G550
Hydraulic System

Hydraulic Shut-off Valves
The Hydraulic System is about the storage and delivery of hydraulic fluid (Skydrol) under high pressure to actuate various systems.

Two (2) main systems:

Supported by two (1) sub-systems:

Aux Hyd Pump

Power Transfer Unit (PTU)
**Hydraulic System Components**

**Reservoir:** To store fluid
- Compressed by bootstrap to prevent cavitation
- Located in the tail compartment
- System must be pressurized for accurate quantity checks

**Shutoff Valve:** To shutoff hydraulic fluid to the engine in case of engine fire or failure

**Fire Handles**

**Pump:** To pressurize the system
- Engine-driven pump
- Located in the engines' accessory gearbox section
- 3,000 Psi (+ 300)
**Filter Manifold:** To filter hydraulic fluid and control direction of flow

- Located in the tail compartment
- Contains several Differential Pressure Indicators (DPIs)

**Hyd fluid to fuel heat exchanger:** To cool hydraulic fluid (and warm up fuel)

- Located in the off-side fuel hopper

**Accumulator:** To absorb fluid shocks

- Pre-charged to **1,200** Psi @ **70°F**
- Absorbs fluid shocks within the system
- Provides minimum pressure of **1,200** Psi
- Serviced with Nitrogen
- Located in the tail compartment

Hydraulically-actuated systems
Differential Pressure Indicators (DPI):

- Inspected for condition (flushed versus extended) during the exterior preflight inspection

- There are ten (10) DPIs

- Hydraulic System Manifold
  - (5) DPIs

- PTU Manifold
  - (1) DPI

- Auxiliary pump Manifold
  - (1) DPI

- Hydraulic System Manifold
  - (3) DPIs
- An extended DPI indicates a filter bypass which requires a maintenance action prior to flight by an aircraft maintenance technician or a trained and authorized individual.

- The only DPI that can be reset by the crew is the PTU DPI.
  (AFM 02-01-20 Exterior Preflight Inspection)

If extended:

1. Reset DPI
2. Make an entry in the Techlog
3. Continued operation is permitted for 50 hours
L Hydraulic System

- Total capacity:
  - Largest Reservoir 20.6 gallons
  - Dual chamber \(3.7 + 2.0 = 5.7\) gallons
  - Considered full at: 4.8 gallons

- Performs the majority of hydraulic functions

- Everything the R System does except:
  - Right Engine Thrust Reverser

- Landing functions:
  - Landing gear
  - Flaps
  - Ground Spoilers
  - L Thrust Reverser
  - Brakes
  - Nose Wheel Steering

- Left Engine-driven Hydraulic Pump (EDP)
  - Constant pressure (3,000 psi) variable volume
  - 18-28 gallons/minute (idle to takeoff power)
  - Located in the gearbox section of the L engine
R Hydraulic System

- Total capacity: 7.0 gallons
- Smallest reservoir: 1.8 gallons
  Considered full at: 1.6 gallons

- Right Engine-driven Hydraulic Pump (EDP)
  • Located in the gearbox section of the R engine
  • Constant pressure (3,000 psi) variable volume
  • 18-28 gallons/minute (idle to takeoff power)

- R Hydraulic System solely powers:
  • Right engine thrust reverser
  • PTU motor

Hydraulically-actuated systems
Auxiliary (AUX) Hydraulic System

- **Supplements** the L Hydraulic System
- Operates either automatically or manually

- Reservoir is physically located within the Hydraulic System reservoir
- Reservoir capacity: 2.0 gallons
- The pump is located in the right landing gear wheelwell

- The pump is powered by the ESS DC bus
  - Two (2) gallons/minute @ 3,000 psi (Slow)
- Operates the Main Entrance Door (MED) and parking brake accumulator by itself

- Capable of powering:
  1. Nose Wheel Steering (NWS)
  2. Main Entrance Door (MED)
  3. Flaps
  4. Brakes
  5. Standby Rudder

- An Aux Boost pump, installed in the supply lane, comes on until pressure reaches 25 psi
- **Functions on the GROUND:**

1. **Auto Latch Feature (Brake Pedal Application and Low Hydraulic Pressure)**

- **Wow GROUND** and brake pedal application > 10°

- L Hyd Sys

- **OR**

- < 1,500 Psi

- **Aux Pump**
  - Off/Arm
  - On

- **PTU**

2. **Maintenance Operations** (Gear ops while on jacks)

3. **Exterior Preflight Inspection:** Gear doors opening/closing
- Functions in the **Air**:

![Image of a plane with hydraulic systems labeled L Hyd Sys and R Hyd Sys]

**Standby Rudder Control Valve**: Provides AUX system fluid and pressure to rudder actuator and yaw damper #1 in the event that L and R hydraulic systems fail in flight.

![Diagram of the system with AUX, pressure, and fluid labeled]

**AUX Systems**: Flaps, NWS, Brakes, MED

**Nosewheel WOW + STBY RUD ON =**

![Diagram of the rudder/actuator system with AUX and rudder/actuator labeled]

`g550_hydraulic_system`
Power Transfer Unit (PTU)

- **Backup** to the **L** Hydraulic System's Engine-driven Hydraulic pump (Operational Redundancy)

- **PTU** = Motor/pump assembly

- Operates either automatically or manually

- Comes **on** automatically if **L** Hydraulic System pressure is < 1,500 psi

- Driven by **R** Hydraulic System pressure and uses **L** Hydraulic System fluid

L Hydraulic System fluid

R Hydraulic System fluid and pressure

PTU

Hydraulically-actuated systems

Pump

Motor

PWR XFR UNIT

OFF/ARM

ON

ON
- The PTU powers everything the L Hydraulic System powers, except:
  - L Thrust Reverser
  - Flight Controls

- The PTU cannot operate without:
  - L Hydraulic System fluid
  - R Hydraulic System fluid and pressure

- The PTU is located in the tail compartment (right side)

- 22 gallons/minute @ 3,000 Psi +300/-400

- Helps retract the landing gear following left engine failure after V1 (regulatory purpose)
- The PTU is prevented from coming on automatically if:

\[ < 1.0 \text{ g} \rightarrow \text{L Hyd Sys} \]

\[ \text{PTU} \downarrow \]

\[ \text{R Hyd Sys} \rightarrow > 104^\circ \text{C} \]

- The PTU can power the HMG

- One (1) Differential Pressure Indicator. If extended you can reset it, log it and operate for 50 hours. Recheck it again prior to each flight
Pulling the **Left Fire Handle** does not shut off the supply of **L** Hydraulic System fluid to the **PTU**.

**L Engine Fire**

Hydraulic Shutoff Valve closes

PTU

L Hyd Sys

R Hyd Sys
Hydraulic Motor Generator

- The Hydraulic Motor Generator (HMG) is a backup AC generator.

- The HMG is part of the Standby Electrical Power System.

- The HMG is driven by:

- The HMG powers:

Rated at 10 kVA

Produces:

115 VAC
400 Hertz
3-phase
- The HMG produces AC power in the event of a dual IDG and APU GEN failure.

- The HMG is located in the main landing gear wheel well.

- HMG operation is permitted only when normal AC power generation is not available.

- The AUX TRU produces DC voltage and will power the L ESS DC R ESS DC buses when selected by the crew with a ten (10) second interval between selections.

- Speed brake deployment is OK as long as the handle is moved from stowed to fully extended in three (3) seconds or more.

\[ > 3 \text{ seconds} \]
Hydraulic fluid to fuel HEAT exchanger

Heat exchanger units are located inside the offside fuel hopper.

HOT hydraulic fluid flows continuously through the heat exchanger and is cooled while COLD fuel in the hopper is warmed up.
The hydraulic shutoff valves are located in the tail compartment and isolate the hydraulic fluid from the engine-driven pumps. The valves are motor operated and energized only when the fire handles in the cockpit are pulled up.
Hydraulic Boost Actuators

Ailerons

Elevators

Hydraulic Boost Actuator

Rudder

Flight Spoilers/Speed Brakes
Hydraulic System Quantities/Pressures

L Hyd System = 20.6 gallons
L Hyd Reservoir = 5.7 gallons
• Considered full = 4.8 gallons

R Hyd System = 7.0 gallons
R Hyd Reservoir = 1.8 gallons
• Considered full = 1.6 gallons

L and R Hyd Systems = 18-28 gallons/minute
• Pump output
  Idle To Takeoff
  3,000 Psi ± 300

AUX Hyd System
• Pump output = 2 gallons/minute
  3,000 Psi ± 300

PTU Hyd System
• Pump output = 22 gallons/minute
  3,000 Psi +300/-100

L and R Hyd System Accumulator Precharge
  1,200 Psi @ 70°F
Power Plant Failure

The failure of either engine will result in:

1. Loss of an engine-driven hydraulic pump (EDP)

2. If the left engine fails, the power transfer unit (PTU) will take over the duties of the inoperative EDP as soon as hydraulic system pressure drops below 1,500 psi
The following components will be lost:

- Redundant hydraulic power to flight controls
- Left Thrust Reverser
- Left Yaw Damper (YD1)

3. If the Right engine fails the R Hyd System will be unavailable and the following components will be lost:

- Redundant hydraulic power to flight controls
- Right Thrust Reverser
- Right Yaw Damper (YD2)
- The
Questions, comments or errors?
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Thank you!