FlightSafety international

CITATION X PILOT TRAINING MANUAL

VOLUME 1
OPERATIONAL INFORMATION

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NOTICE

The material contained in this training manual is based on information obtained from the aircraft manufacturer's Pilot Manuals and Maintenance Manuals. It is to be used for familiarization and training purposes only.

At the time of printing it contained then-current information. In the event of conflict between data provided herein and that in publications issued by the manufacturer or the FAA, that of the manufacturer or the FAA shall take precedence.

We at FlightSafety want you to have the best training possible. We welcome any suggestions you might have for improving this manual or any other aspect of our training program.

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ABBREVIATIONS

TABLES

ABBREVIATIONS

Abbreviations used in this manual are shown in Table ABB-1.

Table ABB-1. ABBREVIATIONS

ABBREVIATION	DEFINITION
A/I	Anti-Ice
ADC	Air Data Computer
AFCS	Automatic Flight Control System
AFM	Aircraft Flight Manual
AHRS	Attitude, Heading Reference System
ANNUN	Annunciator or Annunciation
AOA	Angle of Attack
AP	Autopilot
APP	Approach
APU	Auxiliary Power Unit
ASCB	Avionics Standard Communication Bus
ATTCS	Automatic Takeoff Thrust Control System
AUX	Auxiliary
AVN	Avionics
BATT	Battery
BIT	Built-In Test
BLD	Bleed
BOTTL	Bottle
CAS	Crew Alerting System
CB	Circuit Breaker
CBN	Cabin
CKPT	Cockpit
CLSD	Closed
CRT	Cathode Ray Tube
CTR	Center
CTRL	Control
CVR	Cockpit Voice Recorder

Table ABB-1. ABBREVIATIONS (Cont)

ABBREVIATION	DEFINITION
DAU	Data Acquisition Unit
DC	Direct Current
DCA	Direct Current Amperes
DME	Distance Measuring Equipment
DU	Display Unit
ECU	Environmental Control Unit
ECU	Electronic Control Unit
EDM	Emergency Descent Mode
EFIS	Electronic Flight Instrument System
EGT	Exhaust Gas Temperature
EGPWS	Enhanced Ground Proximity Warning System
EICAS	Engine Indicating & Crew Alerting System
ELEV	Elevator
EMERG	Emergency
ENG	Engine
FADEC	Full Authority Digital Electronic Control
FD	Flight Director
FDR	Flight Data Recorder
FGC	Flight Guidance Computer
FMI	FADEC Mode Indicator
FW	Fire Wall
FWC	Fault Warning Computer
GCU	Generator Control Unit
GEN	Generator
GND	Ground
GPWS	Ground Proximity Warning System
GRV	Gravity
HI	High
HP	High Pressure
HTR	Heater
HYD	Hydraulic

Table ABB-1. ABBREVIATIONS (Cont)

ABBREVIATION	DEFINITION
IAC	Integrated Avionics Computer
IGN	Ignition
IMT	Integrated Maintenance Test
INOP	Inoperative
IRS	Inertial Reference System
ITT	Inter Turbine Temperature
JBOX	Junction Box
LRU	Line Replacement Unit
MADC	Micro Air Data Computer
MFD	Mulitfunction Display
MISCMP	Miscompare
MSG	Message
MTR	Metering
N_1	Engine Fan Speed
N_2	Engine Turbine Speed
NAV	Navigation
O'FULL	Overfull
O'HEAT	Overheat
O'TEMP	Overtemperature
OPN	Open
P/S	Pitot/Static
PAC	Pneumatic Air Conditioning
PCOOLR	Precooler
PFD	Primary Flight Display
PMP	Pump
PRESS	Pressure
PSI	Pounds Per Square Inch
PTU	Power Transfer Unit
RAT	Ram Air Temperature
RSS	Rudder Standby System
RVT	Rotary Variable Transformer

Table ABB-1. ABBREVIATIONS (Cont)

ABBREVIATION	DEFINITION
SAT	Static Air Temperature
SCD	Source Control Drawing
SEC	Secondary
SEL	Select
SG	Symbol Generator
STAB	Stabilizer
STR	Steering
TAT	Total Air Temperature
TCAS	Traffic Collision Avoidance System
TEMP	Temperature
TLA	Throttle Lever Angle
TOPI	Takeoff Phase Inhibit
TR	Thrust Reverser
TURB	Turbine
TX	Transmitter
VDC	Volts Direct Current
VLV	Valve
WOW*	Weight on Wheels
WSHLD	Windshield
XFER	Transfer
XFLW	Crossflow
XMTR	Transmitter
XSIT	Transient
YSAC	Yaw Stability Augmentation Computer

* WOW ALWAYS MEANS WEIGHT ON WHEELS WHEN REFERENCED IN THE *MAINTENANCE MANUAL*. HOWEVER, WOW CAN MEAN WEIGHT ON WHEELS OR WEIGHT OFF WHEELS WHEN REFERENCED IN THE APPROVED *FLIGHT MANUAL*.

LIMITATIONS

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LIMITATIONS

NOTICE

Certification and operational limitations are conditions of the type and airworthiness certificates and must be complied with at all times as required by law.

GENERAL

CERTIFICATION STATUS

This airplane is certificated in the Transport Category of the U.S. Federal Aviation Regulations Part 25.

OPERATIONS AUTHORIZED

This airplane is approved for day and night, VFR and IFR flight and flight into known icing conditions.

This airplane is eligible for over-water operations with applicable equipment specified in the appropriate operating rules.

This airplane is not approved for ditching under FAR 25.801.

This airplane is approved for Category II operations. This does not constitute operational approval.

No acrobatic maneuvers, including spins, are approved. No intentional stalls permitted above 18,000 feet.

MINIMUM CREW

Minimum Flight Crew for All Operations........ Pilot and Copilot

SEATING

The maximum number of seats is 14 (pilot, copilot and 12 passengers).

Passenger seats must be in the following positions during all takeoffs and landings:

a. All seats—Fully upright and outboard with occupied seat headrests fully extended.
b. Seat backs—Clear of emergency exits.

BELTED TOILET SEAT

During taxi, takeoff and landing, when the belted toilet seat is occupied, the aft divider sliding doors must be LATCHED OPEN.

NOSE TIRE LIMITATION

Only the Goodyear 164F03-1 and 164F03-2 nose tires are approved. Approved tires must be inflated to 130 ± 5 psig, unloaded, in accordance with the servicing placard.

NOTE

Tire pressures identified as UNLOADED are pressures with the airplane on jacks or before installed on the airplane.

Loaded tire pressure will be 2 to 5 psi higher, depending on airplane weight and CG.

BAGGAGE COMPARTMENT

- Maximum operating altitude 41,000 feet with the baggage compartment unpressurized.
- Use of the baggage compartment is not authorized with the cabin unpressurized.
- The baggage compartment smoke detection system must be operational if baggage is to be carried in the compartment.
- Live animals may not be carried in the baggage compartment.
- The number of flights with the baggage compartment not pressurized must be logged. Refer to the *Model 750 Aircraft Maintenance Manual*, Chapter 5, for specific number of flights (cycles).
- Maximum weight of baggage in the baggage compartment is 700 lbs.
- Maximum weight in the ski holding compartment is 75 lbs.
- Maximum floor loading distribution is 170 lbs per square foot.

CAUTION

Check center-of-gravity before loading the baggage compartment.

WEIGHT LIMITATIONS

S/N 750-0001 THROUGH 0172

Maximum Design Ramp Weight .... 36,000 lbs

Maximum Design Takeoff Weight .... 35,700 lbs

Maximum Design Landing Weight............................. 31,800 lbs

Maximum Design Zero Fuel Weight.......................... 24,400 lbs

Takeoff weight is limited by the most restrictive of the following requirements:

Maximum Certified Takeoff Weight .... 35,700 lbs

Maximum Takeoff Weight Permitted by:

Climb Requirements .... Refer to *AFM* Section IV—Performance, Takeoff data

Takeoff Field Length .... Refer to *AFM* Section IV—Performance, Takeoff data

Landing weight is limited by the most restrictive of the following requirements:

Maximum Certified Landing Weight............................ 31,800 lbs

Maximum Landing Weight
Permitted by Climb Requirements
or Brake Energy Limit .... Refer to *AFM* Section IV—Performance, Approach and Landing data

Landing Distance .... Refer to *AFM* Section IV—Performance, Approach and Landing data

S/N 750-0173 AND ON

Maximum Design Ramp Weight .... 36,400 lbs

Maximum Design Takeoff Weight .... 36,100 lbs

Maximum Design Landing Weight............................. 31,800 lbs

Maximum Design Zero Fuel Weight .... 24,400 lbs

Takeoff weight is limited by the most restrictive of the following requirements:

Maximum Certified Takeoff Weight .... 36,100 lbs

Maximum Takeoff Weight Permitted by:

Climb Requirements .... Refer to *AFM* Section IV—Performance, Takeoff data

Takeoff Field Length .... Refer to *AFM* Section IV—Performance, Takeoff data

Landing weight is limited by the most restrictive of the following requirements:

Maximum Certified Landing Weight............................ 31,800 lbs

Maximum Landing Weight
Permitted by Climb Requirements
or Brake Energy Limit .... Refer to *AFM* Section IV—Performance, Approach and Landing data

Landing Distance .... Refer to *AFM* Section IV—Performance, Approach and Landing data

WEIGHT AND BALANCE DATA

S/N 750-0001 THROUGH 0172

The airplane must be operated in accordance with the approved loading schedule. Refer to Weight and Balance Data Sheets and Model 750 Citation X FAA-approved *Weight and Balance Manual.*

S/N 750-0173 AND ON

The airplane must be operated in accordance with the approved loading schedule. Refer to Weight and Balance Data Sheets and Model 750 Citation X Airplanes 750-0173 and on FAA-approved *Weight and Balance Manual*.

BALLAST FUEL

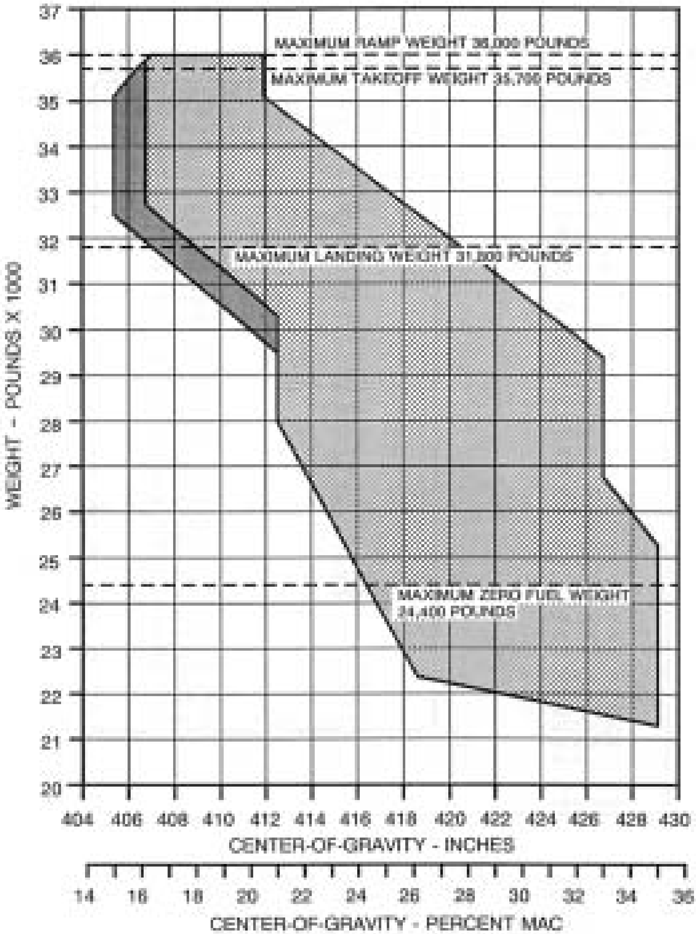
Ballast fuel is fuel that remains within the wing fuel tanks which cannot be used without causing the aft center-of-gravity limit to be exceeded. *Ballast fuel is nonusable fuel.* Ballast fuel requirements must be determined prior to flight. Refer to the Weight and Balance Data Sheets (Airplane Weighing Form and Ballast Fuel Graph) and Model 750 Citation X FAA-approved *Weight and Balance Manual* for determining ballast fuel requirements.

CENTER-OF-GRAVITY LIMITS

Center-of-Gravity Moment Envelope

S/N 750-0001 through 0172...................... Refer to Figure LIM-1

S/N 750-0173 and on................................ Refer to Figure LIM-2



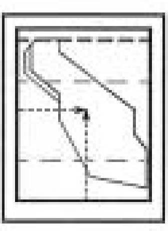


Figure LIM-1. Center-of-Gravity Limits (S/N 750-0001 Through 0172)

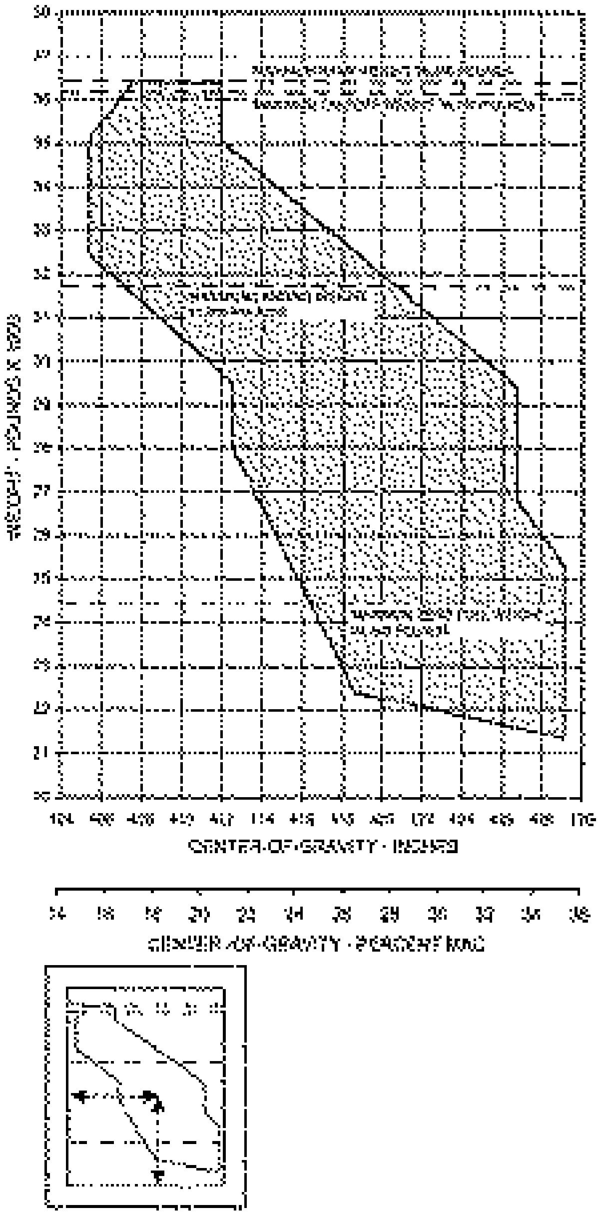


Figure LIM-2. Center-of-Gravity Limits (S/N 750-0173 and on)

LOAD FACTORS

S/N 750-0001 THROUGH 0172

In Flight:

Flaps—UP Position
(slats retracted) .... –1.00 to +2.7 G at 35,700 lbs

Flaps—UP Position
(slats extended) .... 0.0 to +2.0G at 35,700 lbs

Flaps—5° to FULL Position
(slats extended) .... 0.0 to +2.0G at 35,700 lbs

Maximum Duration (Zero to Negative G) .... 10 Seconds

NOTE

These accelerations limit the angle of bank in turns and limit the severity of pullup maneuvers.

Landing .... +3.5G at 31,800 lbs

NOTE

This acceleration represents landing at a sink rate, at touchdown, of 600 feet per minute.

S/N 750-0173 AND ON

In Flight:

Flaps—UP Position
(slats retracted).............................. –1.00 to +2.7G at 36,100 lbs

Flaps—UP Position
(slats extended) .... 0.0 to 2.0G at 36,100 lbs

Flaps—5° to FULL Position
(slats extended) .... 0.0 to +2.0G at 36,100 lbs

Maximum Duration (Zero to Negative G) .... 10 Seconds

NOTE

These accelerations limit the angle of bank in turns and limit the severity of pullup maneuvers.

Landing.. +3.5G at 31,800 lbs

NOTE

This acceleration represents landing at a sink rate, at touchdown, of 600 feet per minute.

SPEED LIMITATIONS

Design Speed Envelope
(calibrated altitude) .... Refer to Figure LIM-3

Maximum Operating Mach:

(M_{MO}) above 30,650 feet .... 0.92 Mach (Indicated)

(M_{MO}) Mach trim off....................... 0.82 Mach (Indicated)

Maximum Operating Knots:

(V_{MO}) 8,000 feet to 30,650 feet......................... 350 KIAS

(V_{MO}) below 8,000 feet..................................... 270 KIAS

NOTE

The M_{MO} and V_{MO} limits are lower for certain equipment failures. Refer to the applicable Emergency or Abnormal Procedure.

The maximum operating limit speeds may not be deliberately exceeded in any regime of flight (climb, cruise or descent) unless a higher speed is authorized for flight test or pilot training.

With standby airspeed indicator as primary speed reference, the following V_{MO} schedule must not be exceeded:

Sea level to 8,000 feet .... 270 KIAS

8,000 feet to 24,000 feet .... 345 KIAS

24,000 feet to 35,000 feet .... 275 KIAS

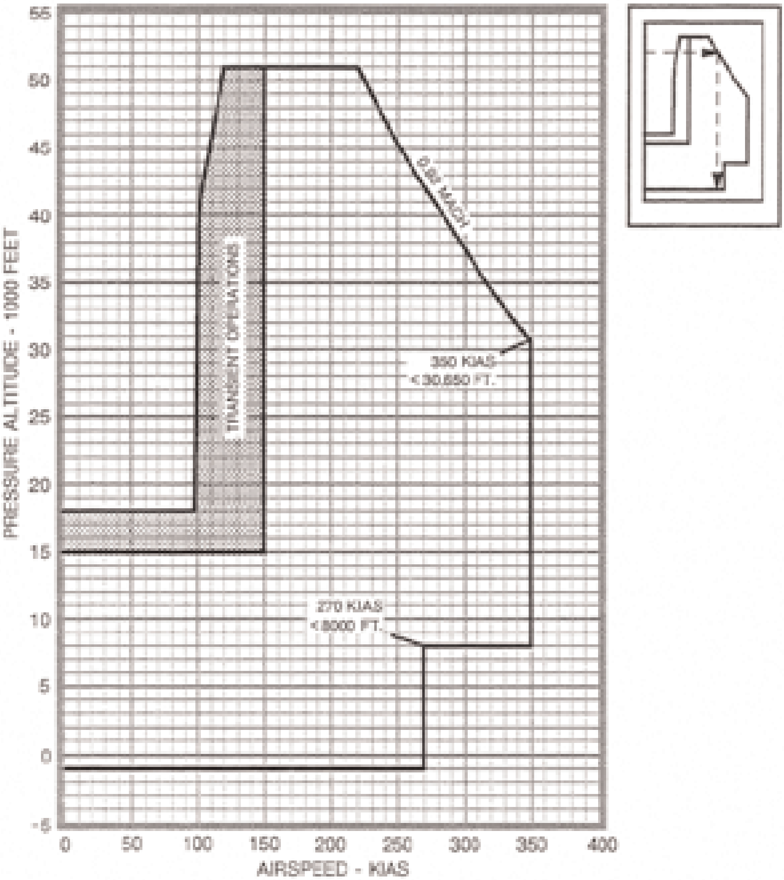
35,000 feet to 41,000 feet .... 240 KIAS

41,000 feet to 51,000 feet .... 190 KIAS

NOTE

Above 24,000 feet, airspeed may be linearly interpolated between altitudes.

Speeds above 24,000 feet are based on 0.82 Mach limit.



NOTE: CONTINUOUS OPERATION IN THE TRANSIENT OPERATIONS AREA IS NOT AUTHORIZED.

Figure LIM-3. Design Speed Envelope

Maximum Maneuvering
Speeds—V_A .... Refer to Figures LIM-4 and LIM-5

NOTE

Full application of rudder and aileron controls, as well as maneuvers that involve angles of attack near the stall, should be confined to speeds below maximum maneuvering speed.

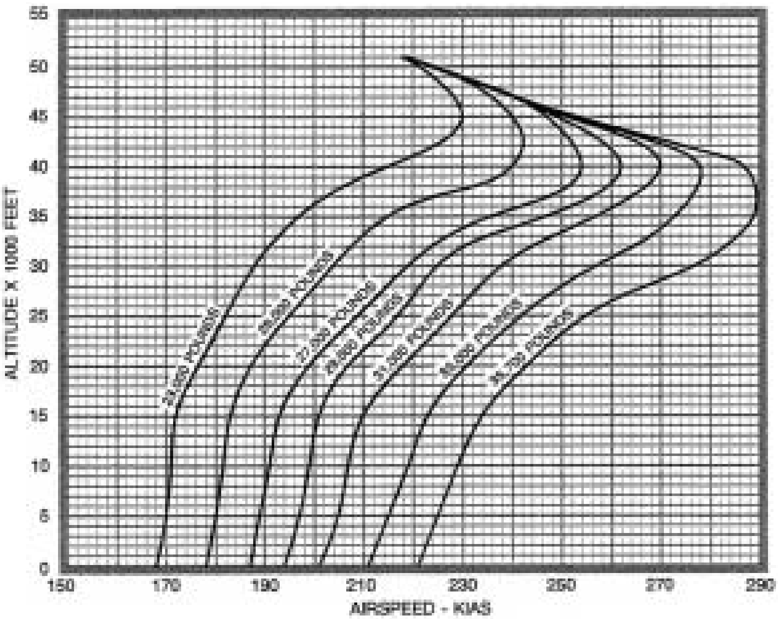


Figure LIM-4. Maximum Maneuvering Speeds (S/N 750-0001 Through 0172)

Maximum Altitude for Extension of Flaps
and Landing Gear .... 18,000 feet

Maximum Slat Extended Speed .... 250 KIAS

Maximum Flap Extended Speed—V_{FE}

Partial Flaps—5° position.. 250 KIAS
15° position....................................... 210 KIAS

Full Flaps—FULL position.. 180 KIAS

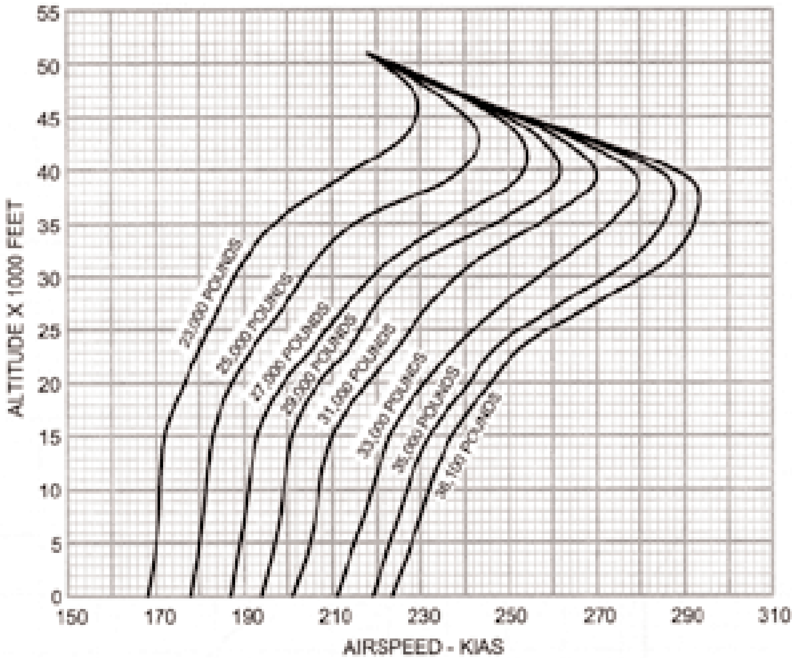


Figure LIM-5. Maximum Maneuvering Speeds (S/N 750-0173 and on)

Maximum Landing Gear
Operating/Extended Speed—V_{LO}/V_{LE} .... 210 Kias

NOTE

This is the maximum speed at which the landing gear may be lowered or raised as well as the maximum speed with landing gear extended.

Maximum Turbulent Air
Penetration Speed .... 300 KIAS/0.9 Mach

Maximum Speed Brake Extension Speed .... No Limit

Minimum Speed Brake Extension Speed......... V_{REF} +15 KIAS

Minimum Single Engine Enroute Climb Speed......... 190 KIAS

Maximum Tire Ground Speed .... 210 kts

Minimum Control Speeds (V_{MCA} and V_{MCG}) ...... Refer to *AFM* Section IV, Performance General

TAKEOFF AND LANDING OPERATIONAL LIMITS

Maximum Altitude Limit.. 14,000 feet

Maximum Tailwind Component... 10 kts

Maximum Ambient Temperature .... Refer to Figure LIM-6 & LIM-7

Maximum Crosswind Component (tower reported winds measured 10 meters above runway):

Manual Flight Controls

(Dual hydraulic failure, rudder standby system on or off; aileron flight control PCU off; rudder flight control PCU off)..................................... 10 kts

Slats Asymmetry.. 10 kts

Minimum altitude for in-flight use of speed brakes... 500 feet AGL

Maximum asymmetric fuel .... 400 lbs

Emergency asymmetric fuel.. 800 lbs

Minimum wing fuel per tank for takeoff.......................... 500 lbs

Takeoff in high idle is prohibited (except touch and go).

ENROUTE OPERATIONAL LIMITS

Maximum Operating Altitude.................................... 51,000 feet

Ambient Temperature Limits ...... Refer to Figure LIM-6, LIM-7 and *AFM* Section IV—Performance, Standard Charts

NOTE

Maximum operating altitude may be limited by some system's failures. Refer to appropriate emergency and abnormal operating procedures.

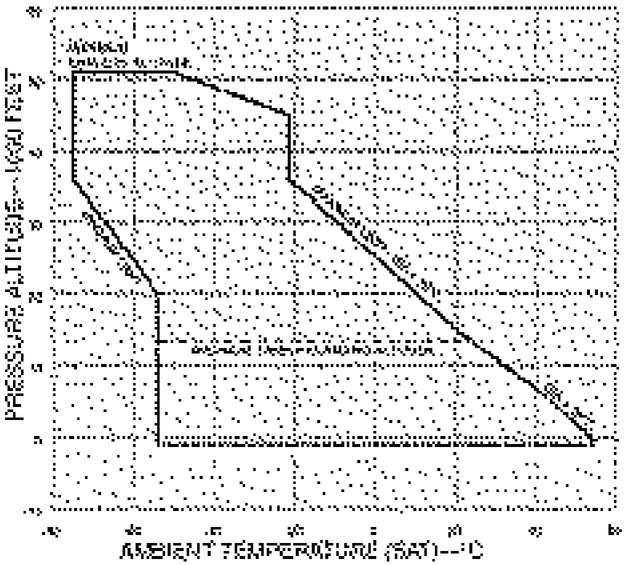


Figure LIM-6. Ambient Temperature Limits (S/N 750-0001 Through 0172)

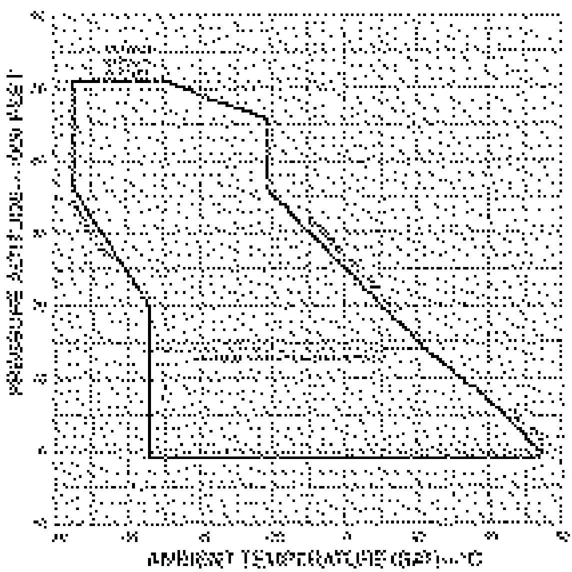


Figure LIM-7. Ambient Temperature Limits (S/N 750-0173 and on)

AVIONICS LIMITATIONS

S/N 750-0001 THROUGH 0127 HONEYWELL PRIMUS 2000 INTEGRATED AVIONICS SYSTEM AND AUTOPILOT

1. The *Honeywell Primus 2000 Pilot's Manual* must be immediately available to the flight crew: Primus 2000 Integrated Avionics System and Flight Control Systems, for the Citation X—Publication Number A28-1146-104-01, dated October 1997 or later appropriate revision.

2. The airplane should not be taxied until the AHRS or IRS ground alignment is complete (approximately three minutes).

NOTE

IRS ground alignment timewill depend on latitude.

3. One pilot must remain in his seat with seat belt and shoulder harness fastened during all autopilot operations.

4. PFD data must be displayed in the No. 1 and No. 5 display units for dispatch.

5. Autopilot minimum use height:

   a. Cruise .... 1,000 feet AGL

   b. Precision Approach (Category I ILS)..... 170 feet AGL

   c. Nonprecision Approach .... 400 feet AGL

6. Autopilot coupled operation with single operational or displayed AHRS or IRS is prohibited.

7. Approved for Category I and II operations. Refer to Category II limitations.

8. Autopilot coupled ILS approaches with flaps up are prohibited.

S/N 750-0001 THROUGH 0127 HONEYWELL PRIMUS II SRZ-850 INTEGRATED RADIO SYSTEM

1. The *Honeywell Pilot's Operating Handbook* for the PRIMUS II Integrated Radio System, Publication Number: A28-1146-50-04, dated April 1993 or later revision, must be immediately available to flight crew. Honeywell Publication A28-1146-121-00, dated February 1999 or later revision, is an acceptable replacement for A28-1146-50-04 and is the required document for those airplanes equipped with 8.33 KHz spacing radios.

2. The STANDBY COMM 1/NAV 1 Control Display Unit must be installed and operational.

S/N 750-0128 THROUGH 0172 HONEYWELL PRIMUS 2000 INTEGRATED AVIONICS SYSTEM AND AUTOPILOT

1. The *Honeywell Primus 2000 Pilot's Manual* must be immediately available to the flight crew: Primus 2000 Integrated Avionics System and Flight Control Systems, for the Citation X—Publication Number A28-1146-104-01, dated October 1997 or later appropriate revision.

2. The airplane should not be taxied until the AHRS or IRS ground alignment is complete (approximately three minutes).

3. One pilot must remain in his seat with seat belt and shoulder harness fastened during all autopilot operations.

4. PFD data must be displayed in the No. 1 and No. 5 display units for dispatch.

5. Autopilot minimum use height:

   a. Cruise .... 1,000 feet AGL

   b. Precision Approach (Category I ILS)..... 170 feet AGL

   c. Nonprecision Approach .... 400 feet AGL

6. Autopilot coupled operation with single-operational or displayed AHRS or IRS is prohibited.

7. Approved for Category I and II operations. Refer to Category II Limitations.

8. Autopilot coupled ILS approaches with flaps up are prohibited.

9. VOR navigation without DME: For proper radial tracking following station passage using a VOR navaid without DME, the VOR navaid must be the active waypoint in the FMS flight plan.

S/N 750-0128 THROUGH 0172 HONEYWELL PRIMUS II SRZ-850 INTEGRATED RADIO SYSTEM

1. The *Honeywell Pilot's Operating Handbook* for the PRIMUS II Integrated Radio System, Publication Number: A28-1146-50-04, dated April 1993 or later revision, must be immediately available to the flight crew. Honeywell Publication A28-1146-121-00, dated February 1999 or later revision, is an acceptable replacement for A28-1146-50-04 and is the required document for those airplanes equipped with 8.33 KHz spacing radios.

ONLY S/N 750-0173 AND ON HONEYWELL LASEREF IV INERTIAL REFERENCE SYSTEM

1. The *Honeywell Pilot's Manual* for the Laseref IV Inertial Reference System (IRS), Publication Number M28-3343-003-0, dated August 1998 or later, must be immediately available to the flight crew.

2. IRS alignment procedures are only approved for latitudes between 78.25°N and 78.25°S.

NOTE

IRS ground alignment time will depend on latitude.

3. Because the limits of reliable magnetic heading are 73°N and 60°S, true heading should be selected for navigation beyond those latitudes.

4. IRS system operations not approved for Line Replaceable Unit (LRU) temperatures less than –40°C.

5. Movement of airplane is prohibited until the IRS ground alignment is complete (2.5 minutes to 17 minutes, depending on latitude).

6. During ATT alignment in flight, after an IRS FAIL, the Autopilot/Flight Director must be disconnected until the failed IRS aligns and the heading is initialized on the FMS Control Display Unit (CDU).

7. Once an IRS is placed in ATT mode, this IRS can no longer be used as a navigation sensor during the flight.

8. Autopilot coupled with single-operational or displayed IRS is prohibited.

STANDBY ATTITUDE, AIRSPEED/ALTIMETER, AND HSI INSTRUMENTS

The standby attitude indicator, airspeed/altimeter, and HSI instruments must be operational. The standby power preflight check must be accomplished each flight.

The standby airspeed indicator speed limitations, as noted on the placard adjacent to the indicator, are applicable only if both the pilot's and copilot's primary airspeed indicators are inoperative. Airspeeds on this placard, above 24,000 feet, are approximately .082 Mach.

NOTE

Standby airspeed and altitude are not corrected for static and pitot source error and will normally vary from calibrated data presented in the PFD. Refer to *AFM* Figure 4-3. Placard airspeeds above 24,000 feet may be linearly interpolated.

ANGLE-OF-ATTACK/STALL WARNING SYSTEM

Both stall warning systems, the autoslat system, and the minimum speed system must be verified to be operational by a satisfactory preflight test as contained in Section III of the *AFM*.

The angle-of-attack indicating system may be used as a reference, but does not replace the airspeed indicator as a primary instrument.

AUTOMATIC DIRECTION FINDER (ADF)

The ADF bearing pointer may be unreliable during HF radio transmissions.

EICAS AND INSTRUMENT MARKINGS

S/N 750-0001 Through 0079, Not Incorporating Phase 6 or 6A

A and B System Hydraulic Pressure

Digital Indication	Green Range:	2,800 to 3,200 psi
	Amber Range:	<2,800, >3,200 psi
(Either engine running and both Hydraulic Pressures Low)	Red Range:	< 2,600 psi
Both engines shut down	Green Range:	< 2,600 psi

A and B System Hydraulic Quantity

Digital Indication	Green Range:	16 to 100%
	Amber Range:	<16 %

Accumulator Pressures

(A and B hydraulic systems, emergency brake, gear blowdown, rudder standby system, and nosewheel steering) .... Per placard according to temperature

APU MFD EICAS

% rpm Indication	Green Range:	0 to 101%
	Amber Range:	>101% to 108%
	Red Range:	>108%
EGT	Green Range:	0 to 665°C
	Amber Range:	>665 to 718°C
	Red Range:	>718°C
APU DC AMPS (Gauge)	Green Range (gnd or flt):	0 to 200
	Yellow Range (gnd only):	>200 to 300
	Red Line:	300
Cabin Differential Pressure Indicator	Green Arc:	0.0 to 9.7 psi
	Red Line:	9.7 psi

Fuel Quantity Digital Indication (Wing Tanks)	Amber:	<500 lbs

Fuel Temperature Indication

Engine	Green:	4 to 99°C
	Amber:	<4, >99°C
Tank	Green:	–35 to 52°C
	Amber:	<–35, >52°C

Left and Right Electrical System

Digital Voltage Indication	Green Range:	23 to 29 VDC
	Amber Range:	<23, >29 VDC

Red when both systems <23 and either engine running
Green when respective engine off

Digital Ammeter Indication (EICAS)

SL to FL410	Green Range:	0 to 400 amps
	Amber Range:	>400 to 401 amps
	Red Range:	>401 amps
Above FL410	Green Range:	0 to 300 amps
	Amber Range:	>300 to 301 amps
	Red Range:	>301 amps

Battery Temperature Indication	Green Range:	>–20 to 62.8°C
	Amber Range:	≤–20°C
	Red Range:	>+62.8°C
Battery Voltage Indication	Green Range:	23 to 29 VDC
	Amber Range:	<23, >29 VDC
Left and Right Inter-Turbine Temperature Indication (EICAS)		
During Start	Red Arrows:	800°C (Max Starting)
Engine Running	Amber Range:	>850°C to ≤888°C
	Red Line:	>888°C
Left and Right N_1 rpm Indication	Red Line:	100% rpm
Left and Right N_2 rpm Indication Engine Running	Green Range (Digits):	<101% rpm
	Red Range (Digits):	≥101% rpm
Left and Right Oil Pressure Indication	Green Range:	50 to 90 psi
	*Amber Range:	34 to 50 psi
	Red Range:	<34, >90 psi
Left and Right Oil Quantity Indication	Green Range:	<8.0 quarts low
	Amber Range:	≥8.0 quarts low
Left and Right Oil Temperature Indication	Green Range:	21 to 127°C
	Red Range:	>+127°C
Oxygen Pressure Indication	Green Arc:	1,600 to 1,800 psi
	Yellow Arc:	0 to 400 psi
	Red Line:	2,000 psi
Stabilizer Trim Indication		
On Ground	Flaps ≤5° Green Arc:	–2° to –5°
	Flaps 15° Green Arc:	–5° to –8°
In Flight	White Arc	+1.2° to –12°

NOTE

Nominal primary stabilizer trim limits are +1.2° and –12°. The EICAS stabilizer trim digits and needle will turn amber beyond these nominal values. Primary stabilizer trim tolerances or the use of secondary trim, may allow stabilizer trim travel slightly beyond these nominal values.

* Amber range displayed if TLA >30° or any time in flight.

S/N 750-0001 Through 0079, Incorporating Phase 6, But not Incorporating 6A and Applicable to S/N 750-0080 Through 0172, not Incorporating Phase 6A

A and B System Hydraulic Pressure

Digital Indication	Green Range:	2,800 to 3,200 psi
	Amber Range:	<2,800, >3,200 psi
(Either engine running and both hydraulic pressures low)	Red Range:	<2,600 psi
Both engines shut down	Green Range:	<2,600 psi

A and B System Hydraulic Quantity

Digital Indication	Green Range:	16 to 100%
	Amber Range:	<16%

Accumulator Pressures

(A and B hydraulic systems, emergency brake, gear blowdown, rudder standby system, and nosewheel steering) .... Per Placard according to temperature

APU MFD EICAS

% rpm Indication..................	Green Range:	0 to 101%
	Amber Range:	>101 to 108%
	Red Range:	>108%
EGT	Green Range:	0 to 665°C
	Amber Range:	>665 to 718°C
	Red Range:	>718°C

APU DC AMPS (Gauge)	Green Range (gnd or flt):	0 to 200
	Yellow Range (gnd only):	>200 to 300
	Red Line:	300
Cabin Differential Pressure Indicator	Green Arc:	0.0 to 9.7 psi
	Red Line:	9.7 psi
Fuel Quantity Digital Indication (Wing Tanks)	Amber:	<500 lbs
Fuel Temperature Indication		
Engine	Green:	4 to 99°C
	Amber:	<4, >99°C
Tank	Green:	–35 to 52°C
	Amber:	<–35, >52°C
Left and Right Electrical System		
Digital Voltage Indication	Green Range:	23 to 29 VDC
	Amber Range:	<23, >29 VDC
Red when both systems <23 and either engine running		
Green when respective engine off		
Digital Ammeter Indication (EICAS)		
SL to FL410	Green Range:	0 to 400 amps
	Amber Range:	>400 to 401 amps
	Red Range:	>401 amps
Above FL410	Green Range:	0 to 300 amps
	Amber Range:	>300 to 301 amps
	Red Range:	>301 amps
Battery Temperature Indication	Green Range:	>–20 to 62.8°C
	Amber Range:	≤–20°C
	Red Range:	>+62.8°C
Battery Voltage Indication	Green Range:	23 to 29 VDC
	Amber Range:	<23, >29 VDC

Left and Right Inter-Turbine Temperature Indication (EICAS)

During Start	Red Arrows:	800°C (Max Starting)
Engine Running	Amber Range:	>850°C to ≤888°C
	Red Line:	>888°C

Left and Right N_1 rpm Indication	Red Line:	100% rpm

Left and Right N_2 rpm Indication

Engine Running.......	Green Range (Digits):	<101% rpm
	Red Range (Digits):	≥101% rpm

Airplanes Incorporating Phase 6A Software*

Left and Right Oil Pressure Indication	Green Range:	50 to 95 psi
	Amber Range:	34 to 50 psi* >95 to 155 psi** (less than two minutes)
	Red Range:	<34, >155 psi >95 to 155 psi (more than two minutes)
Left and Right Oil Quantity Indication	Green Range:	<8.0 quarts low
	Amber Range:	≥8.0 quarts low
Left and Right Oil Temperature Indication	Green Range:	21 to 127°C
	Red Range:	>+127°C

* Amber range displayed if TLA >30° or any time in flight.

** For airplanes incorporating Honeywell P2000 Integrated Avionics Flight Control System Phase 6A Software, the maximum oil pressure is 155 psig (not to exceed two minutes). Maximum oil pressure for continuous operation is 95 psig. A cautionary (amber) oil pressure range exists when oil pressure is >95 and ≤155 psig. This cautionary range will change from amber to red if oil pressure is >95 psig after two minutes.

S/N 750-0001 Through 0172, Incorporating Phase 6A

A and B System Hydraulic Pressure		
Digital Indication	Green Range:	2,800 to 3,200 psi
	Amber Range:	<2,800, >3,200 psi
(Either engine running and both hydraulic pressures low)	Red Range:	<2,600 psi
Both engines shut down	Green Range:	<2,600 psi
A and B System Hydraulic Quantity		
Digital Indication	Green Range:	16 to 100%
	Amber Range:	<16 %
Accumulator Pressures		
(A and B hydraulic systems, emergency brake, gear blowdown, rudder standby system, and nosewheel steering)	Per placard according to temperature	
APU MFD EICAS		
% rpm Indication..................	Green Range:	0 to 101%
	Amber Range:	>101 to 108%
	Red Range:	>108%
EGT	Green Range:	0 to 665°C
	Amber Range:	>665 to 718°C
	Red Range:	>718°C
APU DC AMPS		
(Gauge)	Green Range (gnd or flt):	0 to 200
	Yellow Range (gnd only):	>200 to 300
	Red Line:	300
Cabin Differential Pressure Indicator	Green Arc:	0.0 to 9.7 psi
	Red Line:	9.7 psi
Fuel Quantity Digital Indication (Wing Tanks).......................	Amber:	<500 lbs

Fuel Temperature Indication

Engine	Green:	4 to 99°C
	Amber:	<4, >99°C
Tank	Green:	–37 to 52°C
	Amber:	<–37, >52°C

Left and Right Electrical Systems

Digital Voltage Indication	Green Range:	23 to 29 VDC
	Amber Range:	<23, >29 VDC

Red when both systems <23 and either engine running
Green when respective engine off

Digital Ammeter Indication (EICAS)

SL to FL410	Green Range:	0 to 400 amps
	Amber Range:	>400 to 401 amps
	Red Range:	>401 amps
Above FL410	Green Range:	0 to 300 amps
	Amber Range:	>300 to 301 amps
	Red Range:	>301 AMPS
Battery Temperature Indication	Green Range:	>–20 to 62.8°C
	Amber Range:	≤–20°C
	Red Range:	>+62.8°C
Battery Voltage Indication	Green Range:	23 to 29 VDC
	Amber Range:	<23, >29 VDC

Left and Right Inter-Turbine Temperature Indication (EICAS)

During Start	Red Arrows:	800°C (Max Starting)
Engine Running	Amber Range:	>850°C to ≤888°C
	Red Line:	>888°C

Left and Right N_1 rpm Indication	Red Line:	100% rpm

Left and Right N_2 rpm Indication

Engine Running	Green Range (Digits):	<101% rpm
	Red Range (Digits):	≥101% rpm

Left and Right Oil Pressure Indication	Green Range:	50 to 95 psi
	*Amber Range:	34 to 50 psi >95 to 155 psi (less than two minutes)
	Red Range:	<34, >155 psi >95 to 155 psi (more than two minutes)
Left and Right Oil Quantity Indication	Green Range:	<8.0 quarts low
	Amber Range:	≥8.0 quarts low
Left and Right Oil Temperature Indication	Green Range:	21 to 127°C
	Red Range:	>+127°C

* Amber range displayed if TLA >30° or any time in flight.

Oxygen Pressure Indication..........	Green Arc:	1,600 psi to 1,800 psi
	Yellow Arc:	0 to 400 psi
	Red Line:	2,000 psi
Stabilizer Trim Indication		
On Ground................	Flaps ≤5° Green Arc:	–2° to –5°
	Flaps 15° Green Arc:	–5° to –8°
In Flight......................................	White Arc:	+1.2° to –12°

NOTE

Nominal primary stabilizer trim limits are +1.2° and –12°. The EICAS stabilizer trim digits and needle will turn amber, beyond these nominal values. Primary stabilizer trim tolerances or the use of secondary trim, may allow stabilizer trim travel slightly beyond these nominal values.

S/N 750-0173 and on, and Airplanes Incorporating SB750-71-10

A and B System Hydraulic Pressure

Digital Indication	Green Range:	2,800 to 3,200 psi
	Amber Range:	<2,800, >3,200 psi
(Either engine running and both hydraulic pressures low)	Red Range:	<2,600 psi
Both engines shut down	Green Range:	<2,600 psi

A and B System Hydraulic Quantity

Digital Indication	Green Range:	16 to 100%
	Amber Range:	<16 %

Accumulator Pressures

(A and B hydraulic systems, emergency brake, gear blowdown, rudder standby system, and nosewheel steering) .... Per placard according to temperature

APU MFD EICAS

% rpm Indication..................	Green Range:	0 to 101%
	Amber Range:	>101 to 108%
	Red Range:	>108%
EGT	Green Range	0 to 665°C
	Amber Range:	>665 to 718°C
	Red Range:	>718°C

APU DC AMPS (Gauge)	Green Range (gnd or flt):	0 to 200
	Yellow Range (gnd only):	>200 to 300
	Red Line:	300
Cabin Differential Pressure Indicator	Green Arc:	0.0 to 9.7 psi
	Red Line:	9.7 psi
Fuel Quantity Digital Indication (Wing Tanks).......................	Amber:	<500 lbs

Fuel Temperature Indication

Engine	Green:	4 to 99°C
	Amber:	<4, >99°C
Tank	Green:	–37 to 52°C
	Amber:	<–37, >52°C

Left and Right Electrical Systems

Digital Voltage Indication	Green Range:	23 to 29 VDC
	Amber Range:	<23, >29 VDC

Red when both systems <23 and either engine running
Green when respective engine off

Digital Ammeter Indication (EICAS)

SL to FL410	Green Range:	0 to 400 amps
	Amber Range:	>400 to 401 amps
	Red Range:	>401 amps
Above FL410	Green Range:	0 to 300 amps
	Amber Range:	>300 to 301 amps
	Red Range:	>301 AMPS
Battery Temperature Indication	Green Range:	>–20 to 62.8°C
	Amber Range:	≤–20°C
	Red Range:	>+62.8°C
Battery Voltage Indication	Green Range:	23 to 29 VDC
	Amber Range:	<23, >29 VDC

Left and Right Inter-Turbine Temperature Indication (EICAS)

During Start	Red Arrows:	800°C (Max Starting)
Engine Running	Amber Range:	>857°C to ≤907°C
	Red Line:	>907°C

Left and Right N_1 rpm Indication	Red Line:	100% rpm

Left and Right N_2 rpm Indication

Engine Running	Green Range (Digits):	<101% rpm
	Red Range (Digits):	≥101% rpm

Left and Right Oil Pressure Indication	Green Range:	50 to 95 psi
	*Amber Range:	34 to 50 psi >95 to 155 psi (less than two minutes)
	Red Range:	<34, >155 psi >95 to 155 psi (more than two minutes)
Left and Right Oil Quantity Indication	Green Range:	<8.0 quarts low
	Amber Range:	≥8.0 quarts low
Left and Right Oil Temperature Indication	Green Range:	21 to 127°C
	Red Range:	>+127°C

* Amber range displayed if TLA >30° or any time in flight.

Oxygen Pressure Indication	Green Arc:	1,600 psi to 1,800 psi
	Yellow Arc:	0 to 400 psi
	Red Line:	2,000 psi

Stabilizer Trim Indication

On Ground	Flaps ≤5° Green Arc:	–2° to –5°
	Flaps 15° Green Arc:	–5° to –8°
In Flight	White Arc:	+1.2° to –12°

NOTE

Nominal primary stabilizer trim limits are +1.2° and –12°. The EICAS stabilizer trim digits and needle will turn amber, beyond these nominal values. Primary stabilizer trim tolerances or the use of secondary trim, may allow stabilizer trim travel slightly beyond these nominal values.

CATEGORY II LIMITATIONS

1. Specific operational approval and crew qualification is required for Category II operation.

2. The CAT 2 mode annunciation must be displayed in both PFDs from the final approach fix to the decision height.

3. Maximum final approach speed is V_{REF} +20 knots at the outer marker, slowing to V_{REF} (or V_{REF} adjusted for wind gust) prior to reaching the decision height.

4. Category II approaches with flaps in any position other than FULL (35°) are prohibited.

5. Autopilot minimum use height (Category II ILS) .... 80 feet AGL

6. Wind Limitations:

   Maximum tailwind component .... 10 knots

   Maximum crosswind component .... 15 knots

NOTE

If the FMS indicates significantly different wind on final than reported on the surface, low altitude wind shear may result in exceeding the localizer or glideslope Category II deviation limits.

ELECTRICAL LIMITATIONS

BATTERY LIMITATIONS

CAUTION

If the airplane will be cold soaked (parked) below –20°C (–4°F), the batteries should be removed and stored in a warm environment. Batteries colder than –20°C may be inert and will not discharge or charge.

The battery temperature indicating system must be operational for all ground and flight operations.

If a BATT O'TEMP EICAS message occurs during ground operation, do not takeoff until the proper battery maintenance procedures have been accomplished.

Battery Cycle Limitation...................... Six APU starts per hour
Refer to APU Limitations

NOTE

- If battery cycle limitation is exceeded, a deep cycle including a capacity check may be required to detect possible cell damage. Refer to Chapter 24 of the *Maintenance Manual* for procedure.
- If a ground external power unit is used for APU start, no battery cycle is counted.

GENERATOR LIMITATIONS

Main Generators (each).................. 400 amp up to 41,000 feet
300 amp above 41,000 feet

LIGHTING LIMITATIONS

PULSELITE SYSTEM

The Pulselite System must be OFF and remain OFF during the following night ground and night flight operations: Taxi, takeoff and landing approach at 300 feet AGL and below.

FUEL LIMITATIONS

The following fuels are approved for use in accordance with Table LIM-1:

- Jet A
- Jet A-1
- Jet B, No. 3 (GB6537-94)
- JP-4 (NATO F40)
- JP-5 (NATO F43 or F44)
- JP-8 (NATO F34 or F35)

NOTE

Minimum fuel temperature is based on a maximum fuel viscosity of 12 cenistokes.

Takeoff with engine fuel temperature below +4°C or above 98.9°C is not permitted.

Table LIM-1. FUEL LIMITATIONS

	JET A/A-1 NO. 3 (GB6537-94) JP-5 (NATO F43 OR F44) JP-8 (NATO F34 OR F35)	**JET B JP 4 (NATO F40)**
MINIMUM FUEL TEMPERATURE FOR START, TAKEOFF AND ENROUTE (FUEL TANK TEMPERATURE)	–37°C	–37°C
MAXIMUM FUEL TEMPERATURE FOR START, TAKEOFF AND ENROUTE (FUEL TANK TEMPERATURE)	+52°C	+48°C
MINIMUM FUEL TEMPERATURE (ENGINE), ENGINE OPERATING	+4°C	+4°C
MAXIMUM FUEL TEMPERATURE (ENGINE), ENGINE OPERATING	+98.9°C	+98.9°C
MAXIMUM ALTITUDE	51,000 FEET	51,000 FEET

SINGLE-POINT REFUELING

Single-point refueling operations must be accomplished per the procedures contained on the placard installed on the single-point refueling access door. Maximum refueling pressure is 55 psig, maximum defueling pressure is –10 psig.

UNUSABLE FUEL

Fuel remaining in the fuel tanks when the EICAS fuel quantity indication reads zero is not usable in flight, and is not to be considered ballast fuel. Unusable fuel is 4.81 gallons for each wing/hopper tank and 2.2 gallons for the center tank.

FUEL TRANSFER/CROSSFEED LIMITATIONS

Center tank to wing transfer must be initiated prior to 3,100 lbs per side wing fuel.

Maximum lateral fuel imbalance (intentional) is 400 lbs. An imbalance of 800 lbs has been demonstrated for emergency return.

Simultaneous use of crossfeed and center-to-wing tank transfer is prohibited when the wing fuel quantity is 2,900 lbs or less per side. Fuel lateral imbalance will result.

ENGINE LIMITATIONS

GENERAL

S/N 750-0001 Through 0172

Engine Type..................................... Allison AE-3007C Turbofan

Full Authority Digital Engine
Controls (FADECs) .... All four must be operative for takeoff

Engine Operating Limits.. Refer to Tables LIM-2 through LIM-6

Continuous engine ground static operation up to and including five minutes at takeoff thrust is limited to ambient temperatures not to exceed the limits of Figure LIM-6, Ambient Temperature Limits.

Both Air Data Computers must be operational for takeoff.

Minimum start duct pressure (EICAS)
prior to ground start .... 25 psi

S/N 750-0173 and on

Engine Type .... AE-3007C1 Turbofan

Full Authority Digital Engine
Controls (FADECs) .... All four must be operative for takeoff

Engine Control Limits .... Refer to Tables LIM-2 through LIM-6

Continuous engine ground static operation up to and including five minutes at takeoff thrust is limited to ambient temperatures not to exceed the limits of Figure LIM-6, Ambient Temperature Limits.

Both Air Data Computers must be operational for takeoff.

Minimum start duct pressure (EICAS)
prior to ground start .... 25 psi

Table LIM-2. ENGINE OPERATING LIMITS—7.10 SOFTWARE

OPERATING CONDITIONS	OPERATING LIMITS					
THROTTLE DETENT	TIME LIMIT	ITT TEMPERATURE °C	N_2 % TURBINE RPM (NOTES 5 AND 6)	N_1 % FAN RPM (NOTE 4)	OIL PRESSURE PSIG (NOTE 7)	OIL TEMPERATURE °C
TO/MC (TAKEOFF) (NOTE 1)	5 MINUTES	888	56.7 to 101	100	34 to 90 (95)*	127 MAXIMUM
TO/MC (TAKEOFF) (NOTE 1)	CONTINUOUS (OEI)	850	56.7 to 101	100	34 to 90 (95)*	127 MAXIMUM
CLB (CLIMB) (NOTE 2)	CONTINUOUS	850	56.7 to 101	100	34 to 90 (95)*	127 MAXIMUM
CRU (CRUISE) (NOTE 3)	CONTINUOUS	850	56.7 to 101	100	34 to 90 (95)*	127 MAXIMUM
STARTING	—	800 (NOTE 8)	—	—	90 MAX (95)* (NOTE 4)	(NOTE 4)

NOTES

1. One engine inoperative (OEI) continuous operation is approved in the TO/MC (takeoff) detent. Maximum allowable ITT for takeoff is 888°C in the TO/MC detent (not to exceed five minutes in the amber range), then 850°C for continuous operation in the TO/MC detent (OEI) or CLB detent (multiengine).
2. Multiengine continuous operation is approved in the CLB (climb) detent. When climbing with bleed-air anti-ice on, it is acceptable to use the TO/MC detent provided ITT is ≤850°C and thrust is reduced to the CLB (climb) detent upon reaching cruise altitude.
3. CRU (cruise) detent should be set within 10 minutes after level off from top of climb.
4. During cold day starts, oil pressure may exceed 90 (95)* psig. The pressure will decrease as oil temperature increases. Engine speed should not be advanced above idle until oil pressure no longer exceeds 90 (95)* psig. Once the oil pressure is below 90 (95)* psig, engine speed can be advanced but should not exceed 40% N_1 until the engine fuel temperature is within normal limits, ≥4°C. Refer to ENGINE OIL LIMITATIONS for minimum oil temperature for start.
5. FADEC automatic overspeed shutdowns are set at 106% N_1 and 106.6% N_2. Minimum fan speed for takeoff is 73.6% N_1.
6. When the engine is running, the FADEC will automatically shut the engine down at 54% N_2 or below.
7. Minimum oil pressure BELOW 68% N_2 is 34 psig. A cautionary oil pressure range from ≥34 to <50 psi, exists when in flight or any time the TLAs are above 30° on the ground.
8. Windmilling airstart ITT limit is 888°C.
9. For airplanes incorporating Honeywell P2000 Integrated Avionics Flight Control System Phase 6A Software, the maximum oil pressure is 155 psig (not to exceed two minutes). Maximum oil pressure for continuous operation is 95 psig. A cautionary (amber) oil pressure range exists when oil pressure is greater than 95 and ≤155 psig. This cautionary range will change from amber to red if oil pressure is >95 psig after two minutes.

* Airplanes Incorporating Honeywell P2000 Integrated Avionics Flight Control System Phase V Software.

Table LIM-3. ENGINE OPERATING LIMITS—7.10 SOFTWARE WITH PHASE 6

OPERATING CONDITIONS	OPERATING LIMITS					
THROTTLE DETENT	**TIME LIMIT**	**ITT TEMPER-ATURE °C**	**N_2 % TURBINE RPM (NOTES 5 AND 6)**	**N_1 % FAN RPM (NOTE 4)**	**OIL PRES-SURE PSIG (NOTE 7)**	**OIL TEMPER-ATURE °C**
TO/MC (TAKEOFF) (NOTE 1)	5 MINUTES	888	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
TO/MC (TAKEOFF) (NOTE 1)	CONTINUOUS (OEI)	850	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
CLB (CLIMB) (NOTE 2)	CONTINUOUS	850	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
CRU (CRUISE) (NOTE 3)	CONTINUOUS	850	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
STARTING	---	800 (NOTE 8)	---	---	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	(NOTE 4)

NOTES

1. One engine inoperative (OEI) continuous operation is approved in the TO/MC (takeoff) detent. Maximum allowable ITT for takeoff is 888°C in the TO/MC detent (not to exceed five minutes in the amber range) then 850°C for continuous operation in the TO/MC detent (OEI) or CLB (climb) detent (multiengine).

2. Multiengine continuous operation is approved in the CLB detent. When climbing with bleed air anti-ice on, it is acceptable to use the TO/MC detent provided ITT is ≤850°C and thrust is reduced to the CLB detent upon reaching cruise altitude.

3. CRU (cruise) detent should be set within 10 minutes after level off from top of climb.

4. During cold day starts, oil pressure may exceed 95 psig. The pressure will decrease as oil temperature increases. Engine speed should not be advanced above idle until oil pressure no longer exceeds 95 psig. Once the oil pressure is below 95 psig, engine speed can be advanced but should not exceed 40% N_1 until the engine fuel temperature is within normal limits, ≥4˚C. Refer to Figure 2-7, Approved Oils, for minimum oil temperature for start.

5. FADEC automatic overspeed shutdowns are set at 105% N_1 and 105.6% N_2. Minimum fan speed for takeoff is 73.6% N_1.

6. When the engine is running, the FADEC will automatically shut the engine down at 54% N_2 or below.

7. Minimum oil pressure BELOW 88% N_2 is 34 PSIG. A cautionary oil pressure range, from ≥34 to <50 psi, exists when in flight or anytime the TLAs are above 30° on the ground.

8. Windmilling airstart ITT limit is 888°C.

9. For airplanes incorporating Honeywell P2000 Integrated Avionics Flight Control System Phase 6A Software, the maximum oil pressure is 155 psig (not to exceed two minutes). Maximum oil pressure for continuous operation is 95 psig. A cautionary (amber) oil pressure range exists when oil pressure is >95 and ≤155 psig. This cautionary range will change from amber to red if oil pressure is >95 psig after two minutes.

Table LIM-4. ENGINE OPERATING LIMITS—7.15 SOFTWARE

OPERATING CONDITIONS	OPERATING LIMITS					
THROTTLE DETENT	TIME LIMIT	ITT TEMPER-ATURE °C	N_2 % TURBINE RPM (NOTES 5 AND 6)	N_1 % FAN RPM (NOTE 4)	OIL PRES-SURE PSIG (NOTE 7)	OIL TEMPER-ATURE °C
TO/MC (TAKEOFF) (NOTE 1)	5 MINUTES	868	56.7 to 101	100	34 to 90 (95)*	127 MAXIMUM
TO/MC (TAKEOFF) (NOTE 1)	CONTINUOUS (OEI)	850	56.7 to 101	100	34 to 90 (95)*	127 MAXIMUM
CLB (CLIMB) (NOTE 2)	CONTINUOUS	850	56.7 to 101	100	34 to 90 (95)*	127 MAXIMUM
CRU (CRUISE) (NOTE 3)	CONTINUOUS	850	56.7 to 101	100	34 to 90 (95)*	127 MAXIMUM
STARTING	—	800 (NOTE 8)	—	—	90 MAX (95)* (NOTE 4)	(NOTE 4)

NOTES

1. One engine inoperative (OEI) continuous operation is approved in the TO/MC (takeoff) detent. Maximum allowable ITT for takeoff is 868°C in the TO/MC detent (not to exceed five minutes in the amber range), then 850°C for continuous operation in the TO/MC detent (OEI) or CLB detent (multiengine).

2. Multiengine continuous operation is approved in the CLB (climb) detent.

3. CRU (cruise) detent should be set within 10 minutes after level off from top of climb.

4. During cold day starts, oil pressure may exceed 90 (95)* psig. The pressure will decrease as oil temperature increases. Engine speed should not be advanced above idle until oil pressure no longer exceeds 90 (95)* psig. Once the oil pressure is below 90 (95)* psig, engine speed can be advanced but should not exceed 40% N_1 until the engine fuel temperature is within normal limits, ≥4°C. Refer to ENGINE OIL LIMITATIONS for minimum oil temperature for start.

5. FADEC automatic overspeed shutdowns are set at 105% N_1 and 105.6% N_2. Minimum fan speed for takeoff is 73.6% N_1

6. When the engine is running, the FADEC will automatically shut the engine down at 54% N_2 or below.

7. Minimum oil pressure BELOW 88% N_2 is 34 psig. A cautionary oil pressure range, from ≥34 to <50 psi, exists when in flight or any time the TLAs are above 30° on the ground.

8. Windmilling airstart ITT limit is 868°C.

9. For airplanes incorporating Honeywell P2000 Integrated Avionics Flight Control System Phase 6A Software, the maximum oil pressure is 155 psig (not to exceed two minutes). Maximum oil pressure for continuous operation is 95 psig. A cautionary (amber) oil pressure range exists when oil pressure is >95 and ≤155 psig. This cautionary range will change from amber to red if oil pressure is >95 psig after two minutes.

* Airplanes incorporating Honeywell P2000 Integrated Avionics Flight Control System Phase V Software.

Table LIM-5. ENGINE OPERATING LIMITS—7.15 SOFTWARE WITH PHASE 6

OPERATING CONDITIONS	OPERATING LIMITS					
THROTTLE DETENT	**TIME LIMIT**	**ITT TEMPERATURE °C**	**N_2 % TURBINE RPM (NOTES 5 AND 6)**	**N_1 % FAN RPM (NOTE 4)**	**OIL PRESSURE PSIG (NOTE 7)**	**OIL TEMPERATURE °C**
TO/MC (TAKEOFF) (NOTE 1)	5 MINUTES	888	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
TO/MC (TAKEOFF) (NOTE 1)	CONTINUOUS (OEI)	850	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
CLB (CLIMB) (NOTE 2)	CONTINUOUS	850	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
CRU (CRUISE) (NOTE 3)	CONTINUOUS	850	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
STARTING	---	800 (NOTE 8)	---	---	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	(NOTE 4)

NOTES

1. One engine inoperative (OEI) continuous operation is approved in the TO/MC (takeoff) detent. Maximum allowable ITT for takeoff is 888°C in the TO/MC detent (not to exceed five minutes in the amber range) then 850°C for continuous operation in the TO/MC detent (OEI) or CLB (climb) detent (multiengine).

2. Multiengine continuous operation is approved in the CLB detent.

3. CRU (cruise) detent should be set within 10 minutes after level off from top of climb.

4. During cold day starts, oil pressure may exceed 95 psig. The pressure will decrease as oil temperature increases. Engine speed should not be advanced above idle until oil pressure no longer exceeds 95 psig. Once the oil pressure is below 95 psig, engine speed can be advanced but should not exceed 40% N_1 until the engine fuel temperature is within normal limits, ≥4˚C. Refer to Figure 2-7, Approved Oils, for minimum oil temperature for start.

5. FADEC automatic overspeed shutdowns are set at 105% N_1 and 105.6% N_2. Minimum fan speed for takeoff is 73.6% N_1.

6. When the engine is running, the FADEC will automatically shut the engine down at 54% N_2 or below.

7. Minimum oil pressure BELOW 88% N_2 is 34 PSIG. A cautionary oil pressure range, from ≥34 to <50 psi, exists when in flight or anytime the TLAs are above 30° on the ground.

8. Windmilling airstart ITT limit is 888°C.

9. For airplanes incorporating Honeywell P2000 Integrated Avionics Flight Control System Phase 6A Software, the maximum oil pressure is 155 psig (not to exceed two minutes). Maximum oil pressure for continuous operation is 95 psig. A cautionary (amber) oil pressure range exists when oil pressure is >95 and ≤155 psig. This cautionary range will change from amber to red if oil pressure is >95 psig after two minutes.

Table LIM-6. ENGINE OPERATING LIMITS—8.3 SOFTWARE

OPERATING CONDITIONS	OPERATING LIMITS					
THROTTLE DETENT	TIME LIMIT	ITT TEMPERATURE °C	N_2 % TURBINE RPM (NOTES 5 AND 6)	N_1 % FAN RPM (NOTE 4)	OIL PRESSURE PSIG (NOTE 7)	OIL TEMPERATURE °C
TO/MC (TAKEOFF) (NOTE 1)	5 MINUTES	907	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
TO/MC (TAKEOFF) (NOTE 1)	CONTINUOUS (OEI)	857	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
CLB (CLIMB) (NOTE 2)	CONTINUOUS	857	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
CRU (CRUISE) (NOTE 3)	CONTINUOUS	857	56.7 to 101	100	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	127 MAXIMUM
STARTING	—	800 (NOTE 8)	—	—	50 to 95 (>2 MIN) 95 to 155 (≤2 MIN)	(NOTE 4)

NOTES

1. One engine inoperative (OEI) continuous operation is approved in the TO/MC (takeoff) detent. Maximum allowable ITT for takeoff is 907°C in the TO/MC detent (not to exceed five minutes in the amber range) then 857°C for continuous operation in the TO/MC detent (OEI) or CLB detent (multiengine).

2. Multiengine continuous operation is approved in the CLB (climb) detent.

3. CRU (cruise) detent should be set within 10 minutes after level off from top of climb.

4. During cold day starts, oil pressure may exceed 95 psig. The pressure will decrease as oil temperature increases. Engine speed should not be advanced above idle until oil pressure no longer exceeds 95 psig. Once the oil pressure is below 95 psig, engine speed can be advanced but should not exceed 40% N_1 until the engine fuel temperature is within normal limits, ≥4°C. Refer to ENGINE OIL LIMITATIONS for minimum oil temperature for start.

5. FADEC automatic overspeed shutdowns are set at 105% N_1 and 105.6% N_2. Minimum fan speed for takeoff is 73.6% N_1.

6. When the engine is running, the FADEC will automatically shut the engine down at 54% N_2 or below.

7. Minimum oil pressure BELOW 86% N_2 is 34 psig. A cautionary oil pressure range from ≥34 to <50 psi, exists when in flight or any time the TLAs are above 30° on the ground. Maximum oil pressure is 155 psig (not to exceed two minutes). Maximum oil pressure for continuous operation is 95 psig. A cautionary (amber) oil pressure range exists when oil pressure is >95 and ≤155 psig. This cautionary range will change from amber to red if oil pressure is >95 psig after two minutes.

8. Windmilling airstart ITT limit is 866°C.

GROUND PNEUMATIC CART LIMITATION

If a ground pneumatic cart is being used for engine start, it must be capable of maintaining a minimum air pressure of 30 psi, as displayed in the EICAS, prior to initiating the start.

ENGINE AIR TURBINE STARTER LIMITATIONS

Three consecutive normal starts followed by 25 minutes cooling. One 30-second motoring cycle is equivalent to one normal start.

CAUTION

Do not engage the air turbine starter above 25% N_2 rpm. Air turbine starter drive shaft damage may occur.

ENGINE OIL LIMITATIONS

Only oils listed in Table LIM-7 may be used in the AE300-7C engine.

Table LIM-7. APPROVED OILS

OILS CONFORMING TO MIL-L-7808K	OILS CONFORMING TO MIL-L-23699D
MOBIL RM 284A	MOBIL JET II
	AEROSHELL/ROYCO TURBINE OIL 500
	EXXON TURBO OIL 2380
	MOBIL JET OIL 254

CAUTION

Use of nonapproved oil could result in damage to the engine or premature engine failure, and will be considered misuse under the provisions of the engine warranty.

If mixed with other oils, Mobil Jet Oil 254 can cause washing or shedding of carbon deposits left by those oils. This cleaning process can lead to oil system problems, such as blocked passageways and screens. Changing from Exxon 2380, Mobil Jet II or Aeroshell/Royco 500, to Mobil Jet 254 should only be done when the engine is new or overhauled.

If brands of oil are changed, it should be accomplished gradually using the “top off” method.

Ensure oil temperature is above –40°C (–40°F) before attempting a start when using MIL-L-23699D type oil, or above –54°C (–65°F) when using MIL-L-7808K type oil.

Do not mix MIL-L-23699D and MIL-L 7808K type oils.

NOTE

The AE-3007C engine will perform best on MIL-L-23699D type oil. Use of MIL-L-7808K type oil should be limited to only those times when operating in extreme cold without preheat capability (–40°C to –54°C or –40°F to –65°F) or when MIL-L-7808K is the only oil available.

ENGINE SYNCHRONIZATION

The use of engine synchronization is prohibited during takeoff and landing, single-engine operation, or FADEC ADC or N_1 reversionary operation.

THRUST REVERSER LIMITATIONS

S/N 0001-0085 NOT INCORPORATING SB 750-78-02

Thrust Reversers are restricted to ground operations on paved surfaces only.

Use of Thrust Reversers is prohibited during touch-and-go landings.

Maximum reverse thrust is limited to the preset maximum reverse throttle lever angle (28°) and is approximately 50% N_1 at sea level, standard conditions.

Reverse thrust must be reduced to idle reverse (detent) at 60 KIAS during landing rollout.

During single-engine reversing, either with nosewheel steering inoperative or on a slippery runway, thrust must be reduced to idle reverse (detent) by 70 KIAS during landing rollout.

The thrust reverser(s) must be verified to be operational by a satisfactory preflight test as contained in Section III.

CAUTION

Thrust reversers should not be deployed until the nosewheel is on the ground. Airplane pitch up may occur.

S/N 750-000I THROUGH 0085, INCORPORATING SB 750-78-02, AND AIRPLANES S/N 750-0086 THROUGH 0172

Thrust Reversers are restricted to ground operations on paved surfaces only.

Use of Thrust Reversers is prohibited during touch-and-go landings.

Maximum reverse thrust is limited to the preset maximum reverse throttle lever angle (40.2°) and is approximately 70% N_1 at sea level, standard conditions.

Reverse thrust must be reduced to idle reverse (detent) at 65 KIAS during landing rollout.

During single-engine reversing, either with nosewheel steering inoperative or on a slippery runway, thrust must be reduced to idle reverse (detent) by 70 KIAS during landing rollout.

The thrust reverser(s) must be verified to be operational by a satisfactory preflight test as contained in *AFM* Section III.

CAUTION

Thrust reversers should not be deployed until the nosewheel is on the ground. Airplane pitch up may occur.

S/N 750-0173 AND ON

Thrust Reversers are restricted to ground operations on paved surfaces only.

Use of Thrust Reversers is prohibited during touch-and-go landings.

Maximum reverse thrust is limited to the preset maximum reverse throttle lever angle (46.0 °).

Reverse thrust must be reduced to idle reverse (detent) at 65 KIAS during landing rollout.

During single-engine reversing, either with nosewheel steering inoperative or on a slippery runway, thrust must be reduced to idle reverse (detent) by 70 KIAS during landing rollout.

The Thrust Reverser(s) must be verified to be operational by a satisfactory preflight test as contained in section III.

CAUTION

Thrust Reversers should not be deployed until the nosewheel is on the ground. Airplane pitch up may occur.

HYDRAULIC LIMITATIONS

APPROVED HYDRAULIC FLUIDS

- Hyjet IVA Plus
- Skydrol 5
- Skydrol 500B-4
- Skydrol LD-4

FLIGHT CONTROL LIMITATIONS

The following flight control hydraulic systems must be verified to be operational by a satisfactory preflight test as contained in the *AFM* Section III.

a. A and B hydraulic systems (proper hydraulic pressure, no CAS message).

b. The A system auxiliary pump (proper pressure with A and B Systems off, setting brake).

c. The B-to-A power transfer system (proper pressure cycling after RH engine start).

d. B system rudder standby hydraulic system (absence of CAS messages after RH engine start).

e. PCU monitor system (absence of CAS messages or monitor annunciators).

Both A and B Flight Guidance Computers and all flight control systems including slats, flaps, ailerons, aileron trim, spoilers, speedbrakes, rudders, rudder trim, elevator, primary and secondary stabilizer trim, and all respective indicators, must be verified to be operational by a satisfactory preflight test as contained in the *AFM* Section III.

Both upper and either lower yaw damper channels must be operational for dispatch.

Both rudder limiters must be operational.

The stablilizer trim must be set in accordance with Figure LIM-8 (green arc) for takeoff.

The Mach trim system must be operational for speeds above Mach 0.82.

Except as required by Abnormal or Emergency Procedures, the A and B hydraulic systems may not be intentionally unloaded, (Pump A and/or Pump B switches to UNLOAD) in flight, above 15,000 feet MSL altitude.

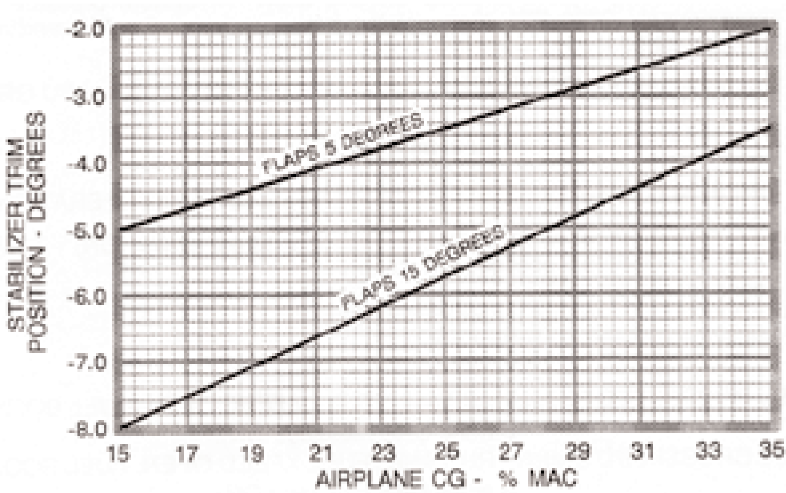


Figure LIM-8. Horizontal Stabilizer Position for Takeoff

ENVIRONMENTAL LIMITATIONS

CABIN PRESSURE LIMITATIONS

Normal Cabin
Pressure Limitations .... 9.7 psi Maximum Differential

PAC HIGH PRESSURE BLEED AIR

Operation of the cabin and cockpit PACs in high-pressure bleed air, HP BLEED SELECT switch to HP, (PAC HP VLV OPEN L–R message on) is not approved for normal takeoff and landing operations.

Operation of the cabin and cockpit PACs in high pressure bleed air (PAC HP VLV OPEN message on) is prohibited when any of the following systems are on: engine anti-ice, slat anti-ice or horizontal stabilizer anti-ice.

The PAC BLEED SELECT switch must be positioned to NORM or HP above 41,000 feet.

COCKPIT AND CABIN PAC SELECTOR SWITCHES

Operation in HIGH mode is not approved for takeoff, landing or flight above 45,000 feet.

Operation in HIGH mode is not approved during normal operation when any of the following systems are on: engine anti-ice, slat anti-ice or stabilizer anti-ice. During emergency operations, HIGH mode is approved when the bleed air anti-ice systems are on, but anti-ice performance will be degraded.

Operation in HIGH is not approved above 25,000 feet when the isolation valve is open and either left or right engine bleed-air switch is OFF.

Single PAC operation above 41,000 feet is prohibited.

OXYGEN SYSTEM

Service the oxygen system with Aviator's Breathing Oxygen per MIL-O-27210. The use of medical oxygen is not approved.

OXYGEN MASKS

NOTE

The following aircraft certification requirements are in addition to the requirements of applicable operating rules. The most restrictive (certification or operating) must be observed.

The pressure demand crew oxygen masks must be checked, adjusted and properly stowed prior to flight.

Crew oxygen masks are not approved for sustained operation at a cabin altitude greater than 40,000 feet.

Passenger oxygen masks are not approved for sustained operation at a cabin altitude greater than 25,000 feet.

Headsets and/or hats must be removed prior to donning crew oxygen masks.

NOTE

Some headsets, eyeglasses, hairstyles, mustaches, beards or hats worn by the crew may interfere with the quick-donning and sealing capabilities of the oxygen masks. Crew members must ensure they can properly don and seal the oxygen mask.

CRACKED WINDSHIELD

If either cockpit windshield cracks in flight, continued flight to destination is permitted in accordance with the *AFM*, Section III, Abnormal Procedures, Cockpit Forward or Side Windshield Cracked or Shattered. After landing, the following guidance applies:

1. If only the outer (nonstructural) ply of the windshield is cracked, flight to a maintenance base is permitted, observing Cockpit Forward or Side Windshield Cracked or Shattered Procedures.

2. If either structural ply of the windshield is cracked, restricted flight is permitted only on a ferry permit (Special Airworthiness Certificate).

NOTE

Windshield construction consists of a 0.10 inch outer (nonstructural) face ply, a 0.19 inch structural ply, and a 0.235 inch structural inner ply, separated by 0.15 inch PVB/Urethane layers for a total thickness of 0.825 inches.

APU LIMITATIONS

WARNING

Do not apply external airplane deicing fluid when the APU is operating.

CAUTION

The APU is not approved for unattended ground operation.

APU ENGINE LIMITS

Ambient Temperature Limits .... Same as airplane
Refer to Figures LIM-6 and LIM-7

Maximum Altitude for Starting................ Refer to Figure LIM-9

Maximum Airspeed/Mach for Starting... Refer to Figure LIM-9

Maximum Operating Altitude................................... 31,000 feet

Maximum Generator Load (26-29 Volts)...... Ground 300 amps
Flight 200 amps

Turbine Speed: Normal Governed .... 100 ± 1% rpm
Caution Range .... >101% to 108% rpm
Maximum .... > 108% rpm

Exhaust Gas Temperature:

Maximum During Start .... 973°C

Maximum (Governed Operation)....................................... 718°C

Maximum Continuous (Governed Operation).................... 665°C

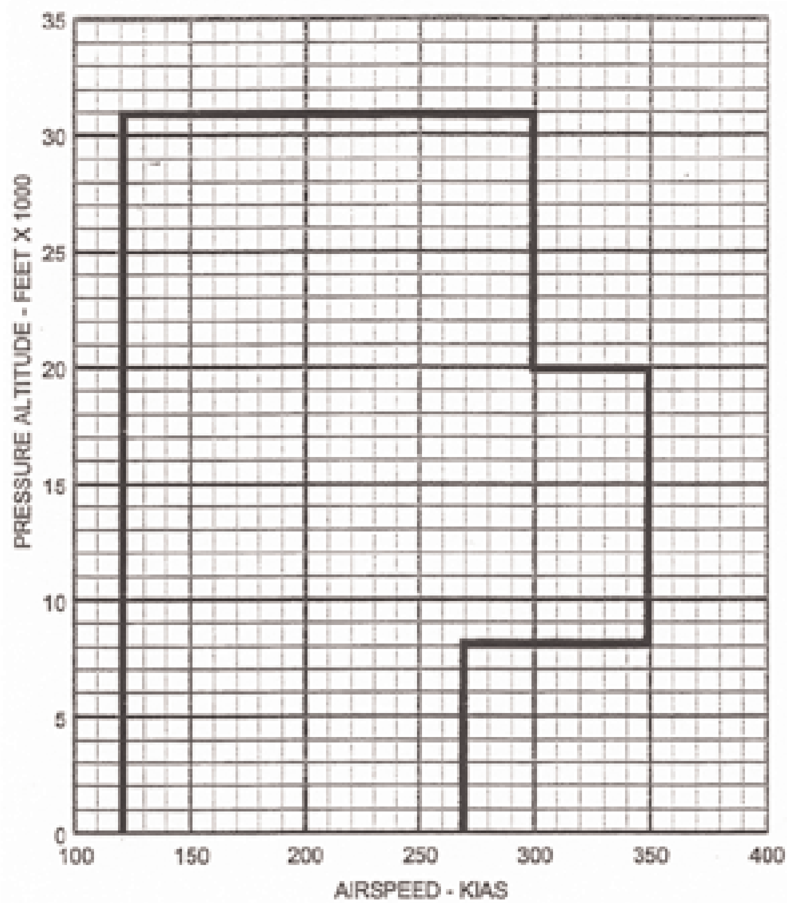


Figure LIM-9. APU Airstart Envelope

APU OIL LIMITS

Approved oils and ambient temperature requirements are the same as for the engines except RM 284A is not approved for the APU. Refer to Figures LIM-6 and LIM-7 and Table LIM-7.

APU FUEL LIMITS

Approved fuels are the same as for the airplane. Refer to Table LIM-1.

STARTER DUTY CYCLE

Maximum starter duty cycles are six consecutive successful starts at 10-minute intervals. A one hour off time must be observed for additional successful starts.

Unsuccessful start attempts:

- Battery:
  - Two cycles, 30 seconds each/30 minutes off
  - Two cycles, 30 seconds each/one hour off (check batteries).
- Generator/GPU:
  - Two cycles, 15 seconds each/20 minutes off
  - Two cycles, 15 seconds each (maximum four cycles per hour).

The APU compartment must be inspected following automatic shutdown.

NOTE

Following automatic shutdown, the APU FAIL annunciator will be illuminated and the APU will not start.

APU BLEED

NOTE

APU bleed will be automatically controlled (reduced) if the 665°C EGT limit is reached. This may occur in very hot or very cold temperature conditions if the APU maximum cool bleed is selected or if maximum cool is selected during engine start.

ICING LIMITATIONS

Pitot-Static/RAT heat, engine, and stabilizer bleed-air anti-ice systems must be utilized when operating in icing conditions as defined in the *AFM* Section III. All anti-ice systems must be activated unless it can be verified that ice is not forming on surfaces. Except for the ground preflight check, maximum SAT for operation of bleed air anti-ice above idle is +20°C.

Minimum speed/configuration for sustained flight in icing is 200 KIAS/slats up except for approach and landing. Approach procedures in icing conditions may be flown at normal airspeeds in the full flap landing configuration.

The airplane must be free of ice as defined in the *AFM* Section VII prior to takeoff. Anti-ice systems must not be used to deice surfaces prior to takeoff.

WARNING

Do not apply external airplane deicing fluid when the APU is operating.

CAUTION

To prevent possible engine damage from the ingestion of ice, do not chip or scrape ice or snow from the engine air inlet. Deice these areas prior to start (refer to Section VII in the *AFM*).

NOTE

Section VII contains advisory information on airplane ground deicing and anti-icing.

Selection of PAC HP bleed with anti-ice on will degrade anti-ice system performance and cause cold messages to illuminate.

OPERATIONS IN SEVERE ICING CONDITIONS

WARNING

Severe icing may result from environmental conditions outside of those for which the airplane is certified. Flight in freezing rain, freezing drizzle, or mixed icing conditions (supercooled liquid water and ice crystals) may result in ice build-up on protected surfaces exceeding the capability of the ice protection system, or may result in ice forming aft of the protected surfaces. This ice may not be shed when using the ice protection systems, and may seriously degrade the performance and controllability of the airplane.

During flight, severe icing conditions that exceed those for which the airplane is certified shall be determined by the following visual cues:

1. Unusually extensive ice accumulation on the airframe and windshield in areas not normally observed to collect ice.

2. Accumulation of ice on the upper surface of the wing aft of the protected area.

If one or more of these visual cues exist, immediately request priority handling from Air Traffic Control to facilitate a route or altitude change to exit the icing conditions.

MANEUVERS AND PROCEDURES

CONTENTS

ILLUSTRATIONS

TABLES

MANEUVERS AND PROCEDURES

INTRODUCTION

Proper operation of the Honeywell Primus 2000 Integrated Avionics Package, including the dual Flight Management Systems, is paramount to the conduct of safe flight in the Citation X. Traditionally, the MANEUVERS AND PROCEDURES section has focused primarily on flap selection, gear extension, thrust settings and recommended airspeeds to be flown during various types of approaches utilizing ground-based, short-range navigational aids (ILS, VOR, etc.). These traditional profiles are included in this section as well.

Additionally, with the advent of the Global Positioning System and FMS databases which include approaches, holds, procedure turns, arcs, and many other capabilities, correct programming and Flight Guidance Mode selection have become critical aspects to the safe operation of the aircraft.

Modern aviation accident history indicates that incorrect programming of FMS and Flight Guidance computers in aircraft with sophisticated, integrated avionics packages, is a major contributing factor in mode confusion resulting in loss of crew situational awareness.

One of the objectives of this section, therefore, is to provide crews with operating limitations, operating notes and quick reference review guides specific to the software versions currently available in the Citation X. An operational example with an accompanying Jeppesen chart is provided for each approach listed below. For the purpose of enhanced clarity, aircraft configurations such as flap selection, gear extension, thrust settings and airspeeds were not included in the examples listed below.

1. FMS—Approach without vertical guidance including missed approach procedure.

2. LOC (BACK CRS)—Approach utilizing the FMS for the procedure turn and transitioning automatically to short-range navigation.

All remaining profiles depicted with illustrations (i.e., Normal Takeoff, Takeoff with Engine Failure Above V_1, etc.) include aircraft configurations, as well as avionics management (where deemed necessary).

Material contained in this section is intended to increase or refresh the knowledge of crews operating the Citation X through the use of limitations, notes, illustrations and operational examples conveniently located for quick review.

Attempting to provide a profile for every type of approach, maneuver or procedure the Citation X is capable of with various versions of software, aircraft configuration (i.e., single engine), and, in addition, reproduce precisely all appropriate checklist procedures from the Citation and *Airplane Flight Manual (AFM)* into the profiles, goes beyond the objective of a small, quick reference manual.

A list of memory items (in the order in which they appear in the *AFM*) and rotary test (with notes) is included in this section for study/review.

It is not the intent of this section to alter any procedure in the FAA-approved *AFM*. The *AFM* is the governing document as to the operation of the aircraft.

STABILIZED APPROACH: CONCEPTS AND TERMS FROM AC 120-71, APPENDIX 2

A *stabilized approach* is one of the key features of safe approaches and landings in air carrier operations, especially those involving transport category airplanes.

A stabilized approach is characterized by a *constant-angle, constant-rate of descent* approach profile ending near the touchdown point, where the landing maneuver begins. A stabilized approach is the safest profile in all but special cases, in which another profile may be required by unusual conditions.

All appropriate *briefings and checklists* should be accomplished before 1,000 feet height above touchdown (HAT) in instrument meteorological conditions (IMC), and before 500 feet HAT in visual meteorological conditions (VMC).

Flight should be *stabilized by 1000 feet* height above touchdown (HAT) in instrument meteorological conditions (IMC), and by 500 feet HAT in visual meteorological conditions (VMC).

An approach is stabilized when all of the following *criteria* are maintained from 1,000 feet HAT (or 500 HAT in VMC) to landing in the touchdown zone:

- The airplane is on the correct* track.
- The airplane is in the proper landing configuration.
- After glide path intercept, or after the FAF, or after the derived fly-off point (per Jeppesen) the pilot flying requires no more than normal bracketing corrections** to maintain the correct track and desired profile (3° descent angle, nominal) to landing within the touchdown zone. Level-off below 1,000 feet HAT is not recommended.
- The airplane speed is within the acceptable range specified in the approved operating manual used by the pilot.
- The rate of descent is no greater than 1,000 fpm.
    - If an expected rate of descent greater than 1,000 fpm is planned, a special approach briefing should be performed.
    - If an unexpected, sustained rate of descent greater than 1,000 fpm is encountered during the approach, a missed approach should be performed. A second approach may be attempted after a special approach briefing, if conditions permit.
- Power setting is appropriate for the landing configuration selected, and is within the permissible power range for approach specified in the approved operating manual used by the pilot.

When no vertical guidance is provided: Vertical guidance may be provided to the pilot by way of an electronic glideslope, a computed descent path displayed on the pilot's navigation display, or other electronic means. On approaches for which no vertical guidance is provided, the flightcrew should plan, execute, and monitor the approach with special care, taking into account traffic and wind conditions. To assure vertical clearance and situation awareness, the pilot not flying should announce crossing altitudes as published fixes and other points selected by the flightcrew are passed. The pilot flying should promptly adjust descent angle as appropriate. A constant-angle, constant-rate descent profile ending at the touchdown point is the safest profile in all but special cases.

- *Visual contact*. Upon establishing visual contact with the runway or appropriate runway lights or markings, the pilot should be able to continue to a safe landing using normal bracketing corrections, or, if unable, should perform a missed approach.

- *No visual contact.* The operator may develop procedures involving an approved, standard MDA buffer altitude or other approved procedures to assure that descent below MDA does not occur during the missed approach. If no visual contact is established approaching MDA or an approved MDA buffer altitude, or if the missed approach point is reached, the pilot should perform the published missed approach procedure. (OpSpec paragraph C073 provides for special authorization under certain conditions to go below the MDA while executing a missed approach.) Below 1,000 feet HAT, leveling off at MDA (or at some height above MDA) is not recommended, and a missed approach should be performed.

* A correct track is one in which the correct localizer, radial, or other track guidance has been set, tuned, and identified, and is being followed by the pilot. Criteria for following the correct track is discussed in FAA Advisory Circulars relating to Category II and Category III approaches. Criteria for following track in operations apart for Category II and Category III is under development.

** Normal bracketing corrections relate to bank angle, rate of descent, and power management. Recommended ranges are as follows (operating limitations in the approved airplane flight manual must be observed, and may be more restrictive):

Bank Angle—Maximum bank angle permissible during approach is specified in the approved operating manual used by the pilot, and is generally not more than 30°; the maximum bank angle permissible during landing may be considerably less than 30°, as specified in that manual.

Rate of Descent—±300 fpm deviation from target.

Power Management—Permissible power range is specified in the approved operating manual used by the pilot.

Overshoots—Normal bracketing corrections occasionally involve momentary overshoots made necessary by atmospheric conditions. Such overshoots are acceptable. Frequent or sustained overshoots caused by poor pilot technique are not normal bracketing corrections.

ABBREVIATIONS USED IN THIS CHAPTER

Table MAP-1 provides a description of abbreviations used in this chapter.

Table MAP-1. ABBREVIATIONS USED IN THIS CHAPTER

ALT	Altitude Selector
APP	Approach (Button on Flight Guidance Selector)
APRCH	Approach Mode (Annunciation on FMS CDU)
BC	Back Course (Button on Flight Guidance Selector)
CDU	Control Display Unit (on the FMS)
DA	Decision Altitude
DGRAD	Degrade Mode (Annunciation on FMS CDU)
DR	Dead Reckoning
FDE	Fault Detection Equipment
FGS	Flight Guidance Selector
FLC	Flight Level Change (Button on Flight Guidance Selector)
FMI	FADEC Mode Indicator
FMS	Flight Management System
GPS	Global Positioning System
HDG	Heading (Button on Flight Guidance Selector)
IRS	Inertial Reference System
LNAV	Lateral Navigation Mode
MDA	Minimum Descent Altitude
MFD	Multifunction Display
NAV	Lateral Navigation (Button on Flight Guidance Selector)

Table MAP-1. ABBREVIATIONS USED IN THIS CHAPTER (Cont)

NSS	Navigation Source Selector
PFD	Primary Flight Display
PRE	Preview (Button on Navigation Source Selector)
RAIM	Receiver Autonomous Integrity Monitor
RNP	Required Navigation Performance
TOD	Top of Descent
VGP	Vertical Glidepath Mode
VNAV	Vertical Navigation (Button on Flight Guidance Selector)
VPTH	Vertical Path Mode
VS	Vertical Speed (Button on Flight Guidance Selector)
VTA	Vertical Track Alert

FMS APPROACH (LNAV ONLY)

REVIEW THE FOLLOWING BEFORE DEPARTURE OR WHILE ENROUTE:

(REFERENCE: AFM 0173 & ON, SUPPLEMENT 11)

NAVIGATION OPERATIONAL APPROVALS (SOFTWARE LEVEL NZ 5.1)

1. Oceanic/Remote
2. North Atlantic (NAT) Minimum Navigational Performance Standards (MNPS)
3. RNP 10 Airspace
4. Enroute and Terminal including RNP 5/BRNAV
5. Nonprecision Approach
6. RNP 0.3 RNAV Approaches
7. Vertical Navigation (VNAV) Enroute, Terminal and Approach

NOTE

Use of VNAV (VPTH) or VGP (vertcal glidepath mode) is currently prohibited in all software levels in the Citation X.

OPERATING LIMITATIONS

1. With the exception of Oceanic/Remote, other navigation equipment appropriate to the ground facilities along the intended route must be installed and operable, as required by the operating rules applicable to the specific type of operation (i.e., VOR, DME, etc.).
2. Navigation within the National Airspace System shall not be predicated upon the FMS during periods of dead reckoning (DR). (If IRS sensors are installed, after a period of dead reckoning (DR) operation (annunciated as DR on the CDU), the FMS position must be verified using ground references or other navigation sources.)
3. IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.
4. The use of manually inserted runway coordinates is limited to VFR operations only.
5. The pilot's and copilot's altimeters are the primary altitude reference during all vertical navigation (VNAV) operations.
6. The FMS is not approved for primary means of navigation in the DEGRADE or DR mode.
7. The FMS equipped with appropriate sensors, has been found to comply with the requirements for GPS primary means of navigation in oceanic and remote airspace, including MNPS, when used in conjunction with the Canadian Marconi/Honeywell SUREFLIGHT FDE prediction program. This does not constitute operational approval.
8. Instrument approaches must be accomplished in accordance with approved instrument approach procedures that are retrieved from the FMS navigation data base. The FMS data base must incorporate the current update cycle.

NOTE

- Not all published approaches are in the FMS data base. The flight crew must ensure the planned approach is in the data base.
- When an instrument approach procedure missed approach point is not identified in the data base as a runway (i.e., RW02, etc.), VNAV guidance may not be appropriate for straight-in approach operations.

9. The FMS approach annunciator (cyan APP left of PFD compass display), must be illuminated at the final approach fix, in order to conduct the instrument approach procedure.

NOTE

- Due to data base constraints, the VNAV glidepath top-of-descent (TOD) may be positioned prior to the final approach fix. This will be depicted on the MFD map. In some cases this may result in failure to capture glidepath at the FAF. Should this occur, use VS mode for initial descent to capture the VNAV path.

10. When conducting RNAV approaches without VNAV guidance to a MDA, the flight director must be coupled to the LNAV mode (autopilot engaged or not engaged).
11. RAIM must be available at the final approach fix in order to accomplish GPS nonprecision approaches using GPS navigation data.
12. When using FMS guidance for conducting instrument approach procedures that do not include “or GPS” in the title of the published procedure, the flight crew must verify the procedure specified navaid and associated avionics are operational.
13. IFR nonprecision approach approval is limited to published approaches within the U.S. National Airspace System. Approaches to airports in other airspace are not approved unless authorized by the appropriate governing authority.

14. RNP 0.3 RNAV approaches: If a procedure note DME/DME RNP 0.3 NA is specified on the approach chart in use, the pilot must deselect the DME sensors on the FMS sensor page. Refer to VOR/DME deselection procedure in Section 6 of the appropriate Honeywell Flight Management System Pilot's Operating Manual.
15. ILS, LOC-BC, LDA, SDF and MLS approaches using the FMS for final approach guidance are prohibited.
16. When conducting missed approach procedures, autopilot coupled operation is prohibited until the flight crew has established a rate of climb that ensures all altitude requirements of the procedure will be met.
17. When the approach at the destination is based on GPS and an alternate airport is required by the applicable operating rules, it must be served by an approach not based on GPS, the airplane must have operational equipment capable of using that navigation aid, and the required navigation aid must be operational.
18. The fuel quantity, fuel required, fuel remaining and gross weight estimate performance functions of the FMS are supplemental information only and must be verified by the flight crew.

OPERATING NOTES

- If a procedure note "Baro-VNAV not authorized below (specified temp)" is specified on the approach chart, do not utilize VGP for descent. At extreme temperatures, the altimeter may display significantly erroneous readings, with an error as much as 1,000 feet.

- If a procedure note "DME/DME RNP 0.3 not authorized" is specified on the approach chart in use, the pilot must deselect the DME sensors by the following sequence on the FMS:

  1. NAV, POS SENSORS 4L, VOR/DME 4L, DEL

  2. Press one of the left line select keys adjacent to one of the VOR stations.

3. DESEL is displayed above all VOR stations in inverse video.

4. If two pages of VOR/DME sensors are present, press NEXT, and repeat steps 2 and 3.

   This action is required to be performed independently on each FMS, and removes the entire sensor (VOR and all DME channels) from being used by the FMS.

- Do not select PRE on the Navigation Source selector. If PRE is armed, the NAV source will transition to short-range navigation if the APP Mode is inadvertently selected.

- The APRCH annunciator must illuminate 2 nm before the final approach fix period. It will remain illuminated for the remainder of the approach. This is a positive cue to the flightcrew that the sensor configuration is correct and sensor integrity is within limits for the approach.

- The DGRAD annunciator must be off throughout the approach. If the DGRAD annunciator illuminates, the FMS should not be used for the remainder of the approach.

- At 2 nm the MISSED APPR prompt appears at 4L on the FMS if a flight plan page is displayed. Do not activate—FMS will drop RNP 0.3 sensitivity and transition to terminal 1.0 nm sensitivity.

- The procedures depicted in review guide format are predicated on operations in a nonradar environment. When operating in a radar environment, use the FLY HDG TO INTRCPT feature of the FMS.

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FMS APPROACH WITHOUT VNAV OR VGP

The following is a review guide designed to assist the crew in avionics management for the FMS (**without VNAV or VGP)** approach. The block numbers correspond to the block numbers depicted in Figure MAP-1.

1 FMS MUST BE THE SELECTED NAVIGATION SOURCE:

A. Check RAIM availability.

NAV, POS sensors 4L, NEXT, GPS 1 STATUS 2R, PRED RAIM 4R, DEST 1L

B. Retrieve approach from navigation database.

NAV, ARRIVAL 3R, APPROACH 2L

C. Verify waypoint and altitude constraints with the published approach chart.

D. Select NAV on FGS.

2 WHEN CLEARED FOR THE APPROACH:

A. Verify TOD is displayed on MFD, or PROG, NEXT on the FMS.

B. Select published minimums with ALT selector.

C. One minute from TOD, VTA is active.

D. Ensure PRE is not selected.

E. Select VS or FLC on the FGS, and descend according to the published approach procedure.

3 2 NM PRIOR TO FINAL APPROACH WAYPOINT:

A. APRCH annunciator illuminates on FMS.

B. Cyan APP appears at nine o'clock position of HSI.

C. MISSED APPR prompt appears at 4L on FMS.

4 FINAL APPROACH WAYPOINT TO LANDING:

A. VS or VFLC appears on the PFD depending on FGS selection.

B. Ensure DGRAD annunciators are not illuminated on the FMS or PFD.

C. FD command bars capture altitude at MDA.

D. At the MAP, continue descent to the runway or execute the missed approach procedure.

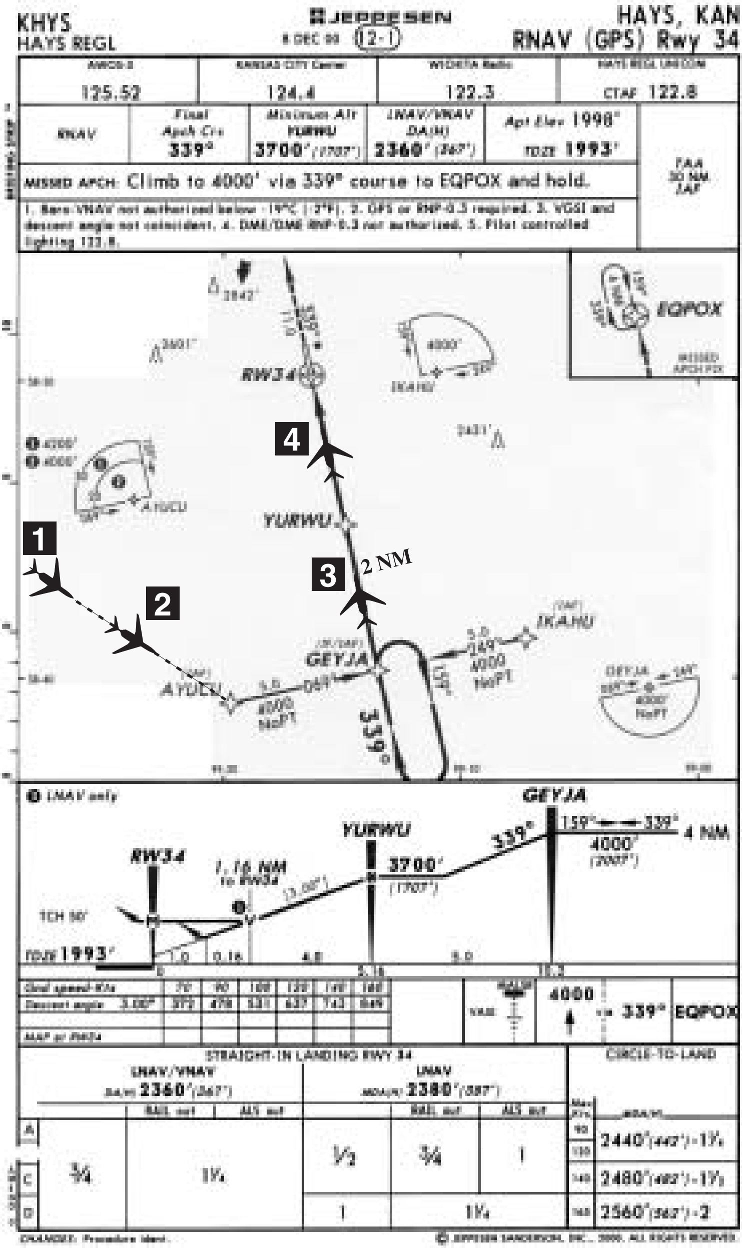

Figure MAP-1. FMS Approach Without VNAV

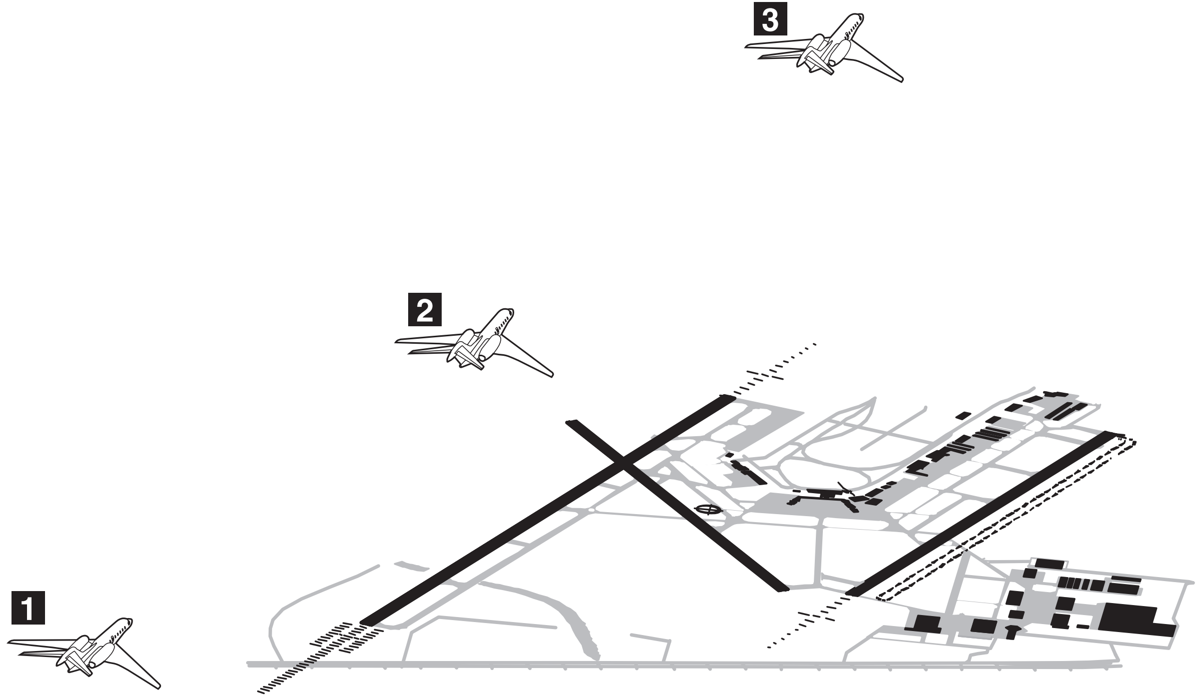

Figure MAP-2. FMS Approach without VNAV or VGP—Missed Approach

FMS Approach without VNAV or VGP—Missed Approach

1 DECISION TO EXECUTE MISSED APPROACH:

A. Push Go-Around button on the throttle

B. Simultaneously: Pitch aircraft to FD command bars
Throttles TO/MC detent

2 CONFIGURE AIRCRAFT:

A. Select Flaps 15° (if landing Flaps 35°)
Select Flaps 5° (if landing Flaps 15°)

B. Positive rate-of-climb: Landing gear up

3 CLIMB TO ASSIGNED OR MISSED APPROACH ALTITUDE:

A. In radar environment: Follow ATC instructions
In nonradar environment: Select missed approach altitude with ALT selector
Select NAV on the FGS

B. Flaps: As required

C. Throttles: As required

D. Execute published missed approach

E. All Engine Go-around Checklist: Complete

LOC (BACK CRS) APPROACH

The following is a review guide designed to assist the crew in flying the localizer backcourse approach. The block numbers correspond to the block numbers depicted in Figure MAP-3.

1 FMS MUST BE THE SELECTED NAVIGATION SOURCE:

A. Retrieve approach with approach transition from navigation data base.

NAV, ARRIVAL 3R, APPROACH 2L, APPROACH TRANS

B. Select NAV on Flight Guidance Selector.

C. Select PRE on Navigation Source Selector.

D. Set front course with Course Selector.

2 WHEN CLEARED FOR THE APPROACH:

A. Established in procedure turn, select BC on Flight Guidance Selector.

B. Set next altitude or published minimums with ALT selector.

3 PRIOR TO FINAL APPROACH FIX:

A. Ensure transition from long-range to short-range navigation.

B. Select VS or FLC on FGS, and descend according to published approach procedure.

4 FINAL APPROACH FIX TO LANDING:

A. VS or FLC appears on PFD depending on FGS selection.

B. FD command bars capture altitude at MDA.

C. At the MAP, continue to the runway or execute the missed approach procedure.

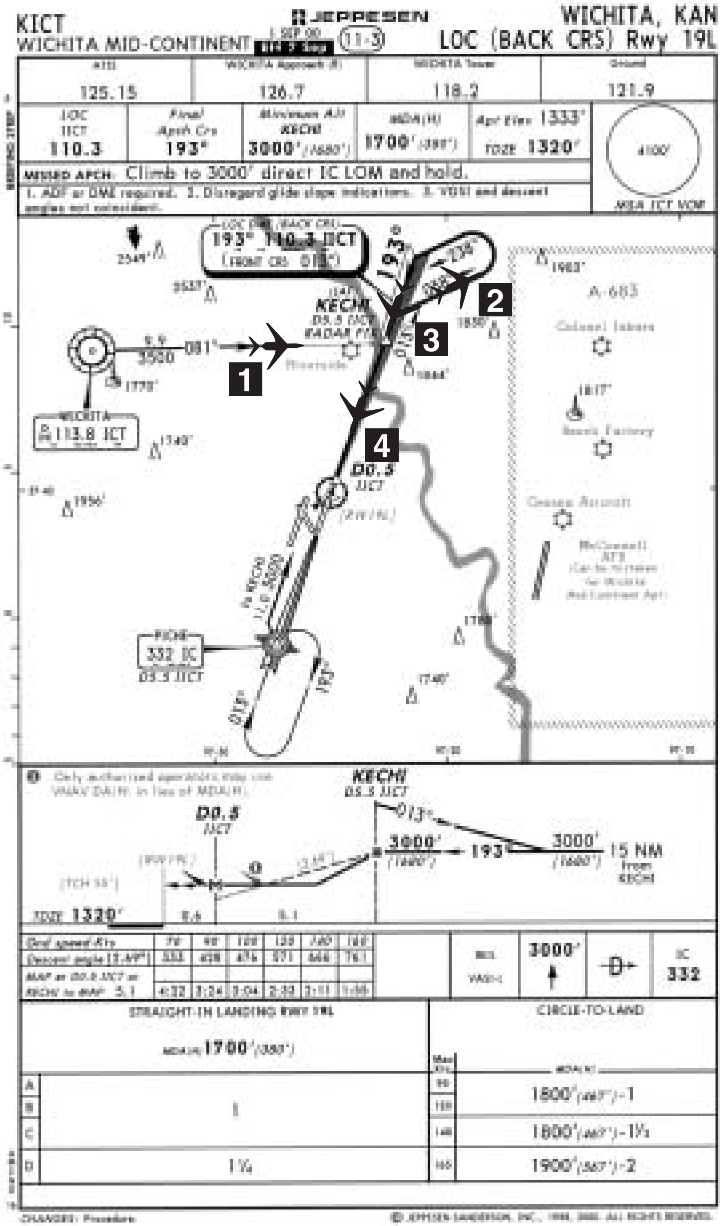

Figure MAP-3. LOC (Back CRS) Approach

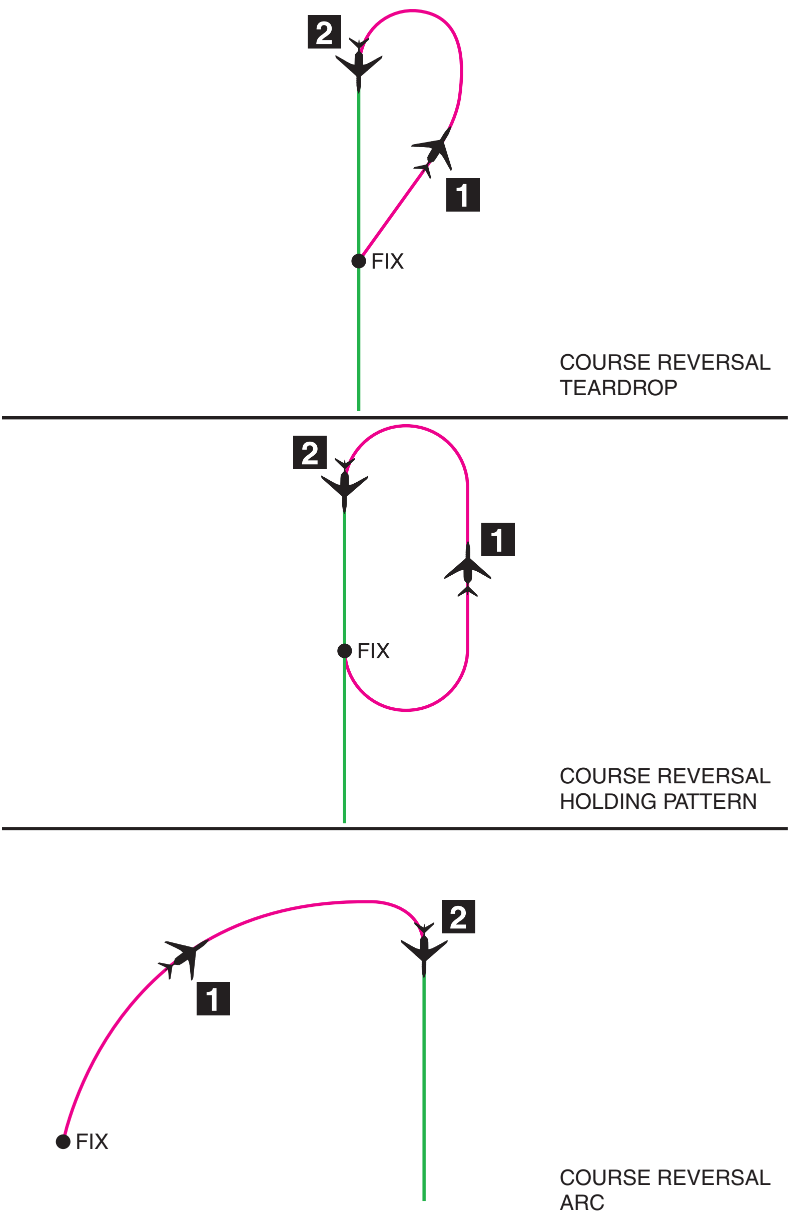

Figure MAP-4. Course Reversal

Course Reversal

Instrument approach procedures in the Honeywell FMS database include course reversal procedures as published on the Jeppesen Charts. These course reversal procedures may be flown in long-range NAV mode with PRE selected to provide a smooth transition to short-range NAV. The PRE mode may be used to automatically transition from FMS to: 1) ILS, 2) Localizer, 3) LOC-BC, or 4) VOR Radial. The following is a review guide designed to assist the crew in programming the FGS.

1 FMS MUST BE THE SELECTED NAVIGATION SOURCE:

A. Retrieve approach with approach transition waypoint.

B. Select NAV on the FGS.

C. Select PRE on the Navigation Source Selector.

D. Set inbound course with the Course Selector.

E. Arm the APP mode on the FGS.

2 WHEN THE PROPER GAINS ARE MET:

A. The FGC will transition to short range navigation.

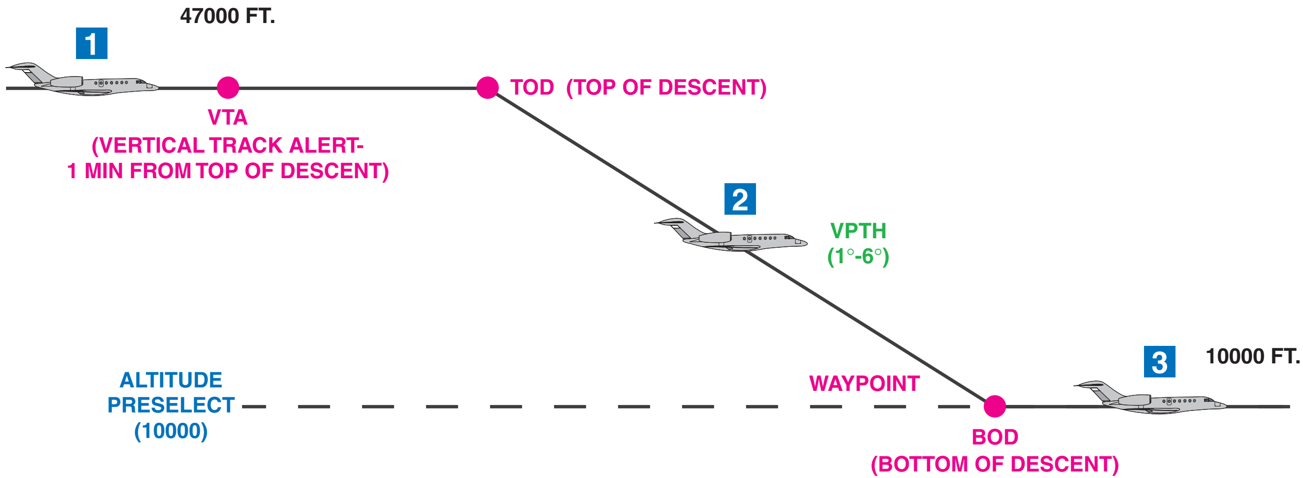

Figure MAP-5. Enroute VNAV Operation

Enroute VNAV Operation

GENERAL VNAV RULES (Source: FMZ Series Flight Management System P. 7-22 through 7-34).

- PERF INIT must be completed in the CDU.
- Vertical navigation is engaged by selecting FMS as the navigation source and NAV and VNAV on the flight guidance selector.
- VNAV never passes through altitude preselector.
- VNAV keeps the aircraft as high as possible as long as possible.
- Vertical path angles are calculated from 1° to 6°.
- VTA (vertical track alert) is issued 60 seconds prior to TOD.
- TOD (top of descent)—Top of Descent is location where the aircraft will commence a descent. Aircraft will only descend if ALT PRESELECT is set lower.

1 DURING ENROUTE OPERATION:

A. PERF INIT must be completed in the CDU.

B. FMS must be the selected navigation source. NAV and VNAV must be engaged on the navigation source controller.

C. Enter altitude constraint at waypoint (10,000) in the CDU.

D. Set altitude selector to 10,000.

E. 60 seconds before TOD, VTA audio tone will sound, and magenta vertical deviation scale will display next to the ADI.

F. Reduce speed to below V_{MO}-M_{MO}. 10 knots minimum is recommended.

2 DESCENT:

A. Aircraft will descend on the calculated path.

3 LEVEL OFF:

A. Aircraft will level off at the selected altitude.

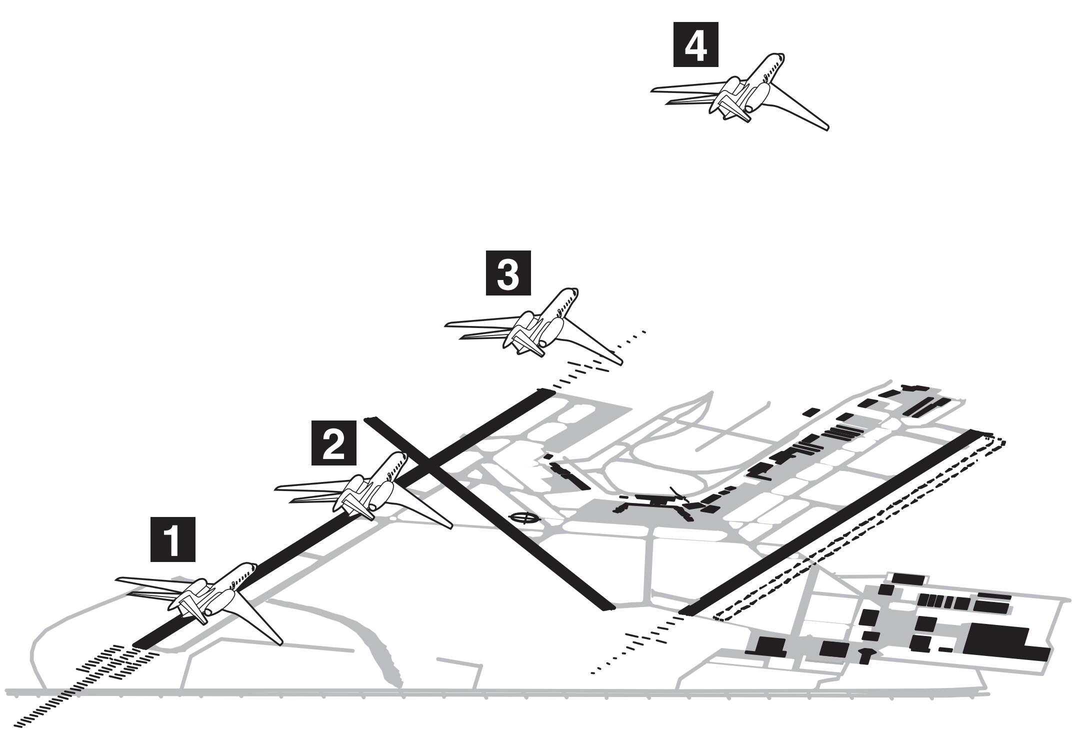

Figure MAP-6. Normal Takeoff

Normal Takeoff

1 TAKEOFF:

A. Before Takeoff Checklist: Complete

B. Ailerons: Position appropriately for wind correction

C. Throttles: Advance to TO/MC detent
Check for green T/O FMI

D. EICAS: Check N_1 matches command
Check all other indications normal

E. Brakes: Release

2 AT V_R:

A. Rotate to FD command bars

3 AFTER TAKEOFF:

A. Positive rate of climb: Landing gear up

B. At 170 KIAS: Retract to Flaps 0°

4 CLIMB TO ASSIGNED ALTITUDE:

A. Throttles: CLB detent or as required

B. After Takeoff/Climb Checklist: Complete

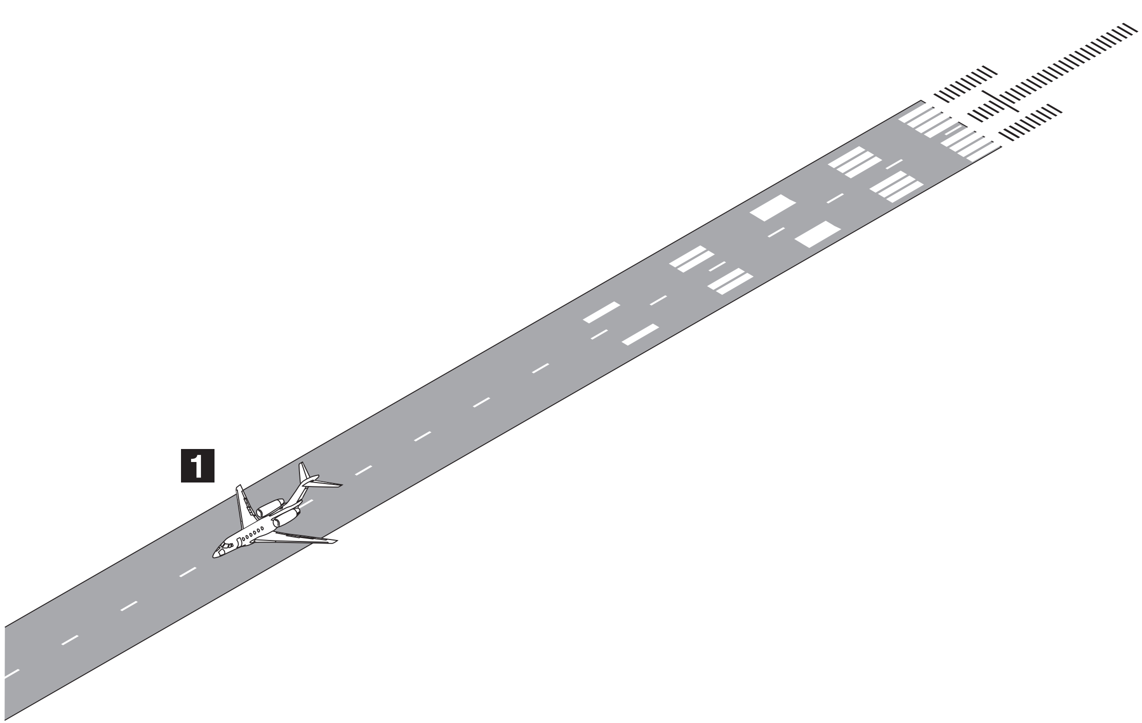

Figure MAP-7. Rejected Takeoff

Rejected Takeoff

1 DECISION TO REJECT TAKEOFF:

A. Simultaneously: Maintain directional control
Brakes: Maximum effort
Throttles: Reduce to IDLE

B. Speed Brakes: Extend

C. Control Column: Forward Pressure

D. Thrust Reverser(s): Deploy as required if no ENG FIRE

E. Applicable Emergency/Abnormal Checklist: Complete

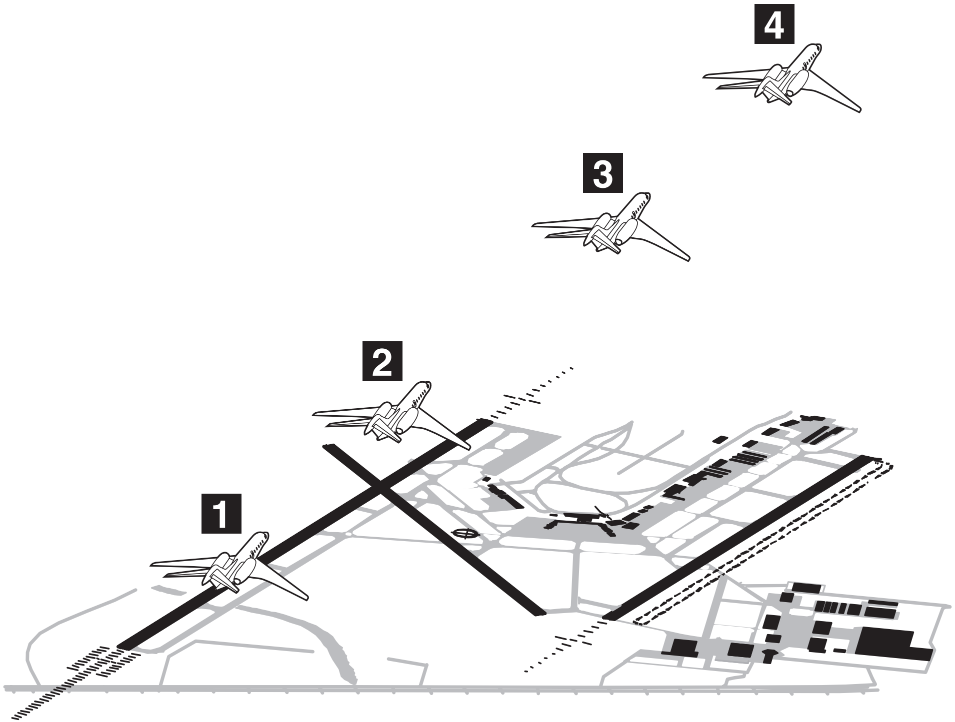

Figure MAP-8. Takeoff with Engine Failure Above V_1 (No Fire)

Takeoff with Engine Failure Above V_1 (No Fire)

1 SPEED ABOVE V_1:

A. At VR: Rotate to FD command bars

B. Maintain directional control

2 CLIMB TO A SAFE ALTITUDE:

A. Positive rate of climb: Landing gear up

B. Press FLC on the FGS: Command V_2 minimum speed

3 FLAP CONFIGURATION:

If returning to departure airport:

A. At V_2 + 15 KIAS minimum: Retract to Flaps 5°

If unable to return to departure airport:

A. At V_2 + 15 KIAS minimum: Retract to Flaps 0°

B. Accelerate to V_{ENR}: 190 KIAS

4 WHEN CLEAR OF OBSTACLES AT OR ABOVE 1,500 FT AGL:

A. Applicable Emergency/Abnormal Checklist: Complete

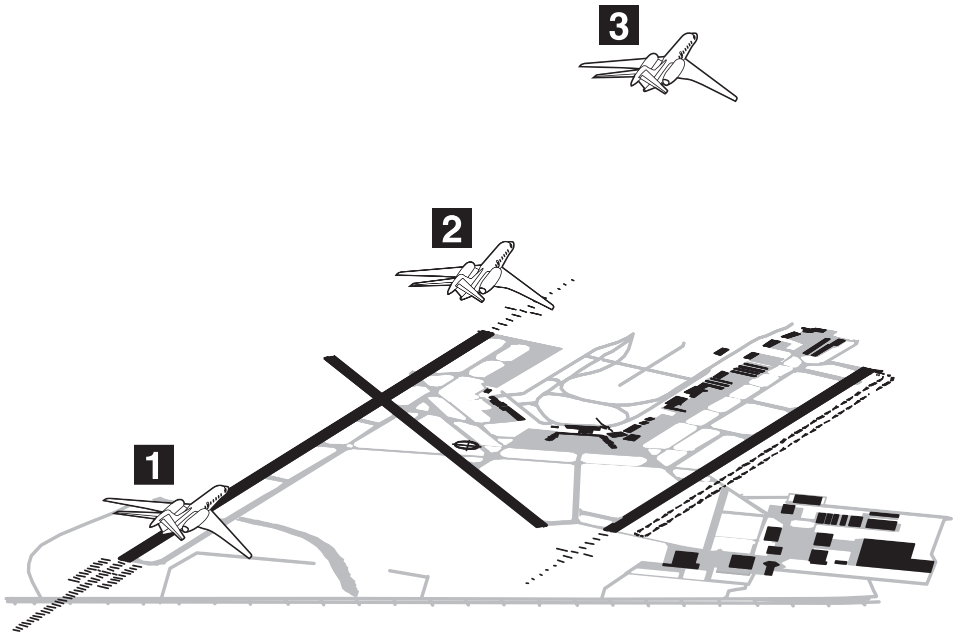

Figure MAP-9. Takeoff with Engine Fire Above V_1

Takeoff with Engine Fire Above V_1

1 SPEED ABOVE V_1:

A. At VR: Rotate to FD command bars

B. Maintain directional control

2 CLIMB TO A SAFE ALTITUDE AT OR ABOVE 400 FT AGL:

A. Positive rate of climb: Landing gear up

B. At 170 KIAS: Retract to flaps 0°

3 WHEN CLEAR OF OBSTACLES:

A. Engine Fire Emergency/Abnormal Checklist: Complete

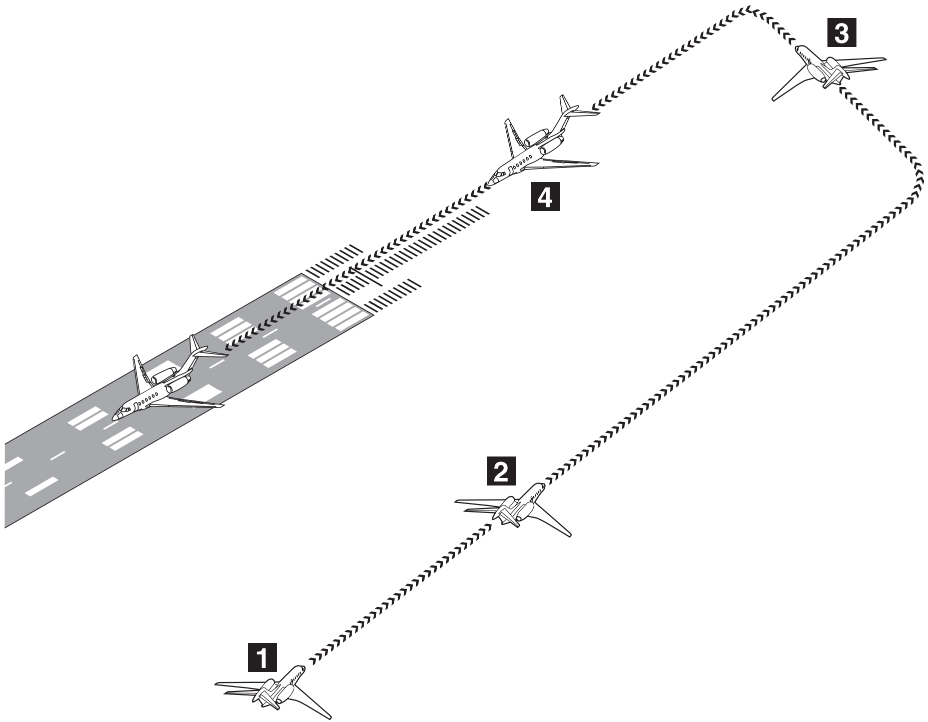

Figure MAP-10. Visual Approach

Visual Approach

NOTE: A single-engine visual approach is flown identically to a two-engine visual approach with the exception that the flaps will be extended to 15° maximum.

1 DOWNWIND LEG:

A. Altitude: 1,500 feet AGL minimum

B. Airspeed: 170 KIAS

C. Flaps: Extend to 15°

D. Approach Checklist: Complete

2 ABEAM TOUCHDOWN POINT:

A. Landing gear: Extend

3 BASE LEG:

A. Flaps: Extend to 35°

B. Airspeed: V_{REF} + 10 KIAS minimum

C. Before Landing Checklist: Complete

4 FINAL APPROACH:

A. Airspeed: Adjust as required to cross threshold at V_{REF}

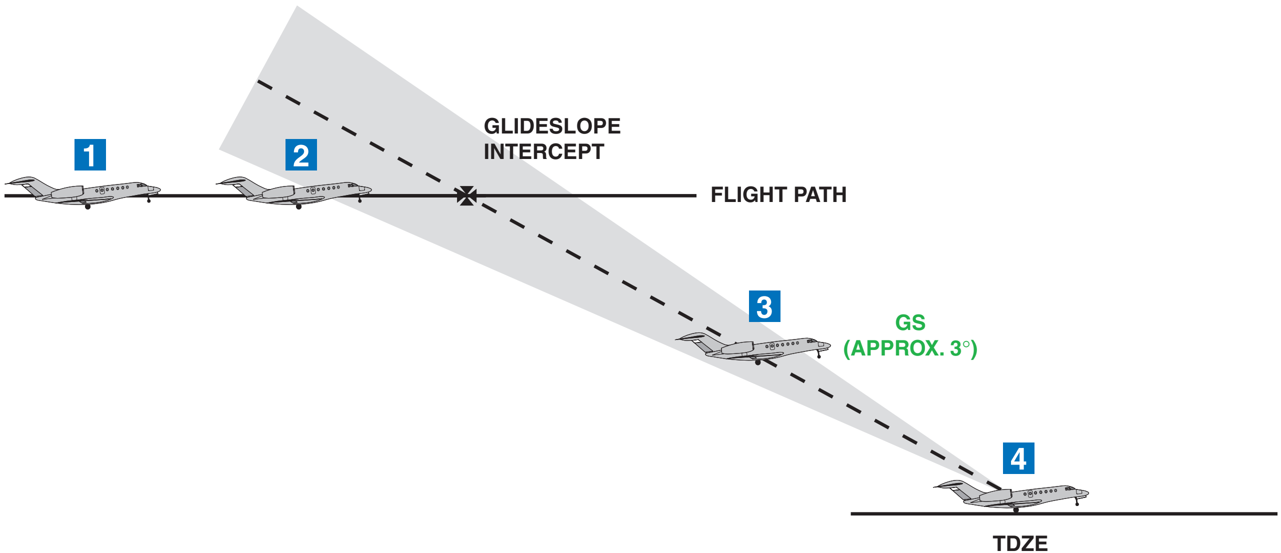

Figure MAP-11. Precision Approach

Precision Approach

NOTE: A single-engine precision approach is flown identically to a two-engine precision approach with the exception that the flaps will be extended to 15° maximum.

1 AT INITIAL APPROACH ALTITUDE:

A. Airspeed: As required

B. Flaps: Extend to 15°

C. Select APP on FGS

2 PRIOR TO GLIDESLOPE INTERCEPT:

A. 1 1/2 dots above GS: Landing gear extend

B. 1/2 dot above GS: Extend flaps to 35°

C. Thrust: Approximately 50% N_1

D. Before Landing Checklist: Complete

3 ON GLIDESLOPE:

A. Airspeed: V_{REF} minimum or as required

4 LANDING:

A. Thrust: Reduce to idle

B. Speed Brakes: Extend

C. Elevator Control: Forward pressure at touchdown

D. Brakes: Apply

E. Thrust Reverser(s): As required

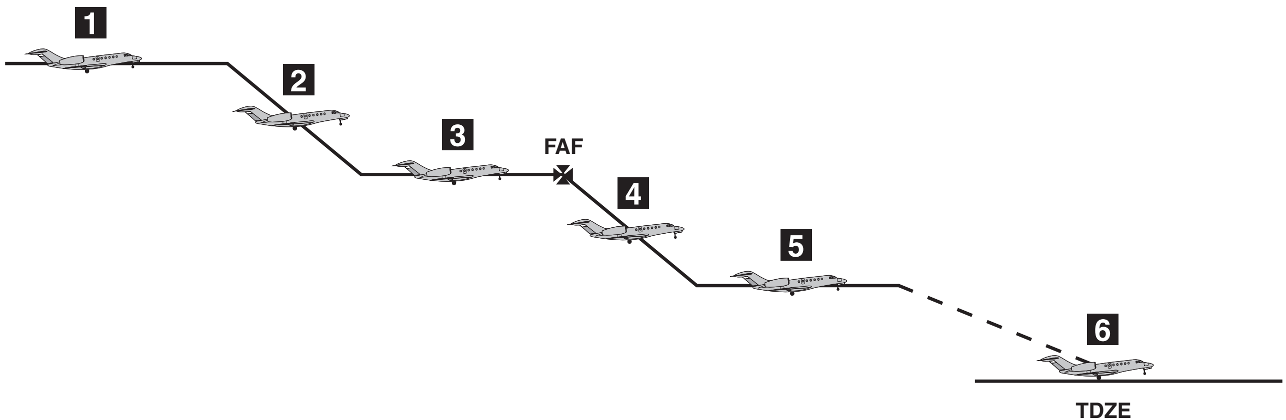

Figure MAP-12. Nonprecision Approach

Nonprecision Approach

NOTE: A Single-engine nonprecision approach is flown identically to a two-engine nonprecision approach with the exception that the flaps will be extended to 15° maximum.

1 AT INITIAL APPROACH ALTITUDE:

A. Airspeed: As required

B. Flaps: Extend to 15°

C. Select NAV or APP on FGS

D. Select next altitude with ALT selector

E. Select VS on FGS

2 DESCEND TO NEXT ALTITUDE:

A. Descend at appropriate vertical speed

3 PRIOR TO FINAL APPROACH FIX:

A. Landing gear: Extend

B. Approximately 1 nm from FAF: Extend flaps to 35°

C. Select next altitude with ALT selector

D. Select VS on FGS

E. Before Landing Checklist: Complete

4 DESCEND TO MDA:

A. Descend at appropriate vertical speed

5 AT MDA:

A. Airspeed: V_{REF} + 10 KIAS minimum

6 LANDING:

A. Thrust: Reduce to idle

B. Speed Brakes: Extend

C. Elevator Control: Forward pressure at touchdown

D. Brakes: Apply

E. Thrust Reverser(s): As required

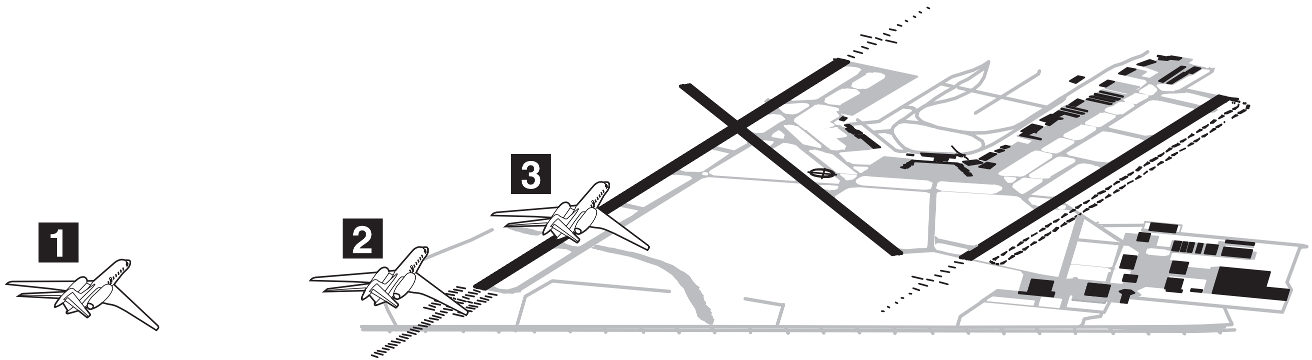

Figure MAP-13. Engine Failure on Final

Engine Failure on Final

1 ENGINE FAILURE:

A. Select flaps 15° (if landing flaps 35°)
   Select flaps 5° (if landing flaps 15°)

B. Airspeed: V_{REF} + 10 KIAS minimum

2 BEFORE LANDING:

A. Autopilot: As desired

B. Speed Brakes: Retract

C. Aux Pump: On

3 TOUCHDOWN:

A. Throttle: Reduce to idle

B. Speed Brakes: Extend

C. Elevator Control: Forward pressure at touchdown

D. Normal or Emergency Brakes: Apply

E. Thrust Reverser(s): As required

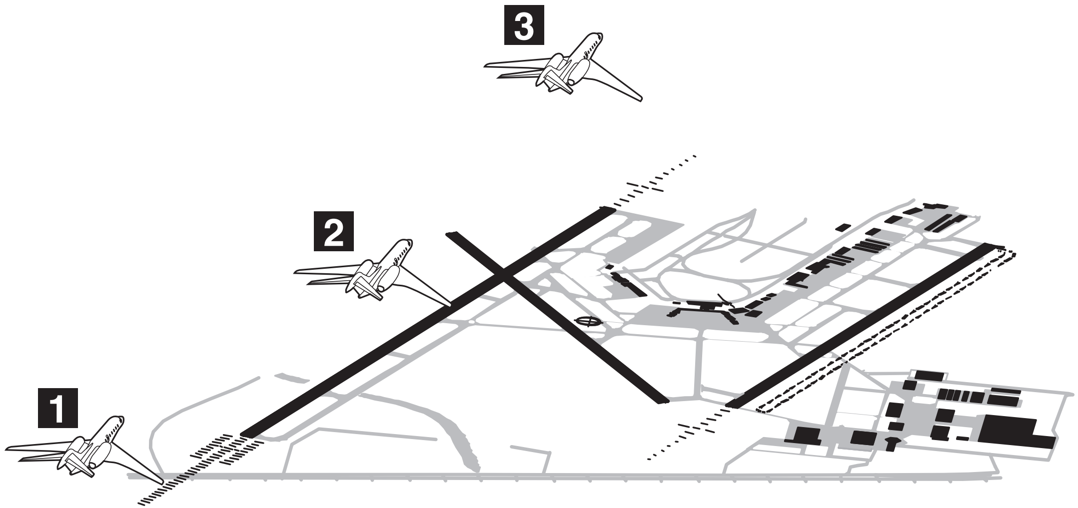

Figure MAP-14. Single-Engine Go-Around

Single-Engine Go-Around

1 DECISION TO EXECUTE MISSED APPROACH:

A. Push Go-Around button on the throttle

B. Simultaneously: Pitch aircraft to FD command bars
Throttles TO/MC detent

2 CONFIGURE AIRCRAFT:

A. Select flaps 5°

B. Positive rate of climb: Landing gear up

3 CLIMB TO ASSIGNED OR MISSED APPROACH ALTITUDE:

A. In radar environment: Follow ATC instructions

In nonradar environment: Select missed approach altitude with ALT selector
Select FMS on the Navigation Source selector
Select NAV on the FGS

B. Flaps: As required

C. Throttle: As required

D. Single-Engine Go-Around Checklist: Complete

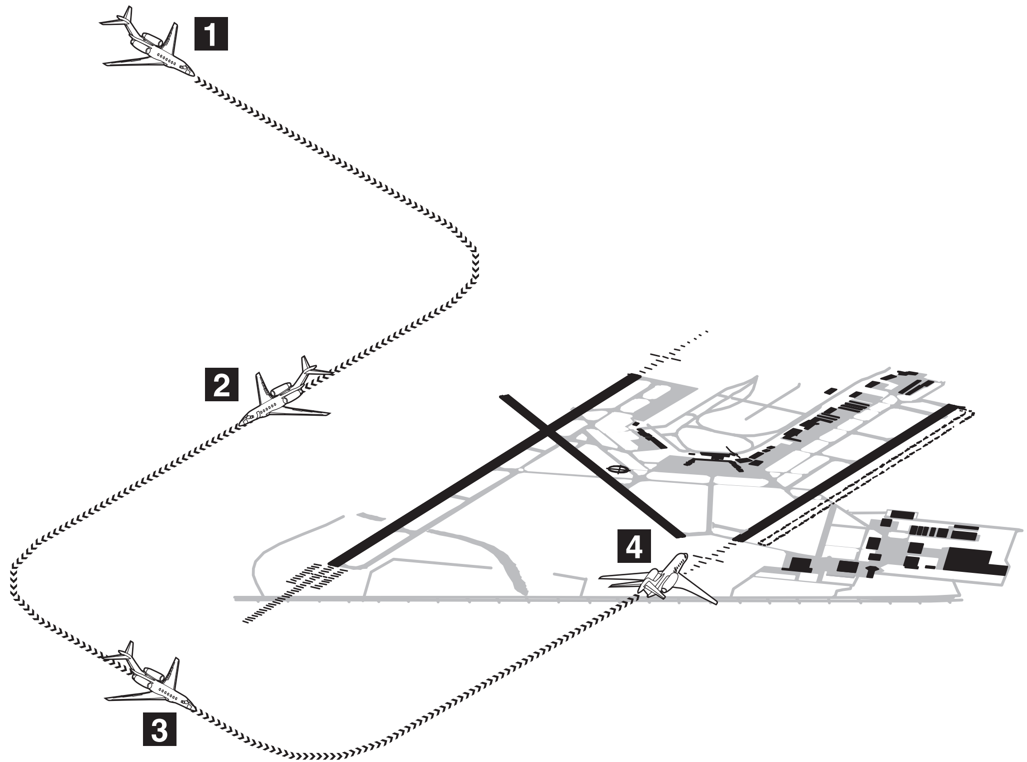

Figure MAP-15. Circle to Land

Circle to Land

NOTE: Circling approaches may be commenced from an instrument approach procedure or visual approach. The profile depicted assumes executing a circling maneuver from an instrument approach (maximum bank angle: 30°; maximum sink rate: 1,000 FPM).

1 AT CIRCLE TO LAND MDA:

A. Airspeed: V_{REF} + 20 KIAS minimum

B. Landing gear and flaps: Landing configuration

C. Approach Checklist: Complete

2 DOWNWIND LEG:

A. Altitude: 1,500 feet AGL minimum, or MDA

B. Airspeed: 170 KIAS

3 BASE LEG:

A. Airspeed: Begin reduction to V_{REF} + 10 KIAS minimum

B. Before Landing Checklist: Complete

4 FINAL APPROACH:

A. Airspeed: Adjust as required to cross threshold at V_{REF}

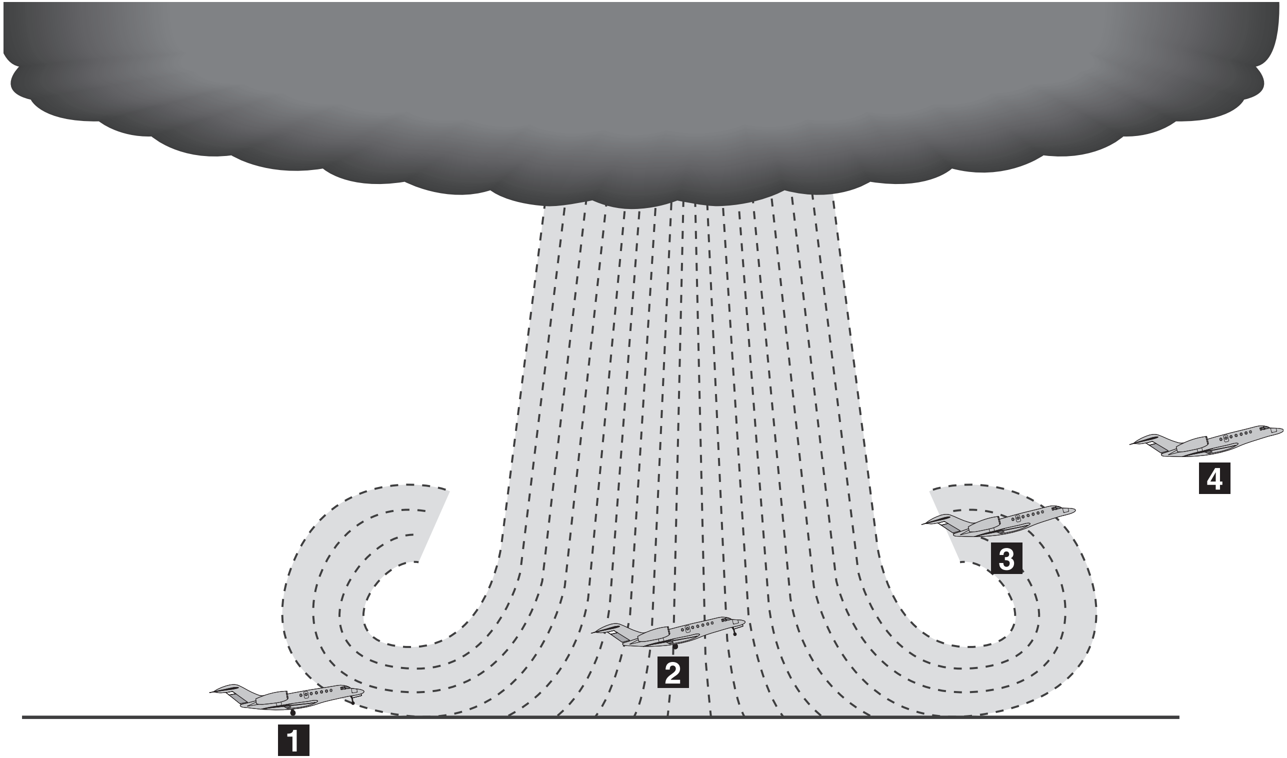

Figure MAP-16. Windshear Recovery

Windshear Recovery

1 WINDSHEAR WARNING OR ENCOUNTER:

A. Push Go-Around button on the throttle

B. Thrust: TO/MC detent

C. Smoothly rotate to initial FD command bars

2 DURING WINDSHEAR:

A. Pitch up smoothly and in small increments to stop descent

B. Speed Brakes: Confirm retracted

C. Do not retract flaps or landing gear until safe climbout assured

3 AFTER POSITIVE RATE OF CLIMB AND 1.3 V_S MINIMUM:

A. Flaps: Retract to 15° if 35°
Retract to 5° if 15°

B. Airspeed: As required

4 CLEAR OF WINDSHEAR:

A. Landing Gear: Up (if ground contact no longer probable)

B. Flaps: As required

C. Thrust: As required

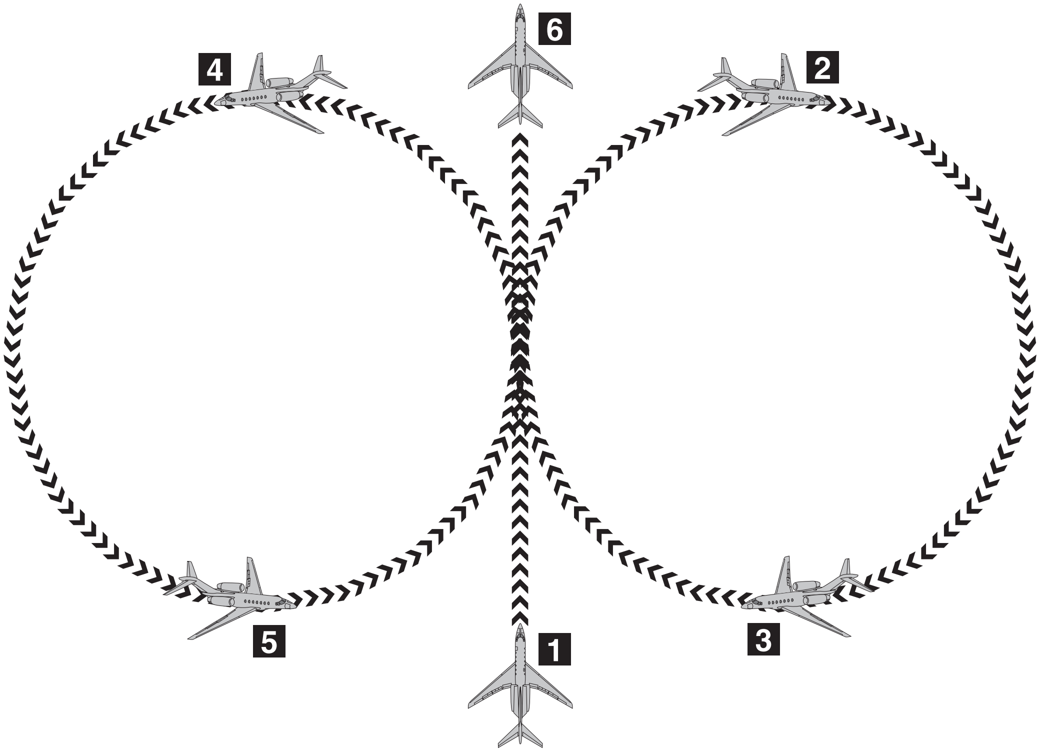

Figure MAP-17. Steep Turns

Steep Turns

1 ENTRY:

A. Airspeed: 250 KIAS

B. FGS: Single Cue, Cross Pointers or Raw Data as desired

C. Landing Gear and Flaps: Clean configuration

2 ROLL IN:

A. Smoothly roll to 45° bank angle

B. Adjust pitch attitude to maintain altitude

C. Increase thrust to maintain 250 KIAS

3 ROLL OUT:

A. Initiate roll out 10° prior to desired heading

B. Decrease thrust to maintain 250 KIAS

C. Adjust pitch to maintain altitude

4 5 IF PERFORMING COMPLETE 360° TURNS:

A. Step 4 is identical to Step 2

B. Step 5 is identical to Step 3

6 EXIT:

A. Airspeed: As required

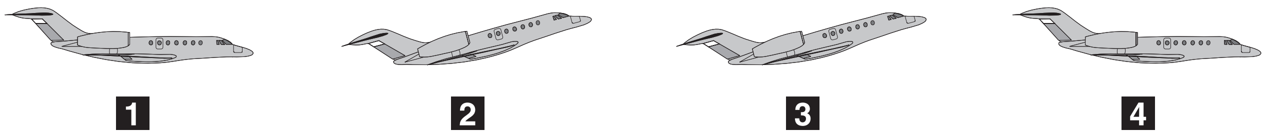

Figure MAP-18. Stall—Clean Configuration

Stall—Clean Configuration

NOTE: Perform A.C.E. Check: A—APU operating with bleed air on
C—Compute and post V_{REF}
E—Engine Synch off

1 ENTRY:

A. Maintain altitude in level flight

B. Thrust: Idle

C. Trim: As required

2 AT STICK SHAKER:

A. Thrust: TO/MC detent

B. Maintain pitch attitude

3 RECOVERY:

A. Maintain altitude in level flight

B. Trim: As required

4 EXIT:

A. Airspeed: As required

B. Trim: As required

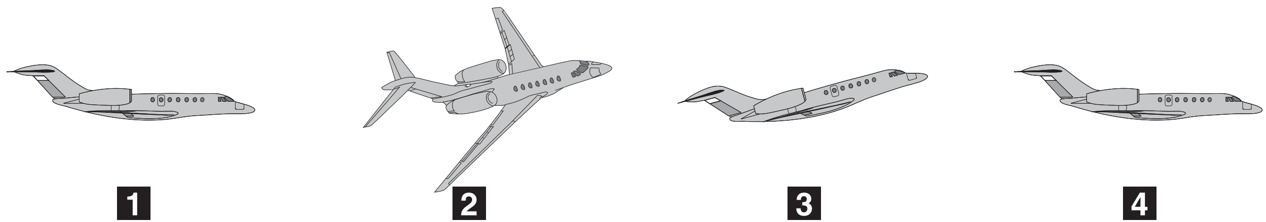

Figure MAP-19. Stall—Departure Configuration

Stall—Departure Configuration

NOTE: Perform A.C.E. Check:
A—APU operating with bleed air on
C—Compute and post V_{REF}
E—Engine Synch off

1 ENTRY:

A. Maintain altitude
B. Thrust: Idle
C. Flaps: 15°
D. Smoothly roll in to 20° bank angle

2 AT STICK SHAKER:

A. Thrust: TO/MC detent
B. Maintain pitch attitude
C. Smoothly roll to wing's level

3 RECOVERY:

A. At V_{REF} + 15 KIAS minimum: Retract flaps to 0°
B. Maintain altitude in level flight
C. Trim: As required

4 EXIT:

A. Airspeed: As required
B. Trim: As required

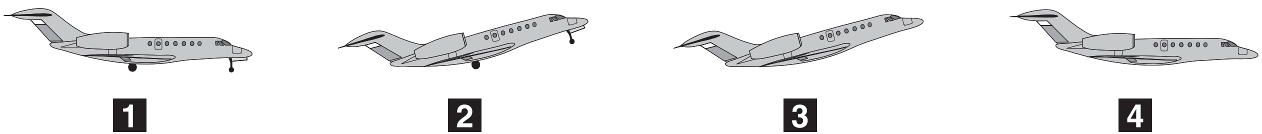

Figure MAP-20. Stall—Landing Configuration

Stall—Landing Configuration

NOTE: Perform A.C.E. Check: A—APU operating with bleed air on
C—Compute and post V_{REF}
E—Engine Synch off

1 ENTRY:

A. Maintain altitude
B. Thrust: 50% N_1
C. Landing gear and flaps: Landing configuration
D. Trim: As required

2 AT STICK SHAKER:

A. Thrust: TO/MC detent
B. Maintain pitch attitude

3 RECOVERY:

A. Flaps: Retract to 15°
B. Positive rate of climb: Landing gear up
C. At V_{REF} + 15 KIAS minimum: Retract flaps to 0°

4 EXIT:

A. Airspeed: As required
B. Trim: As required

Table MAP-2. ROTARY TEST

POSITION	FUNCTIONAL TESTS	CAS MESSAGE	ALERTS
SMOKE/DET	Smoke Detection System	BAGGAGE SMOKE	• Master Warning Double Chimes
LDG GR	Gear Warning System & Indicator Lights	----------------------------	• 3 Green Down • 1 Red Unlocked • Gear Warning Horn
FIRE WARN	Engine Fire Detection System	ENGINE FIRE L–R FIRE DETECT FAIL R FIRE DETECT FAIL L	• ENG FIRE PUSH (2) Illuminated • Master Warning • Master Caution
THRUST REV	Thrust Reverser Indicator Lights	----------------------------	• Reverser Lights (6) Illuminated
FLAP* (SEE NOTE 1)	Flap Controller & Flap Overspeed	FLAPS FAIL	• FLAP RESET • Flap Position Indicator Turns Amber • Master Caution
W/S TEMP* (SEE NOTE 2)	Windshield Heat Automatic Control	WSHLD HEAT INOP L WSHLD HEAT INOP R WSHLD O'TEMP L–R	• Master Caution
OVER SPD* (SEE NOTE 3)	Overspeed Warning	FADEC FAULT L A–B FADEC FAULT R A–B	• Overspeed Warning Horn
AOA	AOA System Stick Shakers Auto Slat System	AUTO SLATS FAIL MINIMUM SPEED AOA PROBE FAIL L–R STALL WARN L–R	• AOA Gauge Indicates FAIL • Indexer Lights
ANNUN* (SEE NOTE 4)	Lamp Test, Normal Engine Shutdown Inhibits	HYD PUMP FAIL A–B OIL PRESS LOW L–R FUEL PRESS LOW L–R YD FAIL UPPER A–B WINDSHEAR FAIL GPWS FAIL	• Master Warning • Master Caution • Optional Lights

Table MAP-2. ROTARY TEST (Cont)

NOTE 1

- There is a five-second debounce on the **FLAP RESET** switchlight annunciation.

NOTE 2

- The W/S HEAT switches must be ON.
- The engines do NOT need to be operating.
- There is a five-second debounce on the **WSHLD O'TEMP L–R** message.

NOTE 3

- The following is displayed in the PILOT'S PFD only during the OVERSPD test:
  1. "ADC TEST"
  2. Altimeter: 1,000 feet
  3. Vertical Speed: Increases slowly to 5,000 fpm
  4. IAS: 350 kts
  5. Indicated Mach: .790M
  6. Airspeed magenta trend vector appears momentarily
  7. Altimeter magenta trend vector appears
  8. Amber, Boxed **ALT** Miscompare in BOTH altimeters.
- The FADEC FAULT messages appear only if electrical power has been supplied to the FADECs, and the throttles have been advanced beyond the idle position.

NOTE 4

- The following are displayed during the ANNUN test:
  1. Flight guidance selector mode indicator lights
  2. FMS control display unit annunciator lights
  3. Flight control shutoff lights
  4. IRS controller annunciator lights
  5. GPWS aural annunciations
  6. WINDSHEAR aural and visual (ADI) annunciations
  7. HF XFER ON light

MEMORY ITEMS

1 ENGINE FAILURE, FIRE, OR MASTER WARNING DURING TAKEOFF

SPEED BELOW V_1—TAKEOFF REJECTED

1. Takeoff—Abort if below V_1.

SPEED ABOVE V_1—TAKEOFF CONTINUED

1. Climb to a safe altitude.
2. Airspeed—V_2 MINIMUM (one engine) or as required (two engines) until clear of obstacles at or above 1,500 feet AGL.

2 ENGINE FIRE

1. Throttle (affected engine)—CONFIRM, then IDLE.

IF ENG FIRE LIGHT REMAINS ON (15 SECONDS) PROBABLE FIRE

1. ENG FIRE Switch—CONFIRM, then LIFT COVER and PUSH.
2. Either Illuminated BOTTLE ARMED Light—PUSH (BOTTLE ARMED light goes off).

3 ENGINE FAILURE DURING FINAL APPROACH

1. Flaps—APPROACH (15°).
2. Airspeed V_{REF} (15) + 10 KIAS MINIMUM, until landing is assured.

4 APU FIRE

1. APU Fire Switch—LIFT COVER and PUSH.

5 DUAL ENGINE FLAMEOUT—LOW ALTITUDE

1. Fuel—CHECK (Tanks/Quantity; Crossfeed/As Required; Transfer/As Required; Boost Pumps/ON).
2. Throttles—CUTOFF.

6 DUAL ENGINE FLAMEOUT—IN CRUISE

1. Crew Oxygen Masks—Don (if required).
2. PASS OXY—ON (if required).

7 TR AUTOSTOW L–R—THRUST REVERSERS NOT DEPLOYED

1. Stow Switches (both)—EMER.
2. Throttles (both)—IDLE then NORMAL OPERATION.

8 THRUST REVERSER INADVERTENT IN-FLIGHT DEPLOYMENT

1. STOW Switch (affected thrust reverser)—EMER.
2. Throttle (affected engine)—CONFIRM, then IDLE.
3. Control Wheel/Autopilot—GRIP/DISENGAGE.
4. Airspeed—REDUCE to 170 KIAS MAXIMUM.

9 COCKPIT/CABIN SMOKE OR FIRE

1. Oxygen Masks—DON and EMER (crew and passengers).
2. Smoke Goggles—DON (as required).

10 DUAL GENERATOR FAILURE (N/A SPLIT BUS)

1. LOAD SHED Switch—O'RIDE.

11 BATTERY 1 OR 2 OVERTEMPERATURE

1. Affected Battery Switch—OFF.

12 LOSS OF CABIN PRESSURE

1. Oxygen Masks—DON AND 100%.
2. Microphone Switches—MIC OXY MASK.
3. Emergency Descent—AS REQUIRED.

13 EMERGENCY DESCENT

1. AP/TRIM/NWS Disengage Button—PRESS (to disengage autopilot).
2. Throttles—IDLE.
3. Speed Brakes—EXTEND.
4. Initial Pitch Attitude—15° DOWN.

14 DUAL HYDRAULIC PUMP FAILURE

1. “A” AUX HYDRAULIC PUMP Switch—ON.

15 JAMMED ROLL OR PITCH CONTROL SYSTEM

1. Control Wheel—RELAX PRESSURE.
2. Pitch/Roll Disconnect Handle—PULL UNTIL LATCHED.
3. Operative Flight Control Wheel—IDENTIFY, RECOVER AIRCRAFT ATTITUDE.

16 DUAL RUDDER LIMITER FAILURE, EXCESS TRAVEL

1. Rudder Pedals—DO NOT APPLY LARGE OR ABRUPT RUDDER INPUT.

17 AUTO SLATS FAIL

1. Control Column—PUSH, PITCH DOWN TO HORIZON.
2. Throttles—SET TO CLB DETENT.
3. Airspeed—INCREASE.

18 PRIMARY PITCH TRIM RUNAWAY

1. AP/TRIM/NWS Disengage Switch—PRESS and HOLD.

19 SECONDARY PITCH TRIM RUNAWAY

1. Secondary Trim Switch—OFF (close guard cover).

20 NOSEWHEEL STEERING MALFUNCTION

1. AP/TRIM/NWS Disengage Button—PRESS and HOLD.

21 HYDRAULIC WHEEL BRAKE FAILURE

1. Brake Pedals—RELEASE BRAKE PEDAL PRESSURE.
2. EMERGENCY BRAKE Handle—PULL and HOLD until stopped.

22 NO TAKEOFF CAS MESSAGE

1. Takeoff—ABORT, IF BELOW V_1.

23 MINIMUM SPEED

1. Control Column—PUSH, PITCH DOWN TO HORIZON.
2. Throttles—SET TO TO/MC DETENT.

24 LOAD SHED (AMBER MESSAGE) (N/A SPLIT BUS)

1. LOAD SHED Switch—O'RIDE.

AIRCRAFT SYSTEMS

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AIRCRAFT SYSTEMS

AIRCRAFT GENERAL

The CE-750 is a pressurized, swept-wing Transport Category jet aircraft approved for day-night, VFR and IFR operations and, provided the required anti-icing equipment is operational, for flights into known icing conditions. The airplane is eligible for overwater operations with applicable equipment specified in the appropriate operating rules; however, it is not approved for ditching under FAR 25.801. Recommended ditching procedures are published in the *AFM*. The CE-750 is approved for Category II operations although this does not constitute operational approval. All flight operations require a crew of two pilots. The maximum number of passenger seats allowed is 12 (plus two pilot seats).

FUSELAGE

The fuselage is divided into four sections: The nose compartment, pressurized cockpit and cabin areas, a pressurized baggage compartment and the unpressurized tail cone compartment.

The nose compartment contains the following:

- Avionics components
- Oxygen tank(s)
- N_2 bottles for emergency operation of the landing gear and brakes
- Standby battery pack for emergency operation of the standby instruments
- Nosewheel steering accumulator
- Blower fan and duct assembly for compartment cooling and rain removal

The pressurized compartments are designed to maintain a normal continuous cabin pressure differential of 9.3 psid. The aircraft has been certified to withstand a maximum differential of 9.7 psid.

One portable fire extinguisher is normally installed under the copilot's seat.

Emergency egress from the main cabin can be accomplished using the emergency exit (located on the right side of the cabin) and the main cabin door (located in the front left side of the cabin). The cabin can be configured to accommodate a maximum of 12 people.

Temperature for the cabin can be controlled from the cockpit or from the cabin's executive position. The vanity compartment is located in the aft cabin area. The vanity compartment includes a toilet, sink and the main landing gear uplock manual release handle. The toilet can be serviced from outside the aircraft through an access panel located on the right, aft side of the fuselage.

Baggage and cargo may be stowed in the cabin area closets or in an external baggage compartment. Access is gained through a door on the outside of the left fuselage under the left engine strut. The baggage compartment door incorporates an inflatable door seal and eight latching pins. Within the baggage compartment, access can be gained to key avionics components, including the four Full Authority Digital Engine Controllers, two Data Acquisition Units, electrical system junction boxes and various circuit breakers or current limiters which are installed in floor or wall compartments within the baggage compartment. Heating within the baggage compartment is provided by a service bleed-air system. Pressurized cabin air is used to pressurize the baggage compartment. In the event of a pressurization leak or a fire, the baggage compartment can be isolated.

Aft of the baggage compartment bulkhead is the tail cone area. Access to the tail cone area is through a hinged door built into the bottom of the fuselage area. The tail cone area contains the following components:

- Engine fire extinguishing bottles
- Pressurization air-conditioning units
- Ducting for the pneumatic and environmental system
- Small storage area for skis

The Garrett Auxiliary Power Unit (APU) is mounted in the aft tail cone compartment and is exhausted through an opening in the upper right fuselage tail cone section. The APU provides 28-volt

DC power and bleed air necessary for starting engines as well as for environmental or pressurization needs, both on the ground or in flight.

The Rolls-Royce AE3007C or 3007C1 engines (Figure AS–1) are mounted on both sides of the fuselage. The engines are manufactured by Rolls-Royce. Each engine is equipped with Dee Howard thrust reversers.

WINGS

The wings are swept at 40° at the leading edge, enabling the aircraft to cruise at .92 Mach with a high level of aerodynamic efficiency. The following equipment is installed on the wings:

- Speed brake
- Roll spoiler panels
- Slats
- Ailerons
- Fuel tanks
- Flaps

Anti-ice capability is provided by both hot engine bleed air for the fixed leading edge and slats, and electrical current to the wing cuff. The internal fuel tanks can be filled by the over-the-wing method or the SPPR system. A manual gravity flow system fills the center tank from the right wing. A trailing link dual-wheel landing gear is mounted on the bottom of each wing and retracts inboard into the center section of the fuselage. Each wheel is equipped with hydraulically-operated carbon brakes. Emergency braking is possible using the high-pressure pneumatic air bottle located in the left avionics compartment.

EMPENNAGE

The empennage is a “T-tail” design. Within the T-tail are two electric motors (primary and secondary trim) to move the front of the horizontal stabilizers to provide vertical trim. Mounted on the aft portion of the stabilizer are conventional elevators. The rudder is split into two sections. The upper rudder is electric and

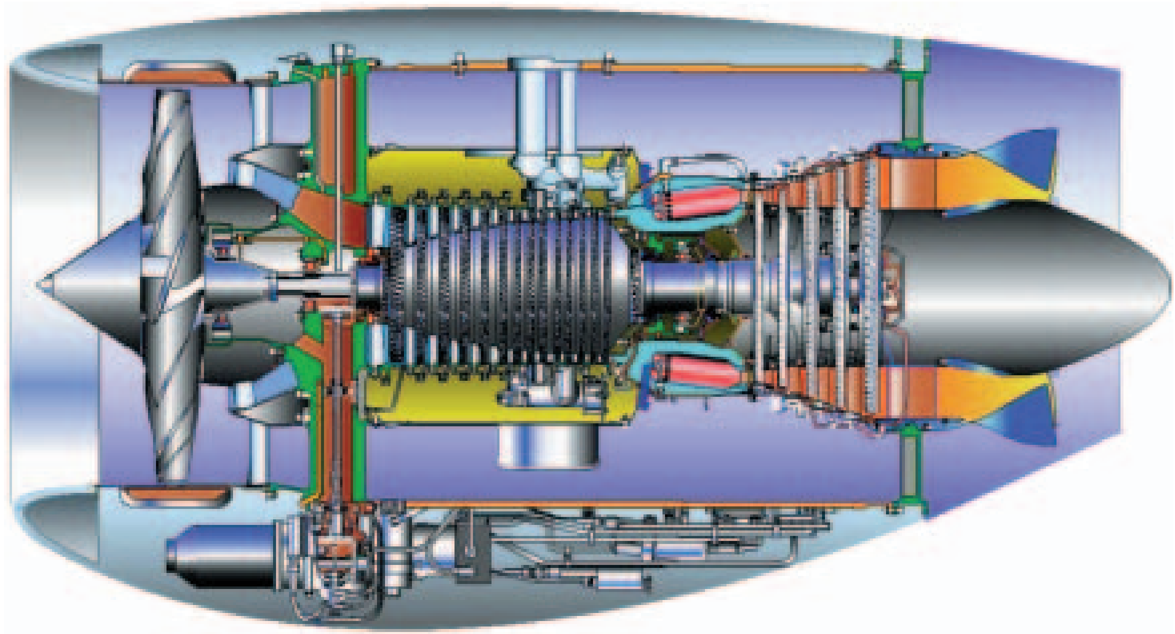

Figure AS-1. Rolls-Royce Engine

is controlled by the yaw stability augmentation system. The lower rudder is hydraulically actuated and receives inputs from the Flight Guidance System. Rudder limiters limit rudder movement to avoid over stressing the rudder system.

AIRCRAFT SYSTEMS

Propulsion

One Rolls-Royce AE3007C/AE3007C1 engine is mounted on each side of the fuselage. Each engine is controlled by its individual FADEC (two per engine). The engines are rated at 6,442/6,764 lbs of thrust at sea level up to +30°C. Bleed air is extracted from the 8th and 14th stage to meet service and bleed-air requirements.

Fuel

Three main fuel tanks comprise the fuel system. The fuel system consists of two wing tanks and one center tank. Fuel to the center tank may come from the right wing via a gravity flow system if SPPR is unavailable. Additionally, there are two hopper tanks (engine feed bays) that contain electric and motive flow pumps, which provide positive fuel pressure to the engine-driven fuel pump and metering unit. Total fuel capacity is 13,000 lbs. A crossfeed system allows each individual hopper tank to feed both engines.

Electrical

Each engine has three electrical generation units connected to its accessory gearbox. These include a DC generator, an AC alternator, and a permanent magnet alternator (PMA).

A separate DC generator is attached to the APU. All aircraft systems and avionics use DC power except for windshield anti-ice (powered by an engine-driven alternator) and FADEC/ignition systems (powered by an engine-driven permanent magnet alternator PMA). The FADECs may also be powered by main or emergency DC power; however, ignition can only be powered by the PMA. Two 44-ampere-hour nicad or lead acid batteries provide limited power to the aircraft for both normal and emergency operation. A small 28-volt lead acid battery pack is installed in the nose compartment as a backup power source to certain standby instruments. Two additional NI-CAD battery packs provide power for the emergency exit lights.

Hydraulics

Hydraulic power is produced by two engine-driven hydraulic pumps. Each is an independent system that does NOT share fluid. However, each system is linked for energy transfer purposes through a power transfer unit. This system allows the “A” system to be powered by the “B” system in the event the “A” system hydraulic pump becomes inoperative. An additional standby electric pump will power the “A” system in the event the PTU has failed. If the “B” system has failed, a rudder standby system will provide power to the lower rudder. Certain systems are powered solely by either the “A” or “B” system. Some components are powered by both the “A” and “B” systems, which allow that system to operate even if one of the hydraulic systems has failed. The landing gear and brakes are normally powered by the “A” system. Should the “A” system fail, the gear and brakes can be operated using high-pressure nitrogen (emergency pneumatic operation).

Flight Controls

The ailerons, elevator, lower rudder, and roll spoilers are all hydraulically powered. Power Control Units (PCU) are small, self-contained hydraulic variable position actuators. Input from the flight controls causes a small valve within the PCU to move which then directs hydraulic fluid to a small actuator within the PCU which moves the control surface. The PCUs are mounted in pairs on the ailerons, elevators and lower rudder while a single PCU is mounted to each of the speedbrakes and roll spoilers.

Pitch Roll Disconnect

Ailerons and roll control spoilers are actuated together though a mechanical linkage. If either system should become mechanically jammed, the system may be separated. Once separated, the pilot retains control of the ailerons while the copilot retains control of the roll spoilers. If a jam occurs in the pitch system, the elevators can be separated. When disconnected, the pilot controls the left elevator and the copilot controls the right elevator. A pitch-roll disconnect handle is used for recovery of the axis that is not jammed and to separate the pilot and copilot controls in the event of a jammed control.

Rudders

Pedal inputs by the pilot or copilot are transmitted to both the upper and lower rudder systems. The upper rudder will only respond to the rudder pedal inputs if the flaps are extended. The lower rudder is hydraulically controlled by two PCUs. If one PCU should fail, the rudder will still operate normally. Should both hydraulic systems fail, the rudder standby system will provide power to the "B" system PCU using trapped "B" system fluid. The upper rudder is electric and receives input from the yaw stability augmentation system. The lower rudder receives input from the Flight Guidance System.

Environmental

Two pressurization air conditioning units (PACs) are located in the tail cone. The PACs route hot and cold air into the cabin and cockpit to ensure a constant source of air for pressurization and temperature control needs. There are three methods for controlling pressurization: NORM, ALT SEL, and MANUAL.

Ice and Rain Protection

The anti-ice systems are designed to prevent ice formation on the pitot tubes, static ports, angle-of-attack probes, ram air temperature (RAT) probes, engines, wings, wing roots, horizontal stabilizer leading edges, windshields, landing lights and overboard water drain lines. The vertical stabilizer does not require anti-icing. The various anti-icing systems use electrical heating elements or hot engine bleed air, and are activated by switches on the copilot instrument panel.

DC electric power is used to anti-ice the pitot tubes and static ports, the AOA probes, the ram air temperature (RAT) probes, the overboard water drain lines, and the wing root. AC electric power is used for the cockpit windshields and front side windows. High pressure temperature-controlled bleed air, or low pressure bleed air (depending upon whether the airplane is in flight or on the ground, and the position of the throttle levers) is used to anti-ice the engine inlets, inboard wings and the slat leading edges, the horizontal stabilizer leading edges, and the landing lights.

Avionics

The Honeywell Primus 2000 Integrated Avionics system includes five display units and various components and controls. The display units provide various information to the flight crew such as navigation, approach and engine monitoring. The Primus 2000 system incorporates redundant flight guidance computer systems (FGCs) and reversionary modes for enhanced capability. Secondary displays are in the form of a standby instrument panel, which provide backup instrumentation.

EICAS

There are five display units on the cockpit instrument panel. The center unit is the Engine Indication and Crew Alerting System. If a system anomaly occurs, an appropriate message will be displayed to alert the crew of its existence.

Flight Planning

Flight planning information is included in Section VII of the *Operating Manual.*

Weight and Balance

Weight and balance information and limitations are included in Sections II and VI of the *AFM*.

Performance

Performance information associated with takeoff and landing is included in Sections II, IV and VII of the *AFM* and in the FMS.

Optional Equipment

Information on optional equipment is found in the applicable *AFM* Supplement.

LIGHTING

Aircraft lighting is divided into two main categories: Interior and exterior. Interior lighting is divided into cockpit, cabin, and emergency lighting. Some of these systems are considered standard lighting while others are optional lighting systems. Additional information can be found in the *Aircraft Operating Manual* and or the *AFM*.

INTERIOR LIGHTING

Interior lighting is provided for the cockpit, cabin, aft baggage and tail cone compartment. Flood lights and internal gage lighting illuminate all instruments in the cockpit, instrument panel, side consoles, and center pedestal. Luminescent, backlit panel lights illuminate switch functions. Secondary lighting includes rheostat-controlled floodlights, overhead map lights, auxiliary panel lighting and windshield ice detection lights.

Cockpit Flood Lights

Two cockpit floodlights, located overhead near the center of the flight compartment, provide illumination of the cockpit and instrument panels. A single rheostat located on the pilot's lighting control panel, labeled FLOOD LTS, controls the intensity of these lights.

Map Lights

Map lights are located on the left and right forward overhead panel. Their brightness is controlled by rheostats located forward of each circuit-breaker panel. The map lights are independent of the DAY/NITE DIM switch.

Electroluminescent Lights

The control panel's background lighting is provided by electroluminescent light (EL) panels. EL intensity can be controlled using the rheostat labeled EL. EL lights are activated using the DAY/NITE DIM switch on the light panel.

Instrument Lights

There are three knobs associated with control of the instrument panel lights. These control knobs are labeled LH, CTR, and RH PANEL LIGHTS. The LH knob controls dimming for the left hand audio panel, reversionary controller, source controller, display controller, flight guidance control panel, the oxygen supply pressure gauge and the left three display unit bezel controls. It also controls illumination for all standby instruments including the standby compass. The CTR knob controls dimming for both FMS and RMU displays, the flap/slat selector, the CRS/HDG controller, radar and the HF radio controller. The RH controls dimming for the right hand audio panel, reversionary controller, source controller and display controller, the SG/DAU reversionary controller, the pressurization panel, digital temperature display, and the right two display units and APU ammeter gauge, and controller digital readouts. The DAY/NITE dim switch must be turned on before these instrument lighting control knobs are active.

DAY/NITE DIM Switch

The DAY/NITE DIM switch activates the instrument EL lights, ice-detection lights and dims various lights and annunciations in the cockpit for nighttime flight operations.

Auxiliary Panel Lights

These lights illuminate the area under the glareshield and are controlled by the AUX PANEL rheostat knob located just forward of the left circuit-breaker panel.

Cabin Lighting

Cabin lighting includes indirect fluorescent lights, individual passenger reading/table lights, dropped aisle lights, divider lights, cabin door lights, divider lights, cabin door lights, and passenger information signs. Individual reading lights are controlled by the individual control switch located at each seat.

Cabin Entry

Cabin entry lights consist of four overhead lights. Control of the cabin entry lights is accomplished by activation of the cabin entry switch, which is located near the cabin door. Power for the cabin entry lights is provided by the (hot) battery bus.

Master Control Box

The master control box is located in the cabin entry area. The master control box controls the upper and lower indirect lighting, the divider lights, and the aisle (foot well) lights. Once power is removed from the aircraft, all the lights are turned off regardless of switch position.

Passenger Advisory Lights

A three-position switch, located on the exterior light switch panel on the copilot's subpanel, controls the passenger advisory lights. The three modes of the switch are: SEAT BELT, PASS SAFE and OFF. In the SEAT BELT position, the FASTEN SEAT BELT signs in the cabin are illuminated. In the PASS SAFE position, the NO SMOKING, FASTEN SEAT BELT and EXIT signs are illuminated, as well as a RETURN TO SEAT sign visible in the aft area. When the switch is off, all the signs are extinguished. Safety chimes, when installed, operate in conjunction with the NO SMOKING and FASTEN SEAT BELT signs.

Interior Master

Located on the copilot's circuit-breaker panel, the interior master switch controls power to the cabin bus. Should this switch be selected to OFF, the interior power, with the exception of the emergency and exit lighting, will no longer be powered. The interior master switch can also be used to reduce generator loading or shutoff cabin electrical power.

Baggage Compartment Lighting

Overhead lights in the baggage compartment and one light under each pylon make up the baggage compartment lighting. A switch located on the baggage compartment doorframe controls the lights.

Tail Cone Compartment

Two lights illuminate the tail cone area. A single switch controls tail cone lighting. This switch is mounted near the doorframe.

Emergency Lighting

The emergency lighting system consists of two battery packs an inertia switch, four overhead lights, cabin reading lights and another light by the exit hatch. The battery packs are kept charged anytime a DC source is powering the emergency bus. The EMER LT ARM switch controls the emergency lighting system. In the ON position, all emergency lights come on. In the OFF or ON position, an amber light illuminates if main DC power is available. In the ARM position, the lights will come on if the aircraft loses main DC power or a 5 g impact is sustained.

EXTERIOR LIGHTING

The exterior lighting consists of:

- Anticollision lights
- Forward recognition lights
- Ground recognition lights
- Landing lights
- Navigation lights
- Pulse lights
- Tail flood (logo) lights
- Taxi lights
- Under pylon worklights
- Wingtip downwash lights
- Wing inspection lights

Most exterior lights are controlled by switches located on the LIGHTS instrument panel, colocated with the HYDRAULIC switches on the copilot's subpanel. The landing and taxi light switches are found on the center pedestal behind the throttle quadrant.

Anticollision Lights

The anticollision lights are white strobe lights located in the wingtips adjacent to the navigation lights.

The lights are controlled by the GND REC & ANTI-COLL switch located on the exterior light panel.

Recognition Lights

The recognition lights (landing lights) are illuminated at reduced intensity to assist in taxi operations. The lights are controlled by a switch labeled RECOG. The switch is located on the light panel.

Ground Recognition Lights

Two red ground recognition lights are located on the aircraft. One is located on the underside of the tail cone and one is on top of the bullet. They are controlled with a three-position switch located on the exterior light panel. The three-position switch is labeled OFF, GND REC and GND REC & ANTI-COLL.

Landing Lights

The landing lights are located flush on each fixed wing leading edge near the wing root. They are controlled by two switches located on the center pedestal just under the throttle quadrant.

Navigation Lights

Navigation lights are located on each wing tip (left—red, right—green) and a white light is on the aft end of the upper tail. Each navigation light subassembly has two bulbs for redundancy. The navigation lights switch is located on the exterior light switch panel.

Pulse Lights

The Precise Flight, Inc. Pulselite System (optional on 0001-0172 and standard on 0173 and ON) provides pulse sequence for the landing lights. The system is activated by a three-position toggle switch on the light panel labeled OFF–PULSE–RECOG. When the PULSE position is selected and the landing lights are in the OFF position, the pulse sequence is active.

The ON position of the landing lights or the RECOG position of the OFF–PULSE–RECOG switch will override the Pulselite System.

Tail Flood (Logo) Lights

The (optional) tail floodlights are flush mounted on top of the aft portion of each engine pylon. A two-position control switch is located in the lower RH corner of the exterior lighting panel.

Taxi Lights

Two taxi lights are attached to the nose gear strut and one is mounted under each wingtip (downwash lights). These are controlled by a single two-position TAXI switch located next to the landing light switches. Taxi lights operate on the ground only, due to squat switch logic.

Wing Inspection Lights

Wing inspection lights illuminate the forward portion of each wing so the pilot can detect ice build up on the wings during night flights. The lights are controlled with a two-position switch located on the anti-ice panel.

AVIONICS

The Primus 2000 avionics package (the total system) has several levels or phases available. A phase depends upon aircraft production serial number or, if available, service bulletin:

- Phase 4—Basic level of software
- Phase 5—Added anti-ice ON messages and increased oil pressure for S/N 750–0080 and on
- Phase 6—Supports aileron regearing of flight controls and PFD changes for S/N 750–0150 and on
- Phase 6A—Supports EICAS changes and increased oil pressure indications
- Phase 7—Supports EICAS changes and increased aircraft weights for S/N 750–0173 and on

FlightSafety simulator configurations:

- KICT No. 1—Phase 5, IRS, EGPWS, split bus electrical
- KTOL No. 2—Phase 4, AHRS, EGPWS, non-split bus electrical

- KCMH No. 3—Phase 6A, IRS, EGPWS, split bus electrical
- KICT No. 4—Phase 7, IRS, EGPWS, split bus electrical

NOTE

KICT No. 1 moving to KMCO in late 2003.

IRS

The STBY PWR switch must be ON in order to apply power to the IRS mode panel on the ground.

Use ALIGN or NAV for a ground alignment. Do not taxi until the alignment is complete and the mode knob is in NAV.

If an IRS fails in flight, an airborne attitude alignment may be possible. Fly in straight and level flight, and position the knob to ATT. ALIGN appears on the mode panel. In about 20 seconds, a useable attitude should be present; however, the heading will show 360°. Push NAV, POS SENSORS, IRS STATUS and enter the magnetic heading from the opposite IRS.

NOTE

If an attitude alignment is successful, the autopilot may be used provided IRS REV is not selected on either side. Any time IRS REV is selected, autopilot use is prohibited.

After flight and the aircraft is chocked or the parking brake is set, turn the IRS to OFF and wait for the ALIGN light to go out before turning off STBY PWR or AVIONICS. Failure to shutdown the IRS properly may result in degraded performance.

FMS

Position initialization and sensor deselection must be done on each FMS control panel. These functions do not transfer between FMS units, regardless of the FMS operating mode.

APPROACHES

The FMS automatically selects the sensor to be used based upon availability and accuracy. GPS is at the top of the list, followed by DME/DME, then VOR/DME and finally IRS. IRS is never used for FMS approaches.

ILS, LOC, BC, SDA and LDA approaches shall not be flown using FMS guidance. The FMS will not enter the approach mode.

Only the approaches within the FMS NAV database may be flown when using FMS as the NAV source. Pilots shall not create an instrument approach. If the chart title includes the word "or" (e.g., VOR or GPS), the ground station does not have to be operational. If the chart title does not include the word "or," that ground station must be operational.

RAIM is required for GPS approaches. Predicted availability at destination ETA is checked by pushing NAV, POS SENSORS, GPS STATUS, PRED RAIM. Selecting DEST prompt will show RAIM availability 15 minutes either side of ETA. The absence of RAIM only means GPS cannot be used; the FMS may be able to achieve approach criteria using DME/DME or VOR/DME.

If an RNAV approach does not authorize use of DME/DME (shown in notes section), the pilot must deselect the VOR/DME sensors. Push NAV, POS SENSORS, VOR/DME, then DELETE any one of the frequencies on both the VOR/DME 1, and VOR/DME 1 and VOR/DME 2 pages.

The FMS must enter the approach mode by 2 nm prior to the final approach fix. This is indicated by the cyan APP to the left of the HSI. The APRCH light or annunciation will also illuminate on the FMS CDU.

The MISSED APPROACH prompt or go-around button must not be pushed during an FMS approach prior to an actual missed approach. Doing so will terminate the approach mode.

FMS approaches do not require the use of VNAV. Currently (June 24, 2002), the *FMS AFM Supplement* limits the use of VNAV to enroute and terminal (arrivals and departures) operations. VNAV is not approved for approach (advisory only)!

FLIGHT DIRECTOR

The M TRIM (Mach trim) button has no function.

Dual-Coupled Approach

When both NAV radios are tuned to the same ILS, LOC and GS are engaged, and the radar altitude is below 1,200 feet AGL, the flight director goes into the dual-coupled approach mode. Both FGCs are using shared information from both NAV radios to provide steering commands. This is indicated by the PFD SEL button showing both A and B lights illuminated and the green arrow in the top of each PFD pointing both directions. In the event one NAV radio signal is lost, steering commands remain valid from the operative side's NAV radio and FGC, even though the side with the failed radio may show red flags over the CDI and/or GS indicator.

Lateral Modes vs. Navigation Source

NAV Arms or engages to the selected NAV source (LOC, VOR or FMS). Does not arm GS if source is LOC.

APP If source is VOR, arms or engages with increased sensitivity for better guidance.

If source is LOC, arms or engages both LOC and GS. LOC must be engaged before GS will engage.

Prior to Phase 6, if source is FMS without PREV source (above PFD) selected, this button is nonfunctional. With PREV source selected, the active NAV radio source previewed will be armed, and the NAV source will change to short range if capture occurs.

Phase 6 and on, if source is FMS without PREV source (above PFD) selected and VNAV is engaged, this button arms VGP. This allows the aircraft to descend on the FMS angle while the altitude alerter is preset to a higher altitude. The FMS must be in its approach mode (cyan APP to left of HSI). With PRE NAV source selected, the active NAV radio source previewed will be armed, and the NAV source will change to short range if capture occurs.

NOTE

Use of VNAV currently not authorized during approaches.

BC If source is LOC or if source is FMS with LOC previewed, it arms or engages the back course guidance. Button is nonfunctional with VOR frequencies. GS is not armed.

With a lateral mode engaged (other than HDG), changing the navigation source (pushing NAV or FMS button above the PFD or changing the active NAV radio frequency) will cause the lateral mode to disengage and result in an amber LATERAL MODE OFF and possibly a VERTICAL MODE OFF message.

FAILURES

MADC

MADC failure is shown as a red X in airspeed and altimeter and a red VS flag in vertical speed indicator. Use ADC REV button on faulty side to regain information (Figure AS-2).

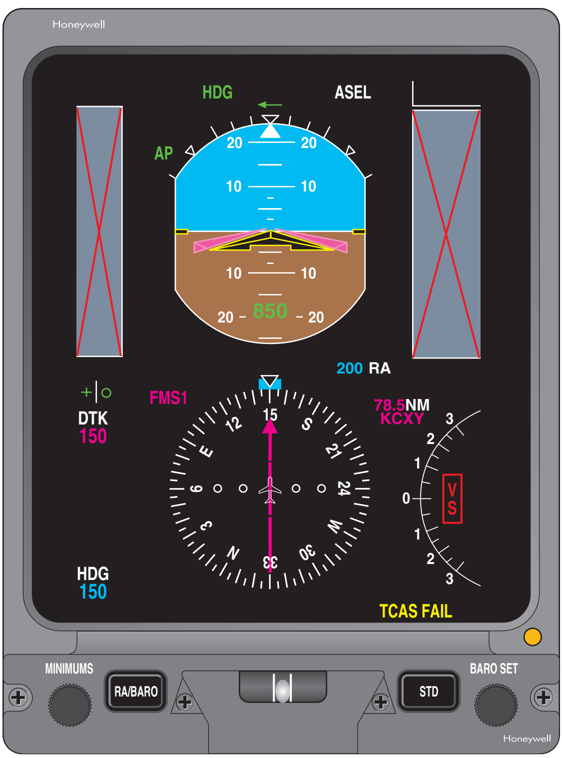

Figure AS-2. MADC Failure

Failure of an MADC results in FADEC FAULT messages, loss of the preset altitude alerter, and possibly the loss of altitude input to transponder. After ADC REV is selected, reenter altitude preset value and ensure transponder is selected to the operative MADC.

Attitude and/or Heading

Attitude and/or heading failure is shown with red ATT FAIL and HDG FAIL flags (Figure AS-3).

AHRS aircraft must press AHRS REV button on faulty side to regain any information (autopilot operation is prohibited with a single AHRS displayed).

Figure AS-3. ATT Failure

IRS aircraft may either:

1. Use IRS REV button on faulty side to regain information (autopilot operation is prohibited with a single IRS displayed)

   or

2. Attempt to realign the platform and heading using the ATT mode on the IRS panel.

Miscompares

Miscompare annunciators (in amber boxes) appear on the PFD. In the case of LOC or GS, ensure both NAV radios are tuned correctly. In the case of IAS or ALT, a cyan FGC–ADC MISCMP message may appear. This will usually cause an abnormal autopilot disconnect with a loss of lower yaw damping and mach trim. These can be regained only after ADC REV is selected.

ELECTRICAL—SPLIT BUS

DESCRIPTION AND OPERATION

General

The DC electrical system is supplied by two engine-driven generators, two 44 ampere-hour nicad or lead acid batteries, an APU-driven generator, and an external power connector (Figure AS-4). The engine-driven generators are rated at 400 amps at 28.5 volts to FL410 and 300 amps above FL410. The APU generator is rated at 300 amps on the ground and 200 amps in flight. The main aircraft batteries are supplemented by a 2.5 ampere-hour, 28-volt lead-acid power pack located in the nose compartment which is a backup source of power for the standby instruments. AC-powered equipment consists of windshield heat (powered by an engine-driven alternator) and FADEC/ignition (powered by a Permanent Magnet Alternator–PMA). The FADECs may also be powered by main or emergency DC power; however, ignition can only be powered by the PMA.

The left and right engine-driven generators operate independently. There is no load paralleling. The APU generator will not come on line or will drop off line if the right engine-driven generator is on line. The left and right feed buses may be connected through a crosstie relay. The crosstie relay is closed on the ground during initial power-up and then opens automatically

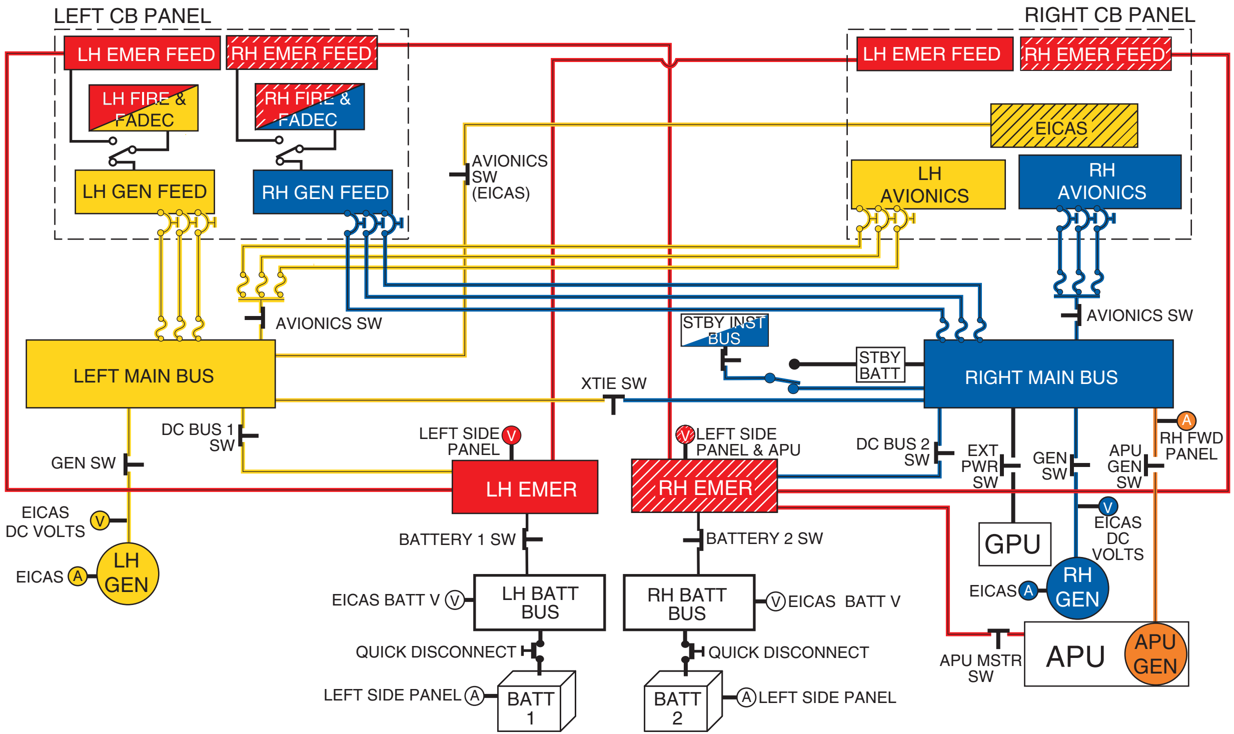

Figure AS-4. Electric Flow Schematic—Split Bus

when the second engine-driven generator comes on line after engine start. In the event a generator overcurrent causes a generator to be automatically shutoff, the crosstie relay will be latched open and cannot be selected closed.

The items powered on the left hot battery bus are as follows:

- Left battery bus No. 1
- Left battery sense No. 1
- Entry lights
- Toilet service lights
- Baggage compartment lights
- Tail cone lights
- External underside pylon work lights

Items powered on the right hot battery bus are as follows:

- Right battery bus No. 2
- Right battery sense No. 2
- Nosewheel steering accumulator relief button
- Single-point refueling panel lights

Items powered on emergency buses are shown in Table AS-1:

From a cockpit perspective remember that the slats/flaps, primary trim, thrust reversers, nosewheel steering, and antiskid are not on the emergency buses. All anti-ice valves will fail open and the pressurization will revert to manual control. Center tank fuel transfer, crossfeed, and gravity crossflow will continue if selected prior to the electrical power loss to the emergency buses. Air traffic control will lose your transponder unless you have it as an option on the left emergency bus, and no external identification lights will be operational.

Left and right circuit-breaker panels are shown in Figures AS-5 and AS-6.

Table AS-1. SPLIT BUS—ITEMS POWERED ON EMERGENCY BUSES

LEFT EMERGENCY BUS	RIGHT EMERGENCY BUS
AHRS OR IRS 1 AUX POWER	A AUX PUMP
AILERON TRIM	AHRS OR IRS 2 AUX POWER
AUDIO AMP 1	APU PWR/ECU/FIRE DET & EXT
AUX PANEL LIGHTS	AUDIO AMP 2
BATTERY 1 AMMETER	BATTERY 2 AMMETER
L & R FADEC A	HF 1
L BLEED PRECOOLER	L & R FADEC B
L EMER LIGHTS	LANDING GEAR
L F/W SHUTOFF	LOWER RUDDER LIMITER B
L FIRE DET & EXT	MADC 2
L FUEL BOOST PUMP	R BLEED PRECOOLER
L START LOGIC	R EMER LIGHTS
L W/S A/I CONTROLLER	R F/W SHUTOFF
LOWER RUDDER LIMITER A	R FIRE DET & EXT
MADC 1	R START LOGIC
PITCH FEEL	RUDDER TRIM
RMU1/COM & NAV	SEC STAB TRIM
STANDBY NAV & COM	STANDBY P/S HEAT
TRANSPONDER 1	UPPER RUDDER YAW DAMP B
UPPER RUDDER YAW DAMP A	WARNING AUDIO 2
WARNING AUDIO 1	

COCKPIT INDICATIONS

EICAS electrical page displays left and right engine-driven voltage (DC VOLTS) and amperage (DC AMPS). It also displays left and right battery temperature (nicad only) and voltage. EICAS battery voltage (BATT V) will be the highest voltage on the left or right battery bus. The APU panel displays the highest voltage on the right emergency bus. The battery amp and volt indicator on the pilot's left side panel displays left and right battery amperage, and the highest voltage on the left or right emergency bus as selected by the toggle switch.

The left and right hand emergency bus voltage and battery amperage is displayed on the left hand electrical side panel (Figure AS-5).

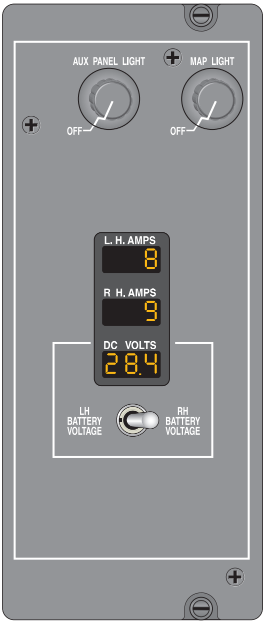

Figure AS-5. LH Electrical Side Panel

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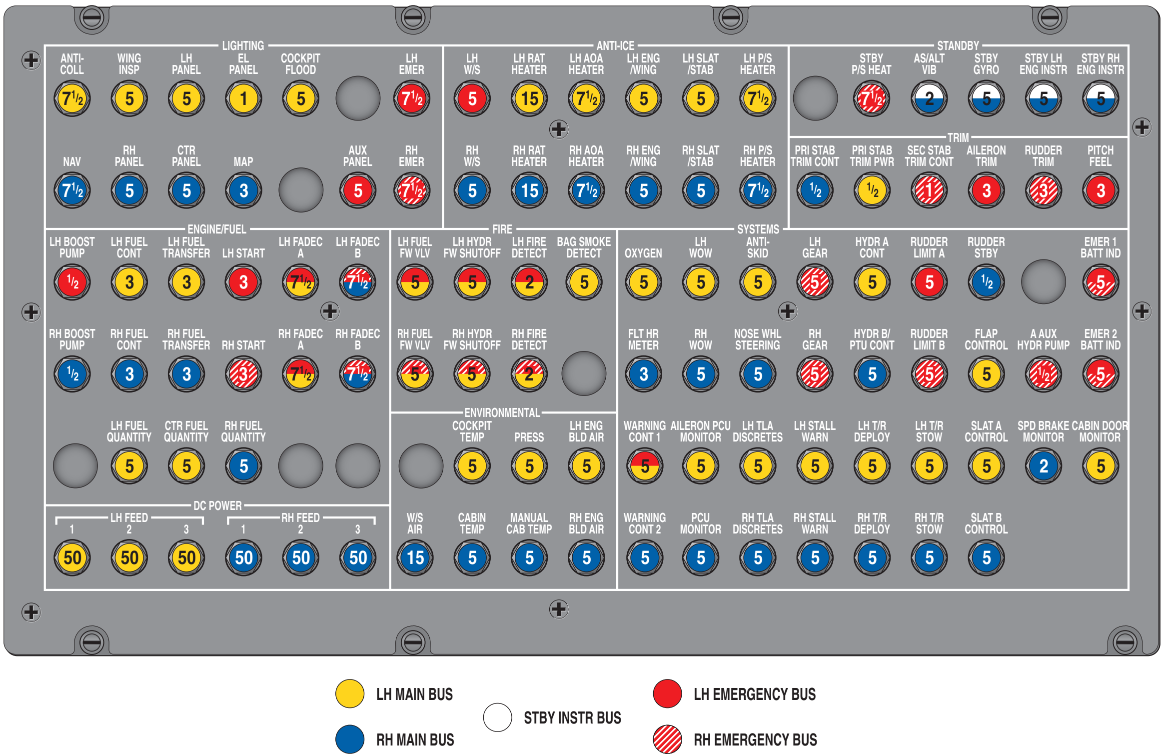


Figure AS-6. Split Bus—Left Circuit-Breaker Panel

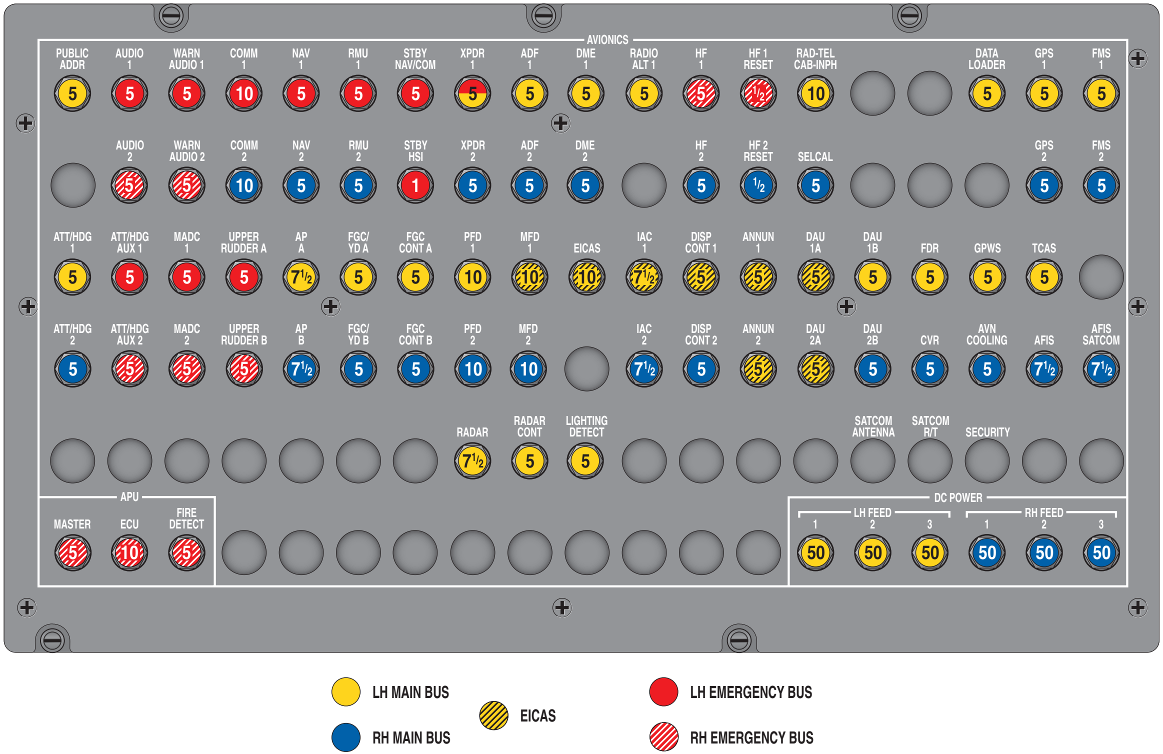


Figure AS-7. Split Bus—Right Circuit-Breaker Panel

ELECTRICAL—NONSPLIT BUS

DESCRIPTION AND OPERATION

General

The DC electrical system is supplied by two engine-driven generators, two 44 ampere-hour nicad or lead acid batteries, an APU-driven generator, and an external power connector (Figure AS-7). The engine-driven generators are rated at 400 amps at 28.5 volts to FL410 and 300 amps above FL410. The APU generator is rated at 300 amps on the ground and 200 amps in flight. The main aircraft batteries are supplemented by a 2.5-ampere-hour, 28-volt lead acid power pack located in the nose compartment which is a backup source of power for the standby instruments. Except for the windshield anti-ice, which is powered by two engine-driven alternators, there is no AC power system. All three generators may be operated individually or in any combination with load sharing but not paralleling. At least one battery switch must be on to operate the APU. The APU generator supplies 28.5-volts power to the crossfeed bus and through the 275-ampere current limiters to the main buses.

A load-shed switch controls a bus isolation relay which connects the crossfeed and emergency buses into one functional bus. In the normal position, the isolation relay is closed on the ground. If any one generator is on line in flight, the isolation relay is closed allowing normal power distribution from any on line source to all airplane systems. With the load-shed switch in the NORM position, and all three generators off line, the bus isolation relay will automatically open (loadshed) approximately 70 seconds after the last generator went off line. This will remove all power from the crossfeed bus, leaving both batteries to supply power to the emergency bus. Selecting the load-shed switch to EMER will manually open the bus isolation relay on the ground or in flight. The O'RIDE position will close the bus isolation relay allowing the batteries to power all buses with no generators on line. With the load-shed switch in override and all generators off line, battery endurance will be approximately 30 minutes.

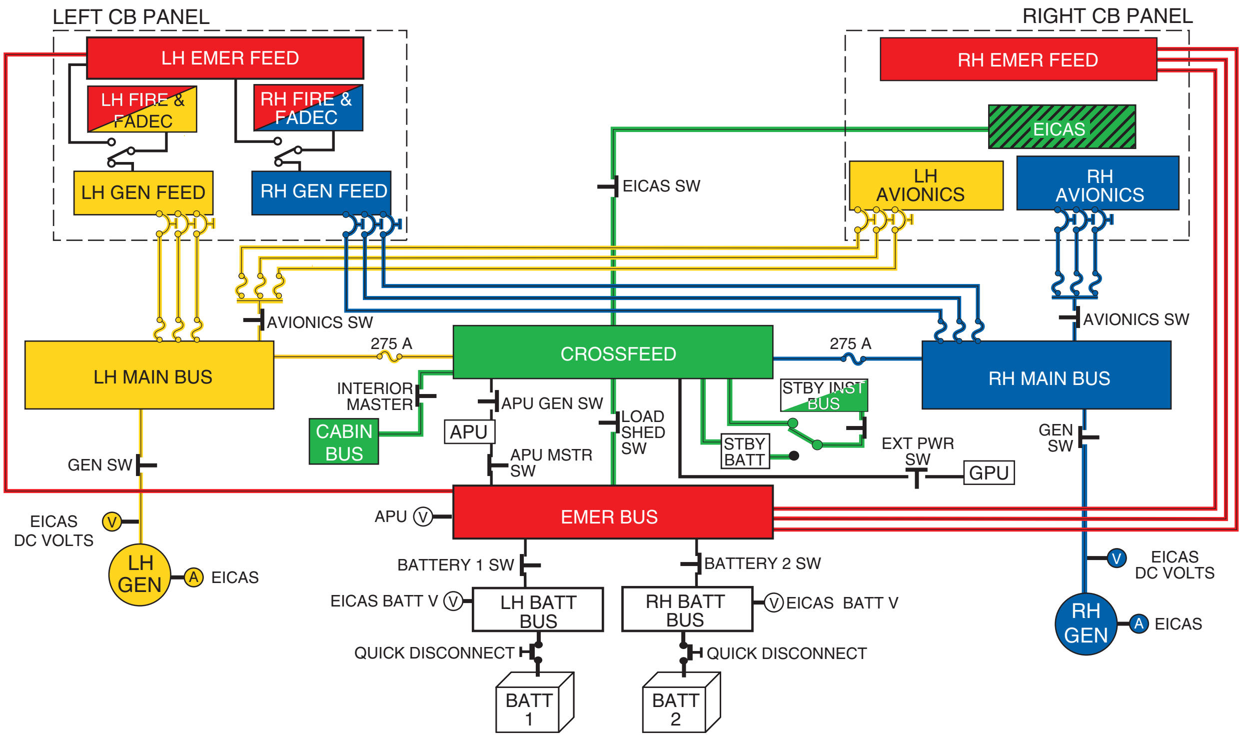


Figure AS-8. Electric Flow Schematic—Non-Split Bus

The items powered on the left hot battery bus are as follows:

- Left battery bus No. 1
- Left battery sense No. 1
- Entry lights
- Toilet service lights
- Baggage compartment lights
- Tail cone lights
- External underside pylon work lights

Items powered on the right hot battery bus are as follows:

- Right battery bus No. 2
- Right battery sense No. 2
- Nosewheel steering accumulator relief button
- Single-point refueling panel lights

Items powered on the emergency bus are shown in Table AS-2:

From a cockpit perspective, remember the slats/flaps, primary trim, thrust reversers, nosewheel steering, and antiskid are not on the emergency bus. All anti-ice valves will fail open and the pressurization will revert to manual control. Center tank fuel transfer, crossfeed, and gravity crossflow will continue if selected prior to the electrical power loss to the emergency bus. Air traffic control will lose your transponder and no external identification lights will be operational.

Left and right circuit-breaker panels are shown in Figures AS-9 and AS-10.

COCKPIT INDICATIONS

The EICAS electrical page displays left and right engine-driven generator voltage and amperage. It also displays left and right battery temperature (nicad) and voltage. The battery voltage will be the highest voltage only on the left or right battery bus. The APU panel displays the highest voltage on the emergency bus.

Table AS-2. NONSPLIT BUS—ITEMS POWERED ON EMERGENCY BUS

POWERED ON THE EMERGENCY BUS	
A AUXILIARY PUMP	LEFT & RIGHT START LOGIC
AHRS OR IRS 1 AND 2 AUXILIARY POWER	LEFT FUEL BOOST PUMP
AILERON AND RUDDER TRIM	LEFT W/S A/I CONTROLLER
APU PWR/ECU/FIRE DET & EXT	LOWER RUDDER LIMITER A AND B
AUDIO AMP 1 AND 2	MADC 1
AUX PANEL LIGHTS	PITCH FEEL
LANDING GEAR	RMU1/COM AND NAV
LEFT & RIGHT BLEED PRECOOLER	SECONDARY STAB TRIM
LEFT & RIGHT EMERGENCY LIGHTS	STANDBY NAV AND COM
LEFT & RIGHT F/W SHUTOFF	STANDBY P/S HEAT
LEFT & RIGHT FADEC A AND B	UPPER RUDDER YAW DAMP A AND B
LEFT & RIGHT FIRE DETECTION & EXTINGUISHER	WARNING AUDIO 1 AND 2

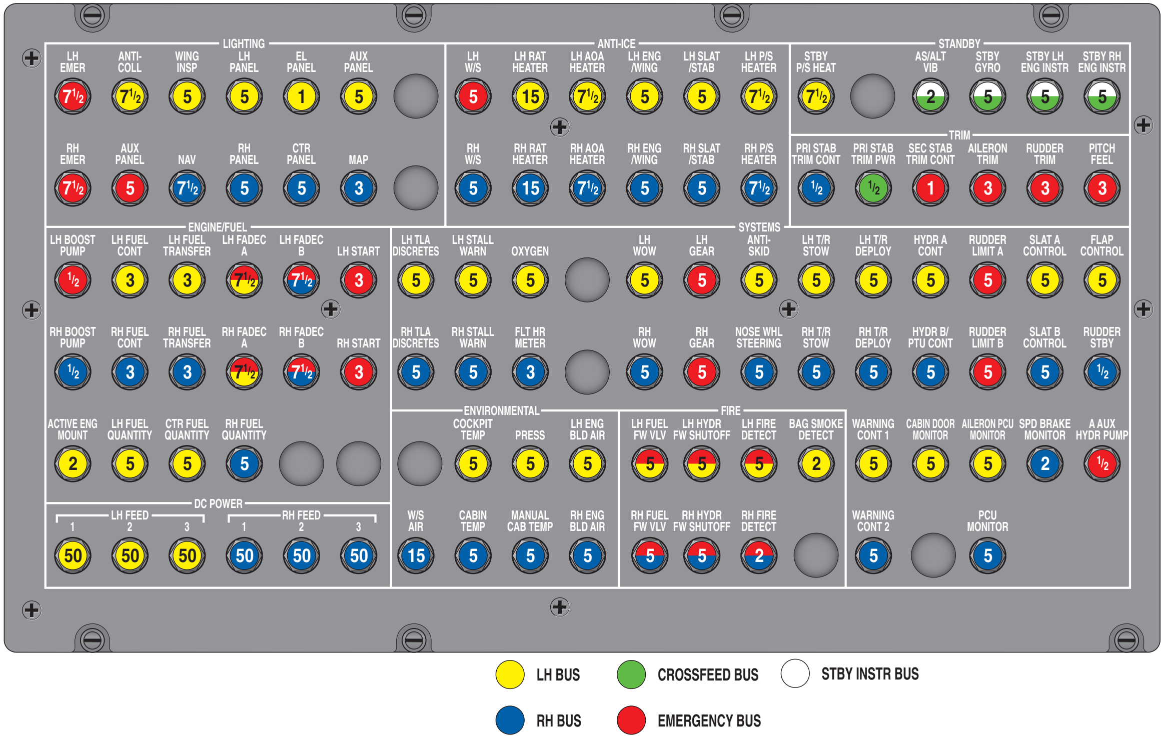
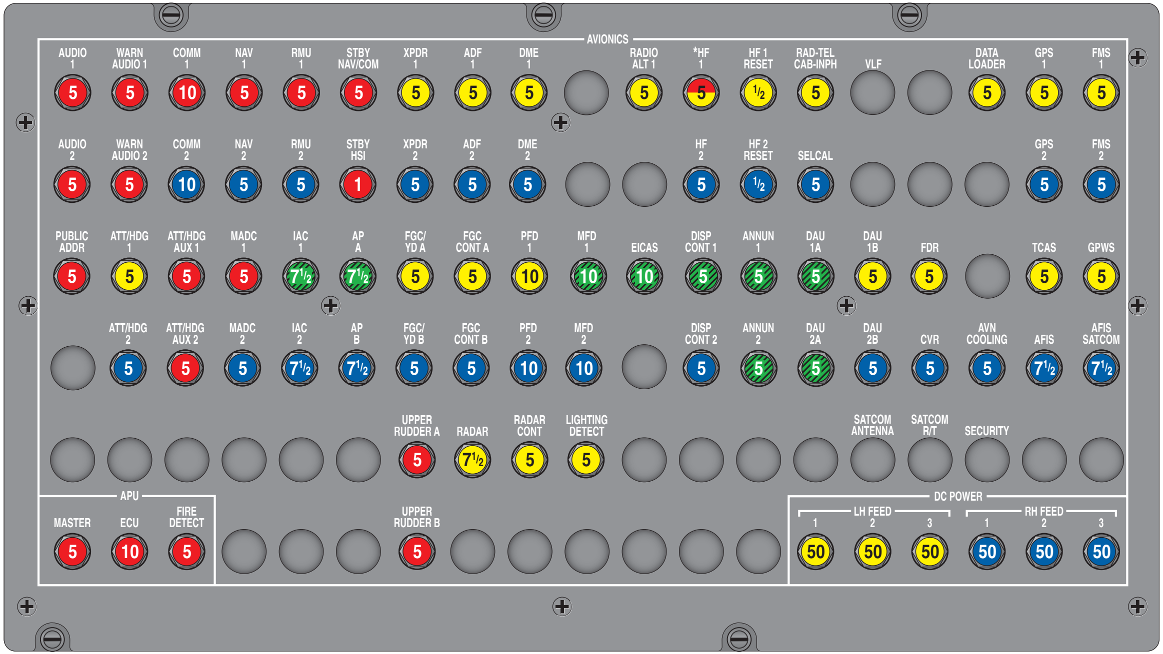


Figure AS-9. Non Split Bus—Left Circuit-Breaker Panel



LH AVIONICS BUS
RH AVIONICS BUS
EICAS BUS
EMERGENCY BUS
*HF 1 SN 0023 - 0100

NOTE: EMERGENCY BUS AVIONICS REQUIRE THE AVIONICS POWER SWITCH TO BE ON OR, ALTERNATLEY, THE LOAD SHED SWITCH TO BE IN EMER POSITION.

Figure AS-10. Non Split Bus—Right Circuit-Breaker Panel

AUXILIARY POWER UNIT (APU)

DESCRIPTION AND OPERATION

General

The tail-mounted Garrett APU provides bleed air and 28.5 voltage for ground and in-flight use. The maximum altitude for starting the APU is 31,000 feet. The APU control panel is located on the copilot's right side panel. APU fuel flow is approximately 120 to 150 pounds per hour.

COCKPIT INDICATIONS

During the APU test the following indications should occur:

- 49% N_1
- 500°C EGT
- Ready to load light
- Bleed valve open light
- APU relay engaged light
- APU fail light
- APU fire light

If the avionics power is on during the test, the master warning, APU fire (red CAS message) and the fire bottle low APU (cyan CAS message) will illuminate.

The APU amperage can only be found on the APU ammeter on the copilot's right instrument panel. APU RPM & EGT are available on the EICAS display selections on the MFDs as well as on the APU control panel.

The APU will abort the start or shutdown at the following limits:

- Overspeed—Above 108% rpm
- Overtemperature—Above 718°C
- Overcurrent—Above 400 amps

- Low oil pressure—Below 31 psi
- High oil temperature—Above 163°C
- No acceleration
- After start sequence initiated
- No EGT
- Loss of EGT indication
- Loss of turbine indication
- APU fire

An APU fire detection system will illuminate the APU fire annunciator switch and shutdown the APU. If the EICAS is on, the APU FIRE red CAS message and Master Warning lights will illuminate. Pressing the APU fire switch will discharge the APU fire extinguisher and, if not already shutdown, will shutdown the APU. The fire extinguisher will not discharge automatically.

The APU is not approved for unattended ground operations. There is a remote shutdown button for the APU located in the tail cone compartment. If utilizing the MAX COOL position on the APU, the bleed air that normally flows only through the cabin PAC valve is now being routed directly to both the cockpit and cabin PAC.

ENVIRONMENTAL SYSTEMS

PNEUMATICS AND PRESSURIZATION

Pressurization and environmental control bleed air is engine-supplied low pressure (LP), high pressure (HP), or onboard APU bleed air (or external ground cart air on the ground). All three onboard sources or any combination can be used on the ground or in flight. APU maximum altitude is FL310. Bleed air and environmental system control is provided in the environmental control panel on the right tilt panel (Figure AS-11).

The L–R ENG BLD AIR switches control engine bleed-air firewall shutoff valves. In the OFF position, both valves are energized closed and no bleed air is supplied from that engine to

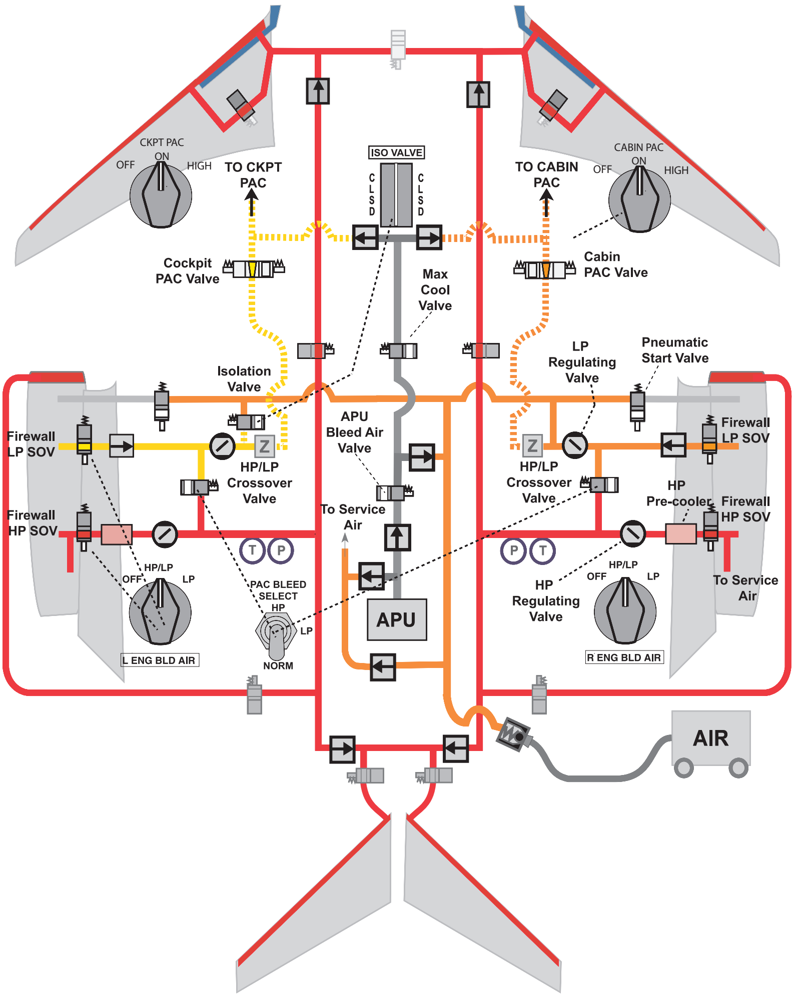


Figure AS-11. Pneumatic System

pressurization/environmental or anti-ice systems. In the LP position, only the LP valve is open and HP bleed air will not be supplied. In the normal HP/LP position, both valves are open and LP and HP air are supplied as required.

With the engine bleed switches in the HP/LP position, actual PAC (pneumatic air conditioning) bleed source is a function of the PAC BLEED SELECT switch (located on the pressurization control panel). If the PAC BLEED SELECT switch is in HP, the HP/LP crossover valves are opened, and both HP and LP bleed air are supplied through the bilevel flow control valves to the PACs. A white PAC HP VLV OPN L–R message is displayed in the CAS area when the crossover valves are open. In the LP position, the HP/LP crossover valves are closed, and only LP air is supplied. In the NORM position, the HP/LP crossover valves operate automatically, and are a function of throttle lever angle (TLA), weight-on-wheels (WOW), gear handle position, and anti-ice switch position. With WOW and low TLA (below 30°), the crossover valves open, allowing both HP and LP air to the PACs. With WOW and TLA above 30°, the crossover valves close and only LP air is supplied. Airborne with the gear handle up, crossover valve position depends upon TLA only: above 30° the valves close; below 30° the valves open. With the gear handle down or any bleed-air anti-ice switch on, the crossover valves remain closed, regardless of TLA. With bleed-air anti-ice systems selected on while on the ground (with WOW), system logic will close the crossover valves when TLA is below 30° to supply those surfaces with HP bleed air. As TLA is advanced above 30° for T/O, the crossover valves will open, the HP firewall shutoff valve will close, and LP air will be supplied to both PACs and bleed-air anti-ice surfaces. When airborne, the crossover valves close and the HP firewall shutoff valves reopen (Table AS-3).

The pressurization control panel on the right tilt panel allows the selection and control of normal (automatic), cabin altitude select mode (semiautomatic), and manual mode. Isobaric cabin altitude selection in the altitude select mode, or landing altitude selection in the autoschedule mode, is available by using the altitude knob on the selector. The system also provides maximum differential pressure limit and maximum cabin altitude limit protection.

With both control switches set to NORM, the system will power up in normal auto schedule mode, from which the cabin altitude is determined automatically by logic in the cabin pressure controller. The logic in normal mode considers landing gear status, throttle position, cabin altitude, airplane altitude and selected landing altitude in order to determine the appropriate cabin altitude. The crew may control the cabin altitude

Table AS-3. PAC BLEED SELECT SWITCH MATRIX

PAC BLEED SEL SWITCH	TLA	WOW	GEAR HANDLE	ANTI-ICE	HP/LP CROSSOVER VALVE POSITION
HP	N/A	N/A	N/A	N/A	Open
LP	N/A	N/A	N/A	N/A	Closed
NORM	<30°	Yes	Down	Off	Open
NORM	>30°	Yes	Down	Off	Closed
NORM	<30°	No	Up	Off	Open
NORM	>30°	No	Up	Off	Closed
NORM	N/A	No	Down	N/A	Closed
NORM	N/A	No	N/A	On	Closed
NORM	<30°	Yes	Down	On	Closed
NORM	>30°	Yes	Down	On	Open*

*HP firewall shutoff valve closes during T/O roll

by selecting the ALT SEL–NORM switch to ALT SEL, and selecting cabin altitude using the altitude knob on the selector. If MANUAL mode is selected using the MANUAL–NORM switch, the automatic modes ALT SEL–NORM are bypassed and the manual control UP–DOWN–ON valve (CHERRY PICKER) is used as the interface for the crew to select cabin altitude. The manual RATE knob determines the climb/descent rate, which is displayed on the CABIN rate-of-climb/descent gauge. The transfer between normal and manual mode can be made at any time with no adverse effect on cabin pressure control. The system should normally be operated in the NORM mode on both switches, and the cabin altitude selector should be set to the landing elevation.

In the automatic modes (NORM and ALT SEL) the controller drives the primary outflow valve by modulating an electrically-driven transfer valve, and the secondary valve follows the primary by virtue of them being connected by an air line. The primary outflow valve's vacuum supply is provided by the air ejector, mounted on the left side of the tail cone, and is driven by the service air system, which operates on HP bleed air from one or both engines, or the APU bleed air. Each outflow valve has an altitude limit control valve that drives the outflow valve closed when the maximum cabin altitude of 14,250 feet MSL (±750 feet).

Each outflow valve also has an overpressurization relief valve that drives the outflow valve open when cabin pressure exceeds 9.5 psi differential. In NORM, the electronic controller limits the cabin pressure to 9.3 psi differential.

In ALT SEL mode, the crew selects the cabin altitude and the cabin altitude rate-of-change on the selector. A “pip” mark on the rate selector provides normal cabin altitude rate changes of approximately 500 feet per minute up and 300 down. Before landing, the crew selects destination field elevation, and the controller adjusts cabin pressure to land with minimum pressure differential.

A critical fault detected in the electronic portion of the cabin pressure control system or loss of main DC electrical power causes the system to automatically switch over to manual mode. Any time the normal mode of operation is faulted, the FAULT lamp on the selector is illuminated.

Emergency depressurization is available by selecting the red-guarded CABIN DUMP switch. The CABIN DUMP position causes the outflow control valves to fully open, releasing cabin pressure and allowing cabin altitude to equalize with airplane altitude up to 13,000 feet MSL (±1,500 feet). Depressurizing can also be accomplished by selecting MANUAL, MAX RATE, and CHERRY PICKER UP (bypassing the controller), or by selecting the L and R ENG BLEED AIR switches to OFF.

In NORM mode, during ground operations, the outflow valves are open. The crew selects the landing field elevation on the controller. During takeoff roll, the cabin pressurizes slightly (field elevation minus 200 feet). Once airborne, pressurization is controlled automatically by the electronic controller and is in the flight mode. When the landing field barometric pressure is set into the altimeter prior to landing, the data is provided to the controller and landing cabin altitude is computed. The system enters the landing mode (with WOW and both throttles below 70% N_1), and the outflow valves are opened at the preselected rate. After one minute, the system enters the ground mode, and both outflow valves open fully. If, upon landing, the cabin altitude is below actual field altitude, the system will automatically raise the cabin altitude at a rate of 500 feet per minute for one minute, or until the cabin becomes unpressurized. After one minute, any remaining cabin pressure is dumped at a rate of 2,000 feet per minute.

The pressurization system is capable of holding the cabin altitude to 8,000 feet while flying at 51,000 feet (9.3 psi differential). Sea level cabin pressure altitude can be maintained up to approximately 25,000 feet with ALT SEL selected. At flight altitudes less than 34,000 feet, a lower cabin altitude can be attained using ALT SEL rather than NORM. Above 34,000 feet, maximum cabin pressure differential of 9.3 psi is maintained, regardless of controller mode selected.

Some capacity in holding maximum pressure differential is lost when the throttles are retarded, anti-ice systems are on, and LP is selected with the PAC BLEED SEL switch. If cabin altitude rises above approximately 8,500 feet, an amber CABIN ALTITUDE CAS message is triggered. Should cabin altitude exceed approximately 10,000 feet, a red CABIN ALTITUDE message is presented.

AIR CONDITIONING

The air distribution system directs the flow of heated air, cooled air, and/or fresh air to the cabin and cockpit for environmental comfort (Figure AS-12). Outlets are located overhead, in the armrests, and at the floor level, including foot warmers in the cockpit, and are positioned to assist in windshield defogging. Instrument panel cooling is accomplished by circulating ambient cockpit air behind the instrument panel. Two fans, located below the glareshield, pull cooling air across the electronic equipment behind the instrument panel, and assist in defogging the windshield. Circulating outside air over the avionics equipment cools the avionics compartment. A fan located in the forward avionics bay, controlled by the W/S AIR switch, achieves this. In NORM, the fan automatically activates when required for cooling. Selecting ON increases fan speed and is used to remove rain or condensation from the windshield on the ground.

The CKPT PAC and CAB PAC switches control the environmental control system air cycle machines. The OFF position closes the bilevel flow control valve, shutting off engine bleed and normal APU bleed flow to that PAC (and to pressurization). The ON position supplies normal airflow rate. The HIGH position supplies an increased flow rate for improved heating or cooling. A valve controlled by the ISOL VALVE switch connects the left and right bleed-air lines to the PACs. When in the CLSD position, the forward (cabin) PAC is operated with right-engine bleed

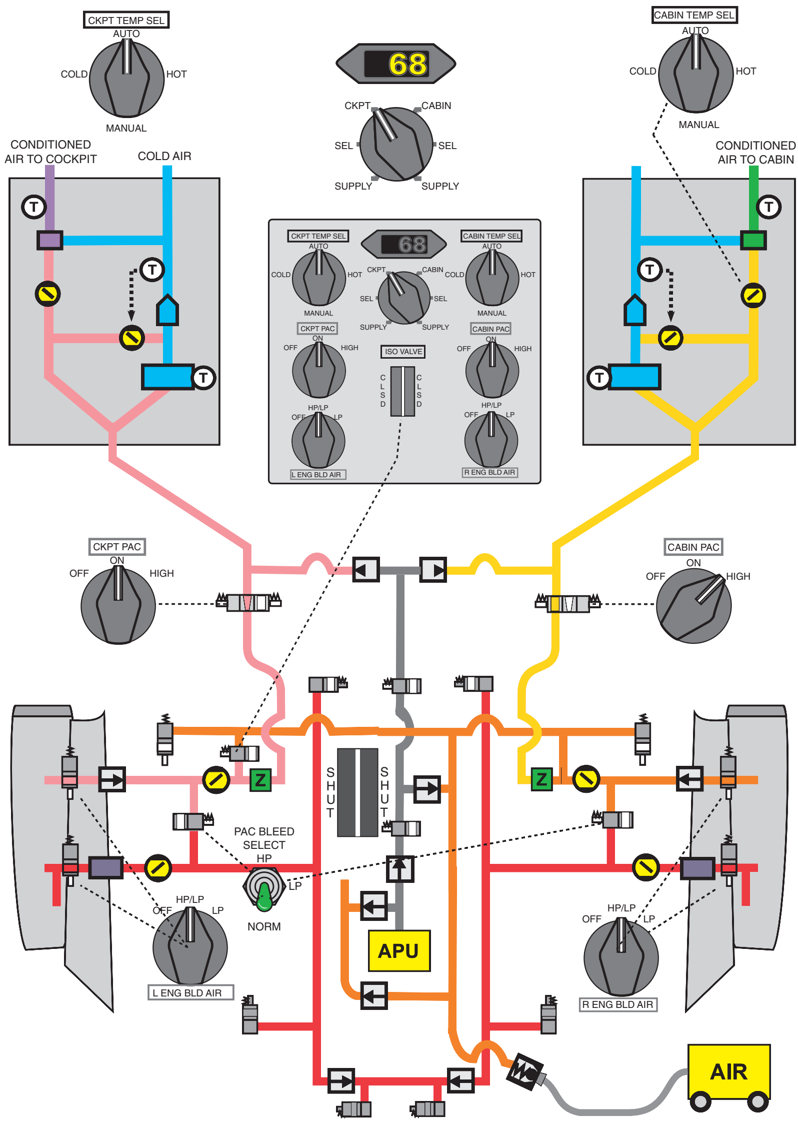


Figure AS-12. Air Conditioning Schematic air, and the aft (cockpit) PAC is operated with left-engine bleed air. When OPEN, both air sources are connected, and either air source can operated both PACs.

APU bleed air is available to operate the PACs in both ground and air operations. With the ISOL VALVE closed and APU BLEED AIR switch ON, APU bleed air operates only the cabin PAC through the engine start duct. Opening the ISOL VALVE allows APU bleed air to operate both PACs. When selected, APU MAX COOL bleed air bypasses the bilevel flow control valves and supplies an alternate source of increased flow rate directly to the PACs.

Cockpit and cabin temperature controls are located on the environmental control panel, and have both automatic and manual features. With either CKPT or CAB TEMP SEL selected to AUTO, specific temperatures may be set in the digital readout display window on the environmental control panel. Temperature sensing ports (aft of right circuit-breaker panel in the cockpit, above rear left-side seat in the cabin) provide input to a thermostat, which controls temperature. When MANUAL is selected, the thermostat is bypassed and temperature is controlled manually. A TEMP DISPLAY SEL control switch allows sensed cockpit or cabin zone temperatures, selected temperatures, or supply temperatures to display on the readout. The CKPT or CAB position displays sensed temperatures. The SEL position displays selected temperatures (available range is 65°F to 85°F), and is not functional with MANUAL selected. The SUPPLY position displays the air temperature of the warm conditioned air supplied to the cockpit or cabin distribution system.

The cockpit PAC supplies temperature-controlled bleed air to the cockpit air outlets, cockpit foot warmers, and the right cabin overhead outlets (WEMACs). The cabin PAC supplies the left cabin WEMACS and the cabin foot warmers. When a switch labeled WEMAC BOOST–OFF (located on the pressurization control panel), is selected, cabin air mixes with the colder overhead air to eliminate fogging from the WEMACS and provides increased airflow for cabin and cockpit comfort.

OXYGEN SYSTEM

Crew Oxygen Masks

The crew EROS MC10-16-100 quick donning diluter demand/emergency pressure breathing masks are located in a side panel stowage box in the cockpit. Each mask regulator can be selected for diluter demand (normal) or demand (100% oxygen flows). At cabin altitudes above 20,000 feet, select 100% to ensure adequate oxygen. If cabin altitude is below 20,000 feet, select normal for oxygen conservation. In normal, the regulator provides automatic scheduling of oxygen to the pilot as a function of cabin altitude, and 100% oxygen is supplied above 30,000 feet cabin altitude. The regulator provides automatic pressure breathing when cabin altitude exceeds 37,000 feet. Selecting the EMER position provides 100% oxygen under pressure, regardless of cabin altitude. When used for smoke protection, select 100% oxygen, regardless of altitude. Refer to the Oxygen Supply Charts for duration of oxygen supply.

When using the EROS masks, select OXY MASK with MIC SEL switch, located on the lower outboard instrument panel. Push the microphone button on the appropriate control yoke to transmit. The INPH button on the audio panel must be out in order to use the interphone feature with the masks donned.

Refer to Figures AS-13 and AS-14 for duration of oxygen supply.

EROS MC10-15-120 CREW OXYGEN MASK WITH 49-CUBIC FOOT (1234 LITERS) CYLINDER								
AVAILABLE TIME IN MINUTES								
CABIN ALTITUDE	1 COCKPIT	2 COCKPIT	2 COCKPIT 2 CABIN	2 COCKPIT 4 CABIN	2 COCKPIT 6 CABIN	2 COCKPIT 8 CABIN	2 COCKPIT 10 CABIN	2 COCKPIT 12 CABIN
8,000	839	420	106	61	42	33	27	22
10,000	964	482	110	62	43	33	27	23
15,000	964	482	112	63	44	34	28	23
20,000	757	379	107	62	44	34	28	23
25,000	405	202	87	55	41	32	27	23
27,000	475	237						
29,000	523	261						
31,000	588	294						
33,000	663	332						
35,000	748	374						
37,000	851	426						
39,000	1,037	518						

EROS MC10-15-120 CREW OXYGEN MASK WITH 76-CUBIC FOOT (1923 LITERS) CYLINDER								
AVAILABLE TIME IN MINUTES								
CABIN ALTITUDE	1 COCKPIT	2 COCKPIT	2 COCKPIT 2 CABIN	2 COCKPIT 4 CABIN	2 COCKPIT 6 CABIN	2 COCKPIT 8 CABIN	2 COCKPIT 10 CABIN	2 COCKPIT 12 CABIN
8,000	1,308	654	165	94	66	51	41	35
10,000	1,502	751	172	97	68	52	42	35
15,000	1,502	751	175	99	69	53	43	36
20,000	1,180	590	167	97	69	53	43	36
25,000	630	315	136	86	63	50	41	35
27,000	740	370						
29,000	815	407						
31,000	916	458						
33,000	1,034	517						
35,000	1,165	583						
37,000	1,326	663						
39,000	1,616	808						

NOTE

- Cockpit masks are assumed to be at the normal setting up to 20,000 feet with a respiratory rate of 10 liters per minute—body temperature pressure saturated. Above 20,000 feet, the masks are assumed to be at the 100% setting.
- Passenger oxygen masks are approved for continuous operation at cabin altitude of 25,000 feet and below. Human physiological limitations prohibit continuous operation above 25,000 feet cabin altitude.
- The above duration does not include oxygen remaining in the bottle below 300 psi. Below this pressure, flow rate begins to decrease. The top of the amber arc (400 psi) represents the minimum pressure which will allow a successful emergency descent.

Figure AS-13. Oxygen Supply Chart—Without Sequencing Regulator

EROS MC10-15-120 CREW OXYGEN MASK WITH 49-CUBIC FOOT (1234 LITERS) CYLINDER WITH PASSENGER OXYGEN SEQUENCE REGULATOR								
AVAILABLE TIME IN MINUTES								
CABIN ALTITUDE	1 COCKPIT	2 COCKPIT	2 COCKPIT 2 CABIN	2 COCKPIT 4 CABIN	2 COCKPIT 6 CABIN	2 COCKPIT 8 CABIN	2 COCKPIT 10 CABIN	2 COCKPIT 12 CABIN
8,000	839	420	153	94	68	53	43	37
10,000	964	482	161	97	69	54	44	37
15,000	964	482	165	100	71	56	46	39
20,000	757	379	155	97	71	56	46	39
25,000	405	202	116	82	63	51	43	37
27,000	475	237						
29,000	523	261						
31,000	588	294						
33,000	663	332						
35,000	748	374						
37,000	851	426						
39,000	1,037	518						

WITH 76-CUBIC FOOT (1923 LITERS) CYLINDER WITH PASSENGER OXYGEN SEQUENCE REGULATOR								
AVAILABLE TIME IN MINUTES								
CABIN ALTITUDE	1 COCKPIT	2 COCKPIT	2 COCKPIT 2 CABIN	2 COCKPIT 4 CABIN	2 COCKPIT 6 CABIN	2 COCKPIT 8 CABIN	2 COCKPIT 10 CABIN	2 COCKPIT 12 CABIN
8,000	1,308	654	239	146	105	74	68	57
10,000	1,502	751	251	151	108	75	69	58
15,000	1,502	751	258	156	111	78	71	60
20,000	1,180	590	242	152	111	79	72	61
25,000	630	315	181	127	98	73	67	58
27,000	740	370						
29,000	815	407						
31,000	916	458						
33,000	1,034	517						
35,000	1,165	583						
37,000	1,326	663						
39,000	1,616	808						

NOTE

- Cockpit masks are assumed to be at the normal setting up to 20,000 feet with a respiratory rate of 10 liters per minute—body temperature pressure saturated. Above 20,000 feet, the masks are assumed to be at the 100% setting.
- Passenger oxygen masks are approved for continuous operation at cabin altitude of 25,000 feet and below. Human physiological limitations prohibit continuous operation above 25,000 feet cabin altitude.
- The above duration does not include oxygen remaining in the bottle below 300 psi. Below this pressure, flow rate begins to decrease. The top of the amber arc (400 psi) represents the minimum pressure which will allow a successful emergency descent.

Figure AS-14. Oxygen Supply Chart—With Sequencing Regulator

Passenger Oxygen Masks

Oxygen for the flight crew and passengers is supplied from either a 49- or 76-cubic foot oxygen cylinder (both bottles if configured for extended range) located in the nose compartment. The oxygen control panel (PASS OXY), located on the pilot's instrument panel, contains a microphone selector switch (MIC SEL), the oxygen control switch (OFF–AUTO–ON), and oxygen cylinder pressure gauge (two for extended range configuration) (Figure AS-15). If equipped with two bottles, two OXY LOW pressure indicators monitor system pressure. An amber indicator light illuminates if system pressure is low, indicating either low pressure or a bottle is turned off (Figure AS-16).

With the oxygen control switch in AUTO, passenger masks will automatically drop if cabin altitude exceeds 14,500 (±445 feet), with main DC power available. Oxygen will flow to the passenger masks when the lanyard is pulled as the mask is donned. Passenger masks drop at any altitude when ON is selected. The OFF position shuts off oxygen flow to the passengers.

Passenger mask flow is altitude compensated to 40,000 feet for emergency descent, but human physiological limitations prohibit continuous operation above 25,000 feet cabin altitude. A Passenger Oxygen Sequence Regulator (POSR) is installed to regulate passenger mask flow. This allows full system pressure during an emergency descent, and then regulates pressure at 25,000 feet cabin altitude and below.

BAGGAGE COMPARTMENT

The aircraft incorporates a pressurized baggage compartment. The baggage compartment isolation valve, located on the mid pressure bulkhead, controls the flow of fan–driven air from the cabin into the avionics racks above the baggage compartment. This air is vented into the baggage compartment and returns to the cabin through a return air check valve, also located on the mid pressure bulkhead. An aneroid assembly located in the baggage compartment senses both cabin and baggage compartment pressures. A baggage compartment isolation valve will close automatically if cabin-to-baggage compartment differential exceeds 1 psi, baggage compartment pressure altitude exceeds 14,500 feet, or main DC power is lost. The baggage compartment can manually be isolated from the cabin

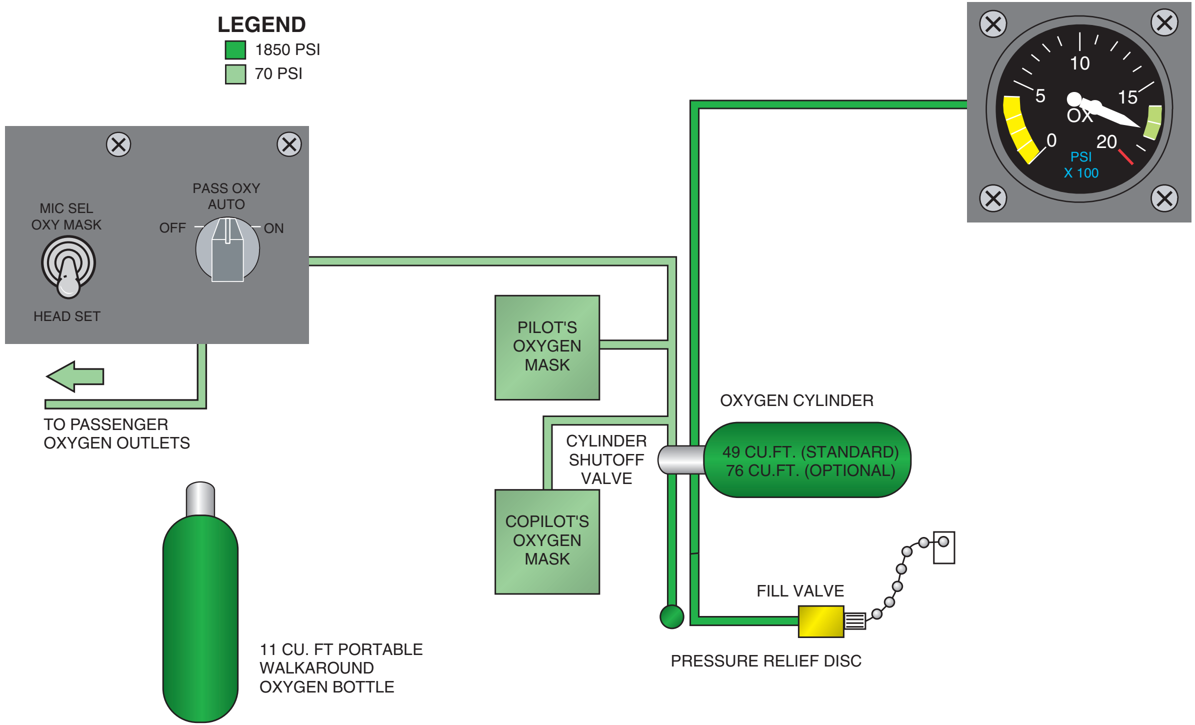


Figure AS-15. Oxygen System

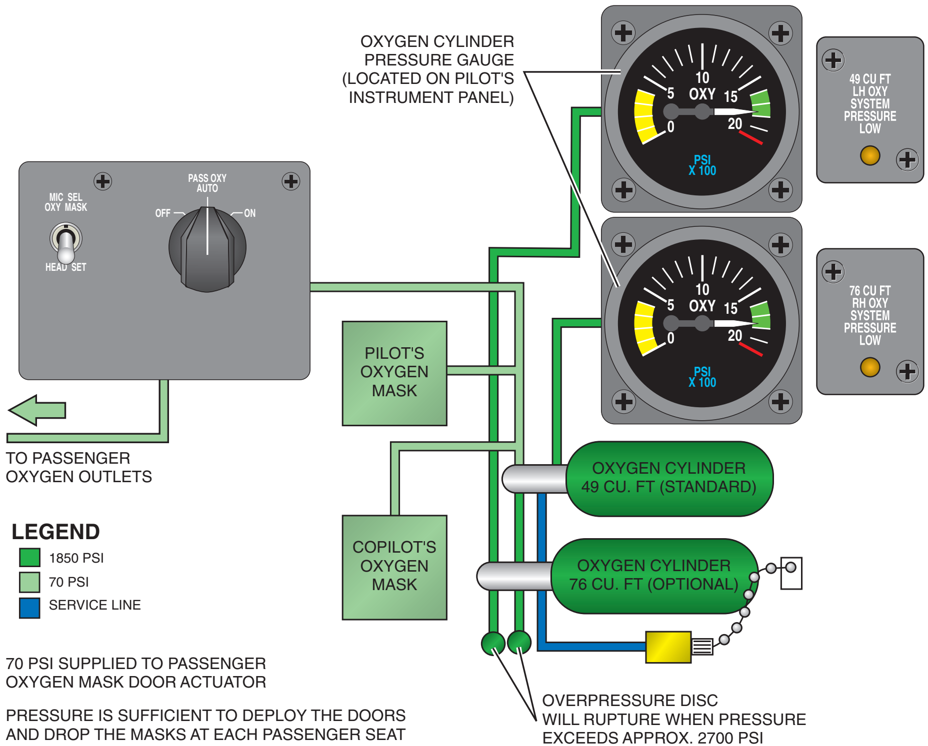


Figure AS-16. Extended Range Oxygen

by selecting the red-guarded ISO VLV CLOSE switch. When activated, the baggage compartment isolation valve will close, heating air will shutoff, and the air circulation fan will stop. Once depressurized in flight, the baggage compartment cannot be repressurized.

When baggage compartment altitude exceeds 14,500 feet, an amber BAGGAGE ALTITUDE CAS message illuminates. Smoke or fire in the baggage compartment will trigger a red BAGGAGE SMOKE CAS message. Selecting the ISO VLV CLOSED isolates and depressurizes the baggage compartment. There is no fire suppression capability in the baggage compartment.

ICE AND RAIN PROTECTION

FLIGHT INTO ICING

Flight into known icing is the intentional flight into icing conditions that are known to exist by either visual observation or pilot weather report information. Icing conditions exist when indicated RAT is +10°C or below, and visible moisture in any form is present (such as clouds, fog with visibility of one mile or less, rain, snow, sleet, or ice crystals). Icing conditions also exist when the OAT (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. Cessna Citations, equipped with properly-operating anti-ice equipment, are approved to operate in maximum intermittent and maximum continuous icing conditions as defined by FAR 25, Appendix C, when that equipment is in operation. The equipment has not been designed, or certified, to provide protection against freezing rain or severe conditions of mixed or clear ice. During all operations, the pilot is expected to exercise good judgement and be prepared to alter the flight plan (i.e., exit icing) if conditions exceed the capability of the airplane and equipment.

Ice accumulations will significantly alter the shape of the airfoils of any aerodynamic surface. The resulting change in shape of the airfoil and, to a lesser extent, the added weight of the ice, will increase the stall speed and possibly change the normal handling characteristics and performance of the airplane. During periods of high angle-of-attack (low airspeed) flight conditions, an increase in drag may be experienced due to a build up of ice on the undersurface of the wing aft of those areas which are protected by the leading edge anti-ice system. To keep the angle-of-attack low, the minimum airspeed for sustained flight in icing conditions (except approach and landing) is 200 KIAS. Prolonged flight in icing conditions with the flaps and /or landing gear extended is prohibited. Trace or light amounts of icing on the horizontal stabilizer can alter airfoil characteristics which will affect stability and control of the airplane.

Freezing rain and clear ice will be deposited in layers over the entire surface of the airplane and can "run back" over control surfaces before freezing. Rime ice is an opaque, granular and rough deposit of ice that usually forms on the leading edges of wings, tail surfaces, pylons, engine inlets, antennas, etc.

An anti-ice flow schematic is shown in Figure AS-17.

Engine Anti-Ice System

The engine anti-ice system consists of the bleed-air-heated engine inlet, bleed-air heated inboard wing leading edge and electrically-heated wing root fillet. These systems are controlled by the ENGINE LH–RH–OFF switches on the anti-ice switch panel. The engine anti-ice systems must be selected ON when the airplane is operated in snow or freezing precipitation on the ground or any time the airplane is flown in visible moisture with RAT below +10°C.

The engine itself is not anti-iced. The compressor section will not ice due to inlet temperature rise. Ice will normally form on the fan spinner, the aft side of the fan blades and the fan stators. This ice will result in an audible engine vibration. When this vibration is noticed, the ice can be cleared by cycling the throttle approximately 20% N_1 a few times until the vibration clears. By design, this ice will all pass through the fan bypass duct. No engine damage will occur. This clearing procedure may need to be accomplished at 5- to 10-minute intervals in heavy icing conditions.

Engine inlet anti-ice temperature is monitored by ENG A/I COLD L–R and ENG A/I HOT L–R amber CAS messages. If ENG A/I HOT is illuminated, the engine inlet anti-ice will automatically shutoff until the overheat has cleared. The wing inboard, fixed, leading edge is monitored by WING A/I COLD L–R and WING A/I HOT L–R amber CAS messages. The hot message detects

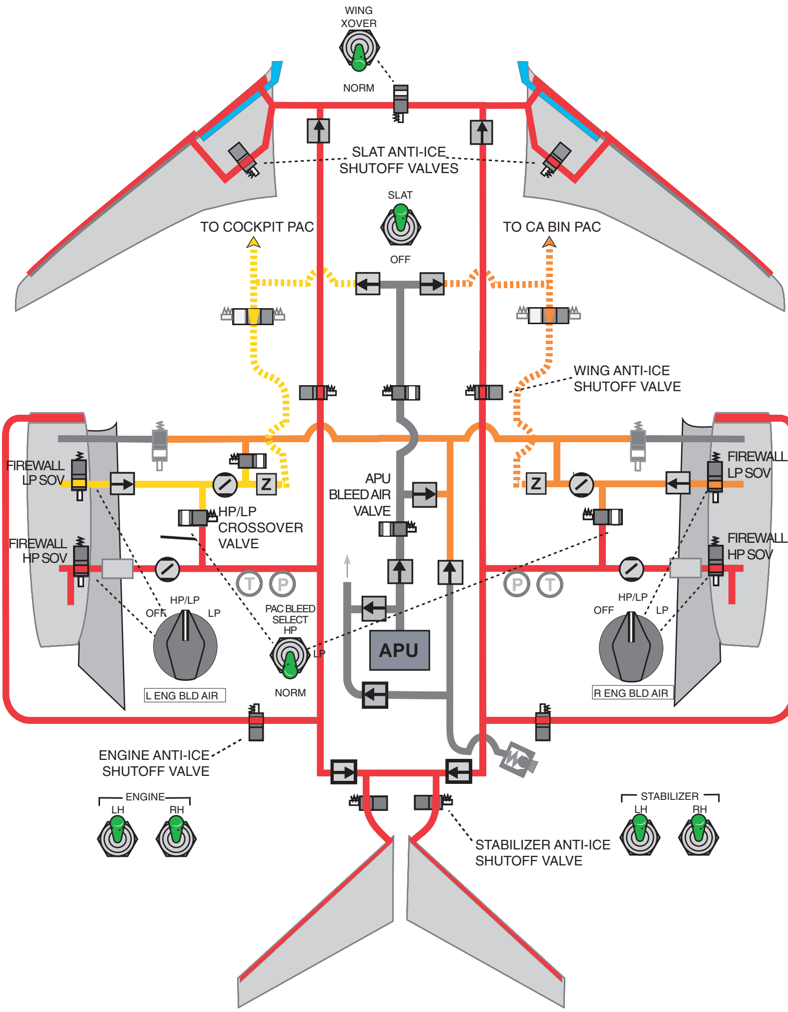


Figure AS-17. Anti-Ice Flow Schematic

an overtemperature or internal leak in the leading edge. The wing (and slat) anti-ice will automatically shutoff until the overtemperature condition has cleared. With only engine anti-ice turned on, the engine and wing cold messages will normally remain out at idle, once the surfaces have warmed. With other anti-ice systems on, N_1 may have to be increased slightly above idle to keep all cold messages out.

The wing (and slat) bleed air supply tube is monitored for leaks in the overwing fairing by WING BLD LEAK L–R amber CAS messages. The WING BLD LEAK monitor is enabled whether or not the anti-ice is on or off. The pylons are monitored for HP or LP bleed leaks by the PYLON BLD LEAK L–R red CAS messages.Pylon BLD LEAK L–R red CAS messages do not result in automatic shutoff. Pilot action is required to reduce power or shutoff bleed air. When the WING BLD LEAK L–R amber CAS message is displayed, the associated wing anti-ice valve closes automatically. The valve will stay closed after the sensor cools and the message is cleared. If a wing bleed leak results in a wing or slat cold condition, the cold CAS message is changed from amber to cyan so as not to infer a power increase. The wing root fillet anti-ice panels are monitored by WING CUFF COLD L–R and WING CUFF HOT L–R amber CAS messages. The panel will automatically shutoff when the hot message illuminates until the overtemperature condition clears. This panel is not considered critical; however, failure could result from formation of ice in a prolonged icing encounter which could cause minor fan damage.

In the event an engine failure or bleed leak occurs, a crossfeed valve will provide opposite side bleed air to supply both wings (and slats). This valve is controlled by the WING XOVER/NORM switch on the anti-ice switch panel. The operating engine (or supply engine must be operated at a higher N_1 to maintain proper wing, slat anti-ice in the crossfeed mode.

Ice Protection Systems—7.15 and 8.3 FADEC Software

Ice protection is provided using engine bleed air and electric energy sources. High pressure, temperature limited bleed air, or low pressure bleed air, is used to anti-ice the engine inlets, inboard wings leading edge, slats leading edge, wing-mounted landing lights and the horizontal stabilizer leading edges. DC electric power is used to anti-ice the pitot tubes, static ports, AOA probes, ram air temperature probes and the wing root fillets. AC electric power is used for cockpit windshield anti-ice.

Anti-ice bleed air is normally high pressure (HP) engine bleed air, except that low pressure (LP) engine bleed air is used on the ground at mid-to-high throttle settings when the HP precooler would be ineffective. HP bleed air is temperature controlled, in flight, by the pylon-mounted HP precooler which regulates ram air through a heat exchanger to limit HP bleed air to a maximum of approximately 480°F. An amber HP PCOOLR O'HT L–R CAS message will illuminate if precooler out temperature exceeds 550°F. At lower power settings, approximately 70% N_1, HP air is below 480°F and the precooler ram air doors will be closed. HP air leaves the precooler and passes through a pressure regulating flow control valve to a supply pipe which then distributes air to selected anti-ice systems.

Because they cannot be monitored for ice formation, engine inlet and horizontal stabilizer anti-ice should be turned on any time icing conditions are encountered. Slat anti-ice may be delayed if it can be visually verified that ice is not forming on the slats. Windshield, pitot-static/RAT and AOA anti-ice are normally operated full time in flight.

Bleed air anti-ice system status is monitored and the crew is alerted through various CAS messages. The white A/I ON ENG–STAB–SLAT message represents status of power to the anti-ice control cards. If all systems are on, this message will be A/I ON–ALL. Both engine, both stabilizer, or both slat cards must be powered to present the respective message. System temperature is monitored for undertemperature and the crew is alerted by A/I COLD L–R amber messages which are further discussed in each system. These systems are in two groups, ENG & STAB and ALL. If either engine or either stabilizer anti-ice switch is on, cold monitoring for both engines and both stabilizers is enabled. If the slat anti-ice is ON, all cold monitors are enabled. This logic alerts the crew to inadvertent improper operation due to a misplaced switch. Anti-ice system HOT and BLD LEAK monitors are enabled whether or not the anti-ice is ON.

Ice Protection Systems—7.10 FADEC Software

Ice protection is provided using engine bleed air and electric energy sources. High pressure, temperature-limited bleed air, or low-pressure bleed air, is used to anti-ice the engine inlets, inboard wings leading edge, slats leading edge, wing-mounted landing lights and the horizontal stabilizer leading edges. DC electric power is used to anti-ice the pitot tubes, static ports, AOA probes, ram air temperature probes and the wing root fillets. AC electric power is used for cockpit windshield anti-ice.

Anti-ice bleed air is normally high pressure (HP) engine bleed air, except that low pressure (LP) engine bleed air is used on the ground at mid-to-high throttle settings when the HP precooler would be ineffective. HP bleed air is temperature controlled, in flight, by the pylon-mounted HP precooler which regulates ram air through a heat exchanger to limit HP bleed air to a maximum of approximately 480°F. An amber HP PCOOLR O'HT L–R CAS message will illuminate if precooler out temperature exceeds 550°F. At lower power settings, approximately 70% N_1, HP air is below 480°F and the precooler ram air doors will be closed. HP air leaves the precooler and passes through a pressure regulating flow control valve to a supply pipe which then distributes air to selected anti-ice systems.

Because they cannot be monitored for ice formation, engine inlet and horizontal stabilizer anti-ice should be turned on any time icing conditions are encountered. Slat anti-ice may be delayed, if it can be visually verified that ice is not forming on the slats. Windshield, pitot-static/RAT and AOA anti-ice are normally operated full time in flight. When climbing with bleed air anti-ice on, it is acceptable to use TO/MC thrust provided ITT does not exceed 850°C.

Slat Anti-Ice

The wing slat anti-ice system is controlled by the SLAT/OFF switch on the anti-ice switch panel. The slat flow control valves open to supply bleed air from the inboard wing supply tube to the slats. Slats must be heated symmetrically, (ON or OFF) and are, therefore, controlled by a single switch. Slat anti-ice performance is significantly better with slats retracted.

WARNING

Holding or extended flight in icing conditions with slats extended is prohibited. Minimum holding speed, slats up, in icing is 200 KIAS.

NOTE

- Slat extension in heavy, cold (<–10°C) icing conditions should be delayed to the final descent and approach procedure.
- Speed brakes may be used to increase drag in icing conditions.

Slat anti-ice is monitored by the SLAT A/I COLD L–R and SLAT A/I HOT L–R amber CAS messages. The SLAT A/I HOT message detects a leak or overtemperature condition in the slat and will result in automatic shutoff of both slat anti-ice valves until the overtemperature condition clears. The cold message indicates slat exhaust air temperature is low, probably due to low power setting bleed supply. The amber SLAT A/I COLD messages will be replaced by cyan messages if the cold condition is the result of a wing bleed leak, so as not to infer a power increase.

Horizontal Stabilizer Anti-Ice

The left and right horizontal stabilizer leading edges are individually anti-iced by HP bleed air from the respective engine. The supply lines are cross-manifolded to automatically supply both stabilizers from the operating engine, or source, in the event of an engine failure or pylon bleed leak. Horizontal stabilizer anti-ice is controlled by the LH and RH STABILIZER switches on the anti-ice switch panel. Stabilizer anti-ice is monitored by the STAB A/I COLD L–R and STAB A/I HOT L–R amber CAS messages and the STAB BLD LEAK L–R red CAS messages. The bleed leak messages monitor for a bleed air leak near structure in the vertical tail bullet area. Pilot action is required to turn off the affected stabilizer anti-ice. The cold messages indicate that stabilizer supply temperature is low, probably due to low power setting/bleed supply. The STAB A/I HOT message indicates excessive supply air temperature and will automatically cycle the stabilizer anti-ice off and on again when the supply air has cooled.

Pitot/Static, RAT, AOA Anti-Ice

DC electric anti-ice for the pitot-static, RAT, and AOA systems is controlled by the LH and RH PITOT/STATIC switches on the anti-ice switch panel. The standby pitot-static anti-ice is on the RH switch. Pitot-static heat should be turned on immediately prior to takeoff and remain on throughout the flight, regardless of icing conditions. Pitot-static, RAT and AOA heat functions are monitored by the EICAS. PITOT HTR FAIL L–R–SB; STATIC HT FAIL L–R; RAT HEAT FAIL L–R; and AOA HEAT FAIL L–R amber CAS messages will appear if the respective heater element is inoperative. A P/S–RAT HEAT OFF cyan CAS message will be displayed on the ground and will change to amber with a MASTER CAUTION, if the throttles are advanced for takeoff with the PITOT/STATIC switches off.

The RAT probes are aspirated to provide accurate temperature data on the ground. RAT probe heat is inoperative on the ground and comes on at lift off. Right probe aspiration is from right engine bleed. Left is from any bleed source. Aspiration corrects sun influence on the probes at low airspeed. It will not compensate for anti-ice heat. RAT probes can be checked on the ground by turning the pitot-static heat on with the rotary test knob in the W/S TEMP test position.

WARNING

The PITOT/STATIC switches should be turned off when on the ground to preclude personal injury or possible discoloration of the pitot probes.

Windshield Anti-Ice

The left and right windshields and the left and right forward cockpit side windows are AC electrically anti-iced. Windshield anti-ice is controlled by the WINDSHIELD LH and RH O'RIDE–ON–OFF switches on the anti-ice switch panel. Windshield anti-ice must be turned on any time icing is detected. It may be operated full time from engine start to shutdown and will improve cockpit comfort at high altitude, particularly at night. It is also required for windshield defog.

The windshield anti-ice system is normally operated in the ON position. This position gradually ramps power to warm the windshield slowly. If icing is encountered with the windshield OFF, an O"RIDE switch position (spring loaded back to ON) will override this ramp to warm the windshield more quickly.

The left and right windshields each have three heating element areas. Power from the left engine-driven alternator is supplied to the left windshield outboard and center section, the right windshield inboard section and the right side window. Power from the right alternator is identically supplied to the opposite sections.

The windshield anti-ice is monitored by WSHLD HEAT INOP L–R and WSHLD O'TEMP L–R amber CAS messages. The INOP message indicates a fault or failure of the controller to supply power to the windshield. The overtemperature indicates the controller has detected an overtemperature condition which automatically shuts the affected windshield off until the overtemperature condition clears.

Ice Detection

During daylight operation, ice formation is usually first noticed on the windshield near the center post or on the wing slats. For night operation, two red ice detection lights (peanut lights) are mounted in the glareshield aimed normal to the windshield. If ice forms on the windshield, it will result in a red glare on the windshield. Wing inspection lights are provided for night inspection of the wing/slat leading edge. The red windshield ice detection lights are turned on when night lighting is selected by the DAY/NITE switch.

WINDSHIELD RAIN REMOVAL

An electric windshield rain removal fan, mounted in the nose bay, directs high velocity air on both windshields to aid in rain clearing during ground operations. Rain removal in flight is natural due to airflow on the surface sealed windshield.

NOTE

If deteriorated visibility is noticed on parts of the windshield in rain, windshield surface servicing may be required.

FUEL SYSTEM

FUEL STORAGE

Fuel Tanks

There are three main tanks: the left wing, the right wing and the center tank (Figure AS-18). The forward fairing tank is considered a part of and is connected to the center tank. Two engine feed bays (hoppers) are surrounded by, and considered a part of, the wing tank system. A surge vent tank is located in each wing tip.

Center Tank

The center tank and forward fairing tanks are connected together by an open line with no valve. The center tank and fairing tank have a combined capacity of 6,000 pounds of fuel (Jet A at 6.75 lbs/gal). The forward fairing tank is located higher than the center tank allowing fuel to transfer from the fairing tank to the center tank by gravity flow. Capacitance probes are installed in the center tank. Center and fairing fuel, compensated for temperature and aircraft attitude is continuously displayed on the EICAS display unit. Attitude compensation is only valid provided the AHRS or IRS system is powered. If attitude information is lost, invalid fuel quantity indications can result. Fuel quantity may also be measured mechanically by two drop-down dipsticks, one under the inboard right wing area and the other under the forward fuselage. The center/forward fairing tank contains two independent vent systems, one at either outboard end of the tank. Each vent system is vented to the atmosphere through a NACA scoop in each trailing edge lower skin between the inboard and outboard flaps. Two center tank relief valves exit through the lower wing skin near each tank scoop.

Wing Fuel

The left and right wing tanks are part of the wing structure. Each tank is internally sealed during manufacture. There are no bladders. The capacity for each wing tank is 3,500 pounds of fuel (Jet A at 6.75 lbs/gal). Total wing capacity is 7,000 pounds and total fuel capacity is 13,000 pounds.

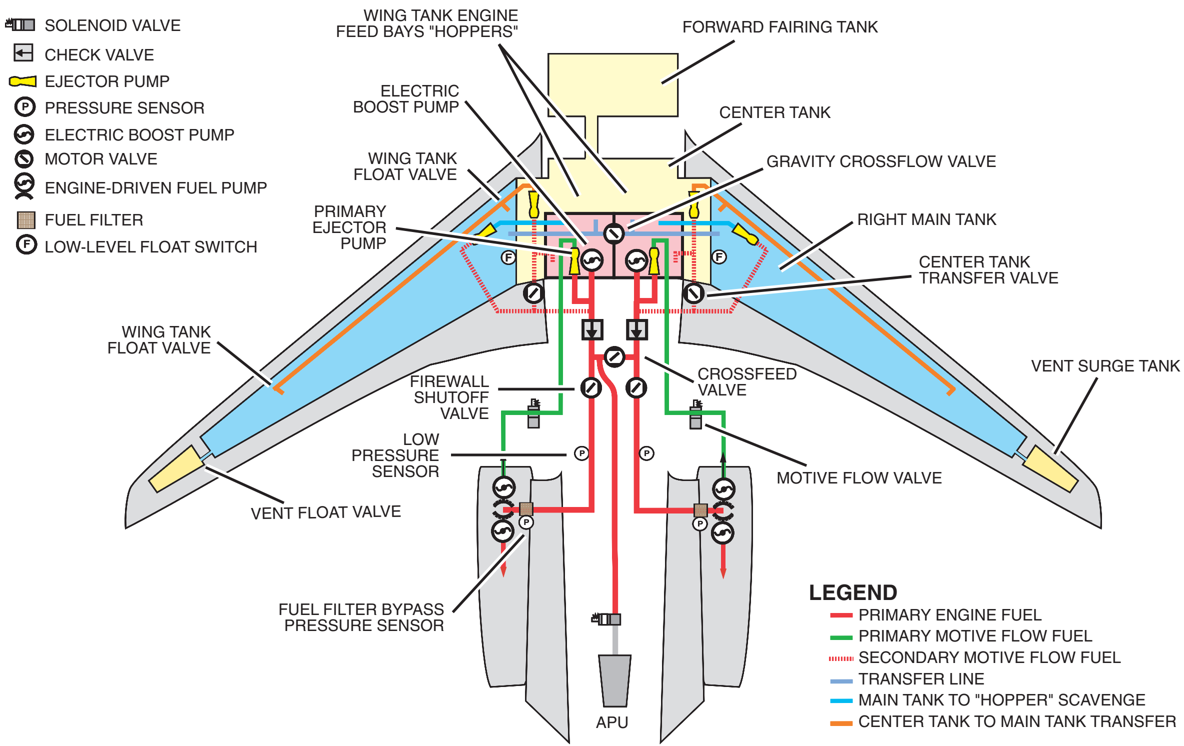


Figure AS-18. Fuel Schematic

The wing tanks are interconnected to the hopper tanks (engine feed bay) remotely located in the aft portion of the center tank. The hopper tanks are sealed from the center tank and are functionally part of the wing tanks. A surge vent tank is located in each wing tip.

Each wing tank is vented to its respective vent surge tank. The surge vent tank is vented to the atmosphere through a flush NACA scoop on the lower skin of the tank. Each tank has a positive/negative pressure relief valve.

Pumps

There are 12 pumps in the fuel system:

- Two electric boost pumps
- Two primary ejector pumps
- Two wing-to-hopper ejector pumps
- Two center-to-wing ejector pumps
- Two engine-driven fuel pumps
- Two engine-driven motive fuel pumps

Valves

Valves are used to control fuel movement in the fuel system. The valves include:

- Firewall shutoff valves
- Wing-to-wing gravity crossflow valve
- Crossfeed valve
- Center-to-wing transfer valves
- Float valves
- Motive flow valves
- APU fuel valve
- Check valves

Fuel Distribution

Fuel is supplied from each hopper tank to the respective engine by a motive flow powered primary ejector pump located in the hopper tank. Motive flow fuel pressure is provided by an engine-driven motive flow pump which taps a small amount of the fuel supply to the engine, boosts its pressure, and returns it to the hopper tank to operate the primary ejector pump. An electric fuel boost pump is mounted in each hopper tank parallel to the primary ejector pump. Fuel is transferred from each wing into its respective hooper tank by a scavenge ejector pump located near the inboard end of the tank. Motive flow for this ejector pump is supplied by the primary ejector pump and/or boost pump in the respective hopper tank. Fuel is supplied at a sufficient rate to maintain the hopper tank full and at a slightly positive pressure at all times. In the event a scavenge ejector pump fails, fuel will gravity flow into the hopper tank.

Center tank fuel is transferred into each wing tank by two transfer ejector pumps mounted forward of the hopper tanks in the center tank. Motive flow for these transfer pumps is supplied by the primary ejector pump and/or boost pump in the hopper tank. Two center fuel transfer valves are normally open and will allow fuel to continue to flow from the center tank into the wing tanks until the center tank is empty. During this period, wing tank quantities will remain at approximately 3,250 to 3,500 pounds (3,100 to 3,400 pounds on earlier airplanes). When the center tank is empty, wing fuel quantity will begin to decrease.

Boost Pump Switches

The boost pump switches have three positions: ON, OFF and NORM. The boost pump is generally off in the NORM position but powered automatically if one of the following conditions exist:

1. Engine supply fuel pressure is low (approximately 9 psi).
2. Engine start
3. Crossfeed
4. The APU is operating and the left engine is not running (LH boost pump only)

In the ON position, the boost pump is always on, and in the OFF position, the boost pump is always OFF.

Center Wing Transfer Switches

The center-wing transfer switches have three positions: OFF, ON and NORM.In the NORM position, the respective valve opens and closes to keep the wing fuel quantity at approximately 3,250 to 3,500 pounds (3,100 to 3,400 pounds on early airplanes) until the center tank is empty. In the OFF position, the respective valve is closed and the flow of the fuel to the center tank ejector pump is stopped. In the ON position, the valve is open and fuel is available to the center tank ejector pump until a low-level fuel sensor is activated. This occurs when the fuel remaining in the wing is approximately 500 pounds. The valve is then closed to stop further transfer of motive fuel in the empty center tank.

Crossfeed Select Switch

When crossfeed is selected, the boost pump in the selected hopper feed tank is turned on. A crossfeed valve opens to supply fuel to the opposite engine and the opposite engine motive flow shutoff valve closes to disable the primary ejector pump in the opposite hopper tank. No wing-to-wing fuel transfer takes place during crossfeed.

Gravity Crossflow Switch

When the gravity crossflow is activated, a gravity crossflow valve opens in a line connecting the two wings and allows left and right fuel tank quantities to seek a common level. The switch should be turned off during all ground refuelling operations.

REFUELING

Single-Point Pressure Refueling (SPPR)

A single-point refueling system is normally used to refuel both wings and the center tank. Tank filling is controlled by automatic sequencing to fill the wings first and then the center tank. A precheck system is included to test the system shutoff valves at the start of fueling. Single-point refueling is accomplished through the single-point access forward of the right wing. Refueling instructions are located on the inside of the door. Electrical power is not required.

Overwing Refueling

Overwing refueling is accomplished through fuel filler ports on the top of each wing. There is no restriction on the lateral unbalance during refueling. Center tank refueling is accomplished by pulling a T-handle in the access bay below the single-point door, to open a gravity flow valve from the right wing to the center tank. This handle must be pushed up to close the valve when the desired fuel quantity is in the center tank or refueling is completed. The access door will not close if the handle is pulled. Refueling, single point or overwing, should be accomplished on an area as level as possible to assure accurate refueling and to avoid fuel vent spills.

FUEL TANK DRAINS

A fuel quick drain is located in each wing tank, center tank, forward fairing tank and one in each hopper tank. These drains should be checked during preflight for contamination during refueling.

FUEL QUANTITY INDICATING SYSTEM

Six probes in each wing tank and one in each hopper combine to yield wing fuel quantity. Four center tank probes combine to give center and forward fairing tank quantity.

Probe signals are processed by a fuel quantity signal conditioner and are displayed as left, center, right and total fuel quantity on the EICAS system.

APU FUEL

Fuel is normally provided to the APU from the left hopper tank. Pressure is provided by the left boost pump or by the left primary ejector pump if the engine is operating.

POWERPLANT

GENERAL

Rolls-Royce AE3007C (S/N 750-0001 through S/N 750-0172) or AE3007C1 (S/N 750-0173 and on, or earlier aircraft with SB750-71-10) (Figure AS-19).

AE3007C—6,442 pounds thrust at sea level static to 86°F.

AE3007C1—6,764 pounds thrust at sea level, static to 86°F.

Two-spool, axial-flow turbofan engine, bypass ratio 5:1

Fourteen-stage compression, with inlet guide vane and first five stages being variable geometry.

Two-stage high-pressure turbine (N_2) connected to the compressor and accessory gearbox.

Three-stage low-pressure turbine (N_1) connected to the fan.

FADEC (Full Authority Digital Engine Control) controlled.

FADEC CONTROL

There are two FADECs (A and B) per engine, one controlling, the other in standby. Controlling FADEC alternates between starts, or can be selected with the FADEC RESET/NORM/SELECT switch.

If the controlling FADEC fails, the other FADEC automatically takes control.

FADECs are powered by an engine-driven PMA above 50% N_2, and other times (before 50% N_2 or PMA failure) by main DC or emergency bus power.

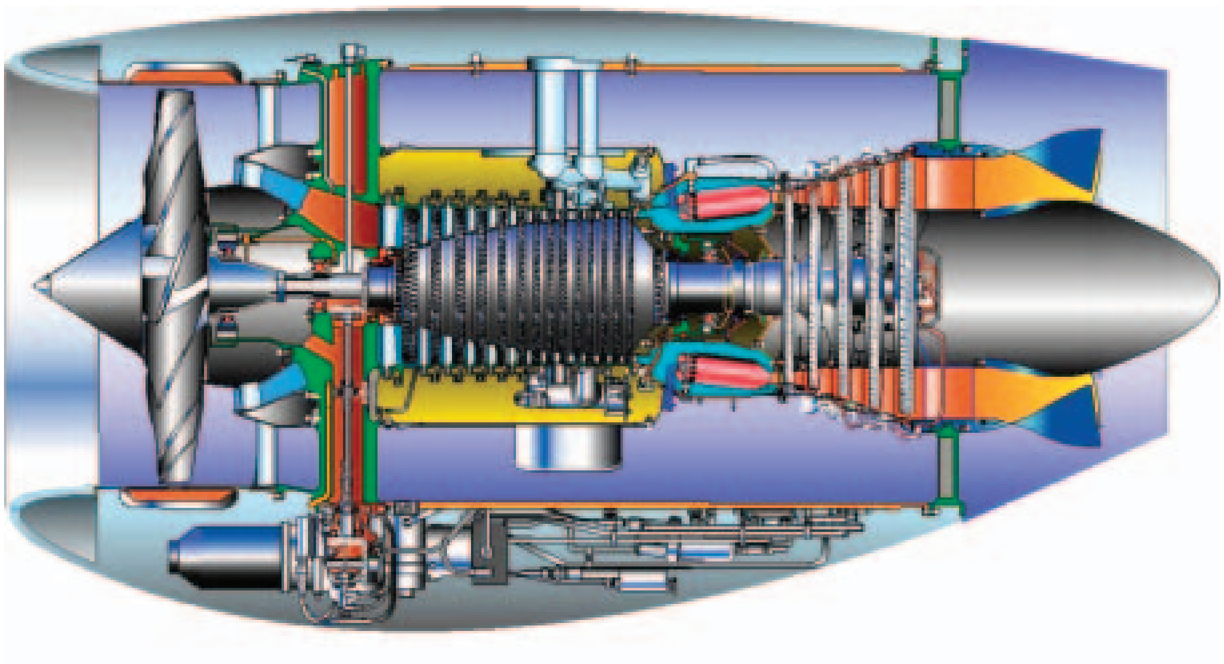


Figure AS-19. Rolls-Royce Engine

FADEC inputs:

- Temperatures and pressure via dual Micro Air Data Computers (MADC)
- Dual resolvers on each throttle (no aircraft DC power needed for throttle control)
- Shutdown commands via firewall shutoff switches and/or throttle cutoff switches
- Anti-ice logic
- N_1 speed
- N_2 speed
- ITT
- High idle switch
- LH or RH FADEC RESET/NORM/SELECT switch
- LH or RH ignition switches
- Thrust reverse logic, including “auto stow”
- Engine synchronization (from opposite side FADEC)
- Other digital information from ASCB and same side FADEC

FADEC outputs:

- CVG scheduling and control
- Main meter valve control
- Controlling FADEC displays N_1 tape and digital data on EICAS
- Noncontrolling FADEC displays N_1 target bugs on EICAS

NOTE

Any time the gear is down, the blue target bugs are referenced to the Max Power N_1 target regardless of TLA detent position.

- Lower of left and right engine noncontrolling FADECs display digital N_1 targets
- Controlling FADEC data to standby engine instruments
- Controllability information to other same side FADEC
- Digital information to the ASCB for other aircraft related systems

Fuel Flow Limiting—FADEC limits fuel back at N_1—100%, N_2—101%, ITT—888°C, or 800°C for start on AE3007C engine; 907°C, or 800°C for start on AE3007C1 engine.

Auto Shutdown—FADEC commands shutdown at N_1—105%, N_2—105.6 %, $N_2 < 54\%$, or if both FADECs fail.

Flameout Detection and Auto Relight—FADEC detects a flameout and commands both ignitions on and meters fuel for a relight.

Fan Damage Logic—FADEC detects abnormal N_1–N_2 relationship (due to fan damage) and adjusts N_2 to regain thrust. N_1 must be greater than 73.6% for fan damage logic to work.

FADEC Faults:

- Indicates FADEC is unable to monitor itself or any other noncritical data is missing or incorrect.
- Faults may possibly be reset by the FADEC RESET–NORM–SELECT switch.
- A FADEC fault does not automatically switch the controlling FADEC.

Reversionary Control Modes:

- FADEC REV N_1 L or R indicates both N_1 sensors for that engine have failed and N_2 is being used for power settings. Some thrust loss may be expected.
- FADEC REV ADC L or R indicates all ADC information is lost to that engine and the engine is using its own temperature and pressure sensors—$P_{2.5}$ and $T_{2.5}$. In this mode, takeoff thrust is maintained but thrust at altitude is reduced.

14% IGNITION

Power for the two ignitors come from the PMA only, and is available at approximately 14% N_2.

FADEC-controlled ignition relays are normally-closed relays. FADEC uses aircraft DC power (FADEC CB) to open relays. If this power is lost, continuous ignition occurs.

FADEC A controls one ignitor, FADEC B controls the other.

The ignition switch has ON–NORM–OFF positions. OFF is off unless power to the relay is lost. NORM is the correct selection for all automatic operations (start, relight, restart).

The ON position is never indicated in any checklist.

The IGN (ignition) text above the N_1 tape is only an indication of ignitor box discharge occurring, not that the ignitor is actually firing.

One ignitor operates (with the associated FADEC) during a ground start, both operate during an air start or autorelight.

ENGINE FUEL SYSTEM

Engine fuel scheduling is accomplished in the fuel pump and metering unit (FPMU).

FADEC controls the main metering valve (MMV) for fuel scheduling.

FADEC controls the latching shutoff valve for engine cutoff (pilot commanded or auto).

The dual-stage engine-driven fuel pump is located in the FPMU.

The fuel filter is located in the FPMU.

Fuel is warmed by the fuel-cooled oil cooler (FCOC).

Engine fuel temperature must be 4°C or above to operate the engine above 40% N_1.

OIL SYSTEM

The engine holds 12 quarts of oil (see engine limitations section of *AFM* for proper oil type).

Aircraft can be dispatched with a maximum of four quarts low.

An OIL LEVEL LOW L or R message indicates eight quarts low (four quarts remaining).

Oil pressure must be in the green range before advancing throttle out of idle after start.

Red OIL PRESSURE LOW L or R sensing is from an oil pressure switch set at <34 psi.

Oil pressure gauge sensing is from an oil pressure transducer.

Oil is cooled by the air-cooled oil cooler (ACOC), and the fuel cooled oil cooler (FCOC).

ENGINE FIRE PROTECTION

FIRE DETECTION

The engine fire detection system consists of sealed inert gas fill tubes with pressure sensing units for each engine, tail cone mounted detection control units, ENG FIRE PUSH switchlights, and EICAS message displays. If the gas pressure in the sealed tube rises because of a heat buildup, the system will turn on the applicable ENG FIRE PUSH switchlight, along with a red ENG FIRE L–R message in the CAS and the right MFD, and the master warning light and double chime. The tube loops around the engine where a fire is most likely to occur.

If the fire loop tube is damaged and the gas escapes, the pressure sensor detects the loss and causes the amber FIRE DETECT FAIL L–R message to appear. The aircraft cannot be dispatched with this message present.

If a fire is indicated, the first action is to bring the applicable engine to idle to determine if the fire detect system is detecting a bleed-air leak. If the indication is still present after 15 seconds, it is probable there is an engine fire.

FIRE EXTINGUISHING

The fire extinguishing system consists of two extinguishing agent (noncorrosive BromoTri-floroMethane) bottles, deployment tubes/nozzles for each engine, firewall fuel and hydraulic shutoff valves for each engine, ENG FIRE PUSH switchlights for each engine, and a white BOTTLE ARM switchlight for each fire bottle.

In the event of an engine fire, the applicable ENG FIRE PUSH switchlight would illuminate along with the applicable CAS message. After first bringing the engine to idle for 15 seconds (if the engine is still running) to eliminate the possibility of a bleed-air leak, the illuminated ENG FIRE PUSH switchlight cover is lifted and the switch is pushed. This action powers the applicable fuel and hydraulic firewall shutoff valves closed, commands the FADEC to shutdown the engine, the associated generator goes off line, the selected thrust reverser is disabled (the isolation valve is closed), and both fire extinguishing bottles are armed and directed toward the selected engine. As the fire bottles are armed, the two light switches illuminate. Either BOTTLE ARMED light switch can be pressed to discharge the applicable fire bottle. If the fire indication is still present after 30 seconds, the other BOTTLE ARMED light switch should be pressed, discharging the remaining bottle.

If the fire bottle has been discharged or the bottle has lost pressure, a cyan FIRE BOTTL LOW L–R message will be displayed. The aircraft cannot be dispatched if this message is displayed. There is no pressure gauge on the fire bottles themselves.

HYDRAULIC SYSTEM

The two main hydraulic systems on the Citation X are the left "A" system and the right "B" system (Figure AS-20). The two main systems have individual fluid reservoirs, and individual left or right engine-driven hydraulic pumps.

APPROVED HYDRAULIC FLUIDS

Fluids authorized for use in the hydraulic system include:

- Chevron/Exxon Hyjet IVA
- Chevron/Exxon Hyjet IVA Plus
- Monsanto Skydrol 500B
- Monsanto Skydrol LD-4

Reservoirs

A and B hydraulic system reservoirs are installed in the left and the right engine pylons respectively. The A reservoir supplies fluid to the A-system engine-driven pump and to the A-auxiliary electric pump. The B reservoir supplies the fluid to the B-system engine-driven pump. Each reservoir contains approximately 1.7 gallons of fluid. Fluid quantity in each reservoir is monitored by EICAS and is available as a display in the cockpit as a percentage.

Pumps

An engine-driven pump mounted on the engine's accessory gearbox powers each system. The pumps are variable displacement pumps that can produce 15.5 gpm at 3,000 psi.

Accumulators

One accumulator is installed in each main hydraulic system. The accumulators are designed to dissipate fluid shock and reduce noise during hydraulic actuation sequences. Each accumulator is precharged with nitrogen to a pressure of 1,500 psi (±200 psi).

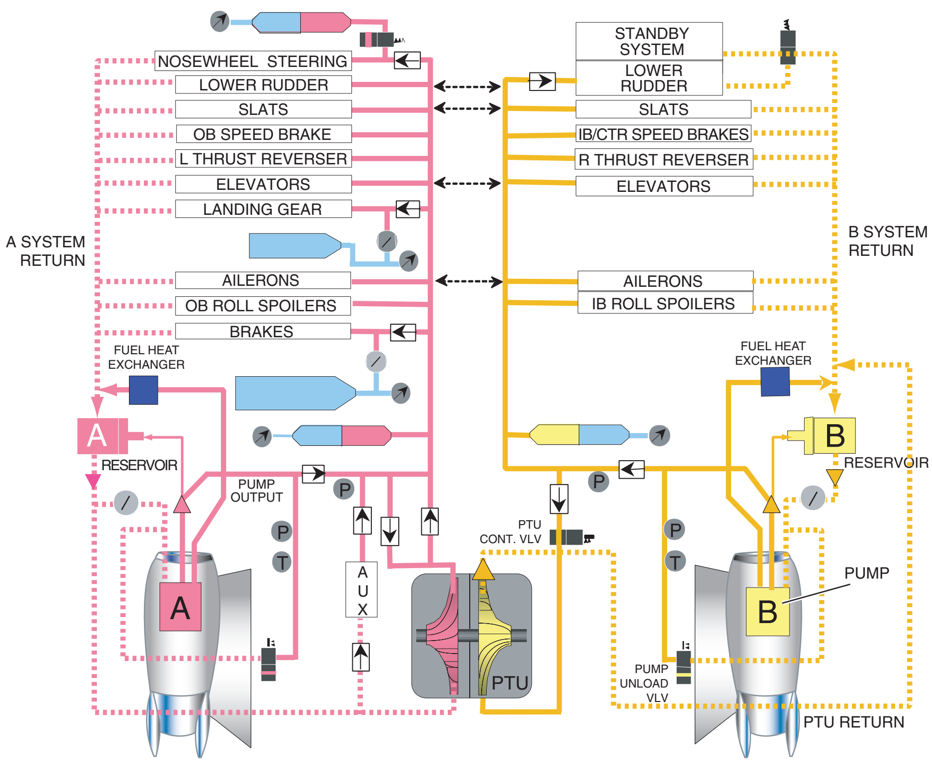


Figure AS-20. Hydraulic Schematic

Firewall Shutoff Valves

A firewall shutoff valve is installed downstream of each system reservoir, in the pump supply line. Pushing the respective ENG FIRE PUSH switch on the instrument panel closes or opens the associated hydraulic firewall shutoff valve.

Unload Valves

An unload valve is installed in each system downstream of the hydraulic pump in each pressure line. When the valve is closed (normal position), pressure is allowed to build up in the line. If the valve is open, fluid in the line is vented back to the pump, dissipating hydraulic pressure. Unloading a pump may be necessary for certain hydraulic abnormalities, such as excessive fluid temperatures.

Power Transfer Unit

The PTU is a sealed unit that transfers B-system energy to A-system hydraulic fluid, providing a backup source of pressure for A-system components. Transfer is allowed in one direction only and occurs automatically provided certain conditions are met. To function, main DC power is necessary to hold the PTU control valve open. If both hydraulic system pressures are approximately equal, the PTU is rendered neutral and does not operate. However, if A-system pressure should drop to less than B-system pressure by a significant amount, pressure on the B side of the PTU overcomes internal pressures within the PTU. The PTU can then begin to repressurize the A-system fluid.

Heat Exchangers

A hydraulic fluid heat exchange system is incorporated for both main hydraulic systems. Separate lines from each main engine-driven pump are routed through the pylon and into the center wing fuel tanks before they reach the reservoir. Heat from the hydraulic line is conducted away by the cooler fuel.

Auxiliary Hydraulic Pump

An auxiliary hydraulic pump is installed in the A-system hydraulic line. The pump is electrically powered from the emergency bus (RH split-bus emergency bus) and has an output of 1 gpm at 3,000 psi.

Nosewheel Steering Accumulator

The nosewheel steering system incorporates a storage accumulator kept at 3,000 psi during flight and is sufficient to steer the aircraft during landing rollout. It is not intended for extended taxi use since the storage pressure in the accumulator is depleted during use.

High Pressure Bottles

The landing gear can be extended using a backup high-pressure bottle filled with nitrogen. Emergency braking is provided by either one or two high-pressure bottles. This high-pressure nitrogen charge is sufficient to stop the aircraft after landing or after an aborted takeoff.

RUDDER STANDBY SYSTEM

A fully automatic rudder standby system (RSS) is installed to provide a backup source of hydraulic pressure to the lower rudder B-system PCU, should the B hydraulic system fail. The system incorporates a pressure switch, a small electric pump, an accumulator, and its own reservoir. It uses B-system fluid and main DC power for the pump.

SYSTEM MONITORING

During normal ground and flight operations, EICAS is used to monitor the hydraulic system. EICAS normally displays A-System and B-System pressure when the EICAS bezel control is selected to NORM. Additional hydraulic information is available by pressing the FUEL–HYD bezel button.

FLIGHT CONTROLS

PRIMARY FLIGHT CONTROLS

Elevators

Inputs to both elevators are made through the pilot or copilot control columns (Figure AS-21). The pilot's and copilot's control columns are mechanically connected by means of the torque tube. Movement of either column will move both elevators. Each elevator is hydraulically controlled by a pair of PCUs. The A-hydraulic system powers one PCU and the B-system powers the other PCU.

Without A and B system pressure, the control columns can still be moved to command a pitch change. The control column input is applied to the input bungee, the input link, and with enough force, to the PCU itself.

Should either pitch or roll become jammed, a pitch/roll disconnect handle can be used to disconnect the left and right elevators and the ailerons from the roll spoilers. The pilot controls the left elevator and the ailerons. The copilot controls the right elevator and roll spoilers.

If the autopilot is engaged when the handle is pulled, it will disengage. The same handle remaining in the up position is then used to mechanically reconnect the good system.

If the input to either PCU became disconnected or misrigged, the other PCU would continue to move not consistent with its partner resulting in a PCU "force fight" generating an amber FLT CONTROL FAULT message.

Autopilot

A single autopilot servo is connected in parallel to the right elevator. If the autopilot is engaged, the autopilot servo provides input to the elevator systems in response to automatic flight control system commands. In the event of a malfunction, the pilots will be able to manually overpower the servo motor causing the autopilot to disengage or by depressing the AP–TRIM–NWS red disconnect button on either control wheel.

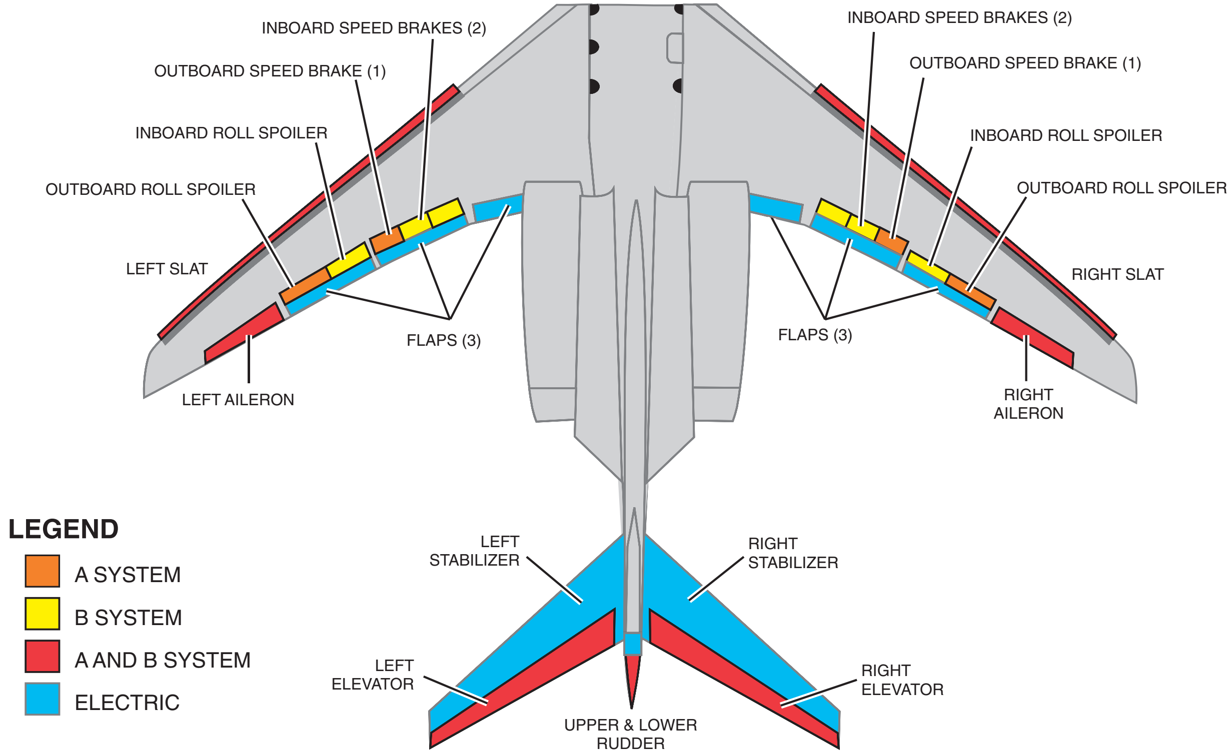


Figure AS-21. Primary and Secondary Flight Controls

Pitch Feel

Pitch feel is provided by the PCU centering bungees and two feel systems. The pitch feel systems contain springs which provide variable pitch forces, according to airspeed.

Gust Lock (If Installed)

Pulling the gust lock T-handle, located under the pilot's instrument panel, locks the rudder and the elevator systems only. Pulling the handle moves a latch assembly into a slot on the elevator torque tube.

Horizontal Stabilizer

The horizontal stabilizer trim actuator includes a jackscrew and two identical 28-volt DC motors. The pilots control the position of the stabilizer electrically, using pitch trim switches located on each control wheel. Secondary-trim rocker switches are mounted on the center console to provide an alternate method for trimming the aircraft. Trim speed varies with the stabilizer position. Trim rates using secondary trim are approximately the same as the rates of primary trim. Electrical power for the secondary trim system comes from the emergency bus while primary trim requires main DC. When the autopilot is engaged, pitch trim functions to relieve loads on the elevator. Failure of primary trim and/or selecting secondary trim would also fail or disconnect autopilot and Mach trim.

Ailerons and Roll Control

The roll control system includes one aileron and two roll-control spoilers on each wing. The pilot's control wheel is connected to the aileron control system. The copilot's control wheel is connected to the roll spoiler system.

The two roll systems are mechanically linked through a torque tube located under the floor of the cockpit. If the roll system becomes jammed, the ailerons can be disconnected from the roll spoilers by pulling the pitch/roll disconnect T-handle.

Aileron Differences Terminology

Original style (S/N 750–0001 through S/N 750–0139)—Single Slope

Bungee mod (S/N 750–0140 through S/N 750–0149 or with service bulletin)—Dual Slope

New style (S/N 750–0150 and on)—Regearing

Aileron Control Differences

Original aircraft design provided full aileron travel when the control yoke achieved full travel. This system was identified as a "single slope" system. Service bulletin modifications allowed for the installation of a bungee (an artificial feel cartridge) to provide extra feel and slightly faster return to neutral of the ailerons during landing in turbulence and crosswinds. This system was identified as a "dual slope" system. Both systems required full yoke travel to achieve full aileron displacement.

Maximum aileron deflection is 15° above and below the wing. Inputs from the control yoke are mechanically transferred by linkage to an input sector, which then acts upon a pair of PCUs. The PCUs are connected mechanically to the ailerons. Movement of the trim actuator shifts the neutral position of the input sector.

Ailerons—Regearing

Aircraft 0150 and on (or by service bulletin modification) have a new design which allows full aileron displacement at one-half yoke travel, provided both hydraulic systems are operating normally. This permits faster aileron input during turbulence and crosswind landings. This system was identified as a "regearing" system. If either hydraulic system is depressurized, a cyan CAS message AILERON RATIO LOW is displayed and full yoke travel will be required to achieve full aileron displacement.

Maximum aileron deflection is 15° above and below the wing. Inputs from the control yoke are mechanically transferred by linkage to a gearing system, which then acts upon a pair of PCUs. The PCUs are connected mechanically to the ailerons. Movement of the trim actuator shifts the neutral position of the gearing system.

Aileron Latch Mechanism

If neither hydraulic system is available, there will be a lag between control wheel movement and an aileron response. This results in an inefficient exchange of mechanical energy. To reduce some of the mechanical free play involved, an aileron latch system is incorporated to bypass the PCUs and bungees (input sector). If an aileron PCU malfunction occurs, the PCU actuators could become pressurized in different directions. This aileron "force fight" will cause an amber FLT CONTROL FAULT message.

Autopilot

The electric servo provides a mechanical input to the aileron system in response to commands from the IAC. Servo inputs drive the entire system including the control wheels. The autopilot servo can be disengaged by pressing the AP/TRIM/NWS disconnect switch on either pilot's control wheel.

Roll Spoilers

Each roll spoiler is operated by a single PCU. The outboard roll spoiler is powered by the A-system and the inboard spoiler is powered by the B system. Roll spoiler input is transferred from the pilots' control wheels to a spoiler mixer and then to the roll spoiler PCUs. Maximum control wheel input deflects the spoilers 40°. If hydraulic pressure drops below 2,000 psi, the check valve will allow the spoiler panel to blow down but prevents the panel from lifting.

Rudders

Upper and lower rudders provide yaw authority and damping capabilities. The lower rudder is hydraulically operated. The upper rudder is electric. Each rudder has an independent, full-time yaw damp control system. Both rudders share mechanical inputs from the pilots' rudder pedals.

Lower Rudder

Two PCUs hydraulically operate the lower rudder. The B-system powers one PCU and the A-system powers the other PCU. If the B-system engine-driven pump fails, a small standby pump is available for this PCU. The electrically-operated pump in the rudder standby system (RSS) can power the B-system PCU even when a B-system fluid loss has occurred. If both main hydraulic and rudder standby systems fail, the lower rudder will still respond to manual inputs to the PCUs.

Rudder Limiters

The amount of rudder travel possible at higher speeds is less than low speeds because of the dual rudder authority limiters. The limiters restrict maximum lower rudder deflection (and rudder pedal movement) from 30° (at low air speeds) to a minimum of 4° at the higher speeds. If one limiter fails, an amber RUDDER LIMIT FAIL message will be displayed. If both limiters fail, the situation is worse, resulting in a red RUDDER LIMIT FAIL message. When both limiters have failed, the possibility exists that the rudder available may exceed the safe rudder travel limits.

Lower Rudder Yaw Damp Actuator

Dutch roll damping and low-speed turn coordination is provided by dual electric yaw damp actuators. The yaw damp system is a full-time active system. There are two actuators, but only one is in control. The FGC receives its inputs from the IRS and the air data computer to determine the proper amount of damping required. The flight guidance and yaw-damp systems alternately power up on the A and B computers, with alternating aircraft electrical power-ups. A trim actuator mounted in the vertical fin provides rudder trim and centering functions.

Upper Rudder

The yaw stability augmentation system (YSAS) controls the upper rudder to provide the airplane with independent Dutch-roll damping and additional yaw control. The YSAS consists of two identical computers using data from it's own internal gyros. The YSAS is capable of maintaining positive Dutch-roll damping capability even when the yaw damping function on the lower rudder system is inoperative.

SECONDARY FLIGHT CONTROLS

Flaps

The flaps are powered electrically by a flap motor, flexible shaft drive units, and gear boxes. When the slat/flap position lever is moved to a detent, a signal is sent to the flap controller. One flex-shaft drive train is provided for the left wing flap actuators and another flex-shaft drive train is provided for the right actuators. Each flap on each wing is moved up or down by two actuators.

Slats

Slat movement is electrically controlled and hydraulically operated, using the slat-flap handle. Four slat actuators are mounted on each wing leading edge. Two actuators on each wing are powered by the A-system and two are powered by the B-system. If either A or B system pressure is lost, the slats can be operated normally using hydraulic power from the remaining system. The slat actuators are kept pressurized, whether the slats are up or down, to hold the slats in the commanded position.

Auto Slats

Slat position inputs are provided to each of the angle-of-attack (AOA) computers. If either of the AOA systems detects the normalized angle of attack exceeds .83 AOA, the computer will issue an autoslat extend command. The slats will automatically restow when the AOA is reduced.

Speed Brakes

There are three speed-brake panels on each wing. The outboard panel on each wing is powered by the A-hydraulic system. The two inboard panels on each wing are powered by the B-hydraulic system. Each speed-brake panel is hydraulically actuated by a single PCU. The middle left, and outboard right panels are monitored for speed-brake position. When both panels indicate deployment, a white message is displayed on EICAS. The message changes to an amber message if radio altitude is less than 500 feet. If both A and B hydraulic system pressures are lost, the speed brakes will not operate.

LANDING GEAR AND BRAKES

OVERVIEW

This section explains how the landing gear and brakes on the Citation X operate and includes information about two other related systems: nosewheel steering and antiskid. A description of each system is presented, as well as some normal and abnormal operating procedures and considerations.

LANDING GEAR

The landing gear system consists of two main-gear and one nose-gear assemblies (Figure AS-22). Each consists of dual wheels attached to an axle at the lower end of a strut. Extension and retraction is accomplished by sending A-system hydraulic power from the engine-driven pump, from the PTU, or the A-AUX pump into gear actuators, which then push the gear down or pull the

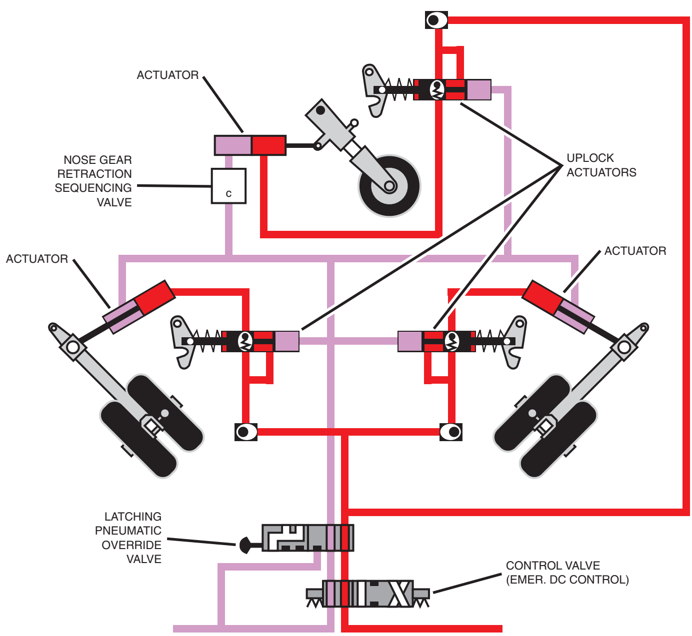


Figure AS-22. Landing Gear and Brakes

gear up. Gear extension and retraction cycles, using the normal A-system engine-driven pump or the pressure provided by the PTU, should take approximately six seconds. If the auxiliary pump is providing the pressure, gear extension will take approximately 22 to 25 seconds. Remember, if the A-AUX pump is the only source of pressure, it should not be used to extend gear. Hydraulic flight control operation could be adversely affected during the lengthy extension cycle as the small electric pump attempts to power the gear and the flight controls at the same time.

If both main hydraulic systems fail and/or if the A-AUX pump is the only source of pressure available on the aircraft, gear is extended by directing the high-pressure nitrogen from the storage bottle into the gear-extension lines. When the landing gear is blown down an override valve latches into position to prohibit mixing the nitrogen with the hydraulic fluid. Once the gear is blown down it cannot be retracted. If this high-pressure system has also failed, a mechanical uplock release system is installed to allow the gear to “free fall” into the down-and-locked position. If either uplock handle is difficult to pull, force can be reduced by unloading the “A” hydraulic system, pulling the HYDR B/PTU CONT circuit breaker, and ensuring the auxiliary hydraulic pump is OFF.

An electrical solenoid-operated locking pin physically prevents gear retraction on the ground. Pulling the pin out of the way to permit handle movement into the up position requires a valid airborne signal from the nose-gear squat switch and from either of the main-gear squat switches. If the gear handle will not come up after takeoff, either the nose or both main squat switches may have failed and/or the solenoid is not receiving electrical power or it has failed. The circuit breaker on the pilot’s CB panel labeled RH GEAR controls power to the solenoid. There are no provisions to override the squat switch logic.

There are four gear position indicator lights: one red UNLOCK indicator and three green (down and locked) lights. In addition to the light indicators on the panel, an aural gear warning tone will sound under the following conditions:

1. Airborne, if any gear is not down and locked while the flaps are beyond 24°.

2. Airborne, if any gear is not down and locked with both throttles are retarded to less than 30° TLA and:

   a. Radio altimeter signal indicates less than 500 feet or

   b. If radio altimeter signal invalid or missing, flaps are <24°, both AOA signals indicate an angle of attack greater than 0.4.

Within the actuators there are mechanical downlocks that engage at the end of the actuator extend stroke. Movement of the gear into the fully-extended position is necessary in order to engage the downlocks. The down-and-locked plunger switches make contact at the end of the extension travel after this locking process takes place. These mechanical locks, once engaged, can only be disengaged hydraulically.

ANTISKID BRAKE SYSTEM

The Citation X brake system consists of four carbon wheel-brake assemblies, an antiskid system, and a pneumatic emergency brake system. Hydraulic braking requires pressure from the A-hydraulic system. Antiskid protection requires main DC electrical power. Electrical voltages are interpreted as wheel-speed inputs to a control box that electrically modulates skid-control valves. If a tire skid occurs, hydraulic pressure to individual brakes is automatically shutoff by electrically closing the associated valve.

To set the parking brake, a pilot applies pedal pressure and lifts the parking brake handle aft of the center console. The handle connects to the parking brake valve, which has four one-way check valves (one for each brake line) that allow in pressure when the brakes are pushed but prevent pressure from escaping when the brakes are released. The pilot may set the brakes by applying brake pressure before or after pulling the brake handle. If the brake handle is pulled, but there is insufficient pressure in the brake lines (less than 1,200 psi), an amber PARK BRAKE/LOW PRESS message is displayed. Once sufficient pressure is available, the amber message extinguishes, and the cyan PARK BRAKE ON message comes on instead. If the handle is pulled in flight, an amber PARK BRAKE ON alert is displayed.

After the pilots extend the gear in flight, electrical power is again applied to the skid control box and a self test is accomplished. After the test is complete, the skid control valves remain powered closed. The valves remain closed until after touchdown (both main-gear squat switches make contact for five seconds) or after a 35-knot wheel spinup is detected, preventing braking until reaching 35 knots wheel speed.

Emergency braking uses high-pressure nitrogen from a storage bottle. Pulling the single emergency-brake lever, located under the pilot's tilt panel, allows a controlled release of this nitrogen pressure into all brake lines simultaneously. The brake force applied is proportionate to the amount of pull force the pilot applies to the emergency brake lever. During emergency braking, pressure should not be placed on the toe brakes.

NOSEWHEEL STEERING

The aircraft is equipped with a hydraulically-powered nosewheel steering (NWS) system. The pilots provide inputs for nosewheel steering through the rudder pedals or through the tiller on the pilot's left console. NWS is active at all times on the ground when A-system hydraulic pressure and main DC electrical power are available. Backup NWS pressure is available from an accumulator, which stores fluid under pressure. However, main DC electrical is required for this backup system to function. Either pilot may disconnect NWS from the cockpit should abnormal steering commands occur. Nose gear centering is part of the retraction sequence. Prior to reaching the nose-gear actuator, retract pressure is first routed to a nosewheel steering centering actuator.

THRUST REVERSER SYSTEM

One thrust reverser (TR) lever is mounted piggyback on each throttle lever. To deploy reversers, the levers are pulled up and aft. To stow reversers, the levers are pushed forward and down. Each thrust reverser is equipped with two hydraulically-powered primary actuators. The primary actuators act on push rods to drive the TR open or closed. Two hook actuators, one on each side of the reverser, hydraulically unlatch the reverser locking hooks in preparation for deployment.

During the deploy cycle, an overstow motion moves the latch away from the hook's barbed end. Once this occurs, hydraulic pressure is routed into the hook actuator allowing the hooks to be positioned out of the way of the latches. Once the hooks are pivoted back in this manner, several switches make contact. One of the switches inputs to the control valves, which move to permit hydraulic pressure into the deploy side of the primary actuators. The primary actuators then move, bringing the doors into the deployed position.

During the stow-cycle, the doors are again placed into the overstowed position in preparation for hook engagement. The reverser control valves move to the stow position and the primary actuators move to stow the doors. Once the stow cycle is complete, hook actuator pressure is vented to return, and the hooks are forced into the normal locked position by the force of the hook actuator spring. Pressure is then relieved from the primary actuators. Leaf springs ensure a positive pressure is kept on the hook latches.

Two latch unlock switches make contact during the unlocking process. As the hooks pivot back, a cam on the hook assembly makes contact with these switches. The switches are connected to the UNLOCK annunciator light in the cockpit, alerting the pilots that one or more locks have been released. The other switch is the unlatch switch. The plunger arm within the hook actuator makes contact with the unlatch switch. The plunger arm is hydraulically positioned to move the hooks back. As it does so, the plunger arm contacts the unlatch switch and a signal is sent to the solenoid-operated control valves. The control valves reposition as required for deployment or stow operations. In the deploy sequence, another switch, which is connected to the outboard primary actuator, makes contact when the thrust reverser doors are fully deployed. When the primary actuator switch makes contact, a DEPLOY annunciator light illuminates on the center panel. Protective features are incorporated to prevent deployment and/or to reduce the impact of a deployed reverser.

AUTOSTOW PROTECTION

In the event of an inadvertent deployment of a thrust reverser, an emergency stow switch is provided. When moved out of normal into the STOW EMER position, a continuous stow signal is sent to the TRCU to position the control valves to stow. During emergency stow, the signal to stow remains active as long the switch remains in EMER. Since pressure is being continuously supplied, the doors will remain in a continuous overstowed condition. The ARMED annunciator light will illuminate and remain illuminated as long as the switch remains in stow.

If any one latching hook becomes unlocked, or if the latch-unlock switch should makes contact with the hook cam, an UNLOCK light will occur on the reverser light panels. There is no CAS message associated with this condition but there are *AFM* procedures, involving use of the emergency stow switch.

If any two of the hooks become unlatched, the UNLOCK light will illuminate and a signal from the TRCU is sent to automatically energize the control valves, on the affected side, into the stow position. This condition will illuminate the ARM annunciator light on that side, indicating pressure is available through the control valve. Once the reversers have reached the overstowed position, the control valve repositions to allow the doors to go back to the normal position again. This should extinguish the UNLOCK and the ARM lights.

If the in-flight condition involves three or four unlocked signals, or a reverser actually deploys, the TRCU acts to electrically position the control valves into the overstowed condition to attempt to stow the reversers. Additionally, with three or more unlocked conditions, FADEC will limit engine thrust to idle. Should this condition occur for either engine, an amber TR AUTOSTOW L or R message will be displayed in EICAS. The idle-thrust FADEC command continues until the crew positions the associated thrust lever to the idle detent. Once the thrust lever is in idle, the TR AUTOSTOW message will go out and increased thrust is again available, regardless of whether the reverser successfully stowed. If this unlocked condition occurs to both engines, the CAS message becomes a red TR AUTOSTOW L–R. The pilot will have only idle thrust regardless of TLA until associated throttles are first manually retarded to idle.

If the FADEC communication link with the TRCU is compromised, the amber message, ENG TR SW FAULT L or R, will appear. This message simply alerts the crew to the fact that, if a reverser deploys in flight, the FADEC controlled thrust reduction is inoperative. Being able to successfully fly the aircraft during an in-flight reverser deployment is greatly enhanced when the affected engine is not operating at high rpm.

Two PCUs hydraulically operate the lower rudder. The B-system powers one PCU and the A-system powers the other PCU. If the B-system engine-driven pump fails, a small standby pump is available for this PCU. The electrically-operated pump in the rudder standby system (RSS) can power the B-system PCU even when a B-system fluid loss has occurred. If both main hydraulic and rudder standby systems fail, the lower rudder will still respond to manual inputs to the PCUs.

Rudder Limiters

The amount of rudder travel possible at higher speeds is less than low speeds because of the dual rudder authority limiters. The limiters restrict maximum lower rudder deflection (and rudder pedal movement) from 30° (at low air speeds) to a minimum of 4° at the higher speeds. If one limiter fails, an amber RUDDER LIMIT FAIL message will be displayed. If both limiters fail, the situation is worse, resulting in a red RUDDER LIMIT FAIL message. When both limiters have failed, the possibility exists that the rudder available may exceed the safe rudder travel limits.

Lower Rudder Yaw Damp Actuator

Dutch roll damping and low-speed turn coordination is provided by dual electric yaw damp actuators. The yaw damp system is a full-time active system. There are two actuators, but only one is in control. The FGC receives its inputs from the IRS and the air data computer to determine the proper amount of damping required. The flight guidance and yaw-damp systems alternately power up on the A and B computers, with alternating aircraft electrical power-ups. A trim actuator mounted in the vertical fin provides rudder trim and centering functions.

Upper Rudder

The yaw stability augmentation system (YSAS) controls the upper rudder to provide the airplane with independent Dutch-roll damping and additional yaw control. The YSAS consists of two identical computers using data from it's own internal gyros. The YSAS is capable of maintaining positive Dutch-roll damping capability even when the yaw damping function on the lower rudder system is inoperative.

CREW ALERTING SYSTEM

CONTENTS

CREW ALERTING SYSTEM

GENERAL

This section describes the Crew Alerting System (CAS) portion of Engine Indicating and Crew Alerting System (EICAS). For the Engine Indicating (EI) portion of EICAS, refer to Engine Indicating—General, in the *Model 750 Maintenance Manual.*

This section covers CAS message description and operation. For a complete list of CAS messages, the definitions, color coding and trigger points, refer to CAS Messages—Troubleshooting, in the *Model 750 Maintenance Manual.*

DESCRIPTION AND OPERATION

CAS messages are designed to replace the traditional annunciator panel with a cathode ray tube display. This display unit has the ability to indicate system abnormalities by means of visual, textual and audible cues.

CAS messages fall into one of four levels:

- Level 0—Status messages appear in white
- Level 1—Advisory messages appear in cyan
- Level 2—Caution messages appear in amber
- Level 3—Warning messages appear in red

Up to 12 CAS messages of various levels can be displayed at a given time. A scroll knob is located in the lower right corner of the display unit and is used to scroll CAS messages on and off the screen.

If more than 12 CAS messages are active at a given time, they will be hidden off screen. The user will be alerted to the presence of off-screen messages by numerals and arrows indicating the number and direction. These messages are viewed by rotating the scroll knob (located on lower right corner of the display unit) in a clockwise or counterclockwise direction.

If the screen is full of red and/or amber CAS messages, the crew will be alerted to any new cyan or white messages by the status line flashing for five seconds.

COLOR CHANGES

In some circumstances, a CAS message may change from one color to another to indicate a change in status. An example would be the failure of the left generator. This failure would generate the amber caution message GEN OFF L. However, if the right generator subsequently failed, the message would change to a red GEN OFF L–R warning.

COMPOUND CAS MESSAGES

EICAS can use certain messages for more than one related annunciation by independently monitoring and annunciating each. For example, if the CAS message DU 1 HOT is being displayed and display unit three subsequently overheats, the original message will be replaced with the compound message DU 1–3 HOT. This is done to minimize the number of CAS messages. The new message would then require acknowledgement and be relocated to the top of the stack with its color hierarchy.

NEW MESSAGES

New messages will appear at the top of the message stack within each color group. If the CAS page is full and a new message occurs, the message status line will increment (relative to color hierarchy) and the new message will be displayed at the top of the stack within its color group. The stack, if hidden, will come into view with the new message at the top of the screen. If RED messages are present, they will not scroll off the screen. By rotating the knob located in the lower right corner of the display unit, hidden CAS messages scroll into view. The order of precedence for displaying messages is all red, amber, cyan, then white.

NO MESSAGES

When no CAS messages are present, the CAS screen will be blank.

MESSAGE ERRORS

The system uses dual fault warning computers (FWCs) which contain the logic as to when a CAS message should be displayed. If both FWCs do not agree, an amber box with the text FWC will appear on the pilot's and copilot's Primary Flight Displays. This will give the crew an opportunity to select the valid FWC for display.

FAULT WARNING COMPUTER FAILURE MESSAGES

If the controlling FWC fails, all CAS messages and status line data will be removed and replaced with a red X drawn through the entire CAS display area until the crew manually selects a reversionary mode. If the cross side FWC (the side not driving the EICAS display) fails, then the amber CAS message FWC 2 FAIL will appear.

DATA ACQUISITION UNIT FAILURE MESSAGES

The DAUs are designed for redundancy with identical inputs going into Channel A and Channel B of each DAU. If both channels do not see the same signal(s), this discrepancy will be flagged through various CAS messages.

INTERFACE WITH MASTER CAUTION SYSTEM

Those systems which generate Level 2 amber caution messages, also cause the Master Caution Annunciator light switch to activate. For caution system sequence, refer to Master Caution and Warning—Description and Operation, in the *Model 750 Maintenance Manual*.

INTERFACE WITH MASTER WARNING SYSTEM

Those systems which generate Level 3 red warning messages also cause the Master Warning Accunciator light switch to activate. For sequence of the warning system, refer to Master Caution and Warning—Description and Operation, in the *Model 75 Maintenance Manual.*

INHIBITED MESSAGES

Some CAS messages are inhibited from appearing under certain conditions. This inhibit, or masking of messages, is done to reduce CAS clutter on the display unit. Messages are inhibited under a strict logic sequence. For a complete list of messages and the logic associated with them, refer to CAS Messages—Troubleshooting, in the *Model 750 Maintenance Manual*.

INHIBIT CONDITIONS

Inhibits occur based on one of the following logic parameters:

1. Engine shutdown Logic—When system detects engine not running, throttle lever angle (TLA) less than 8° (cutoff), and Full Authority Digital Engine Control (FADEC) is valid, certain messages will be replaced with the cyan CAS message ENGINE SHUTDOWN L–R. When throttles are not in cutoff and FADEC declares the engine not running, a red CAS message ENGINE FAILED L–R will be displayed which also inhibits certain messages.

2. Engine Start Logic—Some CAS messages are inhibited from being processed until the engine has been started.

3. Delay Logic—Debounce (delay) is built in for some messages, to prevent nuisance messages. For example, during valve transition.

4. Clear Logic—Some CAS messages will self clear after a few seconds.

5. Ground Logic—Some CAS messages will be shown on the ground only.

6. Flight Logic—Some CAS messages will be shown in flight only.

7. Partial Power Logic—Some CAS messages are inhibited during prestart checks. These checks can occur when the EICAS partial power switch is in the ON position and limited power is being provided to the DAUs and IACs.

8. TOPI (Takeoff Phase Inhibit) Logic—Most CAS messages are inhibited during takeoff phase to minimize crew distraction. The following CAS messages are NOT inhibited during takeoff phase:

- ANTI-SKID FAIL
- APU FIRE
- ATTCS ARMED
- ATTCS INOP
- CABIN SMOKE
- DUAL GEN FAILURE
- ENGINE FIRE L–R
- ENGINE FAILED L–R
- TR AUTOSTOW
- NO TAKEOFF

9. LOPI (Landing Operations Phase Inhibit) Logic—A majority of CAS messages are inhibited during landing operations to minimize crew distraction. The following CAS messages are NOT inhibited during landing operations:

- ALL RED CAS MESSAGES
- AUTO PILOT (aural)
- YD FAIL UPPER A (amber)
- YD FAIL UPPER B (amber)
- YD FAIL UPPER A (cyan)
- YD FAIL UPPER B (cyan)
- SPEED BRAKES
- MINIMUMS (aural)
- LANDING GEAR (aural)

NO TAKEOFF ANNUNCIATION LOGIC

EICAS provides for NO TAKEOFF message based on input from a number of sensors (flaps, parking brakes, gust locks, etc.). Unless every sensor indicates proper configuration for takeoff, a NO TAKEOFF message will occur on EICAS. NO TAKEOFF ADVISORY and NO TAKEOFF WARNING messages cannot be acknowledged. Only when the element contributing to the logic is satisfied will the warning cease. No takeoff logic diagrams are provided in CAS Messages—Troubleshooting, Figure 101 in the *Model 750 Maintenance Manual*.

MESSAGE LEVELS

WARNING MESSAGES

Warning messages are Level 3. The color assignment is red. Warning messages stay on the EICAS display until the condition causing the message is corrected. Red messages are not allowed to scroll off the EICAS display using the control knob. CAS warning messages are annunciated in the following ways:

- By flashing on EICAS screen until acknowledged. After acknowledgement, it remains a steady red color.

NOTE

Acknowledgement means depressing one of the MASTER WARNING RESET switches. Switches are located on the pilot and copilot upper instrument panel.

- By appearing steady on the multifunction display until acknowledged. After acknowledgement, they disappear.
- By flashing on the master warning annunciator switch light until acknowledged.
- By an audio tone (double chime) that is repeated a maximum of three repeats, or until acknowledged.

CAUTION MESSAGES

Caution messages are Level 2. The color assignment is amber. Caution messages stay on the EICAS display until the condition causing the message is corrected. Amber messages may be scrolled off the screen. CAS caution messages are annunciated in the following three ways:

- By an attention chime.
- By flashing on EICAS screen until acknowledged. After acknowledgement, they remain a steady amber color.

NOTE

Acknowledgement means depressing the MASTER CAUTION RESET annunciator light switch, located on the upper instrument panel.

- By steady illumination on the master caution annunciator switch light until acknowledged.

ADVISORY MESSAGES

Advisory messages are Level 1. The color assignment is cyan. They require no acknowledgement, nor trigger any external annunciator systems. These messages will flash for five seconds when first appearing on the EICAS screen.

STATUS MESSAGES

Status messages are Level 0. The color assignment is white. They require no acknowledgement, nor trigger any external annunciator systems. These messages are steadily illuminated on the EICAS screen.

LIST OF MESSAGES

EICAS contains over 200 messages which vary from Level 0 to Level 3. These messages are triggered by various inputs and have assorted tones associated with the message.

A complete list of messages, the colors, triggers, signal inputs and inhibits can be found in CAS Messages—Troubleshooting, in the *Model 750 Maintenance Manual*. This list is helpful in understanding why some messages are masked at certain phases of the flight and for troubleshooting CAS message problems.

RED CAS MESSAGES

TABLES

RED CAS MESSAGES

Table RC-1. RED CAS MESSAGES (1 OF 3)

MESSAGE	CAUSE
APU FIRE	APU fire detected.
AUTO SLATS FAIL	Slats failed to automatically deploy. Indicates imminent stall.
BAGGAGE SMOKE	Aft baggage compartment smoke/fire detected.
BATT 1–2 O'TEMP	Battery temperature >63°C. Reactivates >71°C.
CABIN ALTITUDE	Cabin altitude @10,000 ± 350 feet.
CHECK PFD	Indicates DU wraparound monitor has failed for both PFDs. Information is sent from the IAC SG to the DU. The displayed information is sent back to the IAC SG and is compared to what was originally sent to the DU. If this information is not identical, then an amber CHECK DU message is generated. This may indicate a wiring or communication problem, a failed display or a frozen display. If the display unit is used as a PFD, it may be presenting misleading Mach attitude, airspeed, attitude or baro-set information. If wraparound information is not identical for DU 1 and DU 5 then a red CHECK PFD message will be displayed.

Table RC-1. RED CAS MESSAGES (2 OF 3)

MESSAGE	CAUSE
EMERGENCY DESCENT	Autopilot initiated an emergency descent. FGC–EDM mode active.
ENG VIBRATION L–R	Engine vibration detected by accelerometers in either fan or core.
ENG FAILED L–R	FADEC declares engine shutdown.
ENGINE FIRE L–R	Engine fire detected.
GEN OFF L–R	Both engine generators off line (power relays open).
HYD O'TEMP A–B	Hydraulic fluid temp >130°C.
HYD PUMP FAIL A–B	Both engine-driven pump pressures <2,350 psi.
MINIMUM SPEED	Above FL350 and flaps up and both AOAs sensing >12° pitch attitude. Continuing to slow could result in dual engine flameout.
NO TAKEOFF	TLA >60° weight on wheels and not in takeoff configuation.
OIL PRESS LOW L–R	Engine oil pressure low (switch opens <32 psi).
PYLON BLD LEAK L–R	O'Heat detected in engine pylon (>250°F).

Table RC-1. RED CAS MESSAGES (3 OF 3)

MESSAGE	CAUSE
RUDDER LIMIT FAIL	Both rudder limiters have failed. Rudder authority may be enough to result in structural damage if large pedal input is applied.
STAB BLD LEAK L–R	Horizontal stabilizer structure hot (>200°F).
TR AUTOSTOW L–R	Three latch switches unlocked on each T/R (a total of six unlatched). The FADECs reduce both engine's thrust to idle via software command. This results in throttle remaining in the last position at which it was set. The must be moved to idle to reset the FADEC logic to gain control of thrust

AMBER CAS MESSAGES

TABLES

Table	Title	Page

AMBER CAS MESSAGES

Table AC-1. AMBER CAS MESSAGES (1 OF 19)

MESSAGE	CAUSE
AILERON LATCHED	Aileron latch handle pulled.
ANTISKID FAIL	Antiskid controller detected fault.
AOA HEAT FAIL L–R	AOA probe heater inoperative.
AOA PROBE FAIL L–R	AOA system inoperative. If both left and right AOA systems inoperative, the following systems will also be inoperative: AUTOSLAT SYSTEM, BOTH STICK SHAKERS, MINUMUM SPEED WARNING SYSTEM, AND LOW SPEED AWARENESS SYSTEM.
AP STAB TRIM INOP	AP engaged. Trim is commanded but no feedback is received. AP will not automatically disengage.
APU GEN OFF	Phase 6A and 7—In flight indicates APU is running AND that BOTH the APU and the right-hand engine generators are off line. Phase 4 or Phase 5—In flight indicates APU generator is OFF (or failed) and APU is running, and either main generator is OFF.
APU ON	APU operating above 31,600 feet when climbing and above 31,000 feet descending.
AURAL WARNING FAIL	Aural warning system (computers) failed on both sides. All aural warnings are inoperative.

Table AC-1. AMBER CAS MESSAGES (2 OF 19)

MESSAGE	CAUSE
BAGGAGE ALTITUDE	Baggage compartment altitude >14,000 feet or > 1 psid.
BAGGAGE DOOR OPEN	Baggage door not latched.
BAGGAGE DOOR SEAL	Seal not properly inflated (<5 psi).
BATT 1–2 OFF	Battery switch(es) is (are) OFF with NO BATT O'TEMP (split bus only).
BATT 1–2 O'CURRENT	Battery experiencing a discharge >199 amps (split bus only).
BUS CTRL 1–2 FAIL	Digital data bus controller has failed and opposite controller is automatically selected. Loss of both bus controllers will result in loss of all PFD, MFD, and EICAS displays, both flight guidance computers, lower rudder yaw dampers, primary trim, mach trim, and FADECs will be in ADC reversionary mode.
CABIN ALTITUDE	Cabin altitude >8,500 ft.
CABIN DOOR OPEN	Cabin door latch and/or one or more door pin switches are not seated, or the door mechanism or switch sequencing was not correct. Pressing the MASTER CAUTION RESET will inhibit the message for any one switch, or sequencing problem. Dispatch is permitted if the message clears and visual inspection confirms all door pins to be seated.

Table AC-1. AMBER CAS MESSAGES (3 OF 19)

MESSAGE	CAUSE
CABIN DOOR SEAL	Indicates cabin door seal pressure is low (<5 psi).
CABIN PAC O'TEMP	The cabin PAC has overheated (>435°F) and automatically shutdown by closing the cabin PAC valve and the max cool valve.
CBN VENT DOOR OPEN	Cabin vent door open (proximity switch). May indicate a cabin door sequencing problem. Check for CABIN DOOR OPEN message. If vent door opens, cabin pressurization will be lost.
CHECK AP ENGAGE	Indicates FWC and AFCS monitors disagree on clutch status. Pilot would have to overpower servos to fly aircraft.
CHECK DU 1–2–3–4–5	Indicates DU wraparound monitor has failed. Information is sent from the IAC SG to the DU. The displayed information is sent back to the IAC SG and is compared to what was originally sent to the DU. If this information is not identical, then a CHECK DU message is generated. This may indicate a wiring communication problem, a failed display or a frozen display. If the display unit is used as a PFD it may be presenting misleading Mach altitude, airspeed, attitude or baro-set information. If wraparound information is not identical for DU 1 and DU 5, then a red CHECK

Table AC-1. AMBER CAS MESSAGES (4 OF 19)

MESSAGE	CAUSE
CHIP DETECT L–R	Metal chips detected in engine oil (land as soon as practical within four hours).
COCKPIT PAC O'TEMP	The cockpit PAC has overheated (>435°F) and automatically shutdown by closing the cabin PAC valve and the max cool valve.
CONFIG MISMTCH 1–2	Indicates Primus 2000 system is detecting mismatched software in the IACs. This message is inhibited in flight.
CROSS TIE CLOSED	Inflight—indicates the crosstie relay has been selected closed when both engine generators are online or left engine generator and APU generator is online (split bus only).
CTR XFER OFF L–R	Indicates CTR WING XFER switch has been placed to OFF and the associated valve is closed.
CTR XFER XSIT L–R	Indicates the affected center tank transfer valve is neither open or closed. If fuel is in the center tank, fuel transfer to the affected wing may be reduced.
DAU1–2 MISCMP	Indicates A and B channels of the affected DAU do not agree (except for engine parameters).

Table AC-1. AMBER CAS MESSAGES (5 OF 19)

MESSAGE	CAUSE
DAU 1–2 MISCMP–ENG	Indicates A and B channels of the affected DAU do not agree with respect to engine data (N_1, N_2, ITT, oil temperature, oil pressure, oil quantity, and fuel flow).
DAU 1A–B–2A–B FAIL	DAU internal failure or ASCB data failure (if all four DAUs fail, message will change to DAU ALL FAIL).
DAU ALL FAIL	DAU internal failure of all DAUs or ASCB data failure.
DC BUS EMER 1–2	Indicates the respective battery is not charging and the respective emergency bus is isolated from its respective main bus. BUS 1 or BUS 2 isolation relay is open, either automatically by DC OVERCURRENT or by pilot selection of the affected DC BUS 1 or DC BUS 2 switch to EMER (split bus only).
DC OVERCURRENT L–R	Non-split bus—>400 amps at an altitude <41,000 feet or 300 amps at an altitude >41,000 feet. Split-Bus—FWC has sensed excessive DC generator amperage (exact amperage Honeywell proprietary).
DU 1–2–3–4–5 HOT	Display unit overtemperature.
DUCT O'TEMP CABIN	Cabin conditioned air supply too hot. Odor will be emitted (>260°F).

Table AC-1. AMBER CAS MESSAGES (6 OF 19)

MESSAGE	CAUSE
DUCT O'TEMP CKPT	Cockpit conditioned air supply is too hot. Odor will be emitted (>260°F).
ENG A/I COLD L–R	Engine bleed air to the respective inlet cowl is too cold with switch ON. This message will also be illuminated if the respective engine anti-ice switch is OFF and the opposite engine anti-ice or either stabilizer anti-ice switch is ON (<59°F two-minute delay).
ENG A/I HOT L–R	Engine bleed air to the respective inlet cowl anti-ice is too hot with switch ON or OFF (>250°F).
ENG MTR VLV FAIL L	LH engine metering valve failed at last controlled position. TLA will have no effect on thrust except for cutoff.
ENG MTR VLV FAIL R	RH engine metering valve failed at last controlled position. TLA will have no effect on thrust except for cutoff.
ENG O'SPD SHUTDN L	N_1/N_2 overspeed caused LH engine shutdown (N_1—105, N_2—105.6). Do not attempt to restart engine.
ENG O'SPD SHUTDN R	N_1/N_2 overspeed caused RH engine shutdown (N_1—105, N_2—105.6). Do not attempt to restart engine.
ENG TLA FAILED L–R	Engine not responding to TLA movement. Still at last TLA position.

Table AC-1. AMBER CAS MESSAGES (7 OF 19)

MESSAGE	CAUSE
ENG TR SW FAULT L	The automatic feature that restricts TLA to idle during in-flight TR deployment is disabled or either in-flight deploy switch is faulted (autostow may not be operational). Emergency stow will be operational.
ENG TR SW FAULT R	The automatic feature that restricts TLA to idle during in-flight TR deployment is disabled or either in-flight deploy switch is faulted (autostow may not be operational). Emergency stow will be operational.
ENG VIBRATION L–R	Engine vibration detected (fan <1.8 to ≥2.5 in. per second core <1.1 to ≥2.5 in. per second).
ESCAPE HATCH OPEN	Escape hatch open (door proximity switch).
FADEC BUS FAIL L–A FADEC BUS FAIL L–B FADEC BUS FAIL R–A FADEC BUS FAIL R–B	Indicates electrical connection between FADECs is compromised. If only A or B, select the opposite FADEC. If both A and B on the same engine, both FADECs may be in control which could affect engine stability. Avoid rapid throttle movement.

Table AC-1. AMBER CAS MESSAGES (8 OF 19)

MESSAGE	CAUSE
FADEC FAIL L A–B FADEC FAIL R A–B	**ALTITUDE ≥ FL 450 AND MACH ≤0.6:** Indicates affected FADEC CVG monitor has declared the FADEC incapable or the FADEC has failed, and the engine has automatically switched to the opposite FADEC. The opposite FADEC will continue to operate normally and the affected FADEC may reset when MACH is increased above 0.6 or altitude is below FL450. **ALL OTHER FLIGHT CONDITIONS:** If only A or B—Indicates affected FADEC has failed and the engine has automatically switched to the opposite FADEC. If both A and B on the same engine, engine will flameout.
FADEC FAULT L A–B FADEC FAULT R A–B	The FADEC in control is unable to monitor itself, or the FADEC in control and the FADEC not in control are detecting differences; or faulty data is being received from the MADCs, compressor inlet temperature or pressure sensors. The engine should continue to operate normally. This message will occur during the OVER SPD warning test on the ground if the throttle(s) was (were) above idle when power was applied to the FADEC. It will also occur if the SG REV switched to SG 1 or SG2.

Table AC-1. AMBER CAS MESSAGES (9 OF 19)

MESSAGE	CAUSE
FADEC REV ADC L–R	Engine is operating in reversionary mode due to loss of or faulty MADC data. Significant thrust loss may be experienced at high altitudes. Within the takeoff envelope, full takeoff thrust is available.
FADEC REV N_1 L–R	Engine is operating in reversionary mode due to loss of N_1 data FADEC is using N_2 to obtain N_1 speed. Some thrust loss may be experienced at high altitude or high ambient temperatures. N_1 will not be displayed. FADEC will continue to provide N_1/N_2 protection.
FAN DAMAGE L–R	FADEC has detected a change in the N_1–N_2 relationship (possible bird strike or FOD). FADEC has increased N_2 to its previous value. If actual fan damage has occurred, thrust may be reduced from the predamage setting. FADEC anti-ice logic is canceled.
FGC A–B FAIL	Indicates failure of both flight guidance computers. Depending on the cause, one or both may reset in about 30 seconds. If both flight guidance computers remain failed, the following will be inoperative: • Primary Stabilizer Trim • Autopilot • Flight Director • Mach Trim • Both Lower Yaw Damper

Table AC-1. AMBER CAS MESSAGES (10 OF 19)

MESSAGE	CAUSE
FIRE DETECT FAIL L	LH engine fire detection system inoperative.
FIRE DETECT FAIL R	RH engine fire detection system inoperative.
FIRE DETECT FAIL A	APU fire detection system inoperative.
FLAPS FAIL	Flap system inoperative.
FLT CONTROL FAULT	PCU force flight OR one or more flight control shutoff switches have been depressed.
FUEL BOOST ON L–R	Boost pump on due to low fuel pressure.
FUEL DOOR OPEN	Single-point refueling door AND/OR gravity fuel door is open.
FUEL FLTR BYPASS L	The LH engine fuel filter is becoming clogged and may bypass with continued operation (>11 psid).
FUEL FLTR BYPASS R	The RH engine fuel filter is becoming clogged and may bypass with continued operation (>11 psid).
FUEL FW VLV XSIT L	LH fuel firewall shutoff valve failed between open and closed positions (five-second delay).
FUEL FW VLV XSIT R	RH fuel firewall shutoff valve failed between open and closed positions (five-second delay).

Table AC-1. AMBER CAS MESSAGES (11 OF 19)

MESSAGE	CAUSE
FUEL IMBALANCE	Imbalance between LH and RH wing exceeds limits (>400 lbs).
FUEL LEVEL LOW L–R	Wing tank quantity is <500 lbs. (float switch).
FUEL MOTV FAIL L–R	Indicates the respective fuel motive flow shutoff valve has failed to close when crossfeed has been selected. Crossfeed from opposite tank may not occur.
FUEL PRESS LOW L–R	Fuel pressure being supplied to the engine is low (<5.3 psi).
FUEL TEMP L–R	TANK or ENGINE is too high or too low. Tank temp <–37°C or >52°C. Engine temp <4°C or >99°C.
FUEL XFEED OPEN	Crossfeed valve open when the tank you are crossfeeding to is 50 lbs heavier than the tank you are cross-feeding from.
FUEL XFEED XSIT	Crossfeed valve failed between open closed positions (five-second delay).
FWC 1–2 FAIL	Respective IAC—FWC Failure. If FWC fails, this message will not be displayed until SG REV switch is selected to SG 2.

Table AC-1. AMBER CAS MESSAGES (12 OF 19)

MESSAGE	CAUSE
GND PROX FAIL	GPWS failed.
GROUND IDLE L–R	FADECs will allow ground idle in flight.
HP DUCT O'PRESS L	Air from the LH HP regulator too high (>90 psi). Message will cycle on and off and the HP firewall shutoff valve will automatically cycle closed and open until the throttle is reduced.
HP DUCT O'PRESS R	Air from the RH HP regulator too high (>90 psi). Message will cycle on and off and the HP firewall shutoff valve will automatically cycle closed and open until the throttle is reduced.
HP PCOOLR O'HT L–R	Air discharge from HP precooler is too hot (>550°F).
HYD O'TEMP A–B	Respective hydraulic fluid temperature ≥93°C.
HYD PTU FAIL	Hydraulic PTU inoperative (“A” press low AND “B” press normal).
HYD PUMP FAIL A–B	LH/RH engine-driven hydraulic pump press <2,350 psi.
HYD PUMP UNLOAD A	“A” hydraulic unloading relief valve open either by selecting the hydraulic “PUMP A” switch to UNLOAD and hydraulic pressure is low.

Table AC-1. AMBER CAS MESSAGES (13 OF 19)

MESSAGE	CAUSE
HYD PUMP UNLOAD B	"A" hydraulic unloading relief valve open either by selecting the hydraulic "PUMP B" switch to UNLOAD or automatically due to high hydraulic fluid temperature or a faulty valve. PUMP B switch to UNLOAD.
HYD VOLUME LOW A–B	"A" AND/OR "B" reservoirs <16% (62 cubic inches).
IAC 1–2 O'TEMP	IAC 1 and/or IAC 2 too hot.
IAC TEST INOP 1–2	Both FWCs do not see valid WOW during power up, hence not all power-up tests are run. This message is inhibited in flight and must be corrected prior to flight.
IRS FAN FAIL 1–2–3	Forced air cooling for IRS has failed.
JBOX LIMITER OPEN L	Both 275 amp J-Box fuse limiters failed.
JBOX LIMITER OPEN R	Both 275 amp J-Box fuse limiters failed.
LATERAL MODE OFF	FD has dropped lateral mode.
LOAD SHED	Emergency ISO relay is open (load shed relay) and generators are not charging batteries.
MACH TRIM OFF	Primary trim actuator invalid or FGC failure of: primary, Mach, or AP trim.
NOSE DOOR OPEN L–R	Nose compartment door not locked.

Table AC-1. AMBER CAS MESSAGES (14 OF 19)

MESSAGE	CAUSE
NOSE WHL STR INOP	Red NWS/AP/trim disconnect switch pressed (WOW) or NWS failed.
OIL LEVEL LOW L–R	Oil level >8 qts. low.
P/S RAT HEAT OFF	Pitot/static switches OFF in flight OR TLA >60° on ground.
PARK BRAKE ON	Handle pulled in flight.
PARK BRK/LOW PRESS	Park brake pressure to parking brake <1,200 psi when lever pulled.
PITCH FEEL FAIL	Artificial pitch feel system fail OR loss of power.
PITCH/ROLL DISC	Pitch roll disconnect handle pulled or pins not reconnected after positioning pitch roll to reconnect.
PITOT HTR FAIL L–R	L/R pitot tube heater inoperative.
PITOT HTR FAIL SB	Standby tube heater inoperative.
PRI STAB TRIM FAIL	Actuator invalid OR FGC fail of: primary, Mach, or AP trim.
RAT HEAT FAIL L–R	RAT heater inoperative.
RAT PROBE FAIL L–R	Indicates failure of both RAT probes. No TAS, therefore autopilot will drop vertical mode. Both engines will be in ADC reversionary mode. SAT and RAT will not be displayed in cockpit.

Table AC-1. AMBER CAS MESSAGES (15 OF 19)

MESSAGE	CAUSE
RETRIM L–R WING DOWN	Roll mistrim monitor detects excessive force.
RETRIM NOSE UP–DOWN	Pitch mistrim monitor detects excessive force.
RUD STBY SYS FAIL	Pump run time >15 seconds or <.5 seconds or RSS press <2,200 psi or >3,200 psi. The RUD STBY SYS FAIL message will latch on when triggered by excessive pump run time or by applying power to the EICAS with the RUDDER STBY circuit breaker pulled.
RUDDER LIMIT FAIL	Rudder limiter failed on lower rudder; see CTRL POS page for position of failure (Phase 5 or earlier software).
RUD LIMIT FAIL A	Limiter failed on lower rudder; see CTRL POS page for position of failure.
RUD LIMIT FAIL B	Limiter failed on lower rudder; see CTRL POS page for position of failure.
SEC STAB TRIM FAIL	Secondary trim fail.
SG 1–2 FAIL	Symbol generator failure.
SLAT A/I COLD L–R	Slat A/I on and temperature <260°F at inboard sensor or 122°F at outboard sensor (1.5-minute delay).

Table AC-1. AMBER CAS MESSAGES (16 OF 19)

MESSAGE	CAUSE
SLAT A/I HOT L–R	Slat A/I on and temperature >340°F.
SLATS ASYMMETRY	L and R slat position sensors disagree OR if both slats are neither retracted or fully extended.
SLATS FAIL	Slats failed to reach commanded position.
SPEED BRAKES	Radio altitude <500 feet and speed brakes >5% OR if radio altitude is and gear down.
STAB A/I COLD L–R	Stab A/I ON and temperature <200°F (1.5-minute delay).
STAB A/I HOT L–R	Stab bleed air temperature >420°F (airborne) OR 260°F (on ground) (five-minute delay after landing).
STAB TRIM MISCMP	Indicates disagreement between stabilizer trim position displayed on EICAS and the sensed by the autopilot. This message disabled in flight.
STALL WARN L–R	AOA computer failed. The following will be inoperative: • Stick Shaker • Automatic Slat Extension • Minimum Speed • Low Speed Awareness System
START VLV OPEN L–R	Start valve open after start sequence

Table AC-1. AMBER CAS MESSAGES (17 OF 19)

MESSAGE	CAUSE
STATIC HT FAIL L–R	Static heater failed.
TAILCONE BLD LEAK	Tailcone temperature >160°F (airborne) OR >180°F (on ground).
TAILCONE DOOR OPEN	Tail cone access door open.
TOILET DOOR OPEN	Toilet service door open.
TR AUTOSTOW L–R	Three latch switches unlocked in flight. The FADEC reduces engine thrust to idle via software command. This results in throttle remaining in the last position at which it was set. The throttle must be moved to idle to reset the FADEC logic to gain control of thrust and clear the message.
TRIM SW FAIL L–R	Manual pitch trim failure on one half of split switch for >25 seconds—message latches, AP does not transfer. This message will also illuminate if one half of the switch is depressed for more than 25 seconds. The respective trim switch will remain inoperative.
VERTICAL MODE OFF	FD has dropped vertical mode.
WINDSHEAR FAIL	Windshear system failed.
WING A/I COLD L–R	Wing A/I on, temperature <59°F (three-minute delay).

Table AC-1. AMBER CAS MESSAGES (18 OF 19)

MESSAGE	CAUSE
WING A/I HOT L–R	Area behind wing leading edge, temperature >250°F (airborne) OR >210°F (on ground) (five minutes after landing).
WING BLD LEAK L–R	Overwing fairing area temperature >250°F.
WING CUFF COLD L–R	Engine A/I on, and temperature <60°F (1.5-minute delay).
WING CUFF HOT L–R	Engine A/I switched on, and temperature >200°F.
WING TANK O'FULL L	Wing surge tank full (float switch).
WING TANK O'FULL R	Wing surge tank full (float switch).
WSHLD HEAT INOP L	LH windshield controller unable to supply current to heating element.
WSHLD HEAT INOP R	RH windshield controller unable to supply current to heating element.
WSHLD O'TEMP L–R	Windshield temperature >60°C.
YD FAIL LOWER A–B	Dual YD failure.
YD FAIL UPPER A–B	IN FLIGHT: Indicates the affected upper yaw damper channel has failed. ON GROUND: Indicates the selected upper yaw damper channel has failed or both channels have failed.

Table AC-1. AMBER CAS MESSAGES (19 OF 19)

MESSAGE	CAUSE
YD NOT CENTERED	One or both linear actuators not centered upon power up. This can occur if the yaw damper is powered up with the rudder pedals not centered. This is a ground only message and will initiate a NO TAKEOFF warning.
YD OFF LOWER	Lower rudder yaw damper off.

CYAN CAS MESSAGES

TABLES

CYAN CAS MESSAGES

Table CC-1. CYAN CAS MESSAGES (1 OF 5)

MESSAGE	CAUSE
AC BEARING L–R	Indicates impending alternator bearing failure within approximately 20 hours of operation. Maintenance is required.
ACFT MAINTENANCE	Ground only message which is a key to flight crew that additional AIRCRAFT maintenance data available through AMT. Maintenance is required within 10 hours of indication of the message.
AILERON RATION LOW	Proximity switch—Aileron in low gear (ratio) due to single hydraulic system operation (150 and on and aircraft modified with aileron gearing modification).
APU GEN OFF	In Flight–Indicates APU is running AND the APU GEN is selected ON and both left and right hand generators are ON or the left hand generator s OFF and the right hand generator is ON (split bus). ON Ground—Indicates APU generator is OFF (or failed) and APU is running. IN Flight—Indicates APU generator is OFF (or failed) and APU is running and both main generators are on (non-split bus).
AURAL WARN FAIL 1–2	Aural warn inoperative on one side for headset and speaker.

Table CC-1. CYAN CAS MESSAGES (2 OF 5)

MESSAGE	CAUSE
BATT 1–2 OFF	Battery switch is off and battery over-temperature exists (split bus only).
CROSS TIE CLOSED	Normal closure of cross tie (split bus only).
CVR FAIL	CVR inoperative.
DC BEARING L–R–APU	Indicates impending generator bearing within approximately four hours of operation—maintenance required (S/N 750-0001 through 0206). Indicates impending generator bearing within approximately 20 hours of operation—maintenance is required (S/N 750-0207 and on).
ENG A/I COLD L–R	Engine A/I ON pylon bleed leak exists.
ENG SHUTDOWN L–R	Indicates the affected engine has been shutdown by the engine throttle. Replaces messages associated with engine shutdown. Clears after engine start.
FDR FAIL	FDR inoperative or FDR fault detected.
FGC A–B FAIL	Indicates failure of the respective flight guidance computer. Depending on the cause, the computer may reset in about 30 seconds.
FGC–ADC MISCMP	MADC 1–2 data to FGC do not agree. One or more FD/AP modes may disconnect or not engage.

Table CC-1. CYAN CAS MESSAGES (3 OF 5)

MESSAGE	CAUSE
FGC–ATT MISCMP	Indicates the flight guidance computer has prohibited autopilot engagement due to AHRS or IRS attitude miscompare. This message will clear after five seconds.
FIRE BOTTL LOW APU	APU fire bottle low pressure (<225 psi).
FIRE BOTTL LOW L–R	Engine fire bottle low press (<530 psi).
FLIGHT IDLE L–R	Indicates the ground idle switch is in the HIGH position on the ground.
FUEL GRV XFLW XSIT	Indicates a failure of the gravity cross-flow valve to fully open or to fully close (five-second delay).
GPWS FLAP OVRD	Annunciates the EGPWS selection to cancel TOO LOW FLAPS aural when landing with less than AFM normal flap setting.
GPWS G/S CANCEL	Annunciates the EGPWS selection to cancel Mode 5 excessive deviation glideslope alert for intended low altitude and unavailable G/S operations.
GUST LOCK ON	Gust lock pulled (elevator and rudder).
JBOX LIMITER OPEN L	275-amp fuse limiter failed left (J-Box).
JBOX LIMITER OPEN R	275-amp fuse limiter failed right (J-Box).

Table CC-1. CYAN CAS MESSAGES (4 OF 5)

MESSAGE	CAUSE
LOAD SHED OVERRIDE	Pilot has selected override, without generator online, all buses powered by batteries.
MEMORY FULL	Trend and exceedance memory is full. Download of data is required.
NO TAKEOFF	TLA <60° and aircraft not in takeoff configuration.
OIL FLTR BYPASS L	Impending oil bypass (>55 psid).
OIL FLTR BYPASS R	Impending oil bypass (>55 psid). Twenty hours of operation are allowed provided the amber CHIP DETECT L–R CAS message is not displayed.
P/S–RAT HEAT OFF	Pitot static switches are OFF on the ground. Will change to amber if throttles are advanced.
PARK BRAKE ON	Indicates the parking brake handle has been pulled up and sufficient pressure is being maintained.
RAT PROBE FAIL L–R	If RAT unavailable: No TAS, therefore A/P will disengage due to miscompare.
REMOTE CB TRIPPED	J-Box remote CB tripped. Not access-able in flight.

Table CC-1. CYAN CAS MESSAGES (5 OF 5)

MESSAGE	CAUSE
SLAT A/I COLD L–R	Indicates that the respective slat anti-ice is cold due to wing supply bleed leak.
TONE GEN 1–2 FAIL	Indicates that the respective IAC warning tone generator has failed.
WING A/I COLD L–R	Indicates that the respective inboard wing anti-ice is cold due to wing supply bleed leak
YD FAIL LOWER A–B	Indicates failure of the respective lower yaw damper (single failure).
YD FAIL UPPER A–B	On the ground, indicates that the off-side (not selected) yaw damper channel has failed.

WHITE CAS MESSAGES

TABLES

WHITE CAS MESSAGES

Table WC-1. WHITE CAS MESSAGES (1 OF 3)

MESSAGE	CAUSE
ACFT MAINTENANCE	This is a ground only ADVISORY message that indicates Aircraft Maintenance Test (AMT) data is available.
A/I ON ALL	All anti-ice systems are ON.
A/I ON ENG	Both engine anti-ice switches are ON (inhibited by A/I ON ALL message).
A/I ON SLAT	Slat anti-ice switch is ON (inhibited by A/I ON ALL message).
A/I ON STAB	Both stabilizer anti-ice switches are ON (inhibited by A/I ON ALL message).
APU ON	APU operational.
AVN MAINTENANCE	Ground only message that indicates Integrated Avionics Maintenance Test (IMT) data is available for the Primus 2000 system.
CHECKLIST MISMATCH	The configuration monitor in the IAC detects the two IACs have different checklist procedures.
FGC A–B MASTER	Indicates whether A or B flight guidance computer is in control, and is displayed for five seconds after an automatic or pilot initiated transfer.

Table WC-1. WHITE CAS MESSAGES (2 OF 3)

MESSAGE	CAUSE
FUEL BOOST ON L–R	Fuel boost pump activated/normal operation.
FUEL FW VLV CLSD L	LH fuel firewall shutoff valve—closed.
FUEL FW VLV CLSD R	RH fuel firewall shutoff valve—closed.
FUEL GRV XFLW OPEN	Fuel gravity crossflow valve—open.
FUEL XFEED OPEN	Crossfeed valve open.
HYD AUX PUMP ON	Auxiliary hydraulic pump on as sensed by voltage supplied to the pump.
HYD FW SHUTOFF A–B	"A" or "B" hydraulic firewall shutoff valves closed.
IMT–AFCS ON	Ground only message indicates inability to enter IMT because AFCS is engaged.
IMT–IAS HIGH	Ground only message indicates inability to enter IMT because airspeed is >50 KIAS.
IMT–NO EFIS	Ground only message indicates inability to enter IMT because the electronic flight instruments are not operational, therefore one would be unable to access IMT through MFD.
IMT–NO WOW	Inability to enter IMT because the aircraft must be on the ground.

Table WC-1. WHITE CAS MESSAGES (3 OF 3)

MESSAGE	CAUSE
IRS HI LAT ALN ALL	At higher latitudes, IRS takes longer than normal to align.
IRS HI LAT ALN 1–2–3	At higher latitudes, IRS takes longer than normal to align.
IRS HI LAT ALN ALL	At higher altitudes, all IRSs take longer than normal to align.
KEY NOT ACTIVE	Key depressed has no assigned function.
PAC HI CKPT–CBN	High flow to applicable PAC(s).
PAC HP VLV OPEN L–R	HP/LP crossover valve open.
SATCOM CALL 1–2	Satellite comm. SELCAL ALERT.
SELCAL HF 1–2 UHF	HF or UHF SelCal Alert.
SELCAL VHF 1–2–3	VHF SelCal Alert.
SPEED BRAKES	At least one speed brake not stowed.

AVIONICS MESSAGES

CONTENTS

ILLUSTRATIONS

AVIONICS MESSAGES

LATERAL MODE FLIGHT DIRECTOR ANNUNCIATORS

Refer to Figure AM-1 for mode annunciators.

HDG—Indicates the HDG button has been depressed on the flight guidance controller. The flight director steering command will intercept and maintain the heading selected with the heading bug.

VOR—This mode is selected when the NAV button is depressed on the flight guidance controller. The VOR mode automatically intercepts, captures, and tracks a selected VOR radial using the VOR navigation source displayed on the coupled PFD side. If the aircraft is outside of the normal VOR capture range pressing the NAV button on the flight guidance controller selects VOR armed and HDG mode. The PFD annunciates HDG and VOR in white. The flight director follows a roll command to fly the heading selected with the heading bug until the aircraft reaches the lateral beam sensor trip point. The HDG mode is then dropped and replaced with the VOR capture mode and will flash for five seconds.

LOC—This mode is selected by depressing the NAV button on the flight guidance controller. The LOC mode will automatically intercept, capture, and track a front course localizer beam using the LOC navigation source displayed on the coupled PFD. LOC armed (in white) and HDG select modes will automatically be selected if the beam deviation is outside of the LOC capture range (which is approximately more than one dot deviation). The flight director follows a roll command to fly the heading selected with the heading bug until the aircraft intercepts the localizer beam capture range. The HDG mode is then dropped and replaced with the LOC capture mode and will flash for five seconds.

BC—This mode is selected by depressing the BC button on the flight guidance controller. The BC mode will automatically intercept, capture, and track a back course localizer beam using the LOC navigation source displayed on the coupled PFD. BC armed (in white) and HDG select modes will automatically be selected if the beam deviation is outside of the capture range (which is approximately more than one dot deviation). The flight director follows a roll command to fly the heading selected

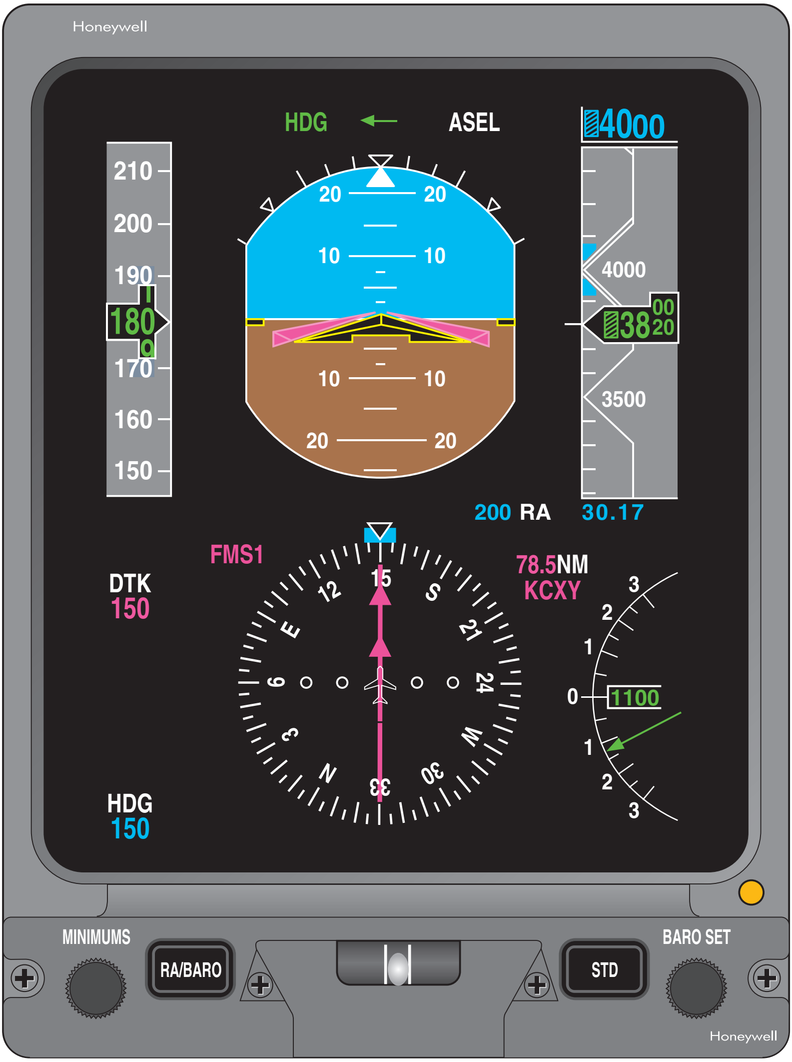


Figure AM-1. Lateral and Vertical Mode Annunciators (1 of 2)

LATERAL MODE FD ANNUNCIATORS
(HDG IS THE MODE DISPLAYED)

HDG	VAPP
VOR	ROL
LOC	
BC	*VOR
LNAV	*VAPP

VERTICAL MODE FD ANNUNCIATORS
(ASEL IS THE MODE DISPLAYED)

VS	GP	VFLC	AL-GS
ASEL	VASEL	VNAV	AL-GP
ALT	PIT	VPTH	AL-VN
GS	EDM	VGP	
TO	VALT		
GA	FLC		

NOTE:

FD modes displayed in white indicate the mode is armed. FD modes indicated in green "flashing" mode indicate the mode is in the process of capturing. FD modes displayed in solid green indicate the mode is captured.

Figure AM-1. Lateral and Vertical Mode Annunciators (2 of 2)

with the heading bug until the aircraft intercepts the back course localizer beam capture range. The HDG mode is then dropped and replaced with the BC capture mode and will flash for five seconds.

LNAV—This mode is selected by depressing the NAV button on the flight guidance controller. The LNAV mode will automatically intercept, capture, and track a course programmed into the FMS navigation source displayed on the coupled PFD. LNAV armed (in white) and HDG select modes will automatically be selected if the airplane position is outside of the capture window. The flight director follows a roll command to fly the heading selected with the heading bug until the aircraft intercepts the FMS course. The HDG mode is then dropped and replaced with the LNAV capture mode (LNAV will flash for five seconds) and the flight director will follow the FMS desired track.

VAPP—This mode is selected when the APP button is depressed on the flight guidance controller. The VAPP mode automatically intercepts, captures, and tracks a selected VOR radial using the VOR navigation source displayed on the coupled PFD side. VAPP mode is similar to the VOR mode except it changes selected gains in the flight guidance system to improve system performance. If the aircraft is outside of the normal VAPP capture range pressing the APP button on the flight guidance controller selects VAPP armed and HDG mode. The PFD annunciates HDG and VAPP in white. The flight director follows a roll command to fly the heading selected with the heading bug until the aircraft reaches the lateral beam sensor trip point. The HDG mode is then dropped and replaced with the VAPP capture mode and will flash for five seconds.

ROL/PIT—Basic autopilot modes. It is automatically selected when the autopilot is on with no other vertical or lateral modes selected, and will maintain the current heading and pitch attitude at engagement if the bank is <6° and pitch is <20°. If the airplane is maneuvered via the TCS button, the ROL mode at TCS release will:

1. Maintain current heading if bank angle at TCS release is less than 6°.

2. Maintain current bank angle if the bank angle at TCS release is between 6° and 35°.

3. Maintain 35° bank angle if the bank angle at TCS release is greater than 35°.

The PIT mode at TCS release will maintain the current pitch attitude, unless it is greater than +20° where it will be reduced to +20° pitch attitude.

AZ/GP—An MLS approach is performed in a similar manner to an ILS approach. The MLS mode will automatically intercept, capture, and track the azimuth and glidepath beams of a microwave landing system, lining up the airplane with the center line of the runway, on the glidepath, in preparation for landing. With this system the pilot can fly a fully-coupled MLS approach to minimums. The glidepath will not capture until azimuth capture has been effected. To accomplish the automatic interception and tracking of the MLS azimuth and glidepath, accomplish the following:

1. Tune the MLS receiver to the correct channel.
2. Verify the correct inbound course on the MLS controller. The MLS receiver automatically slews the HSI course pointer or the pilot can set the course manually.
3. Press the NAV button on the source controller to select MLS for navigation.
4. Verify the PFD displays the correct course.
5. Set the heading bug on the PFD to perform the intercept.
6. Press the APP button on the flight guidance controller to engage the mode. AZ/GP (azmuth/glidepath) function will be armed and heading select mode is selected to accomplish interception if the airplane is outside the AZ capture parameters. The PFD will display AZ/GP armed by showing a white AZ and GP.

VERTICAL FLIGHT DIRECTOR ANNUNCIATORS

Refer to Figure AM-1 for vertical flight direction annunciators.

VS—Indicates that VS has been selected on the flight guidance controller. When selected, FD will maintain current vertical speed. Vertical speed may be changed by using either PITCH wheel. The vertical speed target is displayed in feet per minute above the vertical speed scale. When the vertical speed is changed by using a PITCH wheel, the target value changes and the vertical speed reference bug is repositioned. The vertical speed target is displayed in feet per minute above the vertical speed scale.

ASEL—Indicates the altitude preselect mode is active. The ASEL mode, in conjunction with another vertical mode, automatically captures, levels off, and holds the barometric altitude set with the altitude select knob on the copilot's instrument remote controller. The altitude preselect mode captures and levels off on the preselected altitude, while the other vertical mode flies to the selected altitude. To engage the ASEL mode:

1. Set the preselect altitude in the PFD's altitude preselect window using the copilot's remote instrument controller.

2. Engage another vertical mode (i.e., VS or FLC) on the flight guidance controller.

3. Adjust the throttle to initiate the climb or descent to the preselected altitude. ASEL is armed.

4. The PFD displays ASEL in white, and the captured vertical mode in green (VS, FLC).

The aircraft flies toward the selected altitude using the vertical mode, while ASEL is armed to automatically capture the preset altitude.

When the altitude select capture detector trips, the altitude select mode is captured and the other active vertical mode is dropped. The PFD displays ASEL.

At ASEL capture, a command is generated to flare the airplane onto the selected altitude.

If the altitude select mode is engaged late (the aircraft has already gone through the selected altitude but is still within 250 feet of it), the capture detector trips immediately and initiates the flare maneuver to capture the selected altitude.

The airplane remains in the ASEL mode until the following conditions exist simultaneously:

1. ASEL CAP is annunciated.

2. Altitude error is less than 25 feet.

3. Altitude rate is less than 5 feet/second.

When all three conditions are valid, the system automatically switches to altitude (ALT) hold.

NOTE

If the autopilot is not engaged, ASEL changes to ALT at the preselected altitude, regardless of the altitude rate.

NOTE

The active ASEL mode cancels and the armed ASEL is annunciated (in white) when the selected altitude on the altitude preselect controller is changed while in the capture (ASEL) phase.

ALT—The altitude hold mode is used to maintain a barometric altitude. To fly altitude hold, depress the ALT button on the flight guidance controller. While altitude hold is active ALT is annunciated. The altitude can be changed by pushing the TCS button and maneuvering the aircraft to a new altitude, and releasing the TCS button.

GS—This mode is activated during the ILS approach mode by pushing the APP button on the flight guidance controller. This arms LOC and GS. The heading select mode (HDG) is automatically selected if the beam is outside the LOC capture range. LOC and GS are annunciated in white. The mode is interlocked, so the glide-slope capture is inhibited until localizer capture has occurred. As with the localizer mode, the heading bug is used to initiate the approach intercept. The flight director follows a roll command to fly the heading selected with the heading bug until the aircraft intercepts the localizer beam capture range. The HDG mode is then dropped and replaced with the LOC capture mode. As the airplane nears the glide slope, the vertical beam sensor (VBS) monitors true airspeed, vertical speed, and glide-slope deviation to determine the correct capture point. At glide-slope capture, the flight guidance computer drops any other vertical mode in use, and automatically generates a pitch command to track the glide slope.

TO/GA—The takeoff mode (TO) is initiated only on the ground. It is selected by pushing the TO/GA button located on either outboard throttle handle. Selecting TO mode cancels all other FD modes. The FD commands wings level and a 13° pitch up command.

The go-around mode is selected by pushing the TO/GA button located on either outboard throttle handle. Selecting GA cancels all other FD modes and disengages the autopilot. The FD commands wings level and a 10° pitch up command. The autopilot automatically disengages.

VASEL—Operates the same way as ASEL. ASEL arms when either VFLC or VPTH is engaged. When the mode captures, VASEL is displayed.

EDM—If the airplane is above 31,000 feet and the autopilot is engaged, it will automatically enter emergency descent mode (EDM) when cabin altitude exceeds approximately 14,500 feet. The autopilot will initiate a pitch-down left-turn (90°) maneuver. The light crew must retard throttles to idle and extend the speed brakes. The autopilot will control the descent near the M_{MO}/V_{MO} limit and level of at 15,000 feet. The flight crew must then retract the speed brakes and apply thrust to resume normal flight. If the airplane slows to stick shaker the autopilot will disconnect.

NOTE

The autopilot emergency descent mode (EDM) is annunciated by EDM message at the top of the PFD and an EMERGENCY DESCENT CAS message. This mode can only be cancelled by disengaging the autopilot.

The autopilot EDM cannot achieve maximum rate-of-descent. It is recommended the autopilot be disengaged and the airplane hand flown if maximum rate-of-descent is required.

VALT—Operates the same way as ALT. VALT engages automatically after VASEL captures the target altitude. VALT also engages whenever the VNAV button on the flight guidance controller is pushed and the aircraft is within 250 feet of the FMS target altitude. The FMS ALT mode is annunciated as VALT.

FLC—Pushing the FLC button on the flight guidance controller, selects the FLC mode and overrides all active pitch FD Modes except VNAV. When VNAV is engaged, pushing the FLC button selects the VNAV submode, VFLC. The IAS/Mach reference is synchronized to the existing IAS/Mach speed when the mode is engaged. The aircraft flies a new reference when the pilot uses either PITCH wheel to establish a new reference.

Depending on whether the reference is identified as IAS or Mach (controlled by the changeover (C/O) button on the pilot's flight guidance controller), the system flies an IAS or Mach reference. Switching from IAS to Mach (or Mach to IAS) does not change the current airspeed but rather changes the FD mode airspeed reference display on the PFD. The aircraft attitude does not change when references are switched.

The FLC mode is basically an airspeed mode; however, it differs from a standard IAS mode or Mach mode in the following respects.

1. In the long-term, the FLC mode tracks the reference airspeed with a short-term emphasis on vertical speed. This minimizes vertical speed excursions caused by air disturbances or large airspeed changes. In the short term, the net effect is the actual airspeed can differ from the speed target by up to 20 knots.

2. The FLC mode is set up to change flight level at a selected airspeed from present altitude to the preselected altitude. The system tries to prevent the airplane from flying away from the preselected altitude target. For example, if the throttle is retarded during a climb toward a preselected altitude target, the system holds the airspeed reference by reducing vertical speed. When vertical speed reaches zero, the aircraft decelerates and vertical speed remains zero.

The FLC mode is annunciated with a FLC at the vertical capture point.

The pilot can maneuver the airplane without disengaging the mode by pushing and holding the TCS button. When the TCS button is released, the airspeed target is the current airspeed.

The procedure for flying the FLC mode in a climb to a preselected altitude from a straight and level condition is:

1. Set alert altitude higher than current altitude.

2. Push the FLC button on the flight guidance controller.

3. Using the flight guidance controller or remote mounted PITCH wheel, set the speed reference on the PFD to the desired indicated airspeed.

4. Advance the throttle to the climb detent.

The system climbs the aircraft toward the preselected altitude and holds the speed reference with pitch. The amount of throttle position change varies the rate of climb of the airplane.

In FLC, all armed pitch FD modes can be used, but the capture of any armed pitch mode overrides the FLC mode.

VFLC—Operates the same way as FLC except the target speed and altitude from the FMS are used for climb or descent. VFLC also engages if VNAV altitude hold (VALT) is engaged, the target altitude is more than 250 feet from the aircraft's current altitude, and the FMS initiates a climb or descent. A third method of using VFLC mode is when VALT or VPTH arm is engaged and the FLC button on the flight guidance controller is pushed.

VNAV—Pushing the VNAV button on the flight guidance controller selects the vertical navigation mode and overrides all active pitch flight director modes. In the VNAV mode, the FGC tracks the vertical flight profile of the FMS.

AL–GS—Altitude in glideslope armed.

AS–GP—Airspeed and glidepath armed.

AL–VN—Altitude and vertical NAV armed.

VPTH—VPTH mode is used to fly a fixed flightpath angle to a vertical waypoint during descent. The VPTH mode engages whenever the FMS initiates a path descent that can occur while in VFLC or VALT modes. When the mode captures, a VPTH is displayed on the PFD.

To select the VPTH mode:

1. Use the FMS control display unit (CDU) to enter the altitude required at the waypoint, and

2. Use the FMS CDU to enter an angle of descent if a particular flight path angle is required.

VGP—If a non-localizer approach is selected through the FMS CDU, the flight crew may choose to fly the descent path in either the VPTH or VGP mode. While both will fly the descent path in the same manner, VPTH will respect the altitude preselect and level off appropriately, whereas a descent in VGP mode will ignore the altitude preselect, similar to a glide-slope descent. Therefore, descents in VGP mode will allow the crew to set the altitude preselect to the missed approach altitude without affecting the descent path.

Selecting the APP button on the guidance controller arms VGP mode when a VNAV mode is the current captured mode. In order for VGP to arm, the following conditions must be met:

1. FMS is the selected NAV source on the coupled PFD.
2. An approach has been selected in the active flight plan.
3. The next defined path in the flight plan is the last defined path in the flight plan.
4. Aircraft is in the terminal area (50 nm from destination).
5. FMS is not in degrade mode of operation.

COMPARISON MONITOR ANNUNCIATORS

Refer to Figure AM-2 for comparison monitor annunciators.

ATT	Pitch attitude +5° and/or roll attitude +6°
HDG	±10°
ALT	+200 feet
IAS	+20 knots
RA	+10 feet
LOC	+1/2 dot
GS	+1 dot
FWC	FWC 1 and FWC 2 have a miscompare of CAS message lists.
EICAS	Engine data miscompares are based on the difference between what is displayed on EICAS, and what is sensed by the DAU.

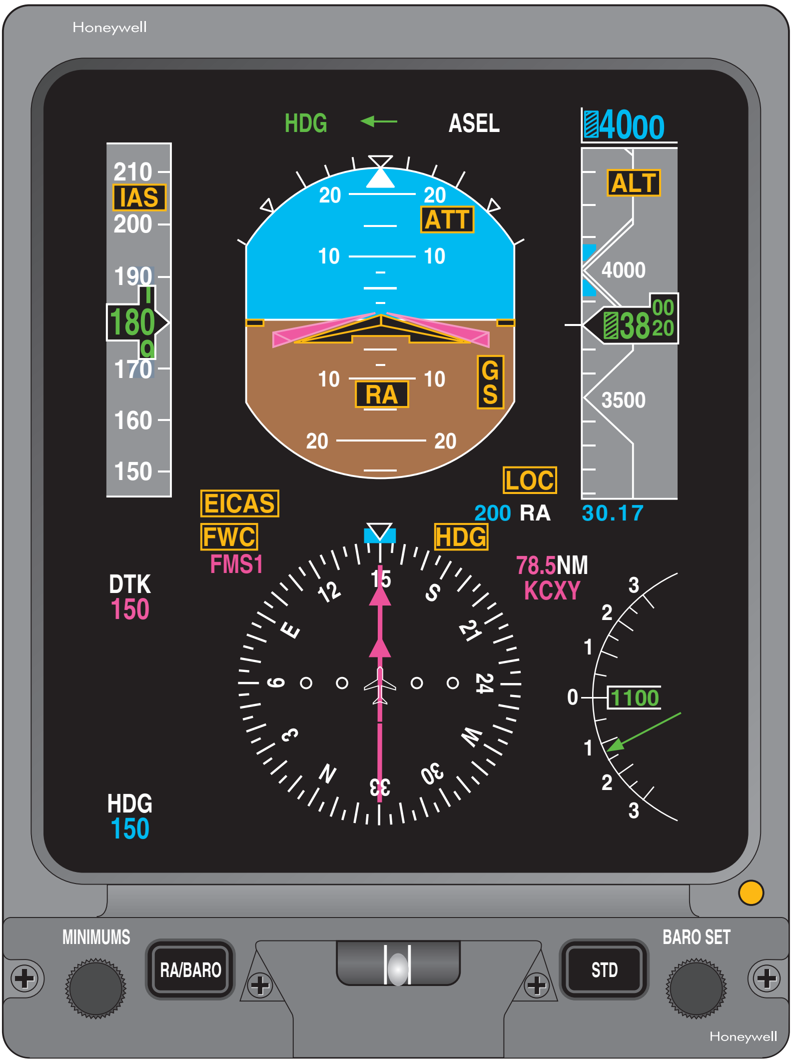


Figure AM-2. Comparison Monitor Annunciators (1 of 2)

COMPARISON MONITOR ANNUNCIATORS

ATT	Pitch attitude ±5° and/or roll attitude is ±6°.
HDG	±10°
ALT	±200 feet
IAS	±20 knots
RA	±10 feet
LOC	±1/2 dot
G S	±1 dot
EICAS	FWC wrap-around monitor detects difference in engine parameters: N1, N2, ITT.
FWC	Miscompare between fault warning computers.

Figure AM-2. Comparison Monitor Annunciators (2 of 2)

AUTOPILOT ENGAGE ANNUNCIATOR

Refer to Figure AM-3 for autopilot engage annunciators.

AP—The AP engage is annunciated by displaying a green AP in the upper left of the ADI. When the autopilot is normally disengaged, the AP is removed. Abnormal disconnects change the annunciation to AP. It flashes until the AP disconnect button is pushed.

TCS—The AP engage annunciator is replaced by a TCS annunciator when either the pilot's or copilot's TCS switch is pushed.

ATTITUDE SOURCE ANNUNCIATOR

ATT1—Amber ATT 1 on both sides. White ATT 1 on PFD 2 and ATT 2 on PFD 1

ATT2—Amber ATT 2 on both sides. White ATT 2 on PFD 1 and ATT 1 on PFD 2

DIGITAL AIR DATA SOURCE ANNUNCIATORS

ADC 1—Amber ADC 1 on both sides. White ADC 1 on PFD 2 and ADC 2 on PFD 1

ADC 2—Amber ADC 2 on both sides. White ADC 2 on PFD 1 and ADC 1 on PFD 2

GPWS ANNUNCIATORS

Refer to Figure AM-4 for GPWS annunciators.

- PULL UP
- WINDSHEAR (AMBER)
- GND PROX
- WINDSHEAR (RED)

MARKER BEACON

Refer to Figure AM-4 for marker beacon annunciators.

- O
- M
- I

APPROACH ALTITUDE SET REFERENCE

- RA—RADIO ALTITUDE DECISION HEIGHT
- BARO – BAROMETRIC MINIMUM DESCENT ALTITUDE

NAV SOURCE ANNUNCIATOR

Refer to Figure AM-5 for NAV source annunciators.

- FMS 1
- FMS 2
- VOR 1
- VOR 2
- LOC 1
- LOC 2
- MLS 1
- MLS 2

COMPASS SYNC ANNUNCIATION

- +lo
- Displayed below airspeed tape on the PFD on AHRS airplanes only.

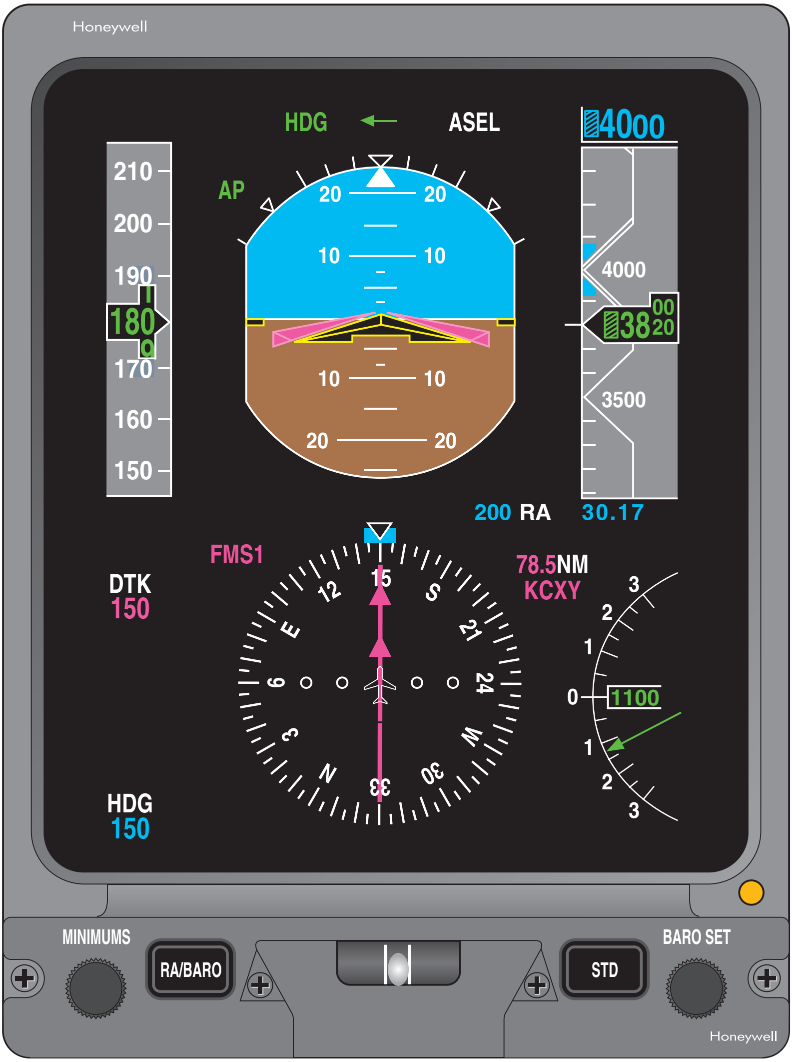


Figure AM-3. Autopilot Engage Annunciators, Touch Control Steering Annunciator (1 of 2)

AUTOPILOT ENGAGE ANNUNCIATORS
TOUCH CONTROL STEERING ANNUNCIATOR

AP	Indicates the autopilot has been engaged (**AP** is the mode displayed).
AP	Indicates an uncommanded autopilot disengagement, accompanied by a repeating tone. (The tone can only be silenced by pressing the red AP–TRIM–NWS disconnect button on either control column.)
TCS	The **AP** engage annunciator is replaced by the **TCS** annunciator when either pilot's or copilot's **TCS** button is pressed.
200 RA	Approach altitude set reference (radio altitude). (**200 RA** is the mode displayed).
1420 BARO	Approach altitude set reference (barometric).

Figure AM-3. Autopilot Engage Annunciators, Touch Control Steering Annunciator (2 of 2)

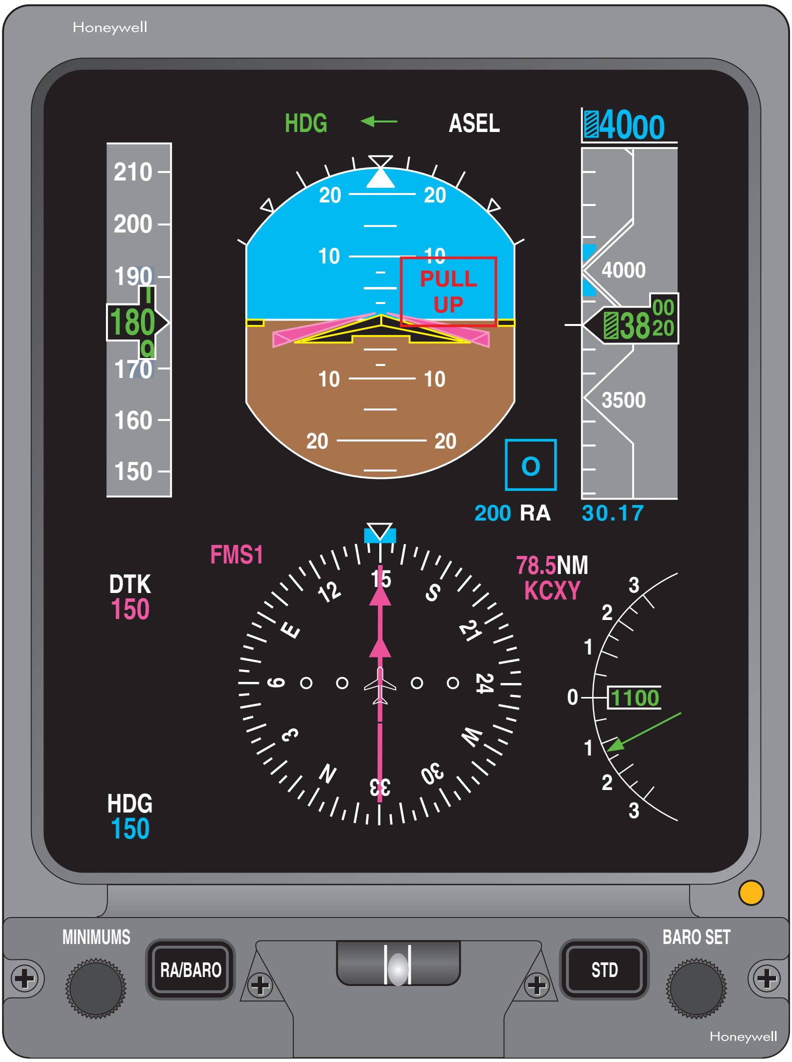


Figure AM-4. Ground Proximity Warning Annunciators, Marker Beacon Visual Annunciators (1 of 2)

GROUND PROXIMITY WARNING ANNUNCIATORS
MARKER BEACON VISUAL ANNUNCIATORS

PULL UP	Indicates the crew should immediately initiate a vertical escape maneuver (PULL UP is the mode displayed).
GND PROX	Visual indication the crew is receiving an aural ground proximity warning.
WIND SHEAR	Visual indication the crew is having a windshear encounter with increasing performance (headwind).
WIND SHEAR	Visual indication the crew is having a windshear encounter with decreasing performance (tailwind).
O	Outer marker visual indication (O is the mode displayed).
M	Middle marker visual indication.
I	Inner marker visual indication.

NOTE:
The above visual indications appear in the same location in or near the ADI.

Figure AM-4. Ground Proximity Warning Annunciators, Marker Beacon Visual Annunciators (2 of 2)

Figure AM-5. Navigation Source Annunciators, Including Preview Mode (1 of 2)

NAVIGATION SOURCE ANNUNCIATORS, INCLUDING PREVIEW MODE	
FMS1	Indicates FMS No. 1 is the navigation source on the pilot's PFD (FMS1 is the mode displayed).
FMS2	Indicates FMS No. 2 is the navigation source on the copilot's PFD.
VOR1	Indicates VOR No. 1 is the navigation source on the pilot's PFD.
VOR2	Indicates VOR No. 2 is the navigation source on the copilot's PFD.
LOC1	Indicates LOC No. 1 is the navigation source on the pilot's PFD.
LOC2	Indicates LOC No. 2 is the navigation source on the copilot's PFD.
MLS1	Indicates MLS No. 1 is the navigation source on the pilot's PFD.
MLS2	Indicates MLS No. 2 is the navigation source on the copilot's PFD.
CAT2	Indicates ILS Category 2 approach criteria is enabled.
LOC1	Indicates preview mode for the localizer is selected to capture while in FMS navigation (LOC1 is the mode displayed).

NOTE:

If a single or cross-side source is being utilized for navigation, the annunciation and CDI indicator will be displayed in amber color, indicating to both crew members that one source of navigation is being utilized.

Figure AM-5. Navigation Source Annunciators, Including Preview Mode (2 of 2)

COURSE/DESIRED TRACK READOUT

- CRS
- DTK

BEARING POINTER IDENTIFIERS

Refer to Figure AM-6 for bearing pointer identifiers.

- ADF 1
- ADF 2
- FMS 1
- FMS 2
- VOR 1
- VOR 2

IRS MAG TRU ANNUNCIATOR

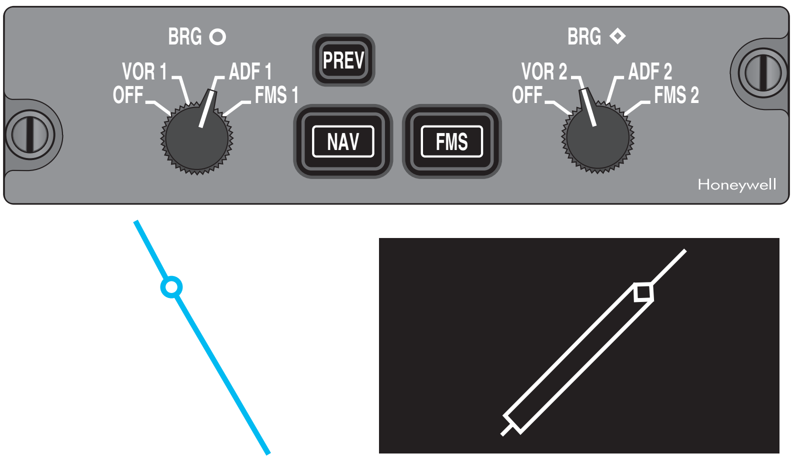
Refer to Figure AM-7 for IRS or AHRS annunciators, and microdata computer annunciators.

- MAG 1
- MAG 2
- MAG 3
- TRU 1
- TRU 2
- TRU 3

AHRS HEADING SOURCE ANNUNCIATOR

- DG 1
- DG 2
- DG 3
- HDG 1
- HDG 2
- HDG 3

Figure AM-6. Bearing Pointer Identifiers (1 of 2)



The blue RMI bearing pointer is selected with the left knob on the navigation source controller (**ADF1** is the mode displayed and is annunciated to the left of the HSI).

The white RMI bearing pointer is selected with the right knob on the navigation source controller.

(**VOR2** is the mode displayed and is annunciated to the left of the HSI.)

Figure AM-6. Bearing Pointer Identifiers (2 of 2)

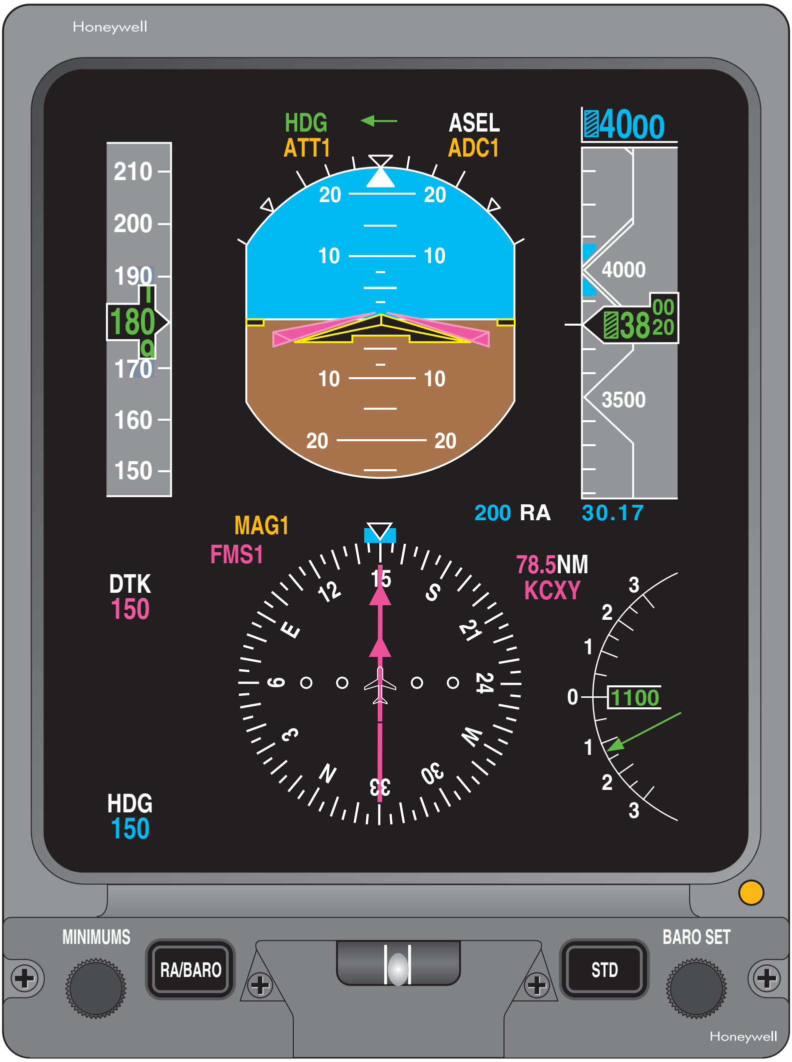


Figure AM-7. IRS or AHRS Annunciators, Microdata Computer Annunciators (1 of 2)

IRS OR AHRS ANNUNCIATORS, MICRODATA COMPUTER ANNUNCIATORS	
ATT1	Indicates pilot and copilot are utilizing No. 1 IRS or No. 1 AHRS for attitude reference (ATT1 is the mode displayed).
ATT2	Indicates pilot and copilot are utilizing No. 2 IRS or No. 2 AHRS for attitude reference.
MAG1	Indicates pilot and copilot are utilizing No. 1 IRS for heading reference (MAG1 is the mode displayed).
MAG2	Indicates pilot and copilot are utilizing No. 2 IRS for heading reference.
HDG1	Indicates pilot and copilot are utilizing No. 1 AHRS for heading reference.
HDG2	Indicates pilot and copilot are utilizing No. 2 AHRS for heading reference.
ADC1	Indicates pilot and copilot are utilizing No. 1 MADC for air data information (ADC1 is the mode displayed).
ADC2	Indicates pilot and copilot are utilizing No. 2 MADC for air data information.

Figure AM-7. IRS or AHRS Annunciators, Microdata Computer Annunciators (2 of 2)

PERFORMANCE

CONTENTS

TABLES

PERFORMANCE

The CE-750 is certified under the provisions of CFR Part 25. This essentially means that engine failure must be taken into account for performance calculations.

The takeoff, initial climb, and landing information is contained in the *Airplane Flight Manual (AFM)*.

TAKEOFF

Part 25 airplanes must meet two requirements for takeoff—akeoff field length and climb. The *AFM* has tables reflecting takeoff field length for the following configurations:

- Flaps 5 anti-ice OFF
- Flaps 5 anti-ice ON
- Flaps 15 anti-ice OFF
- Flaps 15 anti-ice ON

The certification assumptions and conditions are all listed in Section IV of the *AFM*. Some of these are emphasized below:

1. Static takeoff. No corrections for rolling takeoffs exist.
2. Dry or wet runway distances can be computed. The longer of the two (dry or wet) is the required distance. The *AFM* defines a wet runway as sufficient moisture on the surface to appear reflective, but without significant areas of standing water.
3. Winds can be applied. The only data which addresses tailwinds for takeoff is in the *AFM*.
4. Runway gradient can have a significant impact on takeoff distance. Runway gradient is depicted on the FAA instrument chart runway diagrams if it exceeds 0.3%. On Jeppesen charts runway gradient is never depicted. It is also not shown in the J-Aid. In this case, gradient can be computed by subtracting the runway end elevations obtained from the airport diagram from one another, then

dividing that by the runway length, as follows, per the basic gradient formula:

gradient = rise (difference in runway end elevations)
/run (length of the runway)

Gradient correction factors are at the beginning of each takeoff section and can be applied up to +2% (uphill) and –2% (downhill).

CLIMB

There are two types of climb the airplane must meet. One is the certification climb which is stated as Maximum Takeoff Weight Permitted by Climb. These tables are at the beginning of the takeoff section because this requirement often restricts airplane weight before takeoff field length does. This climb requirement is not airport nor runway specific and only guarantees a second segment climb gradient of 2.4% gross and 1.6% net at V_2. This climb requirement is listed in the Limitations section of the *AFM*.

The other type of climb requirement is operationally relevant. IFR departure procedures, as stated in paragraph 5-2-6 of the *AIM*, assume a climb gradient of 200 ft/nm. This can be converted to % gradient by the following formula:

200/6000 (approx. feet in one nautical mile) = 3.3%

Since a percentage is the desired result, simply dividing the ft/nm requirement by 60 will make the calculation easier.

If obstructions are present that cause a greater than 200 ft/nm requirement, this will be shown on the 10-9 or 11-1 airport diagram in Jeppesen charts. FAA charts will depict a “T” inside a black triangle, which refers to a listing at the beginning of the chart volume. If the obstruction requires a climb of 240 ft/nm, then a 4% gradient is the requirement. The second segment climb table in the *AFM* can then be consulted to see if the requirement can be met. If not, and it is IMC, then weight should be reduced to meet the requirement.

To sum up, if the weather is VMC, the 1.6% net climb assures the airplane will gain altitude and obstructions can be seen and avoided. If IMC or restricted visibility conditions are present, the IFR departure climb should be observed.

LANDING

Part 25 airplanes also have to meet two requirements on landing. The landing distance must not exceed runway available and the airplane must be able to climb away from a missed approach or balked landing.

Just as in the takeoff tables, the Maximum Weight Permitted by Climb Requirements or Brake Energy Limits tables are at the beginning of the landing section. Remember, if landing with 35° flaps, the approach flap setting is 15°. If landing with 15° flaps, then 5° flaps will be the approach flap setting. Again, this is a certification climb requirement that only guarantees a minimum of a 2.1% climb gradient. This is the approach climb configuration and is the most limiting since it is based on single engine.

Another operational climb to be considered is the missed approach climb gradient, if IMC conditions are present. The *AIM*, in paragraph 5-4-19, states that an assumed 200 ft/nm climb gradient is provided for obstacle clearance, unless otherwise published. Note that the *AFM* tables for approach climb are expressed as gross climb gradient and not net climb, as in the takeoff tables. The pilot may elect to degrade these numbers just as the FAA requires of the manufacturer for takeoff (0.8%).

The *AFM* only contains landing distance for dry runways. Most turbojet landing accidents/incidents where the aircraft are unable to stop involve unstable approaches and/or tailwinds on contaminated runways. The landing data assumes a 3° glidepath prior to touchdown with the speed at V_{REF}. Power is reduced to idle at 50 feet.

Contaminated runway landing data is shown in Section VII of the *AFM*. Remember, these tables are entered using the dry runway distance without thrust reversers; the *AFM* distance. There are two contaminated tables. One is for no thrust reversers, the other for both thrust reversers. Bear in mind, if a significant crosswind is present, directional control issues may prevent using maximum thrust on both reversers. Also, Cessna does not recommend landings on precipitation-covered runways with any tailwind component.

PERFORMANCE FORMULAS

Equal Time Point	= total distance x GS (return)/GS (return) + GS (to continue)
Bank angle for standard rate turn	= TAS/10 + 7
Radius of standard rate turn in nm	= TAS/100/2
Groundspeed x Gradient	= Feet per minute
Feet per minute divided by groundspeed	= Gradient
Feet per nautical mile divided 60	= Gradient
60 feet per nautical mile	= 1% Gradient
Rise divided by run	= Gradient x 100 = % (100 ft divided by 10,000 ft = .01 x 100 = 1%)
Second segment requirements for visual conditions	= 2.4% Gross Climb Gradient (1.6% Net Climb Gradient)
Second segment requirements when no climb gradient is specified for IMC obstacle clearance	= 3.3% net climb gradient (200 feet per nautical mile)

If climb gradients are greater than 200 feet per nautical mile, avoidance procedures are specified. These procedures may be:

- A ceiling and visibility to allow the obstacles to be seen and avoided.

- A climb gradient greater than 200 feet per nautical mile.
- Detailed flight maneuvers.

  or

- A combination of the above. In extreme cases, IFR take-off may not be authorized for some runways.

Degrees divided by 0.6	= Gradient
Gradient x 0.6	= Degrees
Degrees divided by 0.6 x groundspeeed	= Feet per Minute

FLIGHT PLANNING

Flight planning information is contained in Section VII of the *Operating Manual*. Cessna also provides the same information in a booklet labeled *Citation X Planning and Performance*.

Some rules of thumb:

Block speed	480	
Fuel burn	2,500 lbs	first hour
	2,000 lbs	second/third hour
	1,800 lbs	fourth hour

Flight planning tables are provided for maximum cruise thrust, normal (.82 Mach) cruise, and long-range cruise. Generally, long-range cruise will only be advantageous with a tailwind. Climb table are provided for a 300 KIAS/.80M climb schedule and a 270KIAS/.78M schedule for S/N 750-0173 and on, and airplanes with SB750-71-10. There are tables for both anti-ice OFF and ON. Climb tables are helpful in determining which altitudes are attainable without a step climb.

Cruise tables are provided for both normal- and single-engine operation (Table PER-1).

Table PER-1. FLIGHT TIME AND FUEL BURN FOR SELECTED DISTANCES

	Cruise Altitude (ft)											
	15,000		25,000		31,000		33,000		35,000		37,000	
Dist (NM)	Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)
200	0:31	1710	0:30	1466	0:29	1388	0:29	1356	0:30	1327	0:29	1302
400	0:59	3244	0:54	2741	0:52	2598	0:52	2531	0:53	2449	0:52	2369
600	1:27	4786	1:18	4024	1:15	3806	1:15	3706	1:15	3576	1:15	3433
800	1:55	6334	1:42	5308	1:38	5018	1:38	4881	1:38	4704	1:38	4502
1000	2:23	7887	2:06	6601	2:01	6232	2:01	6059	2:01	5834	2:01	5576
1200	2:51	9447	2:31	7899	2:24	7448	2:24	7241	2:24	6963	2:24	6653
1400	3:19	11009	2:55	9192	2:48	8660	2:47	8425	2:47	8094	2:47	7732
1600			3:20	10493	3:11	9870	3:11	9612	3:11	9227	3:11	8810
1800					3:34	11085	3:33	10800	3:34	10362	3:34	9885
2000											3:57	10962
2200												
2400												
2600												
2800												
3000												
3200												

Assumptions:

- Normal Climb (300 knots/M .80)
- High Speed Cruise
- High Speed Descent
- Flight Time includes Climb, Cruise and Descent
- Fuel Burn includes 200 lbs for Taxi and Takeoff
- Five passengers @ 200 lbs each, 2 Crew
- IFR Reserves (1,451 lbs) Note: Reserves are not included in fuel burn amount
- Zero Winds, Standard Day

Table PER-1. FLIGHT TIME AND FUEL BURN FOR SELECTED DISTANCES (Cont)

Cruise Altitude (ft)												
39,000		41,000		43,000		45,000		47,000		49,000		
Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)	Time (Min)	Fuel (Lbs)	Dist. (NM)
0:29	1265	0:29	1246									200
0:52	2234	0:53	2124	0:53	2039	0:53	1969	0:54	1920	0:55	1895	400
1:15	3203	1:16	3005	1:16	2840	1:17	2700	1:18	2592	1:20	2517	600
1:38	4173	1:40	3889	1:40	3642	1:41	3435	1:42	3264	1:43	3177	800
2:02	5148	2:03	4775	2:03	4449	2:04	4173	2:06	3939	2:07	3852	1000
2:25	6126	2:26	5664	2:27	5258	2:28	4912	2:31	4620	2:31	4534	1200
2:49	7106	2:49	6556	2:51	6070	2:52	5651	2:55	5305	2:56	5218	1400
3:12	8090	3:13	7450	3:15	6887	3:17	6396	3:20	6011	3:20	5918	1600
3:35	9071	3:37	8347	3:39	7705	3:41	7141	3:44	6758	3:45	6664	1800
3:58	10065	4:01	9239	4:03	8526	4:06	7891	4:09	7506	4:09	7413	2000
4:22	11041	4:25	10132	4:27	9346	4:30	8655	4:33	8269	4:34	8173	2200
		4:48	11026	4:51	10171	4:55	9423	4:58	9038	4:58	8941	2400
				5:16	11000	5:19	10225	5:22	9810	5:23	9711	2600
						5:43	11057	5:46	10641	5:47	10637	2800
								6:11	11474	6:12	11370	3000
								6:55	11285	6:56	11251	3200

The engine out driftdown table (Table PER-2) is useful in the event of an engine failure enroute. It is based upon the following criteria:

1. Operating engine throttle set to the climb detent.
2. Hold driftdown speed per weight at engine failure at the top of the table.
3. When 300 ft/nm descent is reached at driftdown speed, hold until final altitude is reached.
4. When final altitude in the table is reached, set throttle on operating engine to cruise detent and consult single engine cruise tables.

The legend at the left margin of the Table PER-2 is as follows:

MIN = Number of minutes required to driftdown to final altitude.

NM = Nautical miles to reach final altitude. This can be adjusted per the wind effect on distance table below the main table.

LB = Pounds of fuel consumed during descent.

FT = Final altitude that can be maintained, based on temperature and weight.

Normal descent is assumed at 3,000 ft/min. The descent table provides time, distance, and fuel used.

Two holding tables are incorporated in this manual. One is for anti-ice OFF and the other for anti-ice ON (Table PER-3).

Table PER-2. ENGINE OUT DRIFTDOWN

MODEL 750

SECTION VI
FLIGHT PLANNING AND PERFORMANCE

ENGINE OUT DRIFTDOWN

[illegible]

TIME, DISTANCE, FUEL, AND FINAL ALTITUDE **ANTI-ICE SYSTEMS OFF**

[illegible]

[illegible]

Table PER-3. HOLDING FUEL

ANTI-ICE SYSTEMS OFF

SPEED BRAKES RETRACTED — GEAR AND FLAPS UP

WEIGHT LBS	KIAS	TOTAL POUNDS PER HOUR — PRESSURE ALTITUDE - FEET						
		SEA LEVEL	5000	10,000	15,000	20,000	25,000	30,000
30,000	180.	1589.	1499.	1414.	1352.	1314.	1268.	1227.
28,000	175.	1511.	1426.	1346.	1273.	1237.	1198.	1155.
26,000	170.	1433.	1355.	1277.	1202.	1161.	1127.	1085.
24,000	165.	1357.	1282.	1208.	1138.	1088.	1056.	1018.
22,000	160.	1283.	1208.	1133.	1075.	1015.	985.	952.

HOLDING FUEL

ANTI-ICE SYSTEMS ON

SPEED BRAKES RETRACTED — GEAR AND FLAPS UP

WEIGHT LBS	KIAS	TOTAL POUNDS PER HOUR — PRESSURE ALTITUDE - FEET						
		SEA LEVEL	5000	10,000	15,000	20,000	25,000	30,000
30,000	200.	1888.	1778.	1672.	1617.	1567.	1509.	1462.
28,000	200.	1851.	1742.	1637.	1574.	1526.	1469.	1421.
26,000	200.	1815.	1709.	1605.	1535.	1487.	1432.	1381.
24,000	200.	1781.	1677.	1576.	1498.	1451.	1398.	1345.
22,000	200.	1745.	1647.	1549.	1465.	1418.	1367.	1312.

HOLDING

Holding fuel in total pounds per hour is presented for various weights at several altitudes.

This data is based on nominal speed with gear and flaps up, and speed brakes retracted.

STALL SPEEDS

The stall speeds are shown in Table PER-4.

Table PER-4. STALL SPEEDS

	FLAP POSITION			
WEIGHT (LBS)	**FULL**	**15°**	**5°**	**UP**
36,100	109	114	120	123
34,000	106	111	116	120
32,000	101	105	112	115
30,000	96	101	107	110
28,000	92	97	103	106
26,000	88	93	99	102
24,000	84	89	94	97
22,000	80	85	90	93

NOTE

For maneuvering prior to approach, minimum airspeed should be maintained to provide adequate margin above stall.

Clean .... V_{REF} +30

Flaps 15°.................................... V_{REF} +20

Full.. V_{REF} +10

CRITERIA

The following mission planning table provides flight time and fuel burn statistics for selected distances and altitudes.

Flight time represents the time for the climb, cruise and descent portion of the mission. No allowance has been added for taxi, takeoff or approach. Fuel burn represents the total amount of fuel consumed for taxi, climb, cruise, and descent. There is a taxi allowance of 200 pounds of fuel included in all fuel burn figures. IFR fuel reserves are considered in each case but are not included in the fuel burn figure.

The mission planning table (Table PER-5) reflects a climb using the cruise climb schedule, cruise at high speed cruise and descent using the high speed cruise schedule. Standard day conditions are assumed with zero wind enroute. The effects of wind can be determined from the wind correction factors shown in Table PER-6. Apply the wind correction factor to the zero wind flight time and fuel burn to estimate the impact of wind.

Typical cruise altitudes for various distances are shown in Table PER-6.

Table PER-5. MISSION PLANNING TABLE

DISTANCE	TYPICAL CRUISE ALTITUDE (FT)
0-100	10,000-16,000
101-200	18,000-35,000
201-300	33,000-39,000
301-500	39,000-43,000
501-1,000	41,000-45,000
1001+	41,000-49,000

Table PER-6. WIND CORRECTION FACTORS

True Airspeed (knots)	Headwinds (knots) 100	75	50	25	0	Tailwinds (knots) 25	50	75	100
400	1.33	1.23	1.14	1.06	1.00	0.94	0.89	0.84	0.80
420	1.31	1.22	1.13	1.06	1.00	0.94	0.89	0.85	0.81
440	1.29	1.21	1.13	1.06	1.00	0.95	0.90	0.85	0.81
460	1.28	1.19	1.12	1.06	1.00	0.95	0.90	0.86	0.82
480	1.26	1.18	1.12	1.05	1.00	0.95	0.91	0.86	0.83
500	1.25	1.18	1.11	1.05	1.00	0.95	0.91	0.87	0.83
520	1.24	1.17	1.11	1.05	1.00	0.95	0.91	0.87	0.84

* Wind Correction Factor is calculated as KTAS divided by the sum of KTAS ± wind component

WEIGHT AND BALANCE

The current airplane basic empty or operating weight should be found in Section VI of the *AFM* along with the moment. Ensure the moment used in calculations is divided by 100. Often, maintenance presents only total moment on the weight sheet. If the moment is on the order of nine million, then it has not been divided by 100!

Some useful formulas:

Weight x Arm = Moment

Arm (CG) = Moment / Weight

Weight shift—wt. shifted/total wt. = dist. CG shifted/dist. wt. moved

also known as LW/BW = LI/BI

LW = Little Weight

BW= Big Weight

LI = Little Inch

BI = Big Inch

Weight addition or removal:

wt. added (removed) new total wt. = dist. CG moved/dist. between wt. arm and old CG location

If a particular CG change is desired, the formula could be adapted as:

> wt. added (removed)/old total wt. = dist CG moved/dist. between wt. arm and old CG arm

Both zero fuel weight (ZFW) and takeoff weight must be within the envelope. If ZFW is aft, then consult the ballast fuel graph to determine how much fuel must remain in the tanks to keep the airplane in the CG envelope. This ballast fuel cannot be used in flight planning calculations. The other alternative is to move the ZFW CG into limits by shifting weight.

Once ZFW CG is determined, the allowable fuel graph (and perhaps its subgraphs) must be consulted to determine how much fuel can be added to avoid exceeding the top slope of the CG envelope.

NOISE LEVELS

The CE-750 complies with Part 36, Stage 3. Certificated noise levels are:

NOISE REFERENCE	EPNdB
Takeoff	73.2
Sideline	83.8
Approach	90.3

Supplemental noise levels (A-weighted):

NOISE REFERENCE	dBA AIRPLANE
Takeoff	61.3
Sideline	70.8
Approach	80.7

AIRCRAFT DIMENSIONS AND SERVICING

CONTENTS

ILLUSTRATIONS

TABLES

AIRCRAFT DIMENSIONS AND SERVICING

AIRCRAFT DIMENSIONS

AIRCRAFT OVERALL

Length .... 72.34 feet (22.04 meters)

Height .... 19.15 feet (5.84 meters)

Wing Span .... 63.64 feet (19.40 meters)

CABIN

Height Maximum

(Interior Stand Up) .... 6.35 feet (1.93 meters)

Width Maximum........................... 6.06 feet (1.85 meters)

WING

Type .... Supercritical

Sweep-Back .... 37.00°

At Leading Edge .... 40°

HORIZONTAL STABILIZER

Span.. 26.09 feet (7.95 meters)

Sweep-Back .... 40°

At Leading Edge .... 42°

Aircraft dimensions are shown in Figure DIM-1. Fuselage dimensions are shown in Figure DIM-2.

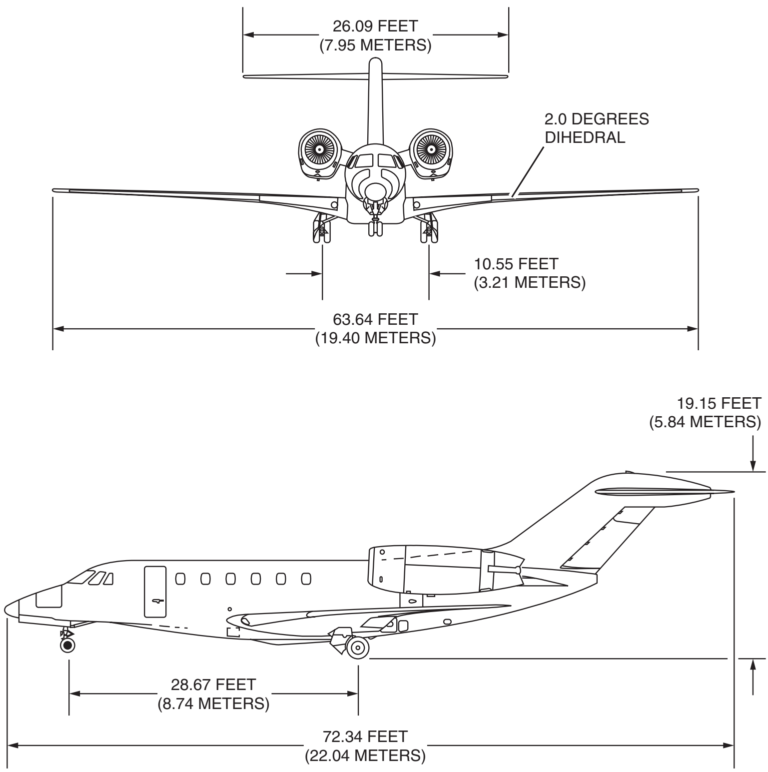


Figure DIM-1. Aircraft Dimensions

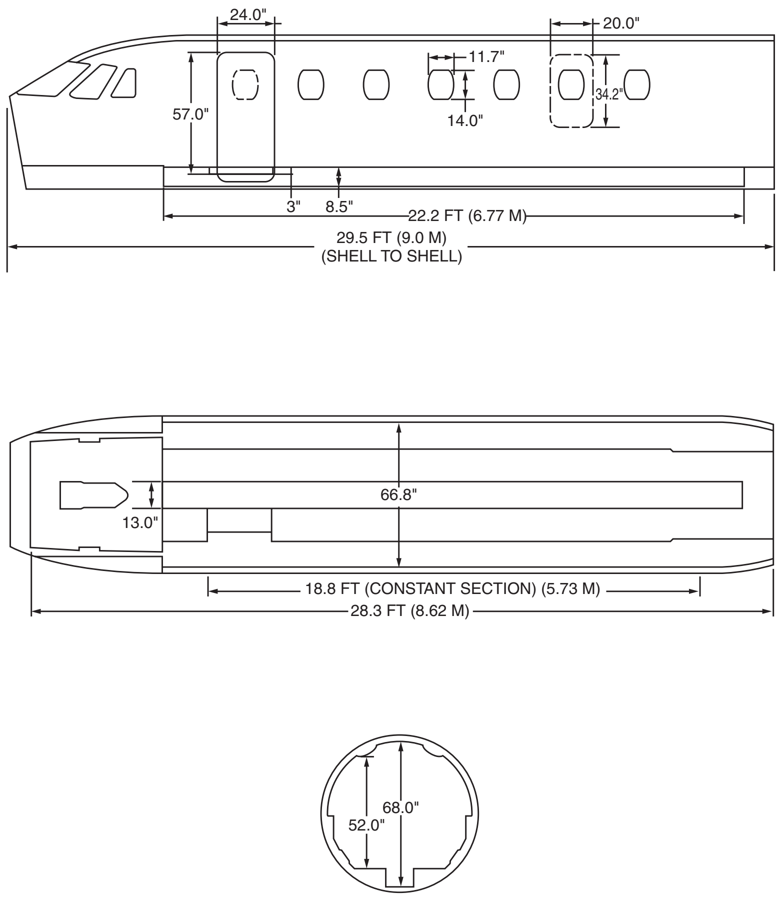


Figure DIM-2. Fuselage Dimensions

TOWING THE AIRCRAFT

WARNING

The nosewheel steering is operational any time the airplane has weight on wheels and the AUX pump is on. Personal injury could result if steering is operated with torque links connected and a tow bar attached. Ensure either the torque link is disconnected or the tow bar is removed from the airplane whenever nosewheel steering is operated.

1. Do not operate engine(s) during towing operations.
2. Towing the airplane with full fuel can cause damage to the nose landing gear taxi light bracket assembly when using the Tronair tow bar.
3. Pay close attention to the clearance between the tow bar head and the taxi light bracket assembly during towing.
4. Relieve hydraulic pressure in the nosewheel steering accumulator by pressing the nose gear bleed button in the LH nose compartment.
5. Remove the torque link disconnect pin by removing the safety pin from the shaft, pushing the release button, and pulling out the pin (Figure DIM-3).
6. Attach and secure the tow bar to the tow bar receptacle, located on the nose landing gear (Figure DIM-4).

CAUTION

Do not turn nose landing gear wheel beyond 90° from centered position in either direction, or damage to the power steering unit may result (Figure DIM-5).

7. Begin towing the aircraft and tow at walking speed.

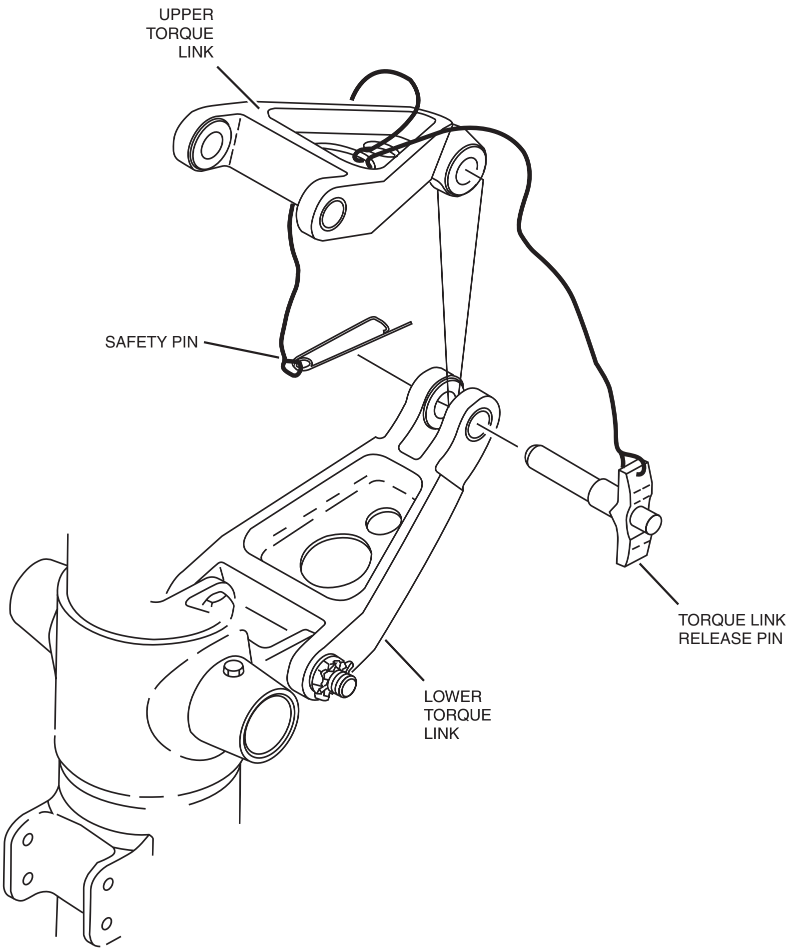


Figure DIM-3. Torque Links

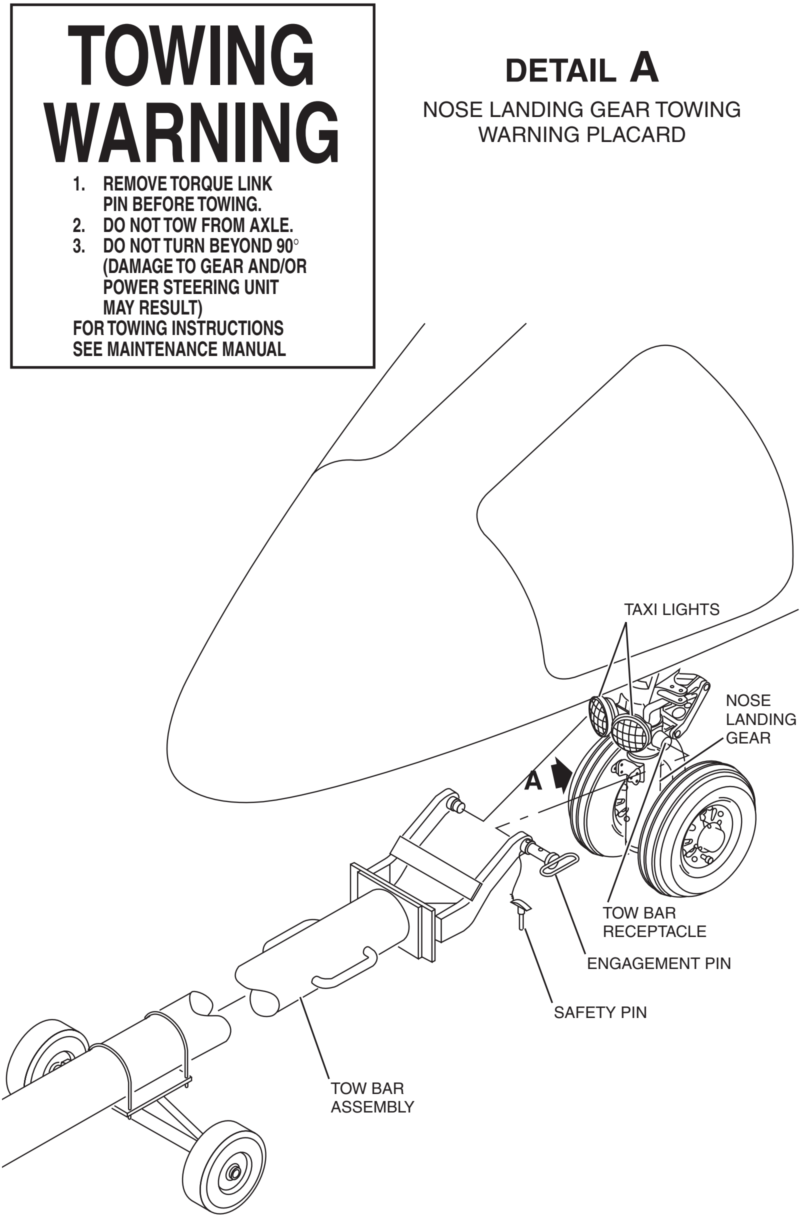


Figure DIM-4. Tow Bar Connection

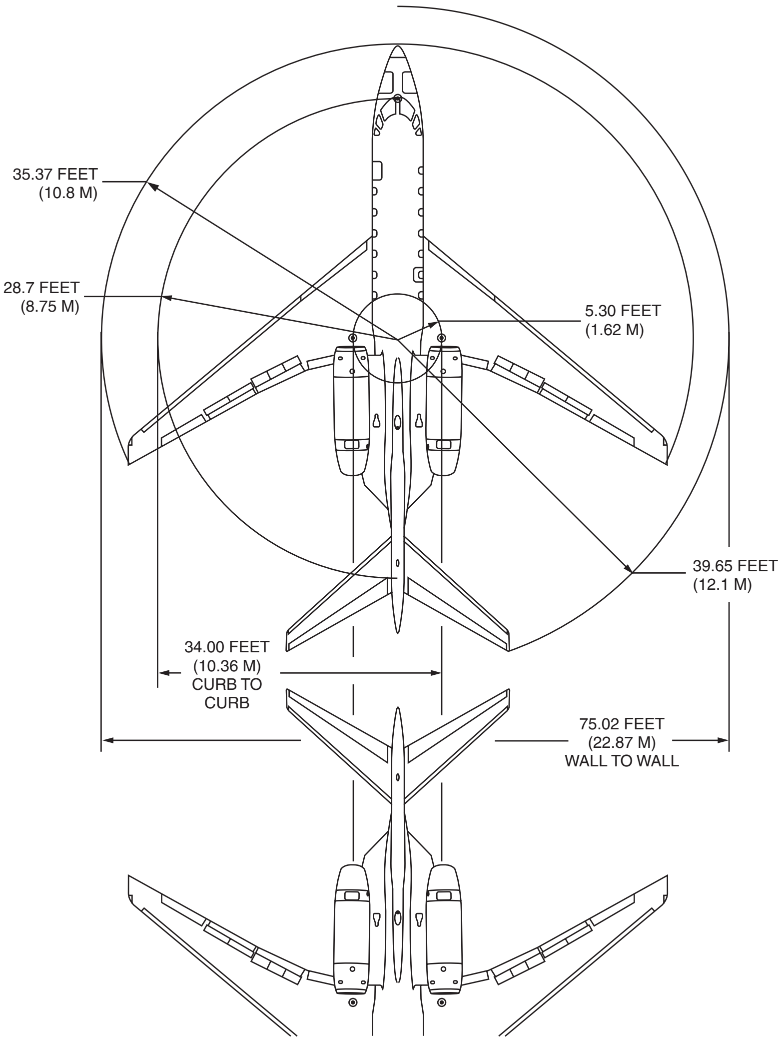


Figure DIM-5. Tow Radius

8. At destination:

   A. Install chocks

   B. Ground the aircraft

   C. Release brakes

   D. Disconnect tow bar

9. Connect the nose gear torque links by aligning pin holes and inserting the torque link disconnect pin and installing the safety pin in the shaft of the disconnect pin.

LEAD ACID BATTERY

The aircraft electrical system is capable of charging the batteries by placing the battery switches on with generators operating or the external power unit connected and operating, provided the battery voltage is above 22 VDC.

CAUTION

If batteries appear to be "dead," do not attempt to charge using the aircraft's generators or external power.

FUEL SERVICING

The following fuels are approved for use in accordance with the FUEL LIMITATIONS table (Table DIM-1):

- JET A
- JET A1
- JET B
- JP-4
- JP-5
- JP-8
- NO.3

Table DIM-1. FUEL LIMITATIONS

Fuel Limitations	JET A, JET A1, JP-5, JP-8, NO.3	JET B, JP-4
MINIMUM FUEL TEMPERATURE FOR: START, TAKEOFF AND ENROUTE (Fuel Tank Temperature)	–37°C	–37°C
MAXIMUM FUEL TEMPERATURE FOR: START, TAKEOFF AND ENROUTE (Fuel Tank Temperature)	+52°C	+48°C
MINIMUM FUEL TEMPERATURE FOR: ENGINE OPERATING (Engine)	+4°C	+4°C
MAXIMUM FUEL TEMPERATURE FOR: ENGINE OPERATING (Engine)	+98.9°C	+98.9°C
MAXIMUM ALTITUDE	51,000 Feet	51,000 Feet

SINGLE-POINT PRESSURE REFUELING

NOTE

Single-point fuel pressure shall not exceed 55 psi maximum.

1. Ensure the aircraft is properly grounded.
2. Insert the refueling nozzle into the receptacle; turn clockwise and latch in place; open nozzle.

CAUTION

Perform a refueling precheck before each single-point refueling.

3. On the precheck panel, open the left, right and center wing fuel tank precheck valves. Within 10 seconds, the refueling operation should shutdown as indicated by the refueling equipment flowmeter or the EICAS display.

NOTE

Each high-level pilot valve requires a maximum of 3 gpm for precheck. Therefore, fuel flow rate during precheck should be 9 gpm for the left, right and center wing tanks. If refueling shutdown does not occur, discontinue refueling operation and correct the malfunction.

4. Close the precheck valves and continue the refueling operation. If fuel is not required in the center wing tank, close the left and right wing precheck valves, and leave the center wing fuel tank precheck valve open.

NOTE

A single-point refueling system sequencing valve automatically sequences refueling of the left, right and center wing fuel tanks during refueling operations, discontinuing fuel flow to individual tanks when full and directing fuel flow to the tank(s) requiring additional fuel.

5. Disconnect the refueling nozzle from the receptacle and install the receptacle cap.

OVERWING TANK FILLING PROCEDURES

1. Connect fueling nozzle ground to the aircraft grounding receptacle, located on the lower surface of the wing adjacent of the filler cap.

2. If fueling the center tank to less than full:

   A. Monitor the fuel quantity by either EICAS indication or by the underwing measuring sticks.

   B. When the desired quantity is reached, close the transfer valve.

3. Place a protective pad on the wing adjacent to the fuel filler and remove the filler cap.

NOTE

When overwing refueling is being performed, fuel must be introduced through both left and right wing fuel fillers. The right wing fuel filler is utilized to refuel the center wing fuel tank via the control-handle-operated center wing refuel valve. With the center wing refuel valve open (control handle pulled downward), the center wing fuel tank will be refueled by gravity flow during refueling of the right wing fuel tank only.

WARNING

The control-handle-operated center wing refuel valve must be closed prior to flight to prevent gravity fuel flow from the right wing tank to the center wing tank and impending fuel imbalance.

4. When refueling is complete, return the control handle on the center wing refuel valve to the stowed/closed position by pushing upward.

CAUTION

Ensure fuel filler caps are properly secured.

5. Remove fuel nozzle and protective pad; disconnect fueling nozzle ground and install fuel filler caps.

ANTI-ICE ADDITIVE AS A BIOCIDE

In addition to preventing icing in fuel tanks, anti-ice additive effectively controls the growth of bacterial and fungal microorganisms which can form in fuel storage tanks.

- Bacterial and fungal microorganisms multiply where water and fuel interface. Because the weather, temperature and climate differ where a particular aircraft is based and operated, the amount of water condensation in the fuel tank varies.

- Microbiological contamination can be an expensive and potentially dangerous condition. This type of contamination is related to water which gravitates to low points in fuel reservoirs and is not circulated or removed. Airborne spores find the way into the fuel tanks and migrate to the water which is utilized as a growth medium while feeding off the hydrocarbon fuel. The first indication of microbiological contamination is a light grayish slime. Heavy contamination will be a thick grey, matty, fibrous formation which may contain black masses of decay products. If the contamination is left unchecked, it can eventually move as a mass and block the fuel system and/or cause corrosion.

- Examination of the fuel tank for bacterial and fungal microorganisms requires opening areas of the fuel tank and checking where trapped water may exist, such as the lower corners near wing ribs. Also check internal screens at flapper valve openings for bacterial and fungal microorganisms which have formed a mass and may be caught on the screen during their movement.

HYDRAULIC SYSTEM RESERVOIR

The following are approved hydraulic fluids:

- HYJET IVA PLUS
- SKYDROL 500B-4
- SKYDROL 5
- SKYDROL LD-4

Hydraulic fluid volume and EICAS quantity levels are indicated in Table DIM-2.

Table DIM-2. HYDRAULIC SYSTEM RESERVOIR

MARKING	VOLUME OF FLUID	EICAS QUANTITY %
MAX	400 cubic inches	100%
ACCUM 0 PSI (NOTE 1)	280 cubic inches	70%
FULL 0 PSI (NOTE 2)	280 cubic inches	70%
REFILL 0 PSI	230 cubic inches	65%
FULL 3000 PSI	210 cubic inches	52%
REFILL 3000 PSI	160 cubic inches	40%
LOW	62 cubic inches	16% (NOTE 3)
EMPTY	0 cubic inches	0%

(NOTE 1): Airplanes S/N 750-0001 through 0056 are marked ACCUM 0 PSI.

(NOTE 2): Airplanes S/N 750-0057 and on and airplanes with replacement reservoirs will be marked FULL 0 PSI.

(NOTE 3): The amber CAS message "HYD VOLUME LOW" will appear at 16% quantity, or below.

TIRE SERVICING

Maintaining correct inflation pressure is the most important part of preventing tire failures.

Underinflation: Indicated by excessive wear in the shoulder area, is particularly severe. It increases the chance of bruising sidewalls and shoulders against rim flanges and shortens tire life by contributing to excessive heat buildup.

Overinflation: Indicated by excessive wear in the center of the tire, reduces traction. Overinflation permits tires to be more easily cut or gouged.

Loaded: Tire pressures identified as “Loaded” are pressures with the airplane weight on the tires.

WARNING

Allow the tire to cool to ambient temperature before attempting to service.

WARNING

Overinflation will cause the tire to rupture. Do not exceed 20 psi over the recommended pressure.

WARNING

The tendency of a bursting tire is to rupture along the bead. Standing in the area could cause serious injury should the tire burst.

- Tire pressure should be checked when the tire is cool with an accurate gauge.
- Tire pressure should be checked daily for one or more flights per day; otherwise, checked prior to each flight; and not less than once per week.
- Dual-mounted tires should be equal pressures, within 5 psi. Care should be taken to ensure each tire is inflated to the precise operating pressure of its axle mate.

Service the nose and main gear tires to the pressure listed in Table DIM-3.

NOTE

Tire inflation pressure at 21°C ambient temperature should be increased by 1.0% for each 3°C drop in temperature anticipated at the coldest airport of operation.

Table DIM-3. RECOMMENDED TIRE PRESSURE

TIRE	RECOMMENDED PRESSURE
NOSE GEAR (LOADED)	135 PSI ±5 PSI
MAIN GEAR (LOADED)	187 PSI ±5 PSI

OVERINFLATION PLUGS

The wheels used on the nose and main gear of the Citation X are equipped with overinflation plugs designed to prevent over-inflation by means of a disk which ruptures when an overinflation occurs. These plugs are located 180° from the wheel inflation valve. The main gear wheel plugs relieve at 300 to 350 psi and the nose gear wheel plugs relieve at 200 to 250 psi. The main gear wheels are also equipped with three thermal relief plugs that will relieve in the event of an overheat condition of 370°F to 390°F.

There have been occurrences of tires being overserviced to the point the overinflation plugs have relieved. This has resulted in some confusion as to whether or not the tire required replacement. Chapter 12-10-30 of the *Citation X Maintenance Manual* states if a fuse plug is blown while the aircraft is rolling, the tire and its axle mate must be scrapped. However, at the end of the same section, another statement says: "If it is known that a major pressure loss occurred while the airplane was at rest or parked and the wheels did not turn with weight on them, the tire and its axle mate can be saved. If doubt exists, tag the tires and have an authorized retread repair station inspect them."

Therefore, in a case where a tire is overserviced and the over-inflation plug relieves, it is not necessary to replace the tire as long as the aircraft was not moved while the tire was flat. The overinflation plug can just be replaced and the tire serviced to the recommended pressure.

EXTERNALLY SERVICEABLE FLUSH TOILET—SERVICING

The flush toilet should be serviced during routine ground maintenance of the airplane following any usage. It is more efficient and convenient to service the toilet on a regular basis than to wait until the tank is filled to capacity. Toilet chemical usage is shown in Table DIM-4.

NOTE

Maximum capacity of the toilet tank is 5.3 gallons.

Table DIM-4. TOILET CHEMICAL USAGE

NAME	USE
MONOGRAM DG19	TANK PRECHARGE MIXTURE
MONOGRAM CHEM KARE (ALTERNATE)	TANK PRECHARGE MIXTURE

External lavatory service connection is shown in Figure DIM-6.

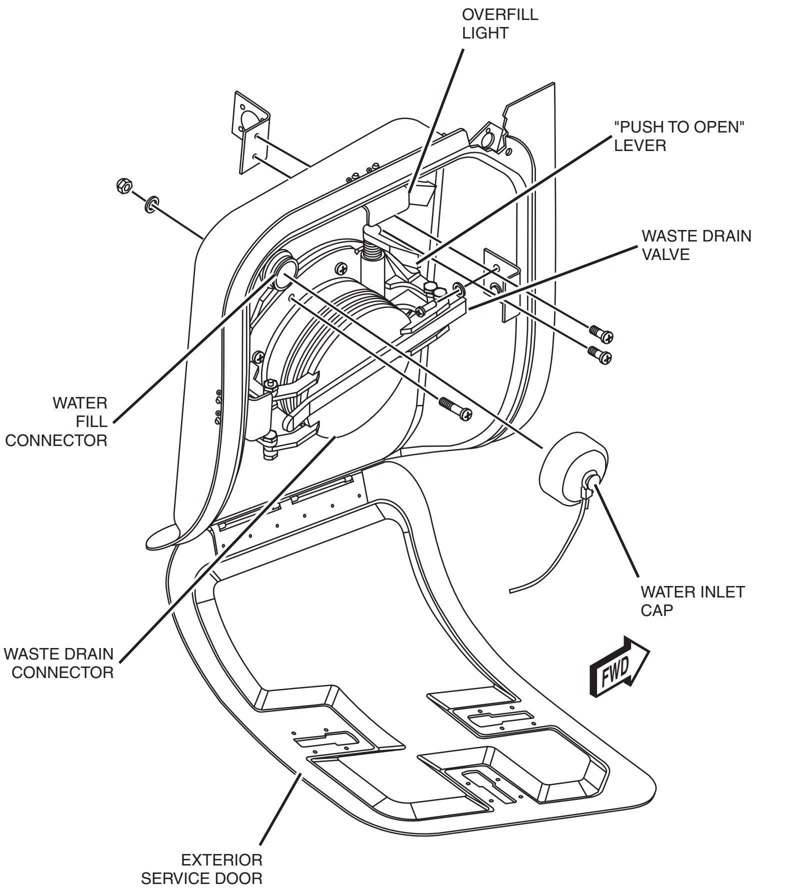


Figure DIM-6. External Lavatory Service Connection

SERVICING THE TOILET

1. Open airplane exterior service panel door.
2. Remove water inlet cap. Open waste drain valve outer door.
3. Connect water fill hose and waste drain hose from the ground service unit to the airplane service panel connections.
4. Toggle PUSH TO OPEN lever on the upper edge of the waste drain valve to open the inner waste drain valve flapper door.
5. To dump waste, pull waste drain valve handle and turn to lock.
6. Turn the inlet water ON and rinse the tank with the waste drain valve open. Cycle a minimum of 1.0 gallon of fluid through the tank.
7. Release the drain valve handle and fill the tank until the red service panel illuminates. Do not exceed 4.0 gallons.
8. Turn the water OFF and open the drain valve to empty the tank.
9. Release the drain valve handle. Charge the toilet tank until the green service panel light illuminates (approximately 1.0 gallon).
10. Disconnect the water fill hose, allowing fluid in the line to drain out of the fill line. Disconnect the waste drain hose from the service panel connection.
11. Replace the water inlet cap and close the outer waste drain valve door, which in turn closes the inner flapper door.
12. Close and secure the airplane exterior service panel door.

NOTE

To ensure toilet recirculation during freezing weather, ethylene glycol base antifreeze containing an antifoam agent may be added to the flush fluid.

VANITY WATER SUPPLY SERVICING

The aft vanities with wash basins incorporate running water. The type of vanity installed determines the location of the water storage tank(s).

DELUXE VANITY WATER SYSTEM (without clothes closet)—Vanities without clothes closets have the water system installed below the wash basin. Each stainless steel hot and cold water storage tank has a capacity of 1.45 gallons.

VANITY (with clothes closet)—The aft vanity with closet is of the modular type. The water system is a gravity-feed system consisting of a single storage tank, pressure transducer and necessary tubing to the faucet. The water may be heated when desired. Vanities with clothes closets, having the water supply system installed in the closet cabinet, routes water from water tanks through hoses and pumps to the vanity water basin. The cold water storage tank has a capacity of 1.45 gallons and is located above the hot water storage tank. The hot water storage tank has a capacity of 1.00 gallon and incorporates a heater.

DELUXE VANITY WATER SYSTEM (WITHOUT CLOTHES CLOSET)—SERVICING

1. Gain access to the hot and cold water tanks by partially opening the water tank drawer just below the wash basin. The water hoses prevent fully opening the drawer.

2. Disengage the WATER circuit breaker located near the right water tank.

3. Disconnect the water hoses from the water tanks at the quick-disconnects. Pull drawer to the full-open position.

4. Unbuckle the tank tie down strap.

5. Remove the tanks from the drawer. The electrical connector for the hot water tank heater will disconnect as the tank is removed.

6. Remove filler caps from the tanks and empty any water remaining in the tanks. Rinse tanks out thoroughly with fresh, clean potable water.

7. Fill each tank with fresh, clean potable water. Verify each filler cap vent hole is clear and install the filler caps.

8. Place the water tanks in the drawer. Carefully push the right (hot water) tank in position to connect the electrical connector.

9. Secure the tanks with the tie-down strap.

10. Partially close the drawer and connect the water hose quick-disconnects.

11. Verify the water HEATER switch is OFF and engage the WATER circuit breaker.

12. Check for water flow from the faucets by opening each (hot/cold) faucet. The water pumps are self priming.

13. Close and latch the water tank drawer.

VANITY (WITH CLOTHES CLOSET)—SERVICING

1. Gain access to the water tank(s) inside the clothes closet. Unlatch the door/panel located on the closet side wall.

2. Disengage the circuit breaker for the water tank heater located in the closet.

3. Release the tank(s) at the hold down(s) and remove the tank(s). The electrical connector for the hot water tank heater will disconnect as the tank is removed.

4. Remove filler caps from the tanks and empty any water remaining in the tanks. Rinse the tanks out thoroughly with fresh, clean potable water.

5. Fill the water tank(s) with fresh, clean potable water. Verify each filler cap vent hole is clear and install filler caps.

6. Place the water tank(s) in the cabinet. Carefully push the hot water tank in position to connect the electrical connector.

7. Secure the tank(s) in place with the hold down(s).

8. Water pump systems: verify the water switch is OFF, and engage the WATER circuit breaker; then, turn water switch ON to check for water flow.

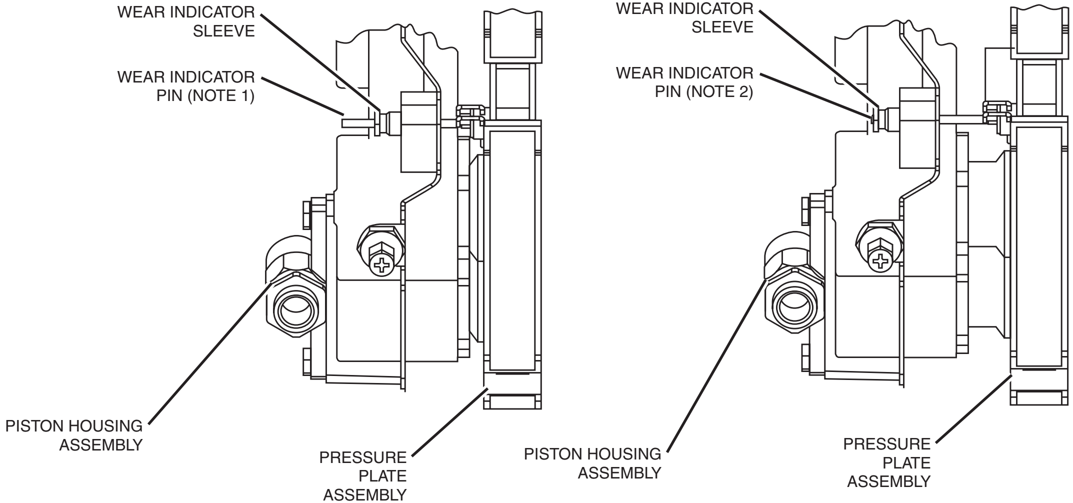
9. Check for water flow from the faucets by opening each faucet (hot/cold).

10. Close and latch the door/panel.

BRAKE WEAR INDICATORS

If the brake wear indicator is flush with the piston housing while brake pressure is applied, there are zero landings remaining. To determine whether or not the indicator is "flush," slide a straight edge along the piston housing. If the straight edge does not catch the wear pin, it is time to change the brakes.

Brake wear indicators are shown in Figure DIM-7.



NOTE 1:
WEAR INDICATOR PIN PROTRUDES FROM INDICATOR SLEEVE.
BRAKE ASSEMBLY MAY REMAIN IN SERVICE.

NOTE 2:
WEAR INDICATOR PIN FLUSH WITH WEAR INDICATOR SLEEVE.
BRAKE SHALL BE TAKEN OUT OF SERVICE FOR OVERHAUL OR REPLACEMENT.

Figure DIM-7. Brake Wear Indicators

BUDDY START PROCEDURE

In situations where additional air pressure from another aircraft is needed in the STARTING ENGINES procedure, a Buddy Start system can be used. Only the Buddy Start Hose (P/N 0043-0028-1) manufactured by Kaiser Electroprecision is recommended for the Buddy Start procedure.

Buddy Start illustrations are shown in Figure DIM-8.

1. BEFORE START procedure—COMPLETE

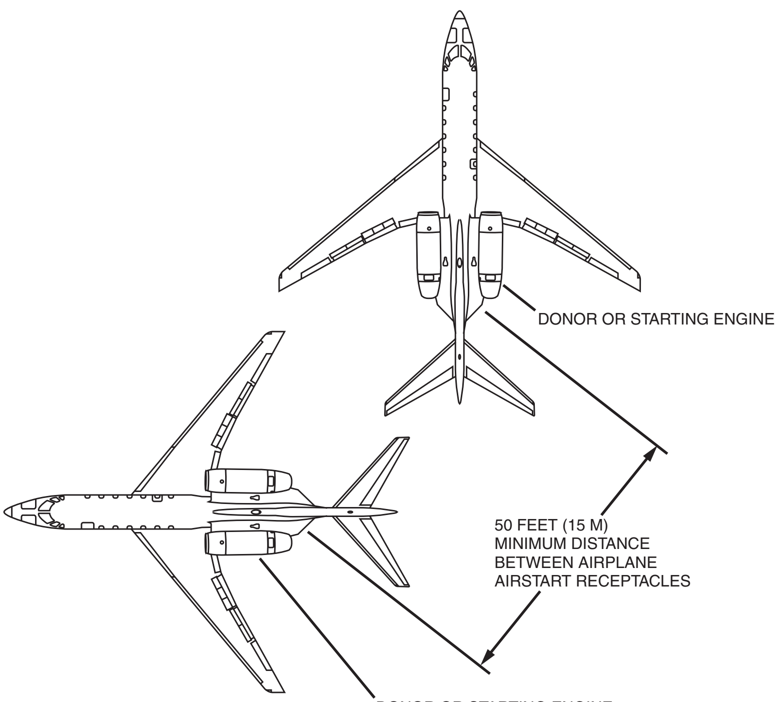


Figure DIM-8. Buddy Start (1 of 2)

2. Both donor and starting aircraft should be situated within the 60-foot length of the Buddy Start Hose so the quick-disconnect couplings can be secured and exhaust blast minimized.

3. Connect the Buddy Start Hose to the ground air start nipple on both aircraft.

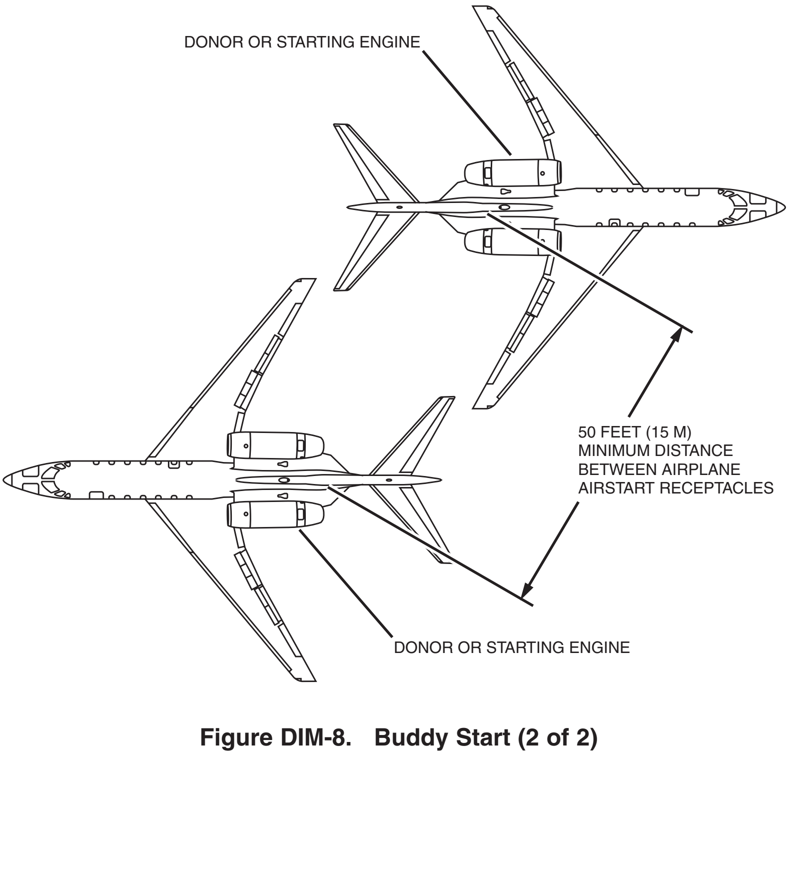


Figure DIM-8. Buddy Start (2 of 2)

CAUTION

When connecting or disconnecting the Buddy Start Hose to either aircraft with an engine or APU running, ensure all bleed-air sources are turned off.

4. CKPT PAC and CAB PAC Switches—OFF

5. APU BLEED AIR MAX COOL Switch—OFF

6. PAC off and APU valves closed on donor aircraft

7. Start the donor aircraft normally and maintain 55% N_1 according to STARTING SECOND ENGINE: CROSS BLEED METHOD checklist.

8. The starting aircraft should follow the remaining STARTING ENGINES sequence in the checklist.

WARNING

The Buddy Start Hose connections and nozzle handles will be hot. Always use protective clothing and gloves before handling the connections.

9. Disconnect Buddy Start Hose from both aircraft.

NOTE

Donor aircraft other than the Model 750 may be used, but manufacturer's procedures for engine starting must be followed. The operator should determine the proper bleed configuration and engine speed to provide a minimum receiving aircraft motoring N_2 of 30%.

ENGINE OIL SERVICING

The oil tank mounted to the outer bypass duct is designed to store a sufficient amount of oil for lubrication of the engine and accessory gear box. The oil tank capacity is 13.0 quarts. The tank has an oil level sight gauge and an oil level/low warning sensor (Figure DIM-9). The sensor assembly allows oil level to be continuously read and includes a switch that is actuated when there are 4.0 quarts or less of usable oil remaining in the tank. The tank also includes a magnetic drain plug at the bot-

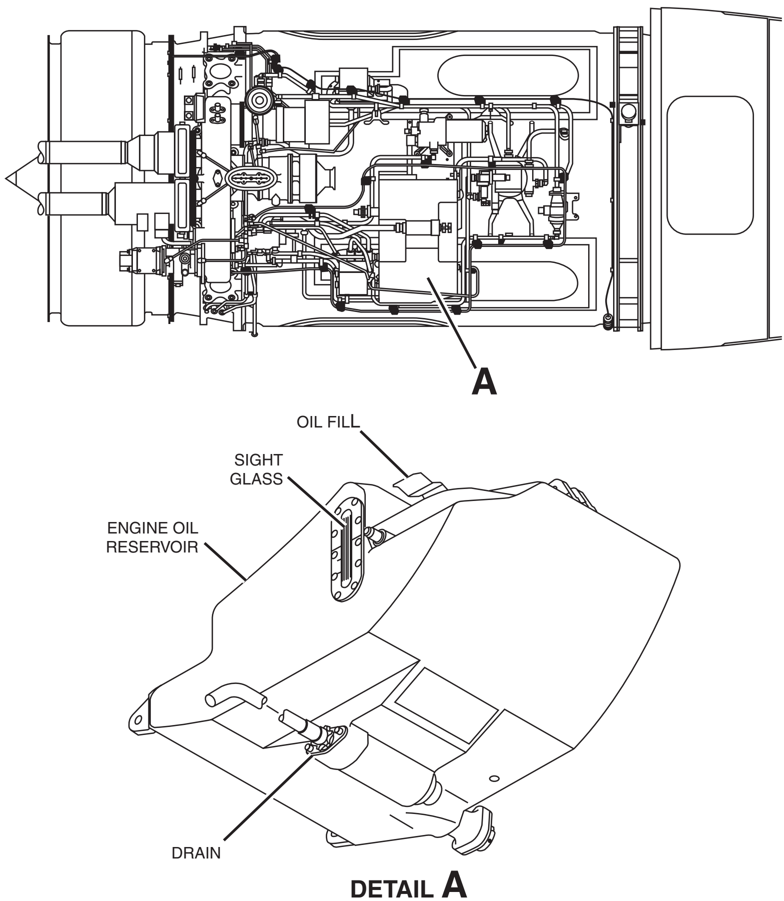


Figure DIM-9. Oil Reservoir

tom of the tank and an indicating magnetic plug at the bottom of the static air/oil separator which is mounted inside the tank.

- Oil Consumption: The maximum oil consumption rate specified for the AE3007C engine is 10.2 ounces per hour.

Only oils listed in Table DIM-5 may be used in the AE3007C engine:

Table DIM-5. APPROVED OILS FOR AE3007C ENGINES

OILS CONFORMING TO MIL-L-7808K	OILS CONFORMING TO MIL-L-23699D
MOBIL RM 284A	MOBIL JET II
	MOBIL JET 254
	AEROSHELL/ROYCO 500
	EXXON 2380

BETWEEN/AFTER FLIGHT OIL SERVICING

1. Check reservoir sight glass oil level. Verify the oil filter is not clogged by checking for a popped (extended) bypass red indicator button located on the right end of the accessory gearbox.

NOTE

If the oil level is not checked within one hour after engine shutdown, operate the engine at idle for five minutes, then check oil level.

2. If reservoir top off is required, remove filler cap and add oil until reservoir reads FULL. Install filler cap.

3. If the oil filter bypass indicator button is popped (extended), check for cause/oil contamination; replace oil filter element and reset bypass indicator button.

ELECTRICALLY-HEATED GLASS WINDSHIELD AND SIDE WINDOWS SERVICING

The electrically-heated windshield and heated side windows are of glass construction. Care must be exercised in cleaning these windows to avoid damage and deterioration of the SURFACE SEAL rain repellent outer surface coating.

CAUTION

Do not apply unauthorized rain repellent coatings or compounds to the electrically-heated glass windshield or associated heated-glass side windows. Surface seal is the only authorized rain repellent coating. Apply only with windshield manufacturer's authorization and instructions.

1. Flush outer surface of windshield/side windows with clean water to remove excessive dirt and other substances.

NOTE

Adhered particles should not be dislodged using fingers or fingernails.

2. Using materials such as a soft cloth or clean sponge, wash windshield/side windows with a 50/50 solution of isopropanol and water. If isopropanol is not available, the following alternate cleaning solutions may be utilized:
   - A 50/50 solution of rubbing alcohol and water.
   - Mild liquid detergents (Ivory or Joy dishwashing liquid) mixed with 1/2 ounce per gallon of water.
   - Full strength Windex glass cleaner.

CAUTION

Read label on glass cleaner container to ensure the cleaner does not contain hydrofloric acid as an ingredient. Hydrofloric acid, even in minute traces, will destroy the surface seal.

3. Flush thoroughly with clean water and dry. Wipe dry with strokes in one direction using a damp soft cloth, damp sponge or soft paper toweling such as Kaydry Wipers.

NOTE

Do not apply polish or wax to the glass surface of the heated windshield or heated forward side windows.

OXYGEN SYSTEM SERVICING

The oxygen filler valve is located inside the right nose compartment door (Figure DIM-10). Pressure indicator gauge(s) are located on the instrument panel. Breathing oxygen conforming to MIL-0-27210 Type 1 is to be used for charging cylinders. If the oxygen bottle were thermally discharged, the green burst disc(s) cap(s) must be replaced and a new discharge indicator installed. The standard oxygen system will provide 76 cubic feet when charged to 1,850 psi at 70°F.

WARNING

Oxygen supports combustion. Materials that will not normally flash in the atmosphere will readily burn or explode in the presence of concentrated oxygen.

- Do not service oxygen bottle while aircraft is being fueled.
- Ensure no uncontained flammable material is near when servicing oxygen bottle.
- Do not direct highly compressed oxygen towards personnel.

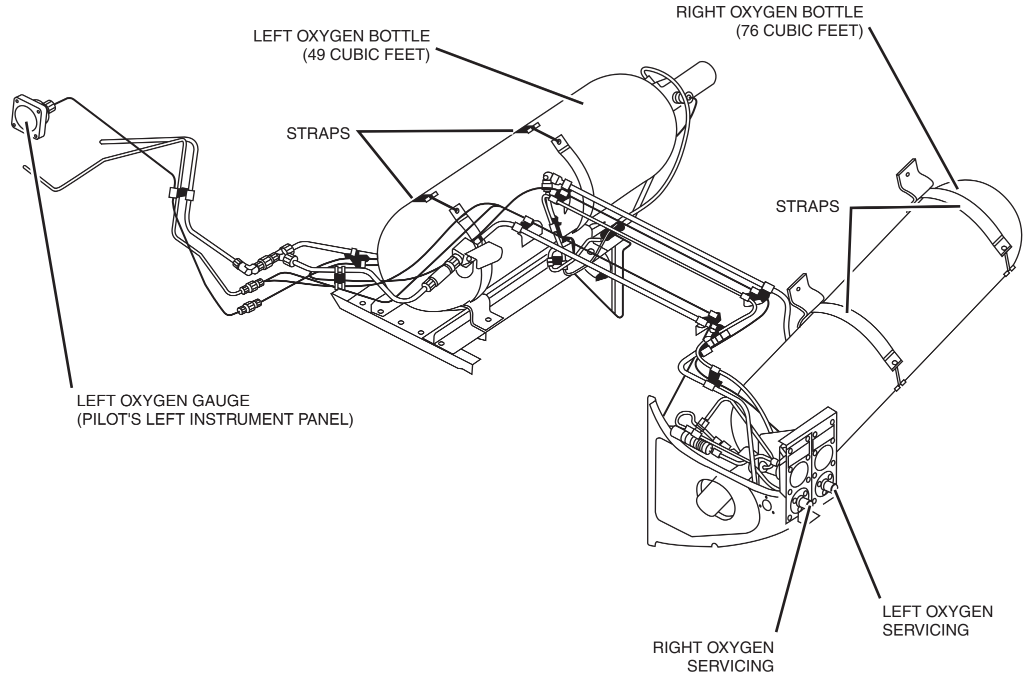


Figure DIM-10. Oxygen Sensor

CHARGING OXYGEN SYSTEM

MIL-0-27210, Type 1 Oxygen Cylinder Fill Pressure for Various Temperatures

Table DIM-6. CHARGING OXYGEN SYSTEM

TEMPERATURE °F	FILL PRESSURE PSI	TEMPERATURE °F	FILL PRESSURE PSI
–50	1242	60	1754
–40	1289	70	1800
–30	1336	80	1846
–20	1383	90	1892
–10	1430	100	1937
0	1477	110	1983
10	1523	120	2029
20	1569	130	2074
30	1616	140	2120
40	1662	150	2165
50	1708		

NOTE

Before servicing oxygen system, examine cylinder for condition and hydrostatic test date. DOT order 8000-40, dated June 2, 1977, states a cylinder which remains charged or partially charged on the due date of its hydrostatic test may remain in service beyond the test date providing the cylinder is retested prior to its next full or partial filling.

1. Open the right nose compartment door (left side of aircraft).
2. Remove oxygen filler valve dust cap located on the nose compartment aft frame.

NOTE

Support bracket when loosening dust cap to avoid damaging bracket.

3. Connect charging cylinder line from the oxygen service cart to filler valve.
4. Slowly open the charging cylinder valve and charge the aircraft oxygen bottle to the correct pressure listed in the table.

CAUTION

Ambient temperature has a direct effect on indicated pressure.

5. Shut off oxygen at charging cylinder and disconnect line.
6. Install dust cap on filler valve and torque approximately 10 to 15 inch-pounds.
7. Close right nose compartment door.

TAXIING THE AIRCRAFT

For reference, the taxi radius is shown in Figure DIM-11.

ENGINE EXHAUST HAZARD AREAS

For reference, the engine exhaust hazard areas are shown in Figure DIM-12.

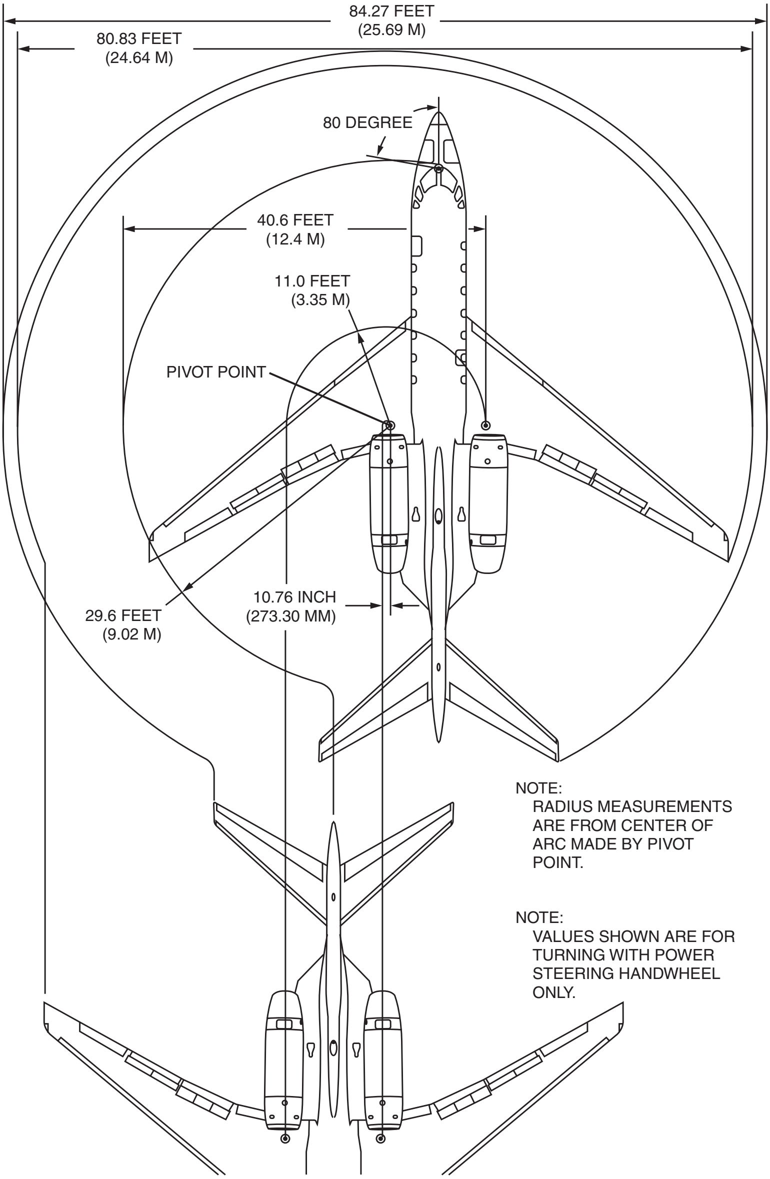


Figure DIM-11. Taxi Radius

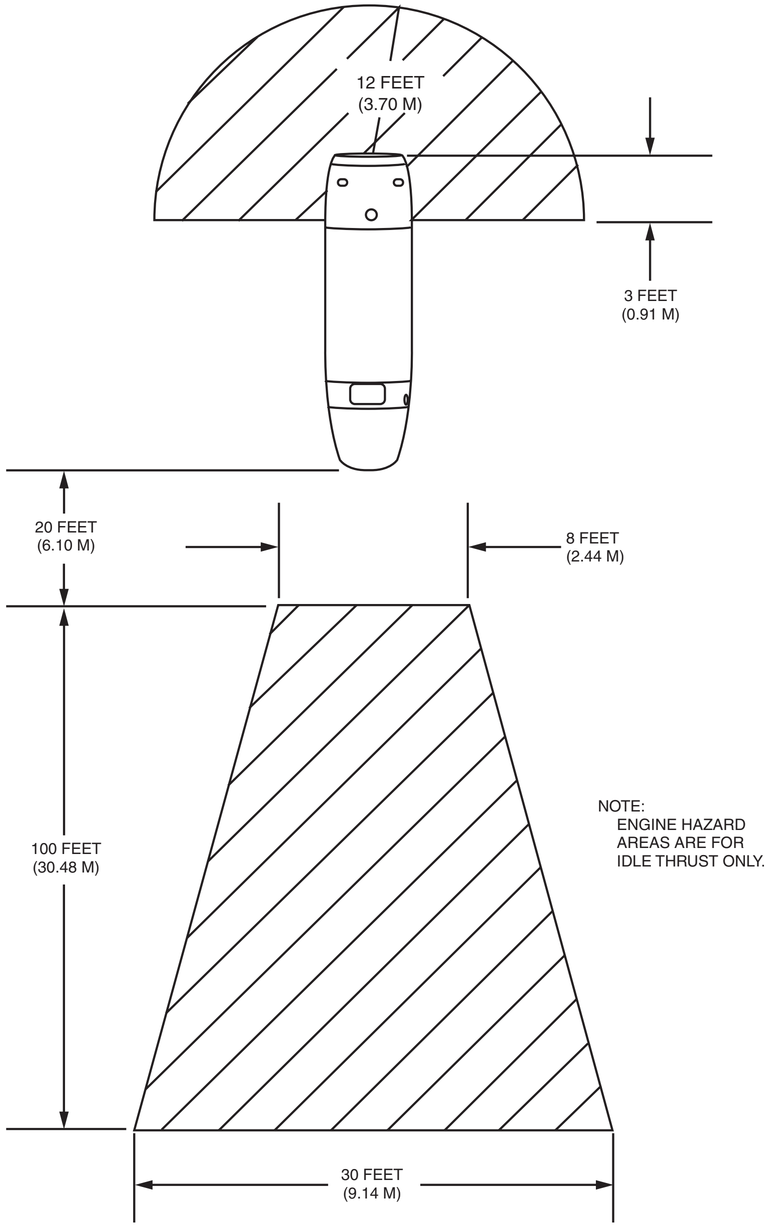


Figure DIM-12. Engine Exhaust Hazard Areas

SPECIAL PROCEDURES

CONTENTS

TABLES

SPECIAL PROCEDURES

HIGH ELEVATION AIRPORT OPERATIONS

The maximum altitude limit for takeoffs and landings is restricted to airport field elevations of 14,000 feet.

The cabin altitude selector is marked with an amber arc from 8,000 feet to 14,000 feet designating that special procedures are required for operation to or from high elevation airports. when the airplane is operated in this region, the pressurization controller will cause the cabin altitude amber (8,500 feet) and red (1,000 feet) CAS messages to both be set to 14,500 feet. the summary of operating procedures using the high altitude airport mode is shown in Table SP-1.

Table SP-1. OPERATING PROCEDURES USING HIGH AIRPORT MODE

CONDITIONS:	PROCEDURE:	PRESSURIZATION SYSTEM WILL:
• Takeoff from field elevation <8,000 feet to high elevation airport.	• Set landing airport elevation. • Set Normal Auto Schedule mode.	• After takeoff, will maintain cabin per auto schedule. • Will begin rating cabin to 8,000 feet when airplane has descended 1,000 feet from cruise. • Will rate cabin to selected altitude when the airplane is below 24,500 feet MSL.
• Takeoff from field elevation ≥ 8,000 feet to another high elevation airport, short distance flight below 24,500 feet.	• Set Altitude Select Mode. • Select landing airport elevation. • Consider Oxygen requirements.	• After takeoff, will rate cabin to landing field elevation.
• Takeoff from field elevation ≥ 8,000 feet to airport < 8,000 feet or to airport ≥ 8,000 feet, longer distance flight above 24,500 feet.	• Set Normal Auto Schedule mode. • Select landing airport elevation.	• After takeoff, will rate to and maintain cabin at 8,000 feet. • Will rate cabin to normal auto schedule after 10 minutes at level cruise or when airplane descends 1,000 feet. • If landing elevation is greater than 8,000 feet, will rate cabin to 8,000 feet after airplane has descended 1,000 feet and will rate to selected elevation when airplane has descended below 24,500 feet.
• Go-around at, and return to land, at high elevation airport. • Takeoff from and return to	• Select Altitude Select Mode at go-around or when returning to land. • Set Landing Airport Elevation	• In auto schedule, cabin will begin rating down to 8,000 feet when climb is started. • Selecting Altitude Select will retain landing airport

NOTE

- If the field elevation selected for the destination is greater than 8,000 feet, then the cabin will begin rating up to the selected altitude upon descent below 24,500 feet MSL. If the airplane subsequently returns to an altitude above 24,500 feet, the cabin will begin rating back down to 8,000 feet. If the airplane reaches 24,500 feet while the cabin altitude is high, the amber and red CABIN ALTITUDE CAS messages will illuminate.
- If the airplane is to hold above 12,000 feet, cabin altitude must be selected at or below 12,000 feet until holding is completed; otherwise one pilot must wear an oxygen mask and use oxygen.

EXTREME COLD WEATHER OPERATIONS— S/N 750-0173 AND ON

Remove EROS crew oxygen masks if temperature will be less than –10°C and drain all cabin fluids.

When the airplane is parked in any conditions of falling or blowing snow, regardless of temperature, the engine, APU and pitot covers should be installed. The airplane should be parked with slats and flaps retracted. Prior to flight, the airplane must be cleared of snow and if wing, empennage or control surfaces are frosted, they must be deiced. Refer to Section VII—Deicing Procedures in the *AFM*.

If the airplane is to be parked outside for more than a few hours at temperatures below –15°C, the following special considerations are advised:

- The airplane batteries should be removed to a warm environment or battery heaters installed and connected. Below –20°C, nicad batteries may be inert and will not charge or discharge.
- Hydraulic accumulators, pneumatic storage bottles, and oxygen cylinders will indicate a lower pressure because of the temperature drop. Refer to the appropriate temperature change placards. It should be noted that hydraulic and pneumatic systems are more prone to leaks in extreme cold. A significantly lower charge may indicate a leak. Prior to preflight, the flaps should be extended to allow inspection of the wing trailing edge for hydraulic leaks.
- The APU should be started as soon as possible or external power used to supply electrical and avionics power and cabin heat. The APU should start normally using external power or warm batteries provided that the airplane has not been cold soaked below –40°C. Preheating will be required if the cold soak was below–40°C. To facilitate cabin warming, select PACs to HI, PAC isolation valve OPEN and both PACs to MANUAL, full hot. APU max cool bleed may be used provided the APU does not cycle on the overtemperature limit.

- Some electrical systems and avionics computers and displays may be slow to warm up. The glareshield auxiliary panel lighting should be turned on and allowed to reach full brightness. Cabin fluorescent lighting will also be slow to illuminate and should be turned on if its use is anticipated. The IACs may be slow to warm up and may result in slightly distorted displays. Failures of the FGC, the yaw damper, the Mach trim, and the primary stabilizer trim may also occur until the computers are warmed up. LCD displays in the RMUs, aileron/rudder trim indicator, standby engine instruments and optional AOA indicators may require several minutes to reach full brightness. FMS computers may require several minutes to give accurate initial position. Typically, warmup may take 20 minutes or more.

NOTE

Dispatch is prohibited until all required avionics systems are verified to be functioning properly.

- Prior to engine start, the rudder control should be cycled to ensure proper operation of the rudder standby system. Cold temperature may result in low pressure excursions and the RUD STBY SYS FAIL message. If the message is displayed, once it is verified that RSS pressure is cycling normally, the message and pressure display can be cleared by selecting the SG REV switch to SG1 (approximately five seconds), NORM (approximately five seconds), SG2 (approximately five seconds), and back to NORM.

NOTE

If this procedure is conducted too quickly, it will clear V-speeds if they have been set and cause both engines' FADEC to be in ADC reversionary mode. V-speeds and FADEC must be reset.

- The right engine should be started first. Following right engine start, flight controls should be exercised to verify the PTU will maintain A-system hydraulic pressure. Following left engine start, all flight controls, slats and speed brakes should be cycled through full travel several times to verify all controls reach full travel and operate normally. Hydraulic quantity should be monitored (EICAS) prior to takeoff to verify no system leaks have occurred.

NOTE

Dispatch is prohibited following cold soak unless it is verified (EICAS), and visually confirmed by comparing deflection of adjacent panels, that all flight controls operate normally and all speed brake and roll spoiler panels fully extend and retract normally. Several cycles of the controls may be required to verify proper operation.

- Engine preheat is required if the engine oil temperature is below –40°C. Engine oil temperature as displayed in EICAS, is a good indicator of cold soak. Engine starts using ground or APU air should be normal except the exhaust will smoke initially and engine oil pressure will be high. Engine oil pressure above 95 psi is normal during cold starts. The engine may not be operated above idle until oil pressure is at or below 95 psi for aircraft S/N 750-0080 through 0172 and S/N 750-0001 through 0079 with Phase 6 software or higher. Once engine oil pressure is in normal limits, the engine may be operated above idle, but cannot exceed 40% N_1 until the engine fuel temperature is in normal limits, ≥4°C. This process should take only a few minutes.

NOTE

For airplanes with Phase 6 software or higher:

- Transient high oil pressure may occur when takeoff N_1 is selected. Oil pressure in the transient (amber) range, >95 to 155 psig, is permitted for up to two minutes.

- Oil pressure above 95 psi is normal following engine start in cold conditions, until the engine has warmed up. Refer to Normal Procedures, EXTREME COLD WEATHER OPERATIONS in the *AFM*.

Table SP-2. FAA TYPE II HOLDOVER TIME GUIDELINE—GUIDELINE FOR HOLDOVER TIMES ANTICIPATED FOR SAE TYPE II FLUID MIXTURES AS A FUNCTION OF WEATHER CONDITIONS AND OAT

This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

OAT		MANUFACTURER SPECIFIC TYPE II FLUID CONCENTRATION NEAT-FLUID/WATER (VOL. %/VOL. %)	APPROXIMATE HOLDOVER TIMES UNDER VARIOUS WEATHER CONDITIONS (HOURS: MINUTES)						
°C	°F		FROST*	FREEZING FOG	SNOW∆	FREEZING DRIZZLE***	LIGHT FREEZING RAIN	RAIN ON COLD SOAKED WING	OTHER†
Above 0	Above 32	100/0	12:00	0:35–1:30	0:20–0:55	0:30-0:55	0:15-0:30	0:05-0:40	CAUTION: No holdover time guidelines exist.
		75/25	6:00	0:25-1:00	0:15-0:40	0:20-0:45	0:10-0:25	0:05-0:25	
		50/50	4:00	0:15-0:30	0:05-0:15	0:05-0:15	0:05-0:10	CAUTION: Clear ice may require touch for confirmation.	
0 to –3	32 to 27	100/0	8:00	0:35-1:30	0:20-0:45	0:30-0:55	0:15-0:30		
		75/25	5:00	0:25-1:00	0:15-0:30	0:20-0:45	0:10-0:25		
		50/50	3:00	0:15-0:30	0:05-0:15	0:05-0:15	0:05-0:10		
Below –3 to –14	Below 27 to 7	100/0	8:00	0:20-1:05	0:15-0:35	**0:15-0:45	**0:10-0:25		
		75/25	5:00	0:20-0:55	0:15-0:25	**0:15-0:30	**0:10-0:20		
Below –14 to –25	Below 7 to –13	100/0	8:00	0:15-0:20	0:15-0:30				
Below –25	Below –13	100/0	SAE Type II fluid may be used below –25°C (–13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the OAT and the aerodynamic acceptance criteria are met. Consider use of SAE Type I when SAE Type II fluid cannot be used.						

°C = Degrees Celsius °F = Degrees Fahrenheit OAT = Outside Air Temperature VOL = Volume

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

* During conditions that apply to aircraft protection for ACTIVE FROST
** No holdover time guidelines exist for this condition below –10°C (14°F)
*** Use light freezing rain holdover times if positive identification of freezing drizzle is not possible
† Snow pellets, ice pellets, heavy snow, moderate and heavy freezing rain, hail
∆ Snow includes snow grains

- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than OAT.
- **SAE TYPE II** fluid used during ground deicing/anti-icing is not intended for and does not provide protection during flight.

Table SP-3. FAA TYPE I HOLDOVER TIME GUIDELINE—GUIDELINE FOR HOLDOVER TIMES ANTICIPATED FOR SAE TYPE I FLUID MIXTURE AS A FUNCTION OF WEATHER CONDITIONS AND OAT

CAUTION

This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

OAT		APPROXIMATE HOLDOVER TIMES UNDER VARIOUS WEATHER CONDITIONS (HOURS: MINUTES)							
°C	°F	FROST*	FREEZING FOG	LIGHT SNOWΔΔ	MODERATE SNOWΔΔ	**FREEZING DRIZZLE	LIGHT FREEZING RAIN	RAIN ON COLD SOAKED WING	OTHER†
–3 and above	27 and above	0:45	0:11-0:17	0:11-0:16	0:06-0:11	0:09-0:13	0:02-0:05	0:02-0:05	CAUTION: No holdover time guidelines exist.
Below –3 to –6	Below 27 to 21	0:45	0:08-0:14	0:08-0:13	0:05-0:08	0:07-0:10	0:02-0:05	CAUTION: Clear ice may require touch for confirmation.	
–7 to –10	20 to 14	0:45	0:06-0:10	0:06-0:10	0:04-0:06	0:05-0:08	0:02-0:05		
Below –10	Below 14	0:45	0:05-0:09	0:04-0:06	0:02-0:04				

°C = Degrees Celsius °F = Degrees Fahrenheit OAT = Outside Air Temperature FP = Freezing Point

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

* During conditions that apply to aircraft protection for ACTIVE FROST

** Use light freezing rain holdover times if positive identification of freezing drizzle is not possible

† Heavy snow, snow pellets, ice pellets, moderate and heavy freezing rain, hial

ΔΔ **TO USE THESE TIMES, THE FLUID MUST BE HEATED TO A MINIMUM TEMPERATURE OF 60°C (140°F) AT THE NOZZLE AND AT LEAST 1 LITER/M^2 (≈2 GALS/100FT^2) MUST BE APPLIED TO DEICED SURFACES.**
SAE Type I fluid/water mixture is selected so that the FP of the mixture is at least 10°C (18°F) below OAT.

CAUTION

- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast will reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than OAT.
- **SAE TYPE I** fluid used during ground deicing/anti-icing is not intended for and does not provide protection during flight.

Table SP-4. FAA TYPE I HOLDOVER TIME GUIDELINE—GUIDELINES FOR THE APPLICATION OF SAE TYPE I FLUID MIXTURES

MINIMUM CONCENTRATIONS AS A FUNCTION OF OUTSIDE AIR TEMPERATURE (OAT). CONCENTRATIONS IN % V/V

<table>
<tr><th rowspan="2">OAT</th><th rowspan="2">ONE-STEP PROCEDURE
DEICING/ANTI-ICING</th><th colspan="2">TWO-STEP PROCEDURE</th></tr>
<tr><th>FIRST STEP: DEICING</th><th>SECOND STEP: ANTI-ICING[1]</th></tr>
<tr><td>–3°C (27°F)
AND ABOVE</td><td rowspan="2">Mix of fluid and water heated to 60°C (140°F) minimum at the nozzle, with a freeze point of at least 10°C (18°F) below OAT.</td><td>Water or a mix of fluid and water heated to 60°C (140°F) minimum at the nozzle.</td><td rowspan="2">Mix of fluid and water heated to 60°C (140°F) minimum at the nozzle, with a freeze point of at least 10°C (18°F) below OAT.</td></tr>
<tr><td>BELOW
–3°C (27°F)</td><td>Freeze point of heated fluid mixture shall not be more than 3°C (5°F) above OAT.</td></tr>
</table>

NOTE

Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.

CAUTION

Wing skin temperatures may differ and, in some cases, be lower than OAT.

A stronger mix (more glycol) can be used under the latter conditions.

[1] To be applied before first step fluid freezes, typically within three minutes.

Table SP-5. FAA TYPE IV HOLDOVER TIME GUIDELINE—GUIDELINE FOR HOLDOVER TIMES ANTICIPATED FOR SAE TYPE IV FLUID MIXTURES AS A FUNCTION OF WEATHER CONDITIONS AND OAT

CAUTION

This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

OAT		MANUFACTURER SPECIFIC TYPE IV FLUID CONCENTRATION NEAT-FLUID/WATER (VOL. %/VOL. %)	APPROXIMATE HOLDOVER TIMES UNDER VARIOUS WEATHER CONDITIONS (HOURS: MINUTES)						
°C	°F		FROST*	FREEZING FOG	SNOWΔ	FREEZING DRIZZLE***	LIGHT FREEZING RAIN	RAIN ON COLD SOAKED WING	OTHER†
Above 0	Above 32	100/0	18:00	1:05–2:15	0:35–1:05	0:40-1:10	0:25-0:40	0:10-0:50	CAUTION: No holdover time guidelines exist.
		75/25	6:00	1:05-1:45	0:30-1:05	0:35-0:50	0:15-0:30	0:05-0:35	
		50/50	4:00	0:15-0:35	0:05-0:20	0:10-0:20	0:05-0:10	CAUTION: Clear ice may require touch for confirmation.	
0 to –3	32 to 27	100/0	12:00	1:05-2:15	0:30-0:55	0:40-1:10	0:25-0:40		
		75/25	5:00	1:05-1:45	0:25-0:50	0:35-0:50	0:15-0:30		
		50/50	3:00	0:15-0:35	0:05-0:15	0:10-0:20	0:05-0:10		
Below –3 to –14	Below 27 to 7	100/0	12:00	0:20-1:20	0:20-0:40	**0:20-0:45	**0:10-0:25		
		75/25	5:00	0:25-0:50	0:15-0:25	**0:15-0:30	**0:10-0:20		
Below –14 to –25	Below 7 to –13	100/0	12:00	0:15-0:40	0:15-0:30				
Below –25	Below –13	100/0	SAE Type IV fluid may be used below –25°C (–13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the OAT and the aerodynamic acceptance criteria are met. Consider use of SAE Type I when SAE Type IV fluid cannot be used.						

°C = Degrees Celsius °F = Degrees Fahrenheit OAT = Outside Air Temperature VOL = Volume

THE RESPONSIBILITY FOR THE APPLICATION OF THESE DATA REMAINS WITH THE USER.

* During conditions that apply to aircraft protection for ACTIVE FROST
** No holdover time guidelines exist for this condition below –10°C (14°F)
*** Use light freezing rain holdover times if positive identification of freezing drizzle is not possible
† Snow pellets, ice pellets, heavy snow, moderate and heavy freezing rain, hail
Δ Snow includes snow grains

CAUTION

- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than OAT.
- **SAE TYPE IV** fluid used during ground deicing/anti-icing is not intended for and does not provide protection during flight.