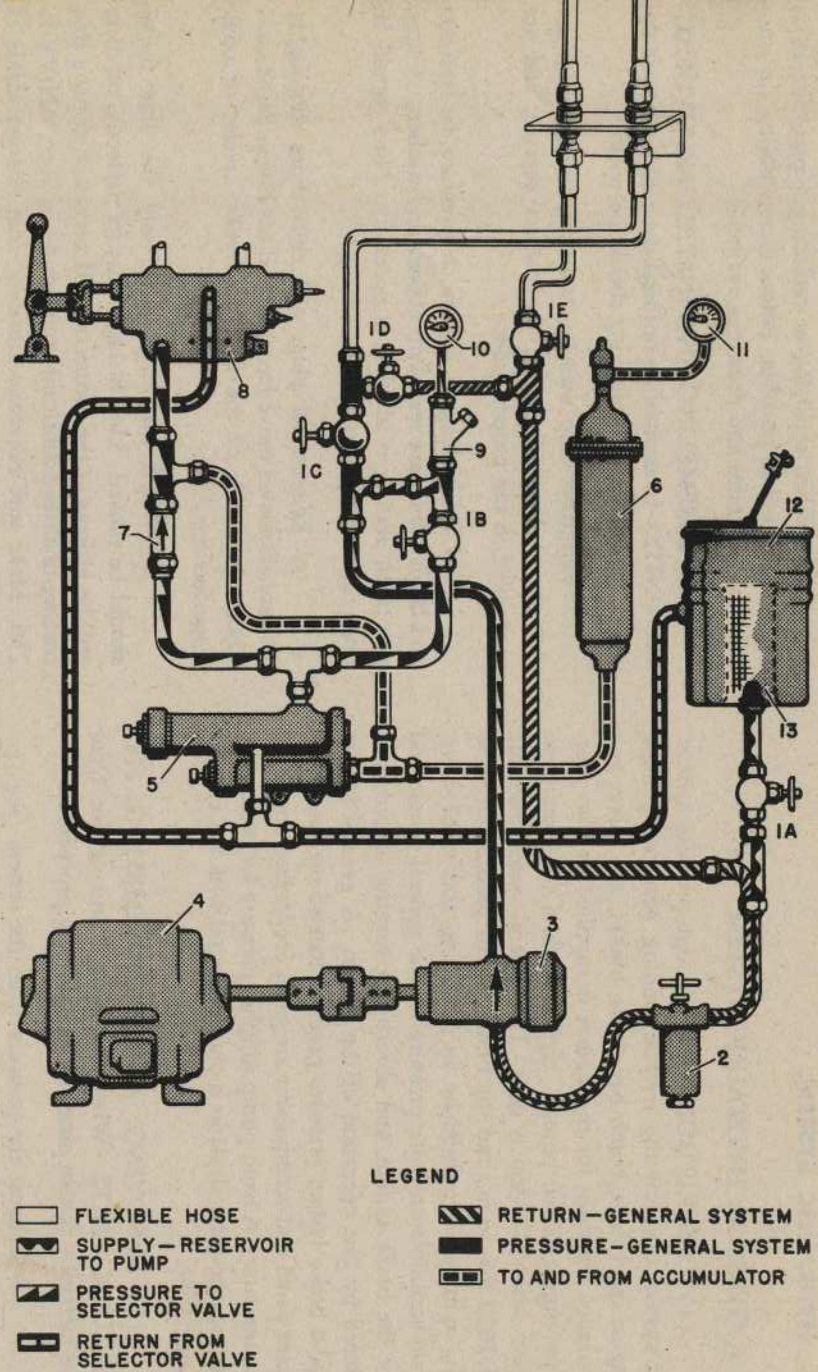




***Figure 159 — Hydraulic Test Stand Construction***

**Key to Figures 160 and 161**

| | | | |
|---|---|---|---|
| 1. | ENGINE-DRIVEN PUMP | (PESCO) | 203A |
| *2. | SELF-SEALING DISCONNECT COUPLING | (AEROQUIP) | 106- |
| *3. | SELF-SEALING DISCONNECT COUPLING | (AEROQUIP) | 106 |
| 4. | FOAM ARRESTOR TANK | | 62-589 |
| 5. | CHECK VALVE | (PARKER) | 475GT-8 |
| 5A. | CHECK VALVE | (PARKER) | 475GT-6 |
| 6. | CHECK VALVE | (PARKER) | 475LFT-8 |
| 7. | WING TO FUSELAGE DISCONNECT BLOCK | | 62A-582 |
| ■8. | AUTOMATIC PILOT SEQUENCE VALVE | | 82-5807 |
| 9. | LEFT ENGINE DISCONNECT FITTING | | 62A-58429 |
| 10. | ENGINE PUMP UNLOADING VALVE | | 62-5807 |
| 11. | FLUID FILTER | (CUNO) | 102 |
| 12. | RESERVOIR | | 62-5805 |
| 13. | EMERGENCY HAND-PUMP | | 62-5802 |
| 14. | EMERGENCY SELECTOR VALVE | | 62-5802 |
| 15. | CHECK VALVE | (PARKER) | 475LGT-6 |
| 16. | ACCUMULATOR THERMAL RELIEF & EXHAUST VALVE | | 82-5808 |
| 17. | CHECK VALVE | (PARKER) | 475HT-6 |
| 18. | RESTRICTOR VALVE | | 62-58084 |
| 19. | LANDING GEAR & WING FLAP SELECTOR VALVE | | 62-5801 |
| 19A. | ENGINE COWL FLAP SELECTOR VALVE | | 62-5801 |
| 20. | CHECK VALVE | (PARKER) | 475GG-¼ |
| 21. | BOMB DOOR CONTROL VALVE | | 62-5801 |
| ■22. | AUTOMATIC PILOT SHUT-OFF VALVE | | 62-5806 |
| 23. | GAGE PRESSURE SNUBBER | (PARKER) | 4PSGGX |
| 24. | PRESSURE GAGE | | SPEC. 94-27922 TYPE E |
| 25. | BRAKE SYSTEM ACCUMULATOR | | 62-58376 |
| 26. | GENERAL SYSTEM ACCUMULATOR | | 62-5837 |
| 27. | ACCUMULATOR AIR PRESSURE GAGE | (U.S. GAGE CO.) | AW1-⅞-17-A |
| 28. | ACCUMULATOR AIR PRESSURE GAGE | (U.S. GAGE CO.) | AW1-⅞-17-A |
| †29. | RIGHT ENGINE DISCONNECT BLOCK | | 62A-58429 |
| †30. | CHECK VALVE | (PARKER) | 475GT-8 |

■ Applicable to airplanes with automatic pilot only.

R.E.C.F.O. — Right Engine Cowl Flaps Open

L.E.C.F.O. — Left Engine Cowl Flaps Open

L.G.D. — Landing Gear Down

W.F.D. — Wing Flaps Down

* Applicable to B-25C Airplanes AC41-13039 and subsequent, and B-25D Airplanes AC41-29848 and subsequent.

† Applicable only to B-25C Airplanes AC41-12434 to AC41-13038, inclusive, and B-25D Airplanes AC41-29648 to AC41-29847, inclusive

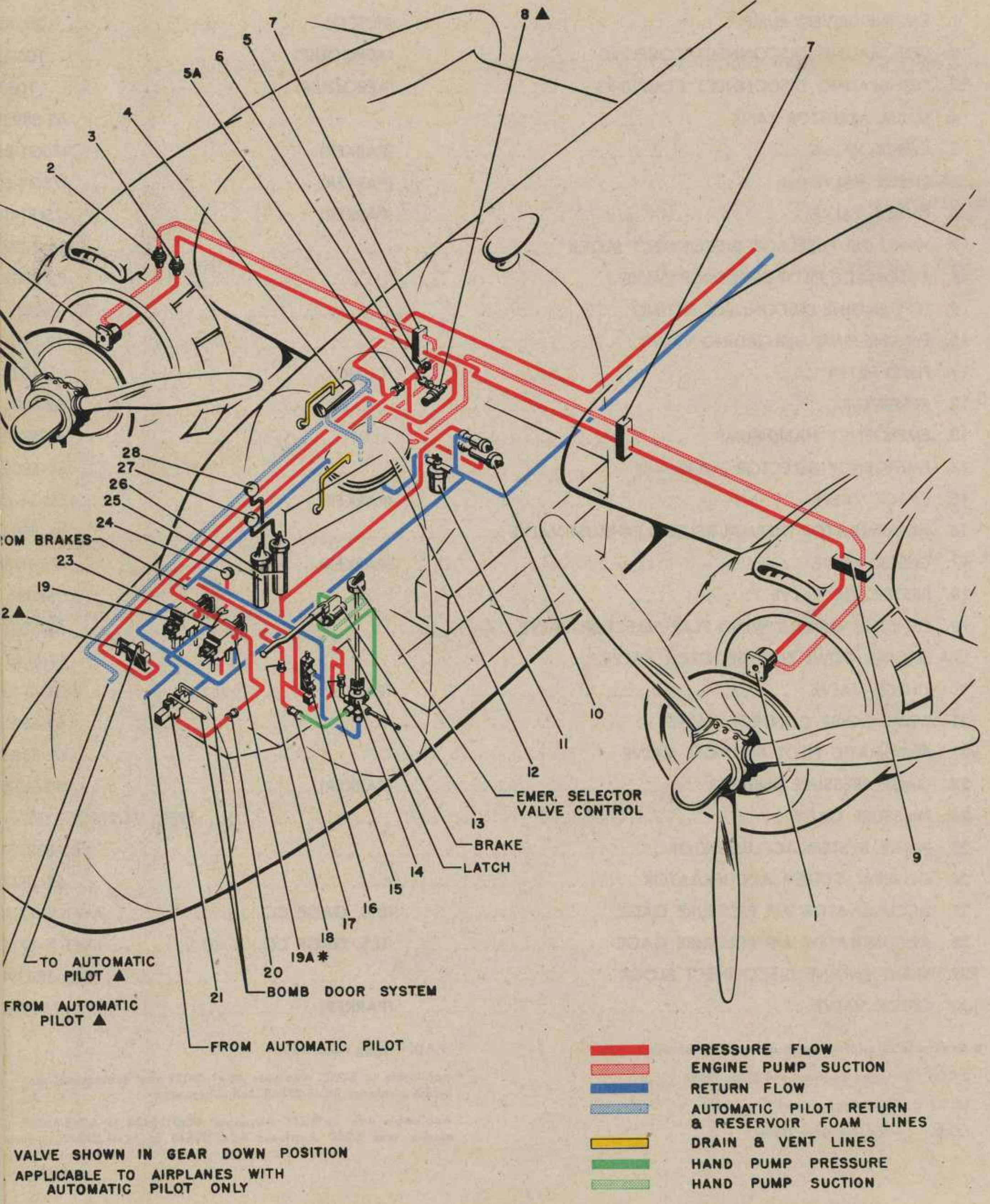



*Figure 160 — Hydraulic System Diagram—Power System*

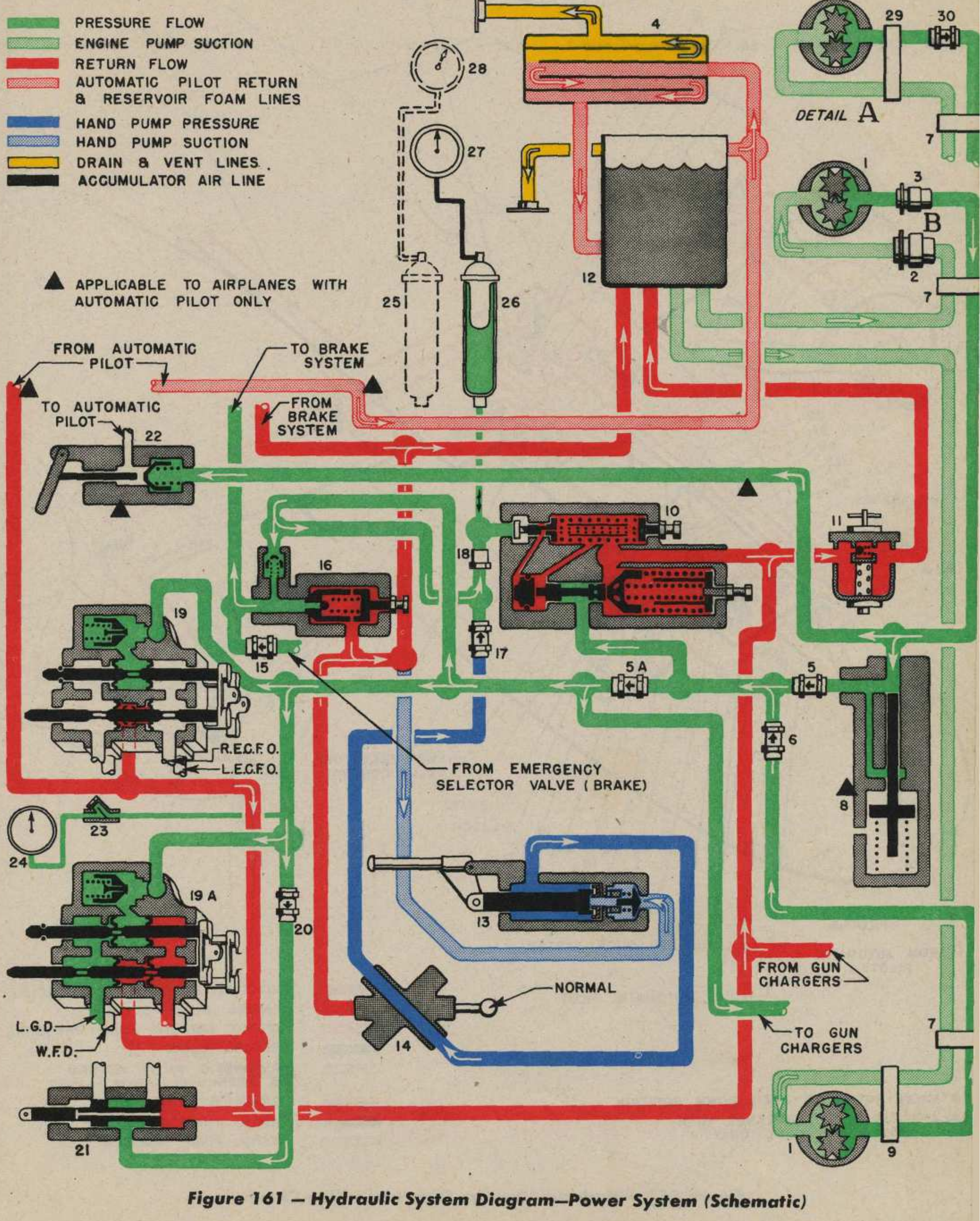



*Figure 161 — Hydraulic System Diagram—Power System (Schematic)*

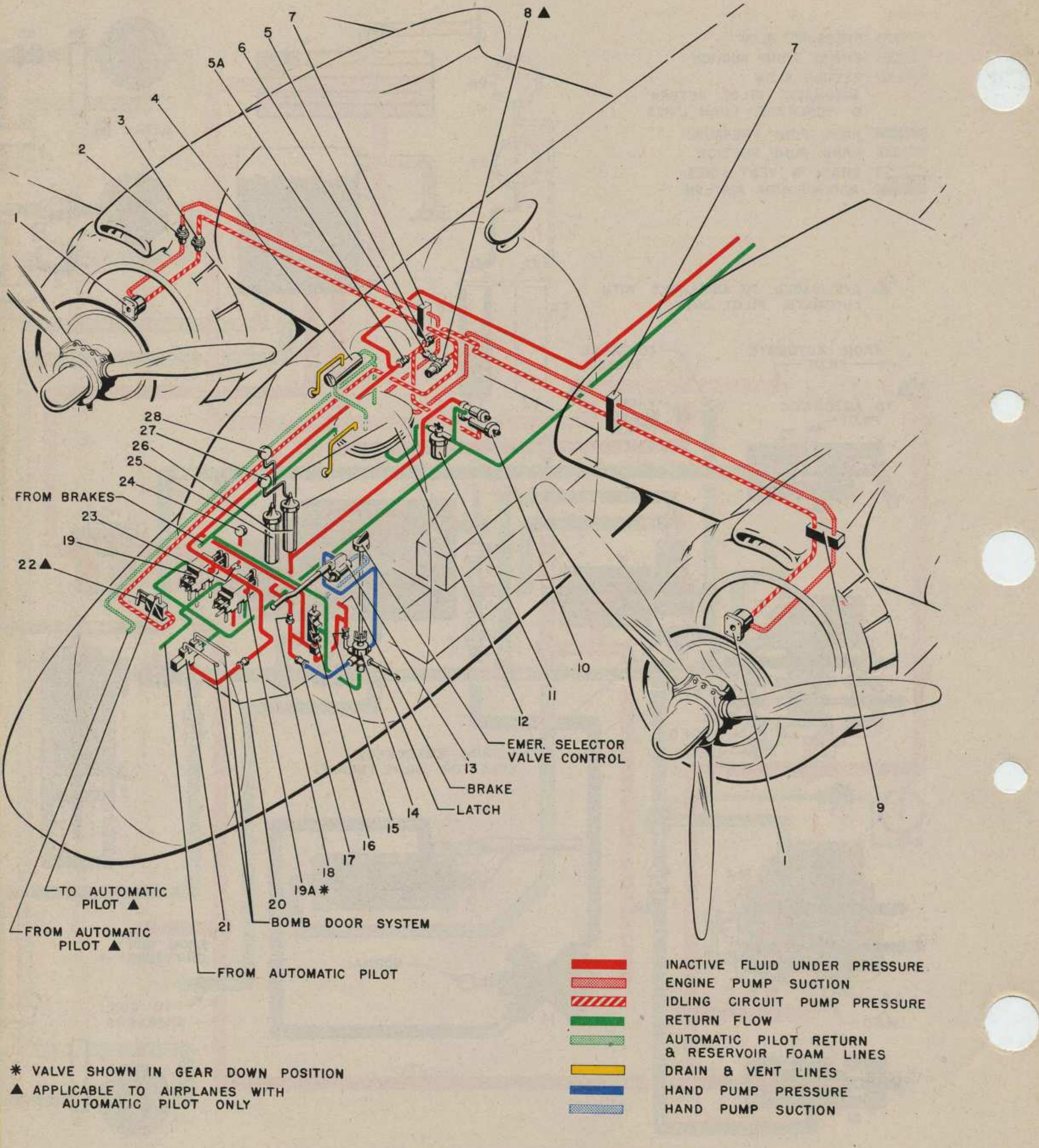



***Figure 162 — Hydraulic System Diagram—Idling Circuit***

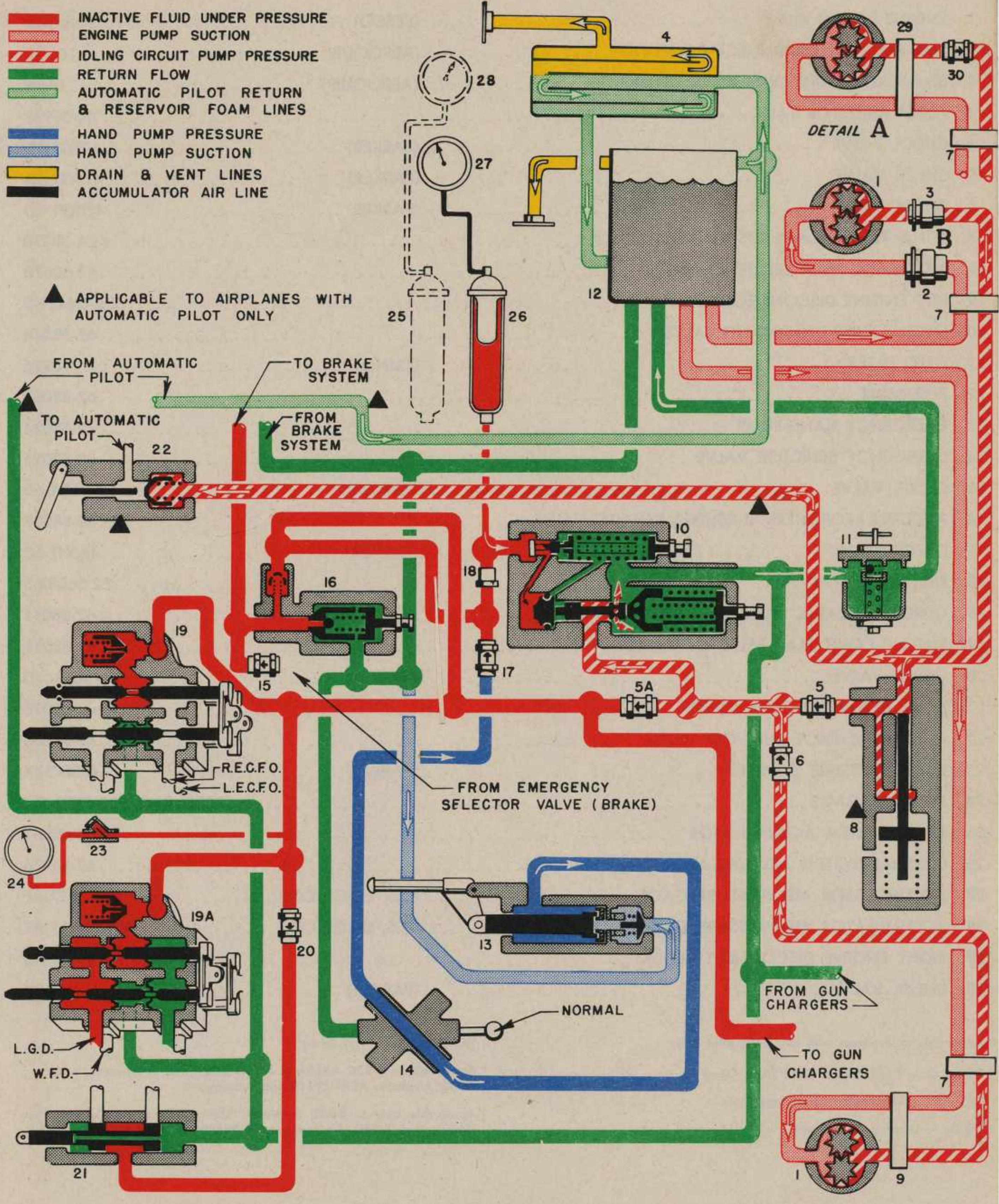



*Figure 163 — Hydraulic System Diagram—Idling Circuit (Schematic)*

**Key to Figures 162 and 163**

| | | | |
|---|---|---|---|
| 1. | ENGINE-DRIVEN PUMP | (PESCO) | 203AD |
| *2. | SELF-SEALING DISCONNECT COUPLING | (AEROQUIP) | 106-12 |
| *3. | SELF-SEALING DISCONNECT COUPLING | (AEROQUIP) | 106-8 |
| 4. | FOAM ARRESTOR TANK | | 62-58959 |
| 5. | CHECK VALVE | (PARKER) | 475GT-8D |
| 5A. | CHECK VALVE | (PARKER) | 475GT-8D |
| 6. | CHECK VALVE | (PARKER) | 475LFT-8D |
| 7. | WING TO FUSELAGE DISCONNECT BLOCK | | 62A-58278 |
| ■8. | AUTOMATIC PILOT SEQUENCE VALVE | | 82-58070 |
| 9. | LEFT ENGINE DISCONNECT FITTING | | 62A-58429-3 |
| 10. | ENGINE PUMP UNLOADING VALVE | | 62-58074 |
| 11. | FLUID FILTER | (CUNO) | 10226 |
| 12. | RESERVOIR | | 62-58051 |
| 13. | EMERGENCY HAND-PUMP | | 62-58024 |
| 14. | EMERGENCY SELECTOR VALVE | | 62-58025 |
| 15. | CHECK VALVE | (PARKER) | 475-LGT-6D |
| 16. | ACCUMULATOR THERMAL RELIEF & EXHAUST VALVE | | 82-58089 |
| 17. | CHECK VALVE | (PARKER) | 475HT-6D |
| 18. | RESTRICTOR VALVE | | 62-58084-3 |
| 19. | LANDING GEAR & WING FLAP SELECTOR VALVE | | 62-58011 |
| 19A. | ENGINE COWL FLAP SELECTOR VALVE | | 62-58011 |
| 20. | CHECK VALVE | (PARKER) | 475GG-¼D |
| 21. | BOMB DOOR CONTROL VALVE | | 62-58016 |
| ■22. | AUTOMATIC PILOT SHUT-OFF VALVE | | 62-58065 |
| 23. | GAGE PRESSURE SNUBBER | (PARKER) | 4PSGGXX |
| 24. | PRESSURE GAGE | | SPEC. 94-27922 TYPE E-4 |
| 25. | BRAKE SYSTEM ACCUMULATOR | | 62-58376-1 |
| 26. | GENERAL SYSTEM ACCUMULATOR | | 62-58376 |
| 27. | ACCUMULATOR AIR PRESSURE GAGE | (U.S. GAGE CO.) | AW1-⅞-17-AF |
| 28. | ACCUMULATOR AIR PRESSURE GAGE | (U.S. GAGE CO.) | AW1-⅞-17-AE |
| †29. | RIGHT ENGINE DISCONNECT BLOCK | | 62A-58429-2 |
| †30. | CHECK VALVE | (PARKER) | 475GT-8D |

■ Applicable to airplanes with automatic pilot only.

R.E.C.F.O. — Right Engine Cowl Flaps Open

L.E.C.F.O. — Left Engine Cowl Flaps Open

L.G.D. — Landing Gear Down

W.F.D. — Wing Flaps Down

* Applicable to B-25C Airplanes AC41-13039 and subsequent, and B-25D Airplanes AC41-29848 and subsequent.

† Applicable only to B-25C Airplanes AC41-12434 to AC41-13038, inclusive, and B-25D Airplanes AC41-29648 to AC41-29847, inclusive.

housing the "unloader" *(see figure 164)*. The relief valve operates when the pressure at port A becomes great enough (1100 to 1200 lbs./sq.in.) to move the poppet valve. This opens the duct to port C, which routes the oil to the reservoir. Oil enters port B from the accumulators. When the accumulator pressure becomes too high (1000 to 1050 lbs./sq.in.), oil entering port B forces the valve over until the annular ring uncovers the duct leading diagonally to the chamber behind the piston. This forces the piston to push the plunger over until the poppet valve is forced wide open, permitting the pumps to unload through port C to the reservoir. After the pumps have unloaded, and the pressure in the accumulator has dropped to 800 lbs./sq.in., the springs force the valve back to the position shown. The piston then returns to its normal position. The oil behind the piston flows back through the diagonal duct, out through the holes in the lap-fitted valve, and dumps into port C to the reservoir. The diagonal duct extending from the chamber at the head of the plunger to port C takes care of leakage past the plunger or piston.

*(b)* REMOVING AND DISASSEMBLING HYDRAULIC SYSTEM UNLOADING AND RELIEF VALVE.—When disassembling the unloading and relief valve remove the adjusting bolts before removing the ends. As there is a slight spring tension against the ends of the valve, it will tend to fly apart. If plunger or valve needs replacing the body must be replaced also as these parts are lap-fitted and must be stocked as a unit.

*(c)* ASSEMBLING AND INSTALLING HYDRAULIC SYSTEM UNLOADING AND RELIEF VALVE.—To facilitate assembling the unloading and relief valve, some means of compressing the springs should be used, although it is possible to do it by hand. If at all possible, testing of the unit should be made before installation.

*(d)* TESTING AND ADJUSTING HYDRAULIC SYSTEM UNLOADING AND RELIEF VALVE.—Although the unloading and relief valves can be tested and adjusted while installed on the airplane, it is advisable to use test equipment whenever possible. To adjust these valves, turn adjusting screws clockwise to increase the pressure required to actuate the valves. Adjust the relief valve to relieve at a pressure of 1100 to 1200 lbs./sq.in., and the unloader to unload at a pressure of 1000 to 1050 lbs./sq.in.

(4) HYDRAULIC SYSTEM THERMAL RELIEF AND EXHAUST VALVE.

*(a)* DESCRIPTION.—The accumulator thermal relief and exhaust valve (NA 82-58098) is located on the

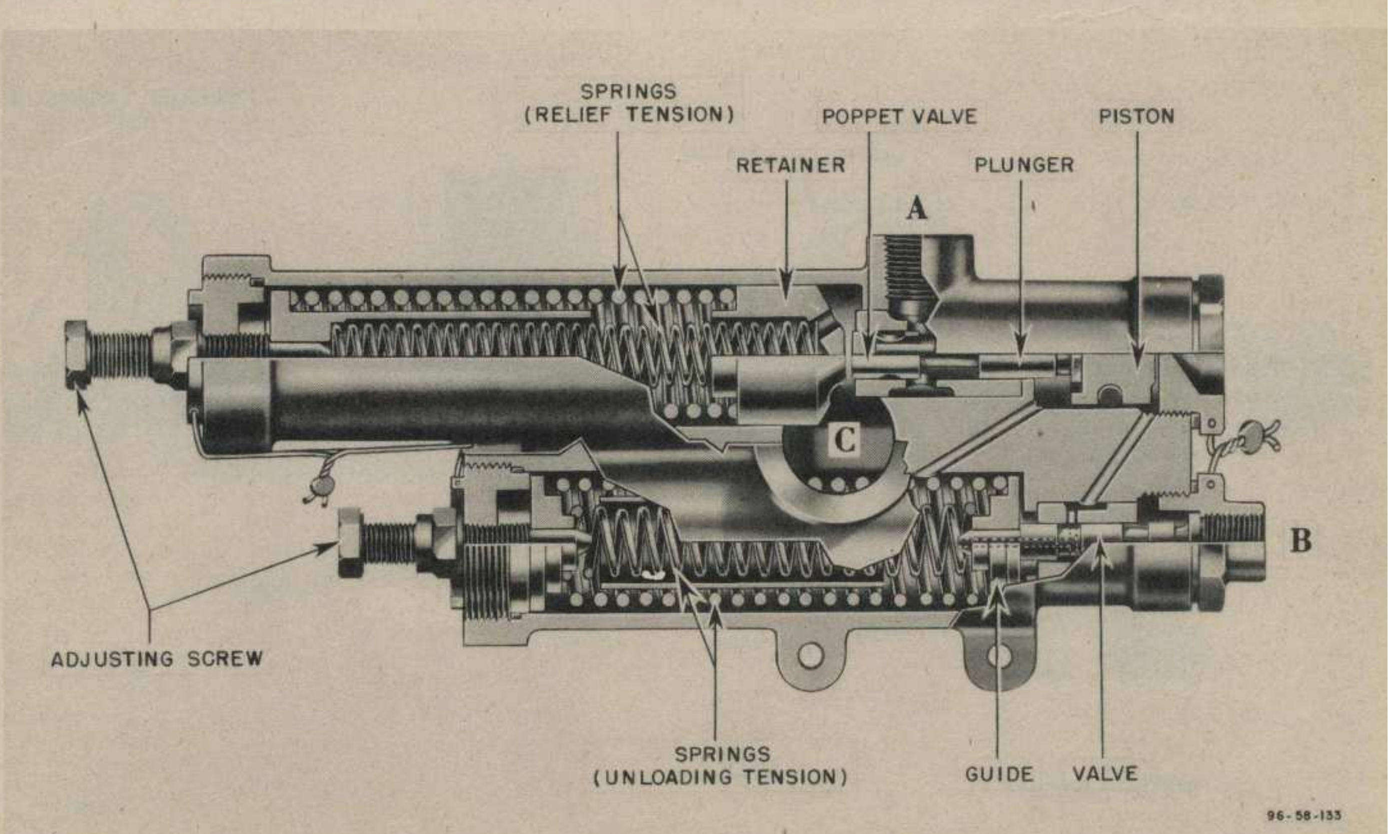



**Figure 164 — Engine Pump Unloading and Relief Valve**

rear wall of the nose gear well. *(See figure 165.)* A one-way check valve in the unit maintains the one-way direction of flow from the general system and from the hand-pump. This check contains a lap-fitted valve. The entire assembly must be stocked as a unit and replaced as such. The ball valve functions as a thermal relief valve and as a safeguard against too high a pressure being applied by the hand-pump. Loosening the bolt allows the valve to unseat, permitting oil to flow out the system return port to the reservoir. Carefully check the bolt to see that the valve is always properly seated, except when exhausting the pressure. The locknut should always be screwed down when the valve is closed.

*(b)* TESTING AND ADJUSTING HYDRAULIC SYSTEM THERMAL RELIEF AND EXHAUST VALVE.

*1.* Screw pressure exhausting bolt all the way down and apply 1000 lbs./sq.in. at brake accumulator port; system pressure and system return ports should not leak.

*2.* Apply pressure at brake accumulator port; relief valve should be set to relieve at 1400 to 1600 lbs./sq.in.

*3.* Unscrew pressure exhausting bolt about 8 turns; there should be free flow from system pressure port to system return port.

*4.* Plug system return port and apply 2000 lbs./sq.in. at brake accumulator port and check for external leaks.

(5) HYDRAULIC SYSTEM PRESSURE ACCUMULATOR.

*(a)* DESCRIPTION.

*1.* EARLY AIRPLANES.—The NA 62-58376 accumulator used on all B-25C Airplanes, and all B-25D Airplanes except the B-25D-35 block, consists of a tubular steel housing with the lower head welded in place. *(See figure 166.)* A butadiene diaphragm is inserted in the housing. The top of the diaphragm is flared out to form the gasket between the housing and the upper head, which is bolted in place. This keeps the head .040 inch off the body, preventing the cracking of the diaphragm. To prevent the extrusion of the diaphragm through the port when the hydraulic pressure has been exhausted, the port has been covered with a perforated plate, and the bottom of the accumulator is reinforced with fabric. Three small feet molded into the bottom of the diaphragm hold it off the port

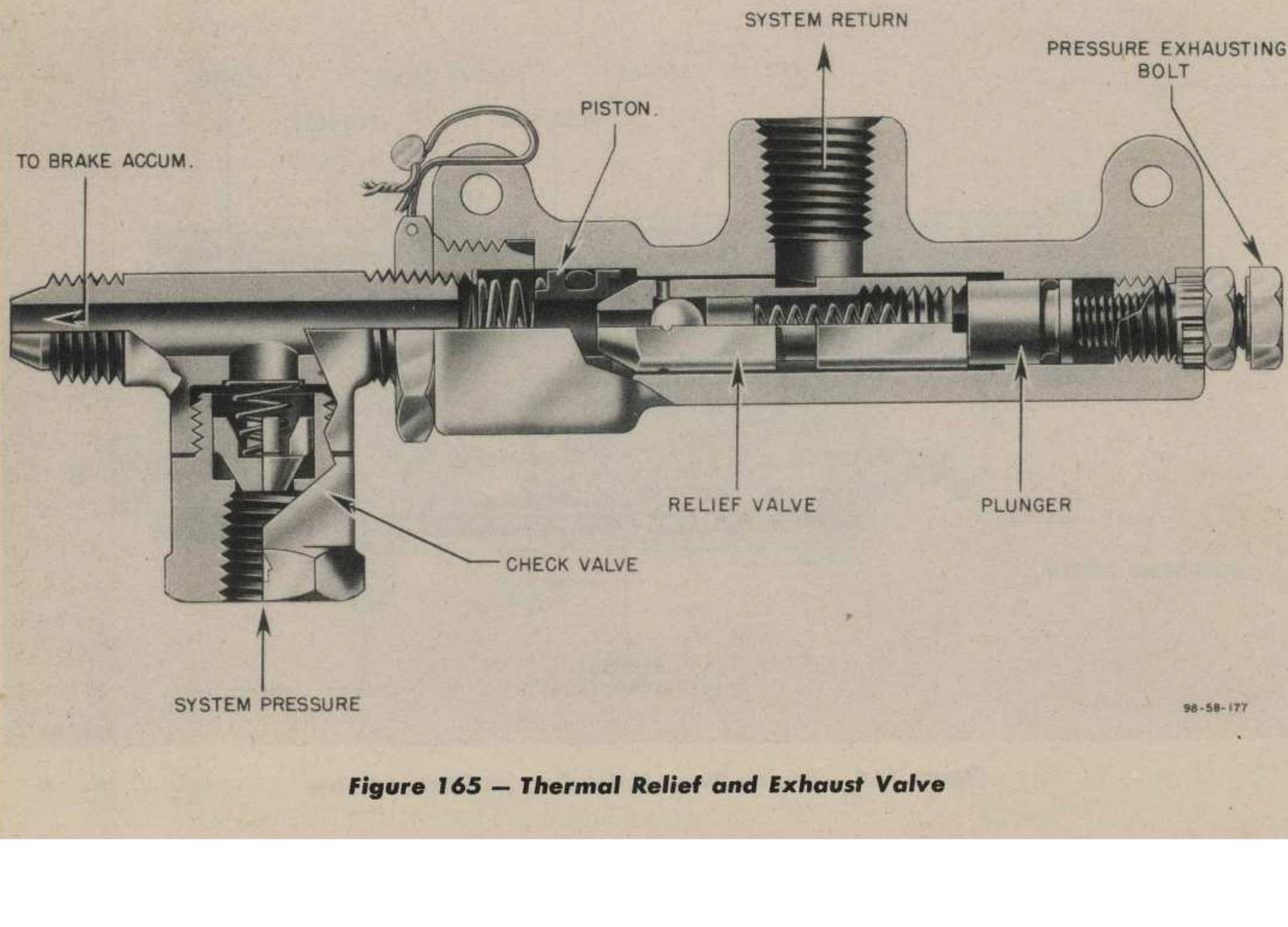
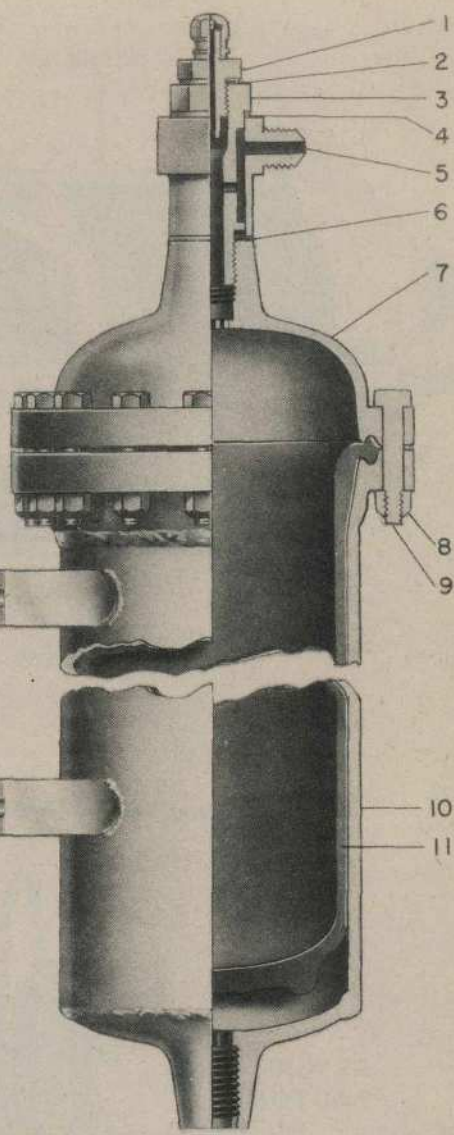



**Figure 165 — Thermal Relief and Exhaust Valve**

so that oil can flow in and out freely. Both accumulators are in the lower right front corner of the navigator's compartment. The rear accumulator serves the general system; the other serves the brake system. A one-way check valve between the accumulators permits oil from the general system and the hand-pump to enter the brake system, but prevents the oil from flowing back into the general system. Each accumulator is equipped with a pressure gage. A Schrader air filler valve (7607A) is provided. The accumulators should be charged with 400 lbs./sq.in. of air.

2. LATER AIRPLANES.—The NA 98-58376 accumulator *(see figure 167)* used on B-25D-35 Airplanes (AC43-3620 and subsequent) provides adequate thermal expansion for oil in the hydraulic pressure system, and acts as a buffer for shock loads within the system. The accumulator consists of a steel housing and a floating piston which forms two chambers; the upper chamber contains hydraulic oil and the lower contains buffer air. Aluminum ends screwed to the housing are provided with butadiene packing rings to prevent the escape of either oil or air. The floating piston also has butadiene ring seals to prevent leakage of oil to the air chamber, or vice versa. The lower chamber is inflated with air through an air-pressure valve located at the bottom. When hydraulic fluid is pumped into the upper chamber, the piston is forced downward, compressing the air and maintaining equilibrium between the two chambers. Pressure will continue to build up in the accmulator until it reaches the point at which the engine pump unloading valve is set. From then on and until exhausted, the accumulator supplies pressure for the functioning of the engine pump unloading valve. Accordingly, the accumulator pressure should equal the highest system pressure obtained (thermal expansions disregarded) so as to be available for immediate use when the engine pumps are unloaded or inoperative. The air chamber of the accumulator can be inflated on the ground only. A pressure gage below the accumulator indicates pressure in the accumulator only. With the engine pump inoperative and the system pressure exhausted, the gage below the accumulator should register from 375 to 425 lbs./sq.in., and the hydraulic pressure gage on the instrument panel should register zero. When the engine pump is operating, both gages should register approximately the same pressure. A bleeder valve next to the air valve bleeds air from the air chamber.

*(b)* TESTING HYDRAULIC SYSTEM PRESSURE ACCUMULATOR.—Fill air chamber to 425 lbs./sq.in., then fill oil chamber to approximately 1500 lbs./sq.in., and check for external leaks. Soapy water can be used for finding air leaks.




1. STEM ........ AN812
   VALVE CORE ........ AN809
   CAP ........ AN813
2. GASKET ........ AN901-5
3. BOLT ........ 62-58980
4. WASHER ........ 2W1K44-28-32
5. FITTING ........ 62-58979
6. WASHER ........ 2W1K32-28-32
7. HEAD ........ 62-58379
8. NUT ........ AC365-428
9. BOLT ........ AN4-12A
10. BODY ........ 62-51378
11. DIAPHRAGM ........ 62-58377

***Figure 166 — Hydraulic Pressure Accumulator Earlier Airplanes***

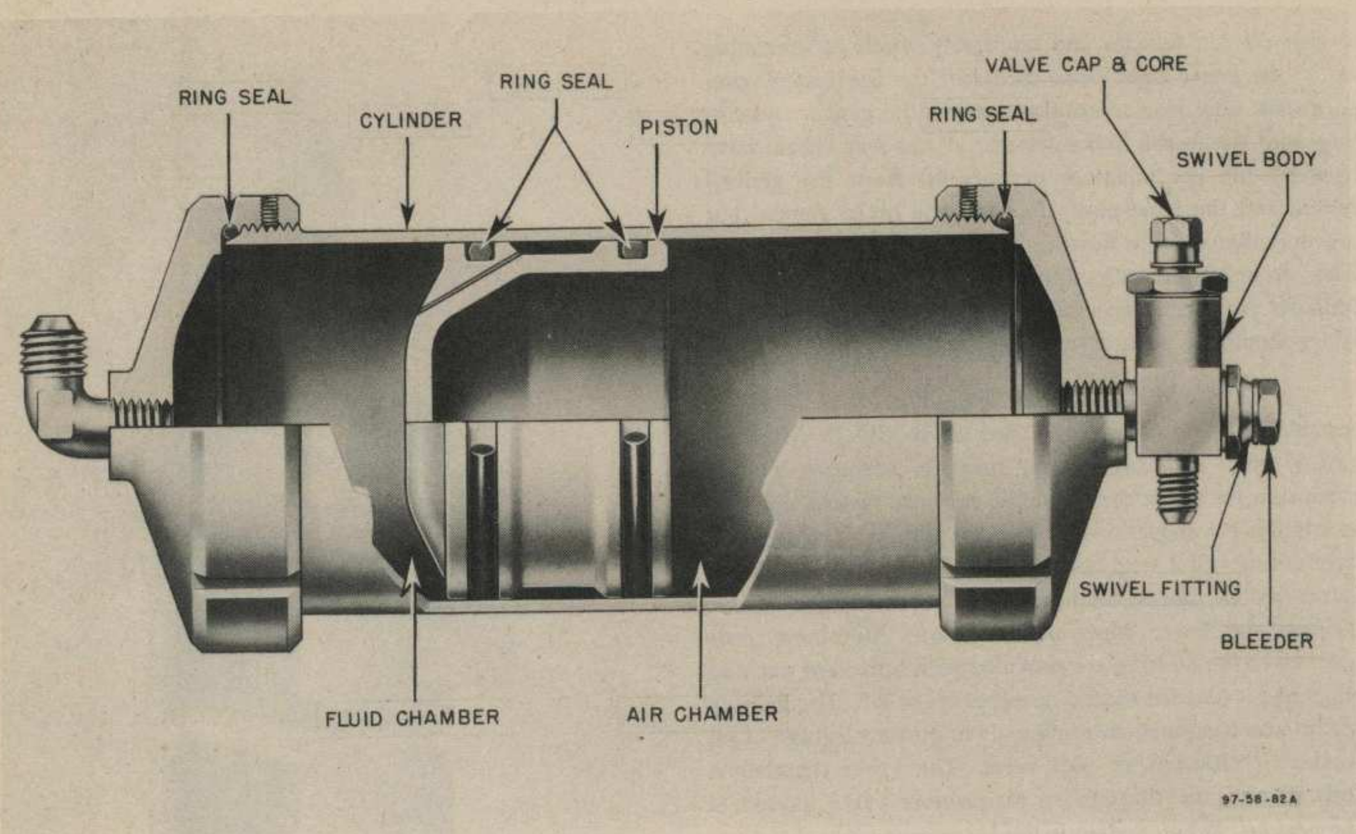



**Figure 167 — Hydraulic System Accumulator Later Airplanes**

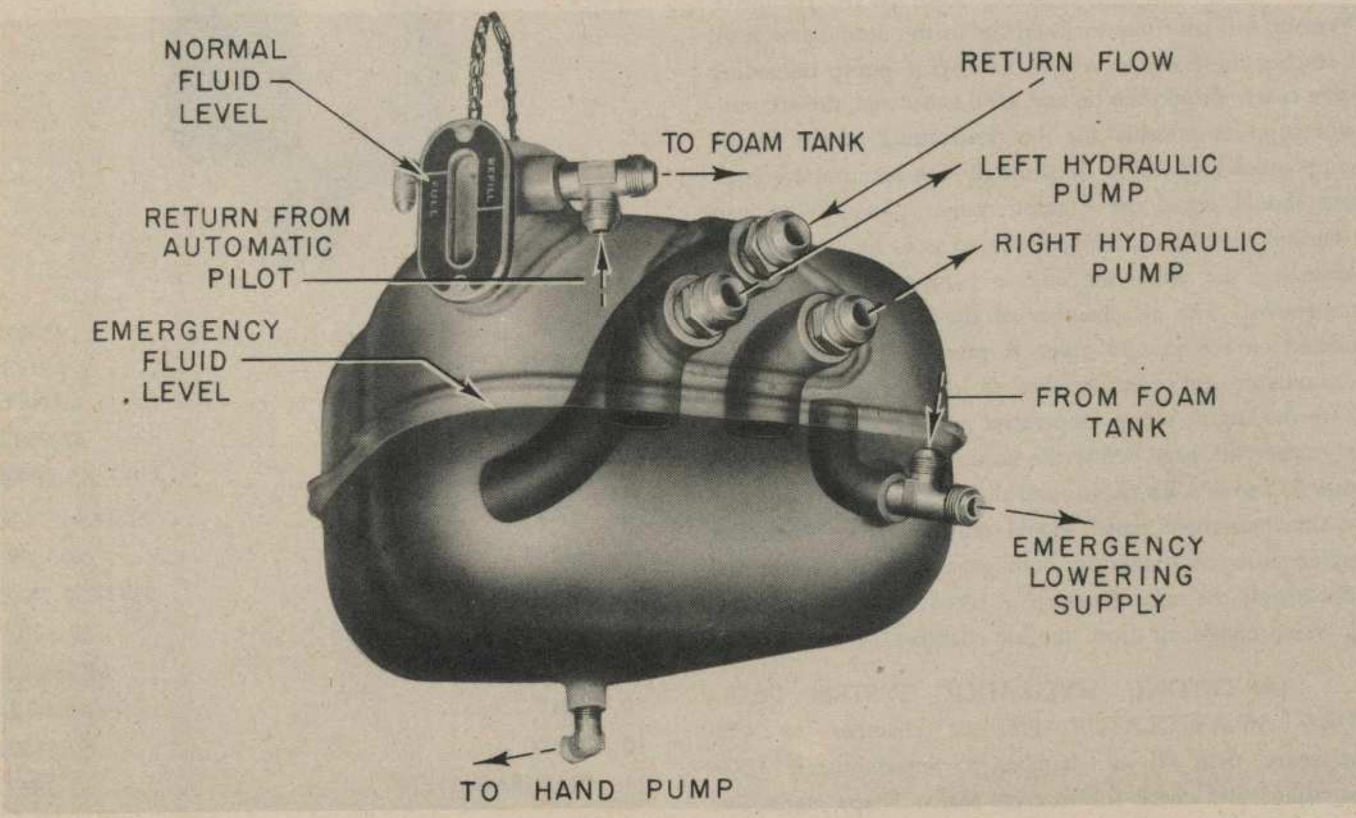



**Figure 168 — Hydraulic System Reservoir**

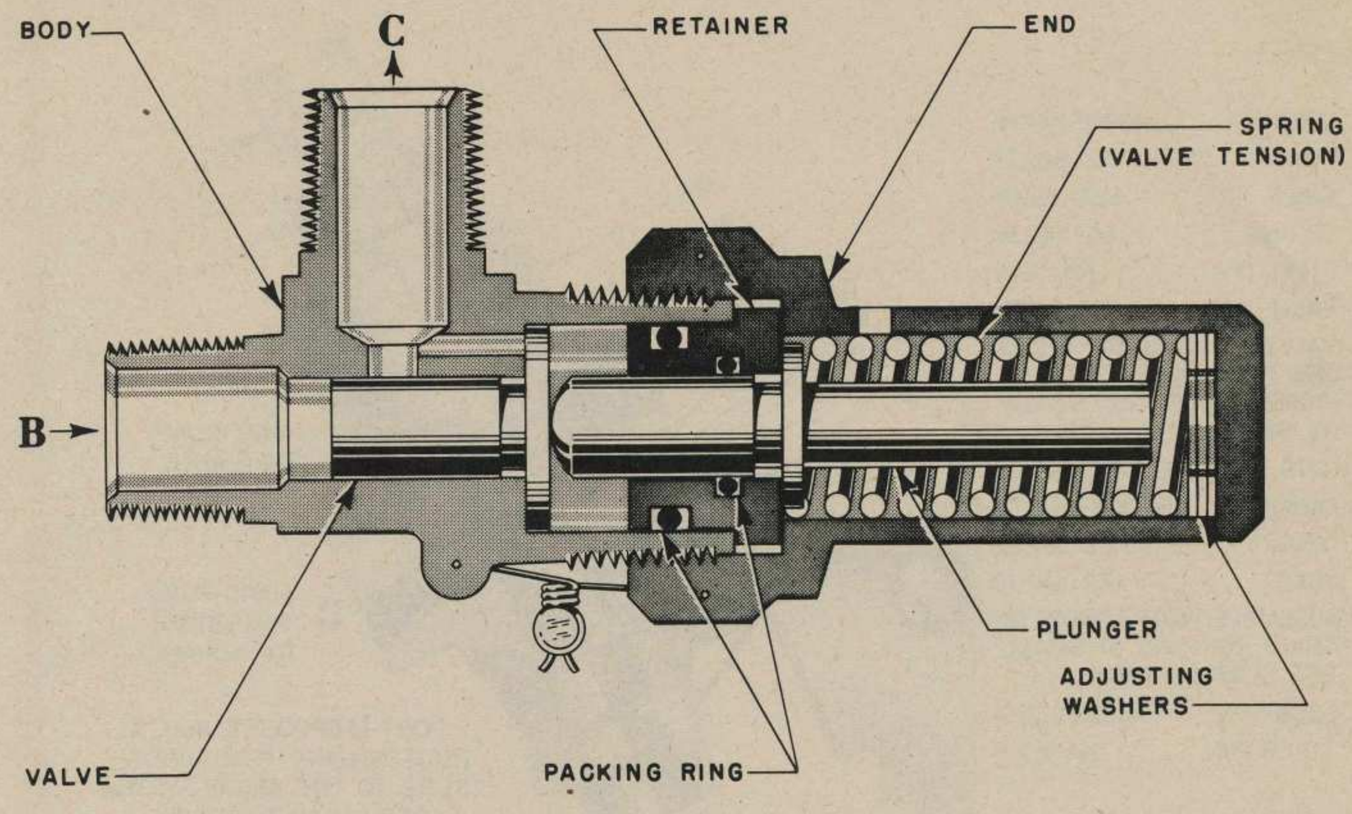



***Figure 169 — Automatic Pilot Sequence Valve***

(6) HYDRAULIC SYSTEM FLUID RESERVOIR.

*(a)* DESCRIPTION.—The hydraulic fluid reservoir *(see figure 168)*, in the right rear corner of the navigator's compartment beneath the navigator's shelf, has a capacity of 5.9 gallons (4.9 Imp. gallons). The filler neck and level gage are accessible when the navigator's riding seat is raised. A standpipe in the reservoir retains a reserve of 2.33 gallons (1.95 Imp. gallons) for the hand-pump. Two ports supply the engine-driven pumps; a third port is for the fluid return; a fourth port, leading from the bottom of the reservoir, supplies the hand-pump. The reservoir is directly connected to a foam tank on the right wall of the navigator's compartment and is vented to the outside through this tank. Clean the filler neck strainer when filling reservoir.

**NOTE**

Do not remove filler cap without first exhausting hydraulic system pressure.

The sight gage is inaccurate unless pressure has been exhausted.

Fill reservoir to full mark.

*(b)* TESTING HYDRAULIC SYSTEM FLUID RESERVOIR.—Test reservoir with about 5 or 10 lbs./sq.in. of air, and check for external leaks.

(7) HYDRAULIC SYSTEM CUNO FILTER.

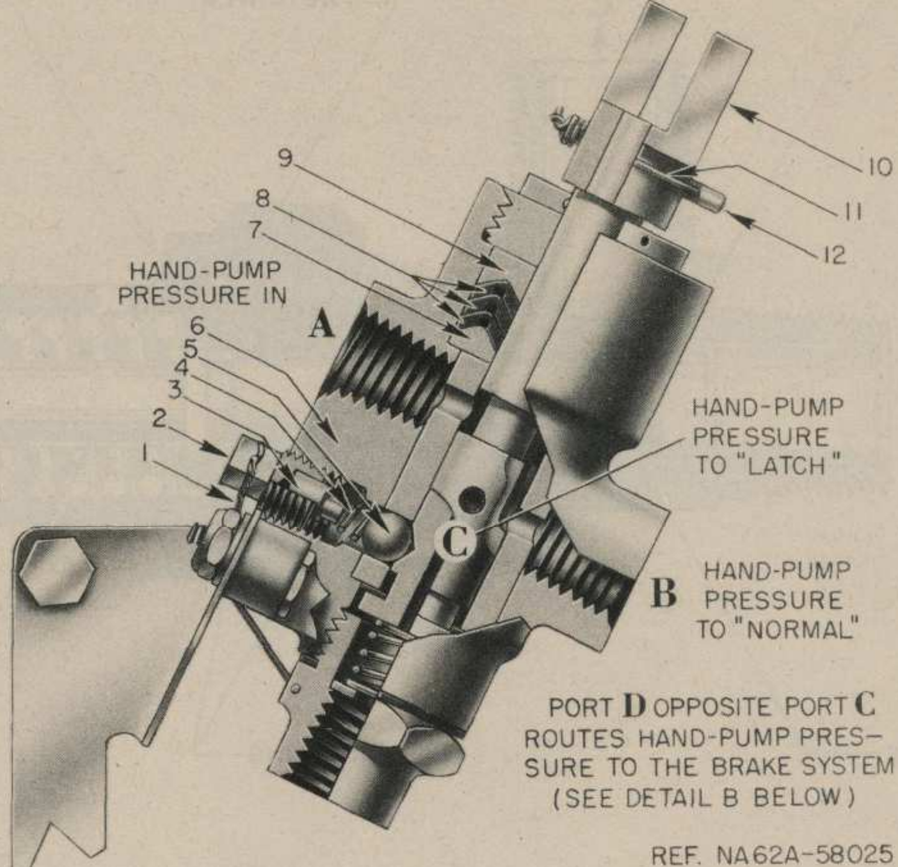
*(a)* DESCRIPTION.—The Cuno filter (No. 10226) is in the right rear corner of the navigator's compartment. It can be cleaned without interrupting the flow. Filtration is obtained by discs through which the flow passes.

*(b)* TESTING HYDRAULIC SYSTEM CUNO FILTER.—Test with about 200 lbs./sq.in. pressure for external leaks. Be sure relief valve in top of filter is operating. The valve is set to open at approximately 20 lbs./sq.in. pressure.

(8) HYDRAULIC SYSTEM AUTOMATIC PILOT SEQUENCE VALVE.—*(Refer to figure 169.)*

*(a)* DESCRIPTION.—The automatic pilot sequence valve (NA 82-58100) is immediately inboard of the hydraulic system fluid reservoir, and is accessible by raising the navigator's riding seat. The valve relieves all pressure over 250 lbs./sq.in. for operation of the automatic pilot.

| | | |
|---|---|---|
| 1. | LOCKWIRE | AC995C40-6 |
| 2. | PLUG | 62-58227 |
| 3. | GUIDE | 62A-58951 |
| 4. | SPRING | 62-58230 |
| 5. | STEEL BALL | 7/32" DIA. |
| 6. | VALVE ASSEM. | 62A-58281 |
| | VALVE SHAFT IS LAP-FITTED INTO BODY. DO NOT DISASSEMBLE AND STOCK AS SINGLE UNIT. | |
| 7. | RING | 62-58228 |
| 8. | PACKING | 5R3G4-0-16 (3) |
| 9. | RING | 62-58222 |
| 10. | YOKE | 62-48100 |
| | ASSEMBLE WITH ARROW ON SHAFT POINTING AT SMALLEST SLOT OF YOKE | |
| 11. | LOCKWIRE | AC995C32-4 |
| 12. | TAPER PIN | 2PI-20-6 |



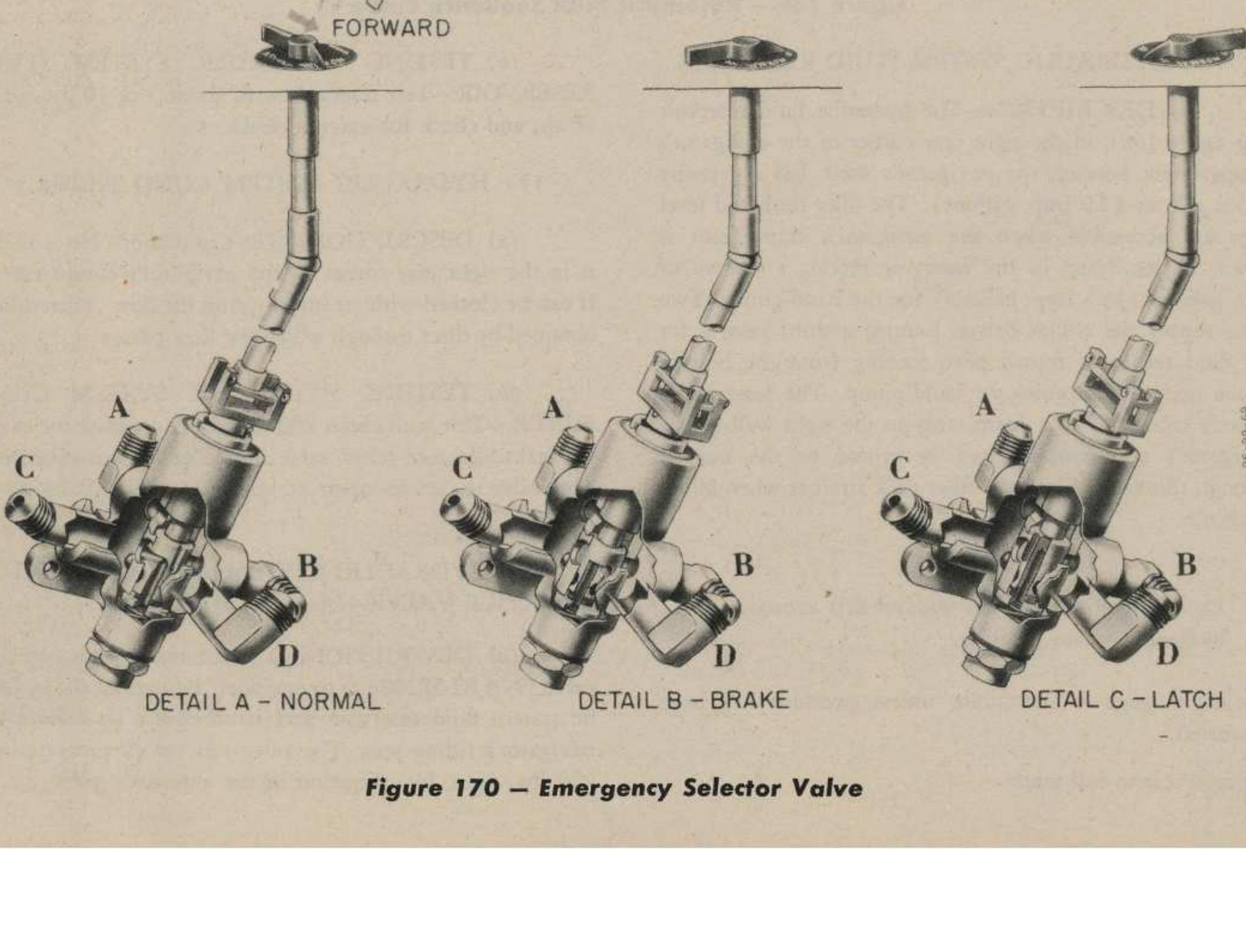
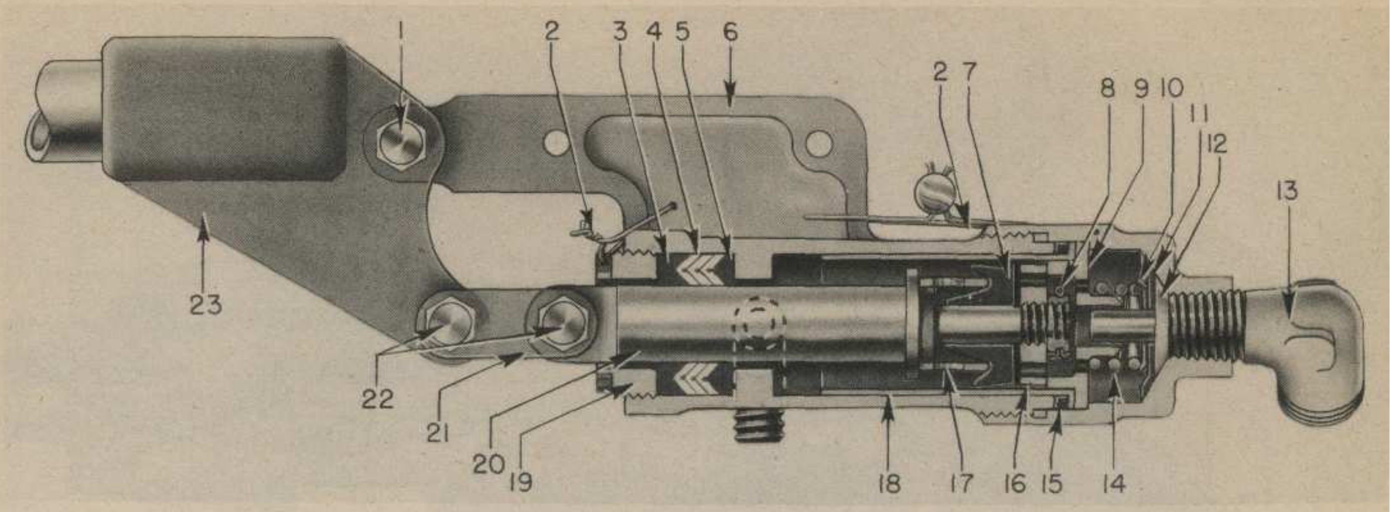




**Figure 170 — Emergency Selector Valve**




REF. NA 62-58024

| | | | |
|---|---|---|---|
| 1. BOLT ............. AN4-21 | 7. CUP .......... B1116 NB | 15. GASKET ...... 51-58101-6 | NUT ........... AN310-4 |
| NUT ............ AN310-4 | 8. COTTER ....... AN380-2-3 | 16. HEAD .......... 25-58018 | COTTER ....... AN380-4-4 |
| COTTER ........ AN380-2-2 | 9. RETAINER ...... 55-58139 | 17. RETAINER ...... 25-58022 | 23. HANDLE |
| 2. LOCKWIRE .... AC995C40-8 | 10. WASHER ....... 62-58259 | 18. LINER .......... 25-51014 | ON EMERGENCY HAND-PUMP ......... 62-58134 |
| 3. RING ........... 55-58157 | 11. WASHER ....... 62-58536 | 19. BEARING ....... 55-58140 | ON LANDING GEAR LOWERING SYSTEM HAND-PUMP ........ 82-58134 |
| 4. PACKING ... B1298G4-0-24 | 12. VALVE ......... 62-58258 | 20. PISTON ........ 25-58016 | |
| 5. RING ........... 55-58158 | 13. ELBOW ....... AC811CT8 | 21. LINK .......... 25-58019 | |
| 6. BODY ........... 62-58185 | 14. SPRING ........ 55-58137 | 22. BOLT ............ AN4-10 | |

***Figure 171 — Emergency Hand-pump***

(*b*) TESTING AND ADJUSTING.—Apply 2 gpm at "B" and adjust valve to relieve at 250 to 275 lbs./sq.in. With 225 lbs./sq.in. at "B" maximum leakage at "C" should be one pint per minute. With "C" plugged, apply 2500 lbs./sq.in. at "B" and inspect for leaks. For adjustment of relief pressure, add or remove washers between the valve end and tension spring.

(9) HYDRAULIC SYSTEM AUTOMATIC PILOT SHUT-OFF VALVE.—*(Refer to figure 189.)*

(*a*) DESCRIPTION.—The automatic pilot shut-off valve (NA 62-58065) is identical to the nose gear up-latch timing valve except for the groove in the poppet valve. The valve must be grooved after it has been lap-fitted.

(*b*) TESTING AND ADJUSTING HYDRAULIC SYSTEM AUTOMATIC PILOT SHUT-OFF VALVE.—With 1000 lbs./sq.in. at port "A," the groove should allow ¾ to 1¼ pints per minute leakage. With port "A" plugged, apply 2000 lbs. pressure at "B" and check for external leakage.

(10) EMERGENCY HYDRAULIC SYSTEM SELECTOR VALVE.—*(Refer to figure 170.)*

(*a*) DESCRIPTION.—The emergency system selector valve (NA 62A-58025) directs hand-pump pressure through the selected emergency lines. The selector valve, located in the lower left rear corner of the nose gear well, is operated by a handle at the rear of the pilot's lower control pedestal. A rod interconnects the control with the yoke of the valve stem. A small ball detent indicates the position of the valve. The name plate on the valve has these three positions:

*1.* "NORMAL."—In this position the hand-pump supplies pressure to the general system.

*2.* "BRAKES."—In this position the hand-pump supplies pressure to the brake system.

*3.* "LATCH."—In this position the hand-pump supplies pressure to force the down-latch plunger to the lock position.

(*b*) TESTING AND ADJUSTING EMERGENCY HYDRAULIC SYSTEM SELECTOR VALVE.—Apply 2500 lbs./sq.in. and check for external leaks. Be sure that the arrow on shaft is pointed at the smallest slot of the yoke.

(11) EMERGENCY HYDRAULIC SYSTEM HAND-PUMP.

(*a*) DESCRIPTION.

*1.* EARLY AIRPLANES.—The NA 62-58024 hand-pump *(see figure 171)* used on all B-25C Airplanes, and on B-25D Airplanes prior to B-25D-35, is located

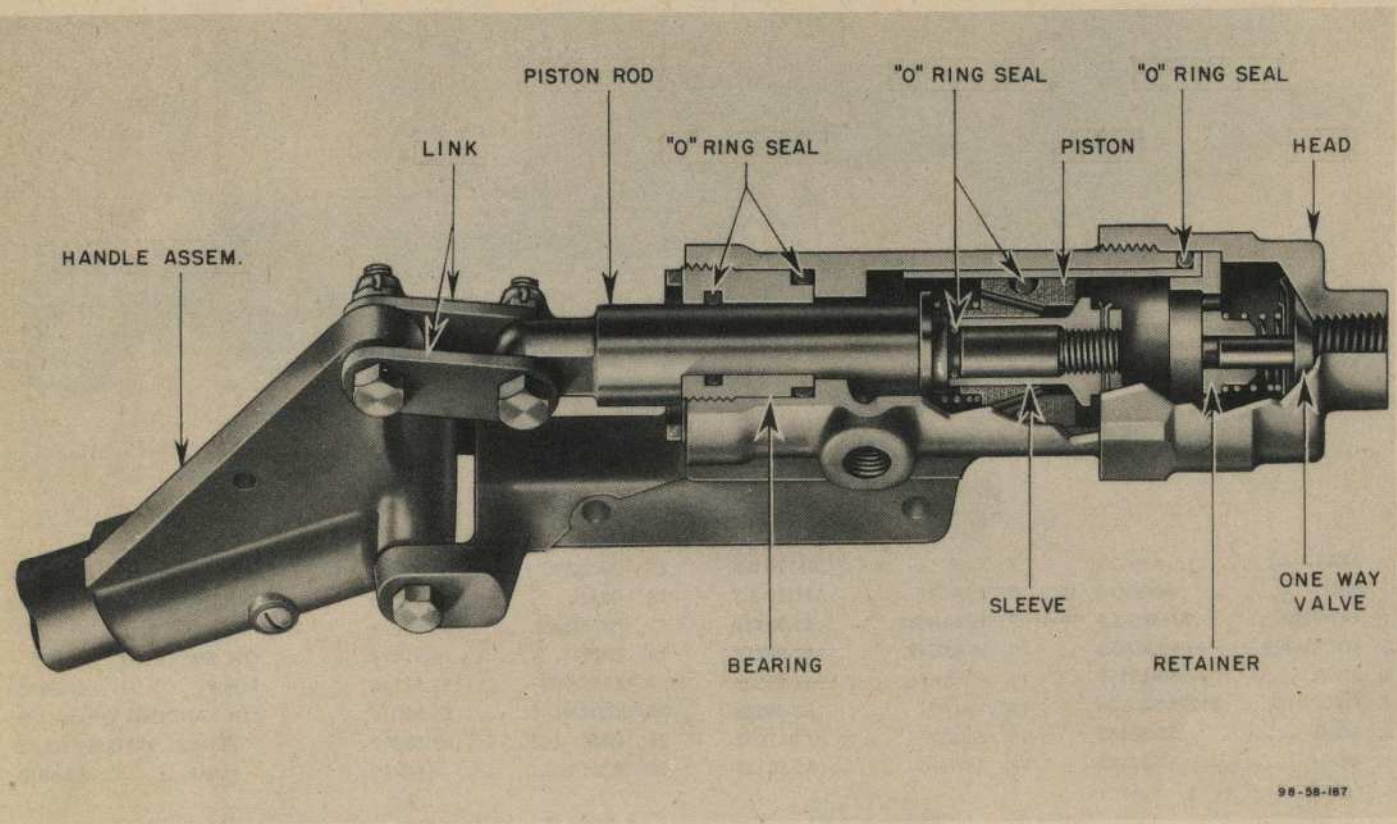



**Figure 172 — Hydraulic System Hand-pump**

between the pilot's and copilot's seats, and is operated by the handle on the pedestal. For access to the pump remove the name plate cover of the pedestal. The pump, of the double-action differential type, pumps oil into the system with both strokes, and is fed from the reservoir by a special line connected to a port in the bottom of the reservoir. Since the engine-driven pumps are connected to a standpipe arrangement in the reservoir, the hand-pump always has a reserve of approximately 2½ gallons (2.1 Imp. gallons). Oil enters the pump through port A, unseating the valve (12) as the piston head (18) is moved when the handle is pulled. The metal poppet valve is backed by a synthetic rubber washer. If a small particle of dirt holds the poppet slightly open, the synthetic rubber washer will still seal properly. Oil flows through the piston past a flexible synthetic rubber cup, which permits the flow in only one direction. Since the piston rod has about half the cross-sectional area of the piston, there is room for only half the oil when the oil has passed the piston. This causes half the oil to be forced out port B on the push stroke. On the pull stroke, the remaining oil is forced out port B to the hydraulic system.

2. LATER AIRPLANES.—The hand-pump (NA 98-58024) used on B-25D-35 Airplanes is approximately the same as the pump described above, with the exception of the packings, which are "O" rings, and the piston. *(See figure 172.)*

**Key to Figure 173**

1. Main Gear Down-Lock Release Cylinder ............... 62-58092
2. Main Gear Timing Valve ............................ 82-58067
3. Main Gear Operating Strut ......................... 62-58026
4. Main Gear Down-Latch Release Cylinder .............. 62-58093

*(b)* TESTING EMERGENCY HYDRAULIC SYSTEM HAND-PUMP.—Apply 2500 lbs./sq.in. and check for external leaks.

(12) HYDRAULIC SYSTEM FOAM ARRESTER TANK.

*(a)* DESCRIPTION.—The foam tank (NA 62-58959) is on the right side of the navigator's compartment above the hydraulic reservoir. Several layers of baffle plates inside the tank hold the foam until it condenses, and fluid then returns to the reservoir through a line at the bottom of the foam tank.

*c.* LANDING GEAR HYDRAULIC SYSTEM.

**NOTE**

Although the main landing gear and nose gear are operated simultaneously by a single control, each has individual features. Therefore they are segregated in this paragraph, where they are referred to as main landing gear and nose gear.

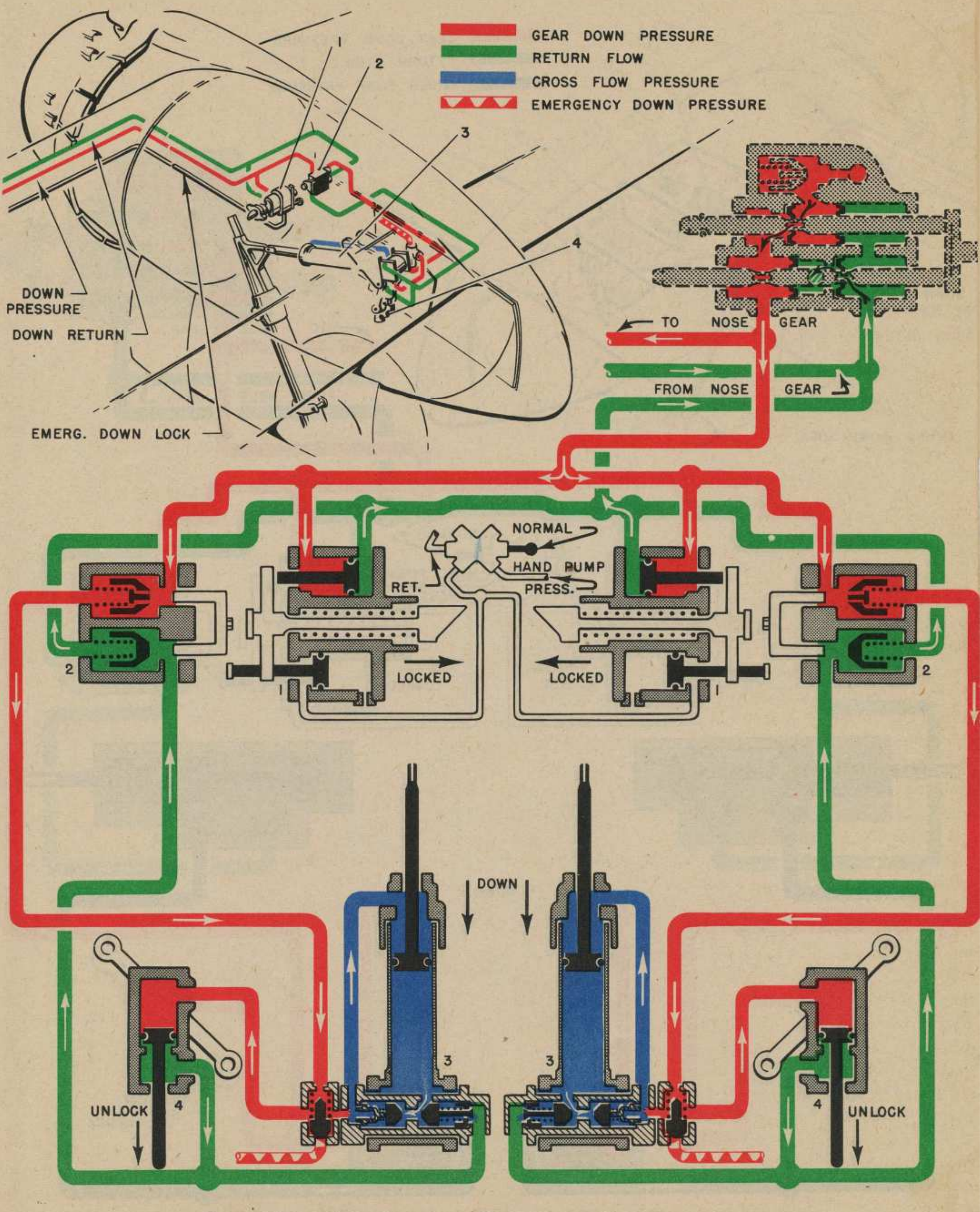



*Figure 173 — Main Gear Extending—Hydraulic System Flow Chart*

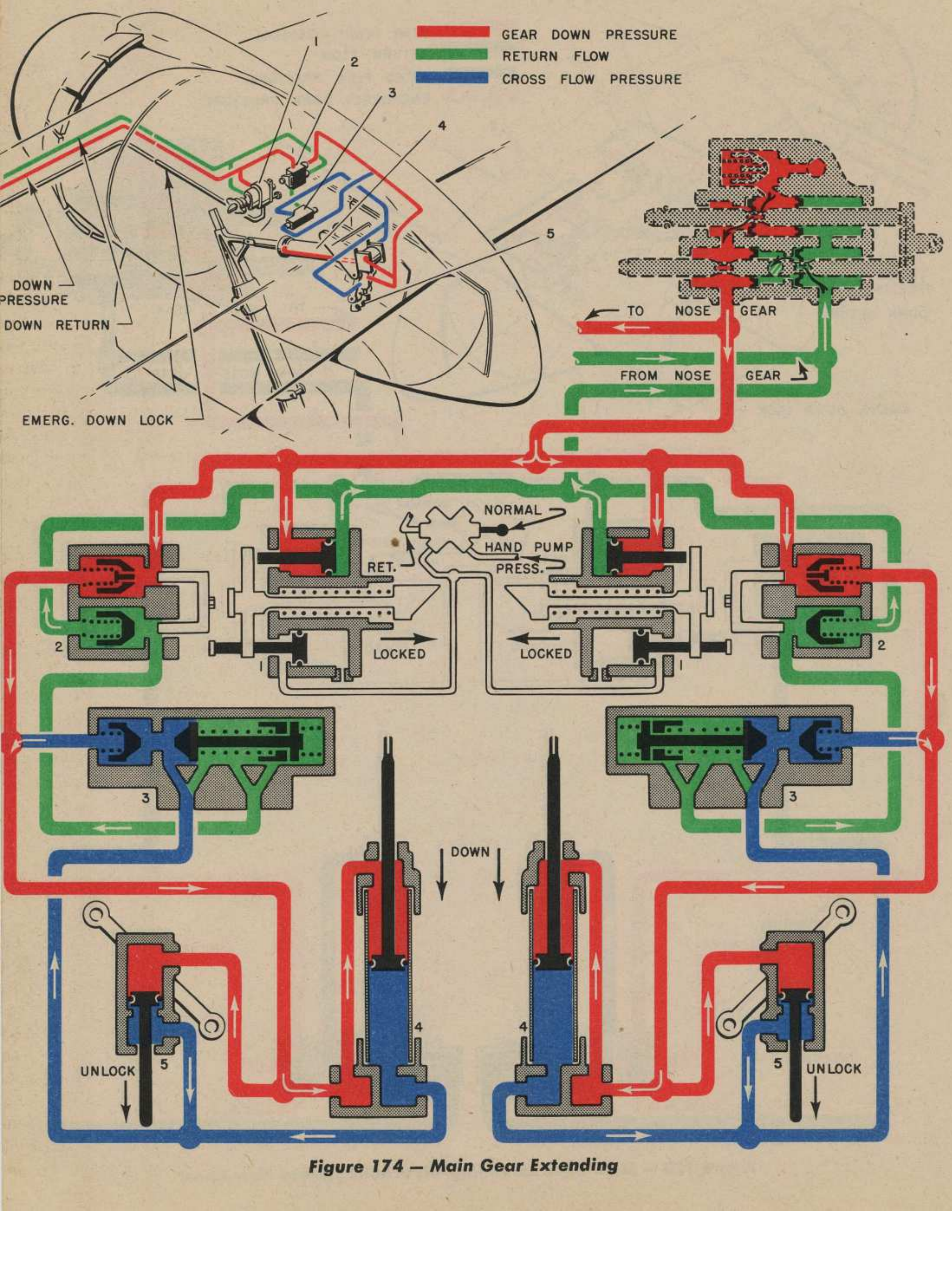



***Figure 174 — Main Gear Extending***

(1) DESCRIPTION.

*(a)* MAIN LANDING GEAR HYDRAULIC SYSTEM EXTENSION.—The normal cycle of operations upon extension of the main landing gear is as follows: Gear is released from up-lock; falling gear mechanically opens fairing doors to permit gear to pass, then mechanically closes them again, except the small rear fairing door which remains open to provide a gap for the extended strut; gear is locked in the down-position. Upon retraction, the gear is released from the down-lock; fairing doors are opened mechanically as gear retracts and are then closed; gear is locked in the up position. When system pressure is employed to lower the gear *(see figures 173 and 174)*, fluid flows to the down-lock valves (1) to lock the latches preparatory to receiving and retaining the gear, then flows on unrestricted through the timing valves (2) to the down sides of the gear actuating struts (4), which cannot be moved as they are still locked up, and finally to the up-lock valves (5) to actuate the up-latch and thereby release the gear from the up and locked position. Since, because of its weight, the gear falls faster than the engine-driven pumps are able to supply fluid to fill the operating struts, the cross-flow valves (3) by-pass fluid forced from the up side to the down side of the struts during this initial rapid travel of the gear toward the extended position. This procedure brings about smoother operation and considerably reduces the time required to complete the extension stroke. However, when the engine-driven pumps finally catch up with the operation, a point is reached where pump pressure equals and then exceeds the pressure created in the return oil forced from the up side of the strut by the falling gear. At this point pump pressure will take over to complete the extension stroke and, at the same time, automatically reposition the cross-flow valves to route the remainder of the strut's return oil back to the reservoir.

*(b)* MAIN LANDING GEAR HYDRAULIC SYSTEM RETRACTION.—When the operation is reversed to retract the gear *(see figures 175 and 176)*, system pressure flows to the landing gear timing valves, where it is temporarily blocked pending the release of the gear from the down and locked position. As the down-lockpins tend to bind when under a load, it is necessary to release the gear from the down-locked position before admitting pressure to the retracting struts. Pressure is therefore applied to the down-

**Key to Figure 174**

1. Main Gear Down-Lock Release Cylinder . . . . . . . . . . . . . . 62-58092
2. Main Gear Timing Valve . . . . . . . . . . . . . . . . . . . . . . . . . . 82-58067
3. Main Gear Operating Strut . . . . . . . . . . . . . . . . . . . . . . . . 62-58026
4. Main Gear Down-Latch Release Cylinder . . . . . . . . . . . . . . 62-58093

**Key to Figures 175 and 176**

1. MAIN GEAR DOWN-LOCK RELEASE CYLINDER . . . . . . . . 62-5809
2. MAIN GEAR TIMING VALVE . . . . . . . . . . . . . . . . . . . . . . . . 82-5806
3. MAIN GEAR CROSS-FLOW VALVE . . . . . . . . . . . . . . . . . . 62A-5807
4. MAIN GEAR OPERATING STRUT . . . . . . . . . . . . . . . . . . . . . 62-5802
5. MAIN GEAR DOWN-LATCH RELEASE CYLINDER . . . . . . . . 62-5809

lock valves to retract the down-lockpins. As this function i completed and the gear is free to move, the pins als mechanically depress the timing valve plungers, whereupo pressure flow blocked at this point is released to complet the retraction stroke. The timing valve plungers are ad justed in such a manner that the poppet which blocks th return flow from the down side of the operating strut bac to the reservoir is depressed .010 inch sooner than the pres sure flow is established to retract the gear. Released pressur flow is then distributed simultaneously to the actuatin struts and to the up-latches to lock them preparatory t receiving and retaining the gear when the retraction strok is completed. As the gear starts moving, the fairing doors interconnected with the struts, open to permit the gear t pass and then close again, as the gear snaps into the up-latc to accomplish the retraction stroke.

*(c)* NOSE GEAR HYDRAULIC SYSTEM—EX TENSION.—Upon extension of the gear, the normal se quence of operations is as follows *(see figures 177 and 178)* Gear is released from the up-latch; gear falls, mechanicall opening the fairing doors to permit gear to pass and the closing them again, with the exception of the small forwar spring-loaded door which is held open by the extende gear; gear is locked in the extended position. Landing gea down pressure flows to the down-lock to lock the latc preparatory to receiving and retaining the gear in the ex tended position; to the up-lock timing valve, where it i temporarily blocked pending the retraction of the up-latch to the up-latch lock to disengage the gear from the up locked position. Inasmuch as the up-lock tends to bin under a load, system pressure must not be permitted t actuate the operating strut until the gear is safely release from the up-locked position. This is accomplished by timing valve in the circuit which, upon release of the up latch, mechanically trips the timing valve plunger which i turn unseats the poppet to establish pressure flow to th extension side of the operating strut. As the gear com mences to extend, mechanical linkage attached to the shoc strut opens the fairing doors and, as soon as the gear ha passed, closes them again. All that is now left is for th operating strut to accomplish the extension stroke, and a the gear snaps into the down-latch, the operation is com pleted. A restrictor valve in the nose wheel up pressure lin ahead of the operating strut limits the speed of the gea

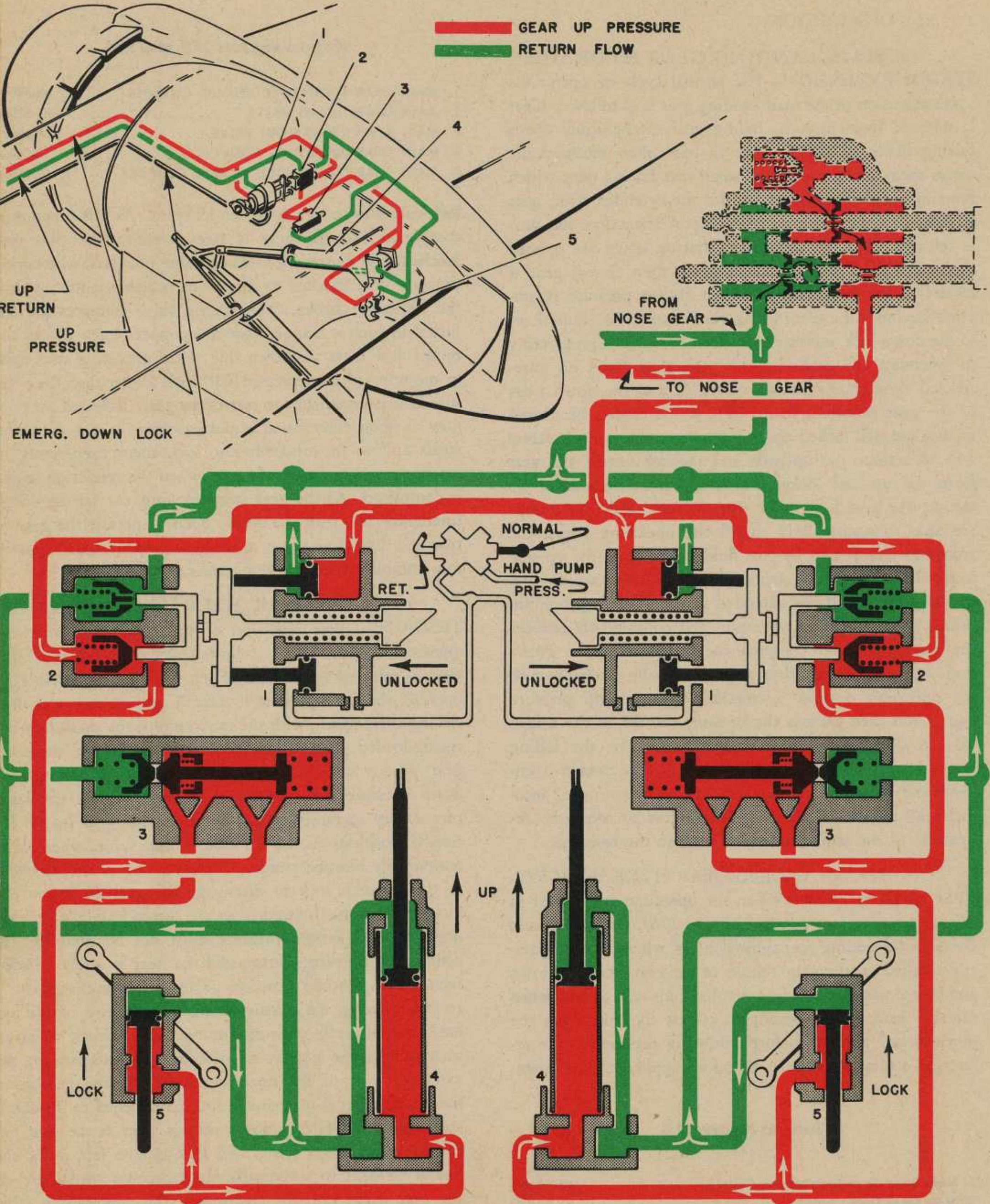



*Figure 175 — Main Gear—Three-fourths Up*

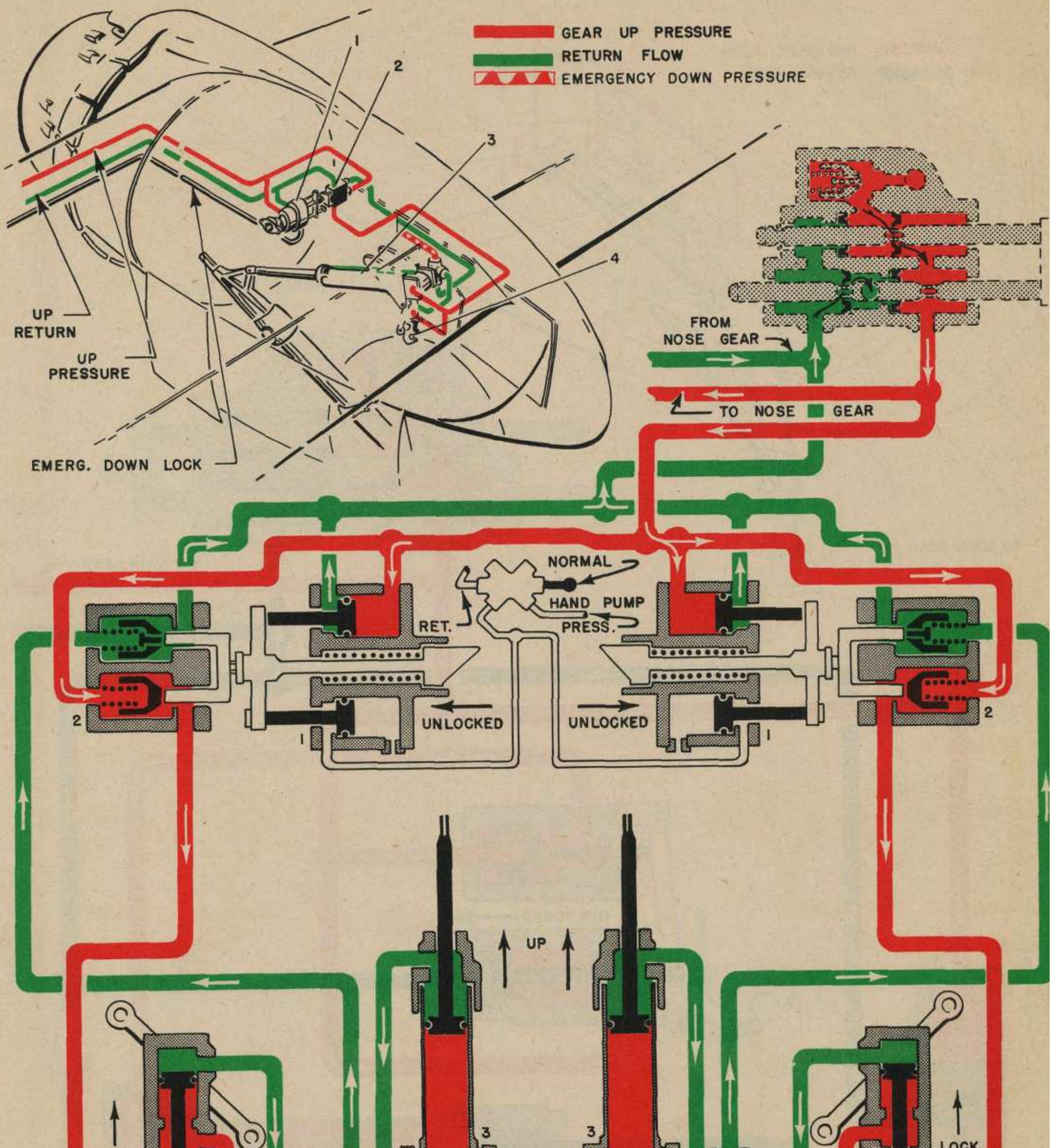



*Figure 176 — Main Gear Three-fourths Up Hydraulic System Flow Chart*

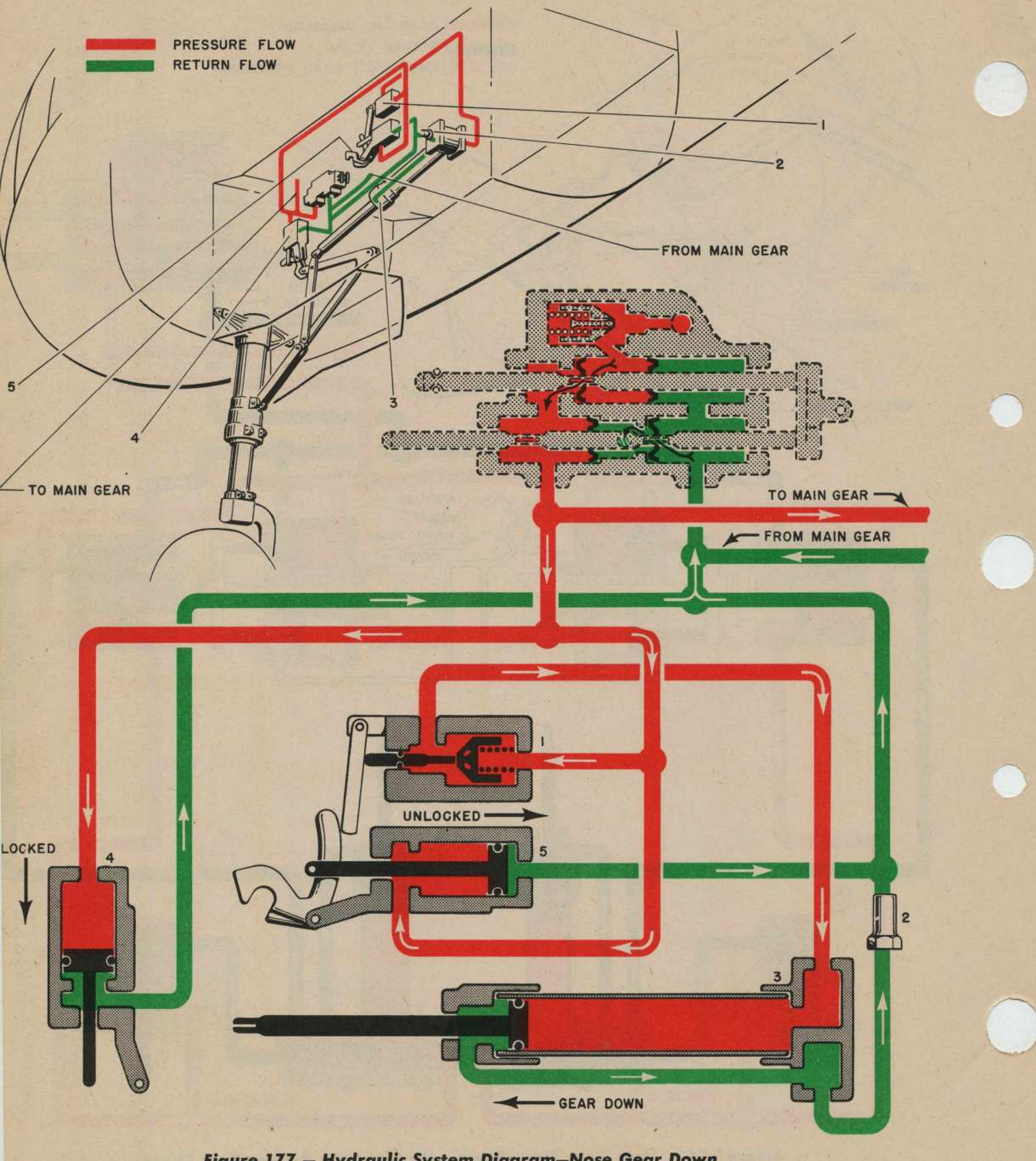



*Figure 177 – Hydraulic System Diagram–Nose Gear Down*

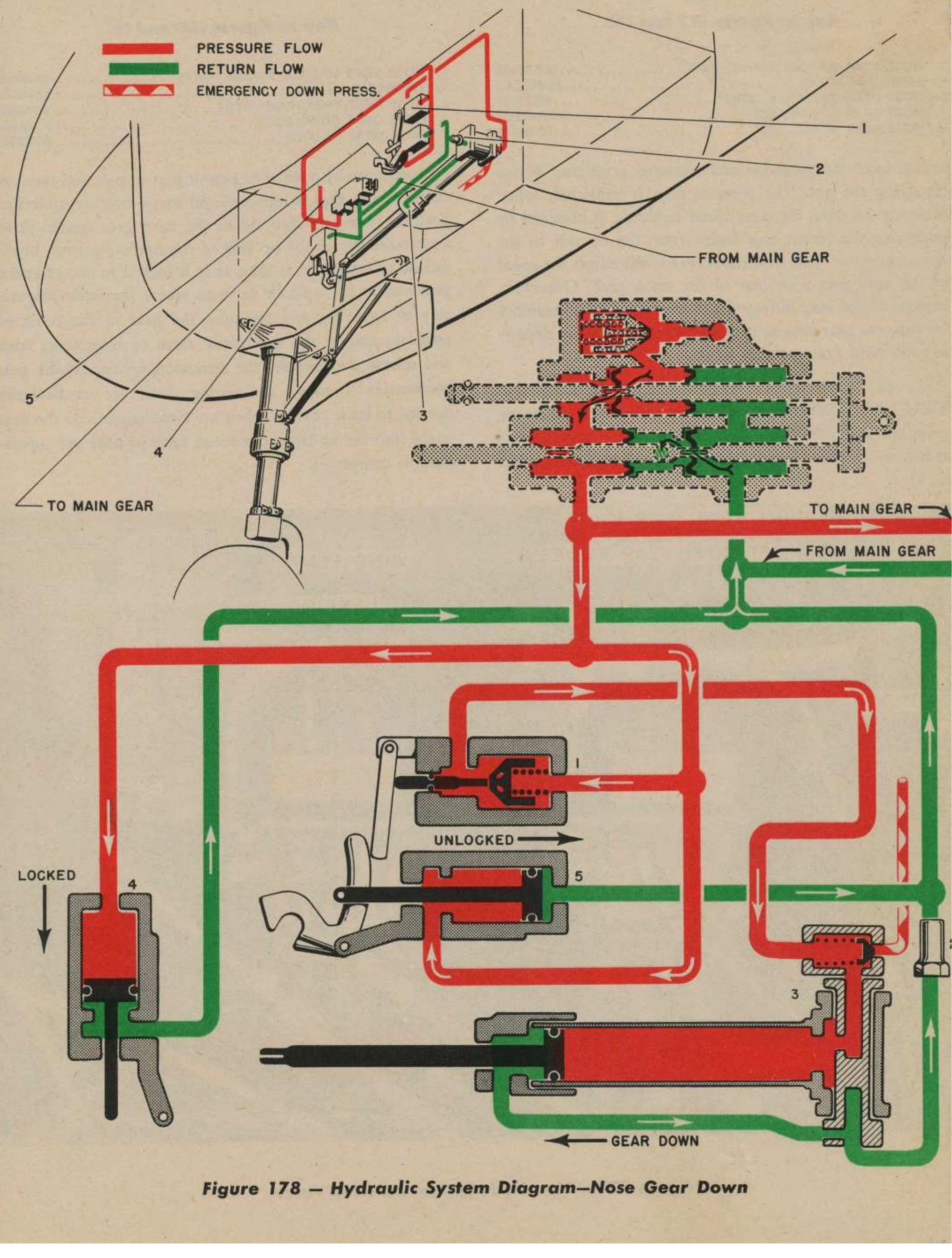



***Figure 178 — Hydraulic System Diagram—Nose Gear Down***

**Key to Figures 177 and 178**

1. NOSE GEAR UP-LOCK TIMING VALVE ...............62-58065
2. RESTRICTOR VALVE ...............................62-58084-2
3. NOSE GEAR OPERATING STRUT .....................62-58028
4. NOSE GEAR DOWN-LOCK .........................62-58029-2
5. NOSE GEAR UP-LOCK ................................62-58029

toward both the extended and retracted positions. When retracting the gear, the pressure flow is restricted; when lowering the gear, the same speed reduction is obtained by restricting the return flow forced from the up side of the operating strut. This flow restriction synchronizes the speed of the nose gear with that of the main gear. Otherwise, because of the load differential, there would be a tendency for the nose gear strut to complete its stroke first by depriving the main gear struts of fluid.

*(d)* NOSE GEAR HYDRAULIC SYSTEM—RETRACTION.—When the operation is reversed to retract the gear *(see figures 180 and 181)*, the sequence of operations is as follows: Gear is released from the down-lock; fairing doors

**Key to Figures 180 and 181**

1. NOSE GEAR UP-LOCK TIMING VALVE ...............62-58065
2. RESTRICTOR VALVE ...............................62-58084-2
3. NOSE GEAR OPERATING STRUT .....................62-58028
4. NOSE GEAR DOWN-LOCK .........................62-58029-2
5. NOSE GEAR UP-LOCK ................................62-58029

are mechanically opened to permit gear to pass and then are closed again; gear is retracted and snaps into the up-locked position. Pressure directed to the nose gear system flows simultaneously to the up side of the operating strut, but is unable to actuate it as long as it is locked in the extended position; to the up-lock valve to secure the latch preparatory to receiving and retaining the gear in the retracted position; and to the down-lock valve to retract the latch and release the gear for the retraction stroke. As the gear commences to move, the fairing doors are mechanically opened to let it pass and then are closed again. As the gear snaps into the up-latch, the entire cycle of nose gear operations is completed.

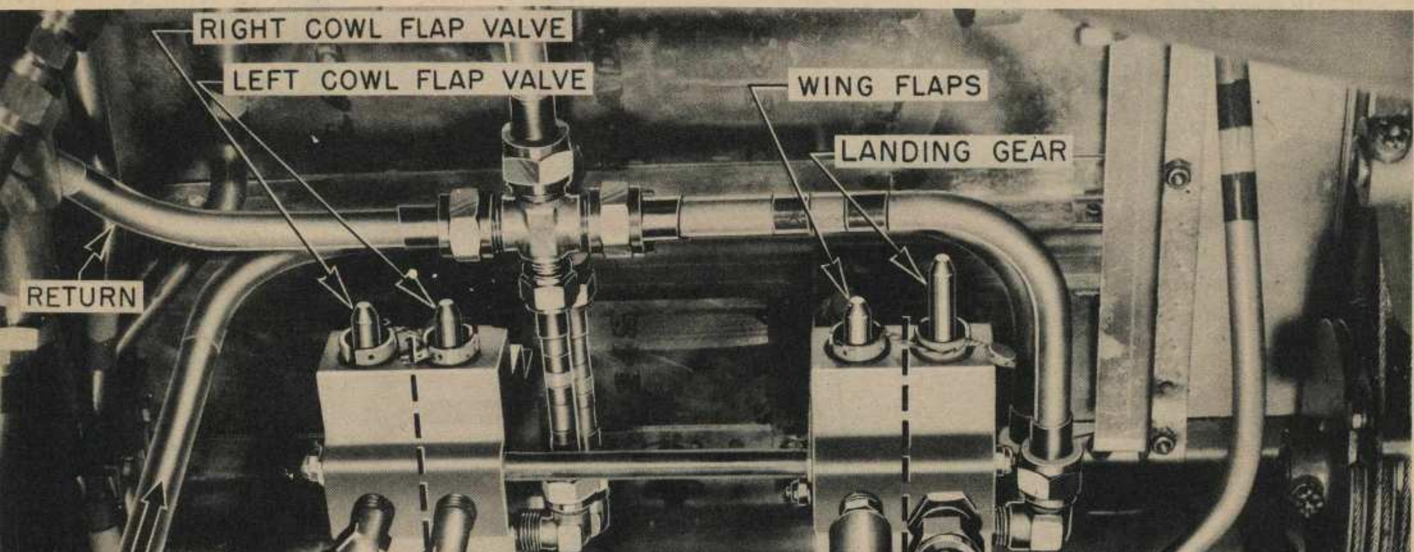



**Figure 179 — Hydraulic System Selector Valve**

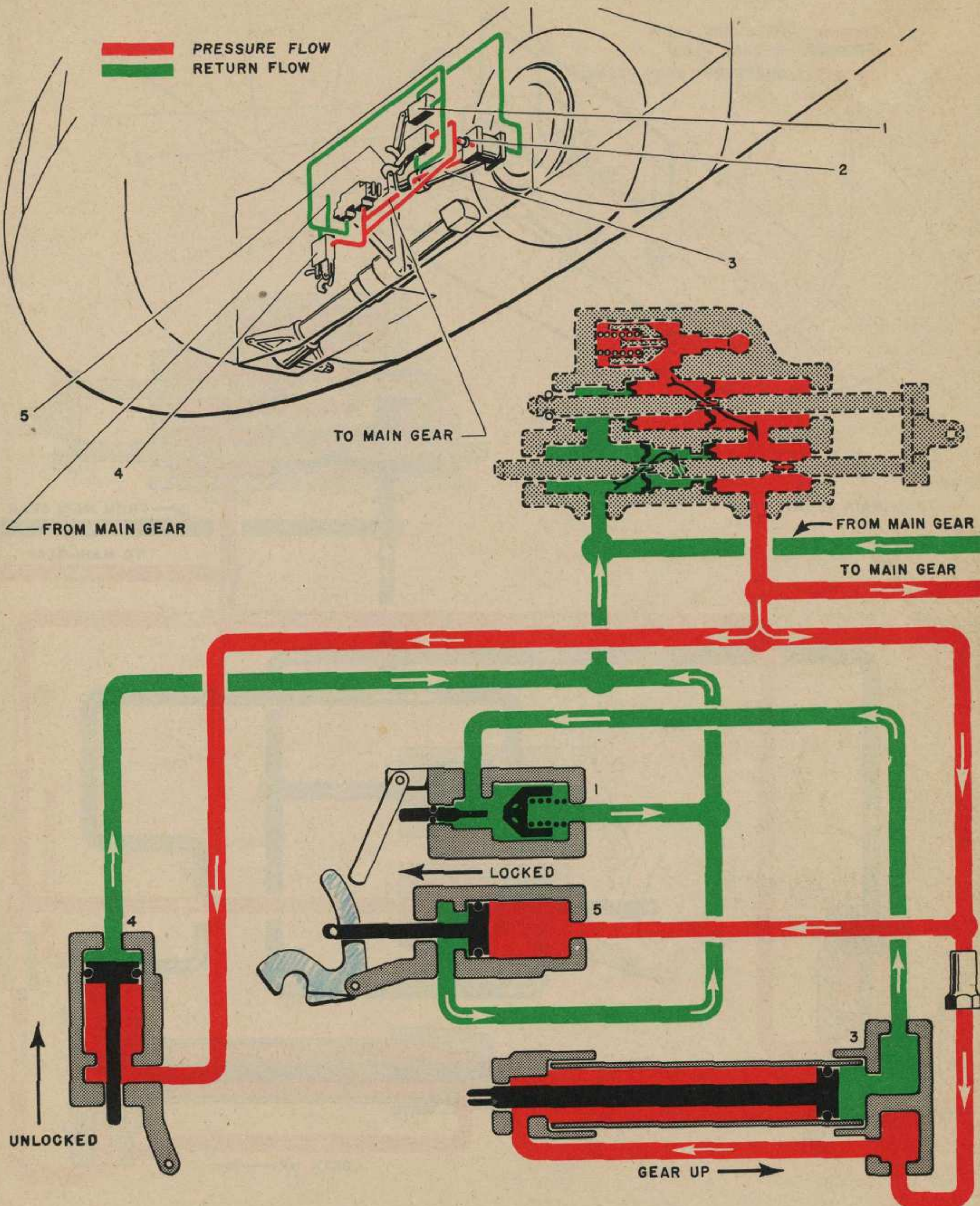



***Figure 180 — Hydraulic System Diagram—Nose Gear Up***

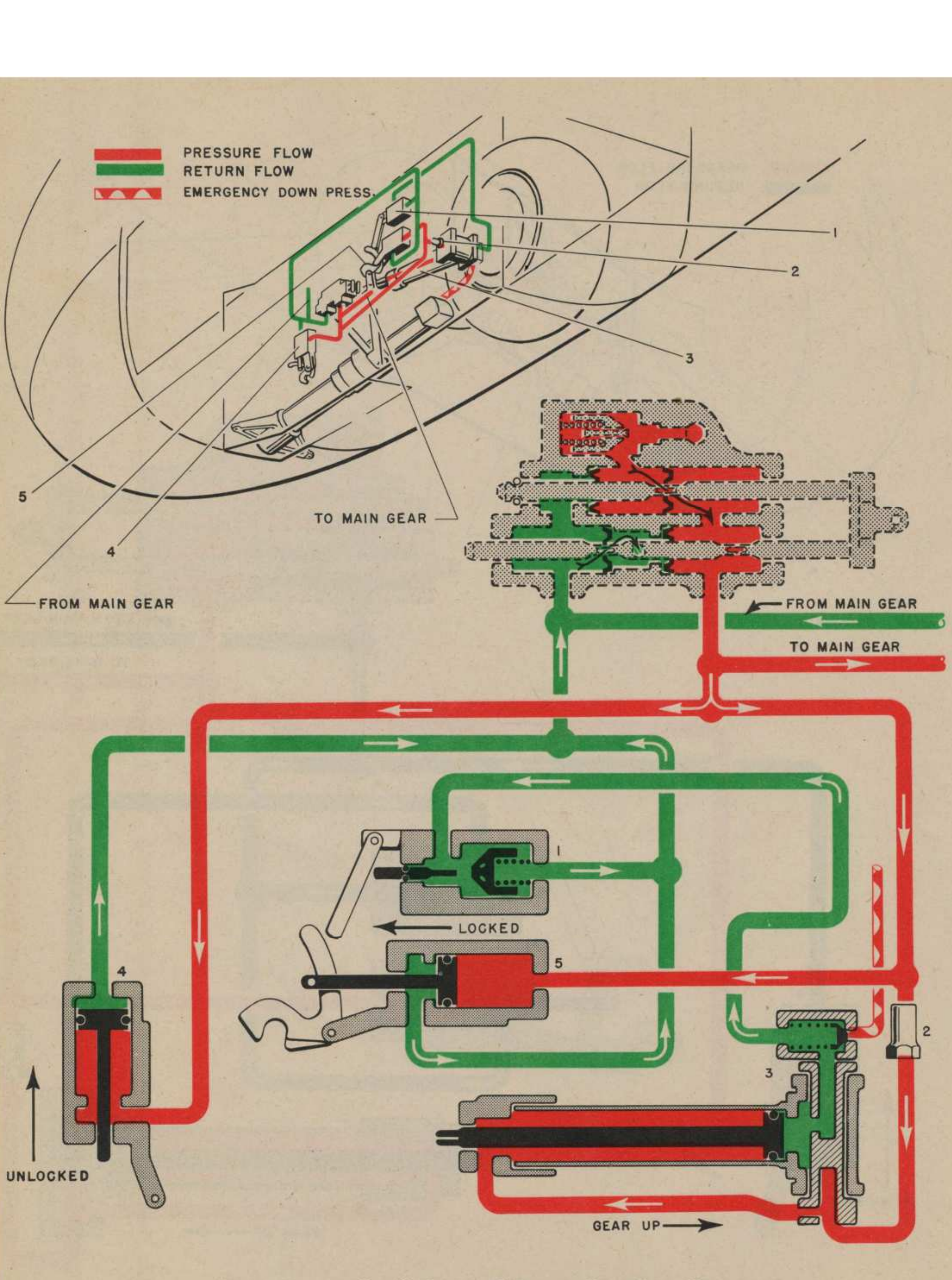
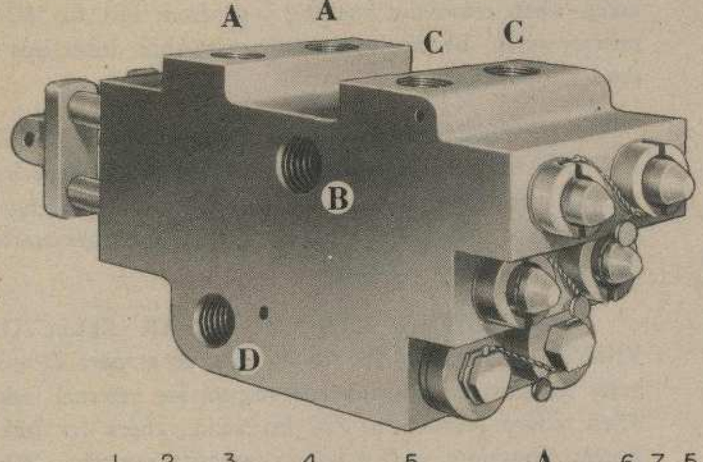



*Figure 181 — Hydraulic System Diagram—Nose Gear Up*




| | | | |
|---|---|---|---|
| 1. NUT | AC365-1032 | 11. PLUG | 55-58179 |
| 2. YOKE | 62-58219 | 12. WASHER | 2WIK50-32-62 |
| 3. SHAFT | 62-58878 | 13. SPRING | 62-58261 |
| 4. BEARING | 62-58893 | 14. VALVE | 62-58260 |
| 5. CUP | 6CINB | 15. RETAINER | 62-58884 |
| 6. BODY | 62-58210 | 16. GASKET | 51-58101-2 |
| 7. RETAINER | 62-58881 | 17. RETAINER | 62-58880 |
| 8. WASHER | 62-58879 | 18. BEARING | 62-58894 |
| 9. SNAP RING | 62-58883 | 19. SHAFT | 62-58877 |
| 10. LOCKWIRE | AC995C40-6 | | |

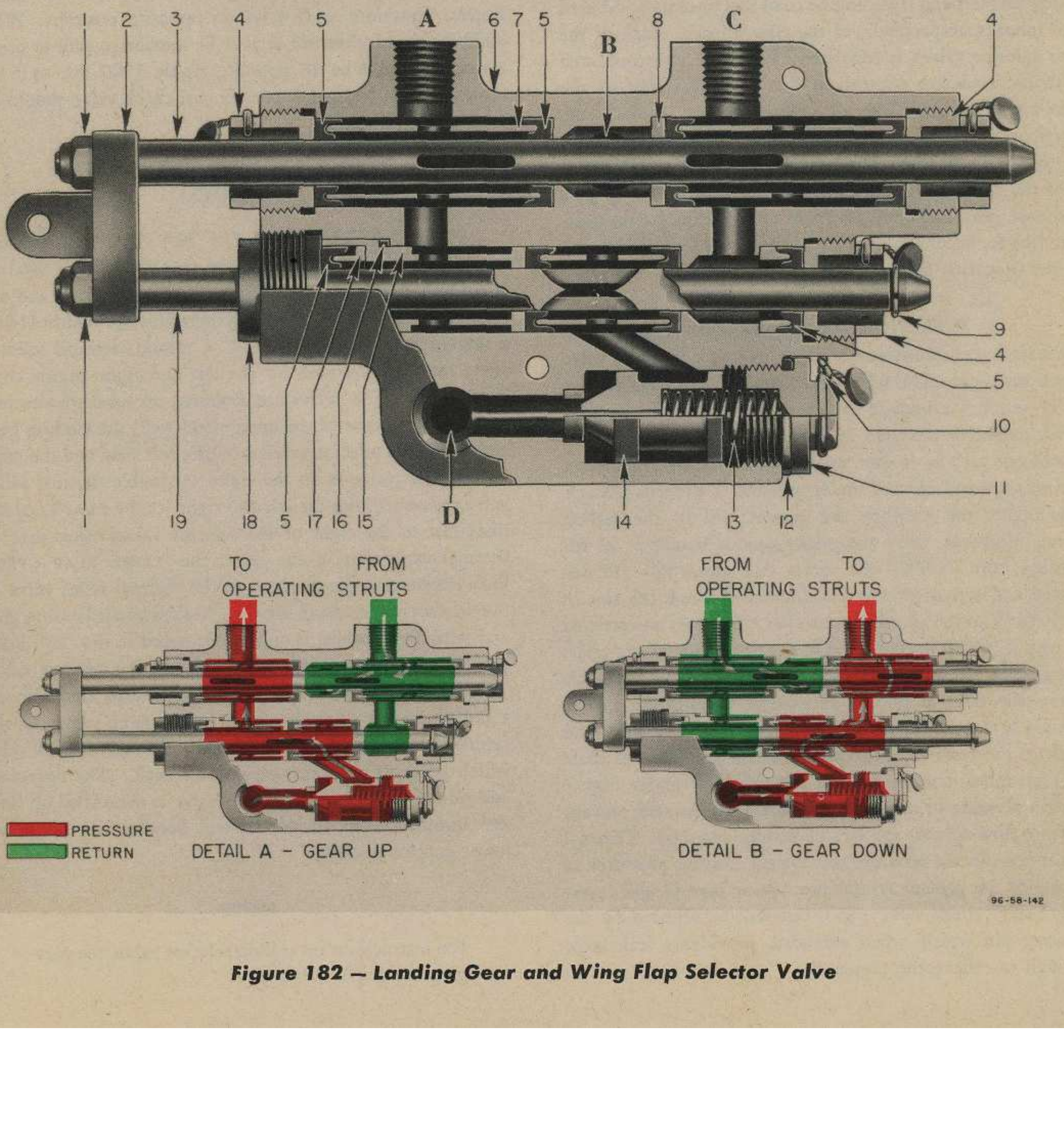



**Figure 182 — Landing Gear and Wing Flap Selector Valve**

(2) LANDING GEAR SELECTOR VALVE (EARLY AIRPLANES).

*(a)* DESCRIPTION.—*(Refer to figure 182.)* The landing gear and wing flap system selector valves used on all B-25C Airplanes and B-25D Airplanes prior to B-25D-35 are housed in a single block (NA 62-58011), and are collectively served by a single system pressure manifold (D) and a single system return manifold (B). A second identical selector valve block serves the engine cowl flap systems. The two blocks are joined as an assembly, and are mounted on brackets attached to the center dome of the nose wheel well. Each block consists of two distinct selector valve units; landing gear and wing flap systems (outboard and inboard, respectively, of the left block looking forward) and left and right engine cowl flap systems (outboard and inboard, respectively, of the right block). Each of the four selector valves is regulated by linkage interconnected with its respective control on the lower quadrant of the pilot's pedestal and, like all selector valves, regulates the distribution of the pressure and return flows of fluid for the system it controls. The landing gear selector valve controls the simultaneous operation of the main landing gear and nose gear, and provides relief to the main system pressure line for accumulated thermal expansions which develop in the operating system.

*1.* FUNCTION.—As long as there is pressure in the main hydraulic system, oil under pressure from the valve block manifold (D) will unseat the one-way check valve (13) and flow crosswise to the inner distribution chamber. With the valve plungers in the neutral position, however, it will not get any farther, as the lips of the inner chamber sealing cups will expand under pressure to prevent passage. The higher the pressure, the greater will be the sealing effect. However, when the pilot's control handle is set for landing gear "DOWN," the shafts (2) and (19) are displaced and system pressure is directed through the slot in shaft (19) to the adjoining chamber, and flows unrestricted to port C, which is connected to the down side of the operating struts. Return oil from the opposite side of the struts enters the valve at port A and passes through the slot in shaft (2) to the valve block's return manifold (B) and back to the reservoir. Return fluid will also flow to shaft (9) chamber, but the sealing action of oil under higher system pressure in the inner pressure chamber will prevent it from flowing past the lips of sealing cup (6). Thermal expansions in the landing gear system causing pressures in excess of the general system pressure at port D will reseat the "leaky" check valve (13), but will be relieved by the floating pin which, when extended, provides a leak large enough to relieve the pressures.

*(b)* REMOVING AND DISASSEMBLING LANDING GEAR SELECTOR VALVE.—Extreme care should be taken when removing packing cups from NA 62-58011 selector valve. Be sure to use cups with short inner lips at the inner positions.

*(c)* ASSEMBLING AND INSTALLING LANDING GEAR SELECTOR VALVE.—When assembling selector valve be sure shafts are not scored and that packing is not damaged. When installing the unit be sure that control linkage is properly adjusted.

*(d)* TESTING LANDING GEAR SELECTOR VALVE.—Apply 2000 lbs./sq.in. pressure at port D with valve in extended position and inspect for external leaks. Then reduce pressure to 200 lbs./sq.in.; check for leaks. Repeat procedure with valve in opposite position. With 1000 lbs./sq.in. pressure at port D, maximum pull to operate valve should be 18 pounds. Apply 1000 lbs./sq.in. at return port B; leakage at port D past check valve should be 3-10 cu.in. per minute.

(3) LANDING GEAR SELECTOR VALVE (LATER AIRPLANES).

*(a)* DESCRIPTION.—The NA 98-58011 landing gear and wing flap selector valves *(see figure 182)* used on B-25D-35 Airplanes, are housed in a single block and are collectively served by a single system pressure manifold and a single system return manifold. A second identical selector valve block is provided for the left and right engine cowl flap systems. The valves are mounted on brackets attached to the center dome of the nose wheel well; the landing gear and wing flap selector valve is on the left side, and the cowl flap selector valve is on the right. A double thermal relief valve connected into the left and right "COWL FLAP CLOSED" lines just to the right of the selector valves takes care of thermal expansion in the lines; the "COWL FLAP OPEN" lines expansion relieves through the thermal relief valve in the selector valve. As thermal expansion in the landing gear and wing flap systems is only encountered in the "UP" lines, it is relieved through the relief valve in the selector valve. The selector valve has a lap-fitted spool-type shaft having a hollow center through which return fluid passes to the return port. Fluid flows into the valve through a check valve which prevents the pressure leaking back. *(For operation and flow, see figure 183.)* Either valve is controlled by linkage interconnected to the control handles on the pilot's lower control pedestal.

**NOTE**

For instructions on testing selector valve, see paragraph 8. *c.* (2) *(d)* above.

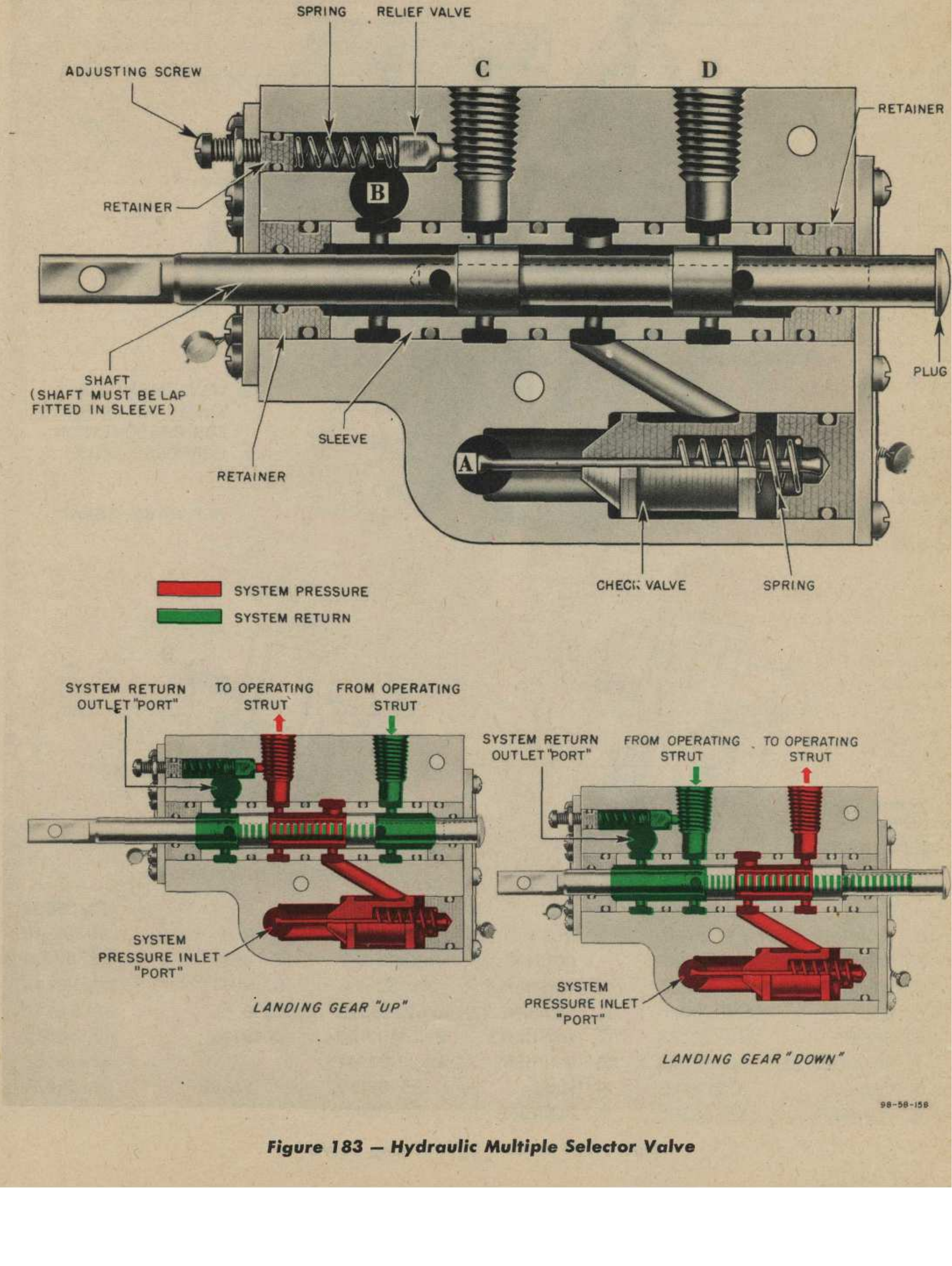
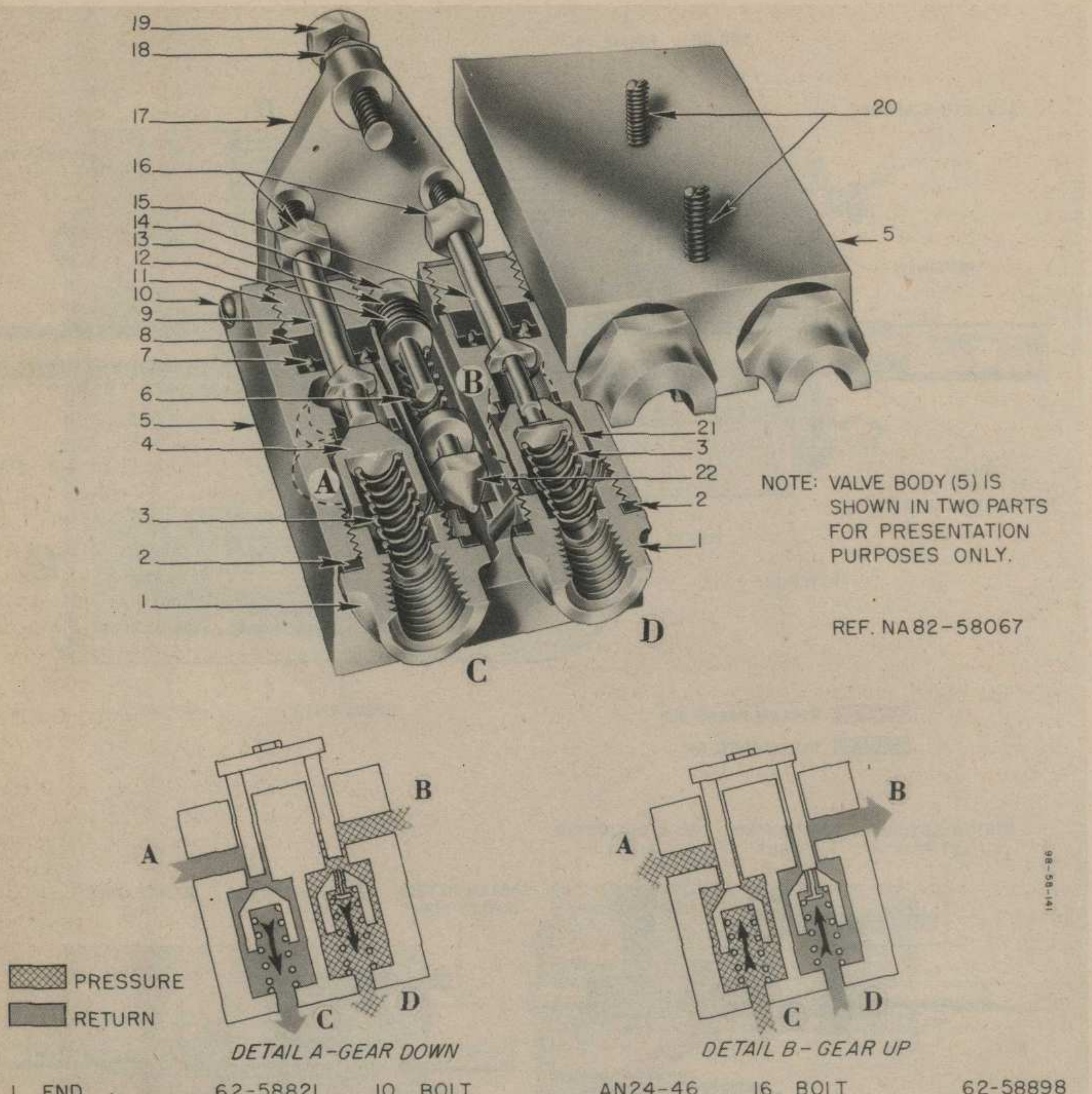



*Figure 183 — Hydraulic Multiple Selector Valve*




| | | | | | |
|---|---|---|---|---|---|
| 1. END | 62-58821 | 10. BOLT | AN24-46 | 16. BOLT | 62-58898 |
| 2. WASHER | 2WIK58-36-64 | NUT | AN320-4 | NUT | AN316-4R |
| 3. SPRING | 62-58957 | COTTER | AN380-2-2 | 17. ARM | 62-58831 |
| 4. VALVE | 62-58836 | WASHER | AN960-416 | 18. NUT | AN316-4R |
| 5. BODY | 62-58820 | 11. BEARING (2) | 62-58823 | 19. BOLT | 82-58432 |
| 6. SPRING | 25-58193 | 12. WASHERS | 2WI-14-10-38 | 20. STUD | 62-58825 |
| 7. RETAINER (2) | 25-58008 | 13. WASHER | 2WIK29-20-64 | 21. VALVE | 82-58533 |
| 8. CUP (2) | 6CI4NB | 14. PLUG | 25-58199 | 22. VALVE | 62-58834 |
| 9. PLUNGER | 62-58835 | 15. PLUNGER | 82-58445 | | |

***Figure 184 — Main Gear Timing Valve***

(4) MAIN LANDING GEAR HYDRAULIC SYSTEM TIMING VALVE.

*(a)* DESCRIPTION.—In order to provide the main landing gear with a lockpin of adequate strength to retain the gear in the down position under the most adverse normal operating conditions, a design is employed which has a tendency to bind when under load. Although this is desirable as long as the gear remains in the down position, precautions must be taken to assure the withdrawal of this pin before applying pressure to retract the gear. To accomplish this, a timing valve (NA 82-58067) is incorporated into the system. *(See figure 184.)* The timing valve is just outboard of the down-lock mechanism in each nacelle. Pressure to retract the gear is mechanically released by the down-lockpin when the pin reaches the fully withdrawn position. The valve plunger setscrews are adjusted so that the plunger governing the gear up return flow (at port C) will be actuated .010 inch before the gear up pressure flow (at port D) is admitted to retract the gear. This timing constitutes an added precaution to assure that the return flow from the down side of the actuating strut is established before pressure flow is admitted to retract the gear. A relief valve, set at 1400 to 1600 lbs./sq.in., relieves thermal expansions in the down pressure line. Thermal expansions for all other flows through this valve are adequately provided for by the positioning of the valve poppets. The poppet valve in the gear up pressure line is equipped with a floating pin to relieve instantaneous shock loads which may develop at the beginning of the main gear retraction stroke.

*1.* FUNCTION.—Landing gear down pressure is directed to port A of the timing valve, unseats the corresponding one-way check valve, and flows out port C to the down side of the operating strut. Return oil from the opposite side of the strut piston enters the timing valve at port B, likewise unseats its corresponding poppet valve, and flows out port D back to the reservoir. When the operation is reversed and the gear is to be retracted, system pressure at port D is blocked at its poppet valve. But as the landing gear down-lockpin is withdrawn, it mechanically depresses the valve arm to unseat the timing valve plungers. The plungers first unseat the poppet to establish return flow from port C to port A, and later unseat the remaining poppet to establish the pressure flow out port B to the up side of the landing gear actuating strut.

*(b)* TESTING AND ADJUSTING MAIN LANDING GEAR HYDRAULIC SYSTEM TIMING VALVE.—Apply 2500 lbs./sq.in. at port D with port B open; there should be no leakage. Apply pressure at port C and adjust thermal relief valve spring with washers, to relieve at 1400 to 1600 lbs./sq.in. Apply 2500 lbs./sq.in. at A and B with ports C and D plugged and check for external leakage. Adjust the relief valve in the main landing gear timi[ng] valve with washers under the spring to relieve at 14[00] lbs./sq.in. Adjust the screw so that it contacts its val[ve] plunger at the time when the triangular plate is parallel [to] the valve body. Adjust the screw (Y) so that it has [a] clearance of .010 inch to its valve plunger when screw (X) is in contact with its valve. Other adjustments are ma[de] after the valve has been installed and while the airplane [is] on the jacks.

**NOTE**

Use a hand-pump to make this adjustment as test stand would cause the gear to move too rapidly, endangering personnel. However, a test stand may be used if it can be made to pump very slowly.

Relieve the pressure in the hydraulic system by operati[ng] the wing flaps or engine cowl flaps. Turn the adjusti[ng] screw (2) away from the plunger of the down-lock. Pla[ce] the landing gear selector handle in the "UP" position. Usi[ng] the hand-pump, apply enough pressure to withdraw t[he] down-lock plunger. Turn the adjusting screw until the ge[ar] creeps upward and then turn the screw out five more co[m]plete turns. Check to see that the screw is not bottome[d;] if it is, screw it in enough to give clearance. Safety w[ire] check nut.

(5) MAIN LANDING GEAR HYDRAULIC SYSTEM DOWN-LOCK.

*(a)* DESCRIPTION.—The landing gear down-po[si]tion lock release cylinder (NA 62-58092) is bolted direc[tly] to the down-position lockpin housing. The lock release u[nit] *(see figure 185)* contains two pistons. The main piston [re]tracts the lockpin and is connected at port B to the landi[ng] gear down and at port A to the landing gear up pressu[re] lines. When lowering the gear, system pressure at port [B] will bottom the piston and relieve all pressure on the lo[ck]pin plate. The compression of the lockpin spring may th[en] maintain the pin extended preparatory to receiving a[nd] retaining the gear in the down and locked position. Wh[en] retracting the gear, the flows are reversed. System pressu[re] at port A extends the main piston, which in turn retra[cts] the lockpin plate and lockpin preparatory to releasing t[he] gear from the extended position. Return oil forced out p[ort] B is routed back to the reservoir. An emergency pist[on] incorporated in the assembly passes through an oversize h[ole] in the lockpin plate, and is provided with a castellated n[ut] and washer. Upon being extended, the piston will n[ot] affect the movement of the plate, but when pressure [is] applied to retract it, the emergency piston will force t[he] plate in and thus extend the lockpin. When the gear [is] being retracted, the piston will afford practically

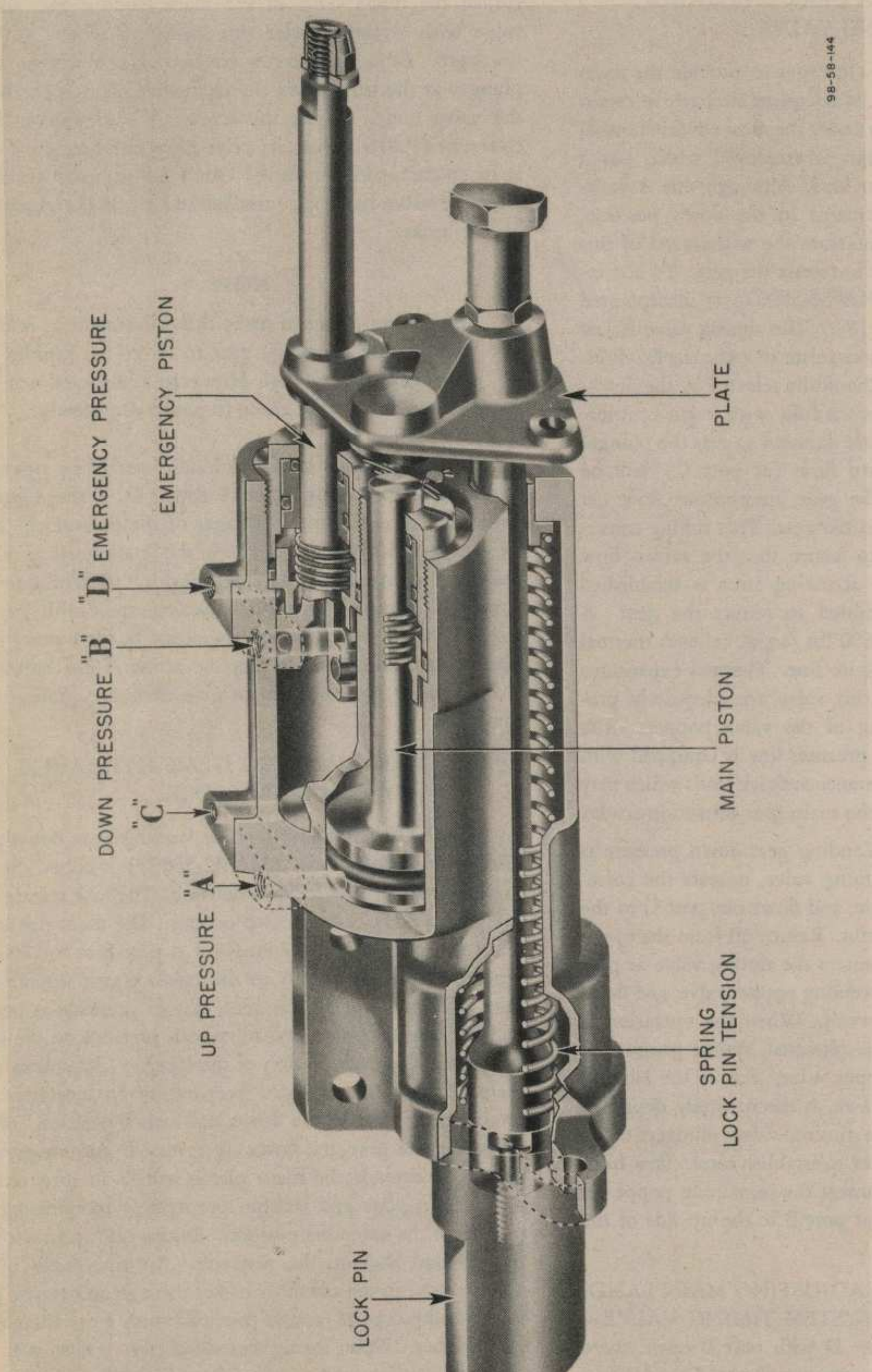
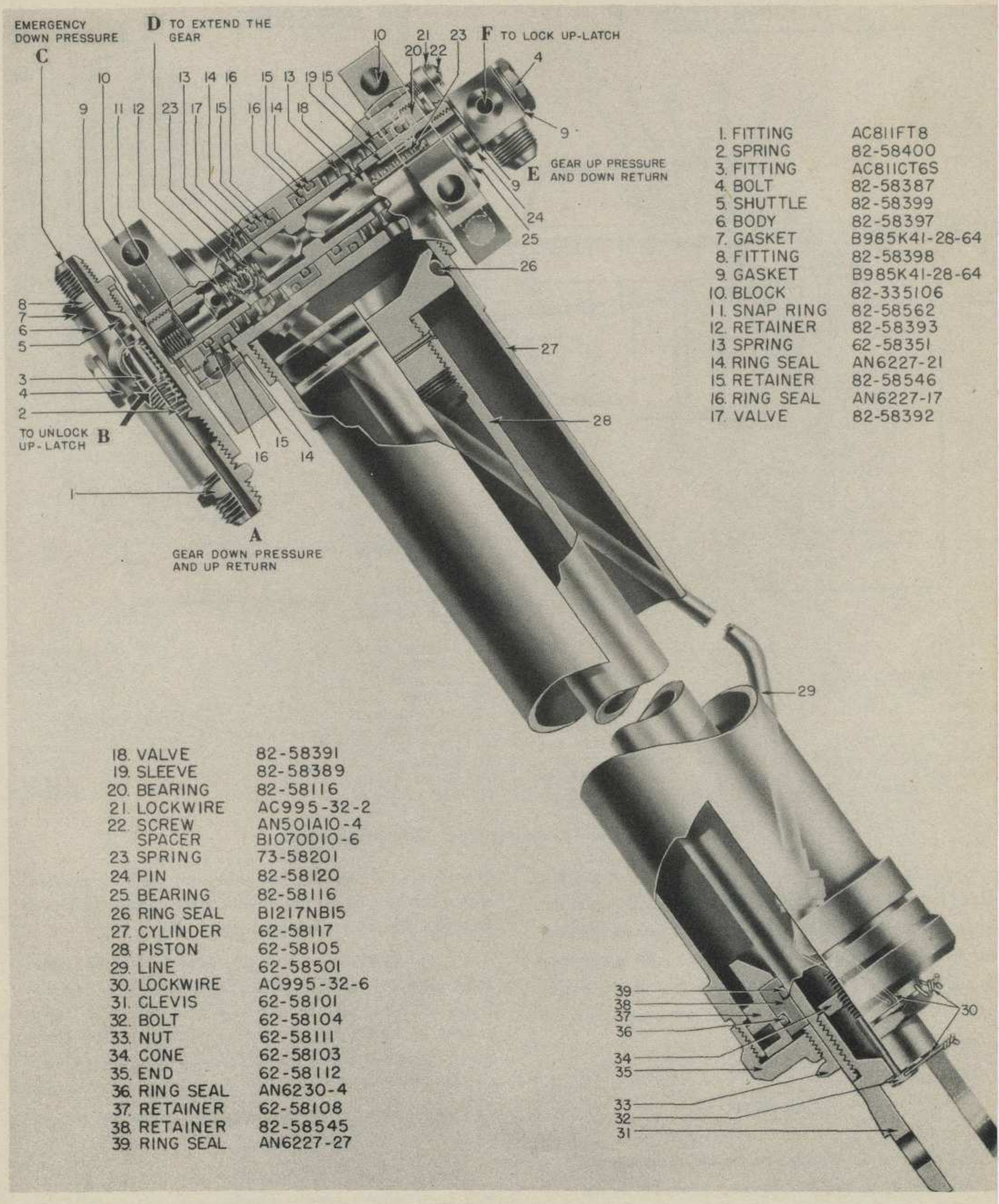


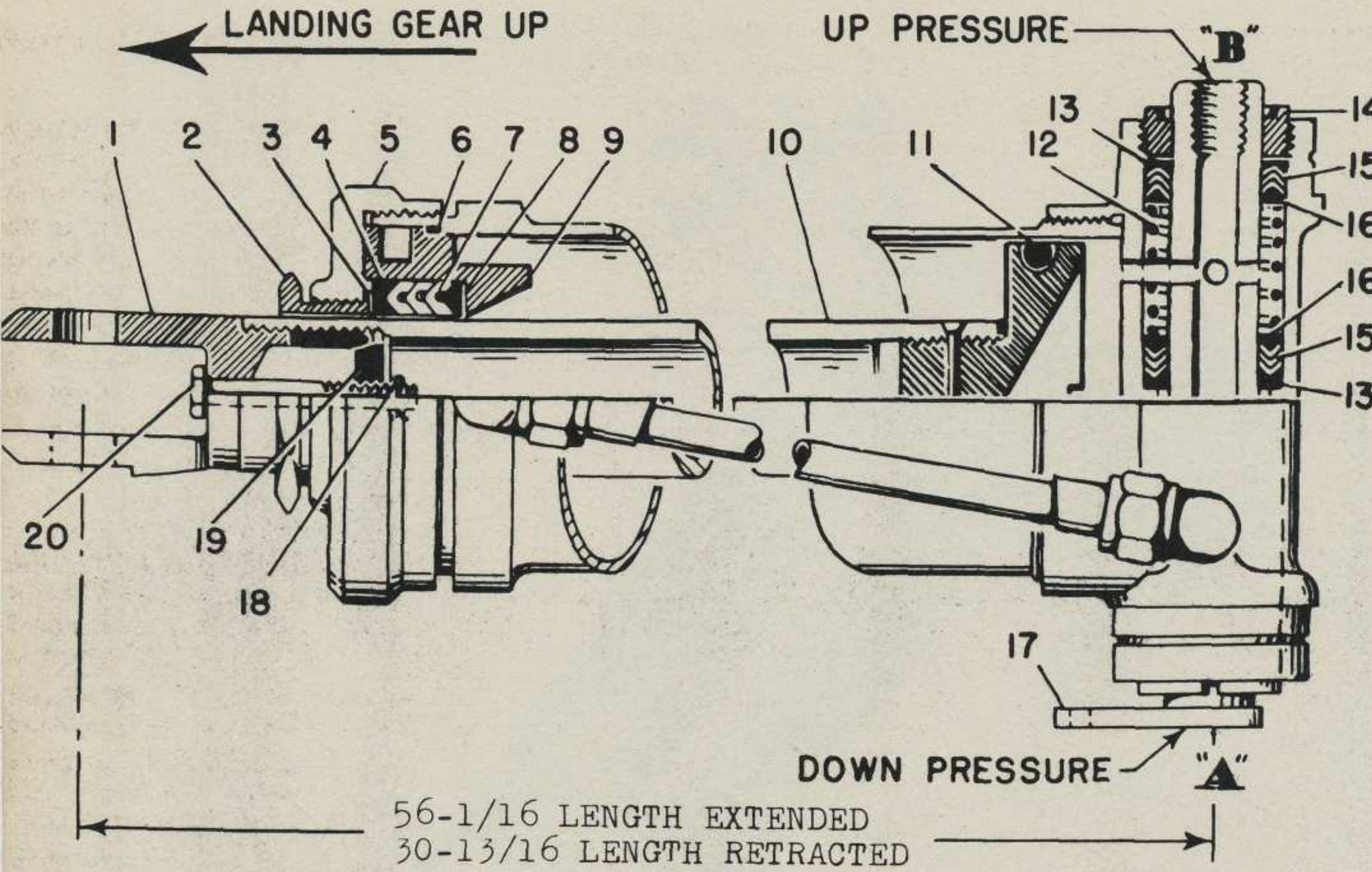

*Figure 185 — Main Gear Down-lock*




| | | |
|---|---|---|
| 1. | FITTING | AC811FT8 |
| 2. | SPRING | 82-58400 |
| 3. | FITTING | AC811CT6S |
| 4. | BOLT | 82-58387 |
| 5. | SHUTTLE | 82-58399 |
| 6. | BODY | 82-58397 |
| 7. | GASKET | B985K41-28-64 |
| 8. | FITTING | 82-58398 |
| 9. | GASKET | B985K41-28-64 |
| 10. | BLOCK | 82-335106 |
| 11. | SNAP RING | 82-58562 |
| 12. | RETAINER | 82-58393 |
| 13. | SPRING | 62-58351 |
| 14. | RING SEAL | AN6227-21 |
| 15. | RETAINER | 82-58546 |
| 16. | RING SEAL | AN6227-17 |
| 17. | VALVE | 82-58392 |

| | | |
|---|---|---|
| 18. | VALVE | 82-58391 |
| 19. | SLEEVE | 82-58389 |
| 20. | BEARING | 82-58116 |
| 21. | LOCKWIRE | AC995-32-2 |
| 22. | SCREW | AN501A10-4 |
| | SPACER | B1070D10-6 |
| 23. | SPRING | 73-58201 |
| 24. | PIN | 82-58120 |
| 25. | BEARING | 82-58116 |
| 26. | RING SEAL | B1217NB15 |
| 27. | CYLINDER | 62-58117 |
| 28. | PISTON | 62-58105 |
| 29. | LINE | 62-58501 |
| 30. | LOCKWIRE | AC995-32-6 |
| 31. | CLEVIS | 62-58101 |
| 32. | BOLT | 62-58104 |
| 33. | NUT | 62-58111 |
| 34. | CONE | 62-58103 |
| 35. | END | 62-58112 |
| 36. | RING SEAL | AN6230-4 |
| 37. | RETAINER | 62-58108 |
| 38. | RETAINER | 82-58545 |
| 39. | RING SEAL | AN6227-27 |

***Figure 186 — Main Gear Operating Strut***




| | | | | | |
|---|---|---|---|---|---|
| 1. | CLEVIS | 62-58102 | 11. | PACKING RING | B1217N-15 |
| 2. | NUT | 62-58111 | 12. | SPRING | 62-58351 |
| 3. | WASHER | B985D-97-64-62 | 13. | CAP RING | 62-58154 |
| 4. | CAP RING | 62-58109 | 14. | BEARING | 62-58154 |
| 5. | END | 62-58112 | 15. | PACKING RINGS | B1298E4-0-28 |
| 6. | GASKET | 51-58101-13 | 16. | BASE RING | 62-58153 |
| 7. | PACKING RINGS | B1298E5-1-16 | 17. | PIN | 62-58120 |
| 8 | BASE RING | 62-58110 | 18. | COTTER | AN380-2-2 |
| 9. | RETAINER | 62-58108 | 19. | CONE | 62-58103 |
| 0. | PISTON ASSEMBLY | 62-58105 | 20. | BOLT | 62-58104 |

***Figure 187 — Main Landing Gear Operating Strut***

esistance. If lockpin compression spring fails, or the pin ails to function, pressure applied at port D will retract the iston and thereby extend the pin to the locked position. ort D is connected by a separate line to the emergency ydraulic system. For emergency operation of the down-osition lockpin, the emergency selector valve must be urned to "LATCH."

**CAUTION**

As there is no positive means of retracting the down-lockpin, the landing gear must be in the fully extended position before using the hand-pump.

Port C at the retracted end of emergency piston is provided with a vented plug for the small amount of fluid which will seep past the piston head packing.

*(b)* TESTING AND ADJUSTING MAIN LANDING GEAR HYDRAULIC SYSTEM DOWN-LOCK.—Apply 2000 lbs./sq.in. at port A; there should be no leakage at port B. Apply 2000 lbs./sq.in. at port D; there should be no leakage at port C. Apply 1000 lbs./sq.in. at port A, checking movement of lockpin.

(6) MAIN LANDING GEAR HYDRAULIC SYSTEM UP-LOCK.

*(a)* DESCRIPTION.—The main landing gear up-lock latch release valve is integral with the up-lock latch support casting (NA 62-58093). The valve is connected to both the landing gear up and down pressure lines so that

it will be actuated when either extending or retracting the gear. The valve initiates the landing gear down operation. System pressure admitted at the top port extends the valve piston to disengage the up-latch, allowing the gear to fall. Return flow from the opposite port is routed back to the reservoir. When the operation is reversed to retract the gear, system pressure at the bottom port maintains the valve piston in the retracted position. Thus there is nothing to hinder the up-latch spring from holding the latch in the locked position preparatory to receiving and retaining the gear in the up and locked position. Return flow forced from the valve at the top port joins the main return line back to the reservoir at the landing gear operating strut.

*(b)* TESTING MAIN LANDING GEAR HYDRAULIC SYSTEM UP-LOCK.—Test for leaks with 2000 lbs./sq.in. pressure.

(7) MAIN LANDING GEAR HYDRAULIC SYSTEM OPERATING STRUT.

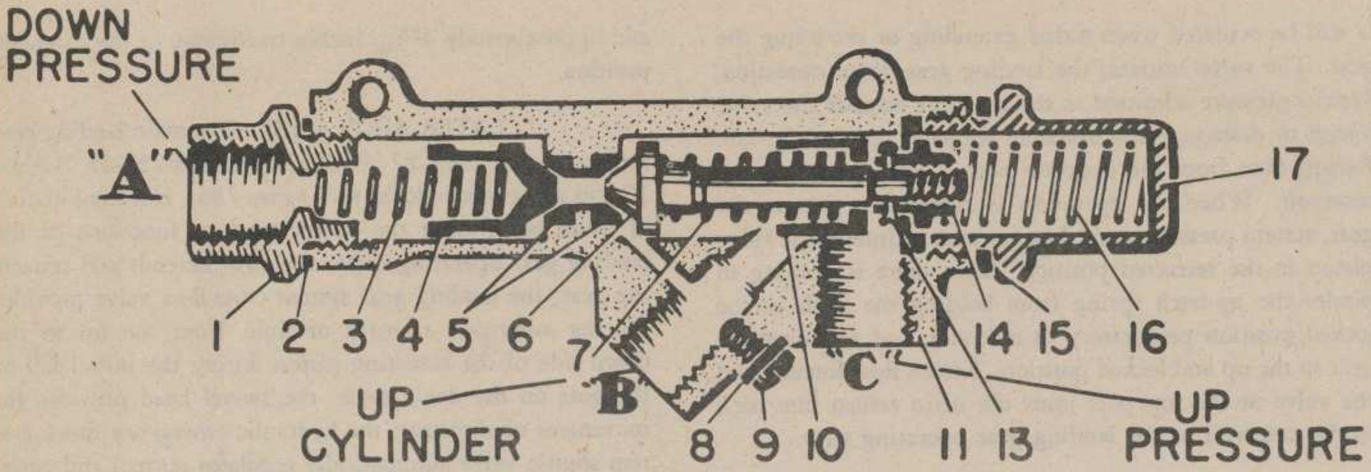
*(a)* DESCRIPTION.

*1.* EARLY AIRPLANES.—The main landing gear operating strut (NA 62-58026) used on B-25C-10, B-25-D-5 and previous Airplanes is suspended from special supporting blocks mounted to the up-lock mechanism support brackets. The struts are accessible from the wheel well interiors. A swivel-type head transmits the pressure and return flows from the general system lines to the operating struts. *(See figure 187.)* The swivel head serves to maintain an uninterrupted flow of fluid throughout the strut's entire angle of operation, from the fully extended to the fully retracted position. The swivel consists of a center pin attached to the airplane structure to prevent it from turning, and thus acts as the pivot point for the strut. Laterally drilled passages from either end of the pin are connected to the system pressure and return lines. The fluid is then directed through radially drilled holes to the swivel part of the head and to either end of the operating strut. Chevron packings facing each other at each side of these radially drilled holes prevent leakage of oil. A spring (12) holds them apart when no load is applied. Fluid is transmitted to the extension end of the strut. The piston rod is characterized by the removable clevis (1). The clevis is too large to pass through the chevron packings and end nut (2), so it must be removed whenever these packings have to be replaced. The bolt (2), which screws lengthwise through the clevis, pulls a wedge (19) tight against the inner wall of the piston rod to prevent the clevis from loosening. The piston head is screwed to the piston rod and is held in place by a flush rivet. The strut design allows approximately $7/16$-inch overstroke in the retracted position, and approximately $4\,25/32$ inches overstroke in the extended position.

*2.* LATER AIRPLANES.—The main landing gear actuating strut (NA 82-58026), used on B-25C-15, B-25D-10 and subsequent blocks *(see figure 186)*, is a combination of units performing the following four functions of the landing gear operating cycle: the strut extends and retracts the gear; the landing gear system cross-flow valve provides for the automatic transfer of fluid from the up to the down side of the actuating piston during the initial fall of the gear on the down cycle; the swivel head provides for movement of the strut; the hydraulic emergency down system shuttle valve automatically regulates normal and emergency pressure flows to extend the gear.

a. ACTUATING STRUT.—The actuating strut proper is connected into the system in such a manner that the strut piston extends to retract the gear and retracts to extend the gear. Pressure at port E is directed to the gear retraction end of the strut piston; pressure to lower the gear is routed from port A to port D and then through an external steel tube (29) to the gear extension end of the strut piston. The cylinder barrel (27) is tightly screwed to the strut head and sweat-soldered; the head should never be removed. Access to the strut cylinder interior is gained exclusively from the piston rod end of the barrel. The piston rod (28) is characterized by the removable clevis end (31). The clevis is too large to pass through the plastic packing retainer (38) and end nut (33), so it must be removed whenever packings have to be replaced. The bolt (32), which screws lengthwise through the clevis, pulls a wedge (34) tight against the inner wall of the hollow piston rod to prevent the clevis from loosening. The piston head is screwed to the piston rod and is safetied in place by a lash rivet. The strut design allows an overstroke of 4.715 inches in the extended position and .433 inch in the retracted position (gear up and down respectively).

b. SWIVEL PIN.—The strut head is provided with a swivel pin (24) which eliminates the necessity of using flexible hose to transmit pressure and return flows from the general system rigid lines to the operating strut. The swivel pin maintains an uninterrupted flow of fluid throughout the entire angle of operation, from the fully extended to the fully retracted positions. The swivel consists of the pin (24) which is attached to the strut support block (10) to prevent it from turning and thus acts as the pivot point for the strut. Laterally drilled passages from either end of the pin are connected to the system pressure and return lines. (Ports A and E.) The fluid is then routed through radially drilled holes to or from the swivel part of the strut head and to either end of the strut piston head.




| | | | |
|---|---|---|---|
| 1. END | 62-58456 | 9. SCREW | AN502-8-4 |
| 2. WASHER | B985K-49-32-64 | 10. RESTRICTOR | 62-58459 |
| 3. SPRING | 62-58469 | 11. BODY | 62A-58452-2 |
| 4. VALVE | 62-58455 | 12. BODY | 62-58452-2 |
| 5. BUSHING | 62-58327 | 13. COTTER | AN380-2-2 |
| 6. VALVE | 62-58454 | 14. NUT | 62-58460 |
| 7. SPRING | 62-58464 | 15. WASHER | B985K-57-36-64 |
| 8. WASHER | B985K-11-10-64 | 16. SPRING | 62-58983 |
| 17. HOUSING | 62-58983 | | |

***Figure 188 — Main Landing Gear Cross-flow Valve***

Plastic retainers (15) with synthetic rubber sealing rings (14) and (16) at either side of these radially drilled holes seal as a fluid load is applied to them. Springs (13) hold the retainers apart when no load is applied. The cross-flow valve is housed entirely within the strut head swivel pin and operates automatically.

*(b)* TESTING MAIN LANDING HYDRAULIC SYSTEM OPERATION STRUT.—Apply 200 lbs./sq.in. to strut and check for external leaks.

(8) MAIN LANDING GEAR HYDRAULIC SYSTEM CROSS-FLOW VALVE.

*(a)* DESCRIPTION.—A cross-flow valve (NA 62A-58072) is used on airplanes prior to B-25C, AC42-32388 and B-25D AC41-30173, and is located near each actuating strut *(see figure 188)*. On subsequent airplanes, the cross-flow valve is an integral part of the actuating strut.

*(b)* TESTING MAIN LANDING GEAR HYDRAULIC SYSTEM CROSS-FLOW VALVE.—The main landing gear cross-flow valve should be adjusted so that 1.5 to 2 gallons (1.2 to 1.7 Imp. gallons) per minute applied at port B with ports A and C open, shall flow out of port C at a maximum rate of .5 gallon (.4 Imp. gallon) per minute. With port A plugged and 1.5 to 2 gallons (1.2 to 1.7 Imp. gallons) per minute applied to port B, the maximum pressure at B shall be 50 lbs./sq.in. With 1.5 gallons (1.2 Imp. gallons) per minute applied at C, a pressure of 35 lbs./sq.in. shall not be exceeded.

(9) AUXILIARY LANDING GEAR HYDRAULIC SYSTEM TIMING VALVE.

*(a)* DESCRIPTION.—The up-lock timing valve (NA 62-58065) in the nose gear system operates as follows: As the up-latch is completely retracted *(see figure 189)*, it mechanically depresses the plunger by the pressure exerted upon the lever. This in turn unseats the poppet valve to release system pressure blocked at port A to flow out port B to the down side of the operating strut. When the operation is reversed to retract the gear, the return flow from the down side of the actuating strut entering the valve at port B flows unrestricted past poppet valve to port A and back to the reservoir. The spring keeps the poppet valve seated when no fluid or pressure is applied to the valve. Its tension is negligible, however, and offers practically no resistance to return flows through the valve from port B to port A. The valve is attached to an angle bolted to a shelf in the nose wheel well, adjacent to the up-lock.

*(b)* TESTING AND ADJUSTING AUXILIARY LANDING GEAR HYDRAULIC SYSTEM TIMING VALVE.—Apply 2000 lbs./sq.in. at port B with port A plugged. Check for external leaks. With timing valve installed on the airplane, place gear in down position and

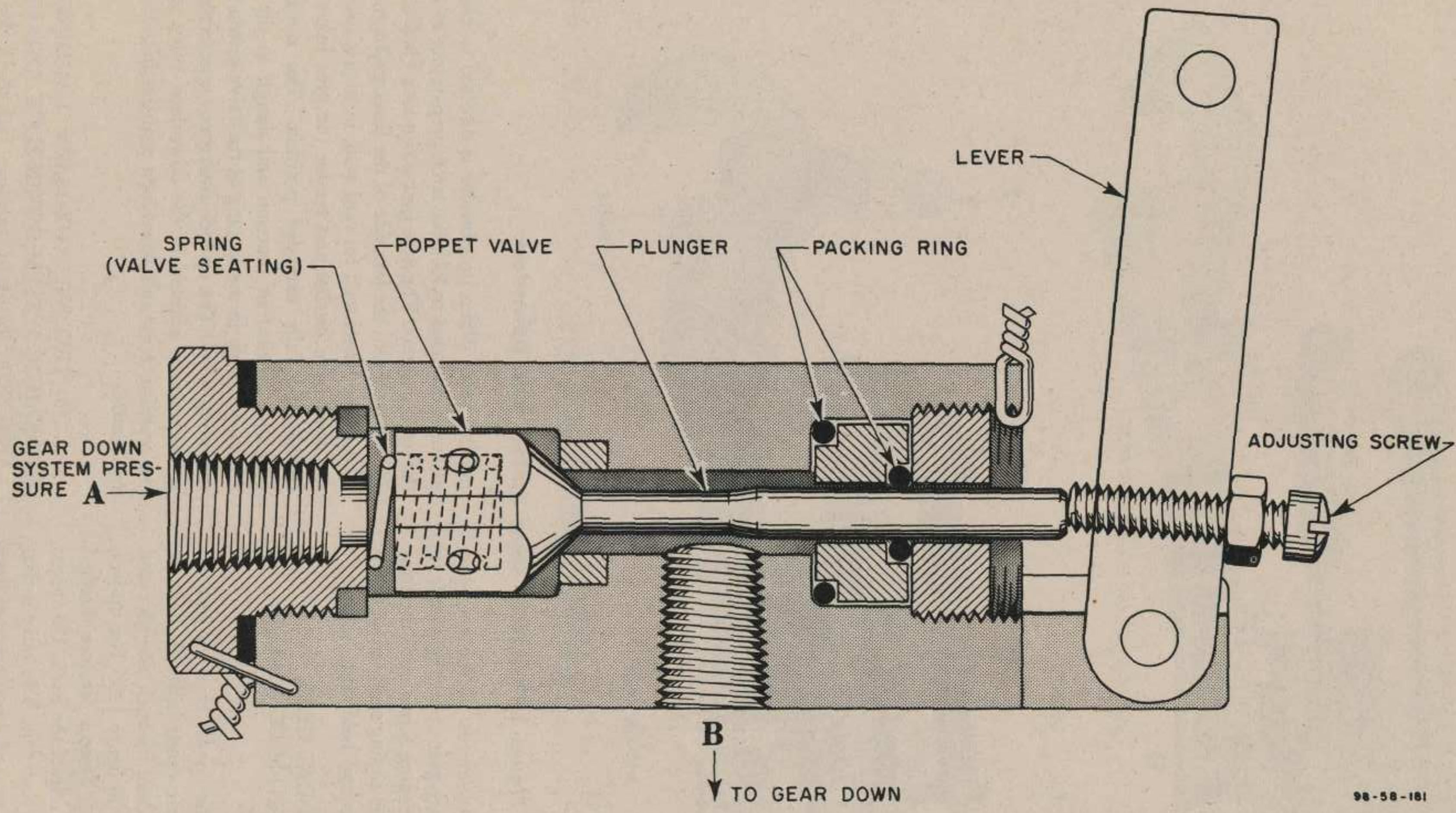



*Figure 189 — Nose Gear Up-latch Timing Valve*

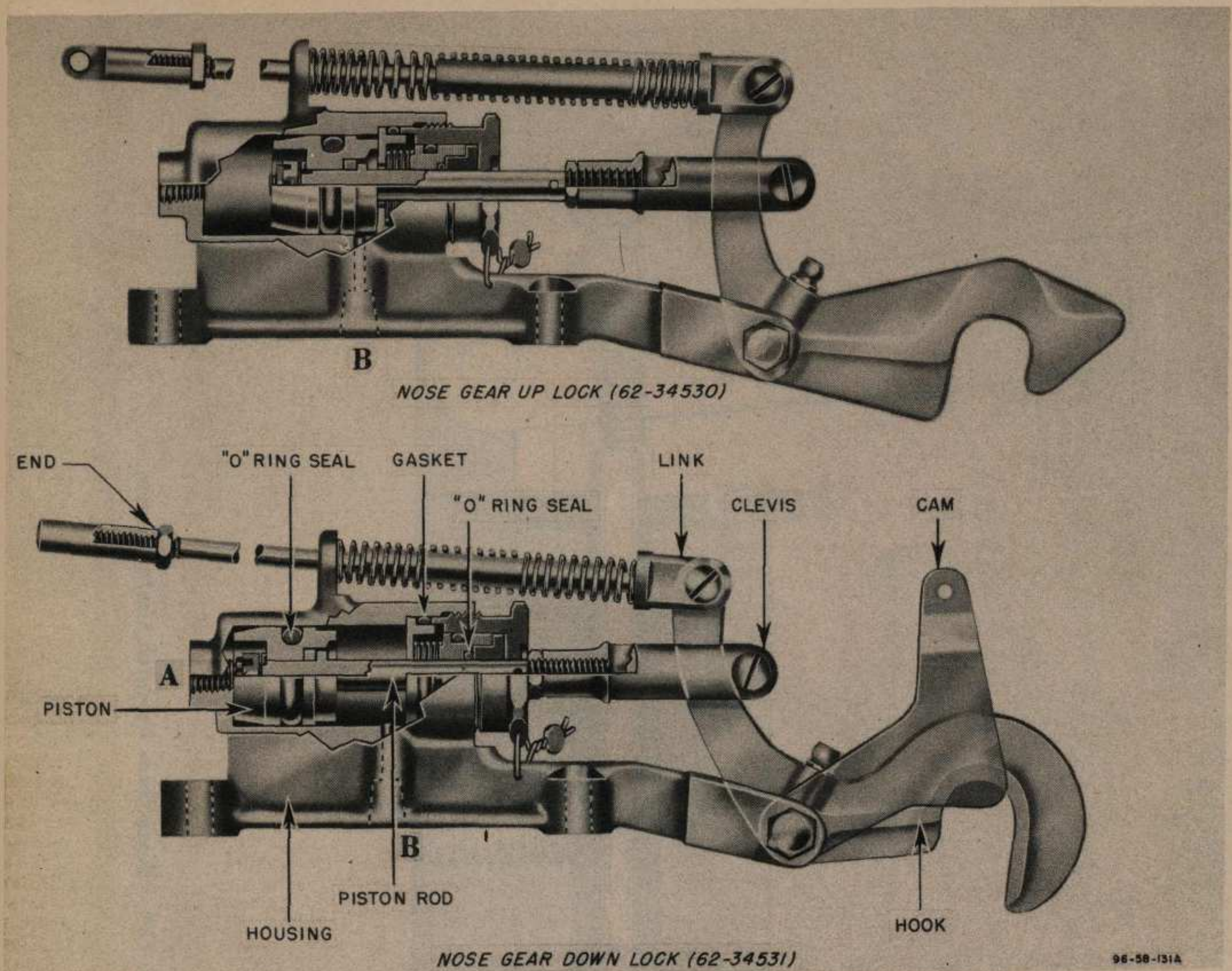


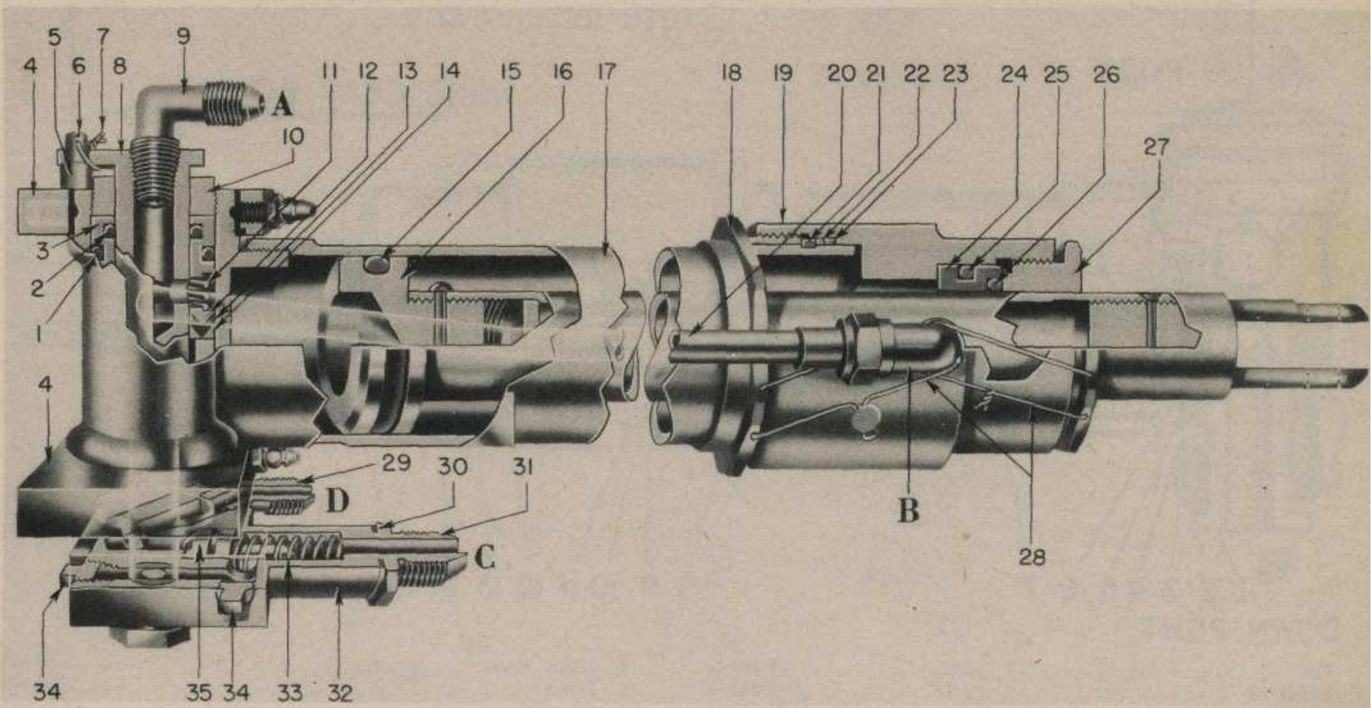

**Figure 190 — Nose Gear Up-lock and Down-lock**

ırn the timing screw about two-thirds of the way out. [ove gear about halfway up, place gear operating handle in ›OWN" position, and turn the timing screw until the strut forced into the down-lock. The timing screw should then ɛ turned in 1½ or 2 full turns and held with locknut.

(10) AUXILIARY LANDING GEAR HYDRAULIC SYSTEM DOWN-LOCK AND UP-LOCK.

*(a)* DESCRIPTION.—The nose gear up-lock is ıounted to the shelf on the left center side of the nose ·heel well. It consists of the actual up-latch assembly and ıe latch release valve as shown in figure 190. The up-lock :lease unit functions as follows: System pressure directed ) port B actuates the piston to retract the latch. Oil forced ɪt port A is routed back to the reservoir. The valve is thus ›nnected to both the nose gear up and down pressure lines that it will be actuated either upon extending or retracting the gear. When up pressure is directed to port A, the piston is extended to lock the latch preparatory to receiving the retracted gear. The nose gear down-lock (NA 62-58029-2) is attached to the left side of the fuselage frame, just aft of the nose wheel well forward wall, in such a manner that the down-latch catches and retains the gear brace when it reaches the fully extended position. The down-lock is basically identical in function and design to the up-lock, differing mainly in the spacing of the valve piston head end mounting holes. The up-lock emergency release mechanism is furthermore adapted in the down-lock valve to actuate the warning horn and down-lock position indicator switch mechanism.

*(b)* TESTING AUXILIARY LANDING GEAR HYDRAULIC SYSTEM DOWN-LOCK AND UP-LOCK. —Apply 2000 lbs./sq.in. pressure and check for external leaks.




1. RING SEAL ............... AN6227-21
2. RING SEAL ............... AN6227-17
3. RETAINER ................... 82-58546
4. BEARING ................... 54-33583
5. SPACER ................. B1070D10-6
6. SCREW ................. AN501A10-4
7. LOCKWIRE ............... AC995-32-2
8. PIVOT PIN ................. 82-58148
9. FITTING ................... AC811CT6
10. BEARING ................... 62-58116
11. SPRING ..................... 62-58202
12. CAP RING ................. 62-58154
13. PACKING RING ......... B1298E4-0-28
14. BASE RING ................. 62-58153
15. RING SEAL ............... B1217NB32
16. PISTON ..................... 62-58156
17. CYLINDER ................. 62-58157
18. NUT ......................... 62-58927
19. END ......................... 62-58926
20. LINE ......................... 62-58502
21. LOCK RING ................. 62-58928
22. RING ......................... 62-58929
23. GASKET ................. 51-58101-15

Ref. ........................ NA82-58028
24. RETAINER ................... 82-58547
25. RING SEAL ................. AN6230-1
26. RING SEAL ............... AN6227-23
27. BEARING ................... 62-58150
28. LOCKWIRE ............... AC995-32-8
29. FITTING ............... AC811CT45-6
30. GASKET ............... B985K41-28-64
31. FITTING ..................... 82-58398
32. BODY ....................... 82-58441
33. SPRING ..................... 82-58400
34. PLUG ......................... AN913-1
35. SHUTTLE ................... 82-58399

***Figure 191 — Nose Gear Operating Strut Later Models***

## (11) AUXILIARY LANDING GEAR HYDRAULIC SYSTEM OPERATING STRUT.

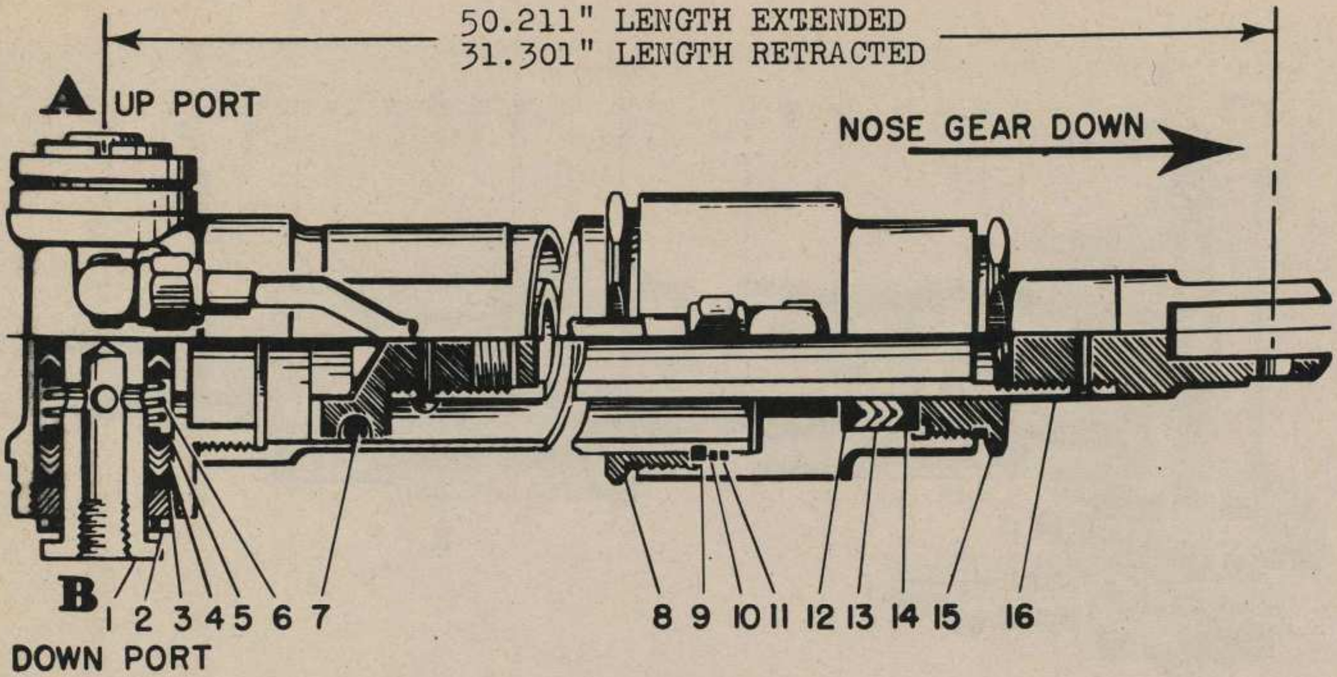
### *(a)* DESCRIPTION.

*1.* NOSE GEAR OPERATING STRUT *(see figures 191 and 192)*.—The nose gear operating strut (NA 62-58028) used on airplanes prior to B-25C AC42-32388 and B-25D AC41-30173, and the NA 82-58028 operating strut used on Airplanes B-25C AC42-32388 and subsequent, and B-25D AC41-30173 and subsequent is suspended from a special fitting attached to the nose wheel well dome structure just forward of the rear wall. The strut incorporates a swivel head fitting. A shuttle valve is installed on the NA 82-58028 strut only. The swivel head fitting functions identically to the main landing gear operating strut swivel head. Fluid is transferred to and from the retraction end of the cylinder by an external steel tube. Synthetic rubber ring seals at the rod end of the strut confine the oil. The strut function is as follows: Pressure flow directed to port C extends the piston to lower the gear, while oil forced from the opposite side of the piston head is transferred through the external steel tube to the swivel head and back to the reservoir via port A. These flows are reversed to retract the piston and the gear. The strut design allows $9/16$ inch overtravel in the retracted position and $4 1/32$ inches overtravel in the extended position.

*(b)* TESTING AUXILIARY LANDING GEAR HYDRAULIC SYSTEM OPERATING STRUT.—Apply 2000 lbs./sq.in. pressure and check for leaks.

## (12) LANDING GEAR EMERGENCY HYDRAULIC LOWERING SYSTEM.

*(a)* DESCRIPTION.—An emergency hydraulic lowering system *(see figure 193)* is provided for the concurrent




| | | |
|---|---|---|
| 1. | PIN | 62-58148 |
| 2. | BEARING | 62-58116 |
| 3. | CAP RING | 62-58154 |
| 4. | GARLOCK PACKING | 8319 .865 ILD |
| 5. | BASE RING | 62-58153 |
| 6. | SPRING | 62-58202 |
| 7. | RING | B1217N-32 |
| 8. | NUT | 62-58927 |
| 9. | LOCK RING | 62-58928 |
| 10. | RING | 62-58929 |
| 11. | GASKET | 51-58101-15 |
| 12. | BASE RING | 62-58151 |
| 13. | PACKING | B1298E5-1-8 |
| 14. | CAP RING | 62-58152 |
| 15. | BEARING | 62-58150 |
| 16. | PISTON ASSEMBLY | 62-58156 |

***Figure 192 — Nose Gear Operating Strut Early Models***

operation of the main landing gear and nose gear on B-25C-15, B-25D-10, and subsequent Airplanes. The system consists of an emergency hand-pump and hydraulic fluid reservoir on the forward wall of the navigator's compartment and automatic valves to regulate normal and emergency flow of fluid to the operating struts, a nose gear up-lock release cable interconnecting the emergency hand-pump handle with the up-lock latch, and fluid transmission lines. The emergency hydraulic fluid reservoir is automatically filled from the main hydraulic system reservoir during normal operation of the main system and fluid is available for emergency lowering of the landing gear even if the main hydraulic system fluid capacity is completely lost.

**NOTE**

It is not necessary to bleed the hydraulic system or the brake system after using the emergency lowering system.

*(b)* LANDING GEAR EMERGENCY LOWERING SYSTEM RESERVOIR AND HAND-PUMP.—The landing gear emergency lowering system fluid reservoir and hand-pump are grouped together in a single housing located on the forward wall of the navigator's compartment. The hand-pump (NA 62-58024-3) is identical to the pilot's emergency hand-pump except that the handle is equipped for attachment of the nose gear up-lock release cable.

*(c)* EMERGENCY SHUTTLE RELEASE VALVE (NA 82-58083).—*(Refer to figure 194.)* This valve is connected into the emergency lowering system lines adjacent to the reservoir and interconnects the pressure line from the hand-pump with the supply line to the reservoir. Hand-pump pressure at the bottom port is routed out fitting (5) to the down side of the landing gear operating struts. However, valve pin (7) is filed flat on one side to permit a leakage of ½ to 4 cu.in./min. to the upper ports. This leakage is adequate to provide relief for any thermal expansions which might develop in the system and also to slowly exhaust emergency hand-pump pressure in the system.

*d.* WING FLAP HYDRAULIC SYSTEM.

(1) DESCRIPTION.—System pressure for the simultaneous operation of the wing flap struts *(see figures 195 and 196)* is regulated by the outboard unit of the inboard selector valve, mounted in the nose wheel well and controlled by a lever on the pilot's control pedestal. The flap operating struts are suspended from a fitting mounted to the outboard center side of each nacelle dome. The piston rods extend

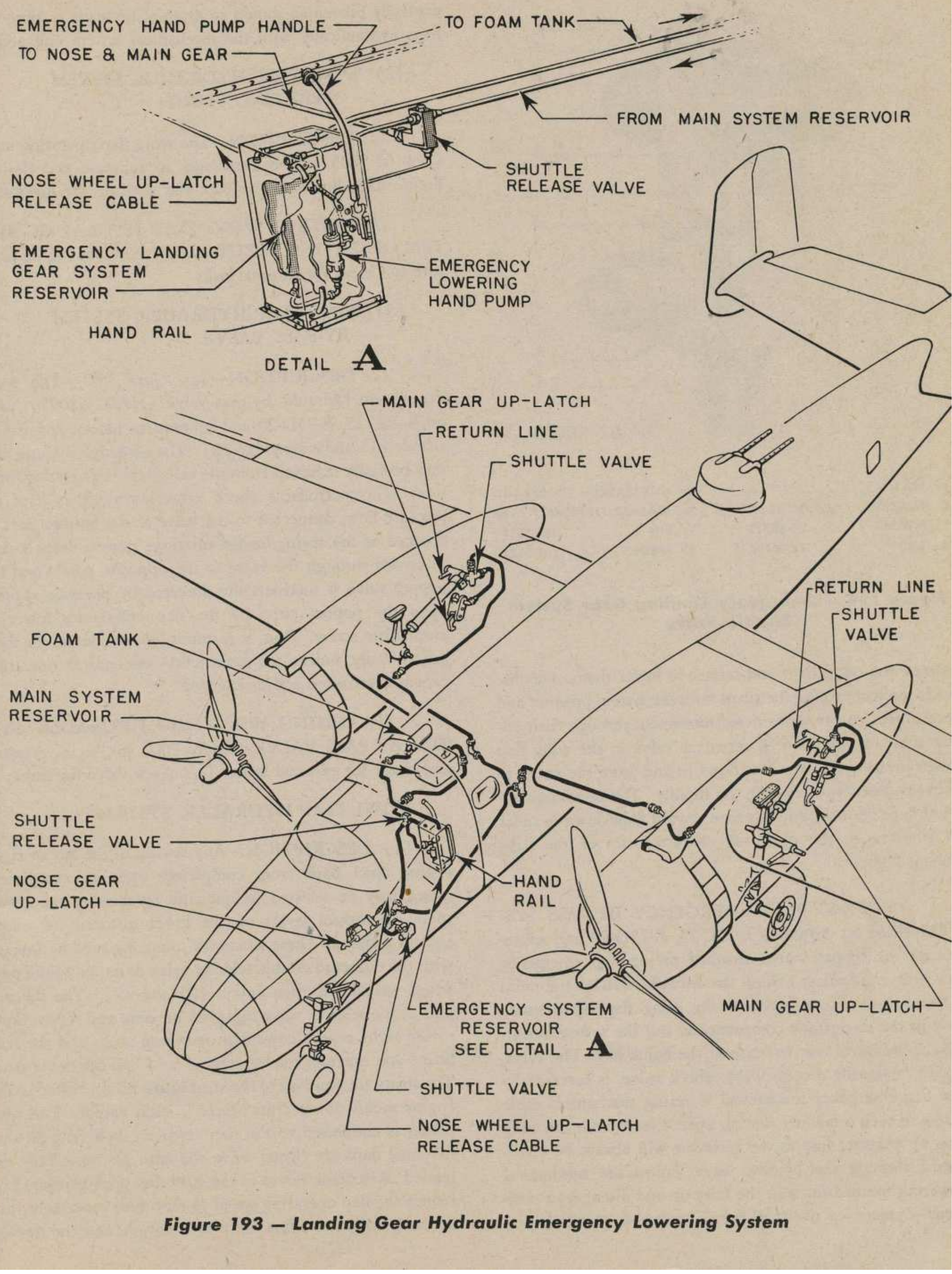
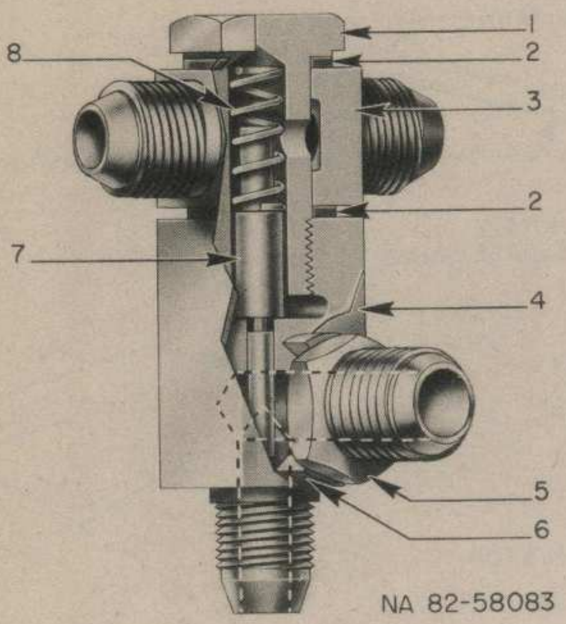



***Figure 193 — Landing Gear Hydraulic Emergency Lowering System***




| | |
|---|---|
| 1. BOLT ...........AN775-5 | 5. NUT (PARKER) 11-1039-1-50 |
| 2. GASKET .......AN901-5C | 6. WASHER .. B985AL37-26-64 |
| 3. FITTING ..........82-58013 | 7. PIN ........... 82-58511 |
| 4. BODY ..........82-58512 | 8. SPRING ........62-58230 |

***Figure 194 — Emergency Landing Gear System Shuttle Valve***

to raise the wing flaps and retract to lower them. Flexible hoses interconnecting the struts with the system pressure and return lines ensure unrestricted movement through their entire angle of operation. A restrictor valve in the wing flap down pressure line restricts flows to and from the struts to prevent them from moving too rapidly. The restriction toward flaps up is slightly less than toward flaps down in order to conform to the operating characteristics of the flaps during flight.

*(a)* WING FLAP EMERGENCY BY-PASS SYSTEM (used on Airplanes B-25C-25, B-25D-20 and subsequent).—A by-pass valve attached to the flap emergency lowering mechanism behind the forward wall of the radio compartment is connected to the wing flap up pressure line in the navigator's compartment and the system return line at the lower rear left side of the bomb bay. The valve, which is actually a controllable check valve, is actuated by the flap emergency mechanical lowering mechanism cable screw in such a manner that an open circuit from the wing flap up pressure line to the reservoir will always be established through the by-pass valve, unless the mechanical lowering mechanism is in the fully up and disengaged position. Damage to the mechanical system is thereby automatically prevented should an attempt be made to raise the flaps hydraulically with the mechanical system engaged.

(2) WING FLAP HYDRAULIC SYSTEM OPERATING STRUT.

*(a)* DESCRIPTION.—The wing flap operating strut (NA 62-58032) is conventional in function and design. Figure 197 illustrates the part and packing arrangements.

*(b)* TESTING WING FLAP HYDRAULIC SYSTEM OPERATING STRUT.—Apply 2000 lbs./sq.in. pressure and check for external leaks.

(3) WING FLAP HYDRAULIC SYSTEM BY-PASS VALVE.

*(a)* DESCRIPTION—*(see figure 198.)*—The wing flap system hydraulic by-pass valve (NA 82-58097), used on B-25C-25, B-25D-20 and subsequent blocks, consists of a body (1) and a cartridge (2). The cartridge is a unit and may be easily removed from the valve body. The valve functions as a controllable check valve inasmuch as flaps up pressure flow, connected to the valve at the bottom port, is checked as the spring-loaded cartridge poppet seats, but is by-passed through the valve to the opposite port when the poppet valve is mechanically unseated by pressure applied upon the poppet stem by the flap emergency lowering mechanism screw. Thus, it is impossible to operate the flaps hydraulically unless the emergency mechanical operating system is retracted and disengaged.

*(b)* TESTING WING FLAP HYDRAULIC SYSTEM BY-PASS VALVE.—Apply 2000 lbs./sq.in. pressure and check for external leaks. Test check valve for leaks.

*e.* COWL FLAP HYDRAULIC SYSTEM.

(1) DESCRIPTION.—Any setting of the left or right engine cowl flaps from completely open to completely closed may be selected individually by moving the corresponding control levers on the lower quadrant of pilot's control pedestal. These levers are interconnected by linkage with the outboard double selector valve mounted to the nose wheel well dome. *(See figures 195 and 196.)* The inboard unit of the selector valve regulates pressure and return flows to the right engine cowl flap operating strut, and the outboard unit operates the left engine cowl flap operating strut. The struts are attached to the strut hinge fitting bolted to the engine mount lower cross braces in each nacelle. The strut piston is connected to the flap actuating bellcrank so that the cowl flaps are closed when the strut piston is fully extended. Restrictor valves in the cowl flap open pressure line reduce the flap operating speed so that their movement may be easily followed from the pilot's station, and the desired

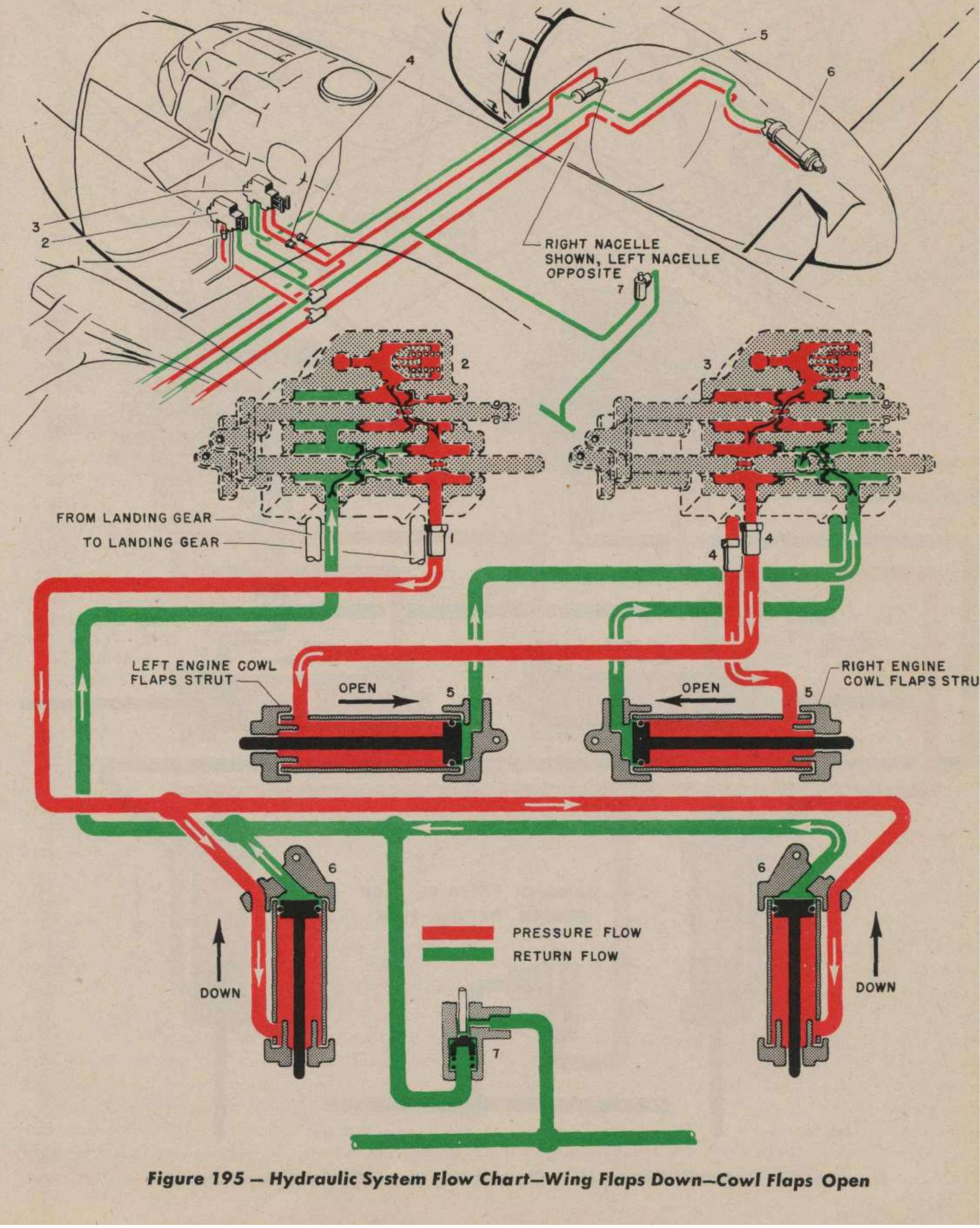



**Figure 195 — Hydraulic System Flow Chart—Wing Flaps Down—Cowl Flaps Open**

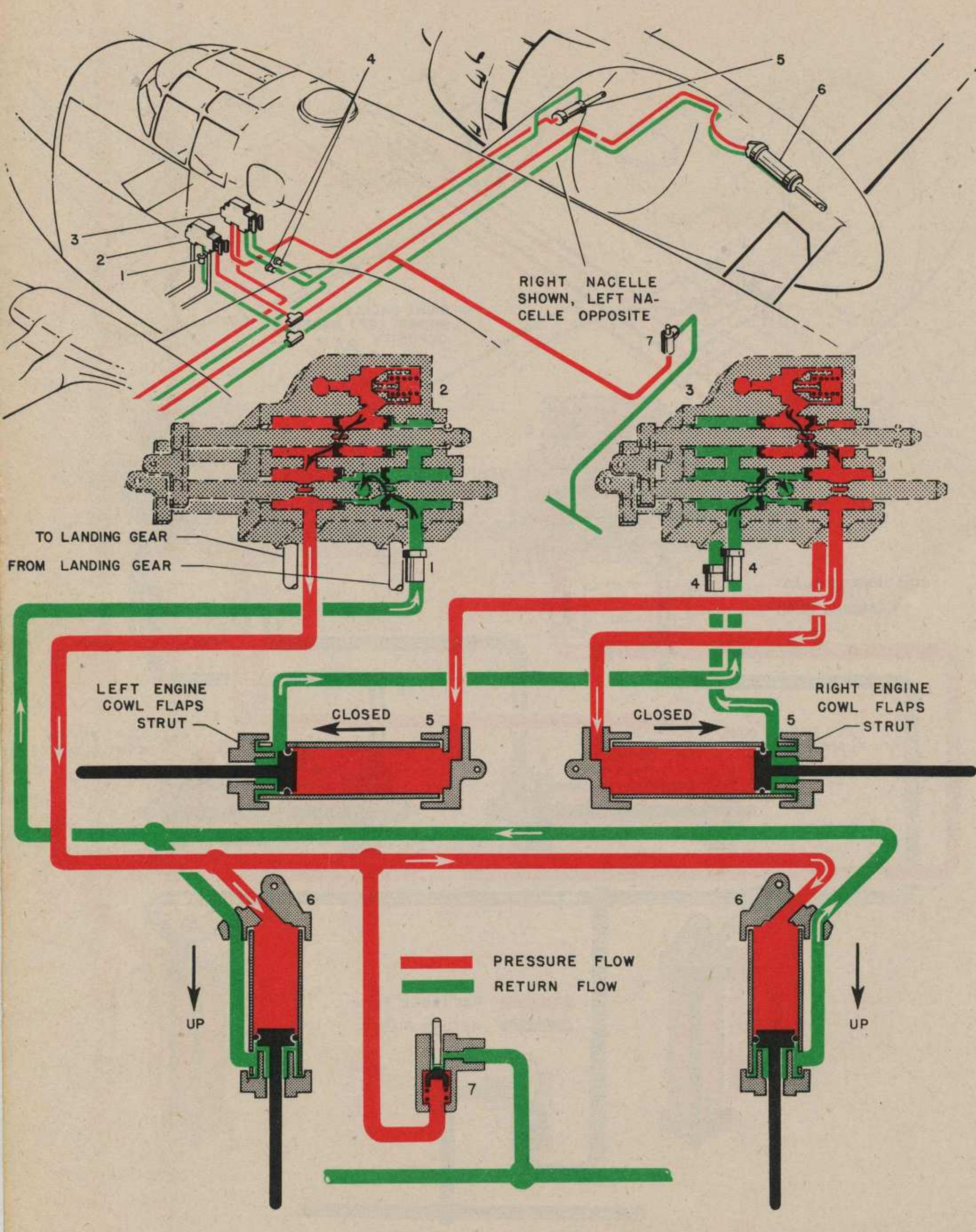
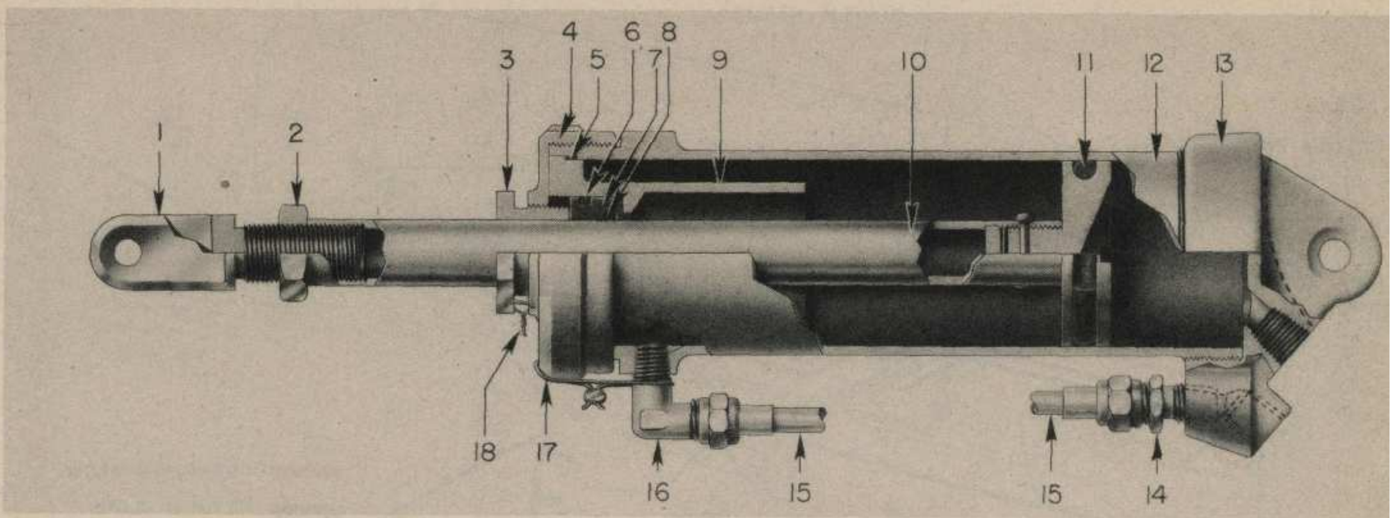



***Figure 196 — Hydraulic System Flow Chart—Wing Flaps Up—Cowl Flaps Closed***




1. CLEVIS FITTING ..............62-58189
2. CHECK NUT ...............AN316-12R
3. END NUT ...................55-58181
4. CAP ........................62-58127
5. GASKET ..................51-58101-15
6. RING SEAL ...............AN6227-17
7. RETAINER ...................82-58552
8. RING SEAL ...............AN6227-23
9. RETAINER ..................62-58191
10. PISTON ....................62-58199
11. RING SEAL ..............B1217-NB-36
12. CYLINDER ..................62-58220

CYLINDER 12 AND HEAD 13 ARE SWEAT-SOLDERED TOGETHER AND SHOULD NOT BE SEPARATED.

14. FITTING ................AC811FT5N
15. LINE .......................62-5850
16. FITTING ................AC811CT5N
17. LOCKWIRE ...............AC995-32-
18. LOCKWIRE ...............AC995-32-

**Figure 197 — Wing Flap Operating Strut**

setting conveniently selected. The speed reduction is identical in both directions and is accomplished for cowl flaps closed by restricting the return flow from the operating struts. This speed restriction also functions to dampen the violent contact which would otherwise result as the strut piston bottoms in the fully open and closed positions.

(2) COWL FLAP HYDRAULIC SYSTEM SELECTOR VALVE.

*(a)* DESCRIPTION.—The engine cowl flap selector valve is identical to the landing gear selector valve. *(Refer to above, and figures 182 and 183,)*

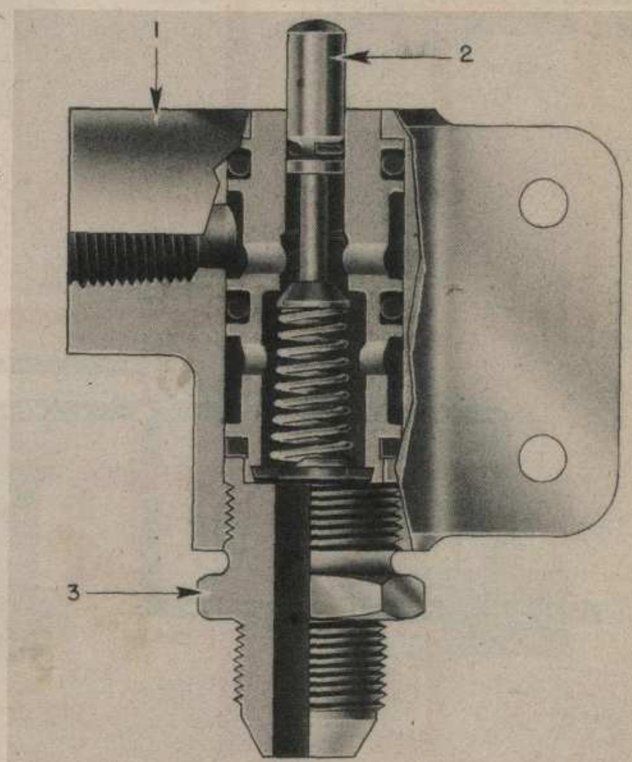
(3) COWL FLAP HYDRAULIC SYSTEM OPERATING STRUT.

*(a)* DESCRIPTION.—The engine cowl flap operating strut (NA 62-58035) is similar in design and function to the wing flap operating strut. *(The part and packing arrangements are illustrated in figure 200.)*

*f.* BOMB DOOR HYDRAULIC SYSTEM.

(1) DESCRIPTION.—Three systems for the operation of the bomb bay doors are provided on successive series of airplanes. They are as follows:

*(a)* A single bomb door control valve (NA 62-58016) *(see figure 199)* interconnected with the delayed




1. BODY......82-58540 2. CARTRIDGE......97-58654 3. END......82-58541

**Figure 198 — Flap Emergency By-pass Valve**

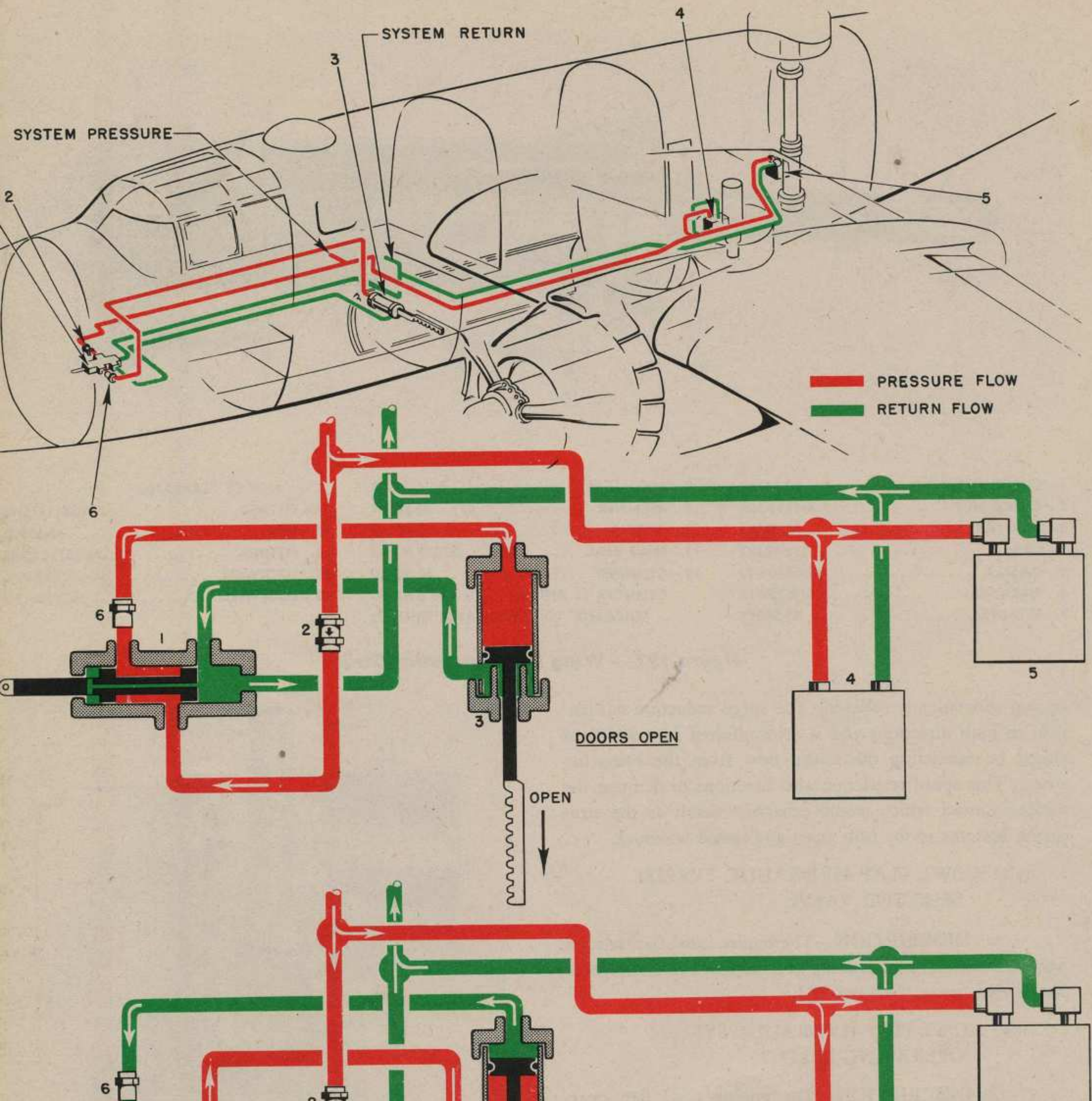
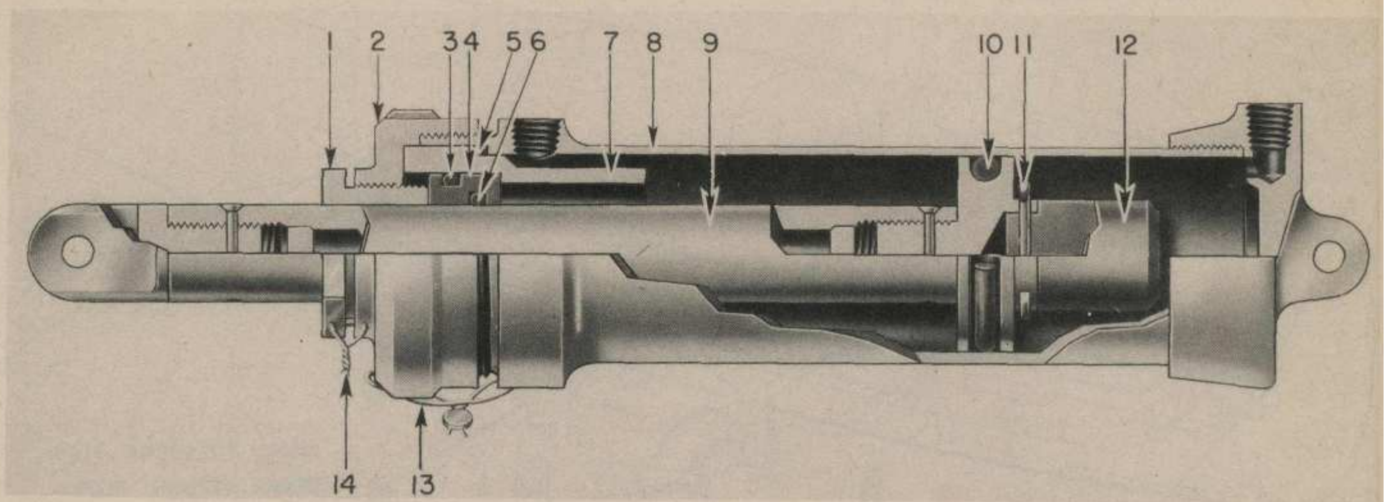



*Figure 199 — Bomb Bay Doors and Gun Charging Systems*




REF. NA 82-58035-2

| | | |
|---|---|---|
| 1. NUT .......................55-58181 | 6. RING SEAL ..............AN6227-17 | 11. COTTER PIN ...............AN380-3- |
| 2. BEARING ....................55-58182 | 7. RETAINER ..................62-58128 | 12. STOP .......................82-5857 |
| 3. RING SEAL .............NA82-58035-2 | 8. CYLINDER ..................62-58124 | 13. SAFETY WIRE ............AC995-32- |
| 4. RETAINER ..................82-58552 | 9. PISTON ..................62-58121-2 | 14. SAFETY WIRE ............AC995-32- |
| 5. GASKET .................51-58101-12 | 10. RING SEAL ................B1217-NB | |

**Figure 200 — Engine Cowl Flap Operating Strut**

action cam mechanism in the nose wheel well, is regulated by the handle in the bombardier's compartment. (Applicable to B-25C Airplanes AC41-12434/3038 only, and B-25D Airplanes AC41-29648/847 only.)

*(b)* An additional control valve is located together with its control lever in the lower right-hand corner of the navigator's compartment. *(See figure 201.)* The bomb bay doors may be operated either from this control, or as described in *(a)* above. (Applicable to B-25C Airplanes AC41-13039/296 only, and B-25D Airplanes AC41-29848/30172 only.)

*(c)* In addition to the system described in *(a)* above, an identical control valve is installed below the pilot's floor and is interconnected with a flexible control to the control knob located on the right side of the pilot's control pedestal.

**Key to Figure 199**

1. BOMB BAY DOOR CONTROL VALVE ................62-58016
2. ONE-WAY CHECK VALVE (PARKER) .............475-GG-1/4D
3. BOMB BAY DOOR OPERATING STRUT ...............62-58037
4. FORWARD TURRET GUN CHARGING VALVE (BENDIX) ..................................76861
5. REAR TURRET GUN CHARGING VALVE (BENDIX) ........78595
6. RESTRICTOR VALVE ............................62-58084-4

**Key to Figure 201**

1. BOMB BAY DOOR CONTROL VALVE ................62-5801
2. ONE-WAY CHECK VALVE (PARKER) .............475-GG-1/4
3. BOMB BAY DOOR OPERATING STRUT ...............62-5803
4. SHUT-OFF VALVE, 1/4-INCH (CRANE) ...................223
5. FORWARD TURRET GUN CHARGING VALVE (BENDIX) ..............................................7686
6. REAR TURRET GUN CHARGING VALVE (BENDIX) ..............................................7859
7. RESTRICTOR VALVE ............................62-58084-

*(See figure 202.)* The bomb doors may thus be operate from either this control or the control in the bombardier' compartment. (Applicable to B-25C-5, B-25D-10 and sub sequent blocks.)

(2) BOMB DOOR HYDRAULIC SYSTEM SELECTOR VALVE.

*(a)* DESCRIPTION.—The bomb bay door contr valve (NA 62-58016) *(see figure 204)* is a convention lap-fitted slide valve, operated by the control handle in th bombardier's compartment. The spool is hollow to perm the oil to return to the reservoir when closing the bomb ba doors; and since internal leakage cannot be entirely checke in this type of valve, it takes care of leakage past the annula

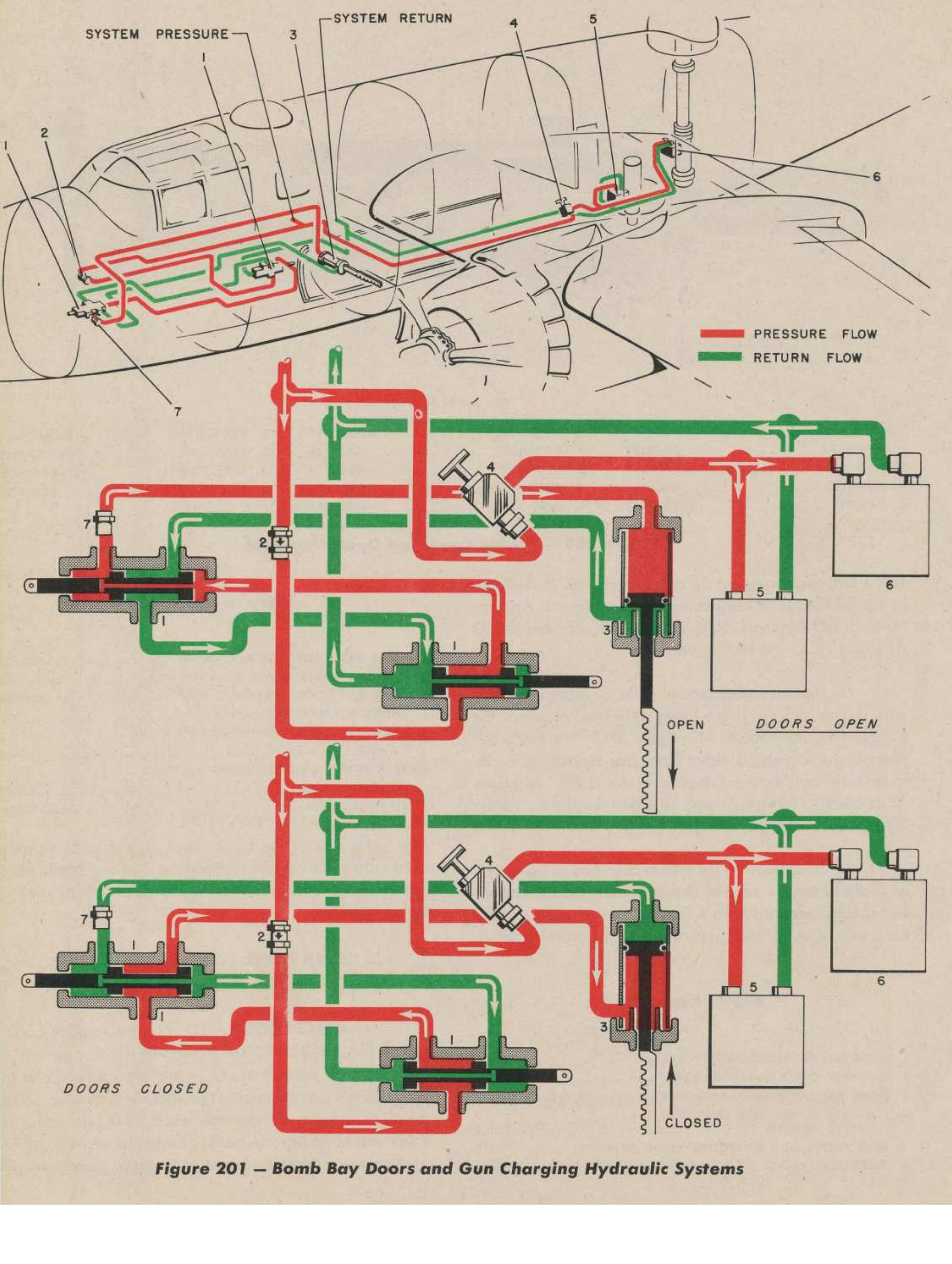



*Figure 201 — Bomb Bay Doors and Gun Charging Hydraulic Systems*

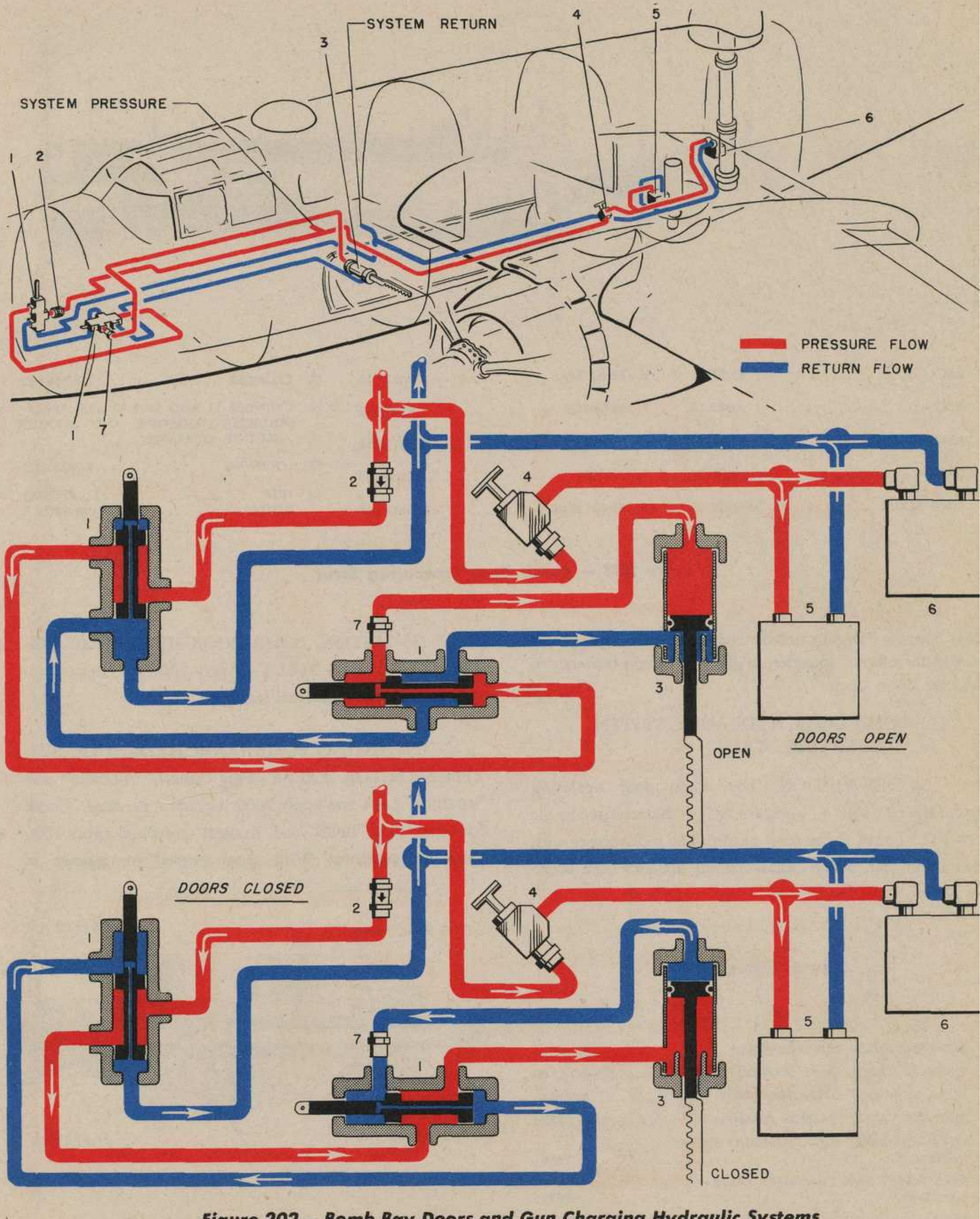
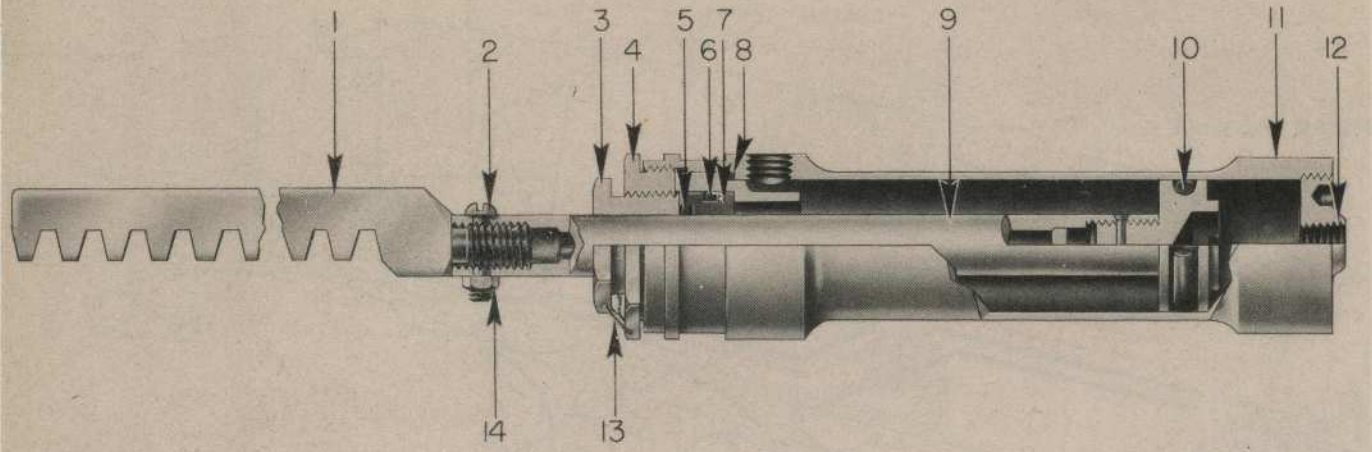



**Figure 202 — Bomb Bay Doors and Gun Charging Hydraulic Systems**




| | | |
|---|---|---|
| . RACK ........................62-58282 | 6. RING SEAL ...............AN6227-18 | 11. CYLINDER ..................62-58160 |
| . BOLT ........................AN23-15 | 7. RETAINER ..................82-58553 | 12. CYLINDER 11 AND END 12 ARE SWEAT-SOLDIERED TOGETHER AND SHOULD NOT BE SEPARATED. |
| . BEARING NUT ...............62-58140 | 8. GASKET ..................51-58101-18 | 13. LOCKWIRE ...............AC995-32-3 |
| . CAP ........................62-58137 | 9. PISTON .................... 62-58158 | 14. NUT .......................AN320-3<br>COTTER ...................AN380-2-2 |
| . RING SEAL ................AN6227-13 | 10. RING SEAL ...............B1217NB18 | |

**Figure 203 — Bomb Door Operating Strut**

ing. There is a slightly unbalanced force toward the "DOORS OPEN—RACK LOCK" position to give the valve a tendency to hold the doors open.

(3) BOMB DOOR HYDRAULIC SYSTEM OPERATING STRUT.

*(a)* DESCRIPTION.—The bomb door operating strut (NA 62-58037) *(see figure 203)* is characterized by the rack (12) bolted to the strut piston. The rack meshes with the pinion gear, which simultaneously actuates both bomb bay doors.

**Key to Figure 202**

. BOMB BAY DOOR CONTROL VALVE .................62-58016
. ONE-WAY CHECK VALVE (PARKER) .............475-GG-1/4D
. BOMB BAY DOOR OPERATING STRUT ................62-58037
. SHUT-OFF VALVE, 1/4-INCH (CRANE) ...................223H
. FORWARD TURRET GUN CHARGING VALVE (BENDIX) ...............................................76861
. REAR TURRET GUN CHARGING VALVE (BENDIX) ...............................................78595
. RESTRICTOR VALVE ..............................62-58084-4

*(b)* TESTING BOMB DOOR HYDRAULIC SYSTEM OPERATING STRUT.—Apply 2000 lbs./sq.in. pressure and check for external leaks.

*(c)* TESTING BOMB DOOR HYDRAULIC SYSTEM SELECTOR VALVE.—Plug "OPEN," "CLOSED" and "RETURN" ports and apply 2000 lbs./sq.in. pressure. Check for leaks. Plug "OPEN" and "CLOSED" ports and apply 1000 lbs./sq.in. pressure. With spool pushed in, leakage at

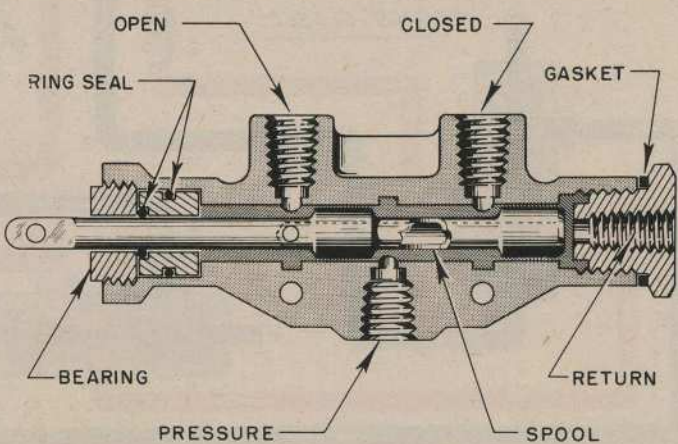
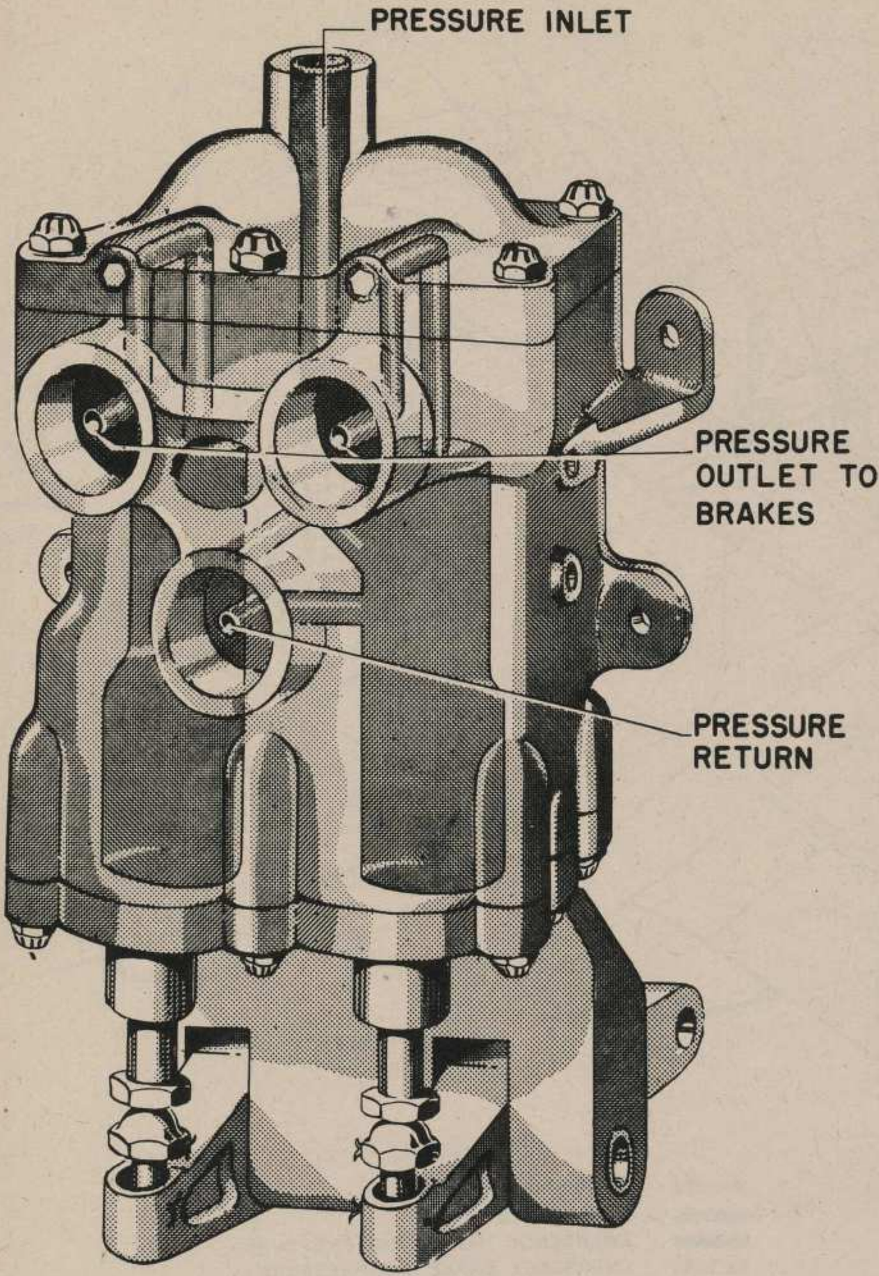
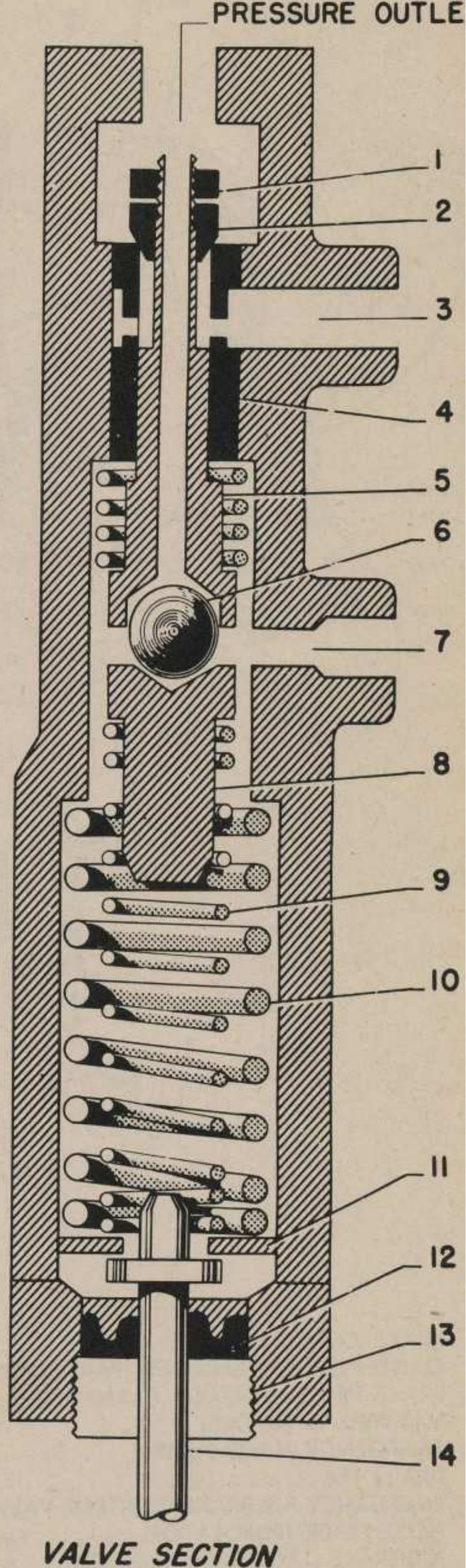


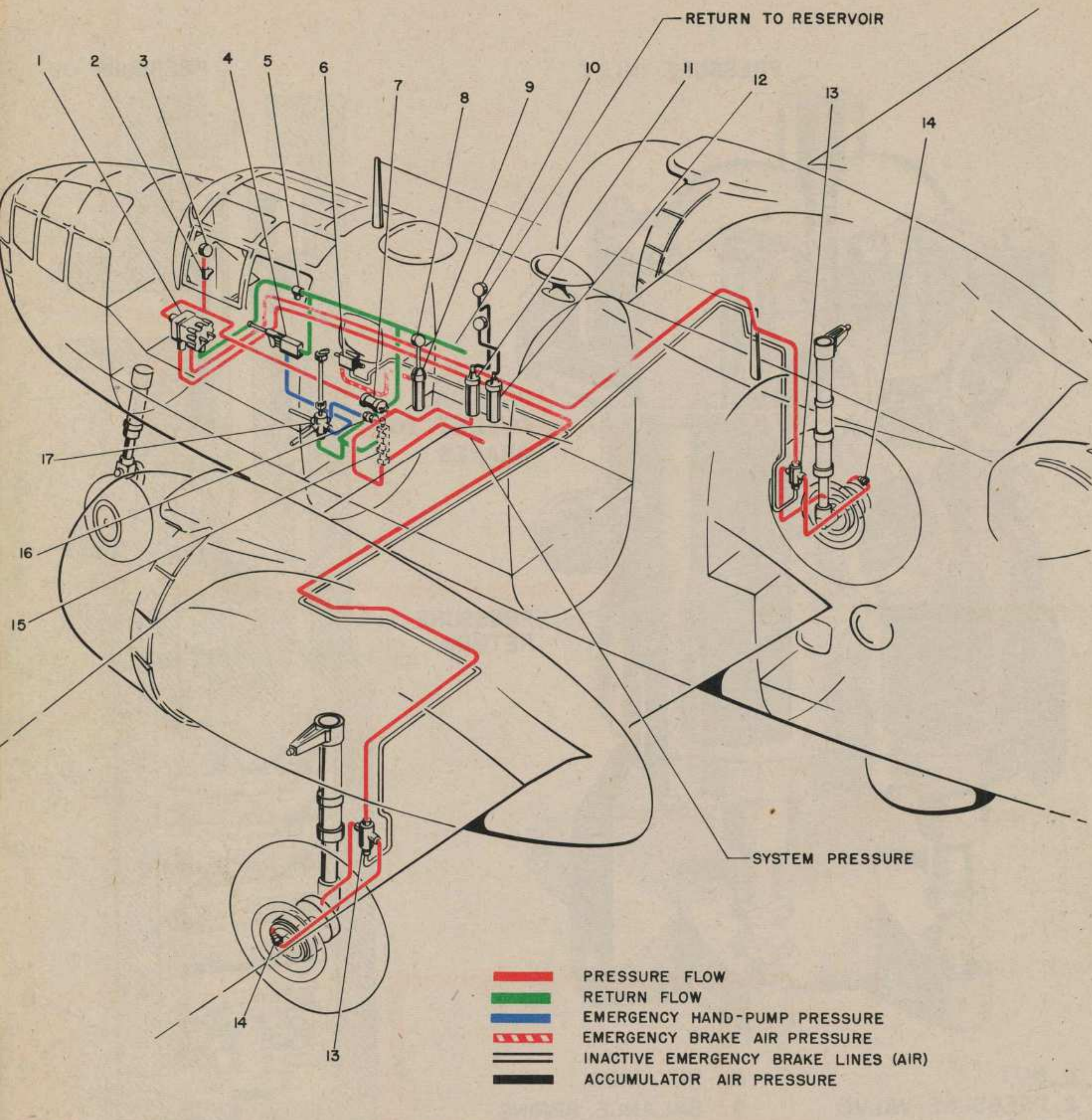

**Figure 204 — Bomb Door Control Valve**




1. NUT
2. PRESSURE VALVE
3. PRESSURE INLET
4. BUSHING
5. SLIDE VALVE
6. RETURN VALVE
7. PRESSURE RETURN
8. RETAINER
9. BALANCE SPRING
10. RETURN SPRING
11. WASHER
12. SEAL
13. END CAP
14. OPERATING PLUNGER

**Figure 205 — Brake Valve (Vickers)**




1. BRAKE CONTROL VALVE ................82-58078
2. GAGE PRESSURE SNUBBER (PARKER) .....4PSGGXX
3. BRAKE PRESSURE GAGE (MANNING, MAXWELL & MOORE) ..................6736-116
4. EMERGENCY HAND-PUMP ...............62-58024
5. DRAIN TEE ...........................
6. EMERGENCY AIR BRAKE CONTROL VALVE . 62-58082-2
7. FLUID FILTER (PUROLATOR) ...............28740
8. AIR BRAKE GAGE (U.S. GAGE CO.)...AW-1-⅞-17-AM
9. AIR TANK ...........................62-33430
10. BRAKE SYSTEM ACCUMULATOR AIR GAGE (U.S. GAGE CO.) ..........AW-1-⅞-17-AE
11. BRAKE SYSTEM ACCUMULATOR .......62-58376-1
12. GENERAL SYSTEM ACCUMULATOR ......62-58376
13. TRANSFER VALVE (HOOF) ..............HL-5100
14. SELF-SEALING COUPLING ..................111-6
15. ACCUMULATOR THERMAL RELIEF & EXHAUST VALVE .......................82-58089
16. ONE-WAY CHECK VALVE (PARKER) ....475LGT6D
17. EMERGENCY SELECTOR VALVE ........62A-58025

***Figure 206 — Brake Systems Diagram—Hydraulic and Pneumatic***

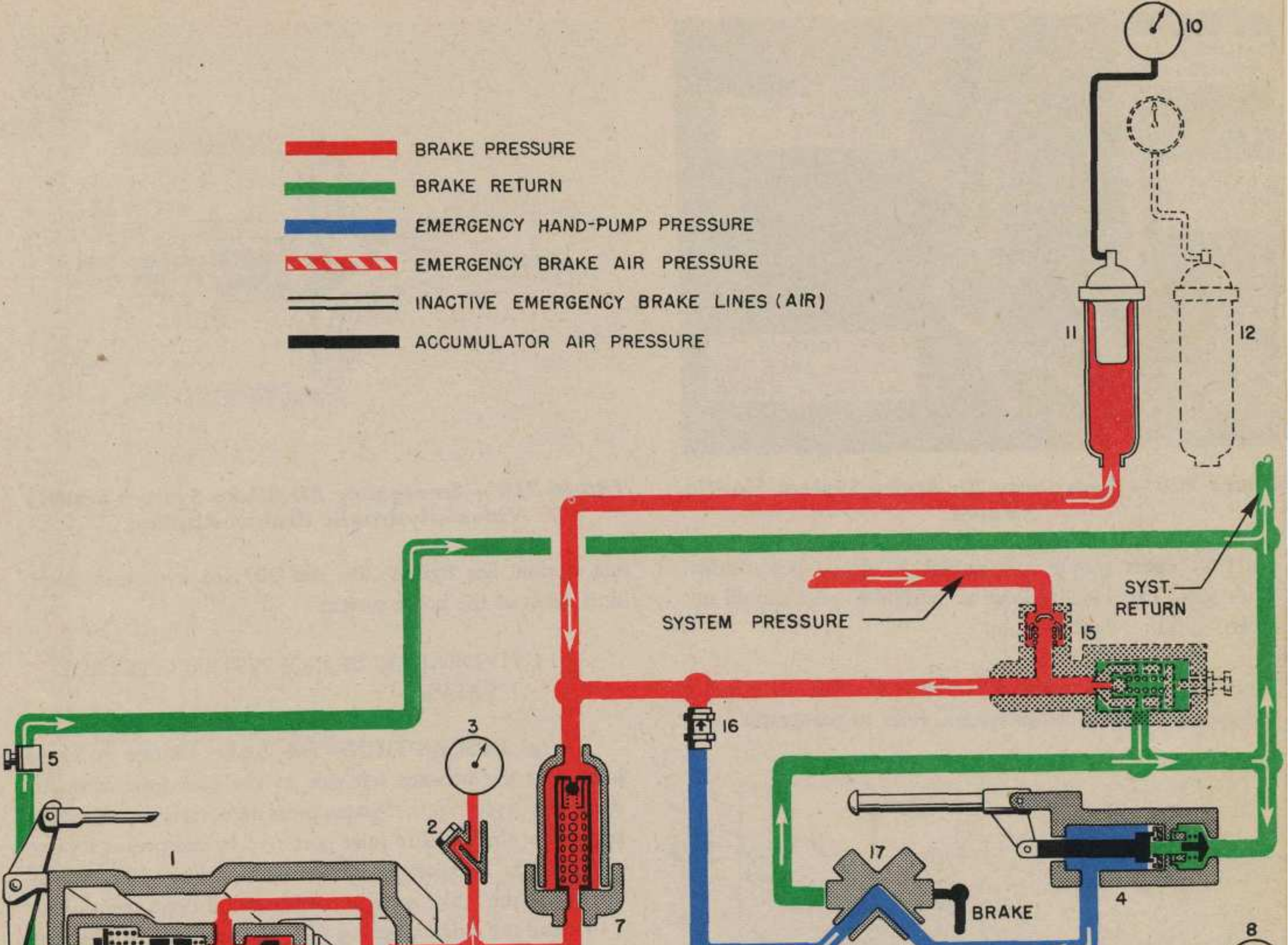



**Figure 207 — Brake Systems Diagram—Hydraulic and Pneumatic**

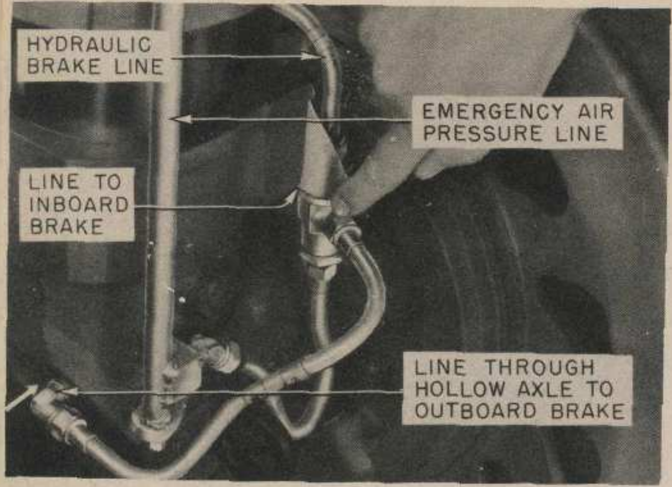



**Figure 208 — Emergency Air Brake System Shuttle Valve**

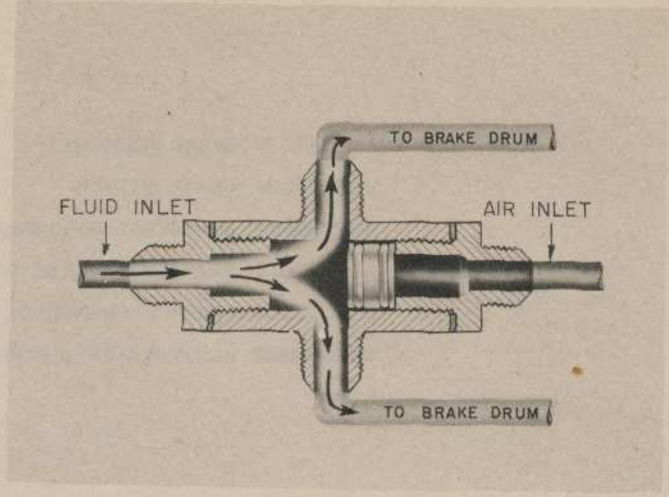



**Figure 210 — Emergency Air Brake System Shuttle Valve—Hydraulic Brakes Applied**

"RETURN" port should not exceed 50 drops per minute. With spool extended, leakage at "RETURN" port should not exceed 100 drops per minute.

*g.* HYDR. JLIC BRAKE SYSTEM.—For description and operation of the brake system, refer to paragraph 7., c., this section. See figures 206 and 207 for a diagrammatic illustration of the brake system.

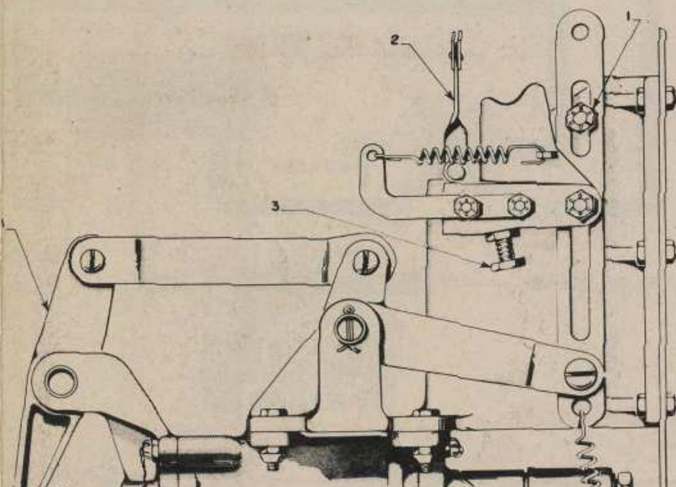



**Figure 209 — Brake Valve Installation**

(1) HYDRAULIC BRAKE SYSTEM CONTROL VALVE.

*(a)* DESCRIPTION.—The brake control valve is located at the forward left side of the nose gear compartment *(see figure 205)*. System pressure entering at the top is stopped at the pressure inlet port (3) by the pressure valve (2), which is balanced by the slide valve (5). A load applied to the brake pedal is transferred through the plunger (14) and the balance spring (9), and seats the ball (6) on the lower end of the slide valve (5). This seals the return port (7) at the bottom from the pressure outlet at the top. A load applied on the bottom of the slide valve (5) forces open the pressure valve (2) which allows the pressure to be delivered to the brakes. The fluid pressure on the brakes is also a down load on the ball (6), and the pedal load is an up load on the ball (6). As long as the pedal load is greater than the fluid pressure on the brakes, the valve (2) will remain open; but when the fluid pressure load on the brakes rises high enough to equal the pedal load on the ball (6), the pressure valve (2) will shut off with the aid of a light spring wrapped around the slide valve (5). When the fluid pressure load on the brakes is large enough to overcome the pedal load, the spring (9) is compressed. This allows the fluid to pass through the center of valve (5) and out to the reservoir (7), since the ball (6) under this condition is not seated on the lower seat of valve (5). If the pedal load were decreased, the brake pressure would push the ball (6) open and allow the pressure to escape into the return port (7). The return spring (10) returns the pedals when the brakes are off, at which time there is no load on the balance spring (9). For clarity, all rubber cups and

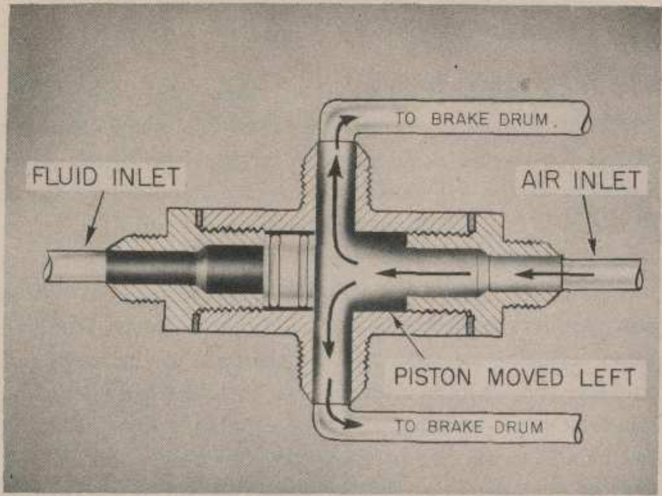



**Figure 211 — Emergency Air Brakes System Shuttle Valve—Air Brakes Applied**


**Figure 212 — Emergency Air Brake Control Handle**

gaskets are not shown. The load on the brakes is equal to the load on the balance spring (9) divided by the area of the ball seat. Hence, the farther the pedals are pushed, the more the balance spring will be compressed, and the load on the brakes will rise proportionately.

(*b*) TESTING AND ADJUSTING HYDRAULIC BRAKE SYSTEM CONTROL VALVE.—The following procedure applies to both sides of the valve. Apply 1500 lbs./sq.in. at pressure inlet port; check for leaks. With pressure return port capped, apply 500 lbs./sq.in. at pressure outlet to brakes; check for leaks. With gage on outlet to brakes, adjust maximum pressure to 250 lbs. Adjust parking brake so there will be 1/16-inch clearance between lock and stop bolt.

(2) HYDRAULIC BRAKE SYSTEM TRANSFER VALVE.

(*a*) DESCRIPTION.—The transfer valve, located at the base of the shock strut *(see figures 206 and 207)*, is connected at the top to the hydraulic pressure line, at the bottom to the pneumatic pressure line, and at either side to the respective brake. When the brakes are operated normally with hydraulic pressure, the shuttle is forced to the position shown. This prevents hydraulic oil from entering the pneumatic tube, yet permits a free flow to both brakes. When pneumatic pressure is applied, the shuttle is forced upward, preventing air entering the hydraulic pressure line and yet allowing free flow to both brakes.

*b.* PNEUMATIC BRAKE SYSTEM.

(1) DESCRIPTION.—An emergency pneumatic system *(see figures 206 and 207)*, for use in the event of hydraulic system failure consists of a tank mounted in the lower forward right side of the navigator's compartment *(see figure 213)*, a control valve and handle located to the right of the pilot's seat, two shuttle valves located one at the base of each shock strut, and lines and fittings.

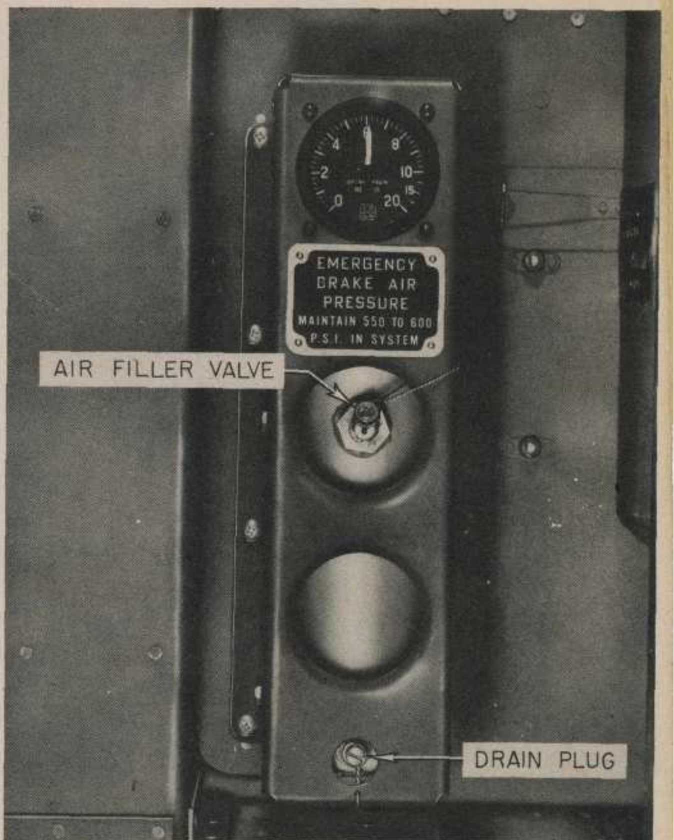



**Figure 213 — Emergency Air Brake Storage Tank and Gage**

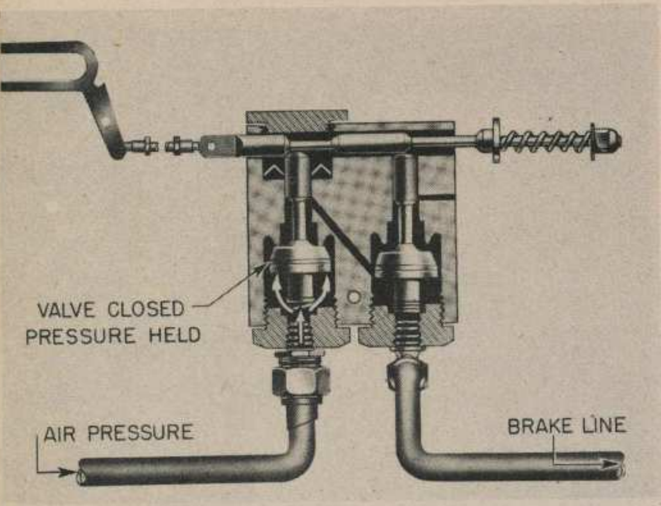



**Figure 214 — Emergency Air Brake Valve— Brakes Off**

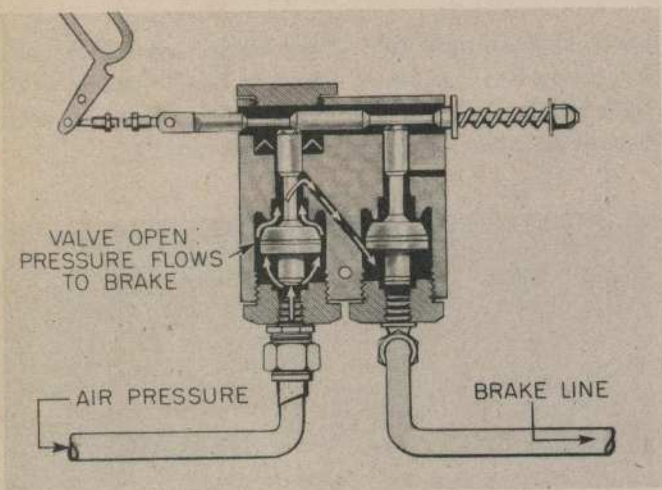



**Figure 215 — Emergency Air Brake Valve— Brakes Applied**

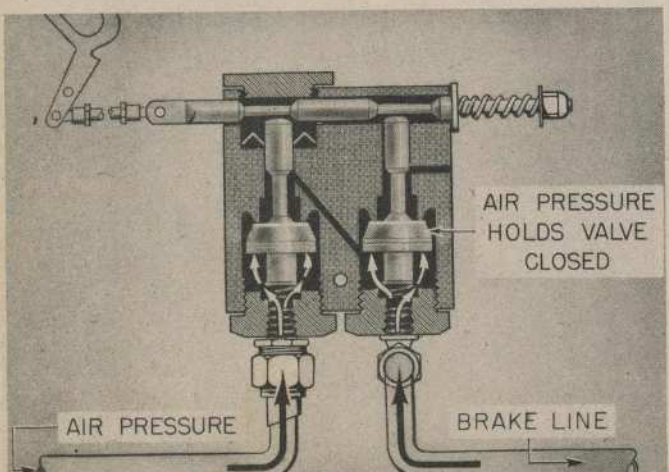



**Figure 216 — Emergency Air Brake Valve— Brakes Held**

(2) PNEUMATIC BRAKE SYSTEM CONTROL VALVE.

*(a)* DESCRIPTION.—The valve (NA 62-58082) and control handle are interconnected by linkage. Pulling up on the handle pulls the shaft against the spring. The valve is in the off position with the handle full down. *(See figure 214.)* Pulling the handle to the full up position causes the shaft to move out until the annular area has moved beneath the stem. This causes the stem to unseat and permits the spring to seat the opposite stem. Air then flows from the air tank into the chamber of the stem, and through the duct to the chamber of the opposite stem, where it flows out the port to the brake system. Moving the handle to the intermediate position moves the annular area of the shaft to a point between the two stems, permitting both stems to seat. This prohibits the passage of air under pressure to the brake system and, at the same time, prohibits air under pressure within the brake system to escape. Moving the handle to the full down position permits the stem to seat while the annular area forces the opposite stem to unseat, allowing the air to escape from the brake system to the atmosphere through the vent in the valve body.

*(b)* TESTING AND ADJUSTING PNEUMATIC BRAKE SYSTEM CONTROL VALVE.—With valve in neutral position apply 450 lbs./sq.in. air pressure at inlet port, place valve under water and check for leaks. Plug outlet port and apply 450 lbs./sq.in. air pressure at inlet port with valve in open position, place under water and check for leaks. When installing valve, adjust it so that flanged end of shaft (next to spring) is $\frac{5}{16}$ inch out from valve body with control handle in down position.

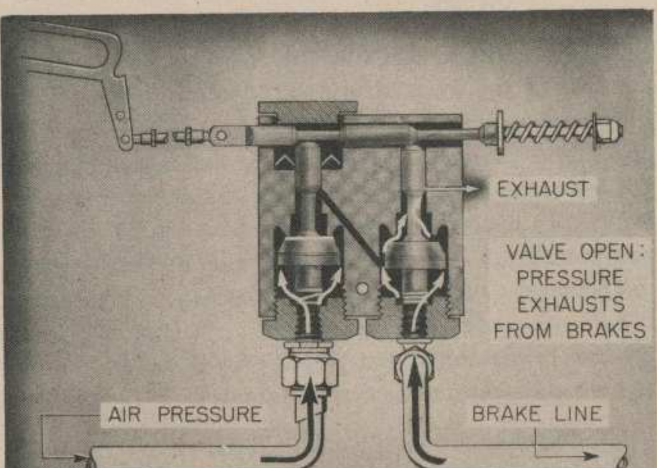



**Figure 217 — Emergency Air Brake Valve— Brakes Released**

*i.* MISCELLANEOUS HYDRAULIC UNITS.

(1) HYDRAULIC SYSTEM CHECK VALVES.

*(a)* DESCRIPTION.—One-way check valves *(see figure 219)* in the pressure lines from the hand-pump prevent system pressure flowing to the emergency selector valve, but allow oil pumped by the hand-pump to flow unrestricted into the system.

(2) HYDRAULIC SYSTEM RESTRICTOR VALVES.

*(a)* DESCRIPTION.—Restrictor valves (NA 62-58084) *(see figure 220)* are incorporated into the systems of various units to provide a restricted flow in two directions. The faster flow is always toward the hexagonal end. When the flow is toward the hexagonal end, the plunger is forced in that direction far enough to uncover the holes in the plunger, allowing the larger amount of oil to flow. When the flow is in the opposite direction, the plunger is forced to move back. This covers up the holes, making the flow smaller in this direction. Restrictor valves of this type are found in the following lines:

| | |
|---|---|
| Brake accumulator | NA 62-58084-3 |
| Engine cowl flaps | NA 62-58084-5 |
| Bomb door | NA 68-58084-4 |
| Nose wheel | NA 62-58084-3 |

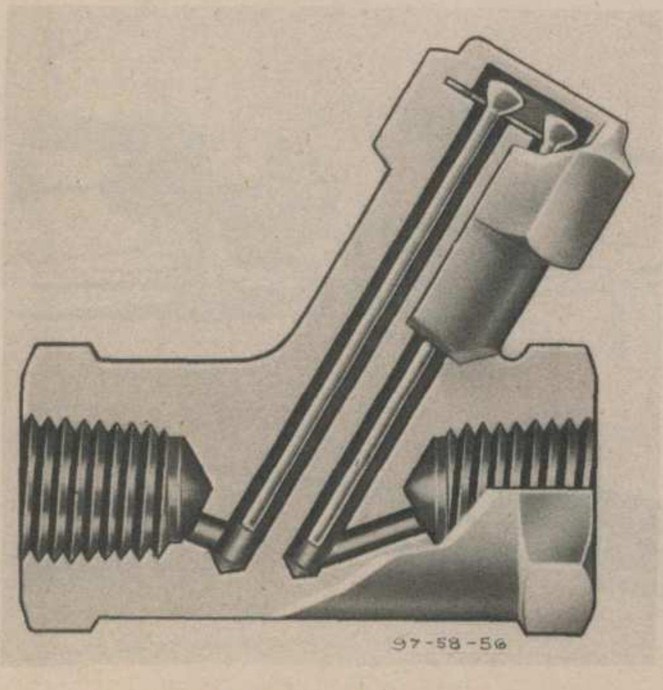
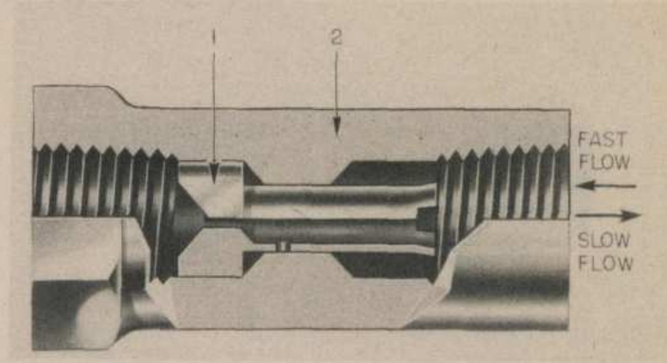


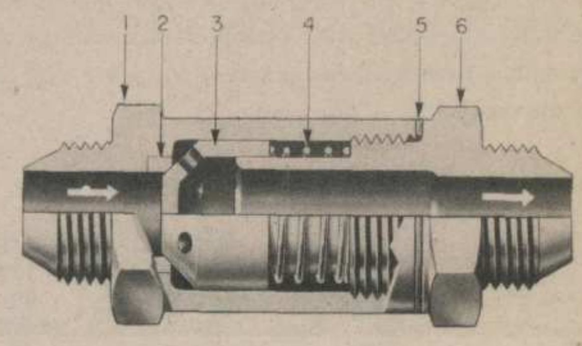

Figure 218 — Gage Pressure Snubber




1. PLUNGER ............................62-58450
2. BODY ...............................36-58016

Ref. NA—62-58084

Figure 219 — Parker Check Valve




1. BODY
2. SEAT
3. VALVE
4. SPRING
5. GASKET
6. CAP

Figure 220 — Restrictor Valve

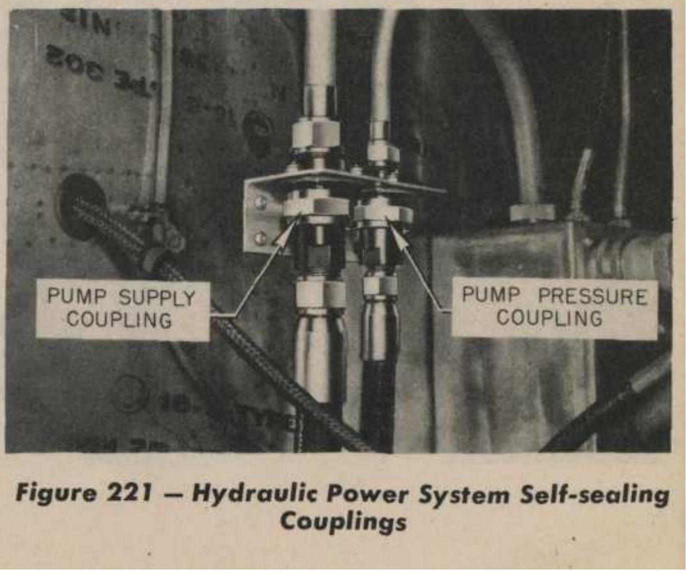



Figure 221 — Hydraulic Power System Self-sealing Couplings

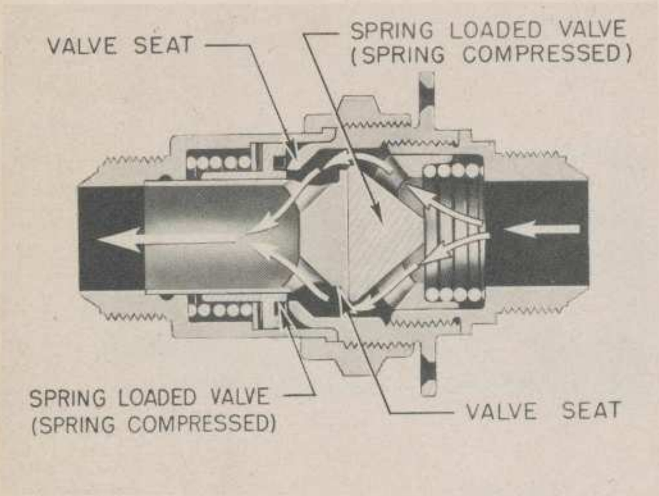



**Figure 222 — Hydraulic Power System Self-sealing Coupling—Uncoupled**

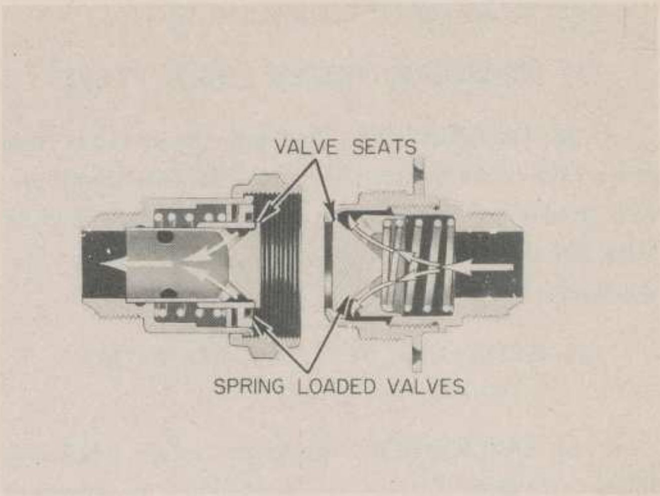



**Figure 223 — Hydraulic Power System Self-sealing Coupling—Coupled**

(3) HYDRAULIC SYSTEM PRESSURE SNUBBER.

*(a)* DESCRIPTION.—Each gage registering hydraulic pressure is equipped with a snubber consisting of an orifice with a floating inertia plunger *(see figure 218)* to damp the oscillations of the needle.

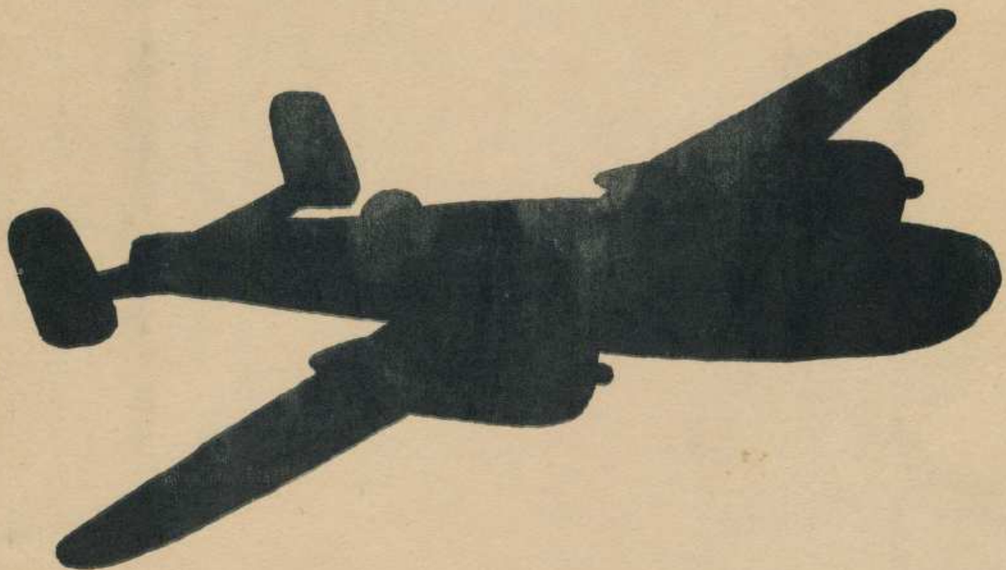
(4) HYDRAULIC SYSTEM DISCONNECT COUPLINGS.

*(a)* DESCRIPTION.—Self-sealing disconnect couplings *(see figures 221, 222 and 223)* are installed at the right engine firewall to provide for disconnection of hydraulic suction and pressure lines without the loss of fluid or the introduction of air into the system.

1,50
2,00
2,10
2,00
2,20
1,45
12,05

TURNER FIELD

# ESCADRILLE FRANCAISE
# ECOLE DE TERRE



# EQUIPEMENT AERONAUTIQUE
# DE L'AVION B-25 (AT-24)

RESTRICTED