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## INTRODUCTION

The DC-3 hydraulic system utilizes 5606 hydraulic fluid and is pressurized by two geared, positive displacement pumps capable of producing a flow rate of two gallons per minute at 1500 PSI. There is one engine driven hydraulic pump mounted on the accessory case of each engine. The hydraulic system consists of five hydraulically operated units as described in this chapter:

- Landing gear
- Brakes
- Wing flaps
- Cowl flaps
- Windshield wipers

Hydraulic system pressure is supplied by each of the engine driven pumps with reserve pressure maintained in the accumulator system. In the event of the failure of either pump, the remaining operative pump will provide sufficient pressure to operate all hydraulic units.

A hand operated hydraulic pump (Emergency Hand Pump) provides an emergency source of pressure in the event the engine driven pumps fail to supply sufficient pressure or become inoperative.

This chapter provides a general overview of the DC-3 Hydraulic System as well as normal operations and limitations.

## GENERAL

### HYDRAULIC SYSTEM COMPONENTS

The component parts of the hydraulic system that supply, regulate, and control the operation of the five hydraulically operated units are as follows:

**Hydraulic Reservoir**
The hydraulic reservoir is located on the aft side of the bulkhead behind the First Officer's seat. A sight gauge, visible from either pilot's seat, is mounted on the hydraulic control panel near the filler neck of the reservoir.

The reservoir capacity is 13 quarts. Ten quarts are available from a standpipe inside the reservoir to the normal hydraulic system. Three quarts of hydraulic fluid are available below the standpipe to the Emergency Hand Pump. The total capacity of the hydraulic system is 28 quarts which includes the fluid in all the lines and the accumulator.

**Accumulator**
The accumulator has a dry nitrogen charge of 250 PSI and affects the hydraulic system in three ways:
- It provides reserve hydraulic pressure when the engine driven pumps are not operating,
- It provides additional pressure to the hydraulic system when the pump output is exceeded by system demands, and
- It dampens hydraulic system surges by absorbing system pressure surges.

**Hydraulic Control Panel**
The hydraulic control panel is located on the right side of the cockpit bulkhead and consists of a sight gauge, a Star Valve, a wing flap selector, a landing gear selector, an Emergency Hand Pump, and two hydraulic pressure output gauges.

**Emergency Hand Pump**
The Emergency Hand Pump is located at the bottom of the hydraulic control panel adjacent to the First Officer's seat. The pump is a double action piston pump and supplies positive fluid pressure with each stroke of the handle. The hand pump provides an alternate means of supplying hydraulic pressure for the operation of all hydraulic systems.

***NOTE:*** *In the event of a hydraulic system leak, three quarts of fluid will remain below the reservoir standpipe for Emergency Hand Pump operation.*

**Hydraulic Star Valve**
The Hydraulic Star Valve is located near the center of the hydraulic control panel. During normal operations this valve is CLOSED (turned clockwise) to provide direct actuation of the hydraulic units without charging the accumulator. When the valve is opened, pressure from the Emergency Hand Pump is applied to the accumulator and then to the hydraulic system.

**Pressure Regulator**
The hydraulic system pressure regulator maintains system pressure supplied by the engine driven pumps at 950 ± 50 PSI.

**System Relief Valve**
The system relief valve prevents system pressure from exceeding 1100 ± 50 PSI in the event of failure of the pressure regulator.

**Pressure Gauges**
Two hydraulic pressure gauges are located on a panel on the outboard right hand side of the cockpit by the First Officer's seat. The aft gauge is the System Pressure Gauge and the forward gauge is the Landing Gear Pressure Gauge.

**System Pressure Gauge**
The System Pressure Gauge is the aft gauge on the pressure gauge panel and indicates system pressure at all times. During wing flap operation, landing gear operation, or brake application, system pressure will normally fluctuate.

**Landing Gear Pressure Gauge**
The Landing Gear Pressure Gauge is the forward gauge on the pressure gauge panel and indicates pressure in the landing gear down line.

Positive pressure in the landing gear down line is one of the three methods used to assure that the landing gear remains down and locked. During all operations with the Landing Gear down, if the Landing Gear Pressure is abnormally high or low, temporarily place the Landing Gear Handle in the full DOWN position to restore normal pressure by combining the hydraulic manifolds. Similarly, when operating with the Landing Gear up, if Landing Gear Pressure is indicated, temporarily place the Landing Gear Handle to UP to assure that the Landing Gear is fully retracted.

For more detailed information see the Landing Gear Chapter in this manual (GTM Ch.14).

**Hydraulic Shutoff Valves**
Hydraulic fluid shutoff valves are installed in each nacelle aft of the firewall. When closed, these valves will immediately shut off the flow of hydraulic pressure from each respective engine. Selectors for these valves are located on the left side of the throttle quadrant and are blocked OPEN by a slide latch. They should remain in the OPEN position unless required by an emergency. Once closed for any reason, only maintenance personnel may re-open the firewall shutoff valves.

## HYDRAULICALLY OPERATED UNITS

**Landing Gear**
See the Landing Gear & Brakes Chapter in this manual (GTM Ch.14).

**Wing Flaps**
See the Flight Controls Chapter in this manual (GTM Ch.15).

**Brake System**
See the Landing Gear & Brakes Chapter in this manual (GTM Ch.14).

**Windshield Wipers**
Windshield wipers are provided for each pilot's windshield. The speed of the wipers is controlled by a control valve that is located on the left side of the wiper motor below the windshield "V". This valve regulates the amount of hydraulic fluid flowing through the wiper motor that controls the wiper blade speed. One valve is provided for each pilot's station. A shutoff valve for the windshield wipers is located on the bulkhead aft of the First Officer's seat.

**Cowl Flaps**
The cowl flaps are operated by hydraulic control valves located on the right side of the cockpit just below the First Officer's sliding window. An actuating cylinder located on the lower segment of each engine ring cowl controls the movement of the cowl flaps around each engine. The actuator is controlled by the left and right cowl flap selectors in the cockpit and directs hydraulic fluid to either open or close the cowl flaps as desired.

The cowl flap control valves have the following selectable positions: CLOSE, OFF, TRAIL, OFF, and OPEN.

- When positioned to CLOSE or OPEN, one line will be under normal system pressure and the other line will be open to the system return line causing the cowl flaps to close or open as appropriate.
- When positioned to OFF, both lines to the actuating cylinder are closed.
- When positioned to TRAIL both lines to the actuating cylinder are open to the hydraulic system return line allowing air loads to determine the cowl flap position.

***NOTE:*** *Place the Cowl Flap Control Valve in the OPEN/ OFF position in accordance with the Shutdown Checklist. Do not leave the Control Valve in the OPEN position.*

## OPERATION

**Emergency Hand Pump Use**

To pressurize the system when the engines are not running, accomplish the following:

Landing Gear Handle ..... NEUTRAL
Flap Handle ..... NEUTRAL
Star Valve ..... OPEN
Pump ..... to desired pressure
Star Valve ..... CLOSED

### COWL FLAPS

- Check system pressure.
- Control valve - Select desired position.

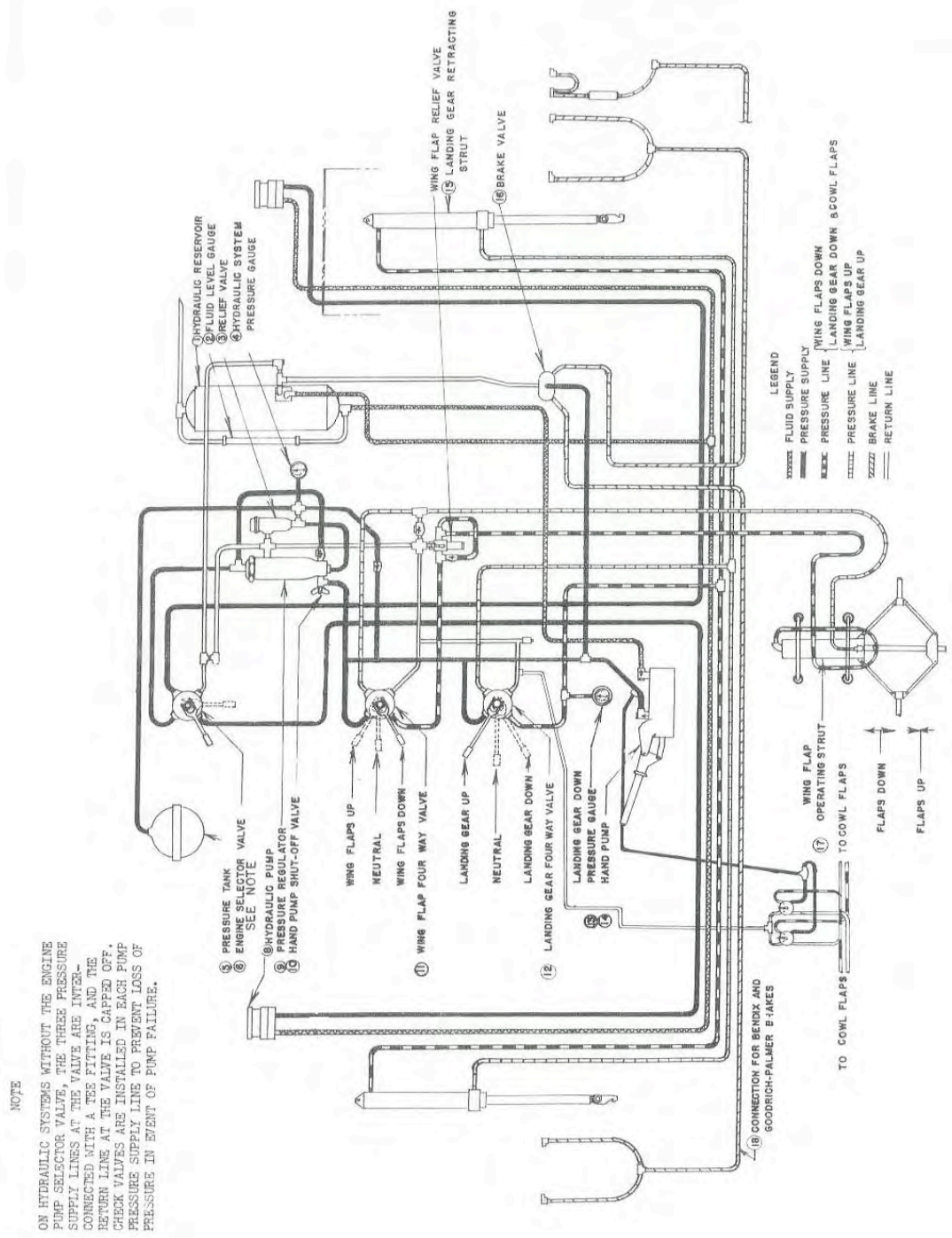
### WINDSHIELD WIPERS

- Check system pressure.
- OPEN Shutoff Valve.
- OPEN Speed Control to desired speed.

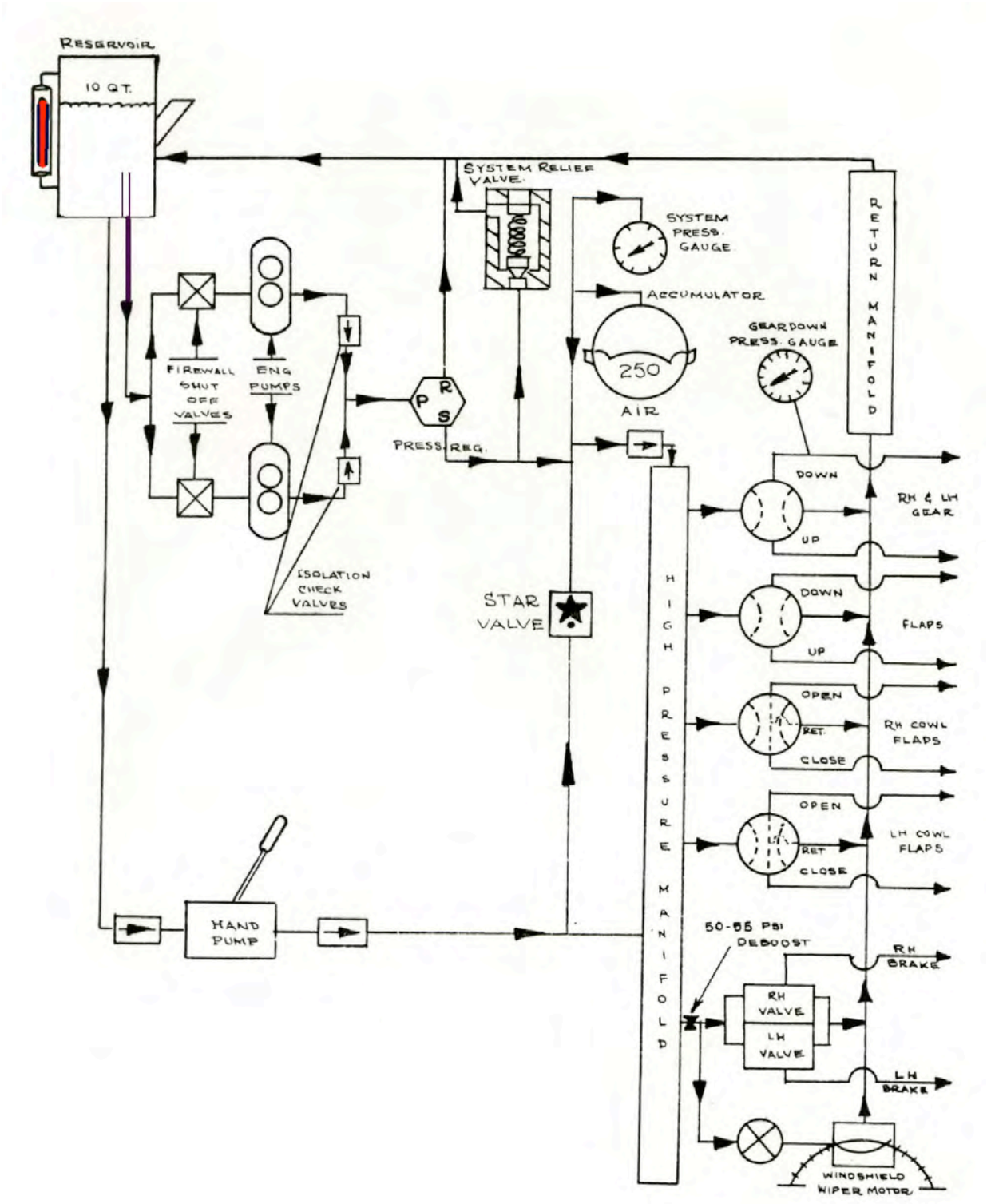
## LIMITATIONS

Normal system pressure (max.) .... 950 ± 50 PSI
Pressure relief valve ..... 1100 ± 50 PSI
Accumulator air charge ..... 250 PSI
Reservoir capacity ..... 13 quarts
System capacity ..... 28 quarts
Emergency reserve ..... 3 quarts
Min. system pressure for brakes ..... 500 PSI

Do not operate windshield wipers on a dry windshield.




**Hydraulic System Schematic**




**Hydraulic System Diagram**

**——— End of Chapter ———**