G650

LANDING GEAR &

BRAKES SYSTEM

Pedal deflection

Electrical signal

BCU commands amount of hydraulic power to brakes

Brake application

Pedal Position Transducer (PPT)

L Hyd Sys

R Hyd Sys

Inboard Brakes

Outboard Brakes
- The G650 has a fully retractable, tricycle-type landing gear.

- Each gear incorporates a conventional oleo-pneumatic shock strut with dual wheels and tires.

- Shock struts are filled with MIL-H-5606 hydraulic fluid and are pressurized with dry nitrogen.

- Strut extension.

- Recommended tire pressure: 216 Psi (Min 186)
The landing gear control unit (LGCU) is the brains of the system. It is located in the REER. The LGCU contains two (2) control lanes and one (1) monitor lane. Either control lane is capable of controlling the gear system.
- Extension and Retraction Requires:
  
  1. Electrical power to operate
     - L_ESS DC
     - R_MAIN DC
  
  2. Hydraulic power to actuate

- Gear Retraction and Extension is normally provided by:

- In the event of a failure of the engine-driven hydraulic pump the gear can be extended or retracted using the:
  
  - PTU
  - Aux Pumps
- PTU helps retract the landing gear following left engine failure after V1 (regulatory purpose)

- In the event of a total failure of the left hydraulic system, the landing gear can be extended via two (2) nitrogen bottles located in the nose gear wheel well.

- The alternate gear extension system ports high pressure nitrogen to the gear extension system to extend the gear. The nitrogen repositions the nose gear and main gear dump valves to a dump position.
Landing gear extension (normal)

1. L Ess DC AND R Main DC OR PTU AVAILABLE

2. \( \leq V_{lo} \) (225 KCAS)

3. Gear handle (electrical switch) selected DOWN (illuminates ⬤)

4. Gear doors open fully

5. Landing gear extends and locks

6. Three green ⬤ (down and locked)

7. Landing gear doors close

8. Gear handle light extinguishes
- Landing Gear Retraction

1. L'ess DC and R Main DC and L Hyd Sys and PTU available

2. \( \leq V_{lo} \) (225 KCAS)

3. Gear handle (Electrical switch) selected up (illuminates •)

4. Gear doors open fully

5. Landing gear retracts into the uplocks

6. Landing gear doors close

7. Gear handle light extinguishes
- Landing gear extension (alternate) - one time use

1. \( \leq V_{lo} \) \((175 \text{ KCAS})\)

2. Gear handle (electrical switch) selected down (illuminates \(\bullet\))

3. Pull EMER landing gear handle

4. Gear doors open fully and remain open

5. Landing gear extends and locks

6. Three green \(\bullet\) \(\bullet\) (down and locked)

7. Gear handle light extinguishes \(\uparrow\)

8. Landing gear doors remain open
The nose gear's steering system is:

- Electrically-controlled
- Hydraulically-driven

by a Steer-by-Wire System

Nose Wheel Steering (NWS): 80° (± 2°)

NWS Overtravel Indicator: ≥ 84°

NWS Maintenance Req.

Rudder pedals: Left 7°/Right 7°

Rudder pedals (NWS failure) Left 16°/Right 16°

Rudder pedal input + NWS = Nose Wheel deflection

NWS = Red guarded switch

* "Clunk" = NWS valve opening

ON Power OFF
Limitations

Maximum altitude to operate gear or fly with the gear extended: 20,000 MSL

VLO 175 KCAS

VLO 225 KCAS

VLE 250 KCAS

Speed brakes and gear down inflight prohibited

Maximum tire speed: 195 knots (ground speed)
**Landing Gear Warnings**

- **< 500 AGL**
  - AND
  - **< 190 KCAS**
  - **“TOO LOW, GEAR”**
  - Voice 
  - Override
  - GPWS
  - Override = Silences aural warning

- **< 350 AGL**
  - AND
  - Near Idle
  - **Gear Unsafe Warning Horn will sound (Klaxon Tone)**
  - Horn
  - Silence
  - = Silences warning horn

- **Flaps > 22°**
  - **Gear Unsafe Warning Horn will sound (Klaxon Tone)**
  - Horn
  - Silence
  - Will **not** silence warning horn
Brakes are controlled by a two-channel Brake Control Unit (BCU). Both channels operate on a continuous basis and back each other up. The BCU is located in the REER.

The purpose of the BCU is to prevent tire damage or failure caused by tire skidding or locked wheels during landing or a rejected takeoff.
Each of the four (4) main gear wheels has individual braking via a brake-by-wire system with:

A) Full anti-skid protection (down to 10 kts)

Touchdown protection: prevents landing with brakes on

- Brakes available < WOW (G) + 5 seconds, or
- Wheel speed > 70 kts
**Locked wheel protection:** compares wheel speeds

- **Left versus Right (Inboard)**
- **Left versus Right (Outboard)**

If **30%** < its paired wheel = brake pressure released

**Wheel spin down:** decelerates main gear wheels prior to entering the wheelwells

**Autobrakes:** automatic application of brakes during a rejected takeoff or during landing

Autobrakes are armed through a four-position rotary switch

There are three (3) levels of deceleration on landing - low, medium and high, and a single rejected takeoff (RTO) mode
1. **Wow - Ground**  
2. **Thrust Levers idle**  
3. **De-rotation phase until NLG wow**  
4. **Then:**

- **Autobrake - Low**  
  Target deceleration rate = 7 ft/sec²

- **Autobrake - Medium**  
  Target deceleration rate = 10 ft/sec²

- **Autobrake - High**  
  Maximum anti-skid braking

Autobrakes are disconnected by the application of toe brakes (rudder pedals)

Contaminated runway = **Autobrake - Low**  
**Autobrake - Medium**

1. **Thrust Levers idle**  
2. **Brake pressure application:**

   600 psi < 80 knots > 600 psi

   **Autobrake - RTO**
8) **Brake Temperature Monitoring System (BTMS)**

Current brake temperatures sensed on each wheel:

- >600°C sensed in one or more brake assemblies
  
  **Brake Overheat**. Vspeeds will not box

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9) **Tire Pressure Monitoring System (TPMS)**

Alerts the crew of improper tire pressures:

- ≤ 186 psi **Tire Pressure Low**
- ≤ 100 psi **Tire Pressure Low**

Recommended: 216 psi > 2 hours stationary

Prior to towing the nose wheel TPMS harness and the nose gear torque link must be disconnected.

**TPMS Maintenance Req'd**

Disconnected

- TPMS harness NG Torque Link

Connected
If the brake pedals are applied and inboard accumulator pressure is low, the AUX pump Auto Latch feature will command the AUX pump, if armed, to come on (ASC 902).

- WOW GROUND and brake pedal application

- Inboard Accumulator

  < 1,500 Psi

  INBD OUTBD

- AUX Pump

  OFF/ARM ON

- Inboard Brakes

  PSI X 1000

  -4 -3 -2 -1

  INBD OUTBD
- Parking Brake System

The Parking Brake System has two (2) independent accumulators pre-charged to 700 psi with Nitrogen and hydraulically charged to 3,000 psi.
Parking brake must be set prior to checking the brake wear indicators - "Life remaining"

If the pump is selected on during ground operations with no engines running only the left accumulator (inboard) is charged.

Parking brake accumulator pressure will decrease continuously over a short time. Always chock aircraft until ready for engine start. Otherwise it may roll away.

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**AUX**
LANDING GEAR CONTROL
MAINTENANCE PANEL (LGCMP)

The LGCMP is located on the right side of the fuselage and is used to:

1. Change wow mode (MX)
2. Retract/extend landing gear while on jacks
   (Maintenance function)
3. Open/close gear doors
   (Exterior Preflight Inspection)

* AUX pump is the normal source of hydraulic power for these activities
Safety Pins (8)

To make them more visible there is a "remove before flight" red flag.

- Three (3) gear pins are installed during post-flight inspection. The pins are removed during the pre-flight inspection in preparation for departure.

One pilot removes/stores the pins. The other pilot confirms that all pins have been removed and announces it. Failure to remove the pins will prevent the landing gear from retracting after takeoff.

The QRH addresses landing gear pins mistakenly left in.

Refer to: Attempted Landing Gear Retraction With Safety Pins Installed
- Two (2) nose gear and two (2) main gear door pins are installed **before** opening the gear doors via the LGCMP.

![Diagram showing the location of the LGCMP and the main and nose doors of the aircraft.]

- One (1) LG mode pip pin is installed in the LGCMP when changing modes - normal to maintenance.

![Diagram showing the location of the LGCMP and the main and nose doors of the aircraft.]

A CAS message will alert the crew that the LGCMP is set to maintenance mode.

![Box highlighting the LGC System Maint Mode feature.]

Returning to normal mode requires that the pin be removed.