



# AS0403 Aircraft Systems & Instruments

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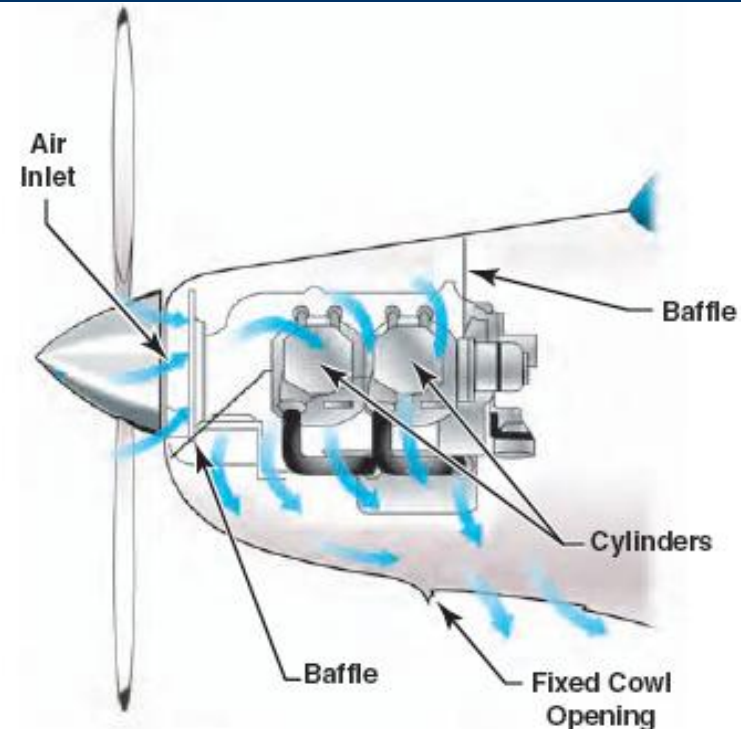
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# **UNIT – I**

# **AIRCRAFT SYSTEM**

# Hydraulic System

- Classified into two major sections
  - Power Section
  - Actuating Section
  
- Power Section :
  - Provides fluid flow
  - Regulates and limits pressure
  - Carries fluid to various selector values in the system

# Hydraulic System

- Actuating Section
  - Contains various operating units such as wing flaps, landing gear, brakes, boost systems and steering mechanisms.
- Power Section may be further classified as
  - Open System
  - Closed System

# Open System

- It has fluid flow but **no appreciable pressure in the system** whenever the actuating mechanisms are idle.
- Selector valves are always **connected in series** with each other, whereby the pressure line goes through each selector valve.
- Pressure developed by the pump is controlled by one of the three valves:
  - **Open-center valve**
  - **Power-control valve**
  - **Pump-control valve**

# Open System

- It **develops no pressure** except when a mechanism is being operated; the pressure is then metered by selector valve and limited by a relief valve.
- **Advantages:**
  - It **does not require** expensive or **complicated pressure regulators**.
  - The **power pump can be a simple gear pump**, although a **fixed – displacement piston pump** may be used

# Open System

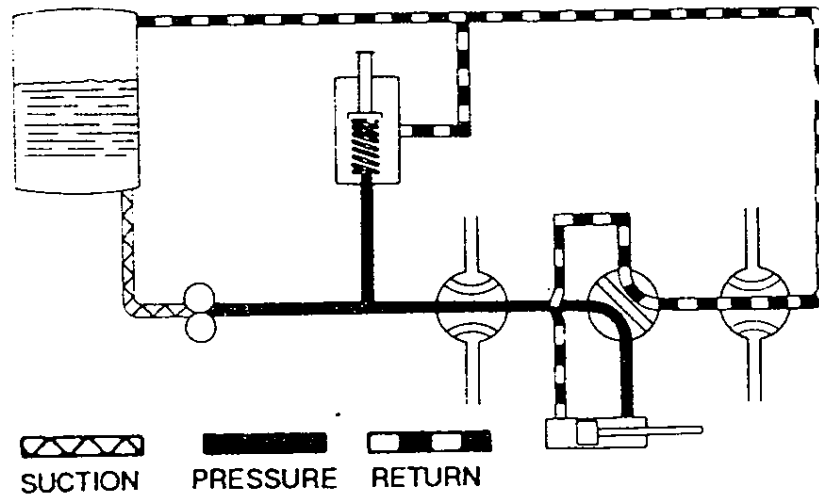
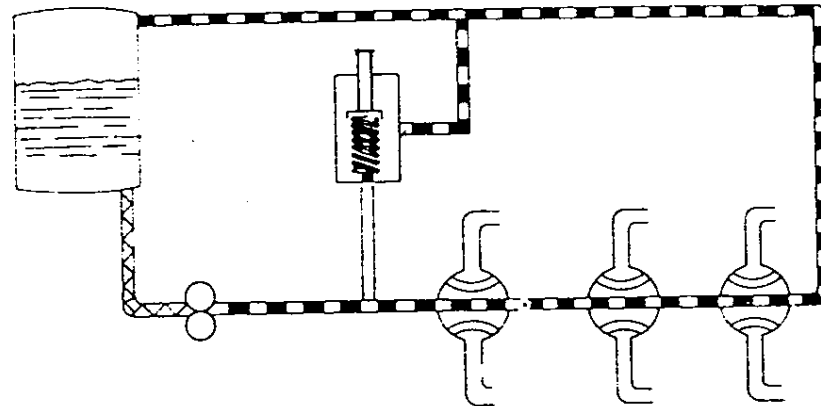
- **Disadvantages:**

- Operation of **only one subsystem at a time is possible** without interference from other systems.
- Transport-category aircraft require more complex systems, which may have several units operating at the same time.

- **Uses:**

- Light, general aviation aircraft.

# Basic Open-Center System





# Closed System

- It directs fluid flow to the main system manifold and **builds up pressure** in that portion of the system that leads to all selector valves.
- Two basic types:
  - **Constant-volume pump and a pressure regulator**
  - **Variable-volume pump**

# Closed System

- **Constant-volume pump and a pressure regulator:**
  - To control pressure at working range .
  - To unload the pump when there is no flow requirement.
  - Pressure builds up in the system manifold.

# Closed System

- **Variable-volume pump:**

- Directs the flow to the system manifold
- Output of the valve is controlled by an integral control valve.
- The valve reduces the pump flow to zero when no units are operating in the system and pressure is built up in the storage chambers, called **accumulators**.

# Closed System

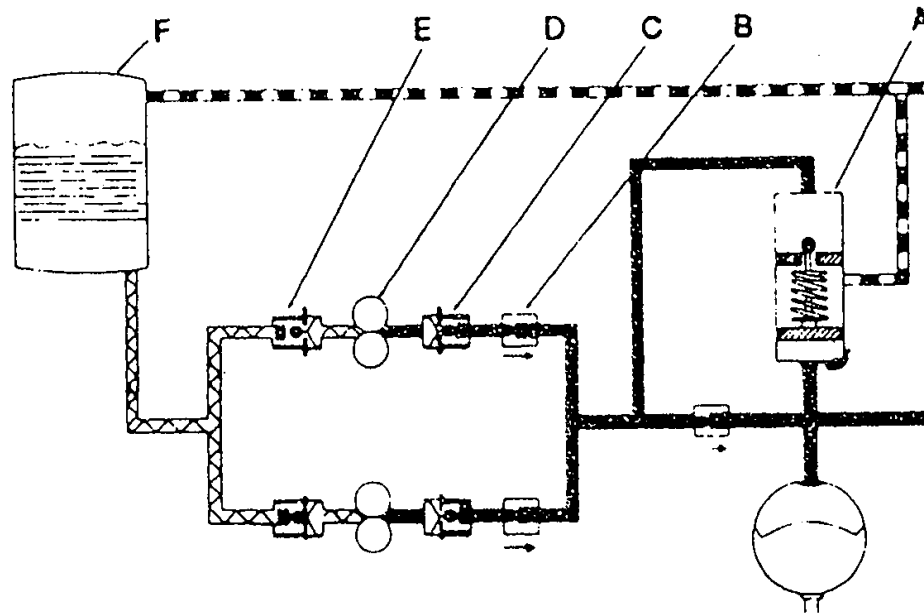
- Any number of subsystems may be incorporated in a closed system
- Selector valves are arranged in parallel
- Based on system pressure the fluid is directed either to the system or to the reservoir by the pressure regulator.
- System pressure is maintained between kick-out and kick-in settings of the regulator when the actuating mechanisms are not in operation.

# Closed System

- **Accumulator:** It stores fluid under pressure, Stabilizes system pressure, ensures smooth operation of the regulator.
- **Relief valve** safeguards the system if the regulator fails.
- Multiple power pumps are used in multiengine aircrafts, where they can be driven by separate engines.

# Closed System with Dual Pumps

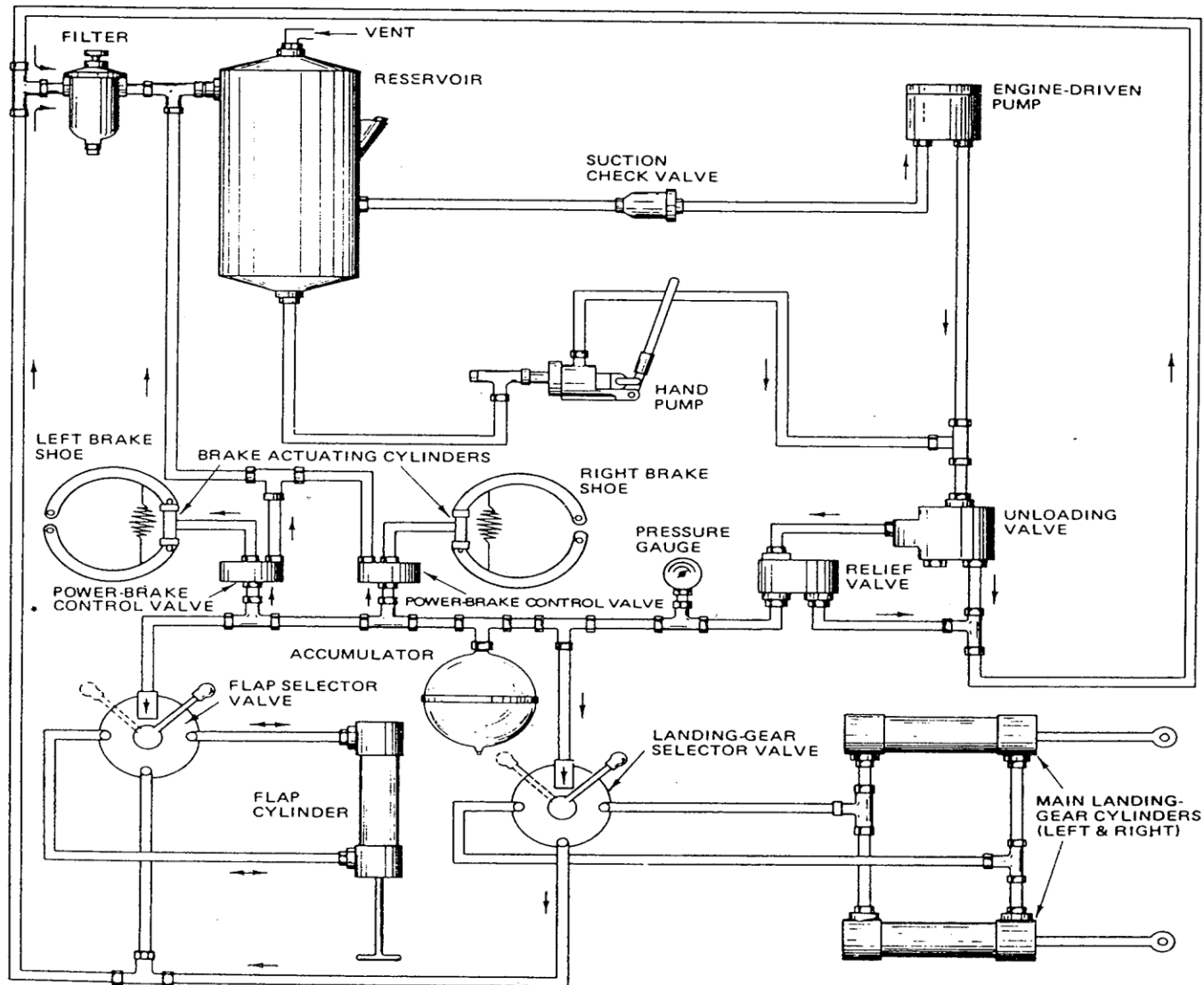
## Closed System with Dual Pumps



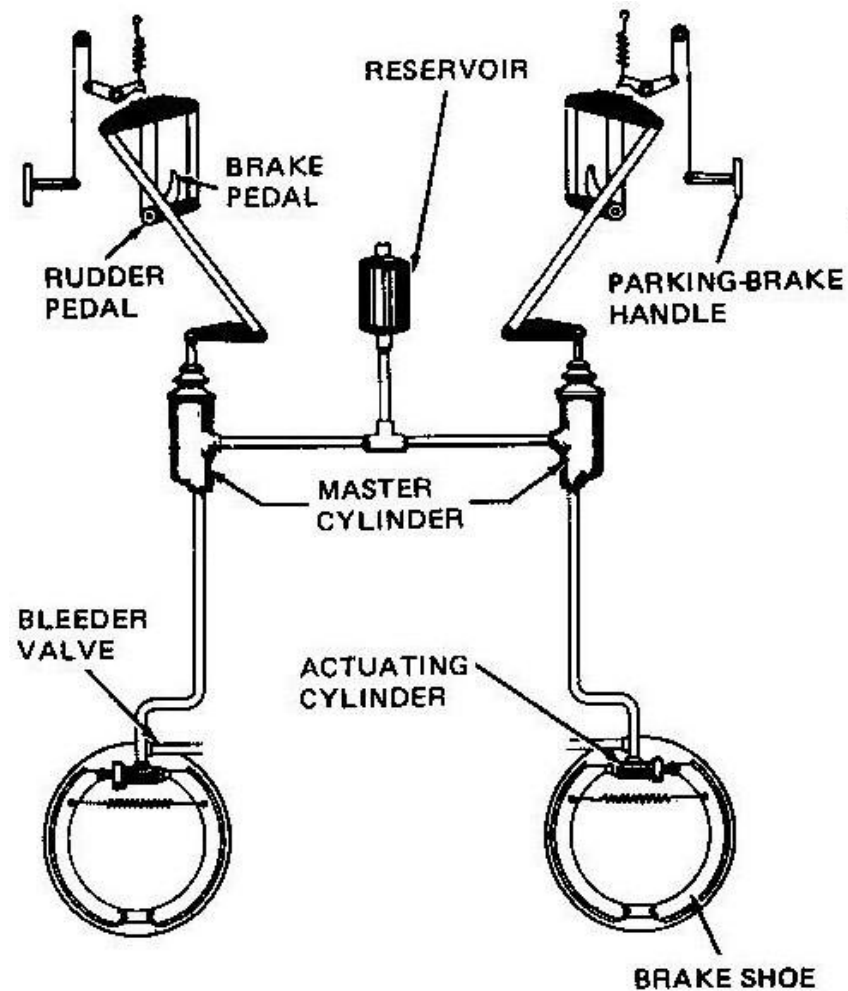
A. PRESSURE REGULATOR  
B. ONE-WAY CHECK VALVE  
C. LINE DISCONNECT

D. POWER PUMP  
E. LINE DISCONNECT  
F. RESERVOIR

# Closed- Center System

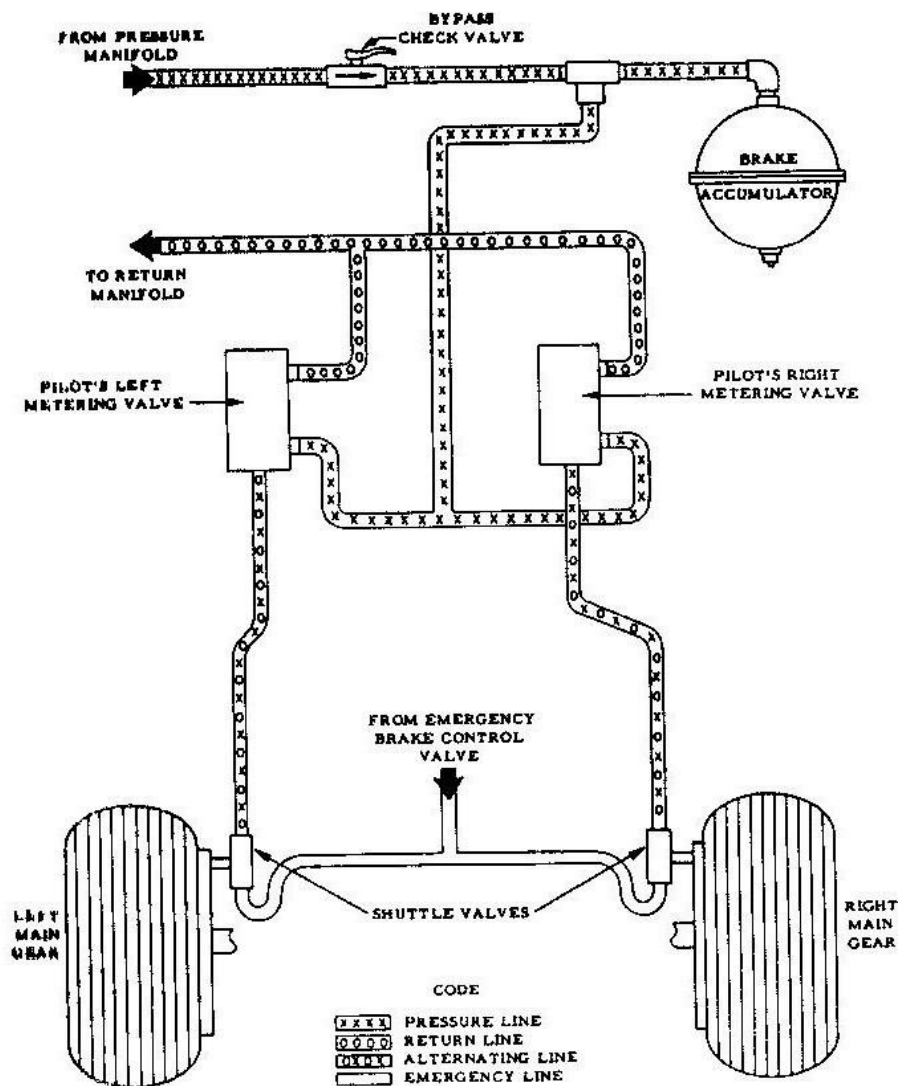


# Independent Brake System

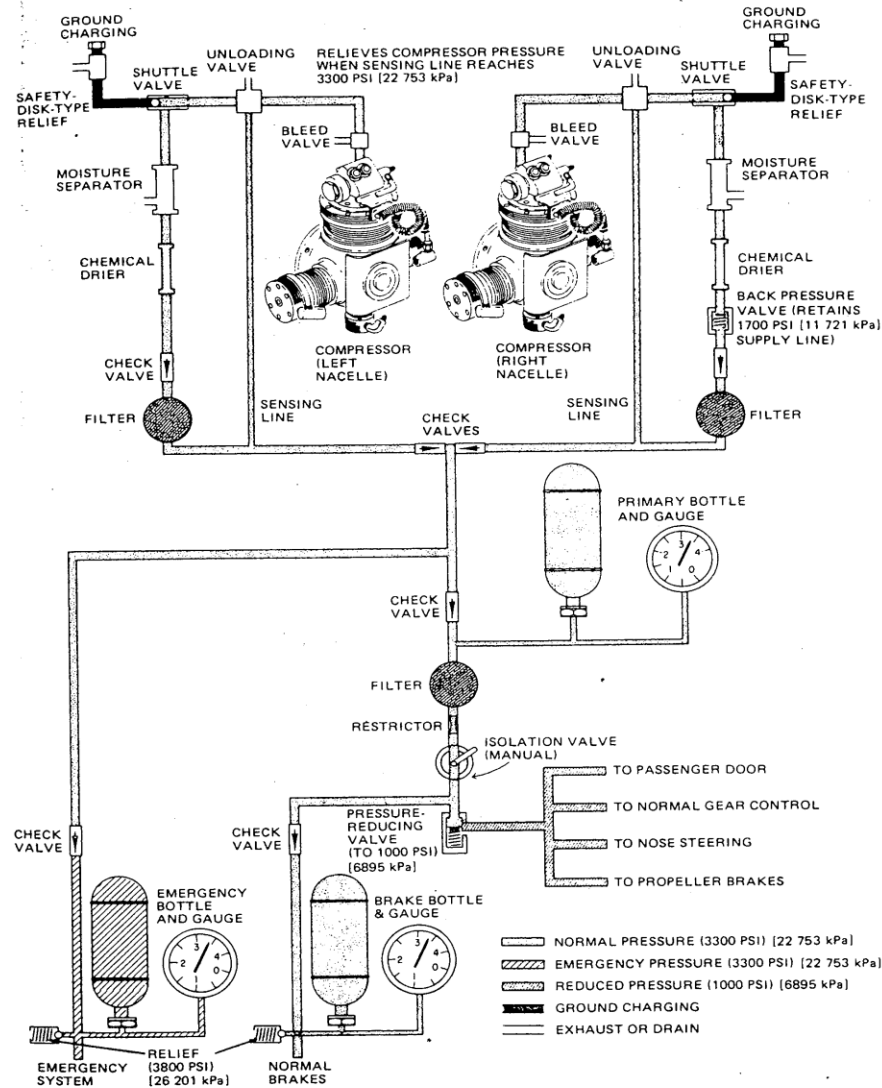




# Power Boost Brake System



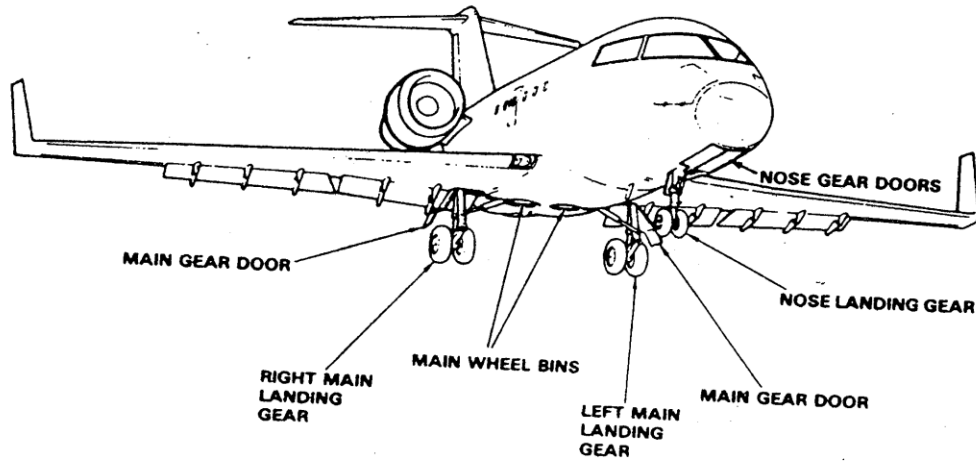
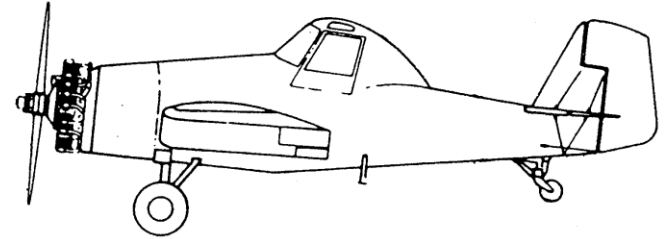
# Pneumatic System



# Aircraft Landing-Gear System

- **Configuration**

- Conventional Geared Aircraft
- Tricycle Landing Gear

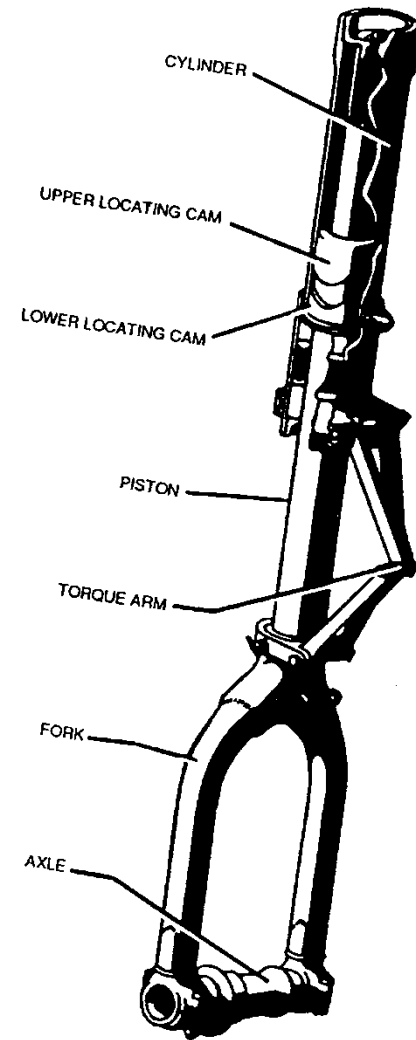


# Classification

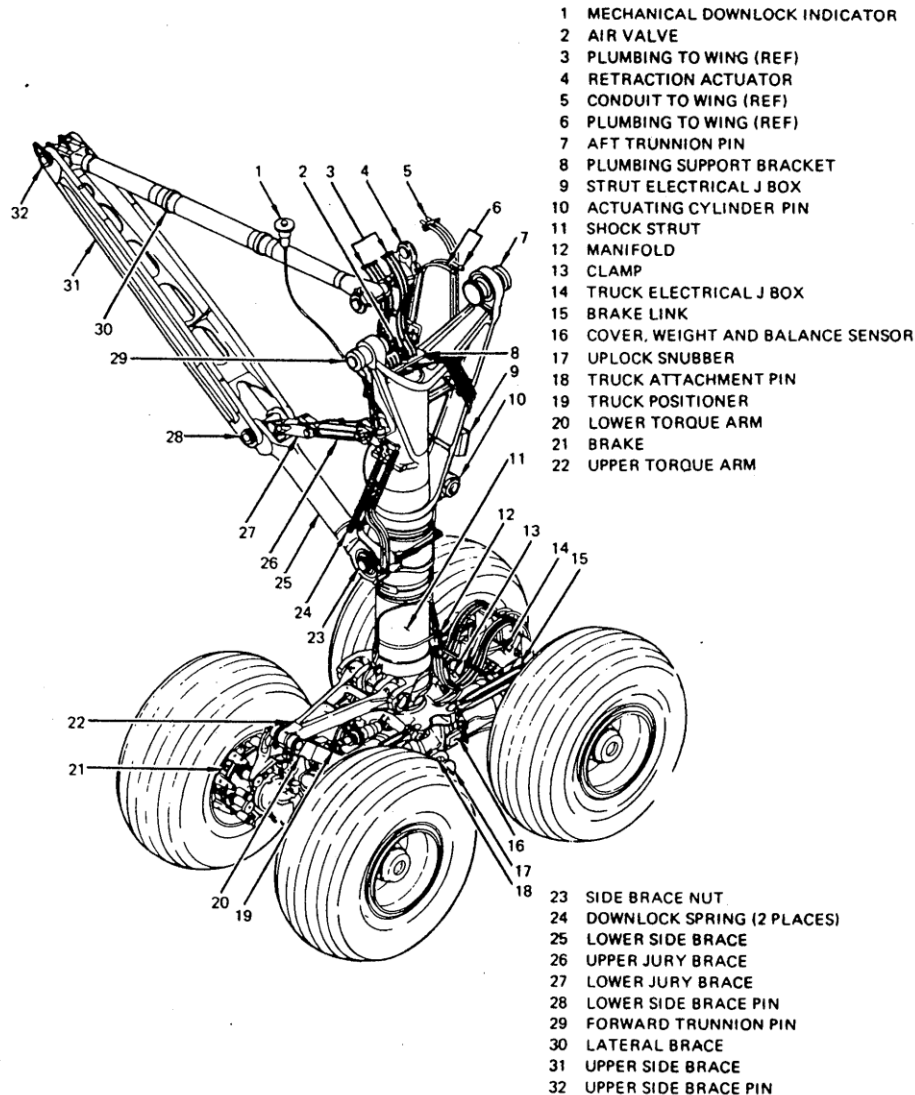
- **Non - Absorbing Landing Gear**
  - Rigid Landing Gear
  - Shock-Cord Landing Gear
  - Spring-Type Gear
- **Shock-Absorbing Landing Gear**
  - Spring - Oleo
  - Air- Oleo
- **Fixed Gear**
- **Retractable Gear**
- **Hulls and Floats**

# Landing-Gear Components

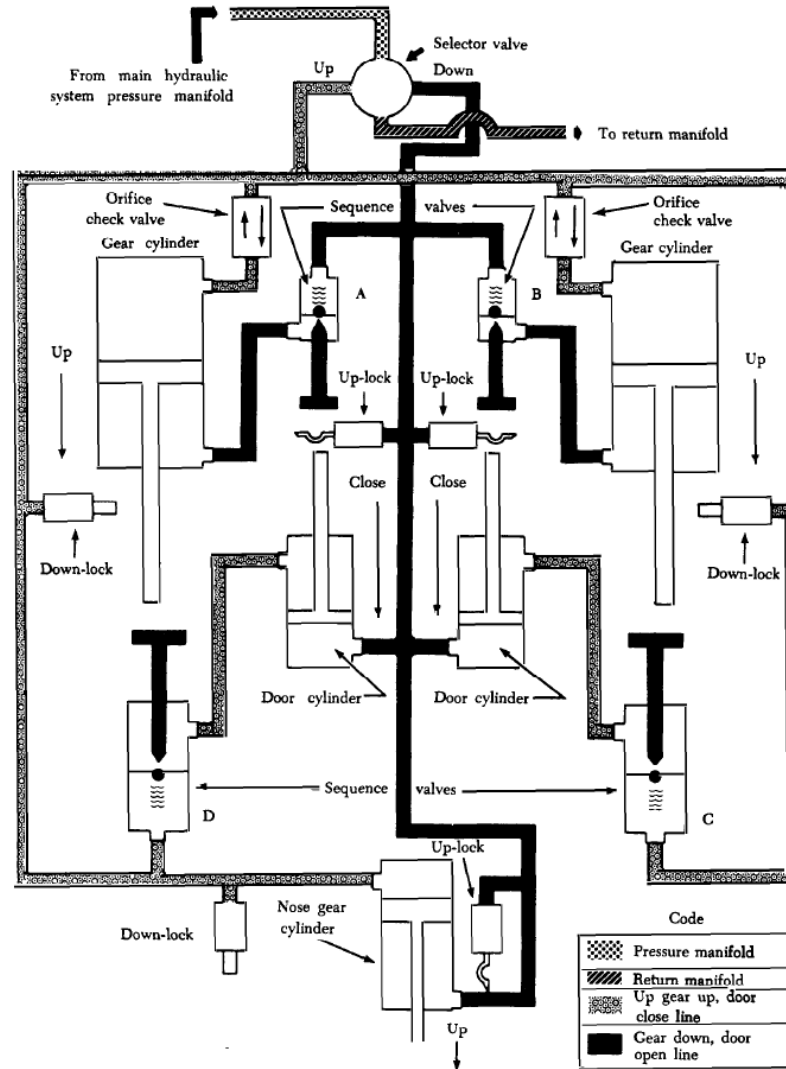
- Trunnion
- Struts
- Torque Links
- Truck or **Bogie**
- Drag Link or **Drag Strut**
- Side Brace Link or **Side Strut**
- Overcenter Link or **Downlock**
- Swivel Gland
- Shimmy Dampers



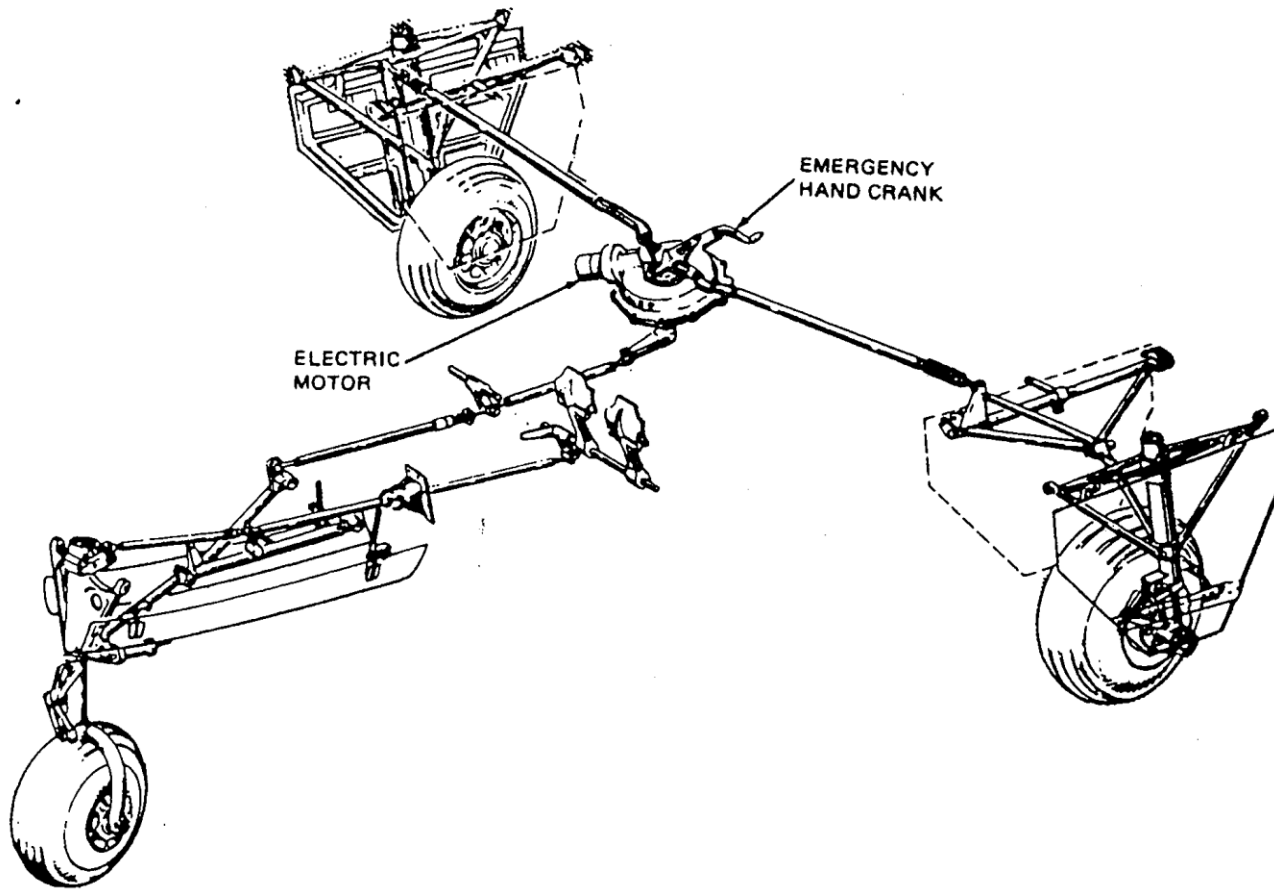
# Landing-Gear Components contd..



# Hydraulic Landing Gear Retraction System



# Landing Gear System (Retractive Mechanism)



Electrically Operated Landing –Gear System