G650 FUEL SYSTEM
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The fuel system consists of two wing tanks, which store all fuel and feed the engines and APU via low pressure, electrically-driven boost pumps.

G650: 44,200 lbs  
G650ER: 48,200 lbs
IT MAY BE POSSIBLE TO UPLOAD FUEL QUANTITIES IN EXCESS OF:

**G650:** $\geq 44,200$ lbs  
**G650ER:** $\geq 48,200$ lbs

This is permitted at or below:

1) **Maximum Ramp Weight:**
   
   **G650:** 100,000 lbs  
   **G650ER:** 104,000 lbs

2) **Maximum Takeoff Weight (MTOW):**
   
   **G650:** 99,600 lbs  
   **G650ER:** 103,600 lbs

3) **Loaded Aircraft is Within C.G. Limit**

* Tank quantity and total quantity indications may show dashes. MCDU and SMC will indicate actual fuel levels.
- **Refueling:**
  - Single point pressure refueling (35-55 psi)
  - Overwing gravity refueling

- There are seven compartments in each wing tank connected by baffles which prevent large C.G. changes due to fuel movement.

- Fuel tanks are fully vented to provide positive internal pressure.

- Fuel shut-off to the engines is via the fire handles.
FUEL HOPPER

SEgregated FUEL TANK within wing TANK

- 190 gallons / 1.283 lbs
- Contains the Hyd fluid-to-fuel heat exchanger

kept full via:

- Flapper-type valves (gravity)
- Ejector pumps which use motive flow from fuel boost pump pressure
- Less than 650 lbs in either or both hoppers

- Proceed to nearest available airport and land
- Avoid extreme nose high/low attitudes, excessive forward acceleration and uncoordinated flight maneuvers
- Do not go-around with < 600 lbs in either tank
- Do not exceed 10° pitch up attitude

- Prolonged ground operation with < 10,000 lbs in each tank
  - Turn fuel boost pumps on to refill the hoppers
- Prolonged flight at altitudes with temperatures colder than \(-70^\circ C\) with fuel tank temperatures colder than \(-30^\circ C\) and < 5,000 lbs fuel remaining.

- Descend to an altitude where SAT is \(-60^\circ C\) or warmer and maintain M0.80 or greater.
Boost pumps

Provide low pressure fuel to the engines and APU

- DC-powered, interchangeable, brushless boost pumps
- Boost pumps can be accessed via the wheelwell and are submerged inside the hoppers
- Without boost pump pressure the engines will:

A) < 20,000' = suction feed
B) > 20,000' = run erratically and flameout

- Boost pump switch (indications)

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L Hopper

<table>
<thead>
<tr>
<th>L Alternate Pump</th>
<th>L Main Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td></td>
</tr>
</tbody>
</table>

L Main DC

L ESS DC

R Hopper

<table>
<thead>
<tr>
<th>R Main Pump</th>
<th>R Alternate Pump</th>
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<tbody>
<tr>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

R Main DC

R ESS DC

Pump switches pressed in and operating (blank)

Pump switch pushed out and unpowered

R ALT FUEL PUMP FAIL
FUEL SHUTOFF VALVES

- Engines:
  1. Fire Handles
    - L\(\text{ESS\ DC}\)
    - R\(\text{ESS\ DC}\)
  2. Fire Handles Valve position indicator:
    - (Open) Engine
    - (Closed) Engine

Wheelwell
(Aft Wall)

Wheelwell
(Crossflow Valve)

Inter Tank Valve
APU:

1. APU switchlight
2. APU fuel shut off valve position indication:

- (Open)
- (Closed)

L wheelwell (Aft Wall)

If the APU is operating pressing the APU switchlight will shutdown the APU immediately (Not recommended)
HEATED FUEL RETURN SYSTEM (HFRS)

FADEC controlled

ON @ 0°C

3 gallons/minute

OFF @ +10°C

Uses HOT Engine oil (Fuel Cooled Oil Cooler)

Fuel/Oil Heat Exchanger = FCOC

Heated fuel at 50°C is sent from FMUs

HOT engine oil is cooled while COLD fuel in the wing tanks is warmed up
Prevents gelling during prolonged high altitude operations

Jet A fuel has a freezing point of \(-40^\circ C\) \((-40^\circ F)\)

Automatically deselected on descent to prevent dislodged ice crystals in the fuel lines from blocking the filters and possibly flaming out the engines.

*Heated fuel return is inhibited when:*

A. Crossflow valve is open
B. Low fuel condition
C. Low fuel pressure
D. High fuel burn rate (\(> 2,650 \text{ pph}\))
E. Fuel temp \(\geq 10^\circ C\)
F. Fire handle pulled
G. Engine run switch off

\[\text{Heated fuel return system valve}\]

\[\text{From engine (FMU)}\]

\[\text{To fuel tank}\]
Hydraulic fluid-fuel HEAT exchanger

Heat exchanger unit is located inside the onside fuel hopper.

**HOT** hydraulic fluid flows continuously through the heat exchanger. No pilot input.

**HOT** Hydraulic fluid is cooled while **COLD** fuel in the hopper is warmed up.
ENGINE FUEL SYSTEM

- Metered fuel from tank’s boost pumps to fuel nozzles
- Introduction of fuel is controlled by FADEC
- Low (LP) and High (HP) pressure pumps are driven by engines’ accessory gearbox
- FCOC extracts heat from hot engine oil
- LP pump can suction feed the engine ≤ 20,000'
Fuel Unbalance Arrows

1900
900
1000

Appears $\rightarrow = 100\text{ lbs}$

2500

Full scale $\rightarrow = 500\text{ lbs}$

1500
1000

Full scale
TURNS AMBER $\rightarrow = 1000\text{ lbs}$

Note: Higher side higher arrow 1500 $\rightarrow$ 1000

Maximum Fuel Imbalance

Inflight = 2,000 lbs

Takeoff = 1,000 lbs
Balancing fuel. Method 1: Inter Tank

1. Autopilot on, level flight
2. Manually adjust rudder trim towards the heavy wing

3. Open inter tank valve and monitor fuel progress

4. Close inter tank valve when within 200 lbs or so

5. Retrim rudder
BALANCING FUEL METHOD 2: CROSSFLOW

1. **Open** crossflow valve

   ![Fuel Crossflow Valve Open](image)

2. **Turn OFF** boost pumps, one at a time, on light wing

   ![Boost Pumps Off](image)

3. **Turn ON** boost pumps

4. **Close** crossflow valve when within 200 lbs or so
- The crossflow valve has a five (5) minute timer to alert the crew that it is still open. The CAS message turns *amber* (caution) and a double-chime aural tone will sound.

The crossflow valve on the fuel synoptic page will also turn amber.

After reassessing the status of the fuel imbalance the crew should then reset the timer by cycling the crossflow valve closed and then, if required, open it again.
APU Fuel Supply

Fuel is normally supplied from the left fuel manifold but can also be supplied from the right manifold by temporarily opening the crossflow valve.

Crossflow Valve

Fuel Flow

L manifold

To

APU

R manifold

To

APU

Crossflow Valve Open

Fuel Crossflow Valve Open
RAT Operations

When operating with the RAT only the following fuel system components remain operative:
- **Zero Fuel Weight:** 60,500 lbs

- **ZFW C.G. Envelope**

- **AFM 01-03-70**

- **ZFW C.G. Must be within Envelope**

  Fueled airplane C.G. will then remain within C.G. Por:
  - Taxi
  - Takeoff
  - In flight
  - Landing

- **Weather Radar Off - Fueling Operations**

  - **During fueling operations, the truck and the aircraft must be bonded**
- **Maximum Fuel Imbalance:**

  - *Inflight* = 2,000 lbs
  - Proceed with balancing before imbalance > 1,000 lbs

- **Takeoff** = 1,000 lbs

- **Gravity Refueling**

  - 1,000 lbs

- **Maximum Useable Fuel Capacity - Gravity:**

  43,650 lbs
- **FUEL TANK TEMPERATURE:**

  ![Diagram of fuel tank temperatures]

  - +54°C
  - -34.5°C to -37°C
  - -36°C
  - -37°C

- **ENGINE FUEL TEMPERATURE:**

  ![Diagram of engine fuel temperatures]

  - MAX: +165°C (15 minutes)
  - MAX: +140°C
  - MIN: -40°C
Questions, comments or errors?
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Thank you!