

# G650 / 650ER SELECTED LIMITATIONS & INFO.

## Maximum Number of Occupants:

- Total number of occupants shall not exceed 22. The number of passengers shall not exceed 19.

## Takeoff & Landing Operations:

### Runway Conditions

- Slope.....±2%  
 Max. Tailwind ..... 10 kts  
 T/O & Landing Demonstrated x-wind ..... 28 KTS  
 T/O & Landing x-wind >10,000ft ..... 25 KTS  
 Landing Max x-wind – other than Normal Law ..... 10 KTS  
 Max Airfield PA (s/n 6003 through 6019)..... 14,500 ft  
 Max Airfield PA (s/n 6001 & >6020) ..... 15,000 ft  
 Min / Max. Operating temp @ SL ..... -50°C to +55°C  
 Min temp for ground ops following prolonged cold soak.....-40°C  
 Max. Fuel imbalance for t/o ..... 1,000 lbs
- With automatic ground spoilers inoperative, takeoff is permitted on dry & wet runways (less than 3mm of standing water) provided 20° flaps are used.
  - Takeoff is prohibited with an inop. inboard spoiler panel (without ASC135)
  - Autobrakes – use of Low & Medium landing modes on contaminated runway surfaces is not authorized.
  - Landing Lights – ground operation is limited to 10 minutes.
  - Steep Approach Ops – Final Approaches up to 4.4° approved. > or equal to 4.5° requires steep approach approval.

### TOLD

- Use of FMS TOLD for t/o and landing perf. Data is permitted. TOLD calculations shall be checked for reasonableness with AFM Chapter 5 – Performance as necessary.
- AFM performance data must be used for t/o at or above 11,000 ft pressure altitude
- FMS TOLD landing performance for abnormal flap configuration do not include consideration of max tire speed and brake energy. Consult AFM Chapter 5 – Performance.
- T/O perf Init – entering multiple obstacles or a SID gradient with one or more obstacles in FMS Takeoff Init Obstacles/SID (page 3/5) is prohibited.

## Enroute:

- Max. Operating Altitude..... 51,000 ft  
 Max. Operating Altitude (single ac pack)..... 48,000 ft  
 Landing Gear extended/extension ..... 20,000 ft  
 Landing Flaps (39°) ..... 20,000 ft  
 Flaps 10° or 20° ..... 25,000 ft  
 Max. Operating Altitude w/interior baggage door open ..... 40,000 ft  
 Max Fuel Imbalance ..... 2,000 lbs  
 (proceed with fuel balancing before imbalance exceeds 1,000#)  
 Min inflight operating temp ..... -54° TAT  
 (refer to AFM 01-03-20 for Min Mach to Maintain -54°C TAT)

## Airspeed Limitations:

- VMCA - Flaps 20° ..... 101.5 KCAS  
 VMCA - Flaps 10° ..... 105.0 KCAS  
 VMCL (Landing) ..... 100.5 KCAS  
 VMCG ..... (Sea Level & ISA) ..... 105 KCAS  
 VMCG ..... (15,000 ft & ISA) ..... 85 KCAS  
 NOTE: VMCG decreases linearly approx. 1 kt / 1000 ft from SL to 15,000 ft.  
 VA ..... 206 KCAS  
 VFE ..... (10°) ..... 250 KCAS  
 VFE ..... (20°) ..... 220 KCAS  
 VFE ..... (39°) ..... 190 KCAS  
 VLE ..... 250 KCAS  
 VLO ..... (normal ops) ..... 225 KCAS  
 VLO ..... (alternate ops) ..... 175 KCAS  
 MMO ..... (35,000 – 51,000 ft) ..... 0.925 M  
 MMO ..... (29,380 ft) ..... 0.875 M  
 VMO ..... (above 8,000 ft) ..... 340 KCAS  
 VMO ..... (below 8,000 ft) ..... 300 KCAS  
 V HOLDING MIN ..... 160 KCAS  
 V HOLDING MIN (ICING) ..... 180 KCAS  
 VTURB ..... (above 10,000 ft) ..... 270 KCAS / 0.85 M  
 VTURB ..... (below 10,000 ft) ..... 240 KCAS  
 VTIRE ..... 195 GS  
 Yaw Damp Inop ..... 285 KCAS/ 0.90 M  
 Degraded Flight Control Law (not Normal) ..... 285 KCAS/ 0.90 M  
 Primary Flight Control Surface Failure ..... 285 KCAS / 0.90 M
- Windmill airstart speed limit: Min 250 kt to Max 340 kt below 30,000 ft.
  - Below MTOW add 15% to DC V<sub>REF</sub> for V<sub>A</sub> (e.g. V<sub>REF</sub> 140 = 161 V<sub>A</sub>)
- RVSM – ADS1 & 2 Max Op airspeed ..... VMO/ 0.90 M  
 RVSM – ADS3 & ADS1 or 2 Max Op airspeed ..... VMO/ 0.88 M

## Flight Load Acceleration:

- Flap 0° ..... (all weights) ..... -1 to +2.5 G  
 Flap 10° or 20° ..... (all weights) ..... 0 to +2.0 G  
 Flap 39° ..... (up to max ldg. weight) ..... 0 to +2.0 G  
 Flap 39° ..... (above max ldg. weight) ..... 0 to +1.5 G

## Weight:

	G650	G650ER
Max Ramp	100,000 lbs	104,000 lbs
Max Takeoff	99,600 lbs	103,600 lbs
Max Landing	83,500 lbs	83,500 lbs
Max Zero Fuel	60,500 lbs	60,500 lbs

## Air Conditioning & Bleed Air

- Max. Cabin Press. Diff. .... 10.69 psi  
 Max. Cabin Press. Diff ..... (t/o & ldg) ..... 0.3 psi

### Internal Baggage Door

- Door shall remain closed above 40,000 ft. (non-EASA)

## Auto Flight:

- Single engine autopilot coupled go-around is not approved.
- Use of auto-throttle during SE approaches is prohibited.

### AUTOPILOT:

- Min. Engage Height ..... 200 ft AGL  
 Min. Disengage Height..... (ILS or LPV) ..... 80 ft AGL  
 Min. Disengage Height (All other ops) ..... 200 ft AGL  
 Max. altitude loss from coupled go-around ..... 50 ft

## Ram Air Turbine (RAT)

- RAT provides electrical power to equipment connected to the L Ess. DC, R Ess. DC & Emer AC busses.
- Except during emergency conditions and as directed by abnormal or emergency procedure checklist, deployment of the RAT is prohibited when normal AC power is available.
- NOTE: If RAT used increase cruise fuel flow by 6%. RAT GEN will drop off line < 180 kts. Allow 30 sec for RAT fan to stabilize to prevent unstable electrical current causing FMS issues.

## Transformer Rectifier Units (TRUs)

- During ground ops, limit TRU loads to:
  - L Main, L Ess, R Main, R Ess – 80%
  - Aux – 40%

## Flight Controls:

- Stall Protection System is operable only in the Normal Flight Control mode.
- Speed brakes are not approved for extension with flaps 39° or with landing gear extended in flight.
- If a touch and go landing is to be performed, GND SPLR must be OFF and manual spoiler distances used.
- Flight into known icing conditions is prohibited when operating in a flight control law other than Normal (i.e., Alternate, Direct, or Backup). If the flight control law mode degrades from Normal while in icing conditions, exit icing conditions.
- T/O prohibited when operating in a flight control law other than Normal (i.e., Alternate, Direct or Backup)

## Fuel:

### G650:

Right Tank	22,100 lb	3,279 gal	12,411 L
Left Tank	22,100 lb	3,279 gal	12,411 L
<b>Total</b>	<b>44,200 lb</b>	<b>6,558 gal</b>	<b>24,822 L</b>

### G650ER:

Right Tank	24,100 lb	3,576 gal	13,534 L
Left Tank	24,100 lb	3,576 gal	13,534 L
<b>Total</b>	<b>48,200 lb</b>	<b>7,152 gal</b>	<b>27,068 L</b>

- Gravity Refueling – 43,650 lb. / 6,515 gal / 24,661 L
- All operable boost pumps shall be ON for all phases of flight unless fuel balancing is in progress.
- Low fuel level alert @ 650 lbs (96 gallons).
- Fuel Tank Temperatures:**  
 Max. .... **Fuel Tank Temperature** ..... +54°C  
 Min. .... **Fuel Tank Temperature** ..... -35° to -36°C  
 Min. .... **Fuel Tank Temperature** ..... -37°C
- When fuel tank temp. is at or below -30°C in flight with less than 5,000 lb. total fuel remaining, the a/c shall be descended to an altitude where SAT is -60°C or warmer and maintain a min. speed of 0.80M.

## Hydraulic Servicing:

- Max. Reservoir Qty. (Pressurized) as indicated on synoptic:**  
 Left ..... 2.8 – 3.0 gal.  
 Right ..... 1.4 – 1.6 gal.

### L/R System Accumulator Pre-Charge

- 1200 psi @ 70°F / 21°C ±25 psi per each Δ10°F / 5°C
- Flight Time Limitation after Hydraulic Failure (with ASC 135)
    - If a hydraulic failure occurs within 1 hour after takeoff – Max. altitude 27,000 ft. / Land within 1.5 hrs. after hydraulic failure
    - If a hydraulic failure occurs >1 hour after takeoff – Land within 9 hrs. after hydraulic failure

## Ice & Rain Protection:

- Icing conditions exist when the SAT on the ground and in flight is between +10°C and -40°C and visible moisture in any form is present (such as clouds, fog with visibility of one mile or less, rain, snow, sleet and ice crystals). The wing & cowl anti-ice systems must be selected ON when entry into icing conditions is imminent, or immediately upon detection of ice formation on wings, winglets or windshield edges.
- Icing conditions also exist when the SAT on the ground and for takeoff is +10°C or below when operating on ramps, taxiways or runways where surface snow, ice, standing water, or slush may be ingested by the engines or freeze on engines, nacelles, or engine sensor probes.
- Takeoff is prohibited with frost, ice, snow, or slush adhering to the wings, control surfaces, engine inlets, or other critical surfaces.

- A visual and tactile (hand on surface) check of the wing leading edge and the wing upper surface must be performed to ensure the wing is free from frost, ice, snow, or slush when the outside air temperature is less than 6°C (42°F), or if it cannot be ascertained that the wing fuel temperature is above 0°C (32°F); and
  - There is visible moisture (rain, drizzle, sleet, snow, fog, etc.) present; or
  - Water is present on the wing; or
  - The difference between the dew point and the outside air temperature is 5°F (3°C) or less; or
  - The atmospheric conditions have been conducive to frost formation.
- The wing & cowl anti-ice systems must be selected ON, if required, at least 2 minutes prior to setting takeoff thrust.
- Automatic anti-ice is provided as a backup to the crew for activation of the anti-ice systems. The auto anti-ice feature is inhibited above 35,000 ft.
- Use of flaps in icing conditions is restricted to takeoff, approach and landing only. Prior to extending flaps for approach & landing, ensure wing anti-icing is activated & functional.
- Holding in icing conditions is limited to Flaps 0° only. A minimum speed of 180 KCAS must be maintained when holding in icing conditions.

## Wing Anti-Icing

- Operation is required if icing conditions are imminent, or immediately upon detection of ice formation on wings, winglets, or windshield edges.

### Cowl Anti-Icing

- Use of cowl anti-icing is required for taxi and takeoff when SAT Temperature (SAT) is +10°C or below and visible moisture, precipitation, or wet runway are present.
- IN FLIGHT:** To help shed the ice when high vibration occurs and operational circumstances permit, one engine at a time may be quickly retarded to idle, held there for five 5 seconds and then accelerated to 90% LP, the power lever may then be returned to its original position.
- ON GROUND:**
  - When taxiing or holding on the ground at low power in temperatures less than +1°C & in visible moisture:
    - At intervals of not more than 60 minutes, slowly accelerate engine to 40% LP for 10 seconds, then resume idle operation.
  - Takeoff – slowly accelerate the engine to 40% LP, pause for 2 seconds to check normal operation, then select takeoff thrust.
  - When operating in snowing conditions with visibility of one (1) statute mile or less, it is recommended that at a maximum of thirty (30) minutes after engine start, slowly accelerate engine to 70% LP, pause for one (1) minute, then either resume idle operation or accelerate to takeoff thrust.
  - If engine inlets could not be thoroughly inspected, engine inlet covers had not been installed while aircraft parked outside for an extended period, or if icing conditions exist after engine inlet cover removal and covers have been removed for sixty (60) minutes or more prior to engine start, slowly accelerate engine to 70% LP, pause for one (1) minute, then resume idle operation.
- Freezing Fog:**
  - 4°C and less to -10°C:** At intervals of not more than 60 minutes, slowly accelerate engine to 40% LP, pause for 2 seconds to check for normal operation, accelerate to t/o thrust, pause for 5 seconds, then resume idle operation.
  - Takeoff – slowly accelerate the engine to 40% LP, pause for 2 seconds to check normal operation, then select takeoff thrust.
  - <-10°C to -20°C:** At a maximum of 30 minutes after engine start, slowly accelerate engine to 70% LP, pause for 1 minute, then either resume idle operation or accelerate to t/o thrust.
  - If idle operation is resumed t/o must be performed within a maximum of 10 minutes.
  - Takeoff – slowly accelerate the engine to 40% LP, pause for 2 seconds to check normal operation, then select takeoff thrust.
  - Takeoff is prohibited if it cannot be performed within 10 minutes after resumption of idle operation. Engines should be shut down as soon as practicable. Ensure all ice accreted on engine components is removed prior to subsequent flight attempt.
- Automatic anti-ice is inhibited above 35,000 ft. If anti-ice protection above 35,000 ft is required, it must be manually selected.

## Tire Pressure

- Recommended tire pressure for all gross weights is 216 psi, measured when tires have been stationary for at least 2 hours. Airplane operations below 186 psi may require tire(s) to be replaced.

## Inertial Reference System (IRS)

- No provision for IRS "Down Mode Align".
- Certified for alignment to 78° Latitudes.
- For flights above 73°N and 60°S Latitude, EFIS heading info. must be switched from MAG to TRUE due to loss of valid MAG heading from the IRS.

# G650 / 650ER SELECTED LIMITATIONS & INFO.

## Airborne Weather Radar:

- Do NOT operate during refueling of the a/c or within 50 ft of other refueling operations.
- Do NOT operate within 11 ft of ground personnel.
- HSI weather radar returns may appear at an incorrect range when weather radar data are selected for display on both Map and HSI

## EFVS:

- Operations to 100 ft. above TDZE – at 100 feet HAT, visual cues must be seen without the aid of EFVS to continue to landing.
- Operations to touchdown & rollout – LOA is required / descending below DA/DH requires visual references be distinctly visible and identifiable to the pilot using an EFVS.

## CAS Messages:

- Dispatch with an active Amber or Blue message shall be with reference to the MEL.

## APU:

- Honeywell RE220
- APU can be operated on the ground and in all phases of flight (with ASC095) [refer to restrictions per AFM Supp. 2016-03-APU Enclosure Sealant]
- APU cannot be used to supply pressurization airflow in flight.
- APU may be used for starter assisted starts below 30,000 ft. Max Operating Altitude.....45,000 ft
- APU Gen. Electrical load.....100% (40 kVA) S/L to 45,000 ft
- Max EGT Start .....1050°C
- Max EGT Running.....732°C
- Max Rotor Speed .....106%

## APU Starting Limits:

- A/C Battery..... 3 consecutive attempts  
1 hour cool down
- Use of an external DC power source to start the APU is prohibited.

## APU Airstart Envelope (with ASC 123):

- Guaranteed ..... Below 37,000 ft
- Possible..... 37,000 ft to 39,000 ft
- Dual Gen. Failure ..... Initiate start at or below 37,000 ft

## APU Airstart Envelope (without ASC 123):

- Guaranteed ..... Below 30,000 ft
- Possible..... 30,000 ft to 39,000 ft
- Dual Gen. Failure ..... Initiate start at or below 30,000 ft

## Powerplant:

- BMW/RR BR725A1-12- High bypass turbofans (4.18:1 bypass ratio). Rated at 16,100 pounds @ 86°F (30°C)

CONDITION	LP % RPM	HP % RPM	MAX TGT	TIME LIMIT
Ground start	--	--	700°C	Momentary
Airstart (relight)	--	--	850°C	Momentary
Takeoff	102.8	100.0	900°C	5 minutes
Max. Continuous	102.8	98.7	885°C	Unrestricted
Max. Overspeed	104.3	101.3	--	20 seconds
Max. Over-temp	--	--	920°C	20 seconds
Reverse thrust	78.1	--	--	30 seconds

- Max. TGT prior to ground start.....150°C
- Max. X-Wind Component for Engine Start ..... 30 kts.
- Max. Tail-Wind Component for Engine Start ..... 20 kts.
- Take Off in the ALTERNATE (LP) control mode is prohibited.
- Static operation above idle is limited to an x-wind component of <25 knots and/or a tailwind component of <20 knots.
- Airstart envelope: Starter assist at <250 KCAS. Windmill start at 250 KCAS to 340 KCAS, max altitude 30,000 ft.

## Engine Fuel Temperature:

- Min. ....- 40°C
- Max. unrestricted.....+140°C
- Max. (15 min) Transient .....+165°C

## Thrust Reversers:

- Idle reverse position by 60 KCAS.
- No time limit for use of idle reverse thrust for taxi purposes.
- If in an emergency, reverse thrust is used to bring the a/c to a halt, record and report such an operation for mx action.
- Use of reverse thrust for power back is NOT approved.
- WET RWY: Dispatch with inop. thrust reverser(s) – increase accelerate-stop distances by multiplying it by 1.11, or decrease the available field length by dividing it by 1.11.

## Starter Duty:

Attempt	Time Limit	Cooling Period
1st	3 minutes	15 Seconds
2nd	3 minutes	15 Seconds
3rd	3 minutes	15 Minutes

- Starter re-engagement – up to starter cut out of 42% (HP)
- Check that residual TGT is <150°C. If not perform engine crank cycle to reduce TGT.

## Oil Inlet Temperature:

- Min. for Starting.....Oil Temp Low .....-40°C
- Min for T/O Power.....Oil Temp Low .....+20°C
- Max. Temp..... Oil Temp HI.....+160°C

## Oil Pressure:

- Engine must be shut down when oil press. is below 25 PSI.

MINIMUM ENGINE OIL PRESSURE		
	For Takeoff	Complete Flight
Below 72.3% HP	35 PSI	25 PSI
Above 90.0% HP	45 PSI	35 PSI

## Fire Extinguishing

- Shot 1 = RIGHT Bottle
- Shot 2 = LEFT Bottle
- APU uses LEFT Bottle

## FLEX T/O THRUST LIMITATIONS / INFO:

### Using Appendix A Tab Data:

Detailed instructions for the procedures (both normal and emergency) and limitations associated with the use of reduced thrust takeoffs are provided in AFM Appendix A.

While use of the data in Appendix A is prohibited in the presence of tailwinds, the general data in Section 05-02-00 can be used for all allowable wind conditions (10-knot tailwind to 40-knot headwind) and all allowable runway slopes (-2% downhill to +2% uphill).

- Reduced/FLEX EPR takeoff thrust may be used on dry or wet hard-surfaced runways.
- Reduced/FLEX EPR takeoff thrust procedures are prohibited on runways contaminated with standing water, snow, slush or ice.
- The FLEX EPR takeoff performance computed using this appendix is limited to takeoffs for no wind or headwind conditions only. Takeoff performance for tailwinds must be computed using the data presented in Section 05-02 of the AFM (spaghetti charts).
- FLEX EPR t/o performance is applicable to Cow/ Anti-Ice bleed ON or OFF. Use of Wing Anti-icing bleed is not approved.
- Auto Ground Spoilers must be operative.
- All t/o EPR limitations must be observed.
- To ensure that at least 75% of rated t/o thrust is used and that t/o configuration warnings are not inhibited, rated thrust EPR may be reduced no more than 0.16 for FLEX takeoffs.

## EGPWS:

The terrain awareness display feature shall be selected OFF (TERRAIN INHIBIT switch selected ON) when within 15 NM of landing at an airport when:

- The airport has no published instrument approach procedure.
- The longest runway is less than 3,500 ft in length.
- The airport is not in the database.
- QFE altimeter settings are used for approach and landing on subsequent takeoff without the availability of geometric altitude.

## Permitted Airplane Operations:

- Polar Nav; RNP-10; BRNAV, RNAV 5, RNP-5; RNP-4; P-RNAV, RNP 1; RNAV 2 / RNAV 1; RNP-2; NAT-HLA; RNP 0.3; RNP-RNAV; RNP-AR; A-RNP; LPV; Radius-to-Fix Legs; VNAV; RVSM; AFN & ADS-C; ADS-B; FANS 1/A+; FANS 2 / ATN B1.

## Gear Horn:

- Below 500ft AGL with both throttle lever at idle, flaps less than 22°, any gear NOT down and locked. Horn can be muted using HORN SILENCE button.
- Flaps greater than 22° and any landing gear NOT down and locked. Horn cannot be muted.

## Pavement Loading:

- ACN must be less than or equal to the airport PCN.
- Ramp permissible loading is not always the same as Rwy.
- Worse/highest ACN is 35 @ MRW 104k / 33.4 @ 100k & Ultra Low (D) pavement at max tire 216 psi. Min tire press is 186 psi (thus no /Y or /Z class, only /W & /X).  
Examples: @85k w/ PCN 80/R/B/W/T the ACN = 26.6 (acceptable). And @ 75k w/ PCN 24/ F/C/Y/T the ACN = 21.7 (unacceptable due /Y 145psi limit). See Perf Handbook PC-9.
- Equivalent Single Wheel Load (ESWL) @ 104k MRW = 36,563 lb. w/ H37.5x12.0R19 tires w/ 22" spacing, 216 psi, reduction factor of 1.28 (i.e., rigid, 13.5" thick concrete). See Perf Handbook PC-17.

