



Citation Sovereign



Operating Handbook

Revision 1



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Use of Operating Handbook

The CAE Operating Handbook is both a training aid for the simulator and a practical tool for the cockpit. This handbook is comprised of four sections.

- The aircraft preflight section (P-pages) are inserted in vinyl sleeves for increased durability and ease of page replacement. This section is an abbreviated listing of major items to be checked on preflight inspection.
- The normal procedures section (N-pages) are inserted in vinyl sleeves for increased durability and ease of page replacement. The checklists provided are CAE developed Standard Operating Procedures (SOPs). If your company has its own SOPs, you may replace the CAE SOPs with your own SOPs.
- The flight planning section (F-pages) contains charts and graphs to facilitate flight planning.
- The emergency/abnormal procedures section (E-pages) contains checklists for emergency and abnormal situations. All immediate action (memory) items are printed in red; procedures with immediate action items also have red titles. This section may be accessed in one of three ways: by table of contents (EMER tab, front), by system tab (front), or by numbered tab (back).

If you are accessing a procedure by the table of contents or by system, simply place your thumb on the proper tab and open the book. For example, place your thumb on the EMER tab and open the handbook; the E-pages table of contents is displayed.

If you are accessing the procedures by cockpit indication, reference the back page of this handbook. Locate the appropriate item and note the number in the adjacent circle. Next, locate the similarly numbered tab; place your thumb on that page and open the handbook. The procedure will be on one of the two pages now open or immediately following.

DEFINITIONS

Land Immediately: Self-explanatory.

Land As Soon As Possible: Land at the nearest suitable airport. Extreme situations could require an off-airport landing. Primary consideration is safety of occupants.

Land As Soon As Practical: Land at a suitable airport. Primary consideration is the urgency of the emergency or abnormal situation. Continuing to the destination or an alternate with appropriate service facilities may be an option.

WARNING: An operating procedure, technique, etc., that may result in personal injury or loss of life if not carefully followed.

CAUTION: An operating procedure, technique, etc., that may result in damage to equipment if not carefully followed.

NOTE: An operating procedure, technique, etc., considered essential to emphasize.

NOTICE: This Citation Sovereign Operating Handbook is to be used for aircraft familiarization and training purposes only. It is not to be used as, nor considered a substitute for, the manufacturer's Pilot or Maintenance Manuals.



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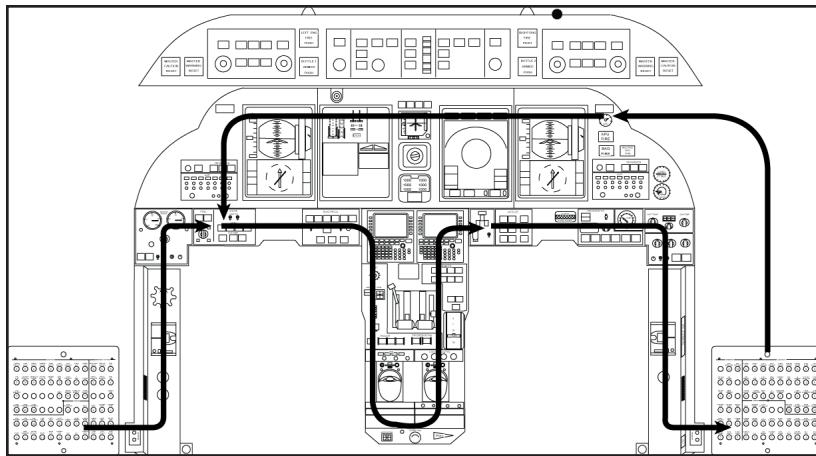
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This section covers the basic preparation and preflight for the Citation Sovereign aircraft.

PRELIMINARY EXTERIOR INSPECTION

Engine/Pitot/APU Covers	REMOVED
Batteries (left and right).....	CONNECTED
APU Inlets and Exhaust.....	CLEAR
APU Oil Level (if APU started prior to conducting Exterior Inspection).....	CHECK
APU Oil Test Switch	LAMP TEST, VERIFY LOW OIL LIGHT (and ADD OIL light if SB680-49-05 not incorporated) illuminates
APU Oil Test Switch	OIL CHECK If no lights are illuminated, the APU may be operated. The oil level is full. If the amber LOW OIL (SB680-49-05 incorporated) or amber ADD OIL (SB680-49-05 not incorporated) light is illuminated, the APU may be operated but should be serviced at the next available opportunity (within a maximum of 20 hours of APU operation). If the red ADD OIL light is illuminated (not applicable if SB680-49-05 has been incorporated), the APU may not be operated prior to servicing the APU.

END



COCKPIT/CABIN INSPECTION

Documents	ONBOARD AND CURRENT
To be displayed in airplane at all times:	
Airworthiness and Registration Certificates.	
Transmitter License(s) (as required).	
To be carried in the airplane at all times:	
FAA Approved Airplane Flight Manual.	
Honeywell Primus Epic Integrated Avionics System Pilot's Guide for the Cessna Citation Sovereign.	
Honeywell Primus Epic Flight Management System Pilot's Guide for the Cessna Citation Sovereign.	
Other applicable pilot's manuals as required in Section II, Operating Limitations or applicable AFM Supplement(s).	
First Aid Kit(s).	
Cabin	CHECK
Main Gear Uplock Release Handle (aft cabin)	STOWED
Water Barrier	STOWED ON BOARD
Emergency ExitSECURE/CLEAR/ LOCK PIN REMOVED/COVER IN PLACE
Life Vests (if required)	STOWED ON BOARD
Seats/Belts	CHECK CONDITION
Cabin Fire Extinguisher	SERVICED/SECURE
Circuit Breakers	IN
Throttles	CUTOFF
FLAP Selector	AGREES WITH FLAP POSITION
Portable Fire Extinguisher (under copilot's seat)	SERVICED/SECURE
STBY PWR Switch	TEST/ON
EMER LTS Switch	ARM
BATT Buttons (both)	ON

EICAS Button ON
 Battery Voltage CHECK, 24 VOLTS MINIMUM
 LANDING GEAR Handle DOWN, CONFIRM 3 GREEN LIGHTS
 Power Source (external power or APU, if desired)

External Power

AVAIL Light ILLUMINATED

EXT PWR Button ON

APU Generator

APU TEST/START

refer to Normal Procedures, "APU Ground
or In-Flight Start (At or Below FL200)"

APU SYSTEM GENERATOR Button ON

APU SYSTEM BLEED AIR Button AS DESIRED

WARNING: Operation with APU bleed air on with the cabin door closed
will result in a slight positive pressure in the airplane. To
avoid potential injury to persons or damage to the cabin
door, APU bleed air should be turned off or a cockpit side
window opened prior to opening the cabin door.

CAUTION: The APU is not approved for unattended ground
operation.

BUS TIE Button VERIFY CLOSED
 Oxygen System CHECK

Smoke Goggles STOWED

Masks TEST/STOWED/100%

Oxygen Pressure CHECK PER TABLE

TEMP (°F)	-40	0	70	100	120
PRESS (PS1)	1290	1475	1800	1940	2075

PASS OXY Selector AUTO

AVN Buttons (both) ON

Stabilizer Trim VERIFY SET TO $6.9^\circ \pm .01$

Speedbrakes CHECK INDICATION

Fuel Quantity and Balance CHECK

Hydraulic Quantity CHECK, 120 TO 700 CU IN

Anti-Ice PITOT/STATIC Buttons (both) ON/CHECK PITOT
STATIC COLD L AND/OR R
AND/OR STBY MESSAGE CLEARED/OFF

AVN Buttons (both) OFF

EXTERIOR/INTERIOR/EMERGENCY LIGHTS ON/CHECK/OFF
OR AS REQUIRED

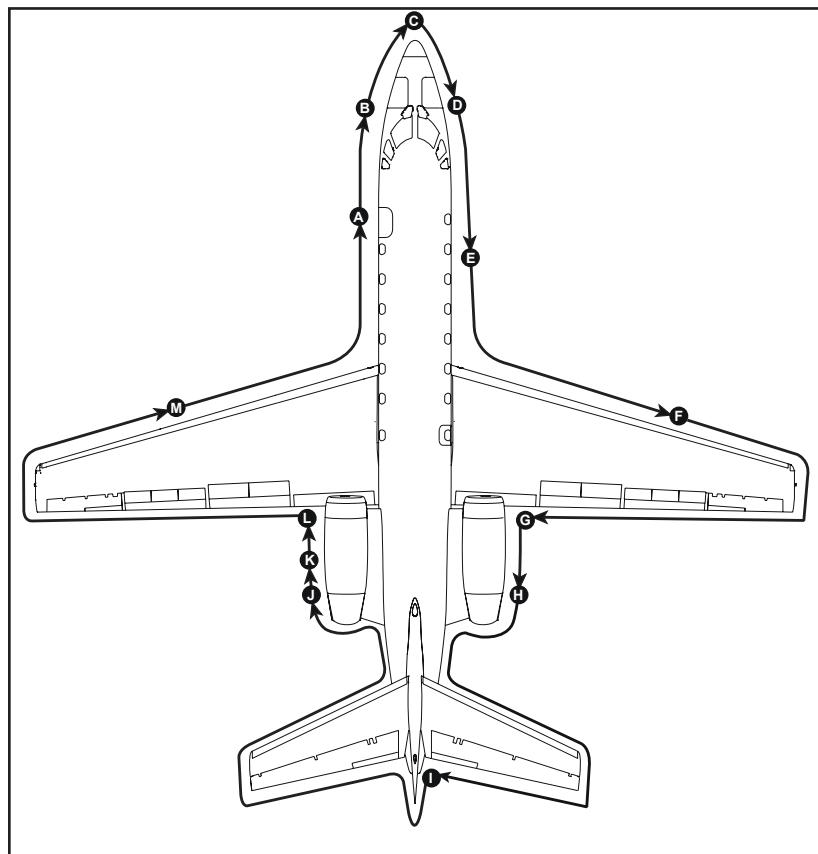
BATT Buttons (both)

If External Power and/or APU Generator ON ON

If no External Power and APU Generator OFF OFF

END

EXTERIOR PREFLIGHT INSPECTION



During inspection, conduct a general check for security, condition, and cleanliness of the airplane and components. Check particularly for damage, fuel, oil and hydraulic leakage, security of access panels and doors, and removal of keys from locks.

WARNING: Pitot tubes and AOA probes may still be hot.

A LEFT FORWARD FUSELAGE

ACM Inlet (bottom of vertical fin)	CLEAR
Cabin Door and Seals	CHECK CONDITION
AOA Probe	HEATING/ROTATES FREELY
Static Ports	HEATING/CLEAR
Pitot Tube	HEATING/CLEAR

B LEFT NOSE COMPARTMENT

Emergency Gear and Brake Pressures	CHECK PER PLACARD
Nosewheel Steering Accumulator	
Pressure Precharge	CHECK PER PLACARD (bleed to precharge)
Static Drain	CLOSED
Nose Compartment Door	SECURE/LOCK

C NOSE GEAR

Taxi Lights	CONDITION
Wheels/Tires/Strut	CONDITION/SCISSORS PIN INSTALLED (Nose strut extension between 2.9 and 6.5 inches)
Wheel Well	CONDITION
Gear Doors	CONDITION/SECURE/LINKAGE OVERCENTER
Radome	CONDITION/SECURE

D RIGHT NOSE COMPARTMENT

Static Drain	CLOSED
Nose Compartment Door	SECURE

E RIGHT FORWARD FUSELAGE

Pitot Tube	HEATING/CLEAR
Drain Lines	CLEAR
Static Ports	HEATING/CLEAR
Standby Pitot Tube	HEATING/CLEAR
AOA Probe	HEATING/ROTATES FREELY
Oxygen Service Door	SECURE
Oxygen Blowout Disc	INTACT
Single-Point Fuel Door	PRECHECK LEVERS DOWN/ CAP SECURE/DOOR SECURE
Fairing Vents (3)	CLEAR
Fuel Quick Drains (3)	DRAIN/CHECK
Upper and Lower Antennas	CONDITION
Drain Masts	CONDITION

F RIGHT WING

Landing/Recognition Lights	CONDITION
Engine and Generator	
Inlet Duct and Fan	CLEAR/CONDITION
Emergency Exit	CHECK
Wing Leading Edge	CONDITION
Boundary Layer Energizers (9)	CONDITION
Fuel Filler Cap	SECURE
Fuel Tank Vent Inlet Scoop	CLEAR
Fuel Tank Pressure Relief Valve	NO LEAKS
Navigation/Anticollision Lights	CONDITION
Static Wicks (4)	CHECK (At least 3 of 4 are required.)
Aileron/Flaps/Spoilers/Trailing Edge	CONDITION
Main Landing Gear Door/Wheels/Tires/ Brakes/Strut/Wheel Well	CONDITION (Main strut extension between 2.0 and 4.9 inches.)

G RIGHT AFT FUSELAGE

Vents	CLEAR
Antennas	CONDITION/SECURE
External Power Receptacle Door (unless in use)	SECURE
Toilet Service Door	SECURE
Battery Compartment Door	SECURE
Hydraulic Reservoir	
Accumulator Pressure	CHECK PER PLACARD
Hydraulic Service Door	SECURE

H RIGHT NACELLE/PYLON

Cowling	SECURED/ALL LATCHES LATCHED
Generator/Alternator Cooling Air Exhaust	CLEAR
Drain Lines	CLEAR
Thrust Reversers	CONDITION/STOWED
Engine Exhaust/Bypass Ducts	CONDITION/CLEAR
Precooler Exhaust Duct	CLEAR

I EMPENNAGE

ACM Heat Exchanger Exhaust	CLEAR
Tailcone Positive Pressure Inlet.....	CLEAR
APU Oil Level (if not accomplished during Preliminary Exterior Inspection).....	CHECK
APU Oil Test Switch	LAMP TEST, VERIFY LOW OIL light (and ADD OIL light if SB680-49-05 not incorporated) illuminates
APU Oil Test Switch	OIL CHECK
If no lights are illuminated, the APU may be operated. The oil level is full.	
If the amber LOW OIL (SB680-49-05 incorporated) or amber ADD OIL (SB680-49-05 not incorporated) light is illuminated, the APU may be operated but should be serviced at the next available opportunity (within a maximum of 20 hours of APU operation).	
If the red LOW OIL (SB680-49-05 not incorporated) light is illuminated, the APU may not be operated prior to servicing the APU.	
APU Drain	CHECK
Tailcone Door.....	SECURE
Elevators/Tabs.....	CONDITION/POSITION (tabs full deflection, trailing edge down)
CAUTION: The trailing edge of the elevator trim tab should be approximately 1 inch below the trailing edge of the elevator control surface when the stabilizer trim is set to -6.9°.	
APU Inlets and Exhaust.....	CLEAR
Vortex Generators (44)	CHECK
Vertical Stabilizer	AT LEAST 6 OF 8 REQUIRED
APU Fairing	AT LEAST 6 OF 8 REQUIRED
Rudder	AT LEAST 16 OF 24 REQUIRED
Wiper Fairing	NONE OF 4 REQUIRED
Static Wicks (9)	CHECK
Rudder	AT LEAST 2 OF 3 REQUIRED
Right Elevator.....	AT LEAST 2 OF 3 REQUIRED
Left Elevator	AT LEAST 2 OF 3 REQUIRED
Rudder and Tab.....	CONDITION
Aft Position Light	CONDITION
Horizontal Stabilizer.....	CONDITION/POSITION (full leading edge down, left side)
APU Service Door	SECURE

J BAGGAGE COMPARTMENT

Baggage	SECURE
Baggage Light.....	OFF
Baggage Seal/Door	CONDITION/SECURE

K LEFT AFT FUSELAGE

Battery Compartment Door	SECURE
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L LEFT NACELLE/PYLON

Precooler Exhaust Duct.....	CLEAR
Engine Exhaust/Bypass Ducts	CLEAR
Thrust Reversers.....	CONDITION/STOWED
Drain Lines	CLEAR
Generator/Alternator Cooling Air Exhaust.....	CLEAR
Cowling	SECURE/ALL LATCHES LATCHED

M LEFT WING

Main Landing Gear Door/Wheels/Tires/ Brakes/Strut/Wheel Well	CONDITION (main strut extension between 2.0 and 4.9 inches.)
Ailerons/Flaps/Spoilers/Trailing Edge	CONDITION
Static Wicks (4)	CHECK (at least 3 of 4 required.)
Navigation/Anticollision Lights.....	CONDITION
Fuel Tank Vent Inlet Scoop	CLEAR
Fuel Tank Pressure Relief Valve	NO LEAKS
Fuel Filler Cap.....	SECURE
Boundary Layer Energizers (9)	CHECK
Wing Leading Edge.....	CONDITION
Landing/Recognition Lights.....	CONDITION
Fuel Quick Drains (3).....	DRAIN/CHECK
Fairing Vents (2)	CLEAR
Engine and Generator Inlet Duct and Fan.....	CLEAR/CONDITION

END

COCKPIT PREPARATION

PM**PF**

1. Preflight Inspection COMPLETE
2. STBY PWR Switch TEST/ON
3. EMER LTS Switch ARM/CHECK INTERIOR LIGHTS
4. BATT Buttons (both) ON
5. EICAS Button. ON
6. Battery Voltage CHECK (24V DC MIN)
7. LANDING GEAR Handle DOWN (3 GREEN)
8. EXT PWR/APU Generator ON/START

Refer to "APU GROUND OR IN-FLIGHT START
(AT OR BELOW FL200)", page N-14.

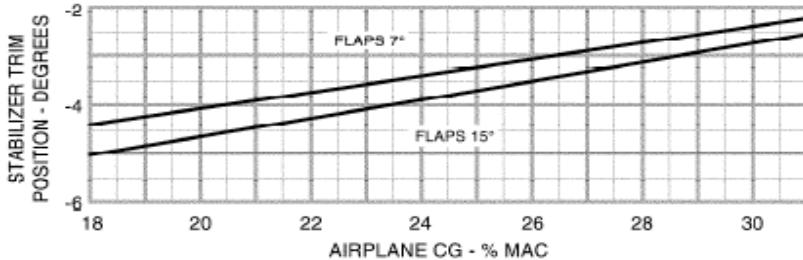
WARNING: Operation with APU bleed air on with the cabin door closed will result in a slight positive pressure in the aircraft. To avoid potential injury to persons or damage to the cabin door, APU bleed air should be turned off or a cockpit side window opened prior to opening the cabin door.

CAUTION: The APU is not approved for unattended ground operation.

9. BUS TIE Button VERIFY PROPER INDICATION
 - a. Battery Power Only OPEN
 - b. APU Generator and External Power ON OPEN
 - c. APU Generator or External Power ON CLOSED
10. Battery AMPS CHECK
11. Cockpit Switches (Test Pg. N-16) CHECK/SET
12. Cockpit Voice Recorder TEST
13. Stabilizer Trim (Test Pg. N-17). CHECK/SET FOR TAKEOFF

NOTE: Do not make rapid primary trim reversals when setting stabilizer trim.

STAB TRIM (HORIZONTAL STABILIZER POSITION FOR TAKEOFF)



14. Aileron and Rudder Trim (Test Pg. N-18) CHECK/SET FOR TAKEOFF
15. Warning Systems (Test Pg. N-19) CHECK/OFF
16. AVN Buttons (both), if on Battery Power Only
or OAT < 0°C (+32°F) OFF
17. FUEL CROSSFEED Selector (Test Pg. N-21) CHECK/OFF

END

DELAY BEFORE FLIGHT WITHOUT APU/EXTERNAL POWER

PM **PF**

1. STBY PWR Switch OFF
2. EMER LTS Switch OFF
3. BATT Buttons (both) OFF

END

BEFORE START

PM **PF**

1. If Start was Delayed Without APU or External Power:
 - a. STBY PWR Switch ON
 - b. EMER LTS Switch ON
 - c. BATT Buttons (both) ON
 - d. ELEC Buttons (both) VERIFY NORM
 - e. EXT PWR/APU Generator. ON/START

Refer to "APU GROUND OR IN-FLIGHT START
(AT OR BELOW FL200)", page N-14.

WARNING: Operation with APU bleed air on with the cabin door closed will result in a slight positive pressure in the aircraft. To avoid potential injury to persons or damage to the cabin door, APU bleed air should be turned off or a cockpit side window opened prior to opening the cabin door.

CAUTION: The APU is not approved for unattended ground operation.

- f. BUS TIE Button VERIFY PROPER INDICATION
- g. AVN Buttons (both) (APU generator and/or external power ON) and OAT ≥ 0°C (+32°F) ON
2. Park Brake SET
 - a. HYDRAULIC PUMP AUX Button. ON
 - b. Brakes APPLY
 - c. PARK BRAKE Handle PULL
 - d. EICAS CHECK

- e. Brake Pedals RELEASE
- f. HYDRAULIC PUMP AUX Button OFF
- 3. Wheel Chocks REMOVED
- 4. Cabin Door CLOSED AND LOCKED
- 5. Passenger Briefing COMPLETE
- 6. Seats/Seat Belts/Shoulder Harnesses/Pedals... ADJUSTED/SECURED
- 7. Cockpit Side Windows CLOSED/LATCHED
- 8. NAV Lights ON
- 9. PAX SAFETY Button ON
- 10. EICAS CHECK
- 11. Fuel Quantity and Balance CHECK
- 12. ATIS/Clearance/FMS (if AVN buttons ON)..... AS REQUIRED

END

STARTING ENGINES

PM

PF

CAUTION: In order to minimize the potential for turbine blade rub, the following is recommended for routine engine starts. Initiate start within 1 minute of engine shutdown or wait a minimum of 10 minutes after engine shutdown. Remain at idle for a minimum of 2 minutes after achieving stabilized idle if the engine had been operated above idle during the previous 30 minutes.

Engine ITT should be $\leq 500^{\circ}\text{C}$ prior to start initiation.

Do not attempt an engine start with a tailwind component greater than 10 knots.

- 1. APU System MAX COOL Button OFF
- 2. GND RECOG Light ON
- 3. Engine L or R START Button (either engine)..... PUSH

CAUTION: Should the engine fail to light up within 15 seconds of moving the throttle to idle or if the ITT limit is exceeded, the FADEC will automatically abort the start. Should the engine fail to achieve stabilized ground idle within 90 seconds of moving the throttle to idle, the engine is deemed to have a "hung start" and the start must be manually aborted.

- a. Throttle (at 9% N₂ minimum) IDLE
- b. Abort start if no oil pressure increase within 20 seconds of engine light up (indicated by a rise in N₂ and ITT).
- c. Abort start if no indication of N₁ rotation by 40% N₂.
- d. Abort start if stabilized ground idle is not achieved within 90 seconds of engine light up (indicated by a rise in N₂ and ITT).

- e. Engine START Button LIGHT EXTINGUISHED
- f. Engine Instruments CHECK NORMAL
- g. Fuel, Oil, Generator and Hydraulic
messages NOT DISPLAYED
- 4. Opposite Engine START Button PUSH
Repeat procedures in Step 3.
- 5. DC Amps and Volts CHECK
- 6. BUS TIE Button VERIFY OPEN
- 7. External Power (if connected) DISCONNECTED
- 8. INTERIOR Button NORM
- 9. APU SYSTEM BLEED AIR Button AS DESIRED
- 10. APU SYSTEM GENERATOR Button AS DESIRED

END

BEFORE TAXI

- | PM | PF |
|---|---|
| 1. AVN Buttons (both) (if not already ON) | ON |
| a. MCDU 2 (if required) | INITIALIZE PRESENT POSITION |
| b. ATIS/Clearance/FMS | RECEIVED/INITIALIZED |
| 2. COCKPIT SPEAKERS Button (either) | AS REQUIRED |
| 3. Avionics Cooling Fans | CHECK FOR AIRFLOW |
| 4. Gust Lock | RELEASED |
| 5. Flight Controls/Nosewheel
Steering Disconnect | FREE AND CORRECT/CHECK |
| 6. Speedbrakes | CHECK/0% |
| 7. Hydraulic Pressure and Volume | CHECK |
| 8. Flaps | SET FOR TAKEOFF |
| 9. Attitude and Heading Displays | ALIGNED/NO FLAGS |
| 10. Flight Instruments | CHECK |
| 11. EICAS | CHECK |
| 12. V Speeds | ENTERED |
| 13. Anti-Ice Systems | AS REQUIRED |
| 14. Bleed Air System (Test Pg. N-21) | CHECK/SET |
| 15. Environmental Controls | AS REQUIRED |
| 16. Pressurization Controller | SET TAKEOFF OR LANDING FIELD
ELEVATION |
| 17. Aft Divider Doors | LATCHED OPEN |

END

SIMPLIFIED CRITERIA - FLAPS 15° TAKEOFF
 (Temperatures at or below 30°C (86°F))

WEIGHT RANGE-POUNDS	20,000 - 23,000	23,001 - 26,000	26,001 - 28,000	28,001 - 30,300
V ₁ (KIAS)	103	103	103	109
V _R (KIAS)	104	104	106	109
V ₂ (KIAS)	113	112	113	115
RUNWAY LENGTH -FEET (MINIMUM)	4,000	4,500	5,000	5,500
V _{REF} (FLAPS 35° - KIAS)	101	107	*111	*116
V _{APP} (FLAPS 15° - KIAS)	108	115	*119	*124

* For use in an emergency landing. Maximum design landing weight is 27,100 pounds (12,292 kg). Landing at weights above 27,100 pounds (12,292 kg) may exceed the Landing Brake Energy Limit.

SIMPLIFIED CRITERIA - FLAPS 15° TAKEOFF
 (Temperatures between 31°C (88°F) and 40°C (104°F))

WEIGHT RANGE-POUNDS	20,000 - 23,000	23,001 - 26,000	26,001 - 28,000	28,001 - 30,300
V ₁ (KIAS)	103	103	105	110
V _R (KIAS)	104	104	106	110
V ₂ (KIAS)	113	112	113	115
RUNWAY LENGTH -FEET (MINIMUM)	4,400	5,200	5,900	7,000
V _{REF} (FLAPS 35° - KIAS)	101	107	*111	*116
V _{APP} (FLAPS 15° - KIAS)	108	115	*119	*124

* For use in an emergency landing. Maximum design landing weight is 27,100 pounds (12,292 kg). Landing at weights above 27,100 pounds (12,292 kg) may exceed the Landing Brake Energy Limit.

TAXI**PM****PF**

1. Exterior Lights AS REQUIRED
2. Brakes APPLY AND HOLD
3. Park Brake RELEASE
4. Brakes CHECK
5. Nosewheel Steering CHECK
6. Rudder Bias System (Test Pg. N-22) CHECK
7. Thrust Reversers (Test Pg. N-22) CHECK/STOWED
8. Gust Lock AS DESIRED

END

BEFORE TAKEOFF**PM****PF**

1. Battery Amps CHECK
2. Flaps SET FOR TAKEOFF
3. Speedbrakes 0%
4. Trim (stabilizer/aileron/rudder) SET FOR TAKEOFF
5. Anti-Ice Systems (Test Pg. N-23) CHECK/AS REQUIRED
6. Takeoff Briefing ACCOMPLISHED
7. Primary and Standby Displays SET FOR DEPARTURE PROCEDURE
8. Radar AS REQUIRED
9. Transponder/TCAS TA/R/A

CLEARED FOR TAKEOFF

10. Gust Lock RELEASED
11. ANTI-ICE PITOT/STATIC Buttons (both) ON
12. Anti-Ice AS REQUIRED
13. Exterior Lights SET
14. EICAS CHECKED
15. Departure Runway Alignment BOTH PILOTS CONFIRM

END

AFTER TAKEOFF/CLIMB

PM	PF
1. Landing Gear.....	UP
2. Flaps	0°
	Retract flaps above V ₂ +10 KIAS and above 400 feet AGL.
3. Throttles.....	MCT DETENT
4. Yaw Damper	AS DESIRED
5. Autopilot (above 400 feet AGL)	AS DESIRED
6. Pressurization	CHECK
7. SEAT BELTS and PAX SAFETY Buttons	AS REQUIRED
8. Anti-Ice.....	AS REQUIRED
9. Altimeters/RECOG Button (at transition altitude).....	SET/OFF
10. APU (prior to climb above FL300)	OFF

Refer to "APU SHUTDOWN", page N-15.

END

CRUISE

PM	PF
1. Throttles.....	CRU DETENT OR AS REQUIRED
NOTE: It is recommended that the throttles be reduced to the CRU detent or below within 10 minutes after reaching an intermediate or the final cruise altitude. The use of MCT during normal operations beyond 10 minutes after reaching cruise altitude may decrease engine life and increase operator costs.	
2. Pressurization	CHECK
CAUTION: It may not be possible to maintain cabin pressure at high altitudes with both engine bleed air sources in LP.	
3. Oxygen Mask (when required).....	DON/NORM
4. Anti-Ice.....	AS REQUIRED
5. FUEL CROSSFEED Selector	AS REQUIRED
NOTE: A panel sweep or a check for normal system operation and indication should be accomplished at top-of-climb, top-of-descent, and at regular intervals during cruise flight.	

END

DESCENT

PM**PF**

1. Pressurization CHECK/SET LANDING ELEVATION
2. Anti-Ice..... AS REQUIRED
3. APU (below FL200) TEST/START AS DESIRED
4. Altimeters/RECOG Buttons (at transition flight level) SET/ON

CAUTION: Do not descend below transition level until obtaining local altimeter setting.

END

APPROACH

PM**PF**

1. Landing Data CONFIRM
 - a. Airspeed V_{APP}/V_{REF}
 - b. Landing Distance..... CALCULATE

SIMPLIFIED CRITERIA - FLAPS 35° LANDING (KIAS)

WEIGHT - POUNDS	20,000	22,000	24,000	26,000	27,000
V_{REF}	94	99	103	107	110
V_{APP}	101	106	110	115	117

NOTE: The above criteria apply only to landings with flaps 35°, anti-ice off, pressure altitude at or below 4,000 ft. MSL, temperatures at or below 46°C (115°F), no tailwind, runway length 3,500 ft. or longer, -0.5% downhill to 2% uphill runway gradient, and dry paved runway. Aircraft Flight Manual, Section IV, Performance, Landing, provides landing data for other conditions.

2. Anti-Ice..... AS REQUIRED
3. Approach Briefing COMPLETE
4. Avionics and Flight Instruments..... CHECK/SET

The planned approach procedure should be loaded in the FMS to ensure proper LNAV guidance if a missed approach is initiated (Airplanes incorporating Epic Phase 5 software).

Auto-preview will not automatically transition to BC when an LOC_BC procedure is loaded in the FMS. The pilot must manually select NAV as the active navigation source, then select BC as the AP/FD mode Prior to crossing the FAF (Airplanes incorporating Epic Phase 5 software).

Airplanes with Primus Epic Phase 5.2 update:

Verify proper preview frequency and course are displayed.

NOTE: The actual landing length of a runway can differ from the FMS database, due to displaced threshold, stopway, or a temporarily relocated threshold. If difference is noted, insert the correct value manually into the FMS on LAND/GA INIT page 1, line 1R.

5. Minimums (RAD/BARO) SET
6. RAD/BARO Knob (if conducting a Category II approach) TEST
7. FUEL CROSSFEED Knob OFF
8. Exterior Lights AS REQUIRED
9. Flaps 7° OR 15°
10. Passenger Briefing COMPLETE
11. Seats/Seat Belts/Shoulder
Harnesses/Aft Divider Doors CHECKED/SECURED/
LATCHED OPEN
12. PAX SAFETY Button ON

END

BEFORE LANDING

- | PM | PF |
|--|------------------|
| 1. Landing Gear | DOWN (3 GREEN) |
| 2. Flaps | 35° |
| 3. Speedbrakes (prior to 500 feet AGL) | 0% |
| 4. EICAS | CHECK |
| 5. Airspeed | V _{REF} |
| 6. Autopilot (prior to minimum use height) | DISENGAGE |
| 7. Yaw Damper (prior to landing) | DISENGAGE |

END

TRAFFIC PATTERN

PM	PF
After Takeoff	
1. Landing Gear	UP
2. Flaps	0°
3. Climb Power	SET
4. Yaw Damper	AS DESIRED
5. Autopilot	AS DESIRED
Pattern	
1. Landing Data	CONFIRM
2. Approach Briefing	COMPLETE
3. Avionics and Flight Instruments	CHECK/SET
4. Flaps	7° OR 15°
Before Landing	
1. Landing Gear	DOWN (3 GREEN)
2. Flaps	35°
3. Speedbrakes	0%
4. EICAS	CHECK
5. Airspeed	V_{REF}
6. Autopilot	DISENGAGE
7. Yaw Damper	DISENGAGE
Taxi-Back	
1. ANTI-ICE PITOT/STATIC Buttons (both)	OFF
2. Exterior Lights	AS REQUIRED
3. Transponder	STANDBY
4. Flaps	SET FOR TAKEOFF
5. Speedbrakes	0%
6. Trim (stabilizer/aileron/rudder)	SET
7. Takeoff Briefing	ACCOMPLISHED
8. FMS	SET
9. Primary and Standby Displays	SET
10. Radar	AS REQUIRED
11. Transponder/TCAS	TA/RRA CLEARED FOR TAKEOFF
12. Gust Lock	RELEASED
13. ANTI-ICE PITOT/STATIC Buttons (both)	ON
14. Exterior Lights	ON
15. V-Speeds	CHECKED
16. EICAS	CHECKED

END

ALL ENGINE GO-AROUND

PM**PF**

1. Go-Around Button (either throttle) PUSH
2. Throttles TO DETENT
3. Airplane Pitch Attitude 7.5° INITIALLY
4. Flaps 15°
5. Landing Gear UP
6. Flaps 0° (VAPP +10 KTS AND AT OR ABOVE 400 FT. AGL)
7. Airspeed AS REQUIRED
8. Throttle MCT DETENT OR AS REQUIRED
9. Yaw Damper AS DESIRED
10. Autopilot AS DESIRED

END

AFTER LANDING

PM**PF**

1. Thrust Reversers STOW
2. Speedbrakes 0%
3. Flaps AS DESIRED
4. Anti-Ice Switches CONFIRM
 - a. PITOT/STATIC Buttons (both) OFF
 - b. ENGINE/STAB Buttons (both) AS REQUIRED
 - c. WING Buttons (both) OFF
5. Exterior Lights AS REQUIRED
6. Stabilizer Position SET TO -6.9°
7. APU TEST/START
Refer to "APU GROUND OR IN-FLIGHT START (AT OR BELOW FL200)", page N-14.

WARNING: Operation with APU bleed air on with the cabin door closed will result in a slight positive pressure in the aircraft. To avoid potential injury to persons or damage to the cabin door, APU bleed air should be turned off or a cockpit side window opened prior to opening the cabin door.

8. BUS TIE Button (if only one generator) CLOSED

END

SHUTDOWN

PM

PF

1. Throttles IDLE

CAUTION: It is recommended that the engines remain at idle for a minimum of 2 minutes prior to shutdown to allow the engine inter-turbine temperatures to stabilize.

For generator cooling during ground operations, the engine must be operated at idle with the generator load less than 75 amps for 4 minutes prior to engine shutdown. Otherwise, a 35-minute cooling period after engine shutdown is required prior to attempting a restart.

2. Park Brake SET

NOTE: If the brakes are suspected to be hot, release the parking brake after wheel chocks are in place.

3. ANTI-ICE ENGINE/STAB Buttons (both) OFF

4. AVN Buttons (both) OFF

5. Throttles CUTOFF

6. SEAT BELTS and PAX SAFETY Buttons OFF

7. EMER LTS Switch OFF

8. STBY PWR Switch OFF

9. APU SHUT DOWN

Refer to "APU SHUTDOWN", page N-15.

10. Exterior Lights OFF

11. BATT Buttons (both) (30 seconds after throttles CUTOFF) OFF

12. Gust Lock AS REQUIRED

13. Engine Inlet and Exhaust Covers AS REQUIRED

NOTE: If the ambient temperature is below -10°C (+14°F), refer to AFM, Extreme Cold Weather Operations.

END

SHUTDOWN (QUICK TURN)**PM****PF**

1. Throttles..... IDLE

CAUTION: It is recommended that the engines remain at idle for a minimum of 2 minutes prior to shutdown to allow the engine inter-turbine temperatures to stabilize.

For generator cooling during ground operations, the engine must be operated at idle with the generator load less than 75 amps for 4 minutes prior to engine shutdown. Otherwise, a 35-minute cooling period after engine shutdown is required prior to attempting a restart.

2. Park Brake..... SET
3. Anti-Ice Systems (all)..... OFF
4. EXT PWR/APU Generator..... ON/START

Refer to "APU GROUND OR IN-FLIGHT START (AT OR BELOW FL200)", page N-14.

WARNING: Operation with APU bleed air on with the cabin door closed will result in a slight positive pressure in the aircraft. To avoid potential injury to persons or damage to the cabin door, APU bleed air should be turned off or a cockpit side window opened prior to opening the cabin door.

CAUTION: The APU is not approved for unattended ground operation.

5. BUS TIE Button VERIFY PROPER INDICATION
a. Battery Power Only OPEN
b. APU Generator and External Power ON OPEN
c. APU Generator or External Power ON CLOSED
6. Throttles..... CUTOFF
7. SEAT BELTS and PAX SAFETY Buttons OFF
8. Exterior Lights..... AS REQUIRED
9. Airplanes with Primus Epic Phase 5 but Not Phase 5.2 update:
 MCDU CLEAR FPL line select key..... PUSH
10. Return to "Before Start" on page N-2.

END

APU GROUND OR IN-FLIGHT START (AT OR BELOW FL200)
PM PF

WARNING: The aircraft batteries must be installed and the battery switches on or the aircraft generator(s) must be operating and on prior to and during all APU operations to assure fire protection system power.

1. BATT Buttons (both) ON
2. EICAS Button. ON
3. Battery Voltage CHECK (24V DC MINIMUM)
4. INTERIOR Button (ground start only) NORM
5. Altitude (in-flight start) FL200 MAXIMUM
6. Airspeed (in-flight start) 250 KIAS MAXIMUM
7. BUS TIE Button (in-flight start only). CLOSED
8. Exterior Lights AS REQUIRED
9. APU SYSTEM MASTER Button ON
10. APU TEST Button PRESS
11. APU SYSTEM START Button PUSH
12. APU RELAY ENGAGED Button ON, THEN OFF
BEFORE READY TO LOAD LIGHT ON
13. APU READY TO LOAD Light. ON
14. BUS TIE Button (in-flight start only). OPEN
15. INTERIOR Button NORM

NOTE: Airplanes incorporating SB680-49-02 (Configuration AF) may operate the APU generator in flight.

16. APU SYSTEM GENERATOR Button. ON OR AS DESIRED
17. APU Ammeter CHECK (275 AMPS MAXIMUM)
18. APU SYSTEM BLEED AIR Button. ON OR AS DESIRED
19. APU SYSTEM MAX COOL Button AS DESIRED

WARNING: Operation with APU bleed air on with the cabin door closed will result in a slight positive pressure in the aircraft. To avoid potential injury to persons or damage to the cabin door, APU bleed air should be turned off or a cockpit side window opened prior to opening the cabin door.

END

APU SHUTDOWN

PM

PF

1. APU SYSTEM STOP Button PUSH
2. APU SYSTEM READY TO LOAD Button EXTINGUISHED
3. APU SYSTEM MASTER Button OFF

NOTE: If BLEED AIR and GENERATOR buttons are left ON when the APU STOP button is pushed, they will automatically come back on when the READY TO LOAD light illuminates after the next APU start.

END

Functional Checks

Cockpit Switches Check

1. Left MIC SEL HEADSET/MASK Button HEADSET
2. STBY SLAVE Switch (N/A if IRS equipped) AUTO
3. LAHRS SLAVE Switch (N/A if IRS equipped) AUTO
4. FUEL BOOST Buttons (both) NORM
5. FUEL CROSSFEED Selector OFF
6. IGNITION Switches (both) NORM
7. FADEC SELECT A/B Buttons (both) A OR B ILLUMINATED
8. HYDRAULIC PUMP AUX Button OFF
9. HYDRAULIC PUMP ENG Buttons (both) ON
10. AVN Buttons (both) ON
11. ELEC Buttons (both) NORM
12. INTERIOR Button
 - a. External Power or APU Generator NORM
 - b. Battery Power Only OFF
13. GEN Switches (both) ON
14. SECONDARY TRIM Button OFF
15. RUDDER BIAS Button NORM
16. ENGINE SYNC Button NORM
17. PITCH/ROLL RECONNECT Handle NORM/DOWN
18. ANTI-SKID Switch ON
19. LANDING GEAR BLOWDOWN Handle IN
20. NG UPLOCK Handle STOWED
21. ANTI-ICE Buttons
 - a. PITOT STATIC Buttons (both) OFF
 - b. WING INSP LTS Button OFF
 - c. ENGINE/STAB Buttons (both) OFF
 - d. W/S FAN Button OFF
 - e. WING Buttons (both) OFF
 - f. WING/STAB XFLOW Button OFF
22. CABIN DUMP Button NORM
23. CABIN PRESS MODE Buttons
 - a. NORM/ALT SEL NORM
 - b. AUTO/MAN AUTO
24. RECIRC AIR Buttons
 - a. CKPT NORM/OFF AS DESIRED

- b. CABIN NORM/HI..... AS DESIRED
- 25. BAGGAGE HEAT NORM/OFF Button..... NORM
- 26. CABIN TEMP CONTROL COCKPIT/CABIN Button AS DESIRED
- 27. CKPT TEMP SEL Knob AS DESIRED
- 28. CABIN TEMP SEL Knob AS DESIRED
- 29. L ENG BLD AIR Selector NORM
- 30. PRESS SOURCE Selector NORM
- 31. R ENG BLD AIR Selector NORM
- 32. R AHRS SLAVE Switch (N/A if IRS installed) AUTO
- 33. Right MIC SEL HEADSET/MASK Button..... HEADSET
- 34. APU SYSTEM MASTER Button (if APU not running) OFF

END

Stabilizer Trim Check

Do not check individual halves of trim switches for more than 20 seconds.

- 1. SECONDARY TRIM Button..... ON
Verify amber ON illuminates in button, and amber **PRIMARY STAB TRIM FAIL** and **AP STAB TRIM INOP** messages display on EICAS.
- 2. SECONDARY TRIM Switch..... CHECK
Push both halves of the secondary trim switches nose down, and verify proper stabilizer trim movement on the EICAS. Repeat in the opposite direction. Push the left half of the secondary trim switch up and down, and verify no stabilizer trim movement. Repeat for the right half of the secondary trim switch.
 - 1) The trim clacker sounds if secondary trim is activated for more than 1 second.
 - 2) The amber **SECONDARY STAB TRIM FAIL** message will display while actuating one half of the trim switch. This message will display in one direction only on one half of the SECONDARY TRIM switch and in the opposite direction on the other half of the SECONDARY TRIM switch. Verify message clears when SECONDARY TRIM switch is released.
- 3. SECONDARY TRIM Button..... OFF
A white OFF illuminates in the button. The amber **AP STAB TRIM INOP** message clears.
- 4. PRIMARY TRIM..... CHECK

NOTE: Do not make rapid primary trim reversals when setting stabilizer trim.

5. Pilot Stab Trim Up Down Switch. Push both halves of pilot's control wheel trim switch down and verify proper stabilizer trim movement on the EICAS display. While trimming, push and hold the AP/TRIM/NWS DISC button and verify trimming stops. Repeat in the opposite direction. Verify the amber **PRIMARY STAB TRIM FAIL** message clears. Push the left half of the PRIMARY TRIM switch up and down and verify no stabilizer movement. Repeat for the right half of the PRIMARY TRIM switch.
6. Copilot Stab Trim Up Down Switch Push both halves of copilot's control wheel trim switch down and verify proper stabilizer trim movement on the EICAS display. While trimming, push and hold the AP/TRIM/NWS DISC button and verify trimming stops. Repeat in the opposite direction. Verify the amber **PRIMARY STAB TRIM FAIL** message clears. Push the left half of the PRIMARY TRIM switch up and down and verify no stabilizer movement. Repeat for the right half of the PRIMARY TRIM switch.
7. Stab Trim SET FOR TAKEOFF

END

Aileron and Rudder Trim Check

1. AILERON TRIM Switch. Push upper half of aileron trim switch (left aileron trim tab) and verify proper aileron trim tab movement on the EICAS display.
2. AILERON TRIM Switch. Push lower half of aileron trim switch (right aileron trim tab) and verify there is no aileron trim tab movement on the EICAS display.
3. RH AILERON TRIM DISPLAY Button Push and hold while performing the next step.
4. AILERON TRIM Switch. Push lower half of aileron trim switch (right aileron trim tab) and verify proper aileron trim tab movement on the EICAS display.
5. AILERON TRIM Switch. Reset both trim tabs to neutral as indicated on the EICAS display.
6. RUDDER TRIM Knob Turn and verify proper rudder trim tab movement on the EICAS display.
7. RUDDER TRIM Knob Reset rudder trim to neutral as indicated on the EICAS display.

END

Warning Systems Check

Rotate the knob to each system test position as follows:

1. SMOKE/DET - Tests both smoke detectors, internal fans, and ability to post warning messages:
 - a. Red **BAGGAGE FIRE** message displays.
 - b. Both MASTER WARNING lights (flashing) illuminate.
 - c. Red BAGGAGE FIRE and white SEC BAG BOTTLE lights illuminate.
 - d. "Baggage Fire" aural sounds (repeats 3 times).
2. LDG GR - Tests landing gear control module 2:
 - a. Green LH, NO, and RH downlock indicators illuminate.
 - b. Red UNLOCK indicator illuminates.
 - c. Gear warning horn sounds.
3. FIRE WARN - Tests the detection loop continuity of both engine fire loop systems and their ability to post messages:
 - a. Both MASTER WARNING lights (flashing) and MASTER CAUTION lights (steady) illuminate.
 - b. Red LH ENG FIRE and RH ENG FIRE lights illuminate.
 - c. Red **ENGINE FIRE L** and **R** message displays.
 - d. Amber **ENGINE FIRE DETECT FAIL L** and **R** message displays.
 - e. "Left Engine Fire, Right Engine Fire" aural (repeats twice) and single chime sounds. Pressing MASTER WARNING and MASTER CAUTION buttons cancels aural warnings.
4. STAB TRIM - Tests the stabilizer trim system.
 - a. Both MASTER CAUTION lights illuminate and a single chime sounds.
 - b. Amber **STAB TRIM MONITOR WARNING** message displays.
 - c. If conducted 2 minutes or more after avionics power is selected on, the amber **PRIMARY STAB TRIM FAIL** and **AP STAB TRIM INOP** messages will display.
5. FLAP - Tests the flap controller and its fault monitoring system.
 - a. Both MASTER CAUTION lights illuminate and a single chime sounds.
 - b. Amber **FLAPS FAIL** message displays and then clears within 6 seconds.
 - c. Flap EICAS indicator turns amber then back to white within 6 seconds.
 - d. Amber FLAP RESET indicator on the center pedestal illuminates then extinguishes within 6 seconds.

6. W/S TEMP - Tests the windshield sensors.
 - a. Both MASTER CAUTION lights illuminate and a single chime sounds.
 - b. Amber **WINDSHIELD OVERTEMP L** and **R** message displays, followed by the amber **WINDSHIELD HEAT INOP L** and **R** message. After 1 second, **WINDSHIELD OVERTEMP L** and **R** message clears. **WINDSHIELD HEAT INOP L** and **R** message remains until the test selector is moved.
7. OVER SPD - Tests the air data and overspeed indications.
 - a. Overspeed warning horn sounds.
 - b. Both PFDs display the following:
 - Mach 0.800
 - IAS 270 knots
 - Red barber pole on airspeed indicator
 - Red ADC TEST indication
 - VSI +5000 FPM
 - Altitude 1,000 feet
 - Barometric setting 29.88
 - Airspeed and altitude trend vectors visible
8. AOA - Tests the stall warning angle-of-attack transducer, stick shaker, and approach indexers.
 - a. Amber **TEST** appears in the AOA window.
 - b. Left stick shaker activates independently and stops.
 - c. Right stick shaker activates independently and stops.
 - d. Both left and right stick shakers activate together and stop.
 - e. AOA indexer lights sequence as the stick shakers activate.
 - f. AOA pointers on both PFDs move up and down the scale as the stick shakers activate.
 - g. Amber **TEST** message extinguishes, a red X appears over the AOA scale and dashes replace the digits on both PFDs.
 - h. AOA indications return to normal after 2 seconds.
9. ANNUN - Tests the following warning lights:
 - a. Both white BOTTLE 1 ARMED and BOTTLE 2 ARMED lights illuminate.
 - b. Red **STAB NO TAKEOFF, GEN OFF, OIL PRESSURE L** and **R**, and amber **FUEL LEVEL LOW L** and **R** standby messages above the standby flight display illuminate.
 - c. Two red O₂ SYSTEM PRESS LOW lights illuminate (optional extended range O₂ system only).

10. BLD LK DET - Tests loop continuity of all six bleed air zones and the capability to post messages.
 - a. Both MASTER CAUTION lights illuminate and a single chime sounds.
 - b. Amber **SUPPLY BLEED LEAK L and R, WING BLEED LEAK L and R, STAB BLEED LEAK**, and **ACM BLEED LEAK** messages display.
11. SPARE - Reserved for future use.
12. OFF - Test functions are off.

END

Fuel System Check

1. FUEL CROSSFEED Selector CHECK
Select crossfeed in either direction. Verify the **FUEL CROSSFEED** and selected tank's cyan **FUEL BOOST PUMP ON** message is displayed.
 - a. The **FUEL CROSSFEED** message may be either cyan (correcting an imbalance) or amber (aggravating an imbalance of more than 60 pounds).
2. FUEL CROSSFEED Selector OFF
Verify the **FUEL CROSSFEED** and cyan **FUEL BOOST PUMP ON L and R** messages are cleared.
 - a. If the APU is running, the cyan **FUEL BOOST PUMP ON R** message will remain displayed on EICAS when the FUEL CROSSFEED selector is selected to OFF.

END

Bleed Air System Check

1. Throttles..... IDLE
2. APU SYSTEM BLEED AIR Button..... OFF
3. L and R ENG BLD AIR and
PRESS SOURCE Selectors NORMAL
4. L ENG BLD AIR Selector OFF THEN NORMAL
Verify decrease then increase in left engine ITT.
5. PRESS SOURCE Selector, position as follows:
 - a. OFF VERIFY DECREASE IN BOTH ENGINE ITT
 - b. EMER VERIFY INCREASE IN LEFT ENGINE ITT AND SMALL INCREASE IN NOISE
 - c. L VERIFY SMALL DECREASE IN NOISE

- d. R VERIFY DECREASE IN LEFT ENGINE ITT AND INCREASE IN RIGHT ENGINE ITT
- e. NORM VERIFY INCREASE IN LEFT ENGINE ITT
- 6. R ENG BLD AIR Selector OFF THEN NORMAL
Verify decrease then increase in right engine ITT.
- 7. APU SYSTEM BLEED AIR Button. AS DESIRED

END

Rudder Bias System Check

- 1. Left Throttle APPROXIMATELY 50% N₁
- 2. Left Rudder Pedal VERIFY MOVES FORWARD
- 3. Left Throttle IDLE
- 4. Right Throttle APPROXIMATELY 50% N₁
- 5. Right Rudder Pedal VERIFY MOVES FORWARD
- 6. Right Throttle IDLE

END

Thrust Reverser Check

- 1. Thrust Reverser Levers DEPLOY (IDLE)
- 2. ARM, UNLK, DPLY Indications DISPLAY SEQUENTIALLY
- 3. EMER STOW Lights FLASHING RED
- 4. LH and RH EMER STOW Buttons. PUSH
 - a. EMER STOW Lights STEADY RED
 - b. Thrust Reversers STOWED
 - c. DPLY and UNLK Indications EXTINGUISH SEQUENTIALLY
 - d. ARM Indication REMAINS DISPLAYED
- 5. Thrust Reverser Levers STOW
- 6. ARM Indication REMAINS DISPLAYED
- 7. EMER STOW Buttons. PUSH
 - a. EMER STOW Lights EXTINGUISHED
 - b. Thrust Reversers REMAIN STOWED
- 8. All Thrust Reverser Indications EXTINGUISHED

END

Anti-Ice Systems Check

The anti-ice system monitors temperature readings to determine that the system is working correctly. If the preflight test is not done with the correct power setting, there will be insufficient bleed air and the test will likely fail. Subsequent attempts at accomplishing the preflight check will likely also fail unless the system is allowed to cool to ambient conditions before reattempting the test.

NOTE: Maintain a minimum of 65% N₂ on both engines if bleed air anti-ice is selected ON for more than 30 seconds.

1. Throttles..... 70-75% N₂
2. Anti-Ice Systems
 - a. ENGINE/STAB Buttons (both)..... ON
 - b. WING Buttons (both)..... ON
3. An ITT increase occurs and the following messages will be displayed:
 - a. Cyan **INDB WING A/I COLD L and R**
 - b. Cyan **WING ANTI-ICE COLD L and R**
 - c. Cyan **STAB ANTI-ICE COLD L and R**
 - d. Cyan **ENG ANTI-ICE COLD L and R**
 - e. Cyan **ANTI-ICE ON ALL**
4. If one or more messages turn amber after 2 minutes:
 - a. Throttle (affected engine) SET A MAXIMUM OF 81% N₂
 - b. Affected Amber **ANTI-ICE COLD** Message.. MONITOR FOR AN ADDITIONAL 2 MINUTES
5. If any amber anti-ice message does not clear or no ITT increase observed, the preflight check is failed.
 - a. Correct prior to flight if anti-ice will be required.
6. If all anti-ice messages except cyan **ANTI-ICE ON ALL** message clear:
 - a. ANTI-ICE WING/STAB XFLOW Button..... XFLOW
Verify cyan **WING A/I CROSSFLOW OPEN** message is displayed.
 - b. ANTI-ICE WING/STAB XFLOW Button..... OFF
Verify cyan **WING A/I CROSSFLOW OPEN** message clears.
7. Anti-Ice Systems
 - a. ENGINE/STAB Buttons (both)..... OFF OR AS REQUIRED
 - b. WING Buttons (both)..... OFF OR AS REQUIRED
8. Throttles..... IDLE

END

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**DISTANCE CONVERSION
METERS / FEET**

METERS	FEET	METERS	FEET
.3048	1		3.2908
.61	2		6.58
.91	3		9.87
1.22	4		13.16
1.52	5		16.45
1.83	6		19.74
2.13	7		23.04
2.44	8		26.33
2.74	9		29.62
3.1	10		32.9
6.1	20		65.8
9.1	30		98.7
12.2	40		131.6
15.2	50		165.5
18.3	60		197.4
21.3	70		230.4
24.4	80		263.3
27.4	90		296.2
31	100		329
61	200		658
91	300		987
122	400		1316
152	500		1645
183	600		1974
213	700		2304
244	800		2633
274	900		2962
305	1000		3291

TEMPERATURE CONVERSION CELSIUS / FAHRENHEIT

°C	°F	°C	°F	°C	°F
-54	-65	-32	-26	-10	14
-53	-63	-31	-24	-9	16
-52	-62	-30	-22	-8	18
-51	-60	-29	-20	-7	19
-50	-58	-28	-18	-6	21
-49	-56	-27	-17	-5	23
-48	-54	-26	-15	-4	25
-47	-53	-25	-13	-3	27
-46	-51	-24	-11	-2	28
-45	-49	-23	-9	-1	30
-44	-47	-22	-8	0	32
-43	-45	-21	-6	1	34
-42	-44	-20	-4	2	36
-41	-42	-19	-2	3	37
-40	-40	-18	0	4	39
-39	-38	-17	1	5	41
-38	-36	-16	3	6	43
-37	-35	-15	5	7	45
-36	-33	-14	7	8	46
-35	-31	-13	9	9	48
-34	-29	-12	10	10	50
-33	-27	-11	11	11	52

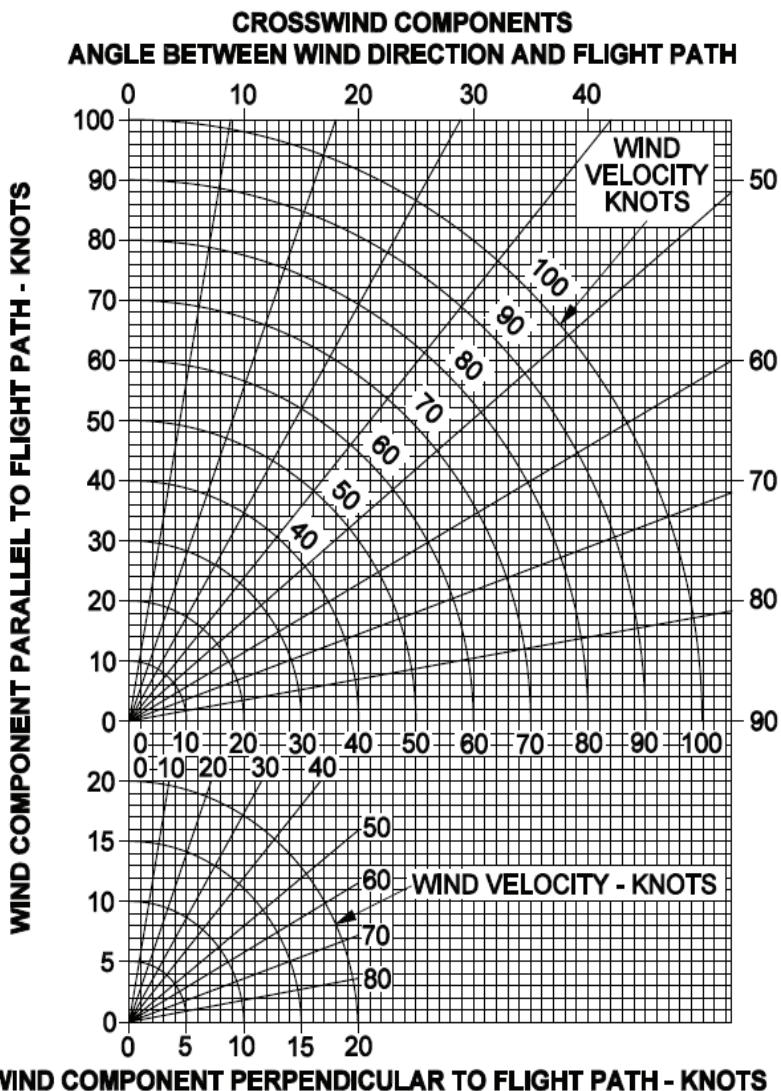
°C	°F	°C	°F
12	54	34	93
13	55	35	95
14	57	36	97
15	59	37	99
16	61	38	100
17	63	39	102
18	64	40	104
19	66	41	106
20	68	42	108
21	70	43	109
22	72	44	111
23	73	45	113
24	75	46	115
25	77	47	117
26	79	48	118
27	81	49	120
28	82	50	122
29	84	51	124
30	86	52	126
31	88	53	127
32	90	54	129
33	91	55	131

FUEL WEIGHT CONVERSION

LB	US GAL	IMP GAL	LITERS
500	75	65	285
1000	150	125	570
1500	230	195	870
2000	300	250	1135
2500	370	310	1400
3000	450	375	1705
3500	520	435	1970
4000	600	500	2275
4500	670	560	2540
5000	740	620	2800
5500	820	685	3105
6000	890	740	3370
6500	970	810	3675
7000	1040	870	3940
7500	1120	935	4240
8000	1190	990	4505
8500	1260	1050	4770
9000	1340	1115	5075
9500	1410	1175	5340
10000	1490	1240	5640
10500	1560	1300	5905
11000	1630	1360	6170
11223	1670	1390	6320

* Based upon a fuel weight of 6.75 lb per US Gal

CROSSWIND COMPONENT CHART



CE-680 NOISE CERTIFICATE

The following Effective Perceived Noise Levels (EPNL) comply with the requirements of 14 CFR Part 36, Appendix B and ICAO Annex 16, Volume 1, Chapter 4, Noise Limits. These noise levels were obtained by analysis of approved data from noise tests conducted under the provisions of both 14 CFR Part 36, Amendment 28 and ICAO Annex 16, Volume 1, Appendix 2, Amendment 7.

<u>Takeoff – Flyover and Lateral:</u>	Approach:
Maximum takeoff gross weight = 30,300 lb. (13,772.7 kg) Speed = 133 KIAS Flaps 7° Thrust reduced to 79.2% N1 at 3265 ft. AGL	Maximum landing gross weight = 27,100 lb. (12,318.2 kg) Speed = 120 KIAS Flaps 35° Landing gear down

The EPNLs for the Cessna Citation Sovereign airplane equipped with PW306C engines, at the conditions listed above, are:

		14 CFR Part 36, Stage 4 and ICAO Annex 16, Chapter 4
	Actual Noise Levels (dBA)	Noise Limits (EPNdB)
Lateral	77.5	87.5
Flyover	63.5	71.8
Approach	80.0	91.3

No determination has been made by the Federal Aviation Administration that the noise levels of this aircraft are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

TAKEOFF PERFORMANCE SIMPLIFIED CRITERIA

When conditions are other than those specified in this simplified criteria, the appropriate tabulated data must be referred to. If the following conditions are met, the simplified performance may be used.

1. No obstacle in flight path.
2. Throttles – TAKEOFF detent (FADEC mode indicator – green TO)
3. Anti-ice systems – OFF
4. Flaps – Takeoff and approach 15°; Landing – FULL
5. Runway gradient – Takeoff = zero to -2% (downhill);
Landing = -2% to 2% (uphill)
6. No tailwind
7. Dry runway
8. Altitude: 4000 feet or below
9. Temperatures at or below 30°C (86°F)

SIMPLIFIED CRITERIA – FLAPS 15° TAKEOFF

WEIGHT RANGE - POUNDS	20,000 to 23,000	23,001 to 26,000	26,001 to 28,000	28,001 to 30,300
V ₁ (KIAS)	103	103	103	109
V _R (KIAS)	104	104	106	109
V ₂ (KIAS)	113	112	113	115
RUNWAY LENGTH – FEET (MINIMUM)	4000	4500	5000	5500
V _{REF} (FLAPS 35° - KIAS)	101	107	111*	116*
V _{APP} (FLAPS 15° - KIAS)	108	115	119*	124*

* For use in an emergency landing. Maximum design landing weight is 27,100 pounds. Landing at weights above 27,100 pounds may exceed the Landing Brake Energy Limit

TAKEOFF FIELD LENGTH AND V_1 ADJUSTED FOR RUNWAY GRADIENT FLAPS 7°, ANTI-ICE OFF

Determine takeoff field length, V_1 , V_R , V_2 and V_{ENR} from Takeoff Planning Tables. If the runway has a gradient, adjust V_1 and takeoff field length using the table below.

If the required distance is greater than the available distance, the airplane weight must be reduced until distance required is less than or equal to distance available.

TAKEOFF FIELD LENGTH (ZERO GRADIENT)	UPHILL GRADIENT FOR BOTH SHADeD AND NON-SHADED				DOWNHILL GRADIENT			
	2%	1.5%	1%	0.5%	-1%	-2%	-1%	-2%
2000	2200	2100	2150	2100	2000	1900	2100	2100
2200	2450	2350	2350	2300	2200	2100	2300	2300
2400	2700	2600	2550	2500	2400	2300	2500	2500
2600	3000	2900	2800	2700	2600	2500	2700	2700
2800	3350	3200	3050	2950	2800	2700	2900	2900
3000	3650	3450	3300	3150	3000	2900	3100	3150
3200	3950	3750	3550	3350	3200	3100	3300	3350
3400	4250	4050	3800	3600	3400	3300	3500	3550
3600	4600	4300	4050	3800	3600	3500	3700	3750
3800	4950	4600	4300	4050	3750	3650	3900	3950
4000	5300	4900	4550	4250	3950	3850	4100	4150
4200	5700	5200	4800	4500	4150	4050	4300	4350
4400	6100	5550	5100	4700	4350	4200	4550	4550
4600	6550	5850	5350	4950	4550	4400	4750	4750
4800	7000	6200	5650	5200	4750	4550	4950	4950
5000	7500	6550	5900	5400	4900	4700	5150	5150
5200	8000	6900	6200	5650	5100	4900	5350	5350
5400	8500	7250	6500	5850	5300	5100	5550	5550
5600	9050	7650	6750	6100	5450	5250	5750	5750
5800	9700	8100	7050	6350	5650	5450	5950	5950
6000	10450	8550	7350	6600	5850	5600	6150	6150
6200	11200	9050	7700	6850	6000	5800	6350	6350
6400	12100	9500	8050	7100	6200	5950	6550	6500
6600	13200	10050	8400	7350	6350	6100	6750	6700
6800	14400	10650	8750	7600	6550	6250	6950	6900
7000	15750	11300	9100	7850	6750	6450	7150	7100
7200	-	11950	9500	8150	6900	6600	7350	7300
V_1 ADJUSTM ENT*	$V_1 + 4$ Knots	$V_1 + 3$ Knots	$V_1 + 1$ Knot	V_1	$V_1 + 3$ Knots	$V_1 + 4$ Knots	$V_1 + 1$ Knot	$V_1 + 1$ Knot

* If the adjusted V_1 is greater than V_R , the value of V_R must be used for V_1 .

TAKEOFF FIELD LENGTH AND V_1 ADJUSTED FOR RUNWAY GRADIENT FLAPS 7°, ANTI-ICE ON

Determine takeoff field length, V_1 , V_R , V_2 and V_{ENR} from Takeoff Planning Tables. If the runway has a gradient, adjust V_1 and takeoff field length using the table below.

If the required distance is greater than the available distance, the airplane weight must be reduced until distance required is less than or equal to distance available.

TAKEOFF FIELD LENGTH (ZERO GRADIENT)	UPHILL GRADIENT FOR BOTH SHADED AND NON- SHADED				DOWNHILL GRADIENT			
	2%	1.5%	1%	0.5%	-1%	-2%	-1%	-2%
2000	2300	2200	2150	2100	1950	1900	2100	2100
2200	2500	2400	2350	2300	2150	2100	2300	2300
2400	2750	2650	2550	2500	2350	2300	2500	2500
2600	3100	2900	2800	2700	2550	2500	2700	2700
2800	3450	3200	3050	2950	2750	2700	2900	2900
3000	3800	3550	3350	3150	2950	2900	3100	3150
3200	4250	3900	3650	3400	3150	3100	3300	3350
3400	4700	4250	3900	3650	3350	3300	3500	3550
3600	5200	4550	4200	3850	3550	3500	3700	3750
3800	5650	4900	4450	4100	3750	3650	3900	3950
4000	6150	5300	4750	4350	3950	3850	4100	4150
4200	6800	5750	5050	4600	4150	4050	4300	4350
4400	7550	6200	5400	4850	4350	4250	4550	4550
4600	8500	6700	5700	5100	4550	4400	4750	4750
4800	9500	7200	6050	5350	4700	4550	4950	4950
5000	10850	7800	6400	5600	4850	4750	5150	5150
5200	12650	8500	6800	5850	5050	4900	5350	5350
5400	15050	9150	7150	6100	5250	5050	5500	5500
5600	-	9800	7550	6350	5450	5250	5700	5700
5800	-	10450	7900	6600	5600	5400	5900	5900
6000	-	11050	8250	6850	5800	5600	6100	6100
6200	-	11700	8600	7100	5950	5750	6300	6250
6400	-	12350	8950	7350	6100	5900	6450	6450
6600	-	12950	9300	7600	6200	6050	6650	6650
6800	-	13600	9650	7800	6350	6450	6850	6850
7000	-	14350	9950	8050	6500	6300	7050	7050
7200	-	15100	10300	8300	6650	6400	7200	7200
V_1 ADJUSTMENT*	$V_1 + 4$ Knots	$V_1 + 3$ Knots	$V_1 + 1$ Knot	V_1	$V_1 + 3$ Knots	$V_1 + 4$ Knots	$V_1 + 1$ Knot	$V_1 + 1$ Knot

* If the adjusted V_1 is greater than V_R , the value of V_R must be used for V_1 .

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**SEA LEVEL
ANTI ICE – OFF/ON**

30,300 lbs.		$V_{ENR} = 180$ KIAS												
Temp °C	V_1	-10 kts Dist		0 kts Dist		2nd Seg		$+10$ kts		2nd Seg		V_R	V_2	
-15	113 4650	5.6	111 3560	6.4	112 3340	6.7	113 122	113 4670	5.2	111 3570	6.0	112 3350	6.3	113 122
-10	113 4710	5.6	111 3620	6.4	112 3400	6.7	113 122	113 4730	5.2	111 3630	6.0	112 3410	6.3	113 122
-5	113 4770	5.6	111 3680	6.4	112 3460	6.8	113 122	113 4790	5.2	111 3690	6.0	112 3470	6.3	113 122
0	113 4840	5.6	111 3740	6.4	112 3520	6.7	113 122	113 4860	5.2	111 3750	5.9	112 3530	6.2	113 122
5	113 4910	5.6	111 3800	6.4	112 3580	6.7	113 122	113 4930	4.5	111 3810	5.2	112 3590	5.4	113 122
10	113 4980	5.6	111 3870	6.4	112 3640	6.7	113 122	113 5010	3.8	111 3880	4.4	112 3650	4.6	113 122
15	113 5060	5.6	111 3930	6.3	112 3710	6.7	113 122							
20	113 5140	5.5	111 4000	6.3	112 3770	6.6	113 122							
25	113 5210	5.5	111 4050	6.3	112 3830	6.6	113 122							
30	113 5290	5.5	111 4130	6.3	112 3890	6.6	113 122							
35	113 5530	5.1	112 4270	5.8	112 4030	6.1	113 122							

29,000 lbs.		$V_{ENR} = 180$ KIAS												
Temp °C	V_1	-10 kts Dist		0 kts Dist		2nd Seg		$+10$ kts		2nd Seg		V_R	V_2	
-15	111 4280	6.3	108 3330	7.2	109 3130	7.6	110 119	111 4300	5.9	108 3340	6.7	109 3130	7.1	111 120
-10	111 4340	6.3	108 3390	7.2	109 3180	7.6	110 119	111 4360	5.9	108 3390	6.8	109 3190	7.1	111 120
-5	111 4440	6.3	108 3440	7.2	109 3230	7.6	110 119	111 4420	5.9	108 3450	6.8	109 3240	7.1	111 120
0	111 4460	6.3	108 3500	7.2	109 3290	7.6	110 119	111 4480	5.9	108 3510	6.7	109 3300	7.0	111 120
5	111 4520	6.3	108 3560	7.2	109 3350	7.5	110 119	111 4540	5.2	108 3570	5.9	109 3350	6.2	111 120
10	111 4590	6.3	108 3620	7.2	109 3410	7.5	110 119	111 4610	4.4	108 3630	5.1	109 3410	5.3	111 120
15	111 4670	6.3	108 3680	7.1	109 3460	7.5	110 119							
20	111 4730	6.2	108 3740	7.1	109 3520	7.4	110 119							
25	111 4810	6.2	108 3800	7.1	109 3580	7.4	110 119							
30	111 4880	6.2	108 3860	7.0	109 3640	7.4	110 119							
35	111 5080	5.8	109 3990	6.6	109 3760	6.9	110 118							

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**SEA LEVEL
ANTI ICE – OFF/ON**

28,000 lbs. V _{ENR} = 180 KIAS											
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	109	4050	6.8	106	3160	7.9	106	2970	8.3	110	119
	109	4060	6.4	106	3170	7.4	106	2970	7.8	110	119
-10	109	4110	6.9	106	3220	7.9	106	3020	8.3	110	119
	109	4120	6.5	106	3220	7.4	106	3020	7.8	110	119
-5	109	4170	6.9	106	3270	7.9	106	3070	8.3	110	119
	109	4180	6.5	106	3270	7.4	106	3070	7.8	110	119
0	109	4230	6.9	106	3320	7.9	106	3120	8.3	110	119
	109	4240	6.4	106	3330	7.3	106	3130	7.7	110	119
5	109	4290	6.9	106	3380	7.8	106	3170	8.2	110	119
	109	4310	5.7	106	3380	6.5	106	3180	6.8	110	119
10	109	4360	6.9	106	3430	7.8	106	3230	8.2	110	119
	109	4370	5.0	106	3440	5.7	106	3230	6.0	110	119
15	109	4430	6.8	106	3490	7.8	106	3280	8.2	110	119
20	109	4490	6.8	106	3550	7.7	106	3340	8.1	110	119
25	109	4560	6.8	106	3610	7.7	106	3400	8.1	110	119
30	109	4630	6.8	106	3660	7.7	106	3450	8.1	110	119
35	109	4780	6.3	106	3780	7.2	107	3560	7.5	110	118

27,000 lbs. V _{ENR} = 180 KIAS											
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	106	3850	7.5	103	3000	8.6	104	2810	9.0	108	118
	106	3850	7.0	103	3010	8.1	104	2820	8.5	108	118
-10	106	3900	7.5	103	3050	8.6	104	2860	9.0	108	118
	106	3910	7.1	103	3050	8.1	104	2870	8.5	108	118
-5	106	3960	7.5	103	3100	8.6	104	2910	9.0	108	118
	106	3970	7.1	103	3100	8.1	104	2910	8.5	108	118
0	106	4020	7.5	103	3150	8.6	104	2960	9.0	108	118
	106	4030	7.0	103	3160	8.0	104	2970	8.4	108	118
5	106	4070	7.5	103	3200	8.6	104	3010	9.0	108	118
	106	4080	6.3	103	3210	7.2	104	3020	7.5	108	118
10	106	4140	7.5	103	3250	8.5	104	3060	8.9	108	118
	106	4150	5.5	103	3260	6.3	104	3070	6.6	108	118
15	106	4200	7.4	103	3310	8.5	104	3110	8.9	108	118
20	106	4260	7.4	103	3360	8.4	104	3170	8.9	108	118
25	106	4320	7.4	103	3420	8.4	104	3220	8.8	108	118
30	106	4390	7.4	103	3470	8.4	104	3270	8.8	108	118
35	107	4520	6.9	104	3580	7.9	104	3370	8.2	108	117

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**SEA LEVEL
ANTI ICE – OFF/ON**

26,000 lbs.		$V_{ENR} = 180$ KIAS									
Temp °C	V_1	-10 kts Dist	2 nd S eg	V_1	0 kts Dist	2 nd Se g	V_1	+10 kts Dist	2 nd Se g	V_R	V_2
-15	103	3650	8.1	101	2860	9.3	101	2660	9.8	106	116
	104	3650	7.7	101	2850	8.8	101	2670	9.3	106	116
-10	103	3700	8.1	101	2900	9.3	101	2710	9.8	106	116
	104	3710	7.7	101	2900	8.8	101	2710	9.3	106	116
-5	103	3750	8.1	101	2950	9.3	101	2760	9.8	106	116
	104	3760	7.7	101	2940	8.8	101	2760	9.3	106	116
0	103	3810	8.1	101	3000	9.3	101	2800	9.8	106	116
	103	3820	7.7	101	2990	8.8	101	2810	9.2	106	116
5	103	3860	8.1	101	3040	9.3	101	2850	9.8	106	116
	103	3870	6.9	101	3040	7.9	101	2850	8.3	106	116
10	103	3920	8.1	101	3090	9.3	101	2900	9.7	106	116
	103	3930	6.1	101	3090	7.0	101	2900	7.3	106	116
15	103	3980	8.1	101	3140	9.2	101	2950	9.7	106	116
20	103	4040	8.1	101	3190	9.2	101	3000	9.6	106	116
25	103	4100	8.0	101	3240	9.2	101	3040	9.6	106	116
30	103	4160	8.0	101	3290	9.1	101	3090	9.6	106	116
35	104	4280	7.6	101	3390	8.6	102	3190	9.0	106	116

25,000 lbs.		$V_{ENR} = 180$ KIAS									
Temp °C	V_1	-10 kts Dist	2 nd Seg	V_1	0 kts Dist	2 nd Seg	V_1	+10 kts Dist	2 nd Seg	V_R	V_2
-15	101	3480	8.8	101	2840	10.1	101	2640	10.7	104	115
	101	3470	8.4	101	2830	9.6	101	2640	10.1	104	115
-10	101	3530	8.8	101	2890	10.1	101	2690	10.7	104	115
	101	3520	8.4	101	2880	9.7	101	2680	10.2	104	115
-5	101	3580	8.8	101	2940	10.2	101	2740	10.7	104	115
	101	3570	8.4	101	2930	9.7	101	2730	10.2	104	115
0	101	3630	8.8	101	2980	10.1	101	2780	10.7	104	115
	101	3620	8.4	101	2970	9.6	101	2770	10.1	104	115
5	101	3680	8.8	101	3020	10.1	101	2820	10.6	105	115
	101	3670	7.5	101	3020	8.9	101	2810	9.1	104	115
10	101	3730	8.8	101	3070	10.1	101	2860	10.6	105	115
	101	3720	6.7	101	3060	7.7	101	2850	8.1	105	115
15	101	3770	8.8	101	3110	10.0	101	2900	10.5	105	115
20	101	3830	8.8	101	3150	10.0	101	2940	10.5	105	115
25	101	3880	8.8	100	3190	10.0	100	2980	10.5	105	115
30	101	3930	8.7	100	3230	9.9	100	3020	10.4	105	115
35	101	4050	8.2	99	3220	9.4	99	3010	9.8	104	115

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**SEA LEVEL
ANTI ICE – OFF/ON**
24,000 lbs. V_{ENR} = 180 KIAS

Temp °C	V ₁	-10 kts Dist		0 kts Dist		+10 kts Dist		V _R	V ₂
		2 nd Seg	2 nd Seg	V ₁	2 nd Seg	V ₁	2 nd Seg		
-15	101 3450	9.6	101 2830	11.0	101 2630	11.6	103	113	
	101 3450	9.1	101 2820	10.5	101 2630	11.1	103	113	
-10	101 3500	9.6	101 2870	11.0	101 2680	11.6	103	113	
	101 3500	9.2	101 2860	10.5	101 2670	11.1	103	113	
-5	101 3560	9.6	101 2920	11.0	101 2720	11.6	103	113	
	101 3550	9.2	101 2910	10.5	101 2710	11.1	103	113	
0	101 3610	9.6	101 2970	11.0	101 2770	11.6	103	113	
	101 3600	9.1	101 2960	10.5	101 2760	11.0	103	113	
5	101 3650	9.6	101 3010	11.0	101 2810	11.6	103	113	
	101 3650	8.3	101 3000	9.5	101 2800	10.0	103	113	
10	101 3700	9.6	101 3050	11.0	101 2850	11.5	103	113	
	101 3690	7.4	101 3040	8.5	101 2840	8.9	103	113	
15	101 3750	9.6	101 3090	10.9	101 2880	11.5	103	113	
20	101 3790	9.5	101 3130	10.9	101 2920	11.4	103	113	
25	101 3840	9.5	101 3170	10.9	101 2960	11.4	103	113	
30	100 3880	9.5	100 3210	10.8	100 3000	11.3	103	113	
35	99 3870	9.0	99 3200	10.2	99 2990	10.7	103	113	

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**2000 FT
ANTI ICE – OFF/ON**

30,300 lbs. V _{ENR} = 180 KIAS																
Temp °C	V ₁	-10 kts	2 nd Seg Dist	V ₁	0 kts	2 nd Seg Dist	V ₁	+10 kts	2 nd Seg Dist	V _R	V ₂					
-15	113 4930	5.5	111 3810	6.3	112 3580	6.6	113	122	113 4950	5.1	111 3820	5.9	112 3590	6.2	113 122	
-10	113 5000	5.5	111 3870	6.3	112 3650	6.6	113	122	113 5020	5.1	111 3880	5.9	112 3650	6.2	113 122	
-5	113 5070	5.5	111 3940	6.3	112 3710	6.6	113	122	113 5090	5.2	111 3950	5.9	112 3720	6.2	113 122	
0	113 5140	5.5	111 4010	6.3	112 3770	6.6	113	122	113 5160	4.6	111 4010	5.3	112 3780	5.5	113 122	
5	113 5220	5.5	111 4070	6.3	112 3840	6.6	113	122	113 5240	4.0	111 4080	4.5	112 3850	4.7	113 122	
10	113 5300	5.5	111 4140	6.3	112 3910	6.5	113	122	113 5380	3.3	112 4180	3.8	112 3940	4.0	113 122	
15	113 5380	5.5	111 4210	6.2	112 3980	6.5	113	122	20	113 5460	5.5	111 4280	6.2	112 4040	6.5	113 122
20	113 5620	5.3	112 4390	6.0	112 4140	6.2	113	122	25	113 6060	4.6	113 4640	5.3	113 4390	5.5	114 122
30	114 6590	4.0	114 4950	4.6	114 4700	4.8	114	122	35	114 6590	4.0	114 4950	4.6	114 4700	4.8	114 122

29,000 lbs. V _{ENR} = 180 KIAS																
Temp °C	V ₁	-10 kts	2 nd Seg Dist	V ₁	0 kts	2 nd Seg Dist	V ₁	+10 kts	2 nd Seg Dist	V _R	V ₂					
-15	111 4540	6.2	108 3560	7.1	108 3350	7.4	111	120	111 4560	5.8	108 3570	6.6	109 3360	7.0	111 120	
-10	111 4610	6.2	108 3620	7.1	108 3410	7.4	111	120	111 4620	5.8	108 3630	6.7	109 3420	7.0	111 120	
-5	111 4670	6.2	108 3680	7.1	108 3460	7.4	111	120	111 4690	5.8	108 3690	6.7	109 3470	7.0	111 120	
0	111 4740	6.2	108 3740	7.1	108 3530	7.4	111	120	111 4750	5.3	108 3750	6.0	109 3530	6.3	111 120	
5	111 4810	6.2	108 3810	7.1	108 3590	7.4	111	120	111 4820	4.6	108 3820	5.2	109 3600	5.5	111 120	
10	111 4890	6.2	108 3870	7.0	108 3650	7.4	111	120	111 4950	3.9	109 3900	4.5	109 3680	4.7	111 120	
15	111 4960	6.2	108 3940	7.0	108 3710	7.3	111	120	20	111 5040	6.2	108 4000	7.0	108 3780	7.3	111 120
20	111 5170	5.9	109 4100	6.7	109 3870	7.0	111	120	25	111 5520	5.3	109 4290	6.0	110 4050	6.2	111 119
30	111 5950	4.6	111 4540	5.3	111 4280	5.5	111	119	35	111 5950	4.6	111 4540	5.3	111 4280	5.5	111 119

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**2000 FT
ANTI ICE – OFF/ON**

28,000 lbs.		$V_{ENR} = 180$ KIAS									
Temp °C	V_1	-10 kts	2 nd Seg	V ₁	0 kts	2 nd Seg	V ₁	+10 kts	2 nd Seg	V_R	V_2
-15	109	4300	6.8	106	3380	7.7	106	3180	8.1	110	119
	109	4310	6.4	106	3390	7.3	106	3180	7.6	110	119
-10	109	4370	6.8	106	3440	7.7	106	3230	8.1	110	119
	109	4380	6.4	106	3440	7.3	106	3240	7.7	110	119
-5	109	4430	6.8	106	3490	7.7	106	3290	8.1	110	119
	109	4440	6.4	106	3500	7.3	106	3290	7.7	110	119
0	109	4500	6.8	106	3550	7.7	106	3340	8.1	110	119
	109	4510	5.8	106	3560	6.6	106	3350	6.9	110	119
5	109	4570	6.8	106	3610	7.7	106	3400	8.1	110	119
	109	4580	5.1	106	3620	5.8	106	3410	6.1	110	119
10	109	4640	6.8	106	3670	7.7	106	3460	8.0	110	119
	109	4680	4.4	106	3700	5.0	106	3490	5.3	110	119
15	109	4710	6.7	106	3730	7.7	106	3520	8.0	110	119
20	109	4780	6.7	106	3800	7.6	106	3580	8.0	110	119
25	109	4890	6.5	106	3880	7.4	107	3660	7.7	110	119
30	109	5160	5.8	107	4060	6.6	107	3830	6.9	109	118
35	109	5510	5.1	108	4250	5.8	108	4010	6.1	109	117

27,000 lbs.		$V_{ENR} = 180$ KIAS									
Temp °C	V_1	-10 kts	2 nd Seg	V ₁	0 kts	2 nd Seg	V ₁	+10 kts	2 nd Seg	V_R	V_2
-15	106	4080	7.4	103	3210	8.4	104	3010	8.8	108	118
	106	4090	7.0	103	3210	8.0	104	3020	8.4	108	117
-10	106	4140	7.4	103	3260	8.4	104	3060	8.8	108	118
	106	4150	7.0	103	3260	8.0	104	3070	8.4	108	117
-5	106	4200	7.4	103	3310	8.4	104	3110	8.8	108	118
	106	4210	7.0	103	3320	8.0	104	3120	8.4	108	117
0	106	4270	7.4	103	3370	8.4	104	3170	8.8	108	118
	106	4270	6.4	103	3370	7.3	104	3170	7.6	108	117
5	106	4330	7.4	103	3420	8.4	104	3222	8.8	108	118
	106	4340	5.6	103	3430	6.4	104	3230	6.8	108	117
10	106	4400	7.4	103	3480	8.4	104	3280	8.8	108	118
	106	4440	4.9	104	3510	5.6	104	3300	5.9	108	117
15	106	4460	7.3	103	3540	8.3	104	3330	8.7	108	117
20	106	4530	7.3	103	3600	8.3	104	3390	8.7	108	117
25	106	4630	7.1	104	3680	8.1	104	3470	8.4	108	117
30	107	4850	6.4	105	3850	7.2	105	3630	7.6	108	116
35	108	5140	5.7	105	4020	6.5	106	3790	6.8	108	116

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**2000 FT
ANTI ICE – OFF/ON**

26,000 lbs.			$V_{ENR} = 180$ KIAS							
Temp °C	V_1	-10 kts Dist	0 kts	2nd Seg Dist	V_1	+10 kts Dist	2nd Seg	V_R	V_2	
-15	104	3870 8.0	101	3030 9.2	101	2850 9.6	106	116		
	104	3870 7.6	101	3040 8.7	101	2850 9.2	106	116		
-10	103	3920 8.0	101	3080 9.2	101	2900 9.6	106	116		
	104	3930 7.6	101	3090 8.7	101	2900 9.2	106	116		
-5	103	3980 8.0	101	3140 9.2	101	2950 9.6	106	116		
	104	3990 7.7	101	3140 8.7	101	2950 9.2	106	116		
0	103	4040 8.0	101	3190 9.2	101	3000 9.6	106	116		
	104	4050 7.0	101	3200 8.0	101	3000 8.4	106	116		
5	103	4100 8.0	101	3240 9.2	101	3050 9.6	106	116		
	104	4110 6.2	101	3250 7.1	101	3050 7.5	106	116		
10	103	4170 8.0	101	3300 9.1	101	3100 9.6	106	116		
	104	4200 5.5	101	3320 6.3	102	3130 6.6	106	116		
15	103	4230 8.0	101	3350 9.1	101	3150 9.5	106	116		
20	103	4290 8.0	101	3410 9.1	101	3210 9.5	106	116		
25	104	4390 7.7	101	3480 8.8	102	3280 9.2	106	116		
30	105	4580 7.0	102	3630 7.9	102	3420 8.3	106	115		
35	106	4790 6.3	103	3790 7.1	103	3570 7.5	106	114		

25,000 lbs.			$V_{ENR} = 180$ KIAS							
Temp °C	V_1	-10 kts Dist	0 kts	2nd Seg Dist	V_1	+10 kts Dist	2nd Seg	V_R	V_2	
-15	101	3660 8.7	101	3010 10.0	101	2800 10.5	104	115		
	101	3670 8.3	101	3000 9.5	101	2800 10.0	104	115		
-10	101	3720 8.7	101	3050 10.0	101	2850 10.5	104	115		
	101	3720 8.3	100	3050 9.5	100	2840 10.0	104	115		
-5	101	3770 8.8	101	3100 10.0	101	2900 10.5	105	115		
	101	3780 8.4	100	3090 9.5	100	2890 10.0	105	115		
0	101	3830 8.8	101	3150 10.0	101	2940 10.5	105	115		
	101	3840 7.7	100	3140 8.8	100	2930 9.2	105	115		
5	101	4880 8.7	101	3200 10.0	101	2990 10.4	105	115		
	101	3890 6.9	100	3190 7.9	100	2980 8.2	105	115		
10	101	3940 8.7	100	3240 9.9	100	3030 10.4	105	115		
	101	3980 6.1	100	3220 7.0	100	3010 7.3	105	114		
15	101	4000 8.7	100	3290 9.9	100	3070 10.4	105	115		
20	101	4060 8.7	100	3330 9.9	100	3120 10.3	105	115		
25	101	4150 8.4	100	3350 9.6	100	3140 10.0	105	115		
30	102	4330 7.7	100	3430 8.7	100	3230 9.1	104	114		
35	103	4520 6.9	100	3580 7.9	101	3370 8.2	104	113		

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**2000 FT
ANTI ICE – OFF/ON**

24,000 lbs. V _{ENR} = 180 KIAS								
Temp °C	V ₁	-10 kts 2 nd Seg Dist	V ₁	0 kts 2 nd Seg Dist	V ₁	+10 kts 2 nd Seg Dist	V _R	V ₂
-15	101 3640 9.5 101 3630 9.1	101 2990 10.9 101 2980 10.4	101 2790 11.4 101 2780 10.9	103 113				
-10	101 3690 9.5 101 3680 9.1	101 3040 10.9 101 3030 10.4	101 2830 11.4 101 2830 10.9	103 113				
-5	101 3740 9.5 101 3730 9.1	101 3080 10.9 101 3080 10.4	101 2880 11.4 101 2870 10.9	103 113				
0	101 3800 9.5 101 3790 8.4	101 3130 10.9 101 3120 9.6	101 2930 11.4 101 2920 10.1	103 113				
5	101 3850 9.5 100 3840 7.6	101 3180 10.9 100 3170 8.6	101 2970 11.4 100 2960 9.1	103 113				
10	101 3890 9.5 100 3870 6.8	101 3220 10.8 100 3200 7.7	101 3010 11.3 100 2990 8.1	103 113				
15	100 3950 9.5	100 3260 10.8	100 3050 11.3	103 113				
20	100 4000 9.5	100 3310 10.8	100 3100 11.3	103 113				
25	100 4020 9.2	100 3330 10.5	100 3120 10.9	103 113				
30	99 4080 8.4	98 3270 9.5	98 3060 10.0	103 112				
35	100 4260 7.6	98 3370 8.6	98 3170 9.1	102 111				

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**4000 FT
ANTI ICE – OFF/ON**

30,300 lbs.				V_{ENR} = 180 KIAS							
Temp °C	V ₁	-10 kts	2 nd Seg Dist	V ₁	0 kts	2 nd Seg Dist	V ₁	+10 kts	2 nd Seg Dist	V _R	V ₂
-15	113 5180	5.6	111 4050	6.3	112 3820	6.6	113 122	113 5200	5.2	112 3830	6.2
-10	113 5260	5.6	111 4120	6.3	111 3890	6.6	113 122	113 5280	5.2	112 3890	6.2
-5	113 5330	5.6	111 4190	6.3	111 3960	6.6	113 122	113 5350	4.7	112 3960	5.6
0	113 5410	5.6	111 4260	6.3	111 4030	6.6	113 122	113 5430	4.0	112 4040	4.8
5	113 5490	5.6	111 4330	6.3	111 4090	6.6	113 122	113 5710	3.4	112 4190	4.0
10	113 5570	5.6	111 4410	6.3	111 4170	6.6	113 122	114 6130	2.8	113 4690	3.2
15	113 5710	5.5	111 4510	6.2	112 4270	6.4	113 122	114 6140	4.8	112 4760	5.4
20	114 6140	4.8	112 4760	5.4	113 4500	5.7	114 122	114 6680	4.2	114 5070	4.7
25	114 6680	4.2	114 5490	4.1	115 5220	4.2	115 122	115 7300	3.6	115 5990	3.4
30	115 7300	3.6	115 5990	3.4	115 5700	3.6	115 122	115 8020	3.0	115 5700	3.6
35	115 8020	3.0	115 5990	3.4	115 5700	3.6	115 122				

29,000 lbs.				V_{ENR} = 180 KIAS							
Temp °C	V ₁	-10 kts	2 nd Seg Dist	V ₁	0 kts	2 nd Seg Dist	V ₁	+10 kts	2 nd Seg Dist	V _R	V ₂
-15	111 4790	6.3	108 3790	7.1	108 3570	7.5	111 120	111 4800	5.9	108 3800	6.7
-10	111 4860	6.3	108 3850	7.1	108 3630	7.5	111 120	111 4870	5.9	108 3860	6.7
-5	111 4930	6.3	108 3920	7.1	108 3690	7.5	111 120	111 4950	5.3	108 3930	6.1
0	111 5010	6.3	108 3980	7.1	108 3760	7.4	111 120	111 5020	4.7	108 3990	5.3
5	111 5090	6.3	108 4050	7.1	108 3830	7.4	111 120	111 5250	4.0	109 4140	4.5
10	111 5170	6.3	108 4120	7.1	108 3890	7.4	111 120	111 5570	3.4	109 4330	3.9
15	111 5280	6.1	108 4220	6.9	109 3980	7.2	111 120	111 5610	5.4	109 4420	6.2
20	111 5610	5.4	109 4420	6.2	109 4170	6.4	111 119	111 6040	4.8	110 4660	5.4
25	111 6040	4.8	110 4660	4.1	112 4700	4.9	112 119	112 6570	4.1	112 4960	4.7
30	112 6570	4.1	112 4960	4.7	112 5110	4.2	112 119	112 7180	3.6	112 5380	4.0
35	112 7180	3.6	112 5380	4.0	112 5110	4.2	112 119				

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**4000 FT
ANTI ICE – OFF/ON**

28,000 lbs.			$V_{ENR} = 180$ KIAS								
Temp °C	V ₁	-10 kts Dist	0 kts		2 nd Seg Dist	V ₁	+10 kts Dist		2 nd Seg Dist	V _R	V ₂
			0 kts	2 nd Seg Dist			+10 kts Dist	2 nd Seg Dist			
-15	109	4540	6.8	106	3590	7.8	106	3390	8.1	110	119
	109	4550	6.5	106	3600	7.4	106	3390	7.7	110	118
-10	109	4610	6.8	106	3650	7.8	106	3440	8.1	110	119
	109	4620	6.5	106	3660	7.4	106	3450	7.7	110	118
-5	108	4680	6.9	106	3720	7.8	106	3500	8.1	110	119
	109	4690	5.9	106	3720	6.7	106	3510	7.0	110	118
0	108	4750	6.9	106	3780	7.8	106	3560	8.1	110	119
	109	4770	5.2	106	3790	5.9	106	3570	6.2	110	118
5	108	4830	6.9	106	3840	7.8	106	3630	8.1	110	119
	109	4940	4.5	106	3930	5.1	107	3700	5.3	110	117
10	108	4900	6.8	106	3910	7.7	106	3690	8.1	110	119
	109	5210	3.9	107	4100	4.4	107	3860	4.6	110	116
15	109	5010	6.7	106	4000	7.6	106	3780	7.9	110	119
20	110	5250	6.0	107	4180	6.8	107	3950	7.1	110	118
25	109	5610	5.3	108	4380	6.0	108	4130	6.3	109	117
30	110	6060	4.6	109	4630	5.3	109	4380	5.5	110	117
35	110	6590	4.0	110	4960	4.6	110	4700	4.8	110	117

27,000 lbs.			$V_{ENR} = 180$ KIAS								
Temp °C	V ₁	-10 kts Dist	0 kts		2 nd Seg Dist	V ₁	+10 kts Dist		2 nd Seg Dist	V _R	V ₂
			0 kts	2 nd Seg Dist			+10 kts Dist	2 nd Seg Dist			
-15	106	4310	7.5	103	3410	8.5	104	3210	8.9	108	118
	106	4320	7.1	103	3410	8.1	104	3210	8.4	108	118
-10	106	4370	7.5	103	3460	8.5	104	3260	8.9	108	118
	106	4380	7.1	103	3470	8.1	104	3270	8.4	108	118
-5	106	4440	7.5	103	3520	8.5	104	3320	8.9	108	118
	106	4450	6.5	103	3530	7.3	104	3320	7.7	108	118
0	106	4510	7.5	103	3580	8.5	104	3380	8.9	108	118
	106	4520	5.7	103	3590	6.5	104	3380	6.8	108	118
5	106	4580	7.5	103	3640	8.5	104	3440	8.8	108	118
	107	4690	5.0	104	3720	5.7	104	3510	6.0	108	117
10	106	4650	7.5	103	3700	8.4	104	3490	8.8	108	118
	107	4890	4.4	105	3870	5.0	105	3650	5.2	108	116
15	106	4750	7.3	103	3790	8.3	104	3570	8.6	108	117
20	107	4960	6.6	104	3960	7.4	105	3730	7.8	108	117
25	108	5230	5.8	105	4140	6.6	105	3900	6.9	108	116
30	107	5590	5.1	106	4330	5.8	106	4090	6.1	107	115
35	108	6060	4.5	107	4600	5.1	108	4340	5.4	108	115

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**4000 FT
ANTI ICE – OFF/ON**

26,000 lbs.			$V_{ENR} = 180$ KIAS							
Temp °C	V ₁	-10 kts Dist	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	103 4080	8.1	101 3230	9.2	101 3030	9.7	106	116		
	103 4090	7.7	101 3230	8.8	101 3040	9.2	106	116		
-10	103 4140	8.1	101 3280	9.2	101 3090	9.7	106	116		
	103 4150	7.7	101 3290	8.8	101 3090	9.2	106	116		
-5	103 4210	8.1	101 3340	9.2	101 3140	9.7	106	116		
	103 4220	7.1	101 3340	8.1	101 3150	8.4	106	116		
0	103 4270	8.1	101 3390	9.2	101 3200	9.7	106	116		
	103 4280	6.3	101 3400	7.2	101 3200	7.5	106	116		
5	103 4330	8.1	101 3450	9.2	101 3250	9.6	106	116		
	104 4430	5.6	101 3520	6.3	102 3320	6.6	106	116		
10	103 4400	8.1	101 3500	9.2	101 3310	9.6	106	116		
	105 4620	4.9	102 3660	5.6	103 3450	5.9	106	115		
15	103 4490	8.0	101 3590	9.0	101 3380	9.4	106	116		
20	104 4690	7.2	102 3740	8.1	102 3530	8.5	106	115		
25	105 4910	6.4	103 3900	7.3	103 3680	7.6	106	114		
30	106 5200	5.7	104 4080	6.5	104 3850	6.8	106	114		
35	105 5560	5.0	104 4280	5.7	105 4040	6.0	105	113		

25,000 lbs.			$V_{ENR} = 180$ KIAS							
Temp °C	V ₁	-10 kts Dist	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	101 3880	8.8	101 3210	10.1	101 3000	10.5	105	115		
	101 3880	8.4	101 3200	9.6	101 2990	10.1	105	115		
-10	101 3940	8.8	101 3260	10.1	101 3040	10.5	105	115		
	101 3940	8.4	101 3250	9.6	101 3040	10.1	105	115		
-5	101 4000	8.8	101 3310	10.1	101 3100	10.5	105	115		
	101 4000	7.8	101 3300	8.8	101 3090	9.2	105	115		
0	101 4060	8.8	101 3360	10.1	101 3150	10.5	105	115		
	101 4050	7.0	101 3350	7.9	101 3140	8.3	105	115		
5	101 4120	8.8	101 3410	10.0	101 3200	10.5	105	115		
	101 4190	6.2	99 3340	7.0	99 3130	7.4	104	114		
10	101 4170	8.8	101 3460	10.0	101 3240	10.5	105	115		
	102 4360	5.5	100 3450	6.3	100 3250	6.6	104	113		
15	101 4250	8.7	100 3490	9.8	100 3270	10.3	105	115		
20	102 4440	7.9	99 3530	8.9	100 3330	9.3	104	114		
25	103 4630	7.1	100 3680	8.0	101 3470	8.4	104	113		
30	104 4850	6.3	101 3850	7.2	101 3630	7.5	104	112		
35	104 5160	5.6	102 4020	6.4	102 3790	6.7	104	111		

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**4000 FT
ANTI ICE – OFF/ON**

24,000 lbs.			$V_{ENR} = 180 \text{ KIAS}$								
Temp °C	V_1	-10 kts Dist	0 kts 2 nd Seg			V_1	+10 kts Dist			V_R	V_2
			0	kts	Dist		0	kts	Dist		
-15	101	3850	9.6	101	3190	10.9	101	2980	11.5	103	113
	101	3850	9.2	101	3180	10.5	101	2970	11.0	103	113
-10	101	3910	9.6	101	3240	10.9	101	3030	11.5	103	113
	101	3910	9.2	101	3230	10.5	101	3020	11.0	103	113
-5	101	3970	9.6	101	3290	10.9	101	3080	11.5	103	113
	101	3960	8.5	101	3280	9.7	101	3070	10.1	103	113
0	101	4030	9.6	101	3340	10.9	101	3130	11.5	103	113
	101	4020	7.7	101	3330	8.7	101	3120	9.1	103	113
5	101	4080	9.6	101	3390	10.9	101	3180	11.4	103	113
	99	4010	6.9	99	3320	7.8	99	3100	8.2	103	113
10	101	4140	9.6	101	3440	10.9	101	3220	11.4	103	113
	99	4110	6.1	97	3280	7.0	97	3070	7.3	102	112
15	100	4170	9.4	100	3470	10.7	100	3250	11.2	103	113
20	99	4190	8.6	98	3420	9.7	98	3200	10.2	103	112
25	100	4370	7.8	98	3470	8.8	98	3270	9.2	102	111
30	101	4560	7.0	98	3620	8.0	99	3410	8.3	102	111
35	102	4780	6.3	99	3780	7.1	100	3560	7.5	102	110

TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY

6000 FT
ANTI ICE – OFF/ON
30,300 lbs. V_{ENR} = 180 KIAS

Temp °C	V ₁	-10 kts 2 nd Seg		0 kts 2 nd Seg		V ₁	+10 kts 2 nd Seg		V _R	V ₂	
		Dist	V ₁	Dist	V ₁		Dist	V ₁			
-15	113 113	5470 5490	5.6 5.3	111 111	4330 4340	6.4 5.9	111 111	4090 4090	6.6 6.2	113 113	122 122
-10	114 113	5540 5570	5.6 4.6	111 111	4400 4410	6.4 5.3	111 111	4160 4170	6.6 5.5	114 113	122 122
-5	114 113	5620 5660	5.6 4.0	111 111	4480 4490	6.4 4.5	111 111	4230 4250	6.6 4.8	114 113	122 122
0	114 113	5710 6070	5.6 3.4	111 112	4550 4730	6.4 3.8	111 112	4300 4470	6.6 4.0	114 113	122 122
5	114 114	5800 6580	5.6 2.8	111 114	4640 5030	6.3 3.2	111 114	4390 4760	6.6 3.3	114 114	122 122
10	113 115	6220 7110	4.9 2.2	112 115	4880 5360	5.6 2.5	112 115	4610 5100	5.8 2.6	113 115	122 122
15	114	6770	4.3	113	52200	4.9	114	4920	5.1	114	122
20	115	7390	3.7	115	5590	4.2	115	5320	4.4	115	122
25	115	8110	3.1	115	6100	3.6	115	5800	3.7	115	122
30	116	8970	2.6	116	6680	3.0	116	6370	3.1	116	122
35	116	10040	2.1	116	7400	2.4	116	7050	2.5	116	122

29,000 lbs. V_{ENR} = 180 KIAS

Temp °C	V ₁	-10 2 nd Seg		0 kts 2 nd Seg		V ₁	+10 2 nd Seg		V _R	V ₂	
		kts	Dist	V ₁	Dist		V ₁	Dist			
-15	111 111	5080 5090	6.3 5.9	108 108	4050 4050	7.1 6.7	108 108	3820 3830	7.5 7.0	111 111	120 120
-10	111 111	5160 5170	6.3 5.3	108 108	4110 4120	7.1 6.0	108 108	3880 3890	7.5 6.3	111 111	120 120
-5	111 111	5240 5260	6.3 4.6	108 108	4180 4200	7.2 5.2	108 108	3950 3970	7.5 5.5	111 111	120 120
0	111 111	5310 5560	6.3 4.0	108 109	4260 4400	7.1 4.5	108 109	4020 4160	7.5 4.7	111 111	120 120
5	111 111	5410 5960	6.3 3.3	108 110	4330 4630	7.1 3.8	108 110	4100 4370	7.4 4.0	111 111	120 120
10	111 112	5710 6410	5.6 2.7	109 111	4540 4890	6.3 3.1	109 111	4290 4630	6.6 3.2	111 112	120 119
15	111	6130	4.9	110	4780	5.6	110	4520	5.8	111	119
20	112	6660	4.3	111	5090	4.9	112	4820	5.1	112	119
25	112	7270	3.7	112	5490	4.2	112	5220	4.4	112	119
30	113	7980	3.1	113	5980	3.6	113	5690	3.7	113	119
35	113	8850	2.6	113	6570	2.9	113	6260	3.1	113	119

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**6000 FT
ANTI ICE – OFF/ON**
28,000 lbs. V_{ENR} = 180 KIAS

Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	108 108	4820 4830	6.9 6.5	106 106	3840 3850	7.8 7.4	106 106	3620 3630	8.1 7.7	110 110	119 119
-10	108 108	4890 4900	6.9 5.8	106 106	3900 3910	7.8 6.6	106 106	3680 3690	8.1 6.9	110 110	119 119
-5	108 108	4970 4980	6.9 5.1	106 106	3970 3980	7.8 5.8	106 106	3750 3760	8.1 6.1	110 110	119 119
0	108 109	5040 5230	6.9 4.5	106 107	4040 4170	7.8 5.1	106 107	3810 3940	8.1 5.3	110 110	119 118
5	108 109	5130 5560	6.9 3.8	106 107	4110 4370	7.7 4.3	106 108	3880 4120	8.1 4.5	110 109	119 117
10	109 109	5370 5920	6.2 3.1	106 108	4300 4570	6.9 3.6	107 108	4060 4320	7.3 3.7	110 109	118 117
15	109	5710	5.4	107	4510	6.2	108	4260	6.4	109	117
20	109	6150	4.8	108	4750	5.4	109	4490	5.7	109	117
25	110	6690	4.2	110	5070	4.7	110	4800	4.9	110	117
30	111	7310	3.6	111	5490	4.1	111	5220	4.2	111	117
35	111	8050	3.0	111	6000	3.4	111	5710	3.6	111	117

27,000 lbs. V_{ENR} = 180 KIAS

Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	106 106	4570 4580	7.5 7.1	103 103	3640 3640	8.5 8.1	104 104	3430 3440	8.9 8.4	108 108	118 118
-10	106 106	4640 4650	7.5 6.4	103 103	3700 3700	8.5 7.3	104 104	3490 3490	8.9 7.6	108 108	118 118
-5	106 106	4710 4720	7.5 5.7	103 103	3760 3770	8.5 6.5	104 104	3550 3560	8.9 6.8	108 108	118 118
0	106 107	4780 4950	7.5 5.0	103 104	3820 3950	8.5 5.7	104 104	3610 3720	8.9 5.9	108 108	118 117
5	106 108	4860 5190	7.5 4.3	103 105	3890 4130	8.4 4.9	104 105	3680 3890	8.8 5.1	108 108	118 116
10	107	5090	6.7	104	4070	7.6	104	3850	7.9	108	117
15	108	5330	6.0	105	4260	6.8	105	4030	7.1	108	116
20	107	5700	5.3	106	4460	6.0	106	4220	6.3	107	115
25	108	6150	4.7	107	4720	5.3	107	4460	5.5	108	115
30	108	6690	4.0	108	5040	4.6	108	4790	4.8	108	115
35	109	7330	3.4	109	5490	3.9	109	5220	4.1	109	115

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**6000 FT
ANTI ICE – OFF/ON**

26,000 lbs. V _{ENR} = 180 KIAS										
Temp °C	V ₁	-10 2 nd Seg		0 kts 2 nd Seg		V ₁	+10 2 nd Seg		V _R	V ₂
		kts	Dist	V ₁	Dist		kts	Dist		
-15	103	4330	8.2	101	3440	9.2	101	3240	9.7	106
	103	4340	7.8	101	3450	8.8	101	3250	9.2	106
-10	103	4390	8.2	101	3500	9.3	101	3300	9.7	106
	103	4400	7.0	101	3510	8.0	101	3310	8.4	106
-5	103	4460	8.2	101	3560	9.3	101	3360	9.7	106
	103	4480	6.3	101	3570	7.1	101	3370	7.5	106
0	103	4530	8.2	101	3620	9.3	101	3420	9.7	106
	104	4680	5.6	102	3730	6.3	102	3520	6.6	106
5	103	4600	8.1	101	3680	9.2	101	3480	9.6	106
	105	4900	4.8	102	3900	5.5	103	3680	5.8	106
10	104	4810	7.4	102	3850	8.3	102	3630	8.7	106
	106	5120	4.1	103	4060	4.7	103	3830	4.9	106
15	105	5040	6.6	102	4020	7.5	103	3800	7.8	106
20	106	5300	5.9	103	4210	6.7	104	3970	7.0	106
25	106	5670	5.2	104	4410	5.9	104	4160	6.2	106
30	106	6130	4.6	105	4670	5.2	106	4410	5.4	106
35	106	6690	3.9	106	5020	4.5	106	4770	4.7	106

25,000 lbs. V _{ENR} = 180 KIAS										
Temp °C	V ₁	-10 2 nd Seg		0 kts 2 nd Seg		V ₁	+10 2 nd Seg		V _R	V ₂
		kts	Dist	V ₁	Dist		kts	Dist		
-15	101	4120	8.9	101	3420	10.1	101	3200	10.5	105
	101	4110	8.5	101	3410	9.6	101	3190	10.1	105
-10	101	4190	8.9	101	3480	10.1	101	3260	10.5	105
	101	4180	7.7	101	3470	8.8	101	3250	9.2	105
-5	101	4250	8.9	101	3540	10.1	101	3310	10.5	105
	101	4240	6.9	101	3520	7.9	101	3300	8.2	105
0	101	4310	8.9	101	3590	10.1	101	3370	10.5	105
	102	4420	6.2	99	3520	7.0	99	3320	7.3	104
5	101	4370	8.9	101	3650	10.0	101	3420	10.4	105
	103	4620	5.4	100	3670	6.2	100	3470	6.5	104
10	101	4550	8.1	99	3640	9.1	99	3430	9.5	105
	103	4810	4.7	101	3630	5.3	101	3610	5.6	104
15	101	4750	7.3	100	3800	8.2	100	3580	8.6	104
20	103	4970	6.5	101	3960	7.4	101	3740	7.7	104
25	104	5260	5.8	102	4140	6.6	102	3910	6.9	104
30	104	5620	5.1	102	4340	5.8	103	4100	6.1	104
35	104	6100	4.5	104	4610	5.1	104	4360	5.3	104

**TAKEOFF PLANNING
FLAPS 7°
DRY RUNWAY**
**6000 FT
ANTI ICE – OFF/ON**

24,000 lbs.			$V_{ENR} = 180 \text{ KIAS}$								
Temp °C	V_1	-10 kts Dist		0 kts Dist		+10 kts Dist		2 nd Seg		V_R	V_2
		-10	2 nd Seg	V_1	2 nd Seg	V_1	2 nd Seg	V_1	2 nd Seg		
-15	101	4090	9.6	101	3400	10.9	101	3180	11.5	103	113
	101	4080	9.2	101	3390	10.5	101	3170	11.0	103	113
-10	101	4150	9.7	101	3450	11.0	101	3240	11.5	103	113
	101	4140	8.4	101	3440	9.6	101	3230	10.0	103	113
-5	101	4220	9.7	101	3510	11.0	101	3290	11.5	103	113
	101	4200	7.6	101	3500	8.7	101	3280	9.1	103	113
0	101	4280	9.7	101	3570	11.0	101	3350	11.5	103	113
	99	4180	6.8	98	3440	7.8	98	3230	8.1	103	112
5	101	4340	9.6	101	3620	10.9	101	3400	11.4	103	113
	100	4360	6.1	97	3460	6.9	98	3260	7.2	102	112
10	99	4290	8.8	98	3560	9.9	98	3340	10.4	103	112
	101	4530	5.3	98	3600	6.0	98	3390	6.3	102	111
15	100	4480	8.0	97	3580	9.0	98	3370	9.4	102	112
20	101	4680	7.2	98	3730	8.1	99	3520	8.5	102	111
25	102	4900	6.4	99	3890	7.3	99	3670	7.6	102	110
30	102	5190	5.7	100	4070	6.5	100	3840	6.8	102	109
35	102	5560	5.0	101	4270	5.7	101	4030	6.0	102	109

TAKEOFF FIELD LENGTH AND V₁ ADJUSTED FOR RUNWAY GRADIENT FLAPS 15°, ANTI-ICE OFF

Determine takeoff field length, V₁, V_R, V₂ and V_{ENR} from Takeoff Planning Tables. If the runway has a gradient, adjust V₁ and takeoff field length using the table below.

If the required distance is greater than the available distance, the airplane weight must be reduced until distance required is less than or equal to distance available.

TAKEOFF FIELD LENGTH (ZERO GRADIENT)	UPHILL GRADIENT FOR BOTH SHADED AND NON- SHADED				DOWNHILL GRADIENT			
	2%	1.5%	1%	0.5%	-1%	-2%	-1%	-2%
2000	2300	2200	2150	2100	1950	1900	2100	2100
2200	2500	2400	2350	2300	2150	2100	2300	2300
2400	2750	2650	2550	2500	2350	2300	2500	2500
2600	3100	2900	2800	2700	2550	2500	2700	2700
2800	3450	3200	3050	2950	2750	2700	2900	2900
3000	3800	3550	3350	3150	2950	2900	3100	3150
3200	4250	3900	3650	3400	3150	3100	3300	3350
3400	4700	4250	3900	3650	3350	3300	3500	3550
3600	5200	4550	4200	3850	3550	3500	3700	3750
3800	5650	4900	4450	4100	3750	3650	3900	3950
4000	6150	5300	4750	4350	3950	3850	4100	4150
4200	6800	5750	5050	4600	4150	4050	4300	4350
4400	7550	6200	5400	4850	4350	4250	4550	4550
4600	8500	6700	5700	5100	4550	4400	4750	4750
4800	9500	7200	6050	5350	4700	4550	4950	4950
5000	10850	7800	6400	5600	4850	4750	5150	5150
5200	12650	8500	6800	5850	5050	4900	5350	5350
5400	15050	9150	7150	6100	5250	5050	5500	5500
5600		9800	7550	6350	5450	5250	5700	5700
5800		10450	7900	6600	5600	5400	5900	5900
6000		11050	8250	6850	5800	5600	6100	6100
6200		11700	8600	7100	5950	5750	6300	6250
6400		12350	8950	7350	6100	5900	6450	6450
6600		12950	9300	7600	6200	6050	6650	6650
6800		13600	9650	7800	6350	6150	6850	6850
7000		14350	9950	8050	6500	6300	7050	7050
7200		15100	10300	8300	6650	6400	7200	7200
V₁ ADJUSTMENT*	V₁ + 4 Knots	V₁ + 3 Knots	V₁ + 2 Knot	V₁ + 1 Knot	V₁ - 2 Knots	V₁ - 4 Knots	V₁ + 1 Knot	V₁ + 1 Knot

* If the adjusted V₁ is greater than V_R, the value of V_R must be used for V₁.

TAKEOFF FIELD LENGTH AND V₁ ADJUSTED FOR RUNWAY GRADIENT FLAPS 15°, ANTI-ICE ON

Determine takeoff field length, V₁, V_R, V₂ and V_{ENR} from Takeoff Planning Tables. If the runway has a gradient, adjust V₁ and takeoff field length using the table below.

If the required distance is greater than the available distance, the airplane weight must be reduced until distance required is less than or equal to distance available.

TAKEOFF FIELD LENGTH (ZERO GRADIENT)	UPHILL GRADIENT FOR BOTH SHADED AND NON- SHADED				DOWNHILL GRADIENT			
	2%	1.5%	1%	0.5%	-1%	-2%	-1%	-2%
2000	2450	2200	2150	2100	2150	2100	2150	2100
2200	2650	2400	2350	2300	2350	2300	2350	2300
2400	2900	2650	2550	2500	2550	2500	2550	2500
2600	3150	2950	2800	2700	2750	2700	2750	2700
2800	3400	3200	3000	2900	2950	2900	2950	2900
3000	3650	3450	3200	3100	3150	3100	3150	3150
3200	4000	3750	3450	3300	3350	3300	3350	3350
3400	4350	4050	3700	3550	3550	3500	3550	3550
3600	4700	4350	4000	3750	3750	3700	3750	3750
3800	5100	4650	4300	4000	3950	3900	3950	3950
4000	5550	5000	4600	4250	4150	4100	4150	4150
4200	5950	5300	4900	4500	4350	4300	4350	4350
4400	6450	5650	5150	4750	4550	4450	4550	4550
4600	6800	5950	5400	4950	4750	4650	4750	4750
4800	7200	6250	5650	5200	4950	4800	4950	4900
5000	7600	6600	5900	5400	5150	5000	5150	5100
5200	8050	6900	6150	5650	5350	5150	5350	5300
5400	8550	7250	6450	5850	5550	5350	5550	5500
5600	9000	7600	6700	6050	5750	5550	5750	5700
5800	9450	7950	6950	6300	5950	5700	5950	5850
6000	9900	8250	7250	6500	6100	5850	6100	6050
6200	10400	8550	7500	6750	6300	6050	6300	6250
6400	10850	8900	7750	7000	6500	6200	6500	6400
6600	11350	9200	8000	7150	6650	6400	6650	6600
6800	11850	9550	8250	7400	6850	6550	6850	6750
7000	12350	9850	8500	7650	7000	6750	7000	6950
7200	12850	10200	8800	7900	7200	6900	7200	7100
V ₁ ADJUSTM ENT*	V ₁ + 4 Knots	V ₁ + 3 Knots	V ₁ + 2 Knot	V ₁ + 1 Knot	V ₁ + 1 Knot	V ₁ - 1 Knots	V ₁ + 1 Knot	V ₁ + 1 Knot

* If the adjusted V₁ is greater than V_R, the value of V_R must be used for V₁.

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**SEA LEVEL
ANTI ICE – OFF/ON**

30,300 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	109 4290	4.7	106 330	5.4	106 3090	5.7	109	115	109 3100	5.3	109 115
	109 4300	4.3	106 3300	5.0	106		109		109		115
-10	109 4340	4.7	106 3350	5.4	106 3140	5.7	109	115	106 3150	5.3	109 115
	109 4360	4.3	106 3360	5.0	106		109		109		115
-5	109 440	4.7	106 3400	5.4	106 3190	5.7	109	115	106 3200	5.3	109 115
	109 4420	4.3	106 3410	5.0	106		109		109		115
0	109 4460	4.7	106 3460	5.4	106 3250	5.7	109	115	106 3250	5.2	109 115
	109 4480	4.3	106 3470	5.0	106		109		109		115
5	109 4520	4.7	106 3520	5.4	106 3300	5.7	109	115	106 3310	4.4	109 115
	109 4540	3.6	106 3520	4.2	106		109		109		115
10	109 4580	4.7	106 3580	5.4	106 3360	5.7	109	115	106 3370	3.6	109 115
	109 4610	2.9	106 3580	3.4	106		109		109		115
15	109 4660	4.7	106 3640	5.4	106 3420	5.6	109	115			
20	109 4720	4.6	106 3690	5.3	106 3470	5.6	109	115			
25	109 4790	4.6	106 3750	5.3	106 3530	5.7	109	115			
30	109 4860	4.6	106 3810	5.3	106 3590	5.5	109	115			
35	109 5090	4.2	106 3940	4.8	107 3710	5.1	109	115			

29,000 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	106 3990	5.4	103 3090	6.2	103 2890	6.6	107	114	106 2900	6.1	107 114
	106 4000	5.0	103 3090	5.8	104		107		107		114
-10	106 4050	5.4	103 3140	6.2	103 2940	6.6	107	114	103 2950	6.1	107 114
	106 4060	5.0	103 3140	5.8	103		107		107		114
-5	106 4110	5.4	103 3190	6.2	103 2990	6.6	107	114	103 3000	6.1	107 114
	106 4120	5.0	103 3200	5.8	103		107		107		114
0	106 4170	5.4	103 3240	6.2	103 3040	6.6	107	114	103 3040	6.1	107 114
	106 4180	5.0	103 3250	5.8	103		107		107		114
5	106 4230	5.4	103 3290	6.2	103 3090	6.5	107	114	103 3100	5.2	107 114
	106 4240	4.2	103 3300	5.0	103		107		107		114
10	106 4290	5.4	103 3350	6.2	103 3140	6.5	107	114	103 3150	4.4	107 114
	106 4300	3.4	103 3350	4.1	103		107		107		114
15	106 4360	5.3	103 3400	6.1	103 3200	6.5	107	114			
20	106 4420	5.3	103 3460	6.1	103 3250	6.4	107	114			
25	106 4480	5.3	103 3510	6.1	103 3300	6.4	107	114			
30	106 4550	5.3	103 3570	6.1	103 3360	6.4	107	114			
35	107 4690	4.9	104 3680	5.6	104 3460	5.9	107	113			

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**SEA LEVEL
ANTI ICE – OFF/ON**

28,000 lbs.											
$V_{ENR} = 180$ KIAS											
Temp °C	V_1	-10 kts Dist	2 nd Seg	V_1	0 kts Dist	2 nd Seg	V_1	+10 kts Dist	2 nd Seg	V_R	V_2
-15	104	3790	5.9	102	2990	6.9	102	2780	7.3	106	112
	104	3800	5.6	102	2990	6.5	102	2780	6.8	106	112
-10	104	3850	5.9	102	3040	6.9	102	2830	7.3	106	112
	104	3850	5.6	102	3030	6.5	102	2820	6.8	106	112
-5	104	3900	6.0	102	3090	6.9	102	2880	7.3	106	112
	104	3910	5.6	102	3080	6.5	102	2870	6.8	106	112
0	104	3960	6.0	102	3140	6.9	102	2930	7.3	106	112
	104	3970	5.5	102	3130	6.4	102	2920	6.7	106	112
5	104	4020	6.0	102	3190	6.9	102	2970	7.2	106	112
	104	4030	4.8	102	3180	5.6	102	2960	5.9	106	112
10	104	4070	5.9	102	3230	6.8	102	3020	7.2	106	112
	104	4080	4.1	101	3230	4.7	101	3010	5.0	106	112
15	104	4140	5.9	101	3280	6.8	101	3060	7.2	106	112
20	104	4200	5.9	101	3320	6.8	101	3100	7.1	106	112
25	104	4260	5.9	101	3370	6.7	101	3140	7.1	106	112
30	104	4320	5.8	101	3410	6.7	101	3190	7.0	106	112
35	104	4460	5.4	101	3490	6.2	102	3280	6.5	106	112

27,000 lbs.											
$V_{ENR} = 180$ KIAS											
Temp °C	V_1	-10 kts Dist	2 nd Seg	V_1	0 kts Dist	2 nd Seg	V_1	+10 kts Dist	2 nd Seg	V_R	V_2
-15	102	3640	6.5	102	2970	7.6	102	2770	8.0	104	111
	102	3630	6.2	102	2970	7.2	102	2760	7.6	104	111
-10	102	3690	6.6	102	3020	7.6	102	2810	8.0	104	111
	102	3680	6.2	102	3010	7.2	102	2810	7.6	104	111
-5	102	3750	6.6	102	3070	7.6	102	2860	8.0	104	111
	102	3740	6.2	102	3060	7.2	102	2580	7.6	104	111
0	102	3800	6.6	102	3120	7.6	102	2910	8.0	104	111
	102	3790	6.1	102	3110	7.1	102	2900	7.5	104	111
5	102	3850	6.6	102	3170	7.6	102	2950	8.0	104	111
	102	3850	5.4	102	3160	6.2	102	2940	6.6	104	111
10	102	3900	6.5	102	3210	7.5	102	3000	7.9	104	111
	101	3890	4.6	101	3200	5.4	101	2990	5.7	104	111
15	102	3950	6.5	102	3250	7.5	102	3030	7.9	104	111
20	101	4000	6.5	101	3300	7.5	101	3080	7.9	104	111
25	101	4050	6.5	101	3340	7.4	101	3120	7.8	104	111
30	101	4100	6.5	101	3390	7.4	101	3160	7.8	104	111
35	102	4220	6.0	100	3380	6.9	100	3150	7.2	104	110

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**SEA LEVEL
ANTI ICE – OFF/ON**
**26,000
lbs.**
 $V_{ENR} = 180 \text{ KIAS}$

Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂			
-15	102 3610	7.2	102 2950	8.4	102 2750	8.8	103 110	102 3600	6.8	102 2950	7.9	102 2740	8.4	103 110
-10	102 3660	7.2	102 3000	8.4	102 2800	8.8	103 110	102 3650	6.8	102 3000	7.9	102 2790	8.4	103 110
-5	102 3720	7.2	102 3050	8.4	102 2840	8.8	103 110	102 3710	6.9	102 3040	7.9	102 2830	8.4	103 110
0	102 3770	7.2	102 3100	8.4	102 2890	8.8	103 110	102 3760	6.8	102 3090	7.9	102 2880	8.3	103 110
5	102 3830	7.2	102 3140	8.3	102 2930	8.8	103 110	102 3810	6.0	102 3130	7.0	102 2920	7.3	103 110
10	102 3870	7.2	102 3190	8.3	102 2980	8.7	103 110	102 3860	5.2	102 3180	6.0	102 2970	6.4	103 110
15	102 3920	7.2	102 3230	8.3	102 3020	8.7	103 110							
20	102 3970	7.2	102 3270	8.2	102 3060	8.7	103 110							
25	101 4020	7.1	101 3320	8.2	101 3100	8.6	103 110							
30	101 4060	7.1	101 3360	8.2	101 3140	8.6	103 110							
35	100 4060	6.6	100 3350	7.6	100 3130	8.0	102 109							

**25,000
lbs.**
 $V_{ENR} = 180 \text{ KIAS}$

Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂			
-15	102 3590	7.9	102 2940	9.2	102 2740	9.7	103 110	102 3580	7.5	102 2930	6.8	102 2730	9.2	103 110
-10	102 3640	7.9	102 2990	9.2	102 2780	9.7	103 110	102 3630	7.6	102 2980	6.8	102 2780	9.2	103 110
-5	102 3690	8.0	102 3030	9.2	102 2830	9.7	103 110	102 3680	7.6	102 3020	6.8	102 2820	9.2	103 110
0	102 3750	8.0	102 3080	9.2	102 2880	9.7	103 110	102 3730	7.5	102 3070	6.8	102 2870	9.1	103 110
5	102 3800	8.0	102 3130	9.2	102 2920	9.7	103 110	102 3790	6.7	102 3120	7.7	102 2910	8.1	103 110
10	102 3850	7.9	102 3170	9.1	102 2960	9.6	103 110	102 3830	5.9	102 3160	6.8	102 2950	7.1	103 110
15	102 3890	7.9	102 3210	9.1	102 3000	9.6	103 110							
20	102 3940	7.9	102 3250	9.1	102 3040	9.5	103 110							
25	101 3990	7.9	101 3290	9.0	101 3080	9.5	103 110							
30	101 4030	7.8	101 3340	9.0	101 3120	9.4	103 110							
35	100 4030	7.3	100 3330	8.4	100 3110	8.9	101 108							

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**SEA LEVEL
ANTI ICE – OFF/ON**

24,000 lbs.		$V_{ENR} = 180$ KIAS									
Temp °C	V_1	-10 kts Dist	2 nd Seg	V_1	0 kts Dist	2 nd Seg	V_1	+10 kts Dist	2 nd Seg	V_R	V_2
-15	102	3560	8.7	102	2930	10.1	102	2730	10.6	103	111
	102	3560	8.3	102	2920	9.6	102	2720	10.1	103	111
-10	102	3620	8.7	102	2970	10.1	102	2770	10.6	103	111
	102	3610	8.3	102	2970	9.6	102	2770	10.1	103	111
-5	102	3670	8.7	102	3020	10.1	102	2820	10.6	103	111
	102	3660	8.3	102	3010	9.6	102	2810	10.1	103	111
0	102	3720	8.7	102	3070	10.1	102	2860	10.6	103	111
	102	3710	8.3	102	3060	9.5	102	2850	10.0	103	111
5	102	3770	8.7	102	3110	10.1	102	2910	10.6	103	111
	102	3760	7.4	102	3100	8.5	102	2900	9.0	103	111
10	102	3820	8.7	102	3150	10.0	102	2950	10.5	103	111
	102	3810	6.6	102	3140	7.5	102	2940	7.9	103	110
15	102	3860	8.7	102	3190	10.0	102	2990	10.5	103	111
20	102	3910	8.7	102	3230	9.9	102	3020	10.4	103	110
25	102	3960	8.6	102	3280	9.9	102	3060	10.4	103	110
30	101	4000	8.6	101	3320	9.9	101	3110	10.4	103	110
35	100	3990	8.1	100	3310	9.3	100	3090	9.8	103	109

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**2000 FT
ANTI ICE – OFF/ON**

30,300 lbs.				V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 2 nd Seg		V ₁	0 kts Dist		2 nd Seg		V ₁	+10 2 nd Seg		V _R	V ₂
		kts	Dist					Dist					
-15	109	4540	4.6	106	3520	5.3	106	3310	5.6	109	115	109	115
	109	4560	4.3	106	3530	4.9	106	3310	5.2	109	115		
-10	109	4600	4.6	106	3580	5.3	106	3360	5.6	109	115	109	115
	109	4620	4.3	106	3590	4.9	106	3370	5.2	109	115		
-5	109	4660	4.6	106	3640	5.3	106	3420	5.6	109	115	109	115
	109	4680	4.3	106	3650	4.9	106	3430	5.2	109	115		
0	109	4730	4.6	106	3700	5.3	106	3480	5.6	109	115	109	115
	109	4750	3.7	106	3710	4.3	106	3480	4.5	109	115		
5	109	4800	4.6	106	3760	5.3	106	3540	5.6	109	115	109	115
	109	4810	3.1	106	3770	3.6	106	3540	3.7	109	115		
10	109	4880	4.6	106	3820	5.3	106	3600	5.5	109	115	109	115
	109	4940	2.4	106	3860	2.8	107	3630	3.0	109	115		
15	109	4950	4.6	106	3890	5.2	106	3660	5.5	109	115		
20	109	5020	4.5	106	3850	5.2	106	3720	5.5	109	115		
25	109	5150	4.3	106	4050	5.0	106	3810	5.2	109	115		
30	109	5550	3.7	107	4250	4.2	107	4000	4.5	109	114		
35	109	6020	3.1	108	4470	3.5	108	4220	3.7	109	114		

29,000 lbs.				V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 2 nd Seg		V ₁	0 kts Dist		2 nd Seg		V ₁	+10 2 nd Seg		V _R	V ₂
		kts	Dist					Dist					
-15	106	4240	5.3	103	3290	6.1	103	3090	6.4	107	114	107	114
	106	4250	4.9	103	3300	5.7	104	3310	6.0	107	113		
-10	106	4300	5.3	103	3350	6.1	103	3150	6.4	107	114	106	114
	106	4310	5.0	103	3360	5.7	103	3150	6.0	107	114		
-5	106	4360	5.3	103	3410	6.1	103	3200	6.4	107	114	106	114
	106	4370	5.0	103	3410	5.7	103	3210	6.0	107	114		
0	106	4420	5.3	103	3460	6.1	103	3250	6.4	107	114	106	114
	106	4430	4.4	103	3470	5.1	103	3260	5.3	107	113		
5	106	4490	5.3	103	3520	6.1	103	3310	6.4	107	114	106	113
	106	4500	3.7	103	3520	4.3	103	3310	4.5	107	113		
10	106	4560	5.3	103	3580	6.1	103	3370	6.4	107	114	106	113
	106	4600	3.0	103	3610	3.5	104	3390	3.7	107	113		
15	106	4630	5.3	103	3640	6.0	103	3420	6.3	107	113		
20	106	4690	5.2	103	3690	6.0	103	3480	6.3	107	113		
25	106	4800	5.0	103	3780	5.8	104	3560	6.0	107	113		
30	107	5070	4.3	104	3960	5.0	104	3730	5.2	107	113		
35	107	5460	3.7	105	4150	4.2	105	3910	4.5	107	112		

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**2000 FT
ANTI ICE – OFF/ON**

		28,000 lbs.			V_{ENR} = 180 KIAS						
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	104 104	4020 4030	5.9 5.5	101 101	3170 3160	6.8 6.4	101 101	2950 2950	7.1 6.7	106 106	112 112
-10	104 104	4080 4090	5.9 5.5	101 101	3220 3210	6.8 6.4	101 101	3000 3000	7.1 6.7	106 106	112 112
-5	104 104	4140 4150	5.9 5.5	101 101	3270 3260	6.8 6.4	101 101	3050 3040	7.1 6.7	106 106	112 112
0	104 104	4200 4210	5.9 4.9	101 101	3320 3320	6.8 5.7	101 101	3100 3100	7.1 6.0	106 106	112 112
5	104 104	4260 4270	5.9 4.2	101 101	3380 3370	6.7 4.9	101 101	3150 3150	7.1 5.1	106 106	112 112
10	104 104	4330 4370	5.8 3.5	101 101	3430 3430	6.7 4.1	101 101	3200 3220	7.0 4.3	106 106	112 112
15	104	4390	5.8	101	3470	6.7	101	3250	7.0	106	112
20	104	4460	5.8	101	3520	6.6	101	3300	7.0	106	112
25	104	4560	5.6	101	3590	6.4	101	3380	6.7	106	112
30	105	4770	4.9	102	3750	5.6	102	3530	5.9	105	111
35	105	5070	4.2	103	3920	4.8	103	3690	5.1	105	110

		27,000 lbs.			V_{ENR} = 180 KIAS						
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	102 101	3830 3830	6.5 6.1	102 101	3150 3140	7.5 7.1	102 101	2930 2930	7.9 7.4	104 104	111 111
-10	102 101	3890 3880	6.5 6.1	102 101	3200 3190	7.5 7.1	102 101	2980 2980	7.9 7.4	104 104	111 111
-5	101 101	3950 3940	6.5 6.1	101 101	3250 3240	7.5 7.1	101 101	3030 3020	7.9 7.4	104 104	111 111
0	101 101	4010 4000	6.5 5.5	101 101	3300 3290	7.5 6.4	101 101	3080 3070	7.8 6.7	104 104	111 111
5	101 101	4060 4060	6.5 4.8	101 101	3350 3340	7.4 5.5	101 101	3130 3120	7.8 5.8	104 104	111 111
10	101 101	4110 4140	6.5 4.1	101 101	3400 3370	7.4 4.7	101 101	3180 3150	7.8 4.9	104 104	111 111
15	101	4170	6.4	101	3440	7.4	101	3220	7.7	104	111
20	101	4230	6.4	101	3490	7.3	101	3270	7.7	104	111
25	101	4320	6.2	100	3520	7.1	100	3290	7.4	104	111
30	102	4520	5.5	100	3550	6.2	100	3340	6.6	104	110
35	103	4730	4.8	100	3710	5.5	101	3490	5.7	104	109

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**2000 FT
ANTI ICE – OFF/ON**
**26,000
lbs.**
 V_{ENR} = 180 KIAS

Temp °C	V ₁	-10 2 nd Seg		0 kts 2 nd Seg		V ₁	+10 2 nd Seg		V _R	V ₂
		kts	Dist	V ₁	Dist		kts	Dist		
-15	102 3800	7.1	102 3120	8.2	102 2910	8.7	103	110	101 3790	6.8
-10	102 3860	7.1	102 3180	8.2	102 2970	8.7	103	110	101 3850	6.8
-5	102 3920	7.1	102 3230	8.2	102 3020	8.7	103	110	101 3910	6.8
0	102 3970	7.1	102 3280	8.2	102 3060	8.6	103	110	101 3960	6.1
5	101 4030	7.1	101 3330	8.2	101 3110	8.6	103	110	101 4020	5.4
10	101 4080	7.1	101 3370	8.2	101 3150	8.6	103	110	101 4050	4.6
15	101 4130	7.1	101 3420	8.1	101 3200	8.5	103	110		
20	101 4180	7.1	101 3460	8.1	101 3240	8.5	103	110		
25	101 4210	6.8	101 3490	7.8	101 3270	8.2	103	109		
30	100 4270	6.1	98 3440	7.0	98 3210	7.3	102	109		
35	101 4470	5.3	98 3500	6.1	98 3300	6.5	102	108		

**25,000
lbs.**
 V_{ENR} = 180 KIAS

Temp °C	V ₁	-10 2 nd Seg		0 kts 2 nd Seg		V ₁	+10 2 nd Seg		V _R	V ₂
		kts	Dist	V ₁	Dist		kts	Dist		
-15	102 3770	7.9	102 3110	9.0	102 2900	9.5	103	110	101 3770	7.5
-10	102 3830	7.9	102 3160	9.1	102 2950	9.5	103	110	101 3820	7.5
-5	102 3890	7.9	102 3210	9.1	102 3000	9.5	103	110	101 3880	7.5
0	102 3940	7.9	102 3260	9.0	102 3040	9.5	103	110	101 3930	6.8
5	102 4000	7.9	102 3300	9.0	102 3090	9.5	103	110	101 3990	6.0
10	101 4050	7.8	101 3350	9.0	101 3130	9.4	103	110	101 4020	5.2
15	101 4100	7.8	101 3400	9.0	101 3180	9.4	103	110		
20	101 4150	7.8	101 3440	8.9	101 3220	9.4	103	110		
25	101 4180	7.6	101 3460	8.6	101 3240	9.1	102	109		
30	98 4120	6.7	98 3410	7.7	98 3190	8.1	101	107		
35	98 4220	6.0	96 3360	6.9	98 3140	7.2	100	106		

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**2000 FT
ANTI ICE – OFF/ON**

24,000 lbs.		$V_{ENR} = 180$ KIAS									
Temp °C	V_1	-10 kts Dist	2 nd Seg	V_1	0 kts Dist	2 nd Seg	V_1	+10 kts Dist	2 nd Seg	V_R	V_2
-15	102 3750 102 3740	8.6 8.2	102 3090 102 3080	9.9 9.5	102 2890 102 2880	10.4 10.0	103 103	110 110			
-10	102 3810 102 3800	8.6 8.3	102 3140 102 3130	9.9 9.5	102 2940 102 2930	10.4 10.0	103 103	110 110			
-5	102 3860 102 3850	8.6 8.3	102 3190 102 3180	9.9 9.5	102 2980 102 2980	10.4 10.0	103 103	110 110			
0	102 3910 101 3900	8.6 7.6	102 3240 101 3230	9.9 8.7	102 3030 101 3020	10.4 9.1	103 103	110 110			
5	102 3970 101 3960	8.6 6.7	102 3280 101 3280	9.9 7.7	102 3070 101 3070	10.4 8.1	103 103	110 110			
10	101 4020 101 3990	8.6 5.9	101 3330 101 3300	9.9 6.8	101 3120 101 3090	10.4 7.1	103 102	110 110			
15	101 4070	8.6	101 3380	9.8	101 3160	10.3	103	110			
20	101 4120	8.6	101 3420	9.8	101 3210	10.3	103	110			
25	101 4140	8.3	101 3440	9.5	101 3230	10.0	102	109			
30	98 4080	7.5	98 3380	8.6	98 3170	9.0	100	107			
35	96 4030	6.7	96 3330	7.7	96 3110	8.1	99	105			

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**4000 FT
ANTI ICE – OFF/ON**

30,300 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	109	4770	4.7	106	3740	5.4	106	3520	5.6	109	115
	109	4090	4.3	106	3750	5.0	106	3530	5.3	109	115
-10	109	4850	4.7	106	3800	5.4	106	3580	5.6	109	115
	109	4860	4.4	106	3810	5.0	106	3590	5.3	109	115
-5	109	4920	4.7	106	3860	5.4	106	3640	5.6	109	115
	109	4930	3.8	106	3870	4.4	106	3650	4.6	109	115
0	109	4990	4.7	106	3930	5.4	106	3700	5.6	109	115
	109	5000	3.1	106	3940	3.6	106	3710	3.8	109	115
5	109	5070	4.7	106	4000	5.3	106	3770	5.6	109	115
	109	5250	2.5	106	4090	2.9	107	3860	3.1	109	115
10	109	5140	4.7	106	4060	5.3	106	3830	5.6	109	115
	109	5610	1.9	107	4280	2.2	107	4040	2.4	109	114
15	109	5260	4.5	106	4160	5.2	106	3920	5.4	109	115
20	109	5620	3.9	107	4360	4.4	107	4110	4.6	109	114
25	109	6090	3.2	108	4590	3.7	108	4330	3.9	109	114
30	109	6690	2.6	109	4890	3.0	109	4620	3.2	109	113
35	110	7420	2.0	110	5330	2.4	110	5070	2.5	110	113

29,000 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	106	4470	5.4	103	3500	6.2	103	3290	6.5	107	114
	106	4480	5.0	103	3510	5.8	103	3300	6.1	107	114
-10	106	4530	5.4	103	3560	6.2	103	3350	6.5	107	114
	106	4540	5.0	103	3570	5.8	103	3360	6.1	107	114
-5	106	4600	5.4	103	3620	6.2	103	3410	6.5	107	114
	106	4610	4.5	103	3630	5.1	103	3410	5.4	107	114
0	106	4670	5.4	103	3680	6.2	103	3460	6.5	107	114
	106	4680	3.8	103	3680	4.3	103	3470	4.6	107	114
5	106	4740	5.4	103	3740	6.1	103	3520	6.4	107	114
	107	4860	3.1	104	3830	3.6	104	3600	3.8	107	113
10	106	4810	5.4	103	3800	6.1	103	3580	6.4	107	114
	107	5120	2.5	104	3990	2.9	105	3760	3.1	107	112
15	106	4920	5.2	103	3890	5.9	103	3670	6.2	107	113
20	107	5160	4.5	104	4070	5.2	104	3840	5.4	107	113
25	107	5530	3.8	105	4270	4.4	105	4030	4.6	107	112
30	107	5990	3.2	106	4490	3.7	106	4240	3.9	107	111
35	107	6590	2.6	107	4780	3.0	107	4530	3.2	107	111

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**4000 FT
ANTI ICE – OFF/ON**

28,000 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	104 104	4240 4250	5.9 5.6	102 101	3380 3380	6.8 6.4	102 101	3160 3150	7.2 6.8	106 106	112 112
-10	103 104	4300 4310	5.9 5.6	102 101	3440 3430	6.8 6.4	102 101	3220 3210	7.2 6.8	106 106	112 112
-5	103 104	4370 4380	6.0 5.0	102 101	3500 3490	6.8 5.7	102 101	3270 3260	7.2 6.0	106 106	112 112
0	103 103	4430 4440	6.0 4.3	102 101	3550 3540	6.8 4.9	102 101	3320 3310	7.1 5.2	106 106	112 112
5	103 104	4500 4610	5.9 3.6	102 101	3610 3630	6.8 4.1	102 102	3380 3420	7.1 4.4	106 106	112 112
10	103 105	4570 4810	5.9 3.0	101 102	3660 3780	6.8 3.4	101 102	3430 3560	7.1 3.6	106 105	112 111
15	104	4670	5.8	101	3700	6.6	101	3480	6.9	106	112
20	105	4890	5.1	101	3860	5.8	101	3640	6.1	106	111
25	105	5150	4.4	101	4040	5.0	103	3810	5.2	105	111
30	105	5540	3.7	103	4240	4.2	104	3990	4.5	105	110
35	105	6030	3.1	104	4470	3.5	105	4210	3.7	105	109

27,000 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	102 101	4070 4060	6.5 6.2	102 101	3360 3350	7.5 7.1	102 101	3140 3130	7.9 7.5	104 104	111 111
-10	102 101	4130 4120	6.6 6.2	102 101	3410 3410	7.5 7.1	102 101	3190 3180	7.9 7.5	104 104	111 111
-5	102 101	4190 4190	6.6 5.6	102 101	3470 3460	7.5 6.4	102 101	3240 3240	7.9 6.7	104 104	111 111
0	102 101	4260 4250	6.6 4.9	102 101	3520 3520	7.5 5.6	102 101	3300 3290	7.9 5.9	104 104	111 111
5	102 102	4320 4370	6.6 4.1	102 100	3580 3510	7.5 4.8	102 100	3350 3280	7.9 5.0	104 104	111 110
10	101 103	4380 4550	6.6 3.5	101 100	3630 3580	7.5 4.0	101 100	3400 3370	7.8 4.2	104 104	111 110
15	101	4430	6.4	101	3660	7.3	101	3430	7.6	104	111
20	102	4630	5.6	99	3650	6.4	100	3440	6.8	104	110
25	103	4850	4.9	100	3820	5.6	100	3600	5.9	104	109
30	103	5140	4.2	101	4000	4.9	101	3770	5.1	103	109
35	103	5540	3.6	102	4190	4.1	102	3950	4.3	103	108

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**4000 FT
ANTI ICE – OFF/ON**

26,000 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	102 4040	7.2	102 3330	8.3	102 3120	8.7	103	110			
	102 4030	6.9	102 3330	7.9	102 3110	8.3	103	110			
-10	102 4100	7.2	102 3390	8.3	102 3170	8.7	103	110			
	102 4090	6.9	102 3380	7.9	102 3160	8.3	103	110			
-5	102 4160	7.2	102 3440	8.3	102 3220	8.7	103	110			
	102 4150	6.2	102 3440	7.1	102 3220	7.5	103	110			
0	102 4220	7.2	102 3500	8.3	102 3270	8.7	103	110			
	101 4210	5.5	101 3490	6.3	101 3270	6.6	103	110			
5	102 4280	7.2	102 3550	8.3	102 3330	8.7	103	110			
	100 4200	4.7	100 3480	5.4	100 3250	5.7	102	109			
10	102 4340	7.2	102 3600	8.2	102 3380	8.6	103	110			
	100 4310	4.0	98 3440	4.7	98 3220	4.9	102	108			
15	101 4380	7.0	101 3640	8.0	101 3410	8.4	103	110			
20	100 4380	6.3	99 3580	7.2	99 3350	7.5	102	109			
25	101 4580	5.5	98 3610	6.3	98 3400	6.6	102	108			
30	102 4800	4.8	99 3770	5.5	99 3550	5.8	102	107			
35	102 5120	4.1	99 3850	4.7	100 3720	5.0	102	107			

25,000 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	102 400	7.9	102 3310	9.1	102 3100	9.6	103	110			
	102 4000	7.6	102 3310	8.7	102 3090	9.1	103	110			
-10	102 4060	8.0	102 3370	9.1	102 3150	9.6	103	110			
	102 4060	7.6	102 3360	8.7	102 3140	9.1	103	110			
-5	102 4120	8.0	102 3420	9.1	102 3200	9.6	103	110			
	102 4120	6.9	102 3420	7.9	102 3200	8.3	103	110			
0	102 4190	8.0	102 3470	9.1	102 3250	9.6	103	110			
	102 4180	6.1	102 3460	7.0	102 3240	7.4	103	110			
5	102 4250	8.0	102 3530	9.1	102 3310	9.5	103	110			
	100 4160	5.3	100 3450	6.1	100 3230	6.4	101	108			
10	102 4300	8.0	102 3580	9.1	102 3350	9.5	103	110			
	98 4130	4.6	98 3410	5.3	98 3190	5.6	101	107			
15	101 4340	7.8	101 3610	8.9	101 3390	9.3	103	110			
20	99 4280	6.9	99 3550	7.9	99 3330	8.3	101	107			
25	98 4320	6.2	97 3500	7.0	97 3270	7.4	100	107			
30	99 4520	5.4	96 3550	8.2	96 3340	6.5	100	106			
35	100 4730	4.7	97 3710	5.4	97 3500	5.7	100	105			

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**4000 FT
ANTI ICE – OFF/ON**

24,000 lbs. $V_{ENR} = 180 \text{ KIAS}$											
Temp °C	V_1	-10 2 nd Seg		0 kts 2 nd Seg		+10 2 nd Seg		V_R	V_2		
		kts	Dist	V_1	Dist	V_1	Dist				
-15	102	3980	8.7	102	3290	10.0	102	3080	10.5	103	111
	102	3970	8.3	102	3290	9.6	102	3080	10.0	103	110
-10	102	4040	8.7	102	3350	10.0	102	3130	10.5	103	111
	102	4030	8.4	102	3340	9.6	102	3130	10.0	103	111
-5	102	4090	8.7	102	3400	10.0	102	3190	10.5	103	111
	102	4090	7.6	102	3400	8.7	102	3180	9.2	103	111
0	102	4150	8.8	102	3450	10.0	102	3240	10.5	103	111
	102	4140	6.8	102	3440	7.8	102	3230	8.2	103	110
5	102	4210	8.7	102	3510	10.0	102	3290	10.4	103	111
	100	4130	6.0	100	3430	6.9	100	3210	7.2	101	109
10	102	4270	8.7	102	3560	9.9	102	3340	10.4	103	111
	98	4090	5.3	98	3390	6.1	98	3170	6.4	100	106
15	101	4300	8.5	101	3590	9.7	101	3360	10.2	103	110
20	99	4250	7.7	99	3530	8.8	99	3300	9.2	100	107
25	97	4190	6.9	97	3470	7.9	97	3240	8.2	99	105
30	96	4260	6.1	95	3420	7.0	95	3190	7.3	99	104
35	97	4450	5.4	94	3490	6.2	95	3280	6.5	98	104

**TAKEOFF PLANNING
FLAPS 15°**

DRY RUNWAY

**6000 FT
ANTI ICE – OFF/ON**

30,300 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	109	5060	4.7	106	3990	5.4	106	3760	5.6	109	115
	109	5070	4.4	106	4000	5.0	106	3770	5.3	109	115
-10	109	5130	4.7	106	4060	5.4	106	3830	5.6	109	115
	109	5150	3.8	106	4060	4.3	106	3840	4.5	109	115
-5	109	5210	4.7	106	4120	5.4	106	3890	5.6	109	115
	109	5230	3.1	106	4140	3.6	106	3900	3.8	109	115
0	109	5290	4.7	106	4190	5.4	106	3960	5.6	109	115
	109	5560	2.5	107	4350	2.9	107	4100	3.0	109	114
5	109	5380	4.7	106	4270	5.3	106	4030	5.6	109	115
	109	6000	1.8	107	4570	2.2	108	4310	2.3	109	114
10	109	5700	4.0	106	4480	4.6	107	4230	4.8	109	115
	109	6500	1.2	108	4280	1.5	109	4550	1.6	109	114
15	109	6160	3.3	107	4710	3.8	108	4450	4.0	109	114
20	109	6750	2.7	109	5010	3.2	109	4730	3.3	109	114
25	110	7470	2.2	110	5410	2.5	110	5140	2.6	110	113
30	110	8370	1.6	110	5980	1.9	110	5690	2.0	110	113
32	110	8800	1.1	110	6240	1.3	110	5940	1.4	110	113

29,000 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	106	4730	5.4	103	3730	6.2	103	3520	6.5	107	114
	106	4740	5.1	103	3740	5.8	103	3520	6.1	107	114
-10	106	4800	5.4	103	3800	6.2	103	3580	6.5	107	114
	106	4810	4.4	103	3800	5.1	103	3590	5.3	107	114
-5	106	4870	5.4	103	3860	6.2	103	3640	6.5	107	114
	106	4890	3.7	103	3870	4.3	103	3650	4.5	107	114
0	106	4950	5.4	103	3920	6.2	103	3700	6.5	107	114
	107	5140	3.1	104	4060	3.6	104	3830	3.7	107	113
5	106	5030	5.4	103	3990	6.1	103	3770	6.4	107	114
	107	5470	2.4	104	4260	2.8	105	4010	3.0	107	112
10	107	5280	4.7	104	4180	5.3	104	3950	5.6	107	113
	107	5850	1.8	105	4450	2.1	105	4200	2.2	107	111
15	107	5620	4.0	104	4390	4.6	105	4150	4.8	107	112
20	107	6060	3.3	105	4610	3.8	105	4350	4.0	107	111
25	107	6650	2.7	107	4900	3.1	107	4630	3.3	107	111
30	107	7360	2.2	107	5310	2.5	107	5050	2.6	107	111
35	108	8270	1.6	108	5880	1.9	108	5590	2.0	108	111

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**6000 FT
ANTI ICE – OFF/ON**

28,000 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	103	4490	6.0	102	3620	6.8	102	3380	7.2	106	112
	103	4500	5.6	101	3610	6.4	101	3370	6.8	106	112
-10	103	4560	6.0	102	3680	6.8	102	3440	7.2	106	112
	103	4570	5.0	101	3670	5.7	101	3430	6.0	106	112
-5	103	4630	6.0	102	3740	6.8	102	3500	7.2	106	112
	103	4640	4.3	101	3730	4.9	101	3490	5.1	106	112
0	103	4690	6.0	102	3800	6.8	102	3560	7.2	106	112
	104	4870	3.6	101	3850	4.1	102	3630	4.3	106	112
5	103	4770	6.0	101	3860	6.8	101	3620	7.1	106	112
	105	5100	2.9	102	4030	3.4	103	3800	3.5	105	111
10	104	5000	5.2	101	3970	6.0	102	3740	6.2	106	112
	105	5430	2.2	103	4200	2.6	103	3960	2.7	105	110
15	105	5250	4.5	102	4160	5.2	102	3920	5.4	105	111
20	105	5630	3.8	103	4360	4.4	103	4110	4.6	105	110
25	105	6090	3.2	104	4580	3.7	104	4330	3.9	105	109
30	105	6700	2.6	105	4880	3.0	105	4620	3.2	105	109
35	106	7440	2.0	106	5340	2.4	106	5080	2.5	106	109

27,000 lbs.		V_{ENR} = 180 KIAS									
Temp °C	V ₁	-10 kts Dist	2 nd Seg	V ₁	0 kts Dist	2 nd Seg	V ₁	+10 kts Dist	2 nd Seg	V _R	V ₂
-15	102	4320	6.6	102	3590	7.5	102	3360	7.9	104	111
	101	4310	6.2	101	3580	7.1	101	3350	7.5	104	111
-10	102	4390	6.6	102	3650	7.5	102	3420	7.9	104	111
	101	4380	5.5	101	3640	6.3	101	3410	6.7	104	111
-5	102	4460	6.6	102	3710	7.5	102	3470	7.9	104	111
	101	4450	4.8	101	3690	5.5	101	3460	5.8	104	111
0	102	4530	6.6	102	3770	7.5	102	3530	7.9	104	111
	102	4610	4.1	99	3650	4.7	98	3440	5.0	104	110
5	102	4590	6.6	10	3820	7.5	10	3590	7.8	104	111
	103	4830	3.4	100	3810	3.9	100	3590	4.1	104	109
10	102	4740	5.8	99	3770	6.6	99	3540	6.9	104	110
	104	5050	2.7	101	3970	3.2	101	3740	3.3	104	109
15	103	4970	5.1	100	3930	5.8	100	3710	6.1	104	109
20	104	5220	4.4	101	4110	5.0	101	3880	5.3	104	109
25	103	5630	3.7	101	4310	4.3	102	4070	4.5	103	108
30	103	6110	3.1	102	4550	3.6	103	4290	3.7	103	107
35	104	6730	2.5	104	4880	2.9	104	4620	3.0	104	107

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**6000 FT
ANTI ICE – OFF/ON**

26,000 lbs.				V_{ENR} = 180 KIAS								
Temp °C	V ₁	-10 2 nd Seg		0 kts		2 nd Seg		V ₁	+10 2 nd Seg		V _R	V ₂
		kts	Dist	V ₁	Dist	V ₁	Dist		V ₁	Dist		
-15	102	4280	7.3	102	3560	8.3	102	3330	8.7	103	110	
	102	4270	6.9	102	3550	7.9	102	3320	8.3	103	110	
-10	102	4350	7.3	102	3620	8.3	102	3390	8.7	103	110	
	102	4340	6.2	102	3610	7.1	102	3380	7.4	103	110	
-5	102	4420	7.3	102	3680	8.3	102	3450	8.7	103	110	
	101	4410	5.4	101	3660	6.2	101	3440	6.5	103	110	
0	102	4480	7.3	102	3740	8.3	102	3510	8.7	103	110	
	98	4360	4.7	99	3620	5.4	99	3390	5.6	102	109	
5	10	4550	7.2	10	3790	8.2	102	3560	8.6	103	110	
	100	4560	4.0	98	3600	4.6	98	3390	4.8	102	108	
10	99	4490	6.5	99	3740	7.4	99	3500	7.7	103	109	
	101	4760	3.2	98	3750	3.8	99	3530	3.9	102	107	
15	100	4690	5.7	97	3720	6.5	98	3500	6.8	102	108	
20	101	4910	5.0	98	3880	5.7	99	3660	6.0	102	107	
25	102	5200	4.3	99	4060	4.9	99	3830	5.1	102	107	
30	101	5610	3.6	100	4270	4.2	100	4020	4.4	101	106	
35	102	6110	3.0	101	4510	3.4	101	4250	3.6	102	105	

25,000 lbs.				V_{ENR} = 180 KIAS								
Temp °C	V ₁	-10 2 nd Seg		0 kts		2 nd Seg		V ₁	+10 2 nd Seg		V _R	V ₂
		kts	Dist	V ₁	Dist	V ₁	Dist		V ₁	Dist		
-15	102	4250	8.0	102	3530	9.1	102	3310	9.6	103	110	
	102	4240	7.6	102	3520	8.7	102	3300	9.1	103	110	
-10	102	4320	8.0	102	3590	9.1	102	3370	9.6	103	110	
	102	4300	6.9	102	3580	7.8	102	3360	8.2	103	110	
-5	102	4380	8.0	102	3650	9.1	102	3430	9.6	103	110	
	102	4370	6.1	102	3640	6.9	102	3410	7.3	103	110	
0	102	4450	8.0	102	3710	9.1	102	3480	9.6	103	110	
	99	4320	5.3	99	3590	6.1	99	3360	6.4	101	108	
5	102	4510	8.0	102	3770	9.1	102	3530	9.5	103	110	
	98	4310	4.6	97	3540	5.2	97	3310	5.5	101	107	
10	99	4450	7.1	99	3710	8.1	99	3470	8.5	101	108	
	99	4490	3.8	96	3540	4.4	96	3330	4.6	100	106	
15	98	4440	6.3	97	3650	7.2	97	3420	7.6	101	107	
20	99	4640	5.6	96	3660	6.4	96	3450	6.7	100	106	
25	100	4860	4.9	97	3830	5.6	97	3610	5.9	100	105	
30	100	5170	4.2	97	4010	4.8	98	3780	5.1	100	105	
35	100	5580	3.5	98	4200	4.1	98	3960	4.3	100	104	

**TAKEOFF PLANNING
FLAPS 15°
DRY RUNWAY**
**6000 FT
ANTI ICE – OFF/ON**

24,000 lbs.		$V_{ENR} = 180 \text{ KIAS}$									
Temp °C	V_1	-10 kts Dist	2 nd Seg	V_1	0 kts Dist	2 nd Seg	V_1	+10 kts Dist	2 nd Seg	V_R	V_2
-15	102	4220	8.8	102	3510	10.0	102	3290	10.5	103	111
	102	4210	8.4	102	3500	9.6	102	3280	10.0	103	111
-10	102	4280	8.8	102	3570	10.0	102	3350	10.5	103	111
	102	4270	7.6	102	3560	8.7	102	3340	9.1	103	111
-5	102	4350	8.8	102	3630	10.0	102	3410	10.5	103	111
	102	4330	6.8	102	3620	7.7	102	3390	8.1	103	111
0	102	4410	8.8	102	3690	10.0	102	3460	10.5	103	111
	99	4280	6.0	99	3560	6.8	99	3340	7.2	101	108
5	102	4470	8.8	102	3740	9.9	102	3510	10.4	103	111
	97	4230	5.2	97	3510	6.0	97	3290	6.3	99	105
10	99	4410	7.9	99	3680	9.0	99	3450	9.4	101	108
	96	4230	4.4	95	3470	5.1	95	3250	5.3	99	105
15	97	4350	7.0	97	3620	8.0	97	3390	8.4	99	105
20	96	4370	6.3	95	3560	7.2	95	3330	7.5	99	105
25	97	4570	5.5	94	3600	6.3	94	3390	6.6	98	104
30	98	4780	4.8	95	3760	5.5	95	3540	5.8	98	103
35	98	5120	4.1	96	3940	4.7	96	3710	5.0	98	102

TAKEOFF CLIMB REQUIREMENTS TABLE: CLIMB LIMITED WEIGHTS: FLAPS 7° - MINIMUM GRADIENT

Conditions:

- For FAA Climb Requirements
- 7° Flaps
- Engine & Wing Anti-Ice ON below 11°C

Ambient Temp: °C	Takeoff Limited Weight (Pounds) For Airport Pressure Altitudes As Shown					
	Sea Level	2000 Feet	4000 Feet	6000 Feet	8000 Feet	10000 Feet
Up to -5	30300	30300	30300	30300	30300	30300
0	30300	30300	30300	30300	30300	30300
5	30300	30300	30300	30300	30300	28860
10	30300	30300	30300	30300	29410	27100
15	30300	30300	30300	30300	30300	30300
20	30300	30300	30300	30300	30300	30300
25	30300	30300	30300	30300	30300	29050
30	30300	30300	30300	30300	30100	27790
33	30300	30300	30300	30300	29430	27030*
35	30300	30300	30300	30300	28750	-
38	30300	30300	30300	30100	27940*	-
40	30300	30300	30300	29680	-	-
42	30300	30300	30300	29090*	-	-
46	30300	30300	30300	-	-	-
50	30300	30300	-	-	-	-
55	30300	-	-	-	-	-

* Climb limited takeoff weights at temperature envelope limits

TAKEOFF CLIMB REQUIREMENTS TABLE: CLIMB LIMITED WEIGHTS: FLAPS 15° - MINIMUM GRADIENT

Conditions:

- For FAA Climb Requirements
- 15° Flaps
- Engine & Wing Anti-Ice ON below 11°C

Ambient Temp: °C	Takeoff Limited Weight (Pounds) For Airport Pressure Altitudes As Shown					
	Sea Level	2000 Feet	4000 Feet	6000 Feet	8000 Feet	10000 Feet
Up to -5	30300	30300	30300	30300	30300	30300
0	30300	30300	30300	30300	30300	29080
5	30300	30300	30300	30300	29630	27330
10	30300	30300	30300	30020	27980	25670
15	30300	30300	30300	30300	30300	30160
20	30300	30300	30300	30300	30300	28860
25	30300	30300	30300	30300	29910	27570
30	30300	30300	30300	30300	28590	26380
33	30300	30300	30300	29950	27950	25660*
35	30300	30300	30300	29600	27320	-
38	30300	30300	30300	28850	26550*	-
40	30300	30300	30300	28220	-	-
42	30300	30300	30020	27670*	-	-
46	30300	30300	28920*	-	-	-
50	30300	30210*	-	-	-	-
55	30300	-	-	-	-	-

* Climb limited takeoff weights at temperature envelope limits

**CRUISE CLIMB
250 KIAS/0.64 MACH**
ANTI-ICE: OFF

Pressure altitude: 25,000 ft ISA -35°C/-30°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	8	8	7	7	6	5
	NM	42	40	38	36	32	25
	LBS	510	488	468	448	390	317
	R/C	2039	2143	2254	2370	2769	3485
ISA	Min	7	7	6	6	5	4
	NM	36	34	33	31	27	22
	LBS	476	456	438	419	366	298
	R/C	2141	2248	2362	2482	2894	3633
ISA -10°C	Min	6	6	6	6	5	4
	NM	32	31	30	28	25	20
	LBS	455	437	419	402	351	287
	R/C	2475	2594	2719	2853	3310	4130

Pressure altitude: 31,000 ft ISA -46°C/-52°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	11	11	10	10	8	7
	NM	63	60	57	54	47	37
	LBS	663	634	605	578	499	403
	R/C	1801	1909	2022	2146	2588	3339
ISA	Min	10	10	9	9	8	6
	NM	55	53	50	48	41	33
	LBS	621	594	568	543	470	381
	R/C	1926	2037	2155	2282	2739	3515
ISA -10°C	Min	9	9	8	8	7	7
	NM	49	47	44	42	37	37
	LBS	587	562	538	515	448	403
	R/C	2137	2255	2379	2514	2996	3339

Pressure altitude: 35,000 ft ISA -54°C/-66°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	14	13	12	12	10	8
	NM	78	74	70	67	57	45
	LBS	759	724	690	657	565	453
	R/C	1491	1596	1707	1824	2221	2933
ISA	Min	12	12	11	11	9	7
	NM	70	66	63	60	51	41
	LBS	712	680	649	619	533	429
	R/C	1541	1647	1759	1877	2278	2995
ISA -10°C	Min	11	11	10	10	8	7
	NM	61	59	56	53	46	36
	LBS	673	643	615	587	508	410
	R/C	1682	1792	1908	2030	2447	3192

CRUISE CLIMB

250 KIAS/0.64 MACH

ANTI-ICE: OFF

Pressure altitude: 37,000 ft ISA -57°C/-70°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	15	14	14	13	11	9
	NM	87	83	76	74	63	50
	LBS	811	772	735	699	599	479
	R/C	1192	1289	1391	1499	1862	2485
ISA	Min	14	13	13	12	10	8
	NM	78	74	71	67	57	45
	LBS	763	727	693	660	567	455
	R/C	1199	1295	1396	1503	1863	2482
ISA -10°C	Min	13	12	11	11	9	7
	NM	69	66	63	60	51	40
	LBS	720	688	656	626	540	435
	R/C	1330	1430	1535	1646	2020	2665

Pressure altitude: 39,000 ft ISA -57°C/-70°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	17	16	15	14	12	10
	NM	99	94	88	84	70	55
	LBS	673	829	780	748	638	508
	R/C	920	1012	1109	1211	1555	2132
ISA	Min	16	15	14	13	11	9
	NM	90	85	81	76	64	50
	LBS	824	783	745	708	605	483
	R/C	910	1001	1096	1197	1535	2102
ISA -10°C	Min	14	14	13	12	10	8
	NM	79	75	71	68	57	45
	LBS	776	740	704	671	576	462
	R/C	1029	1123	1222	1326	1676	2267

Pressure altitude: 41,000 ft ISA -57°C/-70°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	20	18	17	16	14	11
	NM	115	108	101	95	79	62
	LBS	949	897	849	803	680	538
	R/C	661	751	845	943	1270	1817
ISA	Min	18	17	16	15	13	10
	NM	106	99	93	88	73	57
	LBS	900	851	806	763	647	513
	R/C	632	719	810	906	1225	1757
ISA -10°C	Min	17	16	15	14	12	9
	NM	93	88	83	78	65	51
	LBS	844	801	760	721	615	490
	R/C	751	841	936	1035	1366	1919

CRUISE CLIMB 250 KIAS/0.64 MACH

ANTI-ICE: OFF

Pressure altitude: 43,000 ft ISA -57°C/-70°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	24	22	20	19	15	12
	NM	140	129	120	111	91	69
	LBS	1056	988	926	872	729	571
	R/C	362	448	537	631	940	1448
ISA	Min	23	21	19	18	15	11
	NM	132	121	112	104	85	65
	LBS	1009	944	885	833	696	546
	R/C	344	428	515	607	909	1404
ISA -10°C	Min	20	18	17	16	13	10
	NM	113	105	98	91	75	58
	LBS	932	678	828	782	659	521
	R/C	481	568	660	755	1072	1593

Pressure altitude: 45,000 ft ISA -57°C/-70°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	* 43	29	26	23	18	13
	NM	268	174	153	138	107	79
	LBS	1523	1159	1057	976	792	609
	R/C	100	157	239	328	622	1097
ISA	Min	* 47	28	25	22	17	13
	NM	288	167	147	132	101	75
	LBS	1572	1117	1016	937	759	584
	R/C	100	147	228	315	602	1066
ISA -10°C	Min	26	23	21	19	16	12
	NM	147	132	120	111	88	66
	LBS	1073	990	921	860	712	555
	R/C	233	315	403	496	803	1300

**WIND EFFECT ON CLIMB DISTANCE – NM
(SUBSTRACT FOR HEADWIND, ADD FOR TAILWIND)**

CLIMB TIME (MIN)	WIND in KTS			TEMPERATURE			
	25	50	100				
5	2	4	8				
10	4	8	16				
15	6	12	25				
20	8	16	33				
25	10	20	41				
30	12	25	50				
				43000	-	28645	28698
				45000	28155	25901	25897

CRUISE CLIMB SPEED - KIAS

PRESSURE ALTITUDE - FEET										
0	5000	10000	15000	20000	25000	30000	35000	40000	41000	
250	250	250	250	250	250	239	213	189	185	

**CRUISE CLIMB
250 KIAS/0.64 MACH**
ANTI-ICE: ON

Pressure altitude: 25000 ft

ISA -35°C/-30°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	9	9	9	8	7	6
	NM	49	47	45	43	37	30
	LBS	568	544	520	497	431	349
	R/C	1521	1607	1698	1794	2121	2706
ISA	Min	8	8	7	7	6	5
	NM	41	39	37	36	31	25
	LBS	515	493	473	452	394	320
	R/C	1659	1749	1845	1946	2291	2908
ISA -10°C	Min	7	7	6	6	5	4
	NM	35	33	32	30	26	21
	LBS	478	459	440	422	368	300
	R/C	2023	2126	2235	2350	2744	3450

Pressure altitude: 31,000 ft

ISA -46°C/-52°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	18	17	16	15	12	10
	NM	106	98	92	86	71	54
	LBS	917	861	810	763	639	501
	R/C	582	646	714	790	1059	1501
ISA	Min	14	13	12	12	10	8
	NM	77	72	68	65	55	43
	LBS	753	716	680	646	551	440
	R/C	968	1046	1127	1217	1538	2073
ISA -10°C	Min	11	10	10	9	8	6
	NM	59	56	53	51	53	35
	LBS	655	626	598	570	492	397
	R/C	1390	1482	1579	1684	2061	2697

Pressure altitude: 35,000 ft

ISA -54°C/-66°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	27	24	23	21	17	13
	NM	159	146	134	123	98	73
	LBS	1197	1108	1029	959	782	598
	R/C	378	441	508	578	814	1240
ISA	Min	18	17	16	15	13	10
	NM	106	100	93	88	73	56
	LBS	920	868	820	775	653	513
	R/C	722	799	879	964	1248	1757
ISA -10°C	Min	14	14	13	12	10	8
	NM	79	75	71	67	57	44
	LBS	779	741	705	670	574	458
	R/C	1005	1091	1181	1276	1597	2172

**CRUISE CLIMB
250 KIAS/0.64 MACH**
ANTI-ICE: ON

Pressure altitude: 37,000 ft

ISA -57°C/-70°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	34	30	28	25	20	14
	NM	206	183	165	150	116	84
	LBS	1413	1283	1176	1084	867	652
	R/C	151	206	265	328	537	891
ISA	Min	22	20	19	18	15	11
	NM	128	119	110	103	84	64
	LBS	1028	964	906	852	710	553
	R/C	393	459	529	603	847	1261
ISA -10°C	Min	17	16	15	14	12	9
	NM	93	88	83	78	65	51
	LBS	855	810	768	728	619	491
	R/C	679	756	836	920	1202	1683

Pressure altitude: 39,000 ft

ISA -57°C/-70°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	-	-	-	-	25	17
	NM	-	-	-	-	150	102
	LBS	-	-	-	-	1007	727
	R/C	-	-	-	-	246	551
ISA	Min	-	28	25	23	18	13
	NM	-	164	147	133	103	76
	LBS	-	1167	1067	985	795	606
	R/C	-	129	190	254	468	818
ISA -10°C	Min	20	19	18	17	14	11
	NM	116	108	100	94	77	59
	LBS	966	908	854	805	675	530
	R/C	388	458	532	609	868	1294

**CRUISE CLIMB
250 KIAS/0.64 MACH**
ANTI-ICE: ON

Pressure altitude: 41,000 ft

ISA -57°C/-70°F

Temp Dev.	Weight X 1,000 lb	30	29	28	27	24	20
ISA +10°C	Min	-	-	-	-	-	22
	NM	-	-	-	-	-	134
	LBS	-	-	-	-	-	848
	R/C	-	-	-	-	-	244
ISA	Min	-	-	-	-	25	16
	NM	-	-	-	-	147	96
	LBS	-	-	-	-	966	684
	R/C	-	-	-	-	126	426
ISA -10°C	Min	-	26	23	21	17	12
	NM	-	151	134	122	94	70
	LBS	-	1092	1000	925	751	578
	R/C	-	124	189	258	488	862

WIND EFFECT ON CLIMB DISTANCE – NM
(SUBSTRACT FOR HEADWIND, ADD FOR TAILWIND)

CLIMB TIME (MIN)	WIND in KTS		
	25	50	100
5	2	4	8
10	4	8	16
15	6	12	25
20	8	16	33
25	10	20	41
30	12	25	50

CRUISE CLIMB SPEED - KIAS

PRESSURE ALTITUDE -FEET									
0	5000	10000	15000	20000	25000	30000	35000	40000	41000
250	250	250	250	250	250	239	213	189	185

**TWIN ENGINE CRUISE
ANTI ICE – OFF**
**25,000 FT
ISA = -35°C**

WT x 1000	TEMP	POWER	FAN	FF LBS/HR	MACH	KTAS
30	ISA + 10°C	HSC	96.2	2616	.73	447
		NORM	89.6	1960	.630	387
		LRC	82.4	1445	.52	322
	ISA	HSC	94.3	2548	.73	438
		NORM	87.8	1908	.630	379
		LRC	80.8	1411	.53	316
	ISA -10°C	HSC	92.3	2496	.73	429
		NORM	86	1856	.630	371
		LRC	79.1	1369	.52	309
28	ISA + 10°C	HSC	95.7	2574	.73	447
		NORM	89	1921	.630	387
		LRC	81.3	1 n4	.52	319
	ISA	HSC	93.9	2508	.73	438
		NORM	87.3	1871	.630	379
		LRC	79	1352	.52	314
	ISA -10°C	HSC	91.9	2456	.73	429
		NORM	85.5	1820	.630	371
		LRC	78.1	1312	.52	306
27	ISA + 10°C	HSC	95.5	2553	.73	447
		NORM	88.8	1904	.630	387
		LRC	80.8	1356	.52	319
	ISA	HSC	93.7	2488	.73	438
		NORM	87.0	1853	.630	379
		LRC	79.2	1320	.52	312
	ISA -10°C	HSC	91.7	2437	.73	429
		NORM	85.3	1803	.630	371
		LRC	77.6	1285	.52	305
25	ISA + 10°C	HSC	95.1	2512	.73	447
		NORM	87.6	1812	.620	381
		LRC	79.4	1282	.51	312
	ISA	HSC	93.2	2454	.73	438
		NORM	85.9	1764	.620	373
		LRC	77.8	1248	.51	306
	ISA -10°C	HSC	91.3	2398	.73	429
		NORM	84.1	1717	.620	365
		LRC	76.2	1214	.51	299
23	ISA + 10°C	HSC	94.7	2476	.73	447
		NORM	86.3	1723	.610	375
		LRC	78.0	1210	.50	305
	ISA	HSC	92.8	2427	.73	438
		NORM	84.6	1677	.610	367
		LRC	76.4	1178	.50	299
	ISA -10°C	HSC	90.9	2363	.73	429
		NORM	82.9	1633	.610	359
		LRC	74.8	1146	.50	293

ANTI-ICE SYSTEM ON		
MAX FAN % RPM		
-28°C	38°C	48°C
92.1	92.7	92.7
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 12 %		

**TWIN ENGINE CRUISE
ANTI ICE – OFF**
**31,000 FT
ISA = -35°C**

WT x 1000	TEMP	POWER	FAN	FF LBS/HR	MACH	KTAS
30	ISA + 10°C	HSC	98.6	2389	.77	461
		NORM	92.1	1805	.670	402
		LRC	87.4	1455	.58	351
	ISA	HSC	97.3	2407	.78	456
		NORM	90.8	1802	.680	399
		LRC	85.6	1413	.58	343
	ISA -10°C	HSC	98.4	2628	.80	459
		NORM	89.8	1844	.700	402
		LRC	83.7	1373	.58	335
28	ISA + 10°C	HSC	98.5	2391	.77	464
		NORM	91.5	1M2	.670	402
		LRC	85.6	1354	.57	341
	ISA	HSC	97.3	2409	.78	459
		NORM	90.1	1M9	.680	399
		LRC	83.9	1317	.57	334
	ISA -10°C	HSC	97.6	2574	.80	459
		NORM	88.2	1M9	.680	390
		LRC	82.0	1279	.57	327
27	ISA + 10°C	HSC	98	2391	.78	465
		NORM	91.2	1741	.670	402
		LRC	84.6	1301	.56	336
	ISA	HSC	97.3	2410	.78	460
		NORM	89.3	1693	.670	393
		LRC	82.9	1263	.56	329
	ISA -10°C	HSC	97.1	2540	.80	459
		NORM	87.9	1689	.680	390
		LRC	81.0	1229	.56	322
25	ISA + 10°C	HSC	98.4	2393	.78	469
		NORM	89.9	1652	.660	396
		LRC	82.5	1199	.54	326
	ISA	HSC	97.2	2412	.79	463
		NORM	88.7	1652	.670	393
		LRC	80.8	1166	.54	319
	ISA -10°C	HSC	96.4	2472	.80	459
		NORM	87.4	1651	.680	390
		LRC	79.1	1139	.55	313
23	ISA + 10°C	HSC	98.4	2395	.79	472
		NORM	89.2	1613	.660	396
		LRC	80.6	1112	.53	318
	ISA	HSC	97.2	2414	.79	466
		NORM	87.4	1569	.660	387
		LRC	79.0	1083	.53	311
	ISA -10°C	HSC	95.8	2417	.80	459
		NORM	85.5	1524	.660	379
		LRC	77.1	1049	.53	303

ANTI-ICE SYSTEM ON		
MAX FAN % RPM		
-28°C	38°C	48°C
92.1	92.7	92.7
INCREASE FUEL FLOWS AND		
DECREASE SPECIFIC RANGES BY 12 %		

**TWIN ENGINE CRUISE
ANTI ICE – OFF**
**35,000 FT
ISA = -35°C**

WT x 1000	TEMP	POWER	FAN	FF LBS/HR	MACH	KTAS
30	ISA + 10°C	HSC	98.6	2389	.77	461
		NORM	92.1	1805	.670	402
		LRC	87.4	1455	.58	351
	ISA	HSC	97.3	2407	.78	456
		NORM	90.8	1802	.680	399
		LRC	85.6	1413	.58	343
	ISA -10°C	HSC	98.4	2628	.80	459
		NORM	89.8	1844	.700	402
		LRC	83.7	1373	.58	335
28	ISA + 10°C	HSC	98.5	2391	.77	464
		NORM	91.5	1M2	.670	402
		LRC	85.6	1354	.57	341
	ISA	HSC	97.3	2409	.78	459
		NORM	90.1	1M9	.680	399
		LRC	83.9	1317	.57	334
	ISA -10°C	HSC	97.6	2574	.80	459
		NORM	88.2	1M9	.680	390
		LRC	82.0	1279	.57	327
27	ISA + 10°C	HSC	98	2391	.78	465
		NORM	91.2	1741	.670	402
		LRC	84.6	1301	.56	336
	ISA	HSC	97.3	2410	.78	460
		NORM	89.3	1693	.670	393
		LRC	82.9	1263	.56	329
	ISA -10°C	HSC	97.1	2540	.80	459
		NORM	87.9	1689	.680	390
		LRC	81.0	1229	.56	322
25	ISA + 10°C	HSC	98.4	2393	.78	469
		NORM	89.9	1652	.660	396
		LRC	82.5	1199	.54	326
	ISA	HSC	97.2	2412	.79	463
		NORM	88.7	1652	.670	393
		LRC	80.8	1166	.54	319
	ISA -10°C	HSC	96.4	2472	.80	459
		NORM	87.4	1651	.680	390
		LRC	79.1	1139	.55	313
23	ISA + 10°C	HSC	98.4	2395	.79	472
		NORM	89.2	1613	.660	396
		LRC	80.6	1112	.53	318
	ISA	HSC	97.2	2414	.79	466
		NORM	87.4	1569	.660	387
		LRC	79.0	1083	.53	311
	ISA -10°C	HSC	95.8	2417	.80	459
		NORM	85.5	1524	.660	379
		LRC	77.1	1049	.53	303

ANTI-ICE SYSTEM ON		
MAX FAN % RPM		
-28°C	38°C	48°C
92.1	92.7	92.7
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 12 %		

**TWIN ENGINE CRUISE
ANTI ICE – OFF**
**39,000 FT
ISA = -35°C**

WT x 1000	TEMP	POWER	FAN	FF LBS/HR	MACH	KTAS
30	ISA + 10°C	HSC	98.7	1785	.75	441
		NORM	96.3	1594	.710	417
		LRC	94.6	1471	.67	394
	ISA	HSC	96.5	1724	.75	431
		NORM	94.2	1547	.710	407
		LRC	92.7	1434	.67	387
	ISA -10°C	HSC	97.4	1827	.77	433
		NORM	93.1	1576	.730	409
		LRC	90.6	1391	.67	378
28	ISA + 10°C	HSC	98.6	1787	.76	444
		NORM	95.8	1564	.710	417
		LRC	93.7	1419	.66	389
	ISA	HSC	96.4	1728	.76	434
		NORM	93.8	1519	.710	407
		LRC	91.9	1387	.67	383
	ISA -10°C	HSC	97.4	1830	.78	435
		NORM	92.2	1510	.720	403
		LRC	89.8	1344	.67	374
27	ISA + 10°C	HSC	98.6	1789	.76	447
		NORM	95.3	1537	.710	417
		LRC	92.8	1370	.66	385
	ISA	HSC	96.4	1731	.76	436
		NORM	93.3	1492	.710	407
		LRC	91.0	1339	.66	378
	ISA -10°C	HSC	97.3	1833	.78	437
		NORM	91.7	1484	.720	403
		LRC	88.9	1296	.66	369
25	ISA + 10°C	HSC	98.5	1791	.77	454
		NORM	93.4	1429	.700	411
		LRC	90.2	1229	.63	372
	ISA	HSC	96.3	1736	.77	444
		NORM	91.4	1387	.700	402
		LRC	88.1	1186	.63	362
	ISA -10°C	HSC	97.2	1845	.79	444
		NORM	89.8	1378	.710	398
		LRC	86.2	1156	.63	355
23	ISA + 10°C	HSC	98.4	1792	.78	459
		NORM	92.5	1385	.700	411
		LRC	88.3	1135	.62	362
	ISA	HSC	96.3	1740	.78	449
		NORM	90.5	1344	.700	402
		LRC	86.4	1099	.62	353
	ISA -10°C	HSC	97.1	1853	.80	448
		NORM	88.5	1303	.700	392
		LRC	84.3	1062	.61	344

ANTI-ICE SYSTEM ON		
MAX FAN % RPM		
-28°C 92.1	38°C 92.7	48°C 92.7
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 12 %		

**TWIN ENGINE CRUISE
ANTI ICE – OFF****43,000 FT
ISA = -35°C**

WT x 1000	TEMP	POWER	FAN	FF LBS/HR	MACH	KTAS
29	ISA + 10°C	HSC	98.6	1459	.70	413
		NORM	97.7	1401	.680	399
		LRC	97.1	1354	.66	386
	ISA	HSC	96.6	1415	.70	404
		NORM	95.6	1356	.680	390
		LRC	95.0	1312	.66	378
	ISA -10°C	HSC	97.5	1522	.75	419
		NORM	94.8	1337	.710	398
		LRC	92.8	1269	.66	368
28	ISA + 10°C	HSC	98.5	1467	.72	422
		NORM	97.3	1337	.690	405
		LRC	96.3	1318	.66	387
	ISA	HSC	96.5	1425	.72	413
		NORM	95.6	1371	.700	402
		LRC	94.3	1280	.66	380
	ISA -10°C	HSC	97.4	1527	.76	424
		NORM	93.9	1352	.710	398
		LRC		1240	.66	371
27	ISA + 10°C	HSC	98.4	1472	.73	429
		NORM	96.6	1351	.690	405
		LRC	95.3	1262	.65	382
	ISA	HSC	96.4	1432	.73	420
		NORM	94.6	1310	.690	396
		LRC	93.3	1225	.65	374
	ISA -10°C	HSC	97.3	1531	.76	427
		NORM	93.2	1318	.710	398
		LRC	91.2	1188	.65	365
25	ISA + 10°C	HSC	98.2	1476	.75	438
		NORM	95.3	1285	.690	405
		LRC	93.3	1167	.64	374
	ISA	HSC	96.3	1442	.75	430
		NORM	93.3	1246	.690	396
		LRC	91.3	1131	.64	365
	ISA -10°C	HSC	97.2	1537	.77	433
		NORM	92.0	1257	.710	398
		LRC	69.3	1095	.64	357
23	ISA + 10°C	HSC	98.1	1478	.76	445
		NORM	94.1	1228	.690	405
		LRC	91.3	1078	.62	365
	ISA	HSC	963	1447	.76	437
		NORM	92.5	1217	.700	402
		LRC	89.3	1045	.62	357
	ISA -10°C	HSC	97.2	1543	.78	438
		NORM	90.5	1179	.700	392
		LRC	87.2	1009	.62	348

ANTI-ICE SYSTEM ON		
MAX FAN % RPM		
-28°C	38°C	48°C
92.1	92.7	92.7
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 12 %		

LANDING PERFORMANCE SIMPLIFIED CRITERIA

When conditions are other than those specified in this simplified criteria, the appropriate tabulated data must be referred to. If the following conditions are met, the simplified performance may be used.

1. Anti-ice system – OFF.
2. Landing flaps 35°, approach flaps 15°.
3. No tailwind
4. Runway gradient – -0.5% downhill to 2% uphill.
5. Dry runway
6. Runway length - 3500 feet or longer.

SIMPLIFIED CRITERIA – FLAPS 35° TAKEOFF

WEIGHT RANGE - POUNDS	20,000	22,000	24,000	26000	27,000
V _{REF} - KIAS	94	99	103	107	110
V _{APP} - KIAS	101	106	110	115	117

**LANDING
FLAPS: 35°**

**SEA LEVEL
ANTI-ICE: ON/OFF**

30,300 LBS		V_{REF} 116	V_{APP}124
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3100	2610	2470
-15	3140	2650	2500
-10	3180	2680	2540
-5	3210	2710	2570
0	3250	2750	2600
5	3280	2780	2640
10	3320	2810	2670
15	3350	2850	2700
20	3390	2880	2740
25	3430	2920	2770
30	3470	2960	2810
35	3500	2990	2840

27,100 LBS		V_{REF} 110	V_{APP}117
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	2910	2430	2290
-15	2950	2460	2320
-10	2980	2490	2350
-5	3010	2520	2390
0	3040	2560	2410
5	3070	2590	2440
10	3110	2610	2470
15	3140	2650	2500
20	3180	2680	2540
25	3210	2710	2570
30	3240	2750	2600
35	3280	2780	2630

26,500 LBS		V_{REF} 108	V_{APP}116
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	2870	2400	2260
-15	2910	2430	2290
-10	2940	2460	2320
-5	2970	2490	2350
0	3000	2520	2380
5	3030	2550	2410
10	3070	2580	2440
15	3100	2610	2470
20	3130	2640	2500
25	3170	2670	2530
30	3200	2700	2560
35	3230	2740	2590

**LANDING
FLAPS: 35°**

**SEA LEVEL
ANTI-ICE: ON/OFF**

26,000 LBS		V_{REF} 107 V_{APP}115		
TEMP DEG C	WIND KTS			
	-10	0	+10	
-20	2840	2370	2230	
-15	2880	2400	2260	
-10	2910	2430	2290	
-5	2940	2460	2320	
0	2970	2490	2350	
5	3000	2520	2380	
10	3030	2550	2400	
15	3060	2580	2430	
20	3100	2610	2460	
25	3130	2640	2500	
30	3170	2670	2530	
35	3200	2700	2560	

25,000 LBS		V_{REF} 105 V_{APP}113		
TEMP DEG C	WIND KTS			
	-10	0	+10	
-20	2780	2310	2170	
-15	2810	2340	2200	
-10	2840	2370	2230	
-5	2870	2400	2260	
0	2900	2420	2290	
5	2930	2450	2310	
10	2970	2480	2340	
15	3000	2510	2370	
20	3030	2540	2400	
25	3060	2570	2430	
30	3090	2600	2460	
35	3130	2630	2490	

24,000 LBS		V_{REF} 103 V_{APP}110		
TEMP DEG C	WIND KTS			
	-10	0	+10	
-20	2720	2250	2110	
-15	2750	2280	2140	
-10	2780	2300	2170	
-5	2810	2330	2190	
0	2840	2360	2220	
5	2860	2390	2250	
10	2890	2410	2280	
15	2920	2440	2310	
20	2960	2470	2340	
25	2990	2500	2360	
30	3020	2530	2390	
35	3050	2560	2420	

**LANDING
FLAPS: 35°**

**2000 FT
ANTI-ICE: ON/OFF**

30,300 LBS		V_{REF} 116	V_{APP}124
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3210	2710	2570
-15	3240	2750	2600
-10	3280	2780	2640
-5	3320	2820	2670
0	3360	2850	2710
5	3400	2890	2740
10	3440	2930	2780
15	3470	2960	2810
20	3510	3000	2850
25	3550	3030	2880
30	3590	3070	2920
35	3630	3110	2960
	3670	3150	3000

27,100 LBS		V_{REF} 110	V_{APP}117
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3040	2550	2410
-15	3080	2590	2440
-10	3110	2620	2480
-5	3150	2650	2510
0	3180	2680	2540
5	3220	2720	2570
10	3250	2750	2600
15	3280	2780	2640
20	3320	2820	2670
25	3360	2850	2710
30	3400	2890	2740
35	3440	2920	2770

26,500 LBS		V_{REF} 108	V_{APP}116
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3000	2520	2380
-15	3040	2550	2410
-10	3070	2580	2440
-5	3100	2610	2470
0	3140	2640	2500
5	3170	2680	2530
10	3210	2710	2570
15	3240	2740	2600
20	3280	2780	2630
25	3310	2810	2660
30	3350	2840	2700
35	3390	2880	2730

**LANDING
FLAPS: 35°**

**2000 FT
ANTI-ICE: ON/OFF**

26,000 LBS		V_{REF} 107 V_{APP}115		
TEMP DEG C	WIND KTS			
	-10	0	+10	
-20	2970	2480	2350	
-15	3000	2520	2380	
-10	3040	2550	2410	
-5	3070	2580	2440	
0	3100	2610	2470	
5	3140	2640	2500	
10	3170	2670	2530	
15	3210	2710	2570	
20	3240	2740	2600	
25	3280	2780	2630	
30	3310	2810	2660	
35	3350	2840	2700	

25,000 LBS		V_{REF} 105 V_{APP}113		
TEMP DEG C	WIND KTS			
	-10	0	+10	
-20	2900	2420	2280	
-15	2940	2450	2320	
-10	2970	2480	2350	
-5	3000	2510	2380	
0	3030	2550	2400	
5	3060	2580	2430	
10	3100	2600	2460	
15	3130	2640	2500	
20	3170	2670	2530	
25	3200	2700	2560	
30	3240	2740	2590	
35	3270	2770	2620	

24,000 LBS		V_{REF} 103 V_{APP}110		
TEMP DEG C	WIND KTS			
	-10	0	+10	
-20	2840	2360	2220	
-15	2870	2390	2250	
-10	2900	2420	2280	
-5	2930	2450	2310	
0	2960	2480	2340	
5	2990	2510	2370	
10	3020	2540	2400	
15	3060	2570	2430	
20	3090	2600	2460	
25	3130	2630	2490	
30	3160	2660	2520	
35	3190	2690	2550	

**LANDING
FLAPS: 35°**

**4000 FT
ANTI-ICE: ON/OFF**

30,300 LBS		V_{REF} 116	V_{APP}124
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3400	2890	2740
-15	3440	2930	2780
-10	3480	2970	2810
-5	3520	3000	2850
0	3560	3040	2890
5	3600	3080	2930
10	3640	3120	2970
15	3680	3160	3010
20	3720	3200	3040
25	3770	3240	3080
30	3810	3280	3120
35	3850	3320	3160

27,100 LBS		V_{REF} 110	V_{APP}117
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3180	2680	2540
-15	3220	2720	2580
-10	3250	2750	2610
-5	3290	2790	2640
0	3330	2820	2680
5	3370	2860	2710
10	3400	2890	2750
15	3440	2930	2780
20	3480	2970	2820
25	3520	3010	2850
30	3560	3040	2890
35	3600	3080	2930

26,500 LBS		V_{REF} 108	V_{APP}116
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3140	2640	2500
-15	3180	2680	2540
-10	3210	2710	2570
-5	3250	2750	2600
0	3280	2780	2640
5	3320	2810	2670
10	3360	2850	2700
15	3400	2890	2740
20	3440	2920	2780
25	3470	2960	2810
30	3510	3000	2840
35	3550	3030	2880

**LANDING
FLAPS: 35°**

**4000 FT
ANTI-ICE: ON/OFF**

26,000 LBS		V_{REF} 107 V_{APP}115		
TEMP DEG C	WIND KTS			
	-10	0	+10	
-20	3100	2610	2470	
-15	3140	2640	2500	
-10	3180	2680	2540	
-5	3210	2710	2570	
0	3250	2750	2600	
5	3280	2780	2630	
10	3320	2810	2670	
15	3360	2850	2700	
20	3400	2890	2740	
25	3440	2920	2770	
30	3470	2960	2810	
35	3510	2990	2840	

25,000 LBS		V_{REF} 105 V_{APP}113		
TEMP DEG C	WIND KTS			
	-10	0	+10	
-20	3030	2550	2400	
-15	3070	2580	2440	
-10	3100	2610	2470	
-5	3140	2640	2500	
0	3170	2680	2530	
5	3210	2710	2570	
10	3240	2740	2600	
15	3280	2780	2630	
20	3320	2810	2660	
25	3350	2850	2700	
30	3390	2880	2730	
35	3430	2920	2770	

24,000 LBS		V_{REF} 103 V_{APP}110		
TEMP DEG C	WIND KTS			
	-10	0	+10	
-20	2960	2480	2340	
-15	3000	2510	2370	
-10	3030	2540	2400	
-5	3060	2570	2430	
0	3100	2600	2460	
5	3130	2630	2490	
10	3170	2670	2530	
15	3200	2700	2560	
20	3230	2740	2590	
25	3270	2770	2620	
30	3310	2800	2660	
35	3340	2840	2690	

**LANDING
FLAPS: 35°**

**6000 FT
ANTI-ICE: ON/OFF**

30,300 LBS		V_{REF} 116	V_{APP}124
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3560	3040	2890
-15	3610	3080	2930
-10	3650	3130	2970
-5	3690	3170	3010
0	3730	3210	3050
5	3780	3250	3090
10	3820	3290	3130
15	3870	3330	3180
20	3910	3380	3220
25	3960	3420	3260
30	4000	3460	3300
35	4050	3500	3340

27,100 LBS		V_{REF} 110	V_{APP}117
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3330	2830	2680
-15	3370	2860	2720
-10	3410	2900	2750
-5	3450	2940	2790
0	3490	2980	2820
5	3530	3010	2860
10	3570	3050	2900
15	3610	3090	2940
20	3650	3130	2980
25	3690	3170	3020
30	3740	3210	3050
35	3780	3250	3090

26,500 LBS		V_{REF} 108	V_{APP}116
TEMP DEG C	WIND KTS		
	-10	0	+10
-20	3290	2790	2640
-15	3330	2820	2670
-10	3370	2860	2710
-5	3400	2890	2750
0	3440	2930	2780
5	3480	2970	2820
10	3520	3010	2860
15	3560	3040	2890
20	3610	3080	2930
25	3650	3120	2970
30	3690	3160	3010
35	3730	3200	3040

**LANDING
FLAPS: 35°**

**6000 FT
ANTI-ICE: ON/OFF**

26,000 LBS		V_{REF} 107 V_{APP}115		
TEMP DEG C	WIND KTS			+10
	-10	0	+10	
-20	3250	2750	2600	
-15	3290	2790	2640	
-10	3330	2820	2680	
-5	3370	2860	2710	
0	3400	2890	2750	
5	3440	2930	2780	
10	3480	2970	2820	
15	3520	3010	2850	
20	3560	3040	2890	
25	3600	3080	2930	
30	3650	3120	2970	
35	3680	3160	3000	

25,000 LBS		V_{REF} 105 V_{APP}113		
TEMP DEG C	WIND KTS			+10
	-10	0	+10	
-20	3180	2680	2540	
-15	3220	2710	2570	
-10	3250	2750	2600	
-5	3290	2790	2640	
0	3320	2820	2670	
5	3360	2850	2710	
10	3400	2890	2740	
15	3440	2930	2780	
20	3480	2970	2810	
25	3520	3000	2850	
30	3560	3040	2890	
35	3600	3070	2920	

24,000 LBS		V_{REF} 103 V_{APP}110		
TEMP DEG C	WIND KTS			+10
	-10	0	+10	
-20	3100	2610	2470	
-15	3140	2640	2500	
-10	3170	2680	2530	
-5	3210	2710	2570	
0	3240	2740	2600	
5	3280	2780	2630	
10	3320	2810	2670	
15	3360	2850	2700	
20	3400	2880	2740	
25	3430	2920	2770	
30	3470	2960	2810	
35	3510	2990	2840	

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DEFINITIONS

Circuit Breakers

Check

Make sure the Circuit breaker has remained in the normal position or that it has opened the circuit as appropriate.

Reset

Place the circuit breaker in the normal position. If the circuit breaker is currently in the normal position, pull it out to open the circuit, and then push it in to reset the circuit.

Quick-Find Call Callouts

Circuit breakers may be quickly located by using the quick-find callout found in a given procedure. That callout consists of two characters followed by a dash followed by four to six characters.

The first two characters will be either "LP" or "RP" meaning the circuit breaker is located on the left or right circuit breaker panel.

The second group of characters consists of the letter "C" (for 'Column'), a number corresponding to the column number, the letter "R" (for "row"), and a number corresponding to the row number.

The columns are numbered from left to right and the rows are numbered from top to bottom.

Example: LP-C11R3

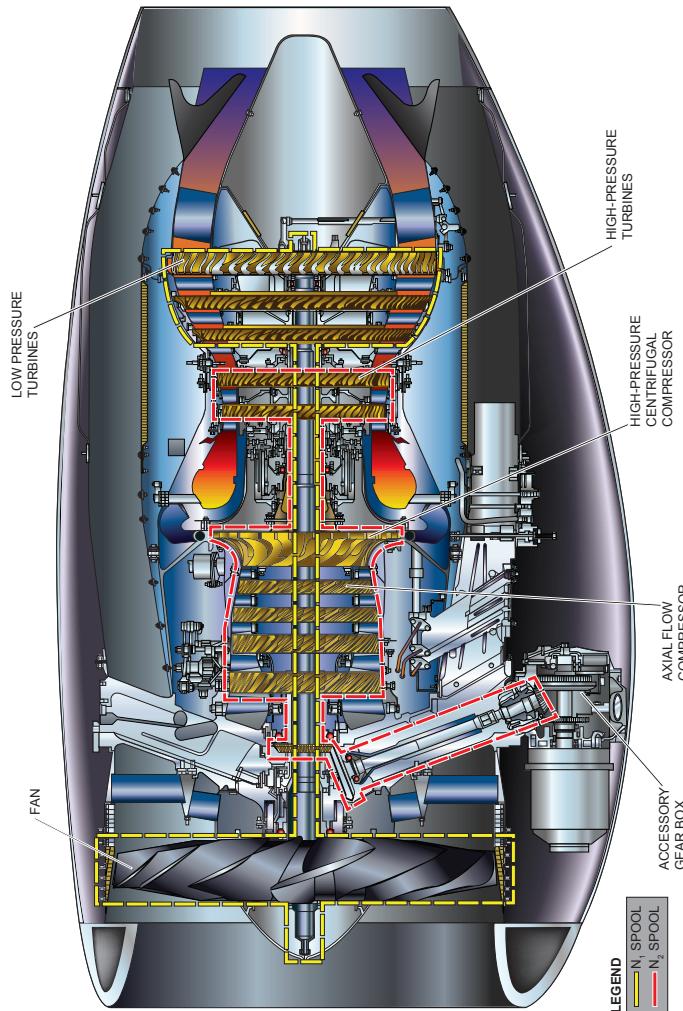
LP - Left Panel (pilot)

C11 - Eleventh column from the left

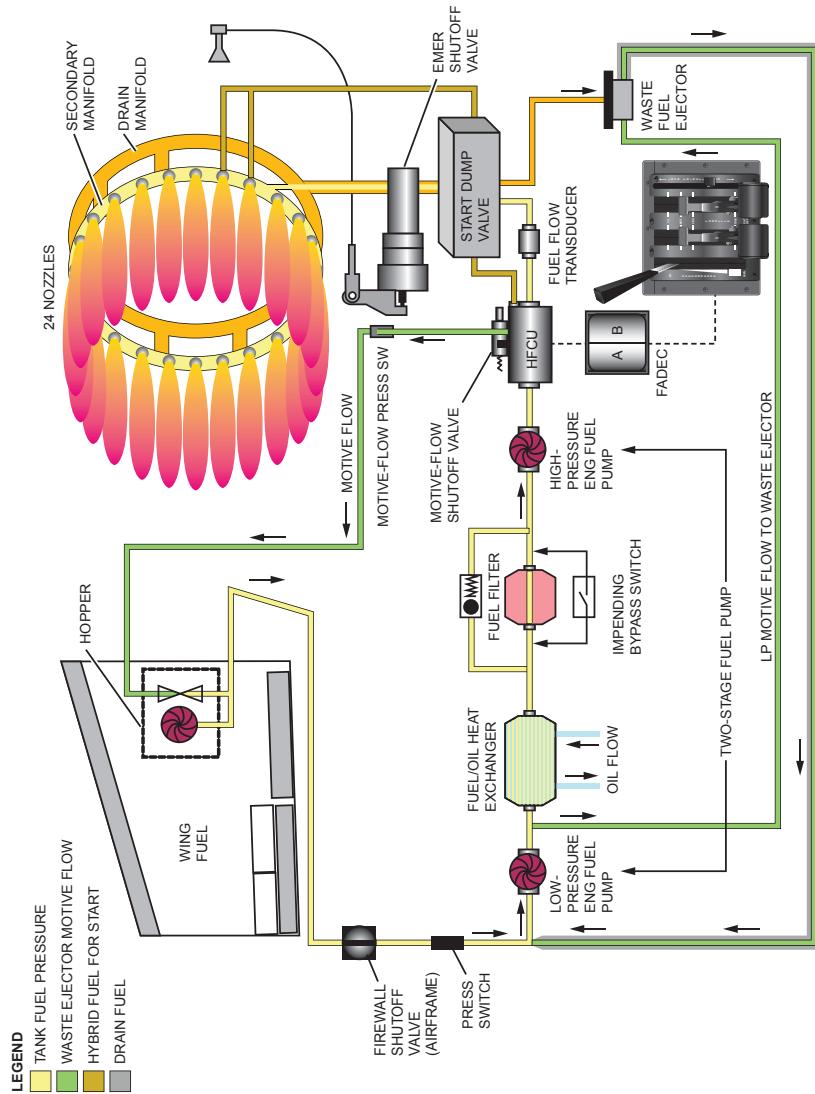
R3 - Third Row from the top

NOTE: The crew must always verify the label of the circuit breaker before taking any action. The circuit breaker label takes precedence over the quick-find callout if any discrepancy exists.

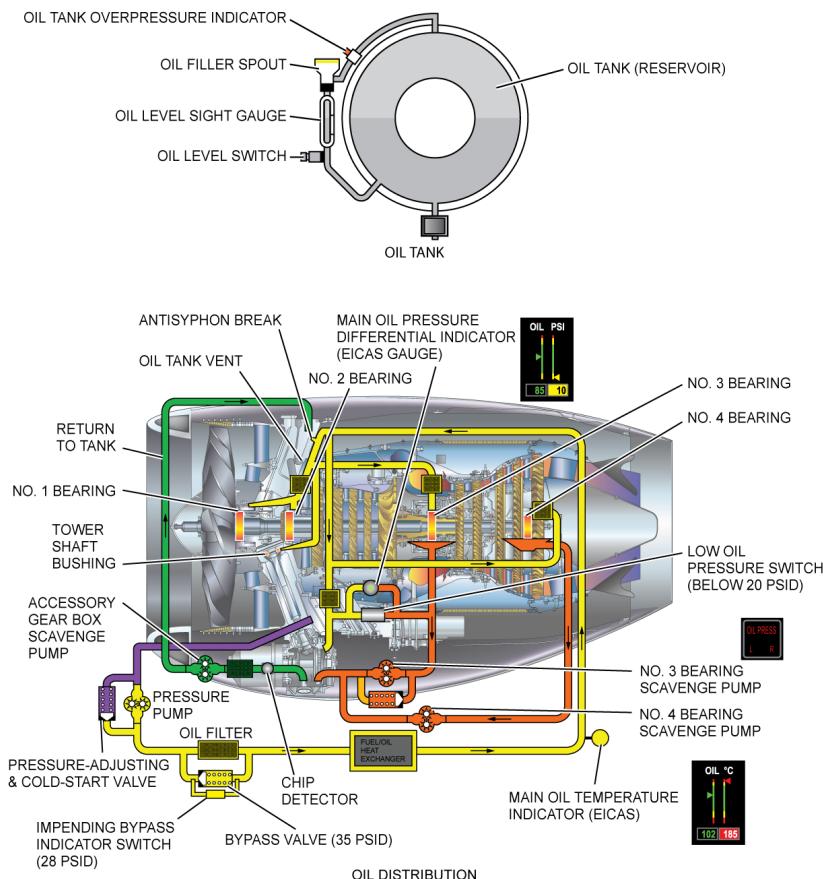
ENGINE CROSS SECTION



ENGINE FUEL SYSTEM



ENGINE OIL SYSTEM



DPLY AND EMER STOW

1 DPLY and EMER STOW

This message is displayed when a deployed thrust reverser is detected in flight. The amber ENGINE CONTROL FAULT L and/or R message will also be displayed. The rudder bias actuator arm will move to the minimum position. Rudder pedal force required for single-engine operations will increase significantly. The airplane will roll in the direction of the deployed reverser. Buffeting is cyclic in nature and is considered normal for this condition. The airplane is controllable through normal use of the flight controls. The autopilot is capable of controlling the airplane throughout this procedure.

1. T/R EMER STOW Button (flashing button) PUSH
2. Throttle (affected engine) IDLE
3. Airspeed REDUCE TO 150 KIAS MAXIMUM

NOTE: Amber T/R ARMED message and ARM will be displayed.

If Reverser Does Not Stow

WARNING: Do not advance the throttle on the affected engine. Reverse thrust will increase after the throttle has been brought to IDLE and then advanced.

4. Throttle (affected engine) CUTOFF

If Deployment Occurred Prior to Final Approach

5. L and R TR CONT Circuit Breakers
(LP-C1-R2 AND RP-C1-R2) CHECK
 6. Electrical Load MONITOR; DECREASE AS REQUIRED
 7. BUS TIE Button CLOSED
 8. Fuel CROSSFEED Selector AS REQUIRED
 9. TRANSPONDER TA ONLY
 10. Airspeed 150 KIAS MAXIMUM
 11. Land as soon as possible. Refer to "Single-Engine Approach and Landing" on page E-159.
- PROCEDURE COMPLETED

If Deployment Occurred During Final Approach

5. Throttle (operating engine) AS REQUIRED
6. Flaps 15° MAXIMUM
7. Airspeed V_{APP}
8. TAWS FLAP OVRD
(time and conditions permitting) ON
9. Multiply FLAPS 35° Landing Distance by 1.20.

CAUTION: Avoid landing with a tailwind or downhill runway gradient.

continued on next page

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NOTE: A go-around with a deployed thrust reverser should not be conducted unless absolutely necessary.

LANDING

1. Throttle IDLE
2. Speedbrakes (at touchdown) 100%
3. Elevator Control (at touchdown) FORWARD PRESSURE
4. Brakes (after nosewheel touchdown) APPLY
5. Thrust Reverser (operating engine after nosewheel touchdown) DEPLOY
6. Thrust Reverser IDLE BY 65 KIAS
PROCEDURE COMPLETED

If Reverser Stows

4. Thrust Reverser Annunciations VERIFY THE FOLLOWING:
 - a. Red DPLY indication changes to white ARM.
 - b. Amber T/R UNLOCK message clears.
 - c. Amber T/R ARMED and ENGINE CONTROL FAULT messages remain.
 - d. Thrust Reverser red EMER STOW light illuminates steady.
5. Throttle (affected engine) ADVANCE SLOWLY THEN NORMAL OPERATION
6. Airspeed 150 KIAS MAXIMUM
7. Altitude FL410 MAXIMUM
8. Land as soon as practical.
PROCEDURE COMPLETED

ENGINE FIRE L AND/OR R

2 ENGINE FIRE L and/or R

This message is displayed when an engine fire is detected. The red LH ENG FIRE and/or RH ENGINE FIRE light will also be illuminated. The affected red ENGINE FAILED message will be displayed when the engine is shut down using the ENG FIRE button with the throttle at or forward of the idle detent. It will be replaced by the cyan ENG SHUTDOWN message when the throttle is placed in cutoff.

Takeoff Above V₁ or in Flight at a Safe Altitude at or Above 400 feet AGL and Conditions Permitting

1. Throttle (affected engine) IDLE
2. ANTI-ICE WING/STAB XFLOW Button
(if bleed air anti-ice systems are on) XFLOW

If ENG FIRE Light Still Illuminated After 15 Seconds

3. Illuminated ENG FIRE Button PUSH
4. Either Illuminated BOTTLE ARMED Button PUSH
5. Throttle (operating engine) MCT OR AS REQUIRED
6. BUS TIE Button CLOSED
7. Illuminated BOTTLE ARMED Button
(if ENG FIRE light still illuminated after 30 seconds) PUSH
8. Throttle (affected engine) CUTOFF
9. Electrical Load MONITOR; DECREASE AS REQUIRED
10. BAGGAGE HEAT Button OFF
11. TCAS TA ONLY
12. Fuel CROSSFEED Selector AS REQUIRED

If in Icing Conditions

13. Land as soon as possible. The amber STAB ANTI-ICE COLD message may illuminate if ENG/STAB ANTI-ICE is selected ON. Ice may accumulate on the horizontal stabilizer. Refer to "Continued Flight in Icing Environment and Single Bleed Air Source" on page E-137.
PROCEDURE COMPLETED

If Not in Icing Conditions

13. Land as soon as possible. Refer to "Single-Engine Approach and Landing" on page E-159.
PROCEDURE COMPLETED

continued on next page

continued from previous page

If ENG FIRE Light Extinguishes With Throttle at IDLE and No Other Engine Fire Indications are Present (Probable Bleed Air Leak)

3. ENG BLD AIR Selector (affected side) OFF
4. BAGGAGE HEAT Button OFF
5. TCAS TA ONLY
6. Fuel CROSSFEED Selector AS REQUIRED
7. Throttle (affected engine) AS REQUIRED TO KEEP ENG FIRE LIGHT EXTINGUISHED
8. Altitude FL410 MAXIMUM (\leq 11 PASSENGERS) OR FL390 MAXIMUM (12 PASSENGERS)

If in Icing Conditions

9. Land as soon as practical. The amber STAB ANTI-ICE COLD message may illuminate if ENG/STAB ANTI-ICE is selected ON. Ice may accumulate on the horizontal stabilizer. Refer to "Continued Flight in Icing Environment and Single Bleed Air Source" on page E-137.

PROCEDURE COMPLETED

If Not in Icing Conditions

9. Land as soon as practical. Plan to use "Single-Engine Approach and Landing" on page E-159.

PROCEDURE COMPLETED

Takeoff Below V₁ or On The Ground

1. Takeoff ABORT
2. Throttles IDLE
3. Illuminated ENG FIRE Button PUSH
4. Either Illuminated BOTTLE ARMED Button PUSH
5. Throttle (affected engine) CUTOFF
(Throttle cannot be placed in CUTOFF unless the thrust reverser levers are stowed)
6. APU MASTER Button OFF
7. Illuminated BOTTLE ARMED Button
(if ENG FIRE light still illuminated after 30 seconds) PUSH
8. Park Brake SET
9. Throttles CUTOFF
10. BATT Buttons (both) OFF
11. Evacuate the airplane. Refer to "Emergency Evacuation" on page E-157.

PROCEDURE COMPLETED

ENGINE VIBRATION L AND/OR R**(3) ENGINE VIBRATION L and/or R**

This message is displayed when excessive engine vibration is detected.

1. Vibration CONFIRM (SOUND AND FEEL INDICATIONS)

If Vibration Exists

2. Throttle (affected engine) RETARD TO REDUCE VIBRATION

If Vibration Continues or Other Evidence of Engine Malfunction Exists

3. Consider shutting down the engine to prevent greater damage and subsequent engine failure. Refer to "Engine Failure or Precautionary Shutdown" on page E-17.
4. Land as soon as possible. If vibration continues in a running engine, the engine will likely fail.

PROCEDURE COMPLETED

If Vibration Discontinues and No Other Evidence of Engine Malfunction Exists

3. Continue flight at a reduced thrust setting on the affected side.
4. Land as soon as practical. Consideration should be given to accomplishing single-engine approach and landing procedures if the affected throttle is reduced below 60% N₁. Refer to "Single-Engine Approach and Landing" on page E-159, if appropriate.
5. If a go-around is attempted using both engines, the affected engine may fail. Consideration should be given to using "Single-Engine Go-Around/Engine Failure on Go-Around" on page E-160.

PROCEDURE COMPLETED

If Vibration Does Not Exist

2. Monitor engine parameters.
3. Land as soon as practical.

PROCEDURE COMPLETED

OIL PRESSURE LOW L AND/OR R**4 OIL PRESSURE LOW L and/or R**

This message is displayed when low oil pressure is detected. The red OIL PRESS L-R annunciator above the standby flight display may also illuminate.

1. EICAS.....CHECK ENGINE OIL PRESSURE

If Oil Pressure is Below 20 PSI

2. Throttle (affected engine).....CUTOFF
(refer to "Engine Failure or Precautionary Shutdown" on page E-17)
PROCEDURE COMPLETED

If Oil Pressure is Between 20 and 35 PSI

2. Throttle (affected engine).....DECREASE BELOW CRU DETENT
3. Oil TemperatureMONITOR (DECREASE THRUST IF TEMPERATURE LIMIT IS APPROACHED)
4. Land as soon as practical.
PROCEDURE COMPLETED

If Oil Pressure is Normal

2. Oil TemperatureMONITOR (DECREASE THRUST IF TEMPERATURE LIMIT IS APPROACHED)
3. Land as soon as practical.
PROCEDURE COMPLETED

ENGINE FAILURE OR OTHER EMERGENCY DURING TAKEOFF

Speed Below V₁

1. Takeoff ABORT
- PROCEDURE COMPLETED

Speed at or Above V₁

1. Climb to safe altitude.
2. ANTI-ICE WING/STAB XFLOW Button XFLOW
(if bleed air anti-ice systems are on)

If Engine Failure

3. Refer to "Engine Failure or Precautionary Shutdown" on page E-17.
- PROCEDURE COMPLETED

If Not Engine Failure

3. Refer to appropriate CAS message or Emergency/Abnormal Procedure.
- PROCEDURE COMPLETED

ENGINE FAILURE DURING FINAL APPROACH

1. Flaps 15°
2. Airspeed V_{APP}
3. Speedbrakes 0%
4. Landing Distance MULTIPLY FLAPS 35° BY 1.20

CAUTION: Avoid landing with a tailwind or downhill runway gradient.

5. TAWS FLAP OVRD (time and conditions permitting) ON
 6. Autopilot (prior to minimum use height) DISENGAGE
 7. Yaw Damper (prior to landing) DISENGAGE
- PROCEDURE COMPLETED

ENGINE FAILURE OR PRECAUTIONARY SHUTDOWN

For a precautionary shutdown, the affected engine should remain at idle for a minimum of 2 minutes prior to shutdown to allow the engine inter-turbine temperatures to stabilize. If an inoperative engine windmills for more than 15 minutes without a positive indication of oil pressure or 3 hours with a positive indication of oil pressure, ground maintenance procedures are required (reference Pratt and Whitney Engine Maintenance Manual).

1. Throttle (affected engine) IDLE
2. BUS TIE Button CLOSED

If Restart Will Not be Attempted

3. Throttle (affected engine) CUTOFF

NOTE: The flight crew shall agree on the correct (inoperative) engine prior to placing the throttle in the CUTOFF position.

4. Electrical Load MONITOR; DECREASE AS REQUIRED
5. TCAS TA ONLY
6. FUEL CROSSFEED Selector AS REQUIRED
7. FUEL BOOST Button ON
(Affected side, if flight will exceed 10 minutes)
8. BAGGAGE HEAT Button OFF
9. If the left engine is shut down, consider using the APU generator to power the left electrical bus.
 - a. APU (if not running and conditions permit, at or below FL200) TEST/START
 - b. APU SYSTEM GENERATOR button ON
 - c. BUS TIE button OPEN

If in Icing Conditions

10. Land as soon as practical. The amber STAB ANTI-ICE COLD message may appear if ENG/STAB ANTI-ICE is selected ON. Ice may accumulate on the horizontal stabilizer. Refer to "Continued Flight in Icing Environment and Single Bleed Air Source" on page E-137.
PROCEDURE COMPLETED

If Not in Icing Conditions

9. Land as soon as practical. Refer to "Single-Engine Approach and Landing" on page E-159.
PROCEDURE COMPLETED

If Restart Will be Attempted

3. Accomplish "In-Flight Restart - One Engine" on page E-30.
PROCEDURE COMPLETED

MAXIMUM GLIDE/EMERGENCY LANDING

1. Airspeed PER CHART BELOW

MAXIMUM GLIDE AIRSPEED (KIAS)

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
0°	115	122	128	133	139	144	152

2. Flaps..... CONFIRM 0°
3. Speedbrakes CONFIRM 0%
4. Landing Gear AS REQUIRED
 - a. Gear retraction may not be possible with both engines windmilling.
5. Shoulder Harness..... SECURE
6. Throttles (if sustained descent) CUTOFF
7. ELEC Buttons (both) (if more than 10 minutes to landing)..... EMER

BEFORE LANDING

8. PAX SAFETY Button ON
9. Flaps (if ELEC buttons NOT selected to EMER) 35°
 - a. The flaps may not extend fully if the left battery has been depleted.
If unable to verify flap position, assume flaps 0 for landing.
10. Landing Gear AS REQUIRED, USE BLOWDOWN

Landing gear will not retract after blowdown.

 - a. LANDING GEAR Handle..... DOWN
 - b. LANDING GEAR BLOWDOWN Handle PULL
 - c. Landing Gear CONFIRM 3 GREEN LIGHTS
11. Landing Data CONFIRM
 - a. Airspeed V_{REF} MINIMUM

V_{REF} (KIAS)

These airspeeds are the minimum recommended until landing flare to ensure sufficient energy to arrest descent rate.

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
0°	105	110	116	121	126	131	136
7°	100	106	111	116	120	125	130
15°	95	101	106	110	115	119	124
35°	89	94	99	103	107	111	116

- b. Landing Distance:
 - Flaps 0°..... MULTIPLY FLAPS 35° BY 2.08
 - Flaps 7°..... MULTIPLY FLAPS 35° BY 1.99
 - Flaps 15°..... MULTIPLY FLAPS 35° BY 1.90
 - Flaps 35°..... MULTIPLY FLAPS 35° BY 1.63

WARNING: Stick shaker will be inoperative, do not slow below V_{REF} .

continued on next page

*continued from previous page***CAUTION:**

- Avoid landing with a tailwind or downhill runway gradient. For flaps 7°, avoid landing at field elevations above 9,000 feet MSL.
- For flaps 0°, avoid landing at field elevations above 5,000 feet MSL.

LANDING

12. Brake Pedals REMOVE FEET
13. EMERGENCY BRAKE Handle PULL AS REQUIRED
 - a. Apply smooth, steady pressure to the emergency brake handle. Repeated application and release will deplete available pneumatic pressure. Anti-skid is inoperative. Emergency brake pressure is regulated for optimum braking at heavier weights on most dry surfaces.
14. Directional Control MAINTAIN WITH NOSEWHEEL STEERING PROCEDURE COMPLETED

DUAL ENGINE FLAMEOUT – CRUISE

1. Crew Oxygen Masks (if required) DON
2. Left and Right MIC SEL Buttons (if required) MASK
3. AP/TRIM/NWS DISC Button PUSH
4. PASS OXY Selector (if required) ON
5. Altitude DESCEND AT OR BELOW FL300 (AS REQUIRED)
6. Fuel CHECK TANKS/QUANTITY
7. ELEC Buttons (both) EMER
8. SECONDARY TRIM Button ON, TRIM AS REQUIRED

At or Below FL300, Attempt Engine Start

Refer to "Engine Airstart Envelope" on page E-29.

9. ELEC Buttons (both) NORM
10. APU System Generator Button (if APU is running) ON
11. BUS TIE Button CLOSED
12. INTERIOR Button OFF
13. HYDRAULIC PUMP ENG Buttons (both) UNLOAD
14. Throttles CUTOFF
15. Engine Firewall Shutoff (both) CHECK OPEN
(cyan FUEL FW SHUTOFF message not displayed)

With Starter Assist

16. Either ENGINE START Button PUSH
17. Throttle IDLE AT 9% N₂
18. Engine Instruments MONITOR

continued on next page

continued from previous page

- a. Abort start if no oil pressure increase within 20 seconds of engine light-up indicated by a rise in N₂ and ITT.
- b. Abort start if stabilized flight idle is not achieved within 90 seconds of engine light-up indicated by a rise in N₂ and ITT.
- c. Engine Instruments NORMAL INDICATIONS
- d. Fuel Pressure, Oil Pressure, and Generator
Messages (Side Started). NONE DISPLAYED
19. ENGINE START Button VERIFY LIGHT EXTINGUISHED
20. Opposite Engine (if first engine start successful) START
(Repeat steps 15 thru 18) (An unsuccessful engine battery start may deplete the batteries to a point where a second battery start may not be possible).
21. Refer to If Neither Engine Starts, If Only One Engine Starts, or If Both Engines Start procedure, as appropriate.

Windmill (Dual)

15. FUEL BOOST Buttons (both) ON
16. Airspeed 200 TO 250 KIAS
17. Throttles (at 9% N₂ minimum) IDLE
18. Engine Instruments MONITOR
 - a. Abort start if no oil pressure increase within 20 seconds of engine light-up indicated by a rise in N₂ and ITT.
 - b. Abort start if stabilized flight idle is not achieved within 90 seconds of engine light-up indicated by a rise in N₂ and ITT.
 - c. Engine Instruments NORMAL INDICATIONS
 - d. Fuel Pressure, Oil Pressure, and Generator
Messages (Side Started). NONE DISPLAYED
19. Refer to IF NEITHER ENGINE STARTS, IF ONLY ONE ENGINE STARTS, or IF BOTH ENGINES START (in this procedure), as appropriate.

If Neither Engine Starts

1. ELEC Buttons (both) (if APU generator not available) EMER
2. FUEL BOOST Buttons (both) NORM
3. Refer to "Maximum Glide/Emergency Landing" on page E-18.

If Only One Engine Starts

1. BUS TIE Button CLOSED
2. SECONDARY TRIM Button OFF
3. INTERIOR Button. NORM
4. FUEL BOOST Buttons
 - a. Operating Engine NORM
 - b. Inoperative Engine ON
(IF FLIGHT WILL EXCEED 10 MINUTES)
5. HYDRAULIC PUMP ENG Buttons (both) ON

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6. If the left engine is shut down, consider using the APU generator to power the left electrical bus.
 - a. APU TEST/START
 - b. APU SYSTEM GENERATOR Button ON
(if not running and conditions permit, at or below FL200)
 - c. BUS TIE Button OPEN

If in Icing Conditions

7. Land as soon as possible. The amber **STAB ANTI-ICE COLD** message may appear if ENG/STAB ANTI-ICE is selected ON. Ice may accumulate on the horizontal stabilizer. Refer to.

PROCEDURE COMPLETED

If Not in Icing Conditions

7. Land as soon as possible. Refer to "Single-Engine Approach and Landing" on page E-159.

PROCEDURE COMPLETED

If Both Engines Start

1. BUS TIE Button OPEN
2. SECONDARY TRIM Button OFF
3. INTERIOR Button NORM
4. FUEL BOOST Buttons (both) NORM
5. HYDRAULIC PUMP ENG Buttons (both) ON
6. Land as soon as possible.

PROCEDURE COMPLETED

DUAL ENGINE FLAMEOUT – LOW ALTITUDE

It is unlikely that an engine start using the battery or APU can be accomplished from below 1,000 feet AGL, or using a windmill start from below 3,000 feet AGL.

1. Fuel **CHECK TANKS/QUANTITY**
2. **FUEL BOOST Buttons (both)** **ON**
3. Throttles **CUTOFF**
4. AP/TRIM/NWS DISC Button **PUSH**
5. APU SYSTEM GENERATOR Button (if APU is running) **ON**
6. BUS TIE Button **CLOSED**
7. Either ENGINE START Button **PUSH**
8. Throttle **IDLE**
9. Engine Instruments **MONITOR**
 - a. Abort start if no oil pressure increase within 20 seconds of engine lightup indicated by a rise in N₂ and ITT.
 - b. Abort start if stabilized flight idle is not achieved within 90 seconds of engine light-up indicated by a rise in N₂ and ITT.
 - c. Engine Instruments **NORMAL INDICATIONS**
 - d. Fuel Pressure, Oil Pressure, and Generator Messages (Side Started) **NONE DISPLAYED**

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10. ENGINE START Button VERIFY LIGHT EXTINGUISHED
11. Opposite Engine (if first engine start successful or APU generator is online) START (REPEAT STEPS 6 THRU 9)

If Neither Engine Starts

12. Landing Gear AS REQUIRED, USE BLOWDOWN
 - a. LANDING GEAR Handle DOWN
 - b. LANDING GEAR BLOWDOWN Handle PULL
 - c. Landing Gear CONFIRM 3 GREEN LIGHTS
13. Flaps. 35°
The flaps may not extend fully if the left battery has been depleted during start attempts. If unable to verify flap position, assume flaps 0° for landing.
14. Landing Data CONFIRM
 - a. Airspeed V_{REF} MINIMUM

V_{REF} (KIAS)

These airspeeds are the minimum recommended until landing flare to ensure sufficient energy to arrest descent rate.

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
0°	105	110	116	121	126	131	136
7°	100	106	111	116	120	125	130
15°	95	101	106	110	115	119	124
35°	89	94	99	103	107	111	116

b. Landing Distance:

- Flaps 0°. MULTIPLY FLAPS 35° BY 2.08
- Flaps 7°. MULTIPLY FLAPS 35° BY 1.99
- Flaps 15°. MULTIPLY FLAPS 35° BY 1.90
- Flaps 35°. MULTIPLY FLAPS 35° BY 1.63

WARNING: Stick shaker may be inoperative, do not slow below V_{REF} .

CAUTION: Avoid landing with a tailwind or downhill runway gradient.

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LANDING

15. Brake Pedals REMOVE FEET
16. EMERGENCY BRAKE Handle PULL AS REQUIRED
 - a. Apply smooth, steady pressure to the emergency brake handle. Repeated application and release will deplete available pneumatic pressure. Anti-skid is inoperative. Emergency brake pressure is regulated for optimum braking at heavier weights on most dry surfaces.
17. Directional Control MAINTAIN WITH NOSEWHEEL STEERING
PROCEDURE COMPLETED

If Only One Engine Starts

12. BUS TIE Button CLOSED
13. FUEL BOOST Buttons
 - a. Operating Engine NORM
 - b. Inoperative Engine ..ON (IF FLIGHT WILL EXCEED 10 MINUTES)
14. If the left engine is shut down, consider using the APU generator to power the left electrical bus.
 - a. APU (if not running and conditions permit, at or below FL200) TEST/START
 - b. APU SYSTEM GENERATOR Button ON
 - c. BUS TIE Button OPEN

If in Icing Conditions

15. Land as soon as possible. The amber **STAB ANTI-ICE COLD** message may appear if ENG/STAB ANTI-ICE is selected ON. Ice may accumulate on the horizontal stabilizer. Refer to "Continued Flight in Icing Environment and Single Bleed Air Source" on page E-137.
PROCEDURE COMPLETED

If Not in Icing Conditions

15. Land as soon as possible. Refer to "Single-Engine Approach and Landing" on page E-159.
PROCEDURE COMPLETED

If Both Engines Start

12. BUS TIE Button OPEN
13. FUEL BOOST Buttons (both) NORM
14. Land as soon as possible.
PROCEDURE COMPLETED

ENG FIRE BOTTLE LOW 1 AND/OR 2

⑤ ENG FIRE BOTTLE LOW 1 and/or 2

This message is displayed when the respective engine fire bottle pressure is low.

1. Land as soon as possible.
PROCEDURE COMPLETED

ENG FIRE DETECT FAIL L AND/OR R

⑥ ENG FIRE DETECT FAIL L and/or R

This message indicates the affected engine fire detection system is inoperative.

1. Land as soon as practical.
PROCEDURE COMPLETED

ENGINE CHIP DETECT L AND/OR R

⑦ ENGINE CHIP DETECT L and/or R

This message is displayed when metal chips have been detected in the engine oil by the electronic magnetic chip detector switch.

1. Land as soon as practical (within 4 hours).
PROCEDURE COMPLETED

ENGINE CONTROL FAULT L AND/OR R**⑧ ENGINE CONTROL FAULT L and/or R**

This message is displayed when the redundancy of the engine control systems is reduced due to the FADEC detecting an internal fault or sensor miscompare.

1. FADEC RESET Button (affected side) PUSH
2. Monitor for reoccurrence.

If Message Does Not Clear

3. ANTI-ICE ENGINE/STAB Buttons (both) ON

If Message Still Does Not Clear (After 5 Minutes)

4. ANTI-ICE ENGINE/STAB Buttons (both) AS REQUIRED
5. Land as soon as practical. If the N₁ target indicator is amber, refer to AFM, Section IV, Performance, STANDARD CHARTS to confirm Takeoff/Go-Around and Maximum Continuous N₁ Thrust settings.
PROCEDURE COMPLETED

If Message Clears

4. ANTI-ICE ENGINE/STAB Buttons (both)
(when clear of visible moisture). OFF
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

If N₁ Target Indicator is Amber

3. Takeoff/Go-Around and Maximum Continuous N₁ Thrust Setting CONFIRM
(refer to AFM, Section IV, Performance, STANDARD CHARTS)
PROCEDURE COMPLETED

If N₁ Target Indicator is Not Amber

PROCEDURE COMPLETED

GROUND IDLE L AND/OR R**⑨ GROUND IDLE L and/or R**

This message is displayed when the FADEC is in ground mode when the airplane is actually in the air.

1. FADEC RESET Button (affected side) PUSH

If Message Does Not Clear

2. FADEC SELECT A/B Button (affected side). PUSH TO SELECT OTHER FADEC CHANNEL

If Message Still Does Not Clear

3. Do not reduce thrust below 73% N₂, as engine acceleration times will be significantly longer due to the idle setting change.
4. Multiply FLAPS 35° Landing Distance by 1.10.

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

OIL LEVEL LOW L AND/OR R**⑩ OIL LEVEL LOW L and/or R**

This message is displayed when the oil quantity is too low for an engine start with the airplane on level ground. This message is displayed only on the ground with engines not running. This message is cyan if the oil level low sensor is failed.

1. Service affected engine oil level prior to starting the engine.
PROCEDURE COMPLETED

T/R ARMED L AND/OR R**(11) T/R ARMED L and/or R**

This message is displayed when the respective thrust reverser is armed in flight.

1. Thrust Reverser Levers CHECK STOWED (DOWN POSITION)
2. T/R EMER STOW Buttons VERIFY NOT PRESSED
(Red light extinguished)

If Message Does Not Clear

3. T/R EMER STOW Button (affected side) PUSH
4. Airspeed 150 KIAS MAXIMUM
5. Altitude FL410 MAXIMUM
6. Land as soon as practical.
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

T/R UNLOCK L AND/OR R**(12) T/R UNLOCK L and/or R**

This message is displayed when two or more of four locks are sensed to be unlocked on the respective thrust reverser in flight. If three or four locks are sensed to be unlocked on the respective thrust reverser, the rudder bias actuator arm will move to the minimum position and rudder pedal force required for single-engine operations will increase significantly.

1. T/R EMER STOW Button (affected side) PUSH
2. Thrust Reverser Levers CHECK STOWED (DOWN POSITION)
3. Airspeed 150 KIAS MAXIMUM
4. Altitude FL410 MAXIMUM
5. Land as soon as practical.
PROCEDURE COMPLETED

ENGINE AIRSTART ENVELOPE

CAUTION:

- In order to maintain ITT below the start limits, the engine ITT must be $\leq 500^{\circ}\text{C}$ prior to start initiation.
- Do not attempt to restart an engine if it is possible that ice has formed in the engine or engine inlet. Significant damage to the engine can occur.

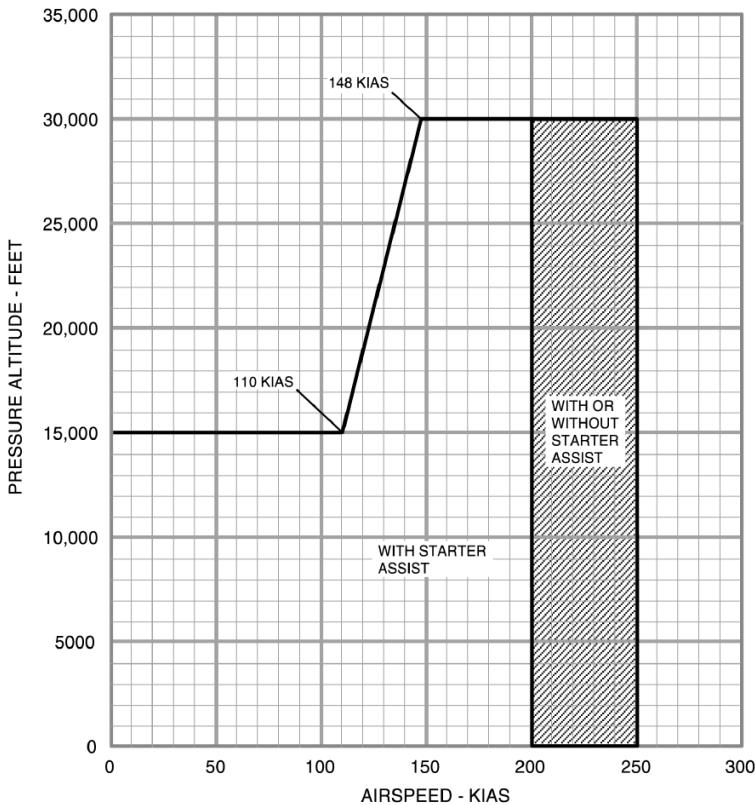
NOTE:

- Engine windmilling astart requires a minimum turbine speed of 9% RPM (N_2); otherwise starter assist is required.
- Residual ITTs below 150°C increase the probability of a successful starter assisted astart.
- Although the engines may be started at any time and increased once a stable idle is achieved, in order to minimize the potential of turbine blade rub, the following procedure is recommended for intentional engine shut downs and restarts for functional check flights, training, etc. Initiate start within 1 minute of engine shutdown, or wait 10 minutes or more after engine shutdown. Remain at idle for at least 2 minutes after achieving stabilized idle, if the engine had been operated above idle during the previous 30 minutes.

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*continued from previous page***ENGINE AIRSTART ENVELOPE**

A25925



IN-FLIGHT RESTART - ONE ENGINE

Refer to previous page for Engine Airstart Envelope.

1. Throttle (affected engine) CUTOFF
2. FUEL CROSSFEED Selector OFF
3. FUEL BOOST Button (affected side) ON
4. HYDRAULIC PUMP ENG Button (affected side) UNLOAD
5. BUS TIE Button CLOSED
6. Engine Firewall Shutoff CHECK OPEN
(cyan **FUEL FW SHUTOFF** CAS message not displayed)
7. ANTI-ICE ENGINE/STAB and WING Buttons OFF FOR START
(affected side)

CAUTION:

- In order to maintain ITT below the start limits, the engine ITT must be $\leq 500^{\circ}\text{C}$ prior to start initiation.
- Do not attempt to restart an engine if it is possible that ice has formed in the engine or engine inlet. Significant damage to the engine can occur.

With Starter Assist

During the start, equipment (including selected flight guidance modes) on the side of the starting engine may lose power momentarily and then recover.

8. AP/TRIM/NWS DISC Button PUSH
9. Yaw Damper AS DESIRED
10. ENGINE START Button (affected engine) PUSH
11. Throttle (affected engine) IDLE AT 9% N₂
12. Engine Instruments MONITOR
 - a. Abort start if no oil pressure increase within 20 seconds of engine light-up indicated by a rise in N₂ and ITT.
 - b. Abort start if stabilized flight idle is not achieved within 90 seconds of engine light-up indicated by a rise in N₂ and ITT.
 - c. Engine Instruments NORMAL INDICATIONS
 - d. Fuel Pressure, Oil Pressure,
and Generator Messages (Side Started) NONE DISPLAYED

CAUTION: The flight crew is responsible for monitoring N₁, N₂ and ITT during ainstarts. The FADEC system will not auto-abort an ainstart for an ITT exceedance.

13. ENGINE START Button VERIFY LIGHT EXTINGUISHED
14. Refer to If Engine Does Not Start or If Engine Does Start (in this procedure), as appropriate.

Without Starter Assist (Windmill)

8. Throttle (affected engine; 9% N₂ RPM minimum;
airspeed 200-250 KIAS) IDLE

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9. Engine Instruments MONITOR
 - a. Abort start if no oil pressure increase within 20 seconds of engine light-up indicated by a rise in N₂ and ITT.
 - b. Abort start if stabilized flight idle is not achieved within 90 seconds of engine light-up indicated by a rise in N₂ and ITT.
 - c. Engine Instruments NORMAL INDICATIONS
 - d. Fuel Pressure, Oil Pressure, and Generator Messages (Side Started) NONE DISPLAYED
10. Refer to If Engine Does Not Start or If Engine Does Start (in this procedure), as appropriate.

If Engine Does Not Start

1. ENGINE START DISENGAGE Button (if required) PUSH
2. Throttle (affected engine) CUTOFF
3. HYDRAULIC PUMP ENG Button (affected side) ON
4. Electrical Load MONITOR; DECREASE AS REQUIRED
5. TRANSPONDER TA ONLY
6. FUEL CROSSFEED Selector AS REQUIRED
7. FUEL BOOST Button (affected side if flight will exceed 10 minutes) ON
8. BAGGAGE HEAT Button OFF
9. If the left engine is shut down, consider using the APU generator to power the left electrical bus.
 - a. APU (if not running and conditions permit, at or below FL200) TEST/START
 - b. APU SYSTEM GENERATOR Button ON
 - c. BUS TIE Button OPEN

If in Icing Conditions

10. Land as soon as practical. The amber **STAB ANTI-ICE COLD** message may appear if ENG/STAB ANTI-ICE is selected ON. Ice may accumulate on the horizontal stabilizer. Refer to "Continued Flight in Icing Environment and Single Bleed Air Source" on page E-137.
PROCEDURE COMPLETED

If Not in Icing Conditions

10. Land as soon as practical. Refer to "Single-Engine Approach and Landing" on page E-159.
PROCEDURE COMPLETED

If Engine Starts

1. FUEL BOOST Button (affected side) NORM
2. HYDRAULIC PUMP ENG Button (affected side) ON WITH ENGINE AT IDLE
3. BUS TIE Button OPEN
4. TRANSPONDER TA/RA

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5. Autopilot and Yaw Damper AS DESIRED
 6. Anti-Ice Systems AS REQUIRED
 7. APU OFF OR AS DESIRED
 8. Fuel Load Balance MONITOR/MAINTAIN
- PROCEDURE COMPLETED

ENGINE START MALFUNCTION (ENGINE DOES NOT START)

1. Throttle (affected engine) CUTOFF
2. ENGINE START DISENGAGE Button PUSH

If Unable to Attempt Another Start

3. Land as soon as practical. Refer to "Engine Failure or Precautionary Shutdown" on page E-17.
- PROCEDURE COMPLETED

If Able to Attempt Another Start

On Ground

3. GEN Switch (affected engine) RESET (HOLD FOR 3 SECONDS) THEN OFF
 4. Refer to "Dry Motoring" on page E-35, prior to making another start attempt.
- PROCEDURE COMPLETED

In Flight

3. Refer to "In-Flight Restart - One Engine" on page E-30.
- PROCEDURE COMPLETED

ENGINE STARTER DOES NOT DISENGAGE**(ENGINE L or R START Light on After Engine Start)**

1. ENGINE START DISENGAGE Button PUSH

If Starter Does Not Disengage and ENGINE START Button Remains Illuminated (Start Relay Failed Closed).

Engine start will proceed normally and the generator will come online.

CAUTION: If the engine is shut down before accomplishing the appropriate steps below, the starter will continue to operate.

On Ground

2. APU SYSTEM STOP Button (if APU is running) PUSH
3. External Power DISCONNECT
4. BATT Buttons (both) OFF
5. Throttle(s) CUTOFF

In Flight

2. BATT Button (affected engine; if engine is not running) OFF
3. BUS TIE Button OPEN

If Single-Engine

4. Land as soon as practical. Refer to "Electrical System Distribution" on page E-50 and "Single-Engine Approach and Landing" on page E-159.
PROCEDURE COMPLETED

If Multi-Engine

4. Land as soon as practical.

SHUTDOWN

5. APU SYSTEM STOP Button (if APU is running) ... PUSH
 6. External Power DISCONNECT
 7. BATT Buttons (both) OFF
 8. Throttle(s) CUTOFF
- PROCEDURE COMPLETED

If Starter Disengages

Engine start will proceed normally and the generator should come on line. (The generator control unit failed to automatically open the start relay after reaching approximately 46% N₂ and pushing the ENGINE START DISENGAGE button corrected the condition).

PROCEDURE COMPLETED

HIGH SUSTAINED ITT DURING GROUND SHUTDOWN

1. Throttle (affected engine) CUTOFF
2. ENGINE START Button (affected engine) PUSH
3. ENGINE START DISENGAGE Button PUSH AFTER 15 SECONDS
PROCEDURE COMPLETED

OIL PRESSURE LOW (NO CAS MESSAGE OR ANNUNCIATOR)

Below 20 PSI (No Other Evidence of a Problem Exists and Oil Temperature is Normal)

1. Land as soon as practical.
PROCEDURE COMPLETED

Between 20 And 35 PSI (Sustained)

Oil pressure in the amber range from 20 to 35 PSI is normal during ground idle, and in flight for a short period following reduction from high thrust to idle.

1. Throttle (affected engine) DECREASE BELOW CRU DETENT
2. Oil Temperature MONITOR (DECREASE THRUST IF TEMPERATURE LIMIT IS APPROACHED)
3. Land as soon as practical.
PROCEDURE COMPLETED

OIL PRESSURE HIGH (>110 PSI)

Oil pressure above 110 PSI is normal following engine start in cold conditions, until the engine has warmed up. Refer to AFM, Operating Information, "Extreme Cold Weather Operations."

1. Throttle (affected engine) DECREASE TO REDUCE OIL PRESSURE AT OR BELOW 110 PSI

If the Indication Does Not Respond

2. Throttle (affected engine) CUTOFF
(Refer to "Engine Failure or Precautionary Shutdown" on page E-17)
PROCEDURE COMPLETED

If the Indication Responds but Pressure is Above 110 PSI at Idle

2. Oil Temperature MONITOR

If Oil Temperature Increases

Engine damage may result from poor lubrication due to the high oil pressure and temperature.

3. Throttle (affected engine) CUTOFF
(Refer to "Engine Failure or Precautionary Shutdown" on page E-17)
PROCEDURE COMPLETED

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If Oil Temperature is Normal

3. Throttle (affected engine) AS REQUIRED
 4. Land as soon as practical.
- PROCEDURE COMPLETED

If the Indication Responds and Pressure Goes Below 110 PSI

PROCEDURE COMPLETED

OIL TEMPERATURE HIGH (>135°C)

1. Throttle (affected engine) DECREASE TO REDUCE OIL TEMPERATURE AT OR BELOW 135°C

If the Oil Temperature Does Not Decrease Below 135°C, Fuel Temperature Limit is Reached, or Oil Pressure Limit is Reached

Engine damage may result from poor lubrication due to the high oil pressure and temperature

2. Throttle (affected engine) CUTOFF
(Refer to "Engine Failure or Precautionary Shutdown" on page E-17)
- PROCEDURE COMPLETED

If the Oil Temperature Decreases Below 135°C and all Other Engine Indications are Normal

PROCEDURE COMPLETED

DRY MOTORING

1. Throttle (affected engine) CUTOFF
 2. IGNITION Switch (affected engine) OFF
 3. ENGINE START Button (affected engine) PUSH
Motor engine for desired duration (observe starter limits; refer to AFM, Operating Limitations, "Start Cycle Limits").
 4. START DISENGAGE Button PUSH
 5. IGNITION Switch (affected engine) NORM
- PROCEDURE COMPLETED

ENGINE N₁ TARGET INDICATOR AMBER

This indication is displayed when the N₁ target being displayed is from the FADEC channel that is in control of the engine and cross check comparison is not being accomplished. The cyan **ENGINE DISPATCH LIMIT** message will also be displayed when on the ground.

If the ENGINE CONTROL FAULT Message is Displayed

1. Refer to "ENGINE CONTROL FAULT L and/or R" on page E-25.
PROCEDURE COMPLETED

If the ENGINE CONTROL FAULT CAS Message is not Displayed

1. Takeoff/Go-Around and Maximum
Continuous N₁ Thrust Settings.....CONFIRM
(Refer to AFM, Section IV, Performance, STANDARD CHARTS)
2. Land as soon as practical.
PROCEDURE COMPLETED

ENGINE DISPATCH LIMIT L AND/OR R

⑬ ENGINE DISPATCH LIMIT L and/or R

This message is displayed when the respective engine FADEC has detected a condition that will require a logbook entry and maintenance within 125 hours of the message being posted. This message is inhibited in flight. Pressing the EVENT MARKER button on the pilot's lower left panel will record additional information to assist maintenance.

ENGINE SHUTDOWN L AND/OR R

⑭ ENGINE SHUTDOWN L and/or R

This message is displayed when the engine throttle has shut down the respective engine or when a below idle recovery is in progress. The message clears after completion of the engine start sequence.

OIL FILTER BYPASS L AND/OR R**(15) OIL FILTER BYPASS L and/or R**

This message is displayed when the pressure across the oil filter becomes large enough due to debris contamination. This check is only active when the oil temperature is greater than -38°C.

Ten hours of operation are allowed, provided the associated amber **ENGINE CHIP DETECT L and/or R** message is not displayed.

1. Engine Oil Pressure/Temperature MONITOR
PROCEDURE COMPLETED

OIL LEVEL LOW L AND/OR R**(16) OIL LEVEL LOW L and/or R**

This message is displayed when a fault has occurred in the oil level low sensor. If engine oil level is low, this message will be amber. This message is displayed only on the ground.

1. Oil Level Sight Gage
(affected engine) CHECK WITHIN
5 TO 20 MINUTES OF SHUTDOWN
OR DRY MOTORING
 - a. Refer to "Dry Motoring" on page E-35, if required.

If Oil Level is Below Min Level of Sight Gage

2. Service oil to between MIN and MAX level of the sight gage.
PROCEDURE COMPLETED

If Oil Level is Above Min Level of Sight Gage

PROCEDURE COMPLETED

APU FIRE**(17) APU FIRE**

This message is displayed when a fire is detected in the APU. The APU FIRE light will also be illuminated.

1. APU FIRE Button PUSH

WARNING: The airplane batteries must be installed and the battery buttons ON or the aircraft generator(s) must be operating and on prior to and during all APU operations to assure fire protection system power.

NOTE: This step will discharge the APU fire extinguisher. APU shutdown will occur immediately after the APU FIRE light illuminates and the extinguisher bottle will be automatically discharged in 8 seconds if the crew has not pushed the APU FIRE button.

2. APU SYSTEM MASTER Button OFF
3. Land as soon as possible.

PROCEDURE COMPLETED

APU FIRE DETECT FAIL**(18) APU FIRE DETECT FAIL**

This message is displayed when the APU SYSTEM MASTER button is selected ON and the APU fire detect system is inoperative. The APU will not start and will automatically shut down if it is running.

1. APU CONFIRM SHUTDOWN
2. Refer to Normal Procedures, "APU Shutdown."

PROCEDURE COMPLETED

APU ON**(19) APU ON**

This message is displayed when the APU is running and altitude is greater than FL300. This message is cyan when altitude is less than or equal to FL300.

1. APU SYSTEM STOP Button PUSH
2. APU SYSTEM READY TO LOAD Light EXTINGUISHED
3. APU SYSTEM MASTER Button OFF

PROCEDURE COMPLETED

APU SYS FAIL**(20) APU SYS FAIL**

Indication on APU control panel indicates failure of APU self-test or automatic shutdown. APU will not start.

On Ground

1. APU SYSTEM MASTER Button. OFF, TO RESET
2. APU SYSTEM MASTER Button. ON

If APU SYS FAIL Light Still Illuminated

3. APU SYSTEM MASTER Button OFF
PROCEDURE COMPLETED

If APU SYS FAIL Light Extinguishes

3. APU. TEST/START
(REFER TO NORMAL PROCEDURES, "APU GROUND OR
IN-FLIGHT START (AT OR BELOW FL200)"
PROCEDURE COMPLETED

In Flight

1. APU SYSTEM MASTER Button. OFF
2. Do not attempt APU start.
PROCEDURE COMPLETED

APU FAILS TO START

1. APU SYSTEM MASTER Button. OFF
2. APU. ATTEMPT START AGAIN
(REFER TO NORMAL PROCEDURES, "APU GROUND OR
IN-FLIGHT START (AT OR BELOW FL200)"
 - a. Observe APU start-cycle limits.
PROCEDURE COMPLETED

APU START RELAY STUCK

(Cyan APU RELAY ENGAGED Light Stays Illuminated After APU Start and APU Generator is Not Online)

The cyan APU RELAY ENGAGED light will be illuminated during APU start and will normally extinguish at approximately 50% RPM. When the start is complete, the cyan READY TO LOAD light will illuminate. The cyan APU RELAY ENGAGED light will also illuminate when the APU generator is providing power to the left emergency bus.

On Ground

If APU Continues to Run

1. Throttles.....CUTOFF
2. External Power.....DISCONNECT
3. BATT Buttons (both).....OFF, APU SHOULD SHUT DOWN
4. Batteries.....DISCONNECT IN BATTERY COMPARTMENT
PROCEDURE COMPLETED

If APU Shuts Down

PROCEDURE COMPLETED

In Flight

1. AltitudeFL300 MAXIMUM

WARNING: Do not shut down the APU until on the ground.

AFTER LANDING

2. Throttles.....CUTOFF
3. External Power.....DISCONNECT
4. BATT Buttons (both).....OFF, APU SHOULD SHUT DOWN

If APU Continues to Run

5. BatteriesDISCONNECT IN BATTERY COMPARTMENT
PROCEDURE COMPLETED

If APU Shuts Down

PROCEDURE COMPLETED

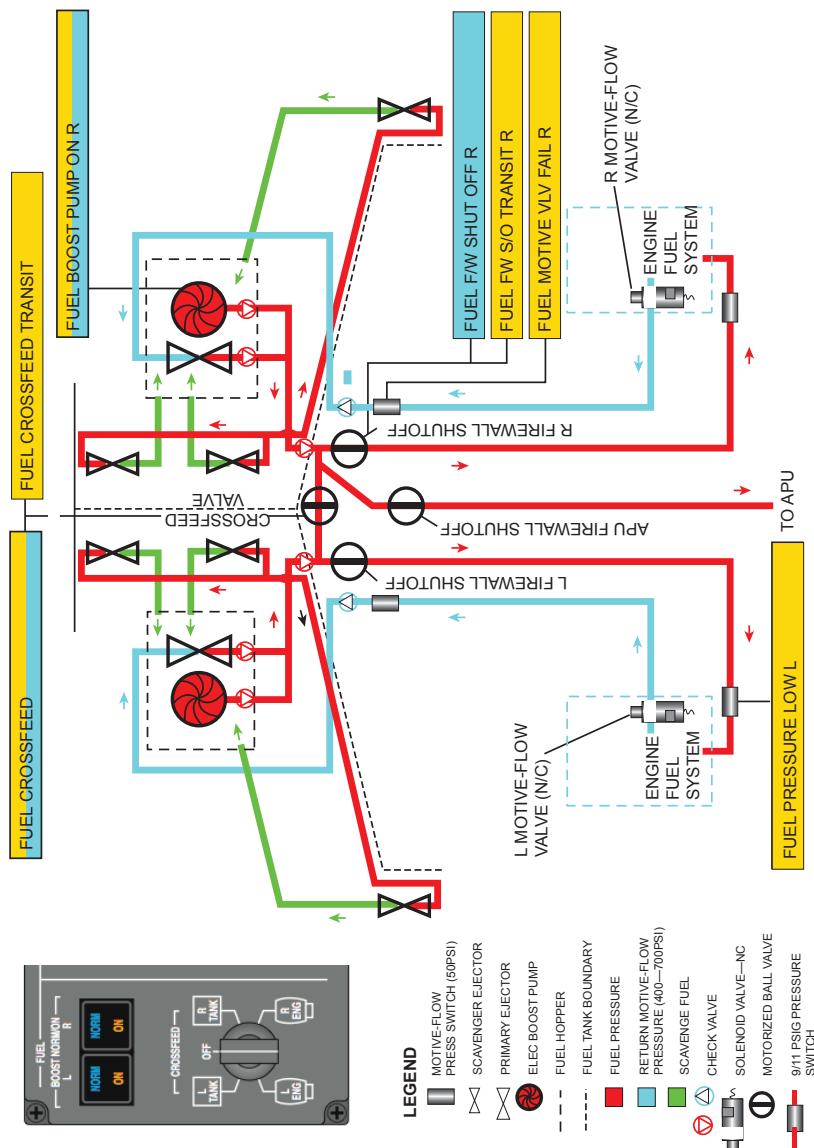
APU ON

21 APU ON

This message is displayed when the APU is running and altitude is less than or equal to FL300. This message is amber if altitude is greater than FL300.

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FUEL SYSTEM



FUEL BOOST PUMP ON L AND/OR R**(22) FUEL BOOST PUMP ON L and/or R**

This message (and the respective amber ON light in the FUEL BOOST button) is displayed when the pump is activated by the low pressure switch. This message is cyan when the fuel boost pump is on in normal operation (i.e., FUEL BOOST L or R button is selected ON by the crew, or automatically comes on during an engine start).

1. FUEL BOOST Button (affected side) PUSH
2. Land as soon as practical.

PROCEDURE COMPLETED

FUEL CROSS FEED**(23) FUEL CROSS FEED**

This message is displayed when the crossfeed valve is open and flow is in the wrong direction with an imbalance more than 60 pounds. This message is displayed cyan when flow is in the correct direction. While crossfeeding, the receiving engine's oil temperature will increase approximately 20°C.

1. FUEL CROSSFEED Selector AS REQUIRED
(select higher quantity tank)
2. Fuel CHECK QUANTITY

PROCEDURE COMPLETED

FUEL CROSS FEED TRANSIT**(24) FUEL CROSS FEED TRANSIT**

This message is displayed when the crossfeed valve is neither fully open nor closed. Crossfeed may or may not occur, depending on actual valve position and primary ejector pump pressure differences.

1. FUEL CROSSFEED Selector OFF

If Message Does Not Clear

2. FUEL BOOST Buttons (both) ON

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

FUEL FILTER BYPASS L AND/OR R**(25) FUEL FILTER BYPASS L and/or R**

This message is displayed when there is an impending bypass of the fuel filter due to fuel contamination.

1. Land as soon as practical.

WARNING: It is possible that contaminated fuel could have been introduced into both fuel tanks. Monitor opposite engine, restrict crossfeed and consider possible partial or total loss of thrust from both engines. Inspect filters after landing.

PROCEDURE COMPLETED

FUEL FW S/O TRANSIT L AND/OR R**(26) FUEL FW S/O TRANSIT L and/or R**

This message is displayed when the fuel firewall shutoff valve is neither fully open nor closed.

CAUTION: Do not cycle the ENG FIRE button. The valve may fail fully open.

1. Land as soon as possible.

PROCEDURE COMPLETED

FUEL LEVEL LOW L AND/OR R**(27) FUEL LEVEL LOW L and/or R**

This message is displayed when the affected tank fuel quantity is less than 540 ± 60 pounds. EICAS fuel quantity digits for each wing tank will turn amber at less than 500 pounds remaining and the total fuel quantity digits will turn amber at less than 1,000 pounds remaining. The respective amber FUEL LOW L or R annunciator above the standby flight display may also illuminate.

1. FUEL BOOST Button (affected side) ON
2. Land as soon as possible.

PROCEDURE COMPLETED

FUEL MOTIVE VLV FAIL L AND/OR R**(28) FUEL MOTIVE VLV FAIL L and/or R**

This message is displayed when crossfeed is selected and the opposite side motive flow pressure failed to drop because the respective shutoff valve has failed to close. Crossfeed from the opposite tank may not occur. Fuel will continue to feed from the affected tank.

1. FUEL CROSSFEED Selector. OFF
PROCEDURE COMPLETED

FUEL PRESSURE LOW L AND/OR R**(29) FUEL PRESSURE LOW L and/or R**

This message is displayed when the fuel pressure supplied to the engine is low. The engine could run irregularly or stop altogether. This message should clear if normal fuel pressure is restored by the respective fuel boost pump. The amber FUEL BOOST ON L and/or R message will be displayed and the amber ON light in the FUEL BOOST button will be illuminated when the fuel boost pump activates.

1. FUEL BOOST Button (affected side) PUSH

If Amber FUEL BOOST PUMP ON Message Does Not Display
(Fuel Boost Pump Is Inoperative)

WARNING: Do not reset the FUEL BOOST circuit breakers.
Do not attempt to crossfeed from the tank on the side with low pressure and a failed boost pump.

- If fuel pressure is low and the boost pump is failed, the engine may flame out.
2. Altitude MAINTAIN, OR DESCEND IF PRACTICAL
(do not climb)
 3. Avoid rapid throttle movements.
 4. Land as soon as practical.
- PROCEDURE COMPLETED

If Amber FUEL BOOST PUMP ON CAS Message Displays

PROCEDURE COMPLETED

FUEL BOOST PUMP ON L AND/OR R**(30) FUEL BOOST PUMP ON L and/or R**

This message is displayed when the fuel pump is on in normal operation (i.e., Fuel BOOST L or R button selected ON by the crew, or automatically comes on during an engine start).

FUEL CROSS FEED**(31) FUEL CROSS FEED**

This message is displayed when the fuel crossfeed valve is open and fuel is flowing from the tank with more fuel. This message will be amber when fuel is flowing from the tank with less fuel.

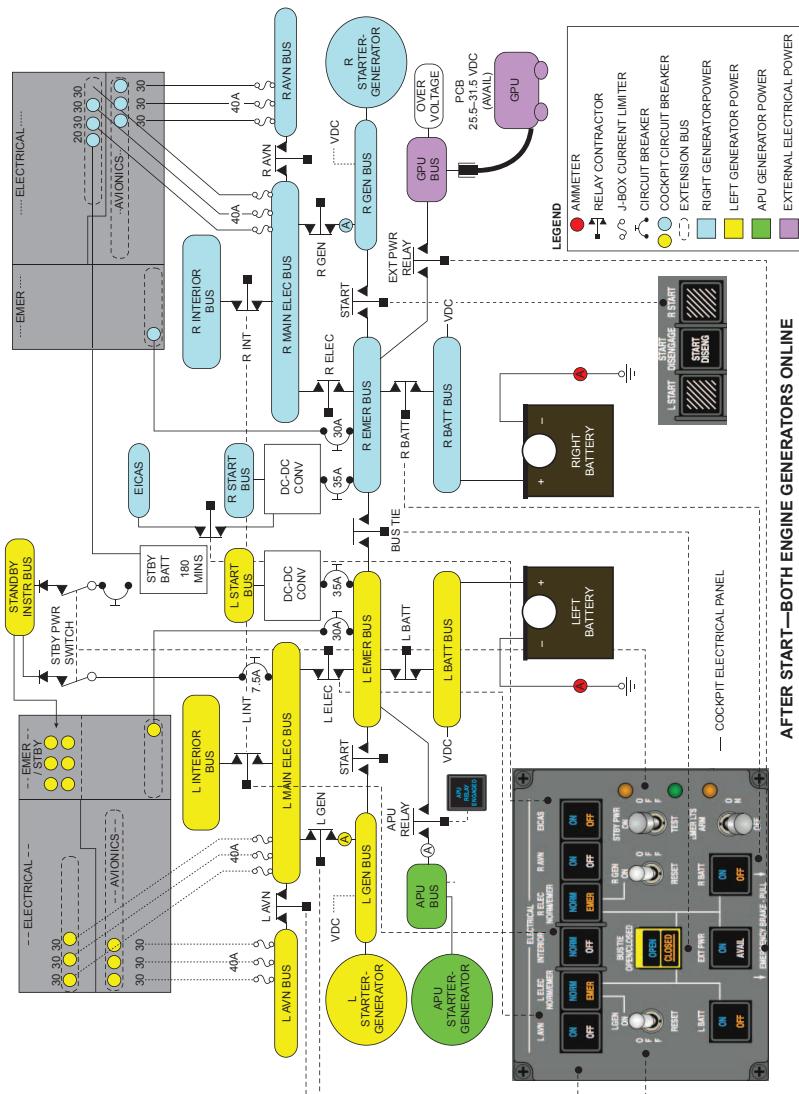
NOTE: While crossfeeding, the receiving engine's oil temperature will increase approximately 20°C.

FUEL FW SHUTOFF L AND/OR R**(32) FUEL FW SHUTOFF L and/or R**

This message is displayed when the fuel firewall shutoff valve is fully closed.

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ELECTRICAL SYSTEM



ELECTRICAL SYSTEM DISTRIBUTION

Left Distribution Buses

LEFT CB PANEL (CB Panel Labels are in UPPER CASE)		
AVIONICS BUS	ELECTRICAL BUS (MAIN)	EMERGENCY BUS
AIR DATA MODULE 1	L AOA COMPUTER	AUDIO AMP 1
L AVN COOLING FAN	L AOA CASE HEAT	Landing Gear Control 1 (LDG GEAR CONT 1)
L ATT/HDG	L AOA VANE HEAT	L BLEED AIR MONITOR
MAU 1	L PITOT HEAT	AILERON TRIM
L AUDIO WARNING	L STATIC HEAT	L MCDU
Display Unit 1 (DU1) (Cold & Warm)	L Engine/Stabilizer Anti-Ice (L ENGINE ANTI-ICE)	L Battery Control (L BATTERY CONT)
Display Unit 3 (DU3)	L WING ANTI-ICE	L Annunciator Lights (L ANNUN LIGHT)
L Cursor Control (L CURSOR CONT)	L Windshield Anti-Ice (L WSHLD ANTI-ICE)	START BUS # 2
L Display Control (L DISPLAY CONT)	OXYGEN	
L AFCS Guidance Control (L AFCS GDNC CONT)	Cockpit Flood Lights (COCKPIT FLOOD LTS)	L Fire Detection (L FIRE DETECT)
L AUTOPILOT YAW DAMP	Warning Lights 1 (WARNING LTS 1)	L Hydraulic Firewall Shutoff (L HYD FW SOV)
L Annunciator Power (L ANNUN POWER)	Auto Temperature Control (AUTOTEMP)	L Fuel Firewall Shutoff (L FUEL FW SOV) GLARESHIELD LIGHT
Radar Control (RADAR CONT)	COCKPIT RECIRC FAN	
RADAR	CABIN DOOR SYSTEM	
RADIO ALTIMETER 1	L ARINC	STANDBY BUS
TCAS II	L START	SFD Magnetometer (STBY HDG)
	L Fuel Boost Pump (L FUEL BOOST)	STBY HSI
	L Thrust Control (L T/R CONT)	STBY FLIGHT DISPLAY
	L Thrust Reverser Emergency Stow (L T/R EMER STOW)	STBY AIR DATA UNIT
	L Bleed Air Control (L BLEED AIR CONT)	L Stby Engine Instruments (STBY L ENG INST)
	Aileron Roll Ratio (AILERON RATIO SYS)	R Stby Engine Instruments (STBY R ENG INST)
	Primary Stab Trim Control (PRI STAB TRIM CONT)	

*Power for the Start Bus is from the Emergency Bus.

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LEFT J-BOX		
AVIONICS BUS	ELECTRICAL BUS (MAIN)	
SELCAL	Ground Recognition Lights	Stby Bus Feed
Radio Telephone/Cabin Interphone	Anti-Collision Lights	L Bus Sense
AFCS Aileron Servo	L/R Wing Inspection Lights	L CB Monitor PCB
AFCS Elevator Servo	L Landing Light	WOW System 1
AFCS Rudder Servo	L SW Lights	MAU 3 (Auxiliary)
Central Maintenance Computer	L Dimming	Primary Stab Trim
START BUS # 1		Power
Start Bus #2 Feed	L Hydraulics	Flap Control
L FADEC A	L Fuel Boost Pump	L RAT A Heat
R FADEC A (Standby)	L Fuel Control Module	R RAT A Heat
MAU 3 (Primary)	L Fuel Qty Signal Conditioner	Baggage Door
L Attitude/Heading, Auxiliary Power (Controlled by EICAS button on 680-0291 and On)	L Bleed Air Leak Detection	Cockpit Voice Recorder
	Aft Baggage Smoke Detection	Cabin Recirc Fan
	L Baggage Fire Bottle Squib	
	Power	

LEFT EMERGENCY J-BOX		
LEFT EMERGENCY BUS		LEFT HOT BUS
L Precooler	MRC1 ADF	Aft Baggage Light
ECU	MRC1 DME	Tailcone Light
L Emergency Distribution	MRC1 NAV	L Battery Voltage
Fwd Emergency Battery Pack	MRC1 NIM	
APU Bus Sense	MRC1 VHF COMM	
L Ignitor A Power	MRC1 XPDR	
R Ignitor A Power	Antiskid System	

*Power for the Start Bus is from the Emergency Bus.

Right Distribution Buses

RIGHT HAND CB PANEL (CB Panel Labels are in UPPER CASE)		
AVIONICS BUS	ELECTRICAL BUS (MAIN)	
AIR DATA MODULE 2	R AOA COMPUTER	R ARINC
R AVN COOLING FAN	R AOA CASE HEAT	R START
R ATT/HDG	R AOA VANE HEAT	R Fuel Boost Pump (R FUEL BOOST)
MAU2	R PITOT HEAT	R Thrust Control (R T/R CONT)
R AUDIO WARNING	R STATIC HEAT	R Thrust Reverser
Display Unit 4 (DU4) (Cold & Warm)	R Engine/Stabilizer Anti-Ice (R ENGINE ANTI-ICE)	Emergency Stow (R T/R EMER STOW)
R Cursor Control (R CURSOR CONT)	R WING ANTI-ICE	R Bleed Air Control (R BLEED AIR CONT)
R Display Control (R DISPLAY CONT)	R Windshield Anti-Ice (R WSHLD ANTI-ICE)	R BLEED AIR MONITOR
R MCDU	Rain Removal Fan (RAIN REMOVAL)	CABIN PRESSURE
R AFCS Guidance Control (R AFCS GDNC CONT)	EL INVERTER	FLIGHT HOUR METER
R AUTOPILOT	Map Lights (MAP LIGHT)	Standby Battery Charge
R YAW DAMPER	PANEL LIGHTS	
R Annunciator Power (R ANNUN POWER)	Warning Lights 2 (WARNING LTS 2)	
Cabin Briefe (CAB BRIEFER)	R COCKPIT RECIRC FAN	
DATA LOADER	MACH TRIM	
Lightning Detection (LIGHTNING DETECT)	NOSEWHEEL STEERING	
	EICAS Power Control (EICAS PWR CONT)	
	Auxiliary Hydraulic Pump (AUX HYD PUMP)	
START BUS # 2		
	R Fire Detection (R FIRE DETECT)	
	R Hydraulic Firewall Shutoff (R HYD FW SOV)	
	R Fuel Firewall Shutoff (R FUEL FW SOV)	
EMERGENCY BUS		
AUDIO AMP 2	RUDDER TRIM	STBY STATIC HEAT
Landing Gear Control 2 (LDG GEAR CONT 2)	APU MASTER	R Battery Control (R BATTERY CONT)
Emergency Pressurization (EMER PRESSURE)	APU Fire Detection (APU FIRE DETECT)	R Annunciator Lights (R ANNUN LIGHT)
Manual Temperature Control (MANUAL TEMP)	STBY PITOT HEAT	

* Power for the Start Bus is from the Emergency Bus.

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RIGHT J-BOX		
AVIONICS BUS	ELECTRICAL BUS (MAIN)	
MRC2 ADF	Navigation Lights	R Bleed Air Leak Detection
MRC2 DME	R Landing Light	Fwd Baggage Smoke
MRC2 NAV	Taxi Light	Detection
MRC2 NIM	Pulse Light	R Baggage Fire Bottle Squib
MRC2 VHF COMM	Tail Flood Lights	Power
MRC2 XPDR	R SW Lights	Smoke/Fire Module
HF2 Receiver	R Dimming	R Bus Sense
VDR Radio	R Hydraulics	R CB Monitor PCB
Flight Data Recorder	R Fuel Boost Pump	Diagnostics Power (Gnd only)
	R Fuel Control Module	WOW System 2
	R Fuel Qty Signal	MAU4 (Auxiliary)
	Conditioner	L RAT B Heat
	Speedbrakes	R RAT B Heat
START BUS # 1	EICAS BUS*	
Start Bus #2 Feed	R FADEC Test	Display Unit 2 (Cold)
R FADEC B	R Attitude/Heading,	Display Unit 2 (Warm)
L FADEC B (Standby)	Auxiliary Power	Engine Vibration
	MAU 4 (Primary)	

RIGHT EMERGENCY J-BOX		
RIGHT EMERGENCY BUS		RIGHT HOT BUS
R Precooler	L Ignitor B Power	ELT
Rudder Bias	R Ignitor B Power	Cabin Entry Lights
R Emergency Distribution	Secondary Stab Trim	Under Pylon Work Lights
Aft Emergency Battery Pack	HF 1 Receive	R Battery Voltage

* Power for the Start Bus and EICAS Bus is from the Emergency Bus.

BATTERY O'TEMP L AND/OR R**(33) BATTERY O'TEMP L and/or R**

This message is displayed when the battery temperature is at +63°C. The red BATTERY O'TEMP message will first occur at +63°C. If the battery temperature continues to rise, the MASTER WARNING and aural warning will repeat at +71°C.

1. BATT Button (affected side) OFF

If Neither Cyan BATTERY OFF L or R Message is Displayed

2. ELEC Button (affected side) EMER
3. Battery Temperature MONITOR

If Battery Temperature Continues to Rise

4. Land as soon as possible
PROCEDURE COMPLETED

If Battery Temperature Stabilizes or Decreases

4. Land as soon as practical. Refer to "Electrical System Distribution" on page E-50 for affected equipment or systems if battery power is depleted prior to landing
PROCEDURE COMPLETED

If Cyan BATTERY OFF L and/or R Message is Displayed

2. Battery Temperature MONITOR

If Battery Temperature Continues to Rise

3. Land as soon as possible.
PROCEDURE COMPLETED

If Battery Temperature Stabilizes or Decreases

PROCEDURE COMPLETED

DC GEN OFF L AND/OR R AND/OR APU**34 DC GEN OFF L and/or R and/or APU**

This message is displayed when the aircraft is operating on battery power only and at least one source of generator power is available (left or right engine driven generator, or APU generator if the APU is running). The red GEN OFF annunciator above the standby flight display will also illuminate. One APU start attempt is permitted within 60 minutes following loss of both engine driven generators.

If APU Is Running

1. APU SYSTEM GENERATOR Button ON
2. BUS TIE Button (if required) CLOSED
3. Electrical Load MONITOR; DECREASE AS REQUIRED
4. GEN Switches (both) RESET (HOLD FOR 3 SECONDS),
THEN OFF
5. Generators CHECK VOLTS

If Either or Both Engine Driven Generator(s) Voltage is 27-29 Volts

6. GEN Switch (generator(s) with voltage 27-29 volts) ON
7. Generator Amps VERIFY GENERATOR(S) ON LINE

If Neither Engine Driven Generator Comes On Line

8. Land as soon as practical.
PROCEDURE COMPLETED

If Only Left Engine Driven Generator Comes On Line

8. APU AS DESIRED
PROCEDURE COMPLETED

If Only Right Engine Driven Generator Comes On Line

8. BUS TIE Button OPEN
PROCEDURE COMPLETED

If Both Engine Driven Generators Come On Line

8. BUS TIE Button OPEN
PROCEDURE COMPLETED

If Neither Engine Driven Generator Voltage is 27-29 Volts

6. Land as soon as practical.
PROCEDURE COMPLETED

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If APU Is Not Running

1. Fuel CROSSFEED Selector OFF
2. INTERIOR Button OFF
3. GEN Switches (both) RESET
(HOLD FOR 3 SECONDS), THEN OFF
4. Generators CHECK VOLTS

If Either or Both Generator(s) Voltage is 27-29 Volts

5. GEN Switch (generator(s) with voltage \leq 29 volts) ON
6. Generator Amps VERIFY GENERATOR(S) ON LINE

If Neither Engine Driven Generator Comes On Line

7. Continue with "If APU is Not Running; If Neither Engine Driven Generator Voltage is 27-29 Volts" in this procedure.

If Only One Engine Driven Generator Comes On Line and Use of APU Generator is Not Desired

7. BUS TIE Button CLOSED
8. Fuel CROSSFEED Selector AS REQUIRED
9. INTERIOR Button NORM
10. Electrical Load MONITOR,
DECREASE AS REQUIRED

PROCEDURE COMPLETED

If Only Right Engine Driven Generator Comes On Line and Use of APU Generator is Desired

7. BUS TIE Button CLOSED
8. APU (if not running and conditions permit, at or below FL200) TEST/START
9. APU SYSTEM GENERATOR Button ON
10. BUS TIE Button OPEN
11. Fuel CROSSFEED Selector AS REQUIRED
12. INTERIOR Button NORM

PROCEDURE COMPLETED

If Both Engine Driven Generators Come On Line

7. BUS TIE Button OPEN
8. Fuel CROSSFEED Selector AS REQUIRED
9. INTERIOR Button NORM

PROCEDURE COMPLETED

If Neither Engine Driven Generator Voltage is 27-29 Volts

5. EICAS Button OFF

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*continued from previous page***If Conditions Do Not Permit Use of APU Generator Within 60 Minutes After the Second Engine Driven Generator Failure**

6. AP/TRIM/NWS DISC Button PUSH
7. ELEC Buttons (both) EMER
 - a. With no generator on line and the ELEC buttons in EMER, the batteries will supply DC power to the emergency bus equipment for approximately 60 minutes, provided EMER was selected within 5 minutes after failure of the second engine driven generator. This includes an allowance for one APU start attempt within one hour.
 - b. If the ELEC buttons are re-selected to NORM, the amber **CABIN DOOR OPEN** message will be displayed and cannot be corrected in flight.
 - c. Exterior lighting will be inoperative.
 - d. The fuel crossfeed valve will remain in its selected position.
 - e. All anti-ice valves (except the crossflow valves) will go to the open position.
 - f. Windshield heat will be inoperative.
 - g. Nosewheel steering is inoperative.
 - h. Gear retraction is not possible.
 - i. Emergency power distribution is shown in "Electrical System Distribution" on page E-50.
8. BUS TIE Button CLOSED
9. SECONDARY TRIM Button ON, TRIM AS REQUIRED
10. Standby Instruments MONITOR
11. AUX Lights Knob AS DESIRED
12. Airspeed MACH 0.77 MAXIMUM
13. Altitude FL410 MAXIMUM
14. Pressurization USE CABIN ALT LEVER AND PRESSURIZATION RATE KNOB
15. Exit icing environment.
16. Land as soon as possible. Refer to BEFORE LANDING, in this procedure.

If Conditions Permit Use of APU Generator Within 60 Minutes But Will be More Than 5 Minutes After the Second Engine Driven Generator Failure

6. AP/TRIM/NWS DISC Button PUSH
7. ELEC Buttons (both) EMER
 - a. With no generator on line and the ELEC buttons in EMER, the batteries will supply DC power to the emergency bus equipment for approximately 60 minutes, provided EMER was selected within 5 minutes after failure of the second engine driven generator. This includes an allowance for one APU start attempt within one hour.

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- b. If the ELEC buttons are re-selected to NORM, the amber CABIN DOOR OPEN message will be displayed and cannot be corrected in flight.
 - c. Exterior lighting will be inoperative.
 - d. The fuel crossfeed valve will remain in its selected position.
 - e. All anti-ice valves (except the crossflow valves) will go to the open position.
 - f. Windshield heat will be inoperative.
 - g. Nosewheel steering is inoperative.
 - h. Gear retraction is not possible.
 - i. Emergency power distribution is shown in "Electrical System Distribution" on page E-50.
8. BUS TIE Button CLOSED
9. SECONDARY TRIM Button ON, TRIM AS REQUIRED
10. Standby Instruments MONITOR
11. AUX Lights Knob AS DESIRED
12. Airspeed MACH 0.77 MAXIMUM
13. Altitude FL410 MAXIMUM
14. Pressurization USE CABIN ALT LEVER AND PRESSURIZATION RATE KNOB
15. Exit icing environment.
16. When conditions permit the use of the APU generator
- a. ELEC Buttons (both) NORM
(The amber **CABIN DOOR OPEN** message will be displayed and cannot be corrected in flight.)
 - b. APU (at or below FL200) TEST/START
 - c. APU SYSTEM GENERATOR Button ON
 - d. EICAS Button ON (AHRS/IRS WILL REALIGN)
 - e. SECONDARY TRIM Button OFF
 - f. Autopilot/Flight Director AS DESIRED
 - g. Fuel CROSSFEED Selector AS REQUIRED
 - h. INTERIOR Button ON
 - i. Airspeed and Altitude USE NORMAL LIMITS
 - j. CABIN PRESS MODE Buttons NORM/AUTO, SELECT LANDING FIELD ELEVATION
 - k. Electrical Load MONITOR, DECREASE AS REQUIRED
17. Land as soon as practical.
- PROCEDURE COMPLETED

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If Conditions Permit Use of APU Generator Within 5 Minutes After the Second Engine Driven Generator Failure

6. BUS TIE Button CLOSED
7. APU (at or below FL200) TEST/START
8. APU SYSTEM GENERATOR Button ON
9. EICAS Button ON (AHRS/IRS WILL REALIGN)
10. Fuel CROSSFEED Selector AS REQUIRED
11. INTERIOR Button NORM
12. Electrical Load MONITOR, DECREASE AS REQUIRED
13. Land as soon as practical.

BEFORE LANDING

1. Landing Data CONFIRM
 - a. Airspeed V_{REF}

V_{REF} (KIAS)

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
0°	105	110	116	121	126	131	136
7°	100	106	111	116	120	125	130
15°	95	101	106	110	115	119	124
35°	89	94	99	103	107	111	116

- b. For flaps 0°, multiply FLAPS 35° Landing Distance by 1.39.
- c. For flaps 7°, multiply FLAPS 35° Landing Distance by 1.29.
- d. For flaps 15°, multiply FLAPS 35° Landing Distance by 1.20.

WARNING: Stick shaker will be inoperative. Do not slow below V_{REF} .

CAUTION:

- Avoid landing with a tailwind or downhill runway gradient.
- For flaps 7°, avoid landing at field elevations above 9,000 feet MSL.
- For flaps 0°, avoid landing at field elevations above 5,000 feet MSL.

2. Crew Briefing COMPLETE
3. Avionics and Flight Instruments CHECK/SET
4. Passenger Briefing COMPLETE
5. Seats/Seat Belts/
Shoulder Harnesses/Aft Divider DOORS CHECKED/SECURED/
LATCHED OPEN
6. EMER LTS Switch ON

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7. Pressurization.....ZERO DIFFERENTIAL PRESSURE AT TOUCHDOWN
8. Landing GearDOWN (3 GREEN)
9. Speedbrakes0%
10. Airspeed..... V_{REF}
PROCEDURE COMPLETED

ELECTRICAL SYSTEM SMOKE OR FIRE

1. Oxygen Masks/GogglesDON AND EMER

WARNING: Some large eyeglasses, headsets, hats and hairstyles may interfere with the quick donning capability of the mask. It is the crew members responsibility to make sure that the mask can be donned quickly.

2. Left and Right MIC SEL Buttons.....MASK
3. PASS OXY Knob (if fire source is known and away from oxygen system)IF APPROPRIATE
(assure passengers are receiving oxygen)

CAUTION: Selection of the passenger oxygen system to ON may be appropriate in situations where the flight crew determines it is safe to do so and where supplemental oxygen may assist the passengers' breathing in a smoke filled cabin.

4. PAX SAFETY ButtonON
5. Determine source of smoke or fire.

Unknown Source

6. AP/TRIM/NWS DISC ButtonPUSH
7. AUX Lights KnobAS DESIRED
8. Standby InstrumentsMONITOR
9. GEN Switches (both)OFF
10. ELEC Buttons (both)EMER

NOTE: After the L and R ELEC buttons have been selected to EMER, the following indications will be present: both amber inverse video T/R UNLK annunciations, aileron and rudder trims will be blank, stab trim will be amber dashes, fuel quantities will be amber dashes, the flap position indicator will be amber, hydraulic pressure will be amber dashes, and hydraulic volume will fluctuate erratically. The following messages will also be displayed: amber BLEED AIR MONITOR FAIL L, CABIN ALTITUDE, DC EMER BUS L and/or R, and HYDRAULIC VOLUME LOW.

11. SECONDARY TRIM ButtonON, TRIM AS REQUIRED
12. Cockpit Divider DoorOPEN
13. Exit icing environment.

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continued from previous page
If Normal Battery Discharge (≤ 30 Amps Per Battery) and Smoke is Clearing (Fault On Main Bus)

14. EICAS Button OFF
 15. Pressurization CONTROL MANUALLY
 (USE CABIN LEVER AS REQUIRED.)
 16. Land as soon as possible (within 60 minutes). Refer to BEFORE LANDING in this procedure.
 Refer to BEFORE LANDING, this procedure, or EMERGENCY/ABNORMAL Procedures, "Smoke Removal" on page E-79 if required.

BEFORE LANDING

17. Landing Gear DOWN
 (3 green lights)
 18. Landing Data.....CONFIRM
 a. Airspeed V_{REF}

V_{REF} (KIAS)

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
0°	105	110	116	121	126	131	136
7°	100	106	111	116	120	125	130
15°	95	101	106	110	115	119	124
35°	89	94	99	103	107	111	116

- b. Landing Distance:
 Flaps 0° MULTIPLY FLAPS 35° BY 1.39
 Flaps 7° MULTIPLY FLAPS 35° BY 1.29
 Flaps 15° MULTIPLY FLAPS 35° BY 1.20

WARNING: Stick shaker will be inoperative. Do not slow below V_{REF} .

CAUTION:

- Avoid landing with a tailwind or downhill runway gradient.
- For flaps 7°, avoid landing at field elevations above 9,000 feet MSL.
- For flaps 0°, avoid landing at field elevations above 5,000 feet MSL.
- The batteries will supply DC power to the emergency bus equipment for approximately 60 minutes. This includes an allowance for one APU start attempt.
- Exterior lighting will be inoperative.
- The fuel crossfeed valve will remain in its selected position. If a change is necessary, select the change prior to selecting the ELEC buttons to EMER.
- All anti-ice valves (except the crossflow valves) will go to the open position.

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- Windshield heat will be inoperative.
- Nosewheel steering is inoperative.
- Gear retraction is not possible.
- Emergency power distribution is shown in "Electrical System Distribution" on page E-50.

19. Speedbrakes..... 0%

20. Airspeed V_{REF}

PROCEDURE COMPLETED

If High Battery Discharge (Fault on Emergency Bus)

14. GEN Switches (both) ON
15. SECONDARY TRIM Button OFF
16. BATT Button (bus with high discharge) OFF
17. ELEC Button (side with normal operation) NORM
18. EICAS Display Button
(if R ELEC button is in EMER) RIGHT
19. Autopilot and Yaw Damper AS DESIRED
20. Land as soon as possible (within 60 minutes). Refer to "Electrical System Distribution" on page E-50, for affected equipment and systems.

WARNING: Whether or not smoke has dissipated, if it cannot be visibly confirmed that any fire has been extinguished following fire suppression and/or smoke evacuation, land immediately at the nearest suitable airport.

PROCEDURE COMPLETED

If Smoke Continues or Unable to Determine Faulty Emergency Bus

14. GEN Switches (both) ON
15. SECONDARY TRIM Button OFF
16. BATT Buttons (both) OFF
17. EICAS Display Button RIGHT
18. Land as soon as possible (within 60 minutes). Refer to "Electrical System Distribution" on page E-50, for affected equipment and systems.

PROCEDURE COMPLETED

Known Source - Cockpit

6. Isolate Faulty Circuit(s) PULL CIRCUIT BREAKER(S)
7. Land as soon as practical.

WARNING: Whether or not smoke has dissipated, if it cannot be visibly confirmed that any fire has been extinguished following fire suppression and/or smoke evacuation, land immediately at the nearest suitable airport.

PROCEDURE COMPLETED

continued on next page

*continued from previous page***Known Source - Cabin**

6. INTERIOR Button..... OFF
7. Land as soon as practical.

WARNING: Whether or not smoke has dissipated, if it cannot be visibly confirmed that any fire has been extinguished following fire suppression and/or smoke evacuation, land immediately at the nearest suitable airport.

PROCEDURE COMPLETED

BATTERY O'CURRENT L AND/OR R**(35) BATTERY O'CURRENT L and/or R**

This message is displayed when the battery current is ≥ 200 amps (positive or negative).

1. BATT Button (affected side)..... OFF
(Equipment on the associated emergency bus will be inoperative if the associated ELEC button is selected to EMER)
2. EICAS Display Button
(if R ELEC Button is in EMER)..... RIGHT
3. Battery Ammeter(affected side) CHECK AMPS

If Still High Discharge (>200 Amps, Fault on Battery Bus)

4. Land as soon as possible.

If Battery Discharge Drops

4. Land as soon as practical.

PROCEDURE COMPLETED

BATTERY OFF L AND/OR R**(36) BATTERY OFF L and/or R**

This message is displayed when the respective L BATT or R BATT button has been selected OFF. This message will be cyan if the battery has been selected OFF in response to a battery overtemperature and the overtemperature condition still exists.

1. BATT Button (affected side)..... ON
- PROCEDURE COMPLETED

BUS TIE CLOSED

(37) BUS TIE CLOSED

This message is displayed when the bus tie contactor between the emergency buses is closed. To accommodate in-flight engine or APU starts, selected cases start out cyan and then change to amber after 5 minutes if an electrical source is active on both sides.

1. BUS TIE Button CHECK/AS REQUIRED
PROCEDURE COMPLETED

DC EMER BUS L AND/OR R

(38) DC EMER BUS L and/or R

This message is displayed when the respective emergency bus isolation relay is open, either automatically by DC generator overcurrent protection or by pilot selection of the affected electrical L or R ELEC buttons to EMER. This message is inhibited when the opposite side engine start contactor is closed. The affected R or L ELEC button will indicate amber EMER.

If ELEC Button Not Intentionally Selected to EMER

WARNING: Do not select the ELEC button to EMER.

- Do not select the BUS TIE button closed.

NOTE: If the current exceeds 600 amps for 4 seconds or more, the bus tie relay will automatically latch open and the amber DC EMER BUS L and/or R message will be displayed. The respective emergency bus will be on battery power only.

- If the current exceeds 600 amps for seven seconds or more, the generator relay will automatically open and the amber DC GEN OFF L and/or R message will be displayed along with the amber DC EMER BUS L and/or R message.

1. Battery Amps (affected side) CHECK

If Unable to Determine Amps

2. BATT Button (affected side) OFF
3. FUEL CROSSFEED Selector OFF
4. GEN Switch (affected side) OFF
5. EICAS Button (if R ELEC is EMER) SELECT RIGHT
6. Fuel CROSSFEED Selector OFF
7. L and R FUEL BOOST Circuit Breakers (LP-C2R1 and RP-C11R1) PULL

NOTE: (For airplanes 680-001 thru 680-0289 and 0291 thru 0296 not incorporating SB680-24-11)

continued on next page

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8. SECONDARY TRIM Button
(if L GEN switch was selected OFF) ON
 9. Land as soon as possible. Refer to "Electrical System Distribution" on page E-50, for affected systems and equipment and "Landing Gear Will Not Extend" on page E-153.
- PROCEDURE COMPLETED

If >30 Amps (Fault on Emergency Bus)

2. BATT Button (affected side) OFF
 3. EICAS Button (if R ELEC is EMER) RIGHT
 4. Land as soon as possible. Refer to "Electrical System Distribution" on page E-50, for affected systems and equipment, and "Landing Gear Will Not Extend" on page E-153.
- PROCEDURE COMPLETED

If ≤30 Amps (Fault On Main Bus)

2. FUEL CROSSFEED Selector OFF
3. GEN Switch (affected side). OFF
4. BUS TIE Button. CLOSED
5. Fuel CROSSFEED Selector OFF
6. L and R FUEL BOOST Circuit Breakers (LP-C2R1 and RP-C11R1). PULL
7. SECONDARY TRIM Button ON
(if L GEN switch was selected OFF)

NOTE: For airplanes 680-001 thru 680-0289 and 0291 thru 0296 not incorporating SB680-24-11

8. Land as soon as possible. Refer to "Electrical System Distribution" on page E-50, for affected systems and equipment.
- PROCEDURE COMPLETED

If ELEC Button Intentionally Selected to EMER

1. ELEC Button (affected side). CHECK AS REQUIRED
- PROCEDURE COMPLETED

DC GEN O'CURRENT L AND/OR R AND/OR APU**39 DC GEN O'CURRENT L and/or R and/or APU**

This message is displayed when the current for the respective generator is too high. This message is inhibited during engine start and for 2 minutes after start. Current limits are listed below:

Current limits are listed below:

STATUS	ENGINE LIMIT	APU LIMIT
Ground	300 Amps	275 Amps
Air	300 Amps	275 Amps*
> 35,000 feet	275 Amps	Not Applicable

* The maximum operating altitude for the APU is FL300.

continued on next page

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WARNING: Do not select the BUS TIE button closed until directed to do so in this procedure.

1. ELEC Button
(if main generator overcurrent, affected side) EMER
2. APU SYSTEM GENERATOR Button
(if APU generator overcurrent) OFF

If L and/or R Message Clears (Fault on Emergency Bus)

3. BATT Button (affected side) OFF
4. EICAS Button (if R ELEC is EMER) RIGHT
5. Land as soon as practical (within 60 minutes).
Refer to Electrical System Distribution on page E-50 for affected systems and equipment, and Landing Gear Will Not Extend on page E-153.
PROCEDURE COMPLETED

If L and/or R Message Does Not Clear (Fault on Main, Interior or Avionics Bus)

3. INTERIOR Button OFF

If L and/or R Message Still Does Not Clear

4. INTERIOR Button NORM
5. AVN Button (affected side) OFF

If L and/or R Message Still Does Not Clear

6. FUEL CROSSFEED Selector OFF
7. GEN Switch (affected side) OFF

The following indications will occur when the respective left or right generator is selected off during this procedure. Actions associated with these messages should not be accomplished.

L ELEC Button EMER	R ELEC Button EMER
Left T/R UNLK amber inverse video Aileron and rudder trims are blank Stab trim is amber dashes Left and total fuel quantity are amber dashes Amber DC EMER BUS L message Amber DC GEN OFF L message Amber EMERGENCY EXIT OPEN message Amber ENGINE CONTROL FAULT L message	Right T/R UNLK amber inverse video Aileron and rudder trims are blank Stab trim is amber dashes Right and total fuel quantity are amber dashes Hydraulic pressure is amber dashes Amber DC EMER BUS R message Amber DC GEN OFF R message Amber HYDRAULIC VOLUME LOW message Amber PITCH/ROLL DISCONNECT message Cyan GUST LOCK ON message Cyan WINDSHEAR FAIL message Cyan TERRAIN FAIL message Cyan GROUND PROX FAIL message

8. BUS TIE BUTTON CLOSED
9. L and R FUEL BOOST Circuit Breakers
(LP-C2R1 and RP-C-11R1) PULL

continued on next page

continued from previous page

10. SECONDARY TRIM Button
(If L AVN Button selected OFF) ON
11. Land as soon as practical.
Refer to Electrical System Distribution on page E-50 for affected systems and equipment
PROCEDURE COMPLETED

IF L and/or R Message Clears (Fault on Avionics Bus)

6. SECONDARY TRIM Button
(if L AVN button selected OFF) ON
7. Land as soon as practical.
Refer to Electrical System Distribution on page E-50 for affected systems and equipment.
PROCEDURE COMPLETED

If L and /or R Message Clears (Fault on Interior Bus)

PROCEDURE COMPLETED

If APU Message Does Not Clear

3. APU SYSTEM STOP Button PUSH
 4. BUS TIE Button (if required) CLOSED
- PROCEDURE COMPLETED

If APU Message Clears

3. BUS TIE Button (if required) CLOSED
- PROCEDURE COMPLETED

DC GEN OFF L AND/OR R AND/OR APU

This message is displayed when a source of generated power is available, but the respective generator is not on line. This message will be red if all available sources of generated power are lost. If the associated amber DC EMER BUS L and/or R message is also displayed, an overcurrent condition was detected on the main bus or one of its extension buses.

If DC GEN OFF L and/or R and DC EMER BUS L and/or R Messages are Displayed (Due to Overcurrent)

If Amber DC GEN OFF L and /or R and Amber DC EMER BUS L and/or R Messages are Displayed (Due to Overcurrent)

1. FUEL CROSSFEED Selector OFF
2. GEN Switch (affected side) OFF
3. BUS TIE Button CLOSED

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4. For airplanes 680-001 thru -289 and -291 thru 0296
not incorporating SB680-24-11 L and R FUEL BOOST
Circuit Breakers (LP-C2R1 and RP-C11R1) PULL
 5. SECONDARY TRIM Button
(If L GEN switch was selected OFF) ON
 6. Electrical Load MONITOR (DECREASE AS REQUIRED)
 7. Land as soon as practical.
Refer to Electrical System Distribution on page E-50 for affected
systems and equipment.
- PROCEDURE COMPLETED

**If Only Amber DC GEN OFF L and/or R Message is Displayed (not
Due to Overcurrent)**

1. GEN Switch (affected side) RESET
(HOLD FOR 3 SECONDS), THEN OFF
2. Generator CHECK VOLTS

If Voltage is ≤29 Volts

3. GEN Switch (affected side) ON
4. Generator Amps VERIFY GENERATOR ON LINE

If Left Generator Does Not Come on Line

5. BUS TIE Button CLOSED
 6. APU (if not running and conditions
permit, at or below FL200) TEST/START
 7. APU SYSTEM GENERATOR Button ON
 8. BUS TIE Button OPEN
- PROCEDURE COMPLETED

If Right Generator Does Not Come on Line

5. BUS TIE Button CLOSED
 6. Electrical Load MONITOR;
DECREASE AS REQUIRED
- PROCEDURE COMPLETED

If Affected Generator Comes Online

PROCEDURE COMPLETED

If Voltage is >29 Volts

3. BUS TIE Button CLOSED
 4. Electrical Load MONITOR; DECREASE AS REQUIRED
- PROCEDURE COMPLETED

If Amber DC GEN OFF APU Message is Displayed

1. APU SYSTEM GENERATOR Button ON
 2. BUS TIE Button (if required) CLOSED
- PROCEDURE COMPLETED

REMOTE CB TRIPPED**(41) REMOTE CB TRIPPED**

This message is displayed when a circuit breaker in the aft J-box has tripped. These circuit breakers cannot be accessed by the crew. The following is a list of the circuit breakers that will cause the message to display:

LEFT J-BOX	RIGHT J-BOX
L ATT/HDG (AUX)	R ATT/HDG (AUX)
MAU 3 (PRI)	MAU 4 (PRI)
L DISTR GEN	R DISTR GEN
L LANDING LT	R LANDING LT
WOW SYSTEM 1	WOW SYSTEM 2
L FUEL CONTROL	R FUEL CONTROL
AFT BAG SMOKE DETECT	FWD BAG SMOKE DETECT
MAU 3 (AUX)	MAU 4 (AUX)
	SMOKE/FIRE MODULE
	SPEED BRAKES
LEFT EMER J-BOX	RIGHT EMER J-BOX
L PRECOOLER	R PRECOOLER
APU BUS SENS	SEC STAB TRIM
FWD EMER BATT PACK	AFT EMER BATT PACK
ECU	RUDDER BIAS

AC BEARING L OR R**(42) AC BEARING L or R**

This message indicates impending alternator bearing failure. Maintenance is required within 20 hours of the message being posted.

BATTERY OFF L AND/OR R**(43) BATTERY OFF L and/or R**

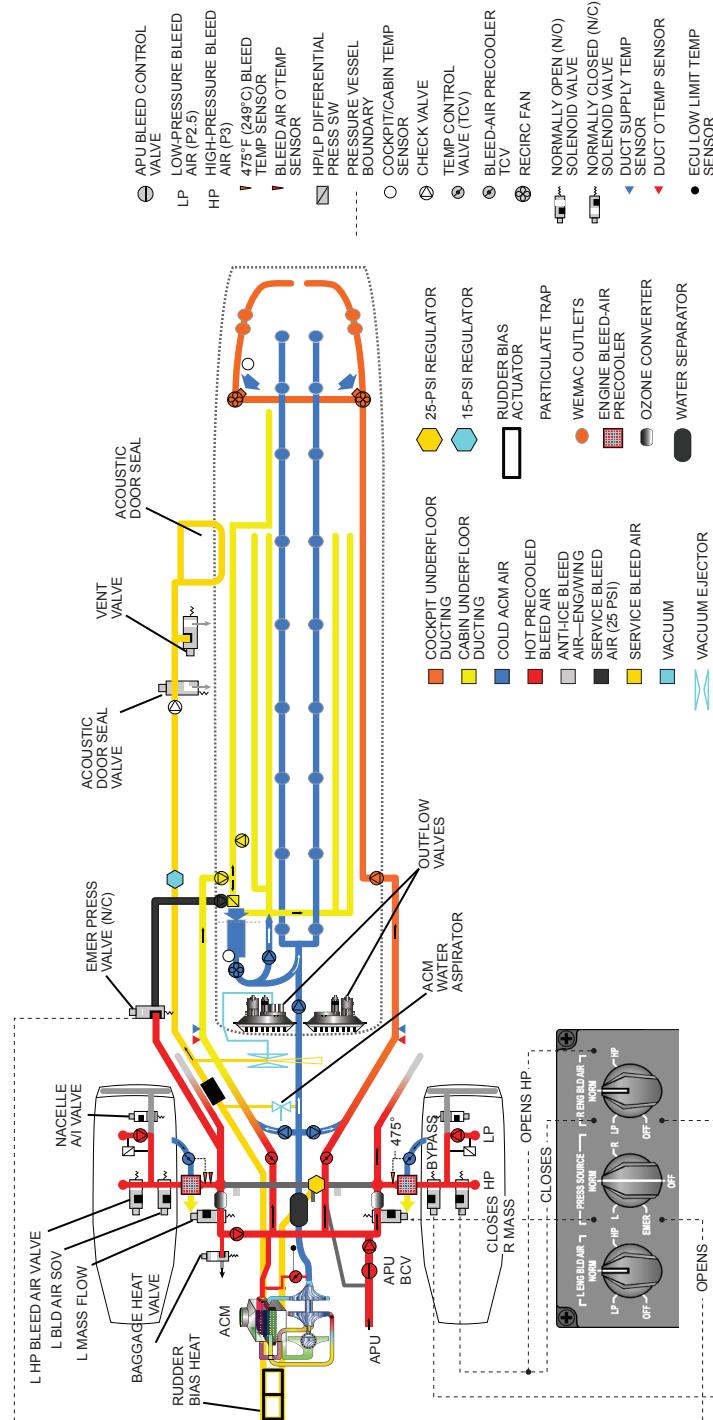
This message indicates the respective battery (L or R BATT button) has been selected OFF in response to a battery overtemperature condition and the battery overtemperature condition still exists. This message will be amber when one or both BATT buttons are selected OFF and a battery overtemperature condition is not present.

BUS TIE CLOSED

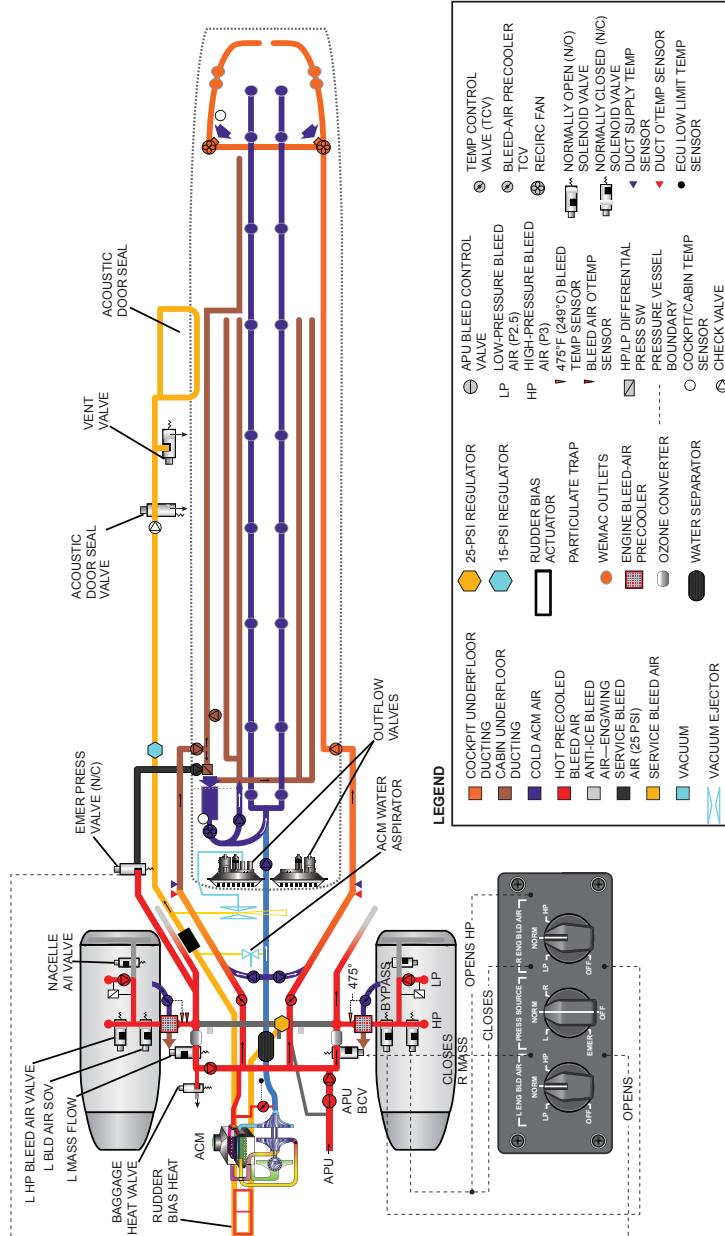
44 BUS TIE CLOSED

This message is displayed when the bus tie contactor between the emergency buses is closed. To accommodate in-flight engine or APU starts, selected cases start out cyan and change to amber after 5 minutes when an electrical source is active on both sides.

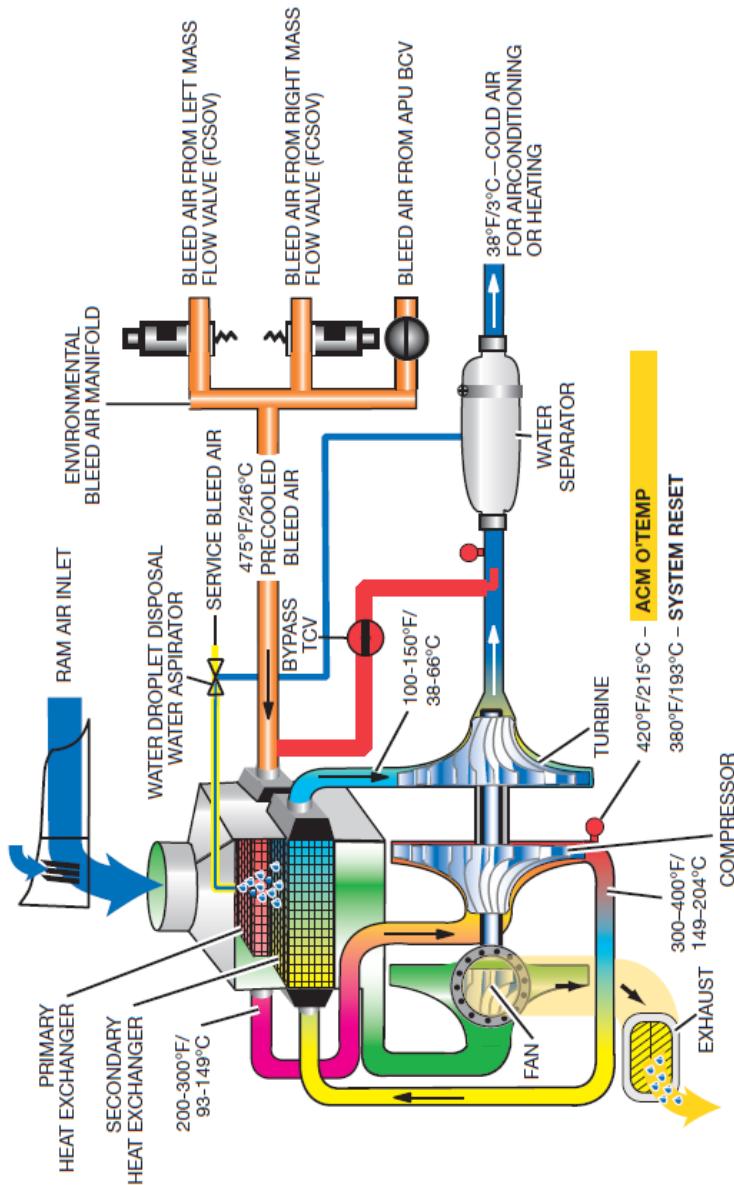
PNEUMATICS SYSTEM



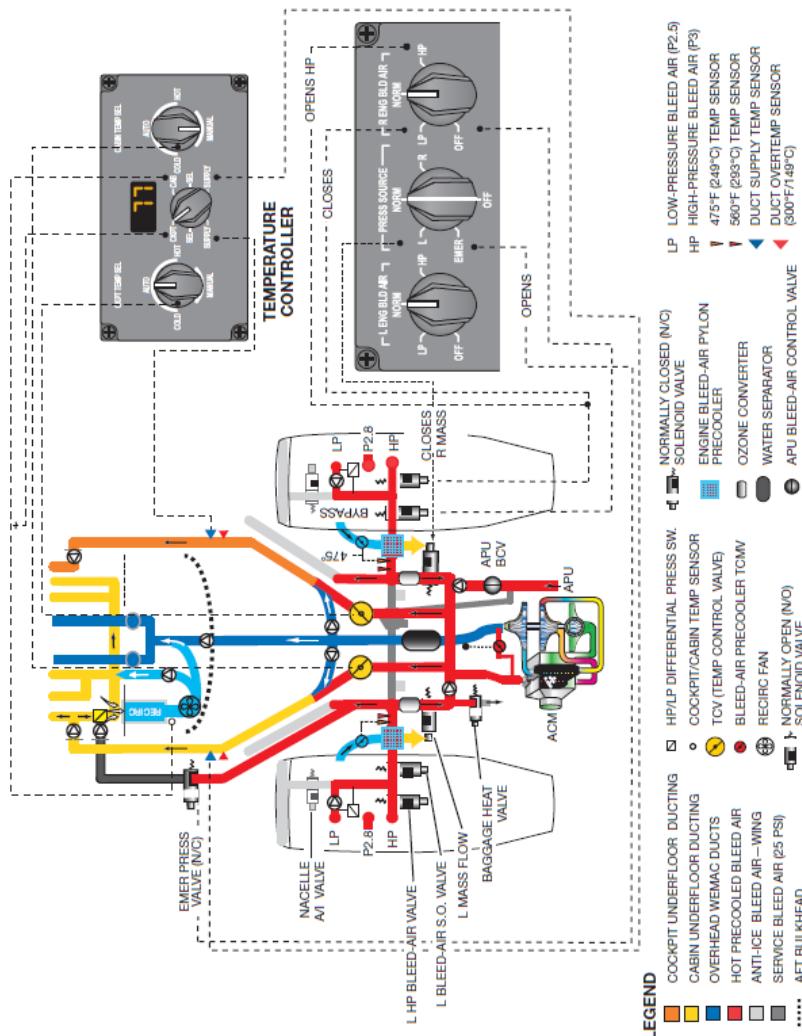
AIR CONDITIONING SYSTEM



AIR CYCLE MACHINE (ACM)



PRESSURIZATION SYSTEM



BAGGAGE FIRE**45 BAGGAGE FIRE**

This message is displayed when smoke is detected in the tailcone baggage compartment. The red BAGGAGE FIRE message may or may not clear due to lingering smoke in the baggage compartment.

1. BAGGAGE HEAT Button OFF

CAUTION: If the right bleed air source is not available due to selecting the right bleed air source off or the right engine being shutdown, there will be no pressurization without selecting EMER on the PRESS SOURCE selector. If EMER is selected, refer to "EMERGENCY PRESSURIZATION" on page E-90.

2. PRESS SOURCE Selector R
3. BAGGAGE FIRE Button PUSH
 - a. Cyan FIRE BOTTLE LOW BAG-APU
Message DISPLAYED WITHIN 15 SECONDS
(APU WILL BE INOPERATIVE)

If Suitable Landing Field is Available Within 15 Minutes

4. SEC BAG BOTTLE Button PUSH
 - a. Center of gravity will move aft approximately 0.7% as the bottle discharges.

WARNING: If the SEC BAG BOTTLE button is not pushed at the beginning of descent, it will begin to flash white at 25,000 feet. The pilot should push the button immediately to maintain adequate fire suppression capability throughout the approach and landing phases of flight.

5. Land as soon as possible (within 15 minutes). Refer to "Emergency Evacuation" on page E-157.

WARNING: Whether or not smoke has dissipated, if it cannot be visibly confirmed that any fire has been extinguished following fire suppression and/or smoke evacuation, land immediately at the nearest suitable airport.

PROCEDURE COMPLETED

If No Suitable Landing Field is Available Within 15 Minutes

4. Altitude CLIMB OR DESCEND TO \geq FL330 AND \leq FL390
(if fuel requirements permit)
5. Cruise Altitude MINIMIZE CHANGES UNTIL
DESCENT FOR LANDING

continued on next page

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6. When beginning descent for landing,
SEC BAG BOTTLE Button.....PUSH
(APU WILL BE INOPERATIVE)
 - a. Center of gravity will move aft approximately 0.7% as the bottle discharges.

WARNING: If the SEC BAG BOTTLE button is not pushed at the beginning of descent, it will begin to flash white at 25,000 feet. The pilot should push the button immediately to maintain adequate fire suppression capability throughout the approach and landing phases of flight.

7. Land as soon as possible (180 minutes maximum cruise time).

WARNING: Whether or not smoke has dissipated, if it cannot be visibly confirmed that any fire has been extinguished following fire suppression and/or smoke evacuation, land immediately at the nearest suitable airport.

PROCEDURE COMPLETED

CABIN ALTITUDE

46 CABIN ALTITUDE

This message is displayed when the cabin altitude exceeds 10,000 feet (14,500 feet in high elevation airfield mode). For amber message (cabin altitude above 8,500 feet), refer to "CABIN ALTITUDE" on page E-86. For cyan message (high elevation airfield mode), refer to "CABIN ALTITUDE" on page E-97.

1. Oxygen MasksDON AND 100%
2. Left and Right MIC SEL Buttons.....MASK
3. Emergency Descent.....AS REQUIRED
 - a. AP/TRIM/NWS DISC Button.....PUSH
 - b. ThrottlesIDLE
 - c. Speedbrakes.....100%
 - d. Initial Pitch Attitude15° DOWN

CAUTION: If structural damage is suspected, limit airspeed to a reasonable value and limit maneuvering loads until damage assessment can be made.

- e. AirspeedMMO/VMO
- f. Altitude15,000 FT MSL OR MINIMUM SAFE ALTITUDE

WARNING: It is the pilots responsibility to determine the minimum safe altitude

- g. PASS OXY Knob.....ON
(as required;assure passengers are receiving oxygen)

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1. Refer to the Crew and Passenger Oxygen Duration Charts in Section III, Operating Information for the available oxygen supply.
2. Further descent to 10,000 Feet MSL is recommended to increase the available oxygen supply time for the pilot and copilot.
3. Descend (if conditions permit) to 10,000 feet MSL.
4. Passenger Briefing.....Complete
5. PASS OXY KNOB (at or below 10,000 feet MSL).....OFF
6. Refer to Amber Message Procedures, CABIN ALTITUDE on page E-86.
PROCEDURE COMPLETE

ENVIRONMENTAL SYSTEM SMOKE OR ODOR

1. Oxygen Masks/Goggles DON AND EMER
- WARNING:** Some large eyeglasses, headsets, hats and hairstyles may interfere with the quick donning capability of the mask. It is the crew members responsibility to make sure that the mask can be donned quickly.
2. Left and Right MIC SEL Buttons. MASK
 3. PAX SAFETY Button ON
 4. Determine source of smoke or fire.

Unknown Source

NOTE: The PRESS SOURCE selector must remain in each position long enough to allow adequate system purging to determine the source of smoke (approximately 1 minute)

5. APU Bleed Air Button (if APU is running) OFF
6. PRESS SOURCE Selector. L
(Allow time to purge)
7. BAGGAGE HEAT Button OFF
8. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS) OR
FL390 MAXIMUM (12 PASSENGERS)

If Smoke is Not Decreasing

9. PRESS SOURCE Selector R (ALLOW TIME TO PURGE)

If Smoke is Not Decreasing

10. PRESS SOURCE Selector EMER
(CONTROL CABIN TEMPERATURE WITH LEFT THROTTLE)

continued on next page

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11. Land as soon as practical. Refer to "Smoke Removal" on page E-79, if required, and "EMERGENCY PRESSURIZATION" on page E-90.

PROCEDURE COMPLETED

If Smoke Is Decreasing

11. Land as soon as practical. Refer to "Smoke Removal" on page E-79.

PROCEDURE COMPLETED

If Smoke Is Decreasing

10. Land as soon as practical. Refer to "Smoke Removal" on page E-79.

PROCEDURE COMPLETED

Known Source

5. PRESS SOURCE Selector OPPOSITE SIDE
6. BAGGAGE HEAT Button OFF
7. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS) OR FL390 MAXIMUM (12 PASSENGERS)

8. Land as soon as practical.

PROCEDURE COMPLETED

SMOKE REMOVAL

This procedure should be accomplished after completing the applicable "Environmental System Smoke or Fire" or "Electrical System Smoke or Fire" procedure.

1. Oxygen Masks/Goggles DON AND EMER

WARNING: Some large eyeglasses, headsets, hats and hairstyles may interfere with the quick donning capability of the mask. It is the crew members responsibility to ensure the mask can be donned quickly.

2. Left and Right MIC SEL Buttons MASK
3. PAX SAFETY Button ON

If Both L and R ELEC Buttons are EMER

4. CABIN ALT Lever UP
5. Descend AS REQUIRED
6. Land as soon as possible (within 60 minutes).

WARNING: Whether or not smoke has dissipated, if it cannot be visibly confirmed that any fire has been extinguished following fire suppression and/or smoke evacuation, land immediately at the nearest suitable airport.

BEFORE LANDING

7. Landing Gear DOWN (3 GREEN)
8. Landing Data CONFIRM
 - a. Airspeed V_{REF}

V_{REF} (KIAS)

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
0°	105	110	116	121	126	131	136
7°	100	106	111	116	120	125	130
15°	95	101	106	110	115	119	124
35°	89	94	99	103	107	111	116

b. Landing Distance

- Flaps 0° MULTIPLY FLAPS 35° BY 1.39
- Flaps 7° MULTIPLY FLAPS 35° BY 1.29
- Flaps 15° MULTIPLY FLAPS 35° BY 1.20.

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WARNING: Stick shaker will be inoperative. Do not slow below V_{REF}.

CAUTION:

- Avoid landing with a tailwind or downhill runway gradient.
- For flaps 7°, avoid landing at field elevations above 9000 feet MSL.
- For flaps 0°, avoid landing at field elevations above 5000 feet MSL.
- The batteries will supply DC power to the emergency bus equipment for approximately 60 minutes. This includes an allowance for one APU start attempt.
- Exterior lighting will be inoperative.
- The fuel crossfeed valve will remain in its selected position. If a change is necessary, select the change prior to selecting the ELEC buttons to EMER.
- All anti-ice valves (except the crossflow valves) will go to the open position.
- Windshield heat will be inoperative.
- Nosewheel steering is inoperative.
- Gear retraction is not possible.
- Emergency power distribution is shown in "Electrical System Distribution" on page E-50.

- | | |
|--------------------------|------------------|
| 9. Speedbrakes | 0% |
| 10. Airspeed | V _{REF} |

PROCEDURE COMPLETED

If Either L or R ELEC Button is NORM

- | | |
|--------------------------------------|---|
| 4. CABIN DUMP Button | DUMP
(CABIN ALTITUDE WILL NOT EXCEED
APPROXIMATELY 15,000 FEET) |
| 5. Autopilot and Yaw Damper. | AS DESIRED |
| 6. Descend. | AS REQUIRED |
| 7. Land as soon as possible. | |

WARNING: Whether or not smoke has dissipated, if it cannot be visibly confirmed that any fire has been extinguished following fire suppression and/or smoke evacuation, land immediately at the nearest suitable airport.

PROCEDURE COMPLETED

ACM BLEED LEAK**(47) ACM BLEED LEAK**

This message is displayed when a bleed leak is detected in the vicinity of the air cycle machine (ACM). The ACM will automatically turn off, emergency pressurization will automatically come on and the amber EMERGENCY PRESSURIZATION message will be displayed. If the APU is running when the amber ACM BLEED LEAK message occurs, the APU will shutdown automatically and will be unavailable for the remainder of the flight even if the amber ACM BLEED LEAK message clears.

1. R ENG BLD AIR Selector OFF FOR APPROXIMATELY
30 SECONDS, THEN NORM
2. L ENG BLD AIR Selector OFF FOR APPROXIMATELY
30 SECONDS, THEN NORM

If Message Does Not Clear or Reoccurs and Amber EMERGENCY PRESSURIZATION Message Remains Displayed

3. Accomplish amber message procedure "EMERGENCY PRESSURIZATION" on page E-90.
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

ACM O'TEMP**(48) ACM O'TEMP**

This message is displayed when an overtemperature of the ACM is detected. The ACM will automatically turn off, emergency pressurization will automatically come on and the amber EMERGENCY PRESSURIZATION message will be displayed. Emergency pressurization will automatically turn off and the ACM will come back on after the ACM has cooled down.

1. CKPT and CABIN TEMP SEL Knobs.....ADJUST TO WARMER SETTING (MAY REQUIRE MANUAL MODE)

If Message Does Not Clear or Reoccurs and Amber EMERGENCY PRESSURIZATION Message Remains Displayed

2. Accomplish amber message procedure "EMERGENCY PRESSURIZATION" on page E-90.
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

BAGGAGE DOOR OPEN**(49) BAGGAGE DOOR OPEN**

This message is displayed when any baggage door sensor indicates the door is not fully closed, any of the four clasps are unlatched, or any one or more of the sensors are faulted.

1. Land as soon as practical.
PROCEDURE COMPLETED

BAGGAGE HEAT FAIL**50 BAGGAGE HEAT FAIL**

This message is displayed when either an overtemperature of the baggage compartment has occurred or the baggage compartment bleed air shutoff valve has failed open. This message will be cyan in flight if the valve is failed closed.

On Ground

1. BAGGAGE HEAT Button OFF

If Message Does Not Clear

2. PRESS SOURCE Selector R
3. Correct prior to flight.

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

In Flight

1. PRESS SOURCE Selector R
 - a. If the right bleed air source is not available, there will be no pressurization without selecting EMER on the PRESS SOURCE selector. If EMER is selected, refer to "EMERGENCY PRESSURIZATION" on page E-90.
2. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS)
OR FL390 MAXIMUM (12 PASSENGERS)

PROCEDURE COMPLETED

BLEED AIR MONITOR FAIL

51 BLEED AIR MONITOR FAIL

This message is displayed when one or both bleed air monitor cards have failed. There is no means of telling if one or both bleed air monitor cards have failed. If both cards have failed, the cabin altitude warning system will be inoperative.

1. Cabin Altitude Gage MONITOR
2. Oxygen Mask (if airplane is above 12,000 feet) ONE PILOT DON
3. MIC SEL Button (affected side) MASK

If in Icing Environment

4. Exit icing environment.

If Landing With Known or Suspected Ice on Wing Leading Edge

5. Refer to "Landing With Ice on Wing Leading Edge" on page E-138.
PROCEDURE COMPLETED

If No Ice on Wing Leading Edge

5. Flaps 15° MAXIMUM
(Refer to "Flaps Not in Landing Position (35°)" on page E-161.)
PROCEDURE COMPLETED

If Not in Icing Environment

PROCEDURE COMPLETED

BLEED AIR O'TEMP L AND/OR R

52 BLEED AIR O'TEMP L and/or R

This message is displayed when the bleed air temperature from the respective precooler has exceeded 293°C (560°F) for more than 20 seconds or 316°C (600°F) instantly. If the ANTI-ICE WING/STAB XFLOW button is selected to XFLOW, then this message is displayed when the bleed air temperature from the respective precooler has exceeded 310°C (590°F) for more than 20 seconds or 343°C (650°F) instantly.

1. ENG BLD AIR Selector (affected side).... OFF FOR APPROXIMATELY 30 SECONDS, THEN NORM

If Message Does Not Clear or Reoccurs

2. ENG BLD AIR Selector (affected side)..... OFF
3. BAGGAGE HEAT Button OFF
4. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS)

continued on next page

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OR FL390 MAXIMUM (12 PASSENGERS)

If in Icing Environment

5. ANTI-ICE WING/STAB XFLOW Button. XFLOW

NOTE: The amber STAB ANTI-ICE COLD L and/or R message may be displayed under certain flight conditions that require a reduced throttle setting. Ice may accumulate on the leading edge of the horizontal stabilizer.

6. Exit icing environment. Refer to "Continued Flight in Icing Environment and Single Bleed Air Source" on page E-137.

PROCEDURE COMPLETED

If Not in Icing Environment

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

BLEED SELECT NOT NORM L AND/OR R

53 BLEED SELECT NOT NORM L and/or R

This message indicates the bleed air selector is not in the normal position with the airplane on the ground. This message is cyan in the air.

If Not Intentional

1. ENG BLD AIR Selector (affected side).....NORM
PROCEDURE COMPLETED

If Intentional

PROCEDURE COMPLETED

CABIN ALTITUDE

54 CABIN ALTITUDE

This message is displayed when the cabin altitude exceeds 8,500 feet due to failure of the pressurization system. This message is also displayed when the pressurization system is operating in high elevation airfield mode and (1) the cabin altitude exceeds 9,650 feet for more than 30 minutes or (2) the cabin altitude exceeds 8,500 feet and the airplane is above 24,500 feet MSL. For cyan message, refer to "CABIN ALTITUDE" on page E-97.

1. Oxygen Masks DON AND NORM
2. L and R MIC SEL Buttons MASK

If Selected Landing Altitude >9650 Ft and Landing is Not Imminent

3. Land as soon as practical.
- PROCEDURE COMPLETED

If Selected Landing Altitude ≤8,000 Feet

3. PRESS SOURCE Selector NORM
4. ENG BLD AIR Selectors (both) NORM
5. CABIN DUMP Button VERIFY NORM

If Cabin Altitude is Not Arrested

6. CABIN PRESS MODE Buttons ALT SEL AND AUTO
7. Pressurization Controller R Knob FULL INCREASE
8. ENG BLD AIR Selectors (both) HP

If Cabin Altitude Still is Not Arrested in ALT SEL Mode

9. CABIN PRESS MODE Buttons ALT SEL AND MANUAL
 10. CABIN ALT Lever DOWN
 11. PRESSURIZATION RATE Knob MAX
 12. PRESS SOURCE Selector EMER
 13. BAGGAGE HEAT Button OFF
 14. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS)
OR FL390 MAXIMUM (12 PASSENGERS)
 - a. If bleed air anti-ice protection is selected on, there are more than nine passengers, and fuel range permits, the airplane should be operated at or below FL250
 15. Control cabin temperature with left throttle.
 16. Overhead WEMACs FULL OPEN
 17. RECIRC AIR COCKPIT Button NORM
 18. RECIRC AIR CABIN Button HI
- PROCEDURE COMPLETED

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**If Red CABIN ALTITUDE Message Displays (in ALT SEL or
MANUAL Mode)**

9. Emergency Descent AS REQUIRED
10. PASS OXY Selector ON (AS REQUIRED)
(Assure passengers are receiving oxygen)

PROCEDURE COMPLETED

If Cabin Altitude is Arrested

PROCEDURE COMPLETED

If Cabin Altitude is Arrested

PROCEDURE COMPLETED

CABIN DOOR OPEN

55

CABIN DOOR OPEN

This message is displayed when the cabin door switches indicate the door is in the open position, the inner handle is not secured, the locks are not engaged, or the monitor system operation has not been verified correct.

On Ground

1. Cycle the cabin door to the open, unlatched, and unlocked condition and back to the closed, latched, and locked condition.
 - a. If the cabin door is closed prior to turning the batteries on or if power to the left electrical bus is interrupted after closing the door, the amber CABIN DOOR OPEN message will be displayed.
2. Verify message clears.

PROCEDURE COMPLETED

In Flight

WARNING: Stay clear of cabin door.

1. CABIN PRESS MODE NORM/ALT SEL Button ALT SEL
2. Cabin Altitude Selector 9,500 FT
(Amber CABIN ALTITUDE message will be displayed when cabin climbs above 8,500 ft.)
3. Altitude FL410 MAXIMUM
4. Land as soon as practical.

PROCEDURE COMPLETED

DUCT O'TEMP CABIN**56 DUCT O'TEMP CABIN**

This message is displayed when the cabin duct temperature exceeds 149°C (300°F).

1. CABIN TEMP CONTROL Button COCKPIT
2. CABIN TEMP SEL Knob SELECT COOLER TEMPERATURE

If Message Does Not Clear or Reoccurs

3. CABIN TEMP SEL Knob MANUAL,
SELECT COOLER SUPPLY TEMPERATURE
 - a. Select full MANUAL COLD at least 10 seconds, then actuate at least 3 seconds toward MANUAL HOT.
 - b. Operation in manual mode, full cold, above 31,000 feet, particularly at low (climb) airspeed, may result in air cycle machine overtemperature and shutdown. In the event that this occurs, refer to "EMERGENCY PRESSURIZATION" on page E-90.

If Cockpit Can Not be Controlled to Comfortable Temperature

4. PRESS SOURCE Selector EMER
5. Refer to "EMERGENCY PRESSURIZATION" on page E-90.
PROCEDURE COMPLETED

If Cockpit Can be Controlled to Comfortable Temperature

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

DUCT O'TEMP COCKPIT

This message is displayed when the cockpit duct temperature exceeds 149°C (300°F).

1. CKPT TEMP SEL Knob SELECT COOLER TEMPERATURE

If Message Does Not Clear or Reoccurs

2. CKPT TEMP SEL Knob MANUAL,
SELECT COOLER SUPPLY TEMPERATURE
 - a. Select full MANUAL COLD at least 10 seconds, then actuate at least 3 seconds toward MANUAL HOT.

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- b. Operation in manual mode, full cold, above 31,000 feet, particularly at low (climb) airspeed, may result in air cycle machine overtemperature and shutdown. In the event that this occurs, refer to "EMERGENCY PRESSURIZATION" on page E-90.

If Cockpit Can Not be Controlled to Comfortable Temperature

3. PRESS SOURCE Selector EMER
4. Refer to "DUCT O'TEMP CABIN" on page E-88.
PROCEDURE COMPLETED

If Cockpit Can be Controlled to Comfortable Temperature

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

EMERGENCY EXIT OPEN**58 EMERGENCY EXIT OPEN**

This message is displayed when an emergency exit door sensor indicates that the emergency exit door is unlatched or the door sensor is faulted.

1. Emergency Exit Door VERIFY SECURE (VISUALLY)
2. Altitude FL410 MAXIMUM

If Door is Not Secure

3. Land as soon as practical.
PROCEDURE COMPLETED

If Door is Secure

PROCEDURE COMPLETED

EMERGENCY PRESSURIZATION

59 EMERGENCY PRESSURIZATION

This message is displayed when emergency pressurization is active. Emergency pressurization is automatically turned on when there is an ACM overtemperature, an ACM bleed leak, or the cabin altitude is greater than 14,500 feet. This procedure should be accomplished after completing the applicable CABIN ALTITUDE, ACM BLEED LEAK, or ACM O'TEMP procedure.

1. CABIN TEMP SEL Knob MANUAL,
SELECT COOLER SUPPLY TEMPERATURE

If Airplane Can Not be Controlled to Comfortable Temperature and APU is
Not Available for Use

2. PRESS SOURCE Selector..... EMER
3. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS)
OR FL390 MAXIMUM (12 PASSENGERS)

NOTE: If bleed air anti-ice protection is selected on, there are more than nine passengers, and fuel range permits, the airplane should be operated at or below FL250.

4. Control cabin temperature with left throttle.
5. Overhead WEMACs FULL OPEN
6. RECIRC AIR CKPT Button..... NORM
7. RECIRC AIR CABIN Button HI
PROCEDURE COMPLETED

If Airplane Can Not be Controlled to Comfortable Temperature and APU is
Available for Use

2. APU (at or below FL200) TEST/START
3. PRESS SOURCE Selector OFF
4. EMER PRESSURE Circuit Breaker
(if message does not clear after step 3; RP-C2R3) PULL
5. APU SYSTEM BLEED AIR Button..... ON
6. Land as soon as practical.
PROCEDURE COMPLETED

If Airplane can be Controlled to Comfortable Temperature

PROCEDURE COMPLETED

HP VALVE FAIL L AND/OR R**(60) HP VALVE FAIL L and/or R**

This message is displayed when the high-pressure bleed valve is failed in the closed position when commanded open on the ground or open position when commanded closed in flight or on the ground. This message will only occur at or below FL370.

1. ENG BLD AIR Selector (affected side) OFF FOR APPROXIMATELY 30 SECONDS, THEN LP, THEN NORM

If Message Does Not Clear or Reoccurs**If Planned Altitude is FL370 or Below and Not in Icing Conditions**

2. ENG BLD AIR Selector (affected side) OFF FOR APPROXIMATELY 30 SECONDS, THEN LP

If Message Still Does Not Clear or Reoccurs

3. Recheck range available based on current fuel flow. Range may be reduced by excessive engine bleed flow through a failed open HP valve.
4. Land as soon as practical.
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

If Planned Altitude is Above FL370 or in Icing Conditions

2. Continue normal operation until descending to FL370 or below and/or exiting icing conditions.
3. ENG BLD AIR Selector (affected side) OFF FOR APPROXIMATELY 30 SECONDS, THEN LP

If Message Still Does Not Clear or Reoccurs

4. Recheck range available based on current fuel flow. Range may be reduced by excessive engine bleed flow through a failed open HP valve.
5. Land as soon as practical.
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

LAVATORY DOOR**61 LAVATORY DOOR**

This message is displayed when the lavatory doors in the aft cabin are not latched open in the taxi, takeoff, approach or landing configurations.

1. Lavatory Door VERIFY LATCHED OPEN
PROCEDURE COMPLETED

NOSE DOOR OPEN L AND/OR R**62 NOSE DOOR OPEN L and/or R**

This message is displayed when either of the two lower latch assemblies on the respective nose door is not secured.

1. Airspeed REDUCE TO AS LOW AS PRACTICAL
(MAXIMUM 210 KIAS)
2. Land as soon as practical.
PROCEDURE COMPLETED

PRESS SOURCE NOT NORM**63 PRESS SOURCE NOT NORM**

This message is displayed when the PRESS SOURCE selector is not in the normal position and emergency pressurization is not active.

If Not Intentional

1. PRESS SOURCE Selector NORM
PROCEDURE COMPLETED

If Intentional

PROCEDURE COMPLETED

TAILCONE DOOR OPEN**64 TAILCONE DOOR OPEN**

This message is displayed when the tailcone door is open as detected by a switch on the forward edge of the door panel.

1. Land as soon as practical.
PROCEDURE COMPLETED

WING BLEED LEAK L AND/OR R**65 WING BLEED LEAK L and/or R**

This message is displayed when a bleed leak in the inboard or outboard wing anti-ice supply line is detected. If wing anti-ice can be verified to be off (buttons, N₂, ITT), this message may be a monitor failure. The associated wing anti-ice valve closes automatically when the amber WING BLEED LEAK L and/or R message is displayed. The valve will stay closed after the sensor cools. The WING ANTI-ICE COLD message is cyan if the WING BLEED LEAK monitor is active.

1. ANTI-ICE ENGINE/STAB Button (affected side) OFF
FOR APPROXIMATELY 30 SECONDS, THEN ON

If Message Does Not Clear or Reoccurs

2. ANTI-ICE WING Buttons (both) OFF
3. ANTI-ICE WING/STAB XFLOW Button OFF
4. Exit icing environment.

If Landing With Known or Suspected Ice on Wing Leading Edge

5. Refer to "Landing With Ice on Wing Leading Edge" on page E-138.
PROCEDURE COMPLETED

If No Ice on Wing Leading Edge

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

OVERPRESSURIZATION

1. CABIN PRESS MODE Buttons NORM AND MANUAL
2. CABIN ALT Lever UP
3. PRESSURIZATION RATE Knob INCREASE (AS REQUIRED)

If Still Overpressurized

4. PRESS SOURCE Selector L OR R
5. ENG BLD AIR Selector
(on side selected as pressure source) LP
6. BAGGAGE HEAT Button OFF
7. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS)
OR FL390 MAXIMUM (12 PASSENGERS)
8. Engine Power
(on side selected as pressure source) DECREASE AS REQUIRED

If Unable to Control

9. Oxygen Masks DON AND 100%
10. Left and Right MIC SEL Buttons MASK
11. PASS OXY Knob ON
(Ensure passengers are receiving oxygen)
12. CABIN DUMP Switch DUMP
13. PRESS SOURCE Selector OFF
14. Descend as required. Consider minimum safe altitude and oxygen duration.

PROCEDURE COMPLETED

If Able to Control

PROCEDURE COMPLETED

If Pressurization Returns to Normal

PROCEDURE COMPLETED

AIRPLANE PRESSURIZED ON THE GROUND

1. PRESS SOURCE Selector OFF,
CABIN WILL DEPRESSURIZE AT
A RATE OF APPROXIMATELY 1,000 FPM
2. APU BLEED AIR Button OFF
3. Verify 0 PSI or open either cockpit side window prior to opening cabin door.

WARNING: The cabin must be depressurized prior to opening the cabin door to avoid potential injury to personnel or damage to the cabin door.

PROCEDURE COMPLETED

COCKPIT FORWARD OR SIDE WINDSHIELD CRACKED OR SHATTERED

Either windshield ply is structurally capable of maintaining cabin pressure.

1. CABIN PRESS MODE Button ALT SEL
2. Cabin Pressurization Controller SET CABIN ALTITUDE TO 9500 FEET
(amber CABIN ALTITUDE CAS message will illuminate)
3. Altitude DESCEND TO THE LOWEST PRACTICAL ALTITUDE CONSISTENT WITH FUEL RANGE REQUIREMENTS; FL410 OR LOWER IS RECOMMENDED.
4. Oxygen Masks
(if cabin altitude > 10,000 feet) ONE PILOT (MINIMUM) DON
(Set regulator to normal)
5. Remain clear of or exit icing environment.

If Either Forward Windshield Cracked/Shattered

6. L and R WSHLD ANTI-ICE Circuit Breakers
(LP-C3R1 and RP-C10R1) PULL
7. Land as soon as practical.
PROCEDURE COMPLETED

If a Side Windshield Cracked/Shattered

6. L or R WSHLD ANTI-ICE Circuit Breaker
(opposite side only)
(LP-C3R1 and RP-C10R1) PULL
7. Land as soon as practical.
PROCEDURE COMPLETED

AUTOMATIC TEMPERATURE CONTROL INOPERATIVE

1. TEMP SEL Knob (affected system) MANUAL, SELECT MANUAL COLD FOR 10 SECONDS, THEN ACTIVATE AT LEAST 3 SECONDS TOWARD MANUAL HOT
- PROCEDURE COMPLETED

PRESSURIZATION CONTROL FAULT LIGHT ILLUMINATED

Indicates the pressurization controller normal mode has faulted and automatically switched to manual mode, possibly due to an internal fault or loss of ADS (air data system) input.

1. Pressurization. USE CABIN ALT LEVER AND PRESSURIZATION RATE SELECTOR
 2. CABIN PRESS MODE Buttons
(to match controller mode) NORM AND MANUAL
- PROCEDURE COMPLETED

USE OF SUPPLEMENTAL OXYGEN (UNPRESSURIZED)

1. Oxygen Masks
 - a. Normal below FL250 cabin altitude
 - b. 100% at or above FL250.
 - c. Make sure crew and passengers are receiving oxygen.
 2. Cabin Altitude
 - a. With Passengers. FL250 MAXIMUM
 - b. With Crew Only. FL400 MAXIMUM
 3. Oxygen. CHECK ENDURANCE
 4. Range. COMPUTE (BASED ON OXYGEN ENDURANCE AND REVISED FUEL FLOW AND GROUND SPEED)
- PROCEDURE COMPLETED

OXYGEN LOW PRESSURE LIGHT ILLUMINATED***NOTE: Extended Range Oxygen System Only.***

If the oxygen bottle gauge reads near zero, the oxygen supply has been exhausted in the affected bottle. If the oxygen bottle gauge shows adequate pressure available, the oxygen supply in the affected bottle is not available for use (probable cause: the bottle valve has been turned off).

1. Oxygen Duration PLAN TO USE REMAINING BOTTLE ONLY
- PROCEDURE COMPLETED

BAGGAGE HEAT FAIL**66 BAGGAGE HEAT FAIL**

This message is displayed in flight if the baggage heat shutoff valve fails to open to provide heat to the baggage compartment.

BLEED SELECT NOT NORM L AND/OR R**67 BLEED SELECT NOT NORM L and/or R**

This message is displayed when an engine bleed air source is selected to other than the normal position. This message is amber on the ground.

CAUTION: If the crew has selected LP or OFF, flight into known icing is prohibited and flight operations are restricted to at or below FL410 when carrying 11 or less passengers or FL390 when carrying 12 passengers.

CABIN ALTITUDE**68 CABIN ALTITUDE**

This message indicates the cabin altitude is above 8,000 feet and the pressurization controller is set for the high elevation airfield mode (landing field elevation above 8,000 feet). This message will be amber if the cabin altitude is above 9,650 feet for more than 30 minutes. This message will be red if the cabin altitude is above 14,500 feet while operating in the high elevation airfield mode.

NOTE: If the cabin altitude exceeds 12,000 feet while operating in high elevation airfield mode, it is recommended that at least one pilot don an oxygen mask.

FIRE BOTTLE LOW BAG-APU**69 FIRE BOTTLE LOW BAG-APU**

This message indicates the rapid discharge baggage compartment/APU fire bottle pressure is low because the bottle has discharged. The baggage heat valve will close and the APU will shut down automatically. The APU will be inhibited from starting.

1. BAGGAGE HEAT Button OFF
2. APU VERIFY SHUTDOWN
(refer to Normal Procedures, "APU Shutdown," if required)

NOTE: If this message occurs on the ground, the crew should verify that the baggage compartment is empty prior to dispatch or have the fire bottle repaired and/or serviced.

PROCEDURE COMPLETED

FIRE BOTTLE LOW BAGGAGE**70 FIRE BOTTLE LOW BAGGAGE**

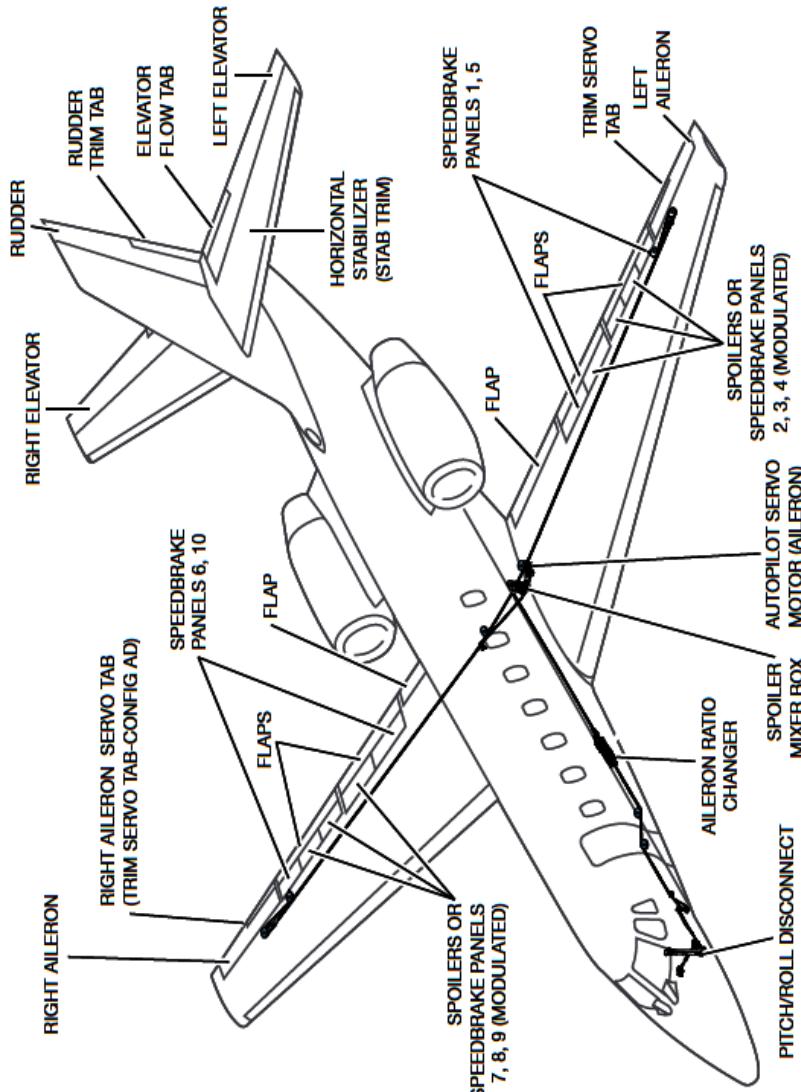
This message indicates the metered discharge baggage compartment fire bottle pressure is low because the bottle has discharged. The baggage heat valve will close.

1. BAGGAGE HEAT Button OFF

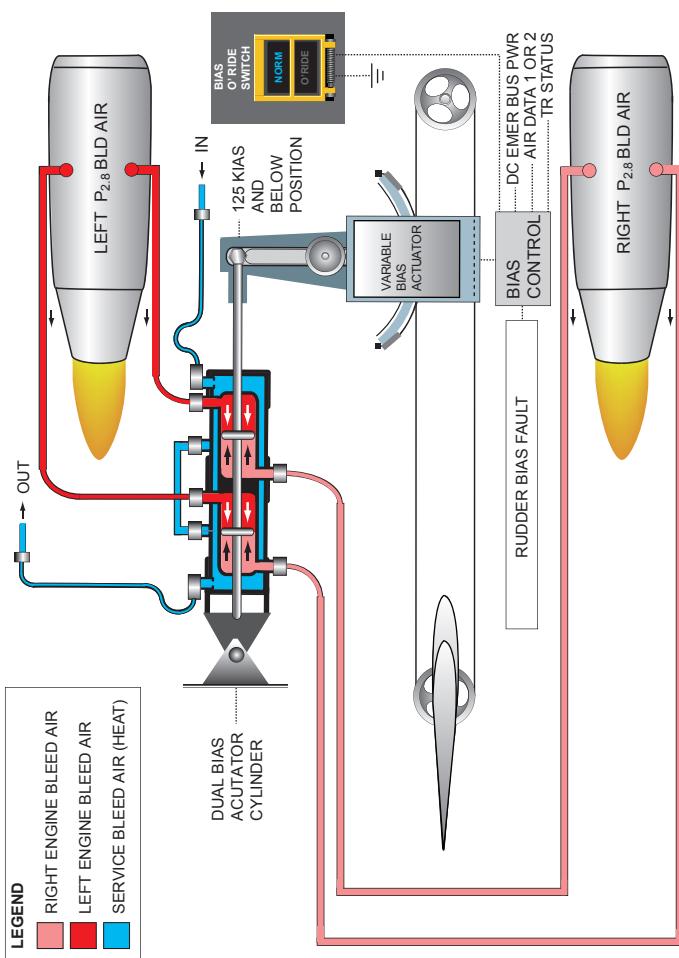
NOTE: If this message occurs on the ground, the crew should verify that the baggage compartment is empty prior to dispatch or have the fire bottle repaired and/or serviced.

PROCEDURE COMPLETED

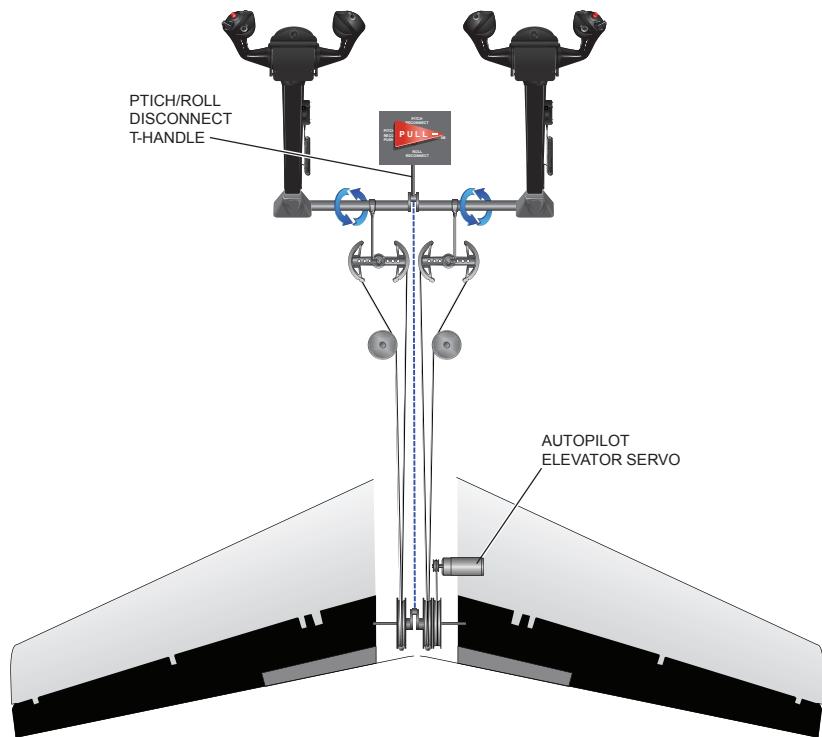
FLIGHT CONTROLS



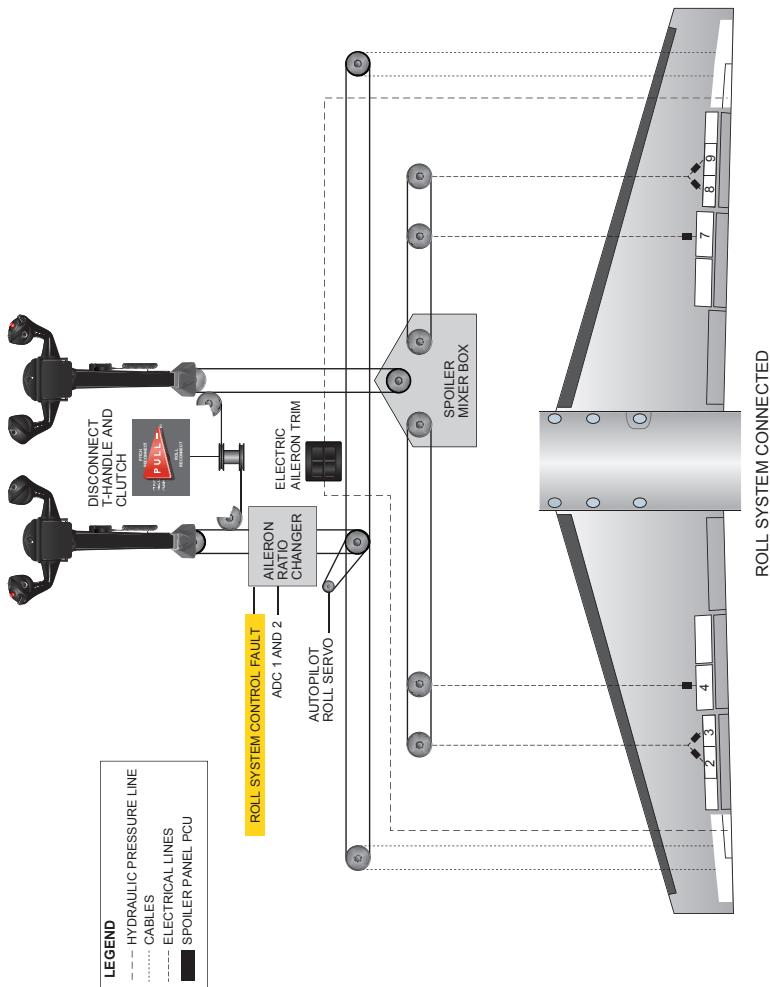
RUDDER BIAS SYSTEM



PITCH SYSTEM



ROLL CONTROL SYSTEM



AILERON TRIM RUNAWAY

1. AP/TRIM/NWS DISC Button PUSH AND HOLD
 2. AILERON TRIM Circuit Breaker (LP-C12R3) PULL
 3. AP/TRIM/NWS DISC Button RELEASE
 4. Land as soon as practical. Refer to "Aileron Trim Inoperative" on page E-114.
- PROCEDURE COMPLETED

UNCOMMANDDED ROLL

WARNING: Do not pull PITCH/ROLL RECONNECT handle until directed to do so in this procedure.

1. Control Wheel APPLY OPPOSITE AILERON AND RUDDER AS REQUIRED
2. AP/TRIM/NWS DISC Button PUSH
3. Aileron and Rudder Trim AS REQUIRED
4. Airspeed DECREASE TO MINIMUM PRACTICAL AIRSPEED TO REDUCE CONTROL FORCES
5. Land as soon as practical.

If Uncommanded Roll Occurred After Speedbrakes Were Extended

6. Speedbrakes 0%

WARNING: Do not extend speedbrakes for remainder of flight.

7. Altitude FL410 MAXIMUM
 8. Land as soon as practical.
 9. Landing Distance MULTIPLY FLAPS 35° BY 1.16
- PROCEDURE COMPLETED

If Uncommanded Roll Occurred as Speedbrakes Were Retracted

6. SPEEDBRAKE Handle RETURN TO PREVIOUS POSITION
7. Land as soon as practical. Refer to "Speedbrakes Fail to Retract" on page E-115.

CAUTION: Do not move speedbrake handle forward.

PROCEDURE COMPLETED

If Uncommanded Roll Occurred During Flap Extension/Retraction

6. FLAP Selector RETURN TO PREVIOUS POSITION
7. Land as soon as practical. If applicable, refer to "Flaps Not in Landing Position (35°)" on page E-161.

PROCEDURE COMPLETED

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If Still Unable to Reduce the Out-of-Trim Force, Airplane Control is Not in Question, and None of the Above Apply

6. Visually inspect the wing into which the airplane tends to roll to determine if a roll spoiler is extended.

If Roll Spoiler is Extended

7. Left Seat Pilot FLY AIRPLANE
8. PITCH/ROLL RECONNECT Handle PULL THEN TURN COUNTERCLOCKWISE TO PITCH RECONNECT
9. Right Control Wheel APPLY AND HOLD OPPOSITE INPUT TO BALANCE SPOILERS
10. Land as soon as practical. Use flaps 15° for landing.

CAUTION: Maximum crosswind limit is 10 knots.

APPROACH

11. Landing Data CONFIRM
 - a. Airspeed V_{REF}

V_{REF} (KIAS) WITH ROLL SPOILER EXTENDED

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
15°	101	107	112	117	122	126	131

- b. Landing Distance MULTIPLY FLAPS 35° BY 1.32

CAUTION: Avoid landing with a tailwind, a downhill runway gradient, or at field elevations above 9,000 feet.

12. Crew Briefing COMPLETE
13. Avionics and Flight Instruments CHECK/SET
14. TAWS FLAP OVRD ON
15. Minimums (RAD/BARO) SET
16. FUEL CROSSFEED Selector AS REQUIRED, THEN OFF
17. Flaps 7°
18. Passenger Briefing COMPLETE
19. Seats/Seat Belts/Shoulder Harnesses/Aft Divider Doors CHECKED/SECURED/LATCHED OPEN
20. PAX SAFETY Button ON
21. Pressurization ZERO DIFFERENTIAL AT TOUCHDOWN

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BEFORE LANDING

- | | |
|----------------------------|------------------|
| 22. Landing Gear | DOWN (3 GREEN) |
| 23. Flaps | 15° |
| 24. EICAS | CHECK |
| 25. Airspeed | V _{REF} |
- PROCEDURE COMPLETED

If Roll Spoiler is Not Extended

7. Land as soon as practical.
- PROCEDURE COMPLETED

PRIMARY PITCH TRIM RUNAWAY

1. AP/TRIM/NWS DISC Button PUSH AND HOLD
(amber PRIMARY STAB TRIM FAIL message will display on the EICAS)
2. SECONDARY TRIM Button ON, TRIM AS REQUIRED
3. AP/TRIM/NWS DISC Button RELEASE
4. PRI STAB TRIM CONT Circuit Breaker
(LP-C1R1) PULL
5. Land as soon as practical. Use 15° flaps for landing. Refer to "Flaps Not in Landing Position (35°)" on page E-161.

CAUTION: Do not extend the flaps beyond 15° with primary pitch trim failure.

PROCEDURE COMPLETED

SECONDARY PITCH TRIM RUNAWAY

1. SECONDARY TRIM Button OFF
 2. Land as soon as practical. Refer to "Jammed Stabilizer Trim System" on page E-118.
- PROCEDURE COMPLETED

JAMMED PITCH OR ROLL CONTROL SYSTEM

1. Stabilizer Trim Switch ACTUATE TO ESTABLISH DESIRED PITCH ATTITUDE
2. Control Wheel RELAX PRESSURE
3. PITCH/ROLL RECONNECT Handle PULL UNTIL LATCHED
4. Operative Flight Control Wheel IDENTIFY, RECOVER AIRPLANE ATTITUDE

WARNING: Stabilizer trim must be used to rotate to a takeoff attitude and/or arrest pitch rate if jam occurs during takeoff, landing, or other critical phase of flight.

NOTE:

- The pilot's control column controls ailerons and left elevator. The copilot's control column controls roll spoilers and right elevator.
 - Relaxing control pressure prior to pulling the disconnect will minimize abrupt control input when the controls disconnect.
 - The amber PITCH/ROLL DISCONNECT message will illuminate.
 - When the pitch/roll disconnect handle is pulled, the autopilot, if engaged, will automatically disengage and will not re-engage.
 - **Do not push the disconnect handle down unless rotated to the PITCH/ ROLL RECONNECT (9 o'clock) position.**
5. Rudder Pedal (as required) APPLY FORCE TO PRODUCE DESIRED ROLL RESPONSE
 6. Trim AS REQUIRED

If Pitch Control Jammed

7. PITCH/ROLL RECONNECT Handle TURN CLOCKWISE TO ROLL RECONNECT
(AMBER PITCH/ROLL DISCONNECT MESSAGE WILL REMAIN ON)

If Only One Elevator is Jammed

8. Land as soon as possible.
 - a. Minimize large elevator inputs. There will be some minor roll coupling with elevator input.
 - b. Minimize the landing sink rate to less than 600 FPM due to reduced elevator authority.

PROCEDURE COMPLETED

If Both Elevators are Jammed

8. Land as soon as possible. Refer to "Landing With Failed Primary Flight Control" on page E-121.

PROCEDURE COMPLETED

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If Roll Control Jammed

7. PITCH/ROLL RECONNECT Handle TURN COUNTERCLOCKWISE TO PITCH RECONNECT (AMBER PITCH/ROLL DISCONNECT MESSAGE WILL REMAIN ON)
 - a. If the jammed control is not centered, the remaining control authority will be limited in one direction. Use rudder control to assist in producing roll response.
 - b. If an aileron is jammed, aileron trim may be ineffective. Rudder trim may improve controllability.
 - c. Roll spoilers have a dead band around neutral. Make small smooth inputs and return to neutral. Rudder control may also be used to assist in producing roll response.
 - d. Autopilot will not re-engage.
8. FUEL CROSSFEED Selector AS REQUIRED
 - a. If time permits, crossfeed to create up to a 400-pound fuel imbalance to assist in reducing roll control forces.
9. Land as soon as possible. Use flaps 15° for landing. Refer to "Flaps Not in Landing Position (35°)" on page E-161.

CAUTION: Do not extend flaps beyond 15° with roll control jammed. For jammed roll spoilers, maximum crosswind limit is 10 knots.

PROCEDURE COMPLETED

RUDDER TRIM RUNAWAY

A small movement in the rudder pedals and an uncommanded movement of the rudder trim indicator on the EICAS indicates rudder trim runaway.

1. AP/TRIM/NWS DISC Button PUSH AND HOLD
2. RUDDER TRIM Circuit Breaker (RP-C1R3) PULL
3. AP/TRIM/NWS DISC Button RELEASE
4. Land as soon as practical. Refer to "Rudder Trim Inoperative" on page E-117.

PROCEDURE COMPLETED

AOA/STALL WARN FAIL L AND/OR R**71 AOA/STALL WARN FAIL L and/or R**

This message is displayed when the AOA and/or stick shaker function has failed. Affected side stick shaker, low speed awareness, and on-speed caret will be inoperative. If left AOA, the AOA indexer display will be inoperative.

If Both Sides Failed

1. Airspeed (>15,000 feet MSL) 150 KIAS MINIMUM
2. Airspeed (\leq 15,000 feet MSL) V_{APP}/V_{REF} MINIMUM
FOR APPROACH AND LANDING (PER FLAP SCHEDULE)

WARNING: The following systems will be inoperative:

- Both Stick Shakers
- Low Speed Awareness System
- On-Speed Caret
- AOA Display and Indexer

PROCEDURE COMPLETED

If One Side Only

1. Opposite Side AOA. MONITOR
- PROCEDURE COMPLETED

FLAPS FAIL**72 FLAPS FAIL**

This message is displayed when the flaps have failed. The amber FLAPS RESET light will also illuminate and the flap position indicator will be amber. Flap position may not match flap handle.

1. Flap Position Indicator CHECK POSITION
2. FLAP Handle VERIFY IN A DETENT
(0°, 7°, 15°, 35°)
3. Airspeed
 - a. If flaps between 15° and 35° REDUCE TO LESS THAN 165 KIAS
 - b. If flaps between 7° and 15° REDUCE TO LESS THAN 210 KIAS
 - c. If flaps between 0° and 7° REDUCE TO LESS THAN 250 KIAS
4. FLAP RESET Button PUSH

If Flaps Remain Inoperative (FLAPS FAIL Message Still Displayed)

CAUTION: If the amber FLAPS FAIL message is latched on, the AOA indications, low-airspeed-awareness, and stick shaker warning, default to the flaps 35° values. If the flaps are extended less than 35°, AOA and low airspeed awareness will indicate an AOA higher than actual, causing stick shaker warning to activate at a higher than normal airspeed for the actual flap extension.

5. Refer to "Flaps Not in Landing Position (35°)" on page E-161.
PROCEDURE COMPLETED

If Flaps Resume Normal Operation (FLAPS FAIL Message Clears)

PROCEDURE COMPLETED

MACH TRIM FAIL**73 MACH TRIM FAIL**

This message is displayed when the Mach trim system has failed.

If Autopilot is Operative

1. Autopilot ENGAGE
 2. Altitude FL410 MAXIMUM
- PROCEDURE COMPLETED

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If Autopilot is Inoperative or Not Engaged

1. Airspeed MACH 0.77 MAXIMUM
 2. Altitude FL410 MAXIMUM
- PROCEDURE COMPLETED

PITCH/ROLL DISCONNECT

(74)

PITCH/ROLL DISCONNECT

This message is displayed when the PITCH/ROLL RECONNECT handle has been pulled up or stowed incorrectly. If a single axis has been reconnected, the message will remain displayed. The autopilot will disengage and will not re-engage.

If Not Intentional

1. PITCH/ROLL RECONNECT Handle PITCH/ROLL RECONNECT, THEN PUSH DOWN AND ROTATE TO NORM

CAUTION: Do not attempt to push the handle down in any position other than PITCH/ROLL RECONNECT.

2. Aileron/Elevator Controls CHECK BOTH SIDES CONNECTED
- PROCEDURE COMPLETED

If Intentional

PROCEDURE COMPLETED

PRIMARY STAB TRIM FAIL**(75) PRIMARY STAB TRIM FAIL**

This message is displayed on the ground until a satisfactory preflight check of the primary stabilizer trim system has been accomplished and in flight if the primary stabilizer trim system has failed. The autopilot will be inoperative.

On Ground

1. Accomplish primary stabilizer trim preflight check.

PROCEDURE COMPLETED

In Flight

1. AP/TRIM/NWS DISC Button PUSH
2. SECONDARY TRIM Button ON, TRIM AS REQUIRED

If Unable to Trim

3. Refer to "Jammed Stabilizer Trim System" on page E-118.

PROCEDURE COMPLETED

If Able to Trim

3. Land as soon as practical. Use 15° flaps for landing. Refetr to "Flaps Not in Landing Position (35°)" on page E-161.

CAUTION: Do not extend the flaps beyond 15° with primary pitch trim failure.

PROCEDURE COMPLETED

RETRIM L OR R WING DOWN**(76) RETRIM L or R WING DOWN**

This message is displayed when the autopilot is detecting a lateral mistrim as indicated by a sustained aileron servo current.

1. Rudder Trim CHECK/SET
2. Aileron Trim TRIM WING DOWN
IN DIRECTION INDICATED (IF STILL REQUIRED)
3. Fuel Quantity CHECK BALANCED

PROCEDURE COMPLETED

RETRIM NOSE UP OR DOWN**77 RETRIM NOSE UP or DOWN**

This message indicates the autopilot is detecting a longitudinal mistrim as indicated by a sustained elevator servo current. This message may be momentarily displayed during aggressive acceleration, deceleration, or configuration changes. If the trim in motion aural alert is present, the message will extinguish as trim is adjusted. Amber Message Procedure, AP STAB TRIM INOP, covers the case where a mistrim situation slowly builds up, whereas this message addresses a mistrim that occurs rapidly.

WARNING: Do not disengage the autopilot or attempt to retrim the stabilizer until directed to do so in this procedure. The pilot can expect large pitch forces in excess of 50 pounds if the autopilot is disengaged.

If Trim Clacker Sounds or Stab Trim Movement Evident on EICAS Display

1. Amber RETRIM NOSE UP or DOWN Message.....MONITOR
PROCEDURE COMPLETED

If Message Does Not Clear, Trim Clacker Does Not Sound, or No Stab Trim Movement on EICAS Display

1. Airspeed and ConfigurationRETURN TO AIRSPEED AND
CONFIGURATION PRIOR TO MESSAGE DISPLAY
2. Control Wheel.....GRIP
3. AP/TRIM/NWS DISC ButtonPUSH
(PITCH FORCES MAY BE >50 POUNDS)
4. Stabilizer Trim.....RETRIM
PROCEDURE COMPLETED

ROLL SYSTEM CONTROL FAULT**78 ROLL SYSTEM CONTROL FAULT**

This message is displayed when the roll system module detects a fault in the aileron ratio changer. Lateral control forces will vary depending on what position the aileron ratio changer failed. If failed to the high-speed position, lateral control forces will be lighter than normal at slower airspeeds, especially during final approach. If the aileron ratio changer is failed to the low speed position, lateral control forces will be higher than normal at high airspeeds.

1. Land as soon as practical.
PROCEDURE COMPLETED

RUDDER BIAS FAULT**79 RUDDER BIAS FAULT**

This message is displayed when a failure of the variable rudder bias system is detected.

1. Rudder Bias Button O'RIDE THEN NORM

If Message Does Not Clear

2. Rudder Bias Button O'RIDE
3. Refer to Normal Procedures, "Descent," "Approach," "Before Landing," and "Landing" with the following exceptions:
 - a. Airspeed (until landing assured) MAINTAIN 110 KIAS MINIMUM
 - b. Thrust Reversers (if used). IDLE THRUST MAXIMUM
4. Rudder pedal force required for single-engine operations will increase significantly.

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

SECONDARY STAB TRIM FAIL**80 SECONDARY STAB TRIM FAIL**

This message is displayed when secondary trim is commanded and there is no resulting stabilizer position feedback or the resulting stabilizer position feedback is in the wrong direction.

1. Refer to "Jammed Stabilizer Trim System" on page E-118.

PROCEDURE COMPLETED

SPEED BRAKES**81 SPEED BRAKES**

This message is displayed if a sensor or hydraulic system failure is detected or when the airplane is below 500 feet radio altitude with speedbrakes deployed and steep approach mode is not selected.

1. Speedbrakes 0%

If Speedbrakes Fail to Retract

2. Refer to "Speedbrakes Fail to Retract" on page E-115.

PROCEDURE COMPLETED

If Speedbrakes Retract

PROCEDURE COMPLETED

STAB TRIM MONITOR WARNING**82 STAB TRIM MONITOR WARNING**

This message is displayed when a degradation of the no-back brake in the stabilizer actuator is detected.

1. Flight CONTINUE USING PRIMARY TRIM
PROCEDURE COMPLETED

AILERON TRIM INOPERATIVE

1. AP/TRIM/NWS DISC Button PUSH
2. Control Wheel APPLY OPPOSITE ROLL INPUT AS REQUIRED
3. Rudder TRIM AS REQUIRED FOR 1/2 SIDESLIP INDICATOR DEFLECTION TO REDUCE ROLL CONTROL FORCES
4. FUEL CROSSFEED Selector AS REQUIRED
 - a. Crossfeed to create up to a 400-pound fuel imbalance to assist in reducing roll control forces if time permits.
5. Autopilot and Yaw Damper AS DESIRED
An amber **RETRIM L** and/or **R WING DOWN** message may be displayed with the autopilot engaged. The autopilot will function normally with this message displayed. Expect some lateral control force when the autopilot is disconnected and this message is displayed.
6. Land as soon as practical.
PROCEDURE COMPLETED

SPEEDBRAKES DEPLOY ASYMMETRICALLY

1. SPEEDBRAKE Handle. ADJUST TO ACHIEVE ZERO ROLL

If Speedbrakes are Not Retracted

2. Land as soon as practical. Refer to "Speedbrakes Fail to Retract" on page E-115.

PROCEDURE COMPLETED

If Speedbrakes are Retracted

2. Land as soon as practical.
3. Landing Distance MULTIPLY FLAPS 35° BY 1.16

PROCEDURE COMPLETED

SPEEDBRAKES FAIL TO RETRACT

1. SPEEDBRAKE Handle. 0% OR ADJUSTED
TO ACHIEVE ZERO ROLL
IF ASYMMETRICAL CONDITION EXISTS
2. Land as soon as practical. Use flaps 15° for landing. If enroute,
consider effect on range.

APPROACH

3. Landing Data CONFIRM
a. Airspeed V_{REF} (UNTIL TOUCHDOWN)

 V_{REF} (KIAS) WITH SPEEDBRAKES EXTENDED

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
15°	100	105	111	116	120	125	130

- b. Landing Distance MULTIPLY FLAPS 35° BY 1.58

CAUTION: Avoid landing with a tailwind, downhill runway gradient, or at field elevations above 9,000 feet MSL. Maximum crosswind limit is 10 knots.

4. Crew Briefing COMPLETE
5. Avionics and Flight Instruments CHECK/SET
6. Minimums (RAD/BARO) SET
7. FUEL CROSSFEED Selector. AS REQUIRED, THEN OFF
8. Flaps. 7°
9. Passenger Briefing. COMPLETE
10. Seats/Seat Belts/Shoulder Harnesses/Aft Divider Doors . . CHECKED/SECURED/LATCHED OPEN
11. PAX SAFETY Button ON
12. Pressurization. ZERO DIFFERENTIAL AT TOUCHDOWN

continued on next page

*continued from previous page***BEFORE LANDING**

13. Landing Gear DOWN (3 GREEN)
The amber SPEED BRAKES message will illuminate at 500 feet AGL with speedbrakes not retracted.
14. EICAS CHECK
15. Flaps 15°
16. Airspeed V_{REF}
17. Autopilot (above minimum use height) DISENGAGE
18. Yaw Damper (prior to landing) DISENGAGE
19. Thrust AS REQUIRED TO PREVENT HIGH SINK RATE
 - a. Pitch attitude on final and in the flare may be higher than normal.
 - b. To avoid a possible high sink rate, the throttles should not be brought to idle too early.

LANDING

20. Throttles IDLE
21. Elevator Control (at touchdown) FORWARD PRESSURE
22. Brakes (after nosewheel touchdown) APPLY
23. Thrust Reverser Levers (after nosewheel touchdown) DEPLOY
24. Thrust Reversers IDLE BY 65 KIAS
PROCEDURE COMPLETED

UNCOMMANDDED RUDDER MOVEMENT

A large movement in the rudder pedals and no out-of-trim indication on the EICAS indicates rudder bias bleed line failure.

1. Rudder APPLY OPPOSITE CONTROL INPUT
2. RUDDER BIAS Button O'RIDE
(Drives the arm to the minimum position)
 - a. Rudder pedal force required for single-engine operations will increase significantly.
3. Use rudder trim as necessary to center slip/skid indicator.
4. Land as soon as practical.
PROCEDURE COMPLETED

RUDDER TRIM INOPERATIVE

1. AP/TRIM/NWS DISC Button PUSH
 2. Rudder APPLY OPPOSING CONTROL INPUT AS REQUIRED
 3. Aileron APPLY OPPOSING CONTROL INPUT AND TRIM AS REQUIRED
 4. FUEL CROSSFEED Selector AS REQUIRED
 - a. If time permits, crossfeed to create up to a 400-pound fuel imbalance to assist in reducing roll control forces.
 5. Autopilot and Yaw Damper AS DESIRED
 An amber **RETRIM L** and/or **R WING DOWN** message may be displayed with the autopilot engaged. The autopilot will function normally with this message displayed. Expect some lateral control force when the autopilot is disconnected and this message is displayed.
 6. Land as soon as practical.
- PROCEDURE COMPLETED

JAMMED RUDDER

1. AP/TRIM/NWS DISC Button PUSH
2. Aileron APPLY OPPOSING CONTROL INPUT AND TRIM AS REQUIRED
3. FUEL CROSSFEED Selector AS REQUIRED
 - a. If time permits, crossfeed to create up to a 400-pound fuel imbalance to assist in reducing roll control forces.
4. Land as soon as practical.

APPROACH

5. Landing Data CONFIRM
 - a. Airspeed V_{REF}

VREF (KIAS)

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
35°	89	94	99	103	107	111	116

Landing Distance

6. Crew Briefing COMPLETE
 7. Avionics and Flight Instruments CHECK/SET
 8. Minimums (RAD/BARO) SET
 9. FUEL CROSSFEED Selector OFF
 10. Exterior Lights AS REQUIRED
 11. Flaps 7° OR 15°
 12. Passenger Briefing COMPLETE
 13. Seats/Seat Belts/Shoulder Harnesses/

Aft Divider Doors CHECKED/SECURED/LATCHED OPEN
 14. PAX SAFETY Button ON
 15. Pressurization ZERO DIFFERENTIAL AT TOUCHDOWN
- continued on next page*

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BEFORE LANDING

It is recommended that the copilot fly the approach and landing so that the pilot can use the nosewheel steering tiller for directional control on landing rollout as required. If possible, land with a crosswind opposite the rudder jam (i.e., rudder jammed right, land with a crosswind from the left).

- | | |
|------------------------|------------------|
| 16. Landing Gear | DOWN (3 GREEN) |
| 17. Flaps | 35° |
| 18. Speedbrakes | 0% |
| 19. EICAS | CHECK |
| 20. Airspeed | V _{REF} |

LANDING

CAUTION: Maximum crosswind limit is 10 knots.

- | | |
|--|------------------|
| 21. Throttles | IDLE |
| 22. Speedbrakes (at touchdown) | 100% |
| 23. Elevator Control (at touchdown) | FORWARD PRESSURE |
| 24. Nosewheel Steering Tiller
(after nosewheel touchdown) | AS REQUIRED |
| 25. Differential Brakes (after nosewheel touchdown)..... | AS REQUIRED |
| PROCEDURE COMPLETED | |

JAMMED STABILIZER TRIM SYSTEM

Jammed at +1.2° to -1.9° (Typical High Speed Cruise)

1. AP/TRIM/NWS DISC Button PUSH
2. Airspeed..... MAINTAIN TRIM AIRSPEED AS LONG AS PRACTICAL
3. Land as soon as practical. Use flaps 15° for landing.
4. SPEEDBRAKE Handle..... PULL TO DETENT (6 PANELS)
TO REDUCE CONTROL FORCES AS AIRSPEED
IS DECREASED FOR APPROACH AND LANDING
5. If time permits, shift passengers to the aft-most seats.
6. Copilot APPLY ELEVATOR FORCE
TO ASSIST PILOT AS REQUIRED
7. Airspeed..... 150 KIAS MINIMUM
UNTIL LANDING IS ASSURED

APPROACH

8. Landing Data
- a. V_{REF} 150 KIAS MINIMUM
- b. Landing distance..... MULTIPLY FLAPS 35° BY 2.34

CAUTION: Avoid landing with a tailwind or downhill runway gradient.

9. Crew Briefing COMPLETE
10. Avionics and Flight Instruments CHECK/SET
11. TAWS FLAP OVRD

continued on next page

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12. Minimums (RAD/BARO) SET
13. FUEL CROSSFEED Selector. AS REQUIRED, THEN OFF
14. Flaps. 7°
15. Passenger Briefing. COMPLETE
16. Seats/Seat Belts/Shoulder Harnesses/
Aft Divider Doors CHECKED/SECURED/LATCHED OPEN
17. PAX SAFETY Button ON
18. Pressurization. ZERO DIFFERENTIAL AT TOUCHDOWN

BEFORE LANDING

19. Landing Gear DOWN (3 GREEN)
20. Flaps. 15°
21. EICAS. CHECK
22. Airspeed 150 KIAS MINIMUM UNTIL LANDING IS ASSURED
23. Thrust. AS REQUIRED TO PREVENT HIGH SINK RATE
 - a. It is recommended that the pilot-not-flying assist with the throttles.
 - b. Delay flaps extension as long as possible. Extending the flaps increases the pull forces on the control column.
 - c. With speedbrakes extended, the pitch attitude on final and in the flare may be higher than normal.
 - d. To avoid a high sink rate, the throttles should not be brought to idle too early.

LANDING

24. Throttles IDLE
25. Speedbrakes (at touchdown) 100%
26. Elevator Control (at touchdown). FORWARD PRESSURE
27. Brakes (after nosewheel touchdown). APPLY
28. Thrust Reverser Levers (after nosewheel touchdown). DEPLOY
29. Thrust Reversers IDLE BY 65 KIAS
PROCEDURE COMPLETED

Jammed at -2.0° To -5.0° (Typical Low Speed Cruise/Approach)

1. AP/TRIM/NWS DISC Button PUSH
2. Land as soon as practical. Use flaps 15° for landing.
3. Airspeed 140 KIAS MAXIMUM

APPROACH

4. Landing Data CONFIRM
 - a. Airspeed V_{REF}

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V_{REF} (KIAS)

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
15°	95	101	106	110	115	119	124

b. Landing Distance MULTIPLY FLAPS 35° BY 1.20

CAUTION: Avoid landing with a tailwind or downhill runway gradient.

5. Crew Briefing COMPLETE
6. Avionics and Flight Instruments CHECK/SET
7. TAWS FLAP OVRD ON
8. Minimums (RAD/BARO) SET
9. FUEL CROSSFEED Selector AS REQUIRED, THEN OFF
10. Flaps 7°
11. Passenger Briefing COMPLETE
12. Seats/Seat Belts/Shoulder Harnesses/
Aft Divider Doors CHECKED/SECURED/LATCHED OPEN
13. PAX SAFETY Button ON
14. Pressurization ZERO DIFFERENTIAL AT TOUCHDOWN

BEFORE LANDING

15. Landing Gear DOWN (3 GREEN)
16. Flaps 15°
17. Speedbrakes 0%
18. EICAS CHECK
19. Airspeed V_{REF}

Jammed at -5.1° To -6.9° (Typical Landing Configuration)

1. AP/TRIM/NWS DISC Button PUSH
2. Speedbrakes 0%
3. Flaps 35°
4. Airspeed V_{REF}
5. Landing Distance MULTIPLY FLAPS 35° BY 1.16

WARNING: An abrupt release of the control column force may cause the airplane to abruptly pitch up and stall.

6. Land as soon as practical.

PROCEDURE COMPLETED

LANDING WITH FAILED PRIMARY FLIGHT CONTROL

A failed flight control is defined as a flight control surface that does not respond to control input. The most probable cause would be a severed flight control cable. This condition typically results in the control surface trailing to the neutral position.

ELEVATOR

1. AP/TRIM/NWS DISC Button PUSH
2. Yaw damper AS DESIRED
3. Pitch Attitude USE STABILIZER TRIM IN SMALL INCREMENTS
4. Make small pitch and power changes and set up landing configuration early.
5. Land as soon as possible. Use flaps 15° for landing. Refer to "Flaps Not in Landing Position (35°)" on page E-161, with the following exception:
 - a. Landing Distance MULTIPLY FLAPS 35° BY 1.24

CAUTION: Avoid landing with a tailwind, downhill runway gradient, or at field elevations above 11,000 feet MSL.

PROCEDURE COMPLETED

Both Aileron and Roll Spoilers

1. AP/TRIM/NWS DISC Button PUSH
2. Use rudder for directional and lateral control. Do not use aileron trim except for gross adjustments.

CAUTION: Limit bank angles to 15° maximum. Do not engage yaw damper.

3. Land as soon as practical. Use flaps 15° for landing.
 - a. If possible, choose a runway with the least possible crosswind.
 - b. Establish a long, straight-in final and minimize maneuvering.

CAUTION: Maximum crosswind limit is 10 knots.

APPROACH

4. Landing Data CONFIRM
 - a. Airspeed V_{REF}

V_{REF} (KIAS)

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
15°	95	101	106	110	115	119	124

- b. Landing Distance MULTIPLY FLAPS 35° BY 1.34

CAUTION: Avoid landing with a tailwind or downhill runway gradient.

5. Crew Briefing COMPLETE
6. Avionics and Flight Instruments CHECK/SET
7. TAWS FLAP OVRD ON
8. Minimums (RAD/BARO) SET

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9. FUEL CROSSFEED Selector AS REQUIRED, THEN OFF
10. Flaps 7°
11. Passenger Briefing COMPLETE
12. Seats/Seat Belts/Shoulder Harnesses/
Aft Divider Doors CHECKED/SECURED/LATCHED OPEN
13. PAX SAFETY Button ON
14. Pressurization ZERO DIFFERENTIAL AT TOUCHDOWN

BEFORE LANDING

15. Landing Gear DOWN (3 GREEN)
16. Flaps 15°
17. EICAS CHECK
18. Airspeed V_{REF}

LANDING

19. Throttles IDLE
20. Elevator Control (at touchdown) FORWARD PRESSURE
21. Speedbrakes (after nosewheel touchdown) 100%
22. Brakes (after nosewheel touchdown) APPLY
23. Thrust Reverser Levers (after nosewheel touchdown) DEPLOY
24. Thrust Reversers IDLE BY 65 KIAS
PROCEDURE COMPLETED

RUDDER

1. AP/TRIM/NWS DISC Button PUSH
2. Rudder TRIM FOR COORDINATED FLIGHT
 - a. Yaw Damper AS DESIRED
3. Land as soon as practical.
 - a. Consideration should be given to landing on a runway that is not less than 150 feet wide.
 - b. Avoid the use of thrust reversers during landing rollout.
 - c. Use of differential braking and/or the nosewheel steering tiller may be required for directional control upon landing.

CAUTION: Maximum crosswind limit is 10 knots.

PROCEDURE COMPLETED

GUST LOCK ON**(83) GUST LOCK ON**

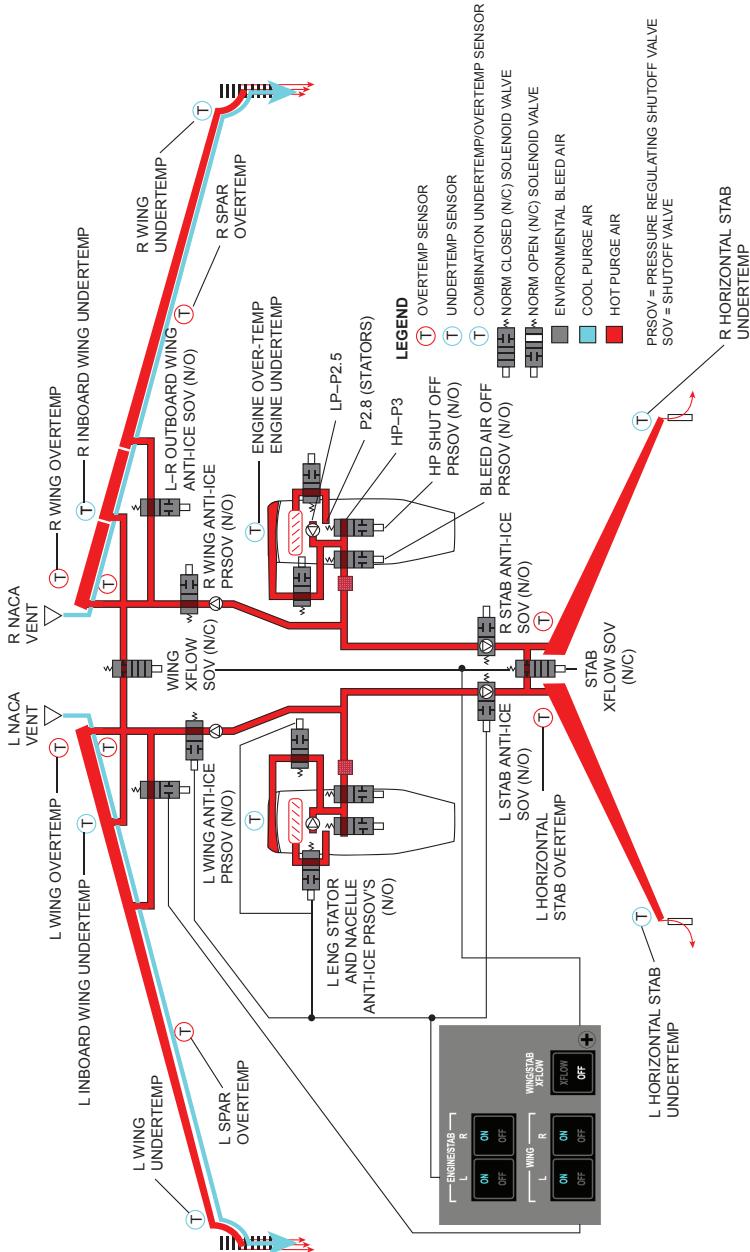
This message indicates that the flight control and throttle gust lock is engaged. This message will trigger the NO TAKEOFF warning system.

YD FAIL A AND/OR B**(84) YD FAIL A and/or B**

This message indicates the respective yaw damper system has failed. A loss of the guidance panel or rudder servo will also cause the message to be displayed. The AFCS will automatically select the other side if it is available.

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ANTI-ICE SYSTEM



AOA HEAT FAIL L AND/OR R**85 AOA HEAT FAIL L and/or R**

This message is displayed when the ANTI-ICE PITOT/STATIC buttons are selected ON and current is not detected at the respective AOA probe. Affected side stall warning and low speed awareness may be unreliable in icing conditions.

1. Exit icing environment.

PROCEDURE COMPLETED

ENG ANTI-ICE COLD L AND/OR R**86 ENG ANTI-ICE COLD L and/or R****On Ground**

This message is displayed when either the preflight check has failed, the stator anti-ice valve is not open, or the surface has not achieved adequate temperature for anti-icing. If this message is present after a satisfactory preflight check, then the surface is cold and can be cleared by continuing to wait for the surface to warm up.

1. Increase thrust on affected side to a maximum of 81% N₂.

PROCEDURE COMPLETED

In Flight

This message is displayed when an undertemperature condition of the engine inlet is detected or the engine stator anti-ice valve has not opened fully. This message is inhibited for 2.5 minutes after turning the system on to allow the inlet to achieve adequate temperature for antiicing. This message will be cyan if the respective amber **ENG ANTI-ICE O'TEMP** or **SUPPLY BLEED LEAK L** and/or **R** message is displayed. This may occur if the engine inlet anti-ice is operating normally and the engine stator anti-ice valve is not fully open. This message will also be displayed if the respective ANTI-ICE ENGINE/STAB button is OFF and the opposite ANTI-ICE ENGINE/STAB button is ON.

1. ANTI-ICE ENGINE/STAB Buttons (both)CHECK ON
2. Throttle (affected side)INCREASE

If Message Does Not Clear

3. ENG BLD AIR Selector (affected side)HP

If Message Still Does Not Clear

4. Exit icing environment.

PROCEDURE COMPLETED

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If Message Clears

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

ENG ANTI-ICE O'TEMP L AND/OR R

87 **ENG ANTI-ICE O'TEMP L and/or R**

This message is displayed when an overtemperature condition of the engine inlet is detected. The system automatically closes the respective engine anti-ice shut off valve. After the surface has cooled, the system will automatically restore normal operation. Overtemperature monitoring is active at all times regardless of the position of the ANTI-ICE buttons. An overtemperature indication with the system off indicates either a failure of the monitoring system or failure of the respective anti-ice valve.

NOTE: When operating the anti-ice system with a single bleed source and WING/STAB XFLOW selected to XFLOW, the system is automatically switched to HP. With high power settings, it is considered normal for the amber ENG ANTI-ICE O'TEMP message to cycle in this condition.

1. Reduce thrust on affected side (if practical).
2. Monitor for reoccurrence.

If Message Does Not Clear or Reoccurs

3. ENG BLD AIR Selector (affected side) LP
4. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS) OR
FL390 MAXIMUM (12 PASSENGERS)
5. Exit icing environment.

If Amber ANTI-ICE COLD Messages are Displayed

6. ENG BLD AIR Selector (affected side) NORM
7. ANTI-ICE ENGINE/STAB Buttons (both) OFF

PROCEDURE COMPLETED

If Amber ANTI-ICE COLD Messages are Not Displayed

6. ANTI-ICE ENGINE/STAB Buttons (both) OFF

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

INBD WING A/I COLD L AND/OR R

88 **INBD WING A/I COLD L and/or R**

On Ground

This message is displayed when either the preflight check has failed or the surface has not achieved adequate temperature for anti-icing. If this message is present after a satisfactory preflight check, then the surface is cold and can be cleared by continuing to wait for the surface to warm up.

1. Increase thrust to a maximum 81% N₂.

PROCEDURE COMPLETED

In Flight

This message is displayed when an undetemperature condition of the inboard wing is detected. The inboard wing is considered part of engine anti-ice protection and is turned on with the ANTI-ICE ENGINE/STAB buttons. This message is inhibited for 2.5 minutes after turning the system on to allow the surface to achieve adequate temperature for anti-icing. This message will be cyan when the respective amber **WING ANTI-ICE O'TEMP L and/or R** or **WING BLEED LEAK L and/or R** message is also displayed.

1. ANTI-ICE ENGINE/STAB Buttons (both)CHECK ON
 - a. This message will remain illuminated if the respective ANTI-ICE ENGINE/STAB button is selected OFF, ANTI-ICE WING/STAB XFLOW is OFF, and the opposite ANTI-ICE ENGINE/STAB button is selected ON.
2. Throttle (affected side)INCREASE

If Message Does Not Clear

3. ENG BLD AIR Selector (affected side)HP

If Message Still Does Not Clear

4. ANTI-ICE WING/STAB XFLOW ButtonXFLOW
 - a. The STAB ANTI-ICE COLD L and/or R message may be displayed under certain flight conditions that require a reduced throttle setting. Ice may accumulate on the leading edge of the horizontal stabilizer.
5. Airspeed180 KIAS MINIMUM
(UNTIL CLEAR OF ICING ENVIRONMENT)
6. Exit icing environment.

Refer to "Continued Flight in Icing Environment and Single Bleed Source on page E-137.

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

PITOT/STATIC COLD L AND/OR R AND/OR STBY**89 PITOT/STATIC COLD L and/or R and/or STBY**

This message is displayed when either ANTI-ICE PITOT/STATIC button is ON and no current is flowing to the probe or static port, when either switch is OFF and a throttle is in the TO detent, or either switch is OFF and the airplane is airborne.

1. Airspeed/Altitude
(affected system) COMPARE WITH REMAINING SYSTEMS

If Air Data Information Not Normal

2. Reversion ADC Button (affected side) PUSH
3. PFD ADI Displays CONFIRM ADC1 OR ADC2 IS DISPLAYED IN BOTH PFDS
4. Exit icing environment.
PROCEDURE COMPLETED

If Air Data Information Normal

2. Continue to monitor.
PROCEDURE COMPLETED

RAT HEAT FAIL L AND/OR R**90 RAT HEAT FAIL L and/or R**

This message is displayed when current is not detected at one or both of the respective RAT probes with the ANTI-ICE ENGINE/STAB button ON. If in icing conditions, the FADECs will automatically compensate RAT information.

1. Exit icing environment.

If Amber ENGINE CONTROL FAULT Message is Displayed

2. Refer to "ENGINE CONTROL FAULT L and/or R" on page E-25.
PROCEDURE COMPLETED

If Amber ENGINE CONTROL FAULT Message is Not Displayed

PROCEDURE COMPLETED

STAB ANTI-ICE COLD L AND/OR R

91 STAB ANTI-ICE COLD L and/or R

On Ground

This message is displayed when either the preflight check has failed or the surface has not achieved adequate temperature for anti-icing. If this message is present after a satisfactory preflight check, then the surface is cold and can be cleared by continuing to wait for the surface to warm up.

1. Increase thrust to a maximum of 81% N₂.

PROCEDURE COMPLETED

In Flight

This message is displayed when an undertemperature condition of the horizontal stabilizer exists. This message is inhibited for 2.5 minutes after turning the system on to allow the surface to achieve adequate temperature for anti-icing. This message will be cyan when the respective amber STAB ANTI-ICE O'TEMP L and/or R or STAB BLEED LEAK message is also displayed.

1. ANTI-ICE ENGINE/STAB Buttons (both)CHECK ON

NOTE: This message will remain illuminated if the respective ANTI-ICE ENGINE/STAB button is selected OFF, the ANTI-ICE WING/STAB XFLOW is OFF, and the opposite ANTI-ICE ENGINE/STAB button is selected ON.

2. Throttle (affected engine)INCREASE

If Message Does Not Clear

3. ENG BLD AIR Selector (affected side)HP

If Message Still Does Not Clear

4. ANTI-ICE WING/STAB XFLOW ButtonXFLOW

- a. The amber STAB ANTI-ICE COLD L and/or R message may be displayed under certain flight conditions that require a reduced throttle setting. Ice may accumulate on the leading edge of the horizontal stabilizer.

5. Airspeed180 KIAS MINIMUM
(UNTIL CLEAR OF THE ICING ENVIRONMENT)

6. Exit icing environment.

7. Flaps15° MAXIMUM
(refer to "Flaps Not in Landing Position (35°)" on page E-161).

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

STAB ANTI-ICE O'TEMP L AND/OR R**92 STAB ANTI-ICE O'TEMP L and/or R**

This message is displayed when an overtemperature condition of the respective horizontal stabilizer is detected. The system automatically closes the respective horizontal stabilizer anti-ice shutoff valve. After the surface has cooled, the system will automatically restore normal operation. Overtemperature monitoring is active at all times regardless of the position of the ANTI-ICE buttons. An overtemperature indication with the system off indicates either a failure of the monitoring system or failure of the respective anti-ice valve.

1. Reduce thrust on affected side (if practical).
2. Monitor for reoccurrence.

If Message Does Not Clear or Reoccurs

3. ENG BLD AIR Selector (affected side).....LP
4. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS)
OR FL390 MAXIMUM (12 PASSENGERS)
5. Exit icing environment.

If Amber ANTI-ICE COLD Messages are Displayed

6. ENG BLD AIR Selector (affected side)NORM
7. Exit icing environment.
8. ANTI-ICE ENGINE/STAB Buttons (both) OFF
9. Flaps 15° MAXIMUM
(refer to "Flaps Not in Landing Position (35°)" on page E-161).
PROCEDURE COMPLETED

If Amber ANTI-ICE COLD Messages are Not Displayed

6. Exit icing environment.
7. ANTI-ICE ENGINE/STAB Buttons (both) OFF
8. Flaps 15° MAXIMUM
(refer to "Flaps Not in Landing Position (35°)" on page E-161).
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

STAB BLEED LEAK

93

STAB BLEED LEAK

This message is displayed when a bleed leak in the vertical or horizontal stabilizer anti-ice bleed air supply system is detected. The stabilizer anti-ice valve closes automatically. The valve will stay closed after the sensor cools. The cyan STAB ANTI-ICE COLD message will also be displayed. The STAB BLEED LEAK monitor is enabled whether or not the anti-ice is on. If the stabilizer anti-ice can be verified to be off (buttons, N₂, ITT), this message may be a monitor failure.

1. ANTI-ICE ENGINE/STAB Buttons (both) OFF FOR APPROXIMATELY 30 SECONDS, THEN ON

If Message Does Not Clear or Reoccurs

2. ANTI-ICE WING/STAB XFLOW Button OFF
3. Airspeed 180 KIAS MINIMUM UNTIL CLEAR OF THE ICING ENVIRONMENT
4. Exit icing environment.
5. Flaps 15° MAXIMUM (refer to "Flaps Not in Landing Position (35°)" on page E-161).

CAUTION: The engine inlet and inboard wing ice protection is still operating. Do not turn the ANTI-ICE ENGINE/STAB buttons off.

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

SUPPLY BLEED LEAK L AND/OR R**94 SUPPLY BLEED LEAK L and/or R**

This message is displayed when a bleed leak to the ECS supply or wing and stabilizer anti-ice system is detected.

1. ENG BLD AIR Selector (affected side)..... OFF FOR APPROXIMATELY 30 SECONDS, THEN NORM
2. ANTI-ICE ENGINE/STAB Button
(affected side, if selected ON) OFF THEN ON

If Message Does Not Clear or Reoccurs

3. ENG BLD AIR Selector (affected side)..... OFF
4. BAGGAGE HEAT Button OFF
5. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS)
OR FL390 MAXIMUM (12 PASSENGERS)
6. ANTI-ICE ENGINE/STAB Button
(affected side). OFF THEN ON
7. ANTI-ICE WING/STAB XFLOW Button XFLOW
If ENG/STAB anti-ice is on, the amber **STAB ANTI-ICE COLD L** and/or **R** message may be displayed under certain flight conditions that require a reduced throttle setting. Ice may accumulate on the leading edge of the horizontal stabilizer.
8. Exit or avoid icing environment. Refer to "Continued Flight in Icing Environment and Single Bleed Air Source" on page E-137.

PROCEDURE COMPLETED

If Message Clears

3. ANTI-ICE ENGINE /STAB Buttons (both) AS REQUIRED

PROCEDURE COMPLETED

WINDSHIELD HEAT INOP L AND/OR R**95 WINDSHIELD HEAT INOP L and/or R**

This message is displayed when the windshield heat has failed. The windshield temperature controller has detected a fault and has shut off the windshield heat. This message may cycle if the detected fault is cycling. If this message is accompanied by the amber WINDSHIELD OVERTEMP L and/or R message, refer to "WINDSHIELD OVERTEMP L and/or R" on page E-134.

1. L or R WSHLD ANTI-ICE Circuit Breaker
(affected side, LP-C3R1 or RP-C10R1) PULL
2. Exit icing environment.

Defog capability and ice protection will be lost to the outboard and center sections of the affected windshield, the inboard section of the opposite windshield, and the opposite side window.

PROCEDURE COMPLETED

WINDSHIELD OVERTEMP L AND/OR R**96 WINDSHIELD OVERTEMP L and/or R**

This message is displayed when the windshield controller has detected an overheat situation which could result in damage. This message may cycle as the windshield cools and heats.

If Message Is Steady

1. L or R WSHLD ANTI-ICE Circuit Breaker
(affected side, LP-C3R1 or RP-C10R1) PULL
2. Exit icing environment.

Defog capability and ice protection will be lost to the outboard and center sections of the affected windshield, the inboard section of the opposite windshield, and the opposite side window.

PROCEDURE COMPLETED

If Message Cycles

1. Windshield MONITOR
- PROCEDURE COMPLETED

WING A/I CROSSFLOW OPEN

97

WING A/I CROSSFLOW OPEN

This message is displayed when the wing anti-ice crossflow valve has failed to fully close. This message will be cyan if the ANTI-ICE WING/STAB XFLOW button is selected to XFLOW and the valve is open.

1. ANTI-ICE WING/STAB XFLOW Button XFLOW
The amber **STAB ANTI-ICE COLD L** and/or **R** message may be displayed under certain flight conditions that require a reduced throttle setting. Ice may accumulate on the leading edge of the horizontal stabilizer.
2. Exit icing environment. Refer to "Continued Flight in Icing Environment and Single Bleed Air Source" on page E-137.
PROCEDURE COMPLETED

WING ANTI-ICE COLD L AND/OR R

98

WING ANTI-ICE COLD L and/or R**On Ground**

This message is displayed when either the preflight check has failed or the surface has not achieved adequate temperature for anti-icing. If this message is present after a satisfactory preflight check, then the surface is cold and can be cleared by continuing to wait for the surface to warm up.

1. Increase thrust to a maximum of 81% N₂.

PROCEDURE COMPLETED

In Flight

This message is displayed when an undertemperature condition of the outboard wing is detected. This message is inhibited for 2.5 minutes after turning the system on to allow the surface to achieve adequate temperature for anti-icing. This message will be cyan when the respective amber **WING ANTI-ICE O'TEMP L** and/or **R** or **WING BLEED LEAK L** and/or **R** message is also displayed.

1. ANTI-ICE WING Buttons (both) CHECK ON
This message will remain illuminated if the respective ANTI-ICE ENGINE/STAB button is selected OFF, ANTI-ICE WING/STAB XFLOW is OFF, and the opposite ANTI-ICE ENGINE/STAB button is selected ON.
2. Throttle (affected engine) INCREASE
(allow 2 minutes for message to clear)

continued on next page

*continued from previous page***If Message Does Not Clear**

3. ENG BLD AIR Selector (affected side) HP
(allow 2 minutes for message to clear)

If Message Still Does Not Clear

4. ANTI-ICE WING/STAB XFLOW Button XFLOW
(allow 2 minutes for message to clear)

The amber STAB ANTI-ICE COLD L and/or R message may be displayed under certain flight conditions that require a reduced throttle setting. Ice may accumulate on the leading edge of the horizontal stabilizer.

5. Airspeed 180 KIAS MINIMUM
UNTIL CLEAR OF ICING ENVIRONMENT
6. Exit icing environment. Refer to "Continued Flight in Icing Environment and Single Bleed Air Source" on page E-137.
7. If the message still does not clear after 2 minutes of selecting crossflow on:
- ANTI-ICE WING/STAB XFLOW Button OFF
 - ANTI-ICE WING Buttons (both) OFF
 - Refer to "Landing With Ice on Wing Leading Edge" on page E-138.
- PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

WING ANTI-ICE O'TEMP L AND/OR R

99

WING ANTI-ICE O'TEMP L and/or R

This message is displayed when an overtemperature condition of either the inboard or outboard section of the respective wing is detected. The system automatically closes the respective wing anti-ice shutoff valve. After the surface has cooled, the system will automatically restore normal operation. Overtemperature monitoring is active at all times regardless of the position of the ANTI-ICE buttons. An overtemperature indication with the system off indicates either a failure of the monitoring system or failure of the respective anti-ice valve.

- Reduce thrust on affected side.
- Monitor for reoccurrence.

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If Message Does Not Clear or Reoccurs

3. ENG BLD AIR Selector (affected side).....LP
4. Altitude FL410 MAXIMUM (11 OR LESS PASSENGERS)
OR FL390 MAXIMUM (12 PASSENGERS)
5. Exit icing environment.

If Amber ANTI-ICE COLD Messages are Displayed

6. ENG BLD AIR Selector (affected side)NORM
7. Exit icing environment.
8. ANTI-ICE WING Buttons (both) OFF

If Landing With Known or Suspected Ice on Wing Leading Edge

9. Refer to "Landing With Ice on Wing Leading Edge" on page E-138.
PROCEDURE COMPLETED

If no Ice on Wing Leading Edge

PROCEDURE COMPLETED

If Amber ANTI-ICE COLD Messages are Not Displayed

6. Exit icing environment.
7. ANTI-ICE WING Buttons (both) OFF

If Landing With Known or Suspected Ice on Wing Leading Edge

8. Refer to "Landing With Ice on Wing Leading Edge" on page E-138.
PROCEDURE COMPLETED

If No Ice on Wing Leading Edge

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

CONTINUED FLIGHT IN ICING ENVIRONMENT AND SINGLE BLEED AIR SOURCE

The amber **STAB ANTI-ICE COLD L** and/or **R** message may be displayed under certain flight conditions that require a decreased throttle setting. Ice may accumulate on the leading edge of the horizontal stabilizer.

1. ANTI-ICE WING/STAB XFLOW ButtonXFLOW
2. Throttles
 - a. Engine with operative bleed air.....INCREASE
 - b. Engine with inoperative bleed air (if engine is running).....REDUCE
as required to maintain desired airspeed/flight path.

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3. Airspeed 180 KIAS MINIMUM UNTIL CLEAR OF THE ICING ENVIRONMENT
4. Exit icing environment.
5. When clear of the icing environment, ANTI-ICE WING/STAB XFLOW, WING and ENGINE/STAB Buttons OFF
6. Throttles AS REQUIRED
7. Land as soon as practical.

If Landing With Known or Suspected Ice on Wing Leading Edge

8. Refer to "Landing With Ice on Wing Leading Edge" on page E-138.
PROCEDURE COMPLETED

If No Ice on Wing Leading Edge

If Operating Single-Engine

7. Refer to "Single-Engine Approach and Landing" on page E-159.
PROCEDURE COMPLETED

If Operating Multi-Engine

7. Use flaps 15° for landing. Refer to "Flaps Not in Landing Position (35°)" on page E-161.
PROCEDURE COMPLETED

LANDING WITH ICE ON WING LEADING EDGE

APPROACH

1. Landing Data CONFIRM
a. Airspeed V_{REF} (KIAS)

V_{REF} (KIAS) WITH ICE ON WING LEADING EDGE

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
15°	110	116	121	125	130	134	139

- b. Landing Distance MULTIPLY FLAPS 35° BY 1.50

CAUTION: Avoid landing with a tailwind, downhill runway gradient, or at field elevations above 4,000 feet MSL.

2. Crew Briefing COMPLETE
3. Avionics and Flight Instruments CHECK/SET
4. TAWS FLAP OVRD ON
5. Minimums (RAD/BARO) SET
6. FUEL CROSSFEED Selector OFF
7. Exterior Lights AS REQUIRED
8. Flaps 7°
9. Passenger Briefing COMPLETE

continued on next page

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10. Seats/Seat Belts/Shoulder Harnesses/Aft Divider Doors CHECKED/SECURED/LATCHED OPEN
11. PAX SAFETY Button ON
12. Pressurization. ZERO DIFFERENTIAL AT TOUCHDOWN

BEFORE LANDING

13. Landing Gear DOWN (3 GREEN)
 14. Speedbrakes 0%
 15. EICAS CHECK
 16. Flaps. 15°
 17. Airspeed V_{REF}
 18. Autopilot (prior to minimum use height) DISENGAGE
 19. Yaw Damper (prior to landing) DISENGAGE
- PROCEDURE COMPLETED

ANTI-ICE ON ALL

(100) ANTI-ICE ON ALL

This message is displayed when all anti-ice is selected ON.

ANTI-ICE ON ENGINE/STAB

(101) ANTI-ICE ON ENGINE/STAB

This message is displayed when engine/stab anti-ice (ANTI-ICE ENGINE/STAB L and R buttons) is selected ON and either wing anti-ice (ANTI-ICE WING L or R button) is selected OFF. This message is not displayed when the cyan ANTI-ICE ON ALL message is displayed.

ENG ANTI-ICE COLD L AND/OR R

(102) ENG ANTI-ICE COLD L and/or R

On the ground, this message is displayed cyan when the respective engine anti-ice (ANTI-ICE ENGINE/STAB L or R) button is selected ON and the inlet lip surface is cold (below 60°C). In flight, this message is displayed cyan if the inlet lip surface is cold (below 60°C) due to automatic shutoff from an engine anti-ice overheat condition.

INBD WING A/I COLD L AND/OR R**(103) INBD WING A/I COLD L and/or R**

On the ground, this message is displayed cyan when the respective inboard wing anti-ice (ANTI-ICE ENGINE/STAB L or R) button is selected ON and the surface is cold (below 18°C). This message should clear within 2.5 minutes of selecting the button ON; otherwise the message will turn amber.

In flight, this message is displayed cyan if the surface is cold (below 18°C) due to automatic shutoff from a wing anti-ice overheat condition or a wing bleed leak condition.

PITOT/STATIC COLD L AND/OR R AND/OR STBY**(104) PITOT/STATIC COLD L and/or R and/or STBY**

This message is displayed on the ground with the ANTI-ICE PITOT/STATIC buttons selected OFF. The message will be amber in flight or on the ground when a throttle is advanced.

STAB ANTI-ICE COLD L AND/OR R**(105) STAB ANTI-ICE COLD L and/or R**

On the ground, this message is displayed cyan when the respective stabilizer anti-ice (ANTI-ICE ENGINE/STAB L or R) button is selected ON and the surface is cold (below 10°C). This message should clear within 2.5 minutes of selecting the button ON; otherwise the message will turn amber.

In flight, this message is displayed cyan if the surface is cold (below 10°C) due to automatic shutoff from a stabilizer anti-ice overheat condition or a stabilizer bleed leak condition.

WING A/I CROSSFLOW OPEN**106 WING A/I CROSSFLOW OPEN**

This message is displayed when the ANTI-ICE WING/STAB XFLOW button has been selected to XFLOW and the wing crossflow valve is open. This message will be amber if the valve is not fully closed and the ANTI-ICE WING/STAB XFLOW button has been selected to OFF.

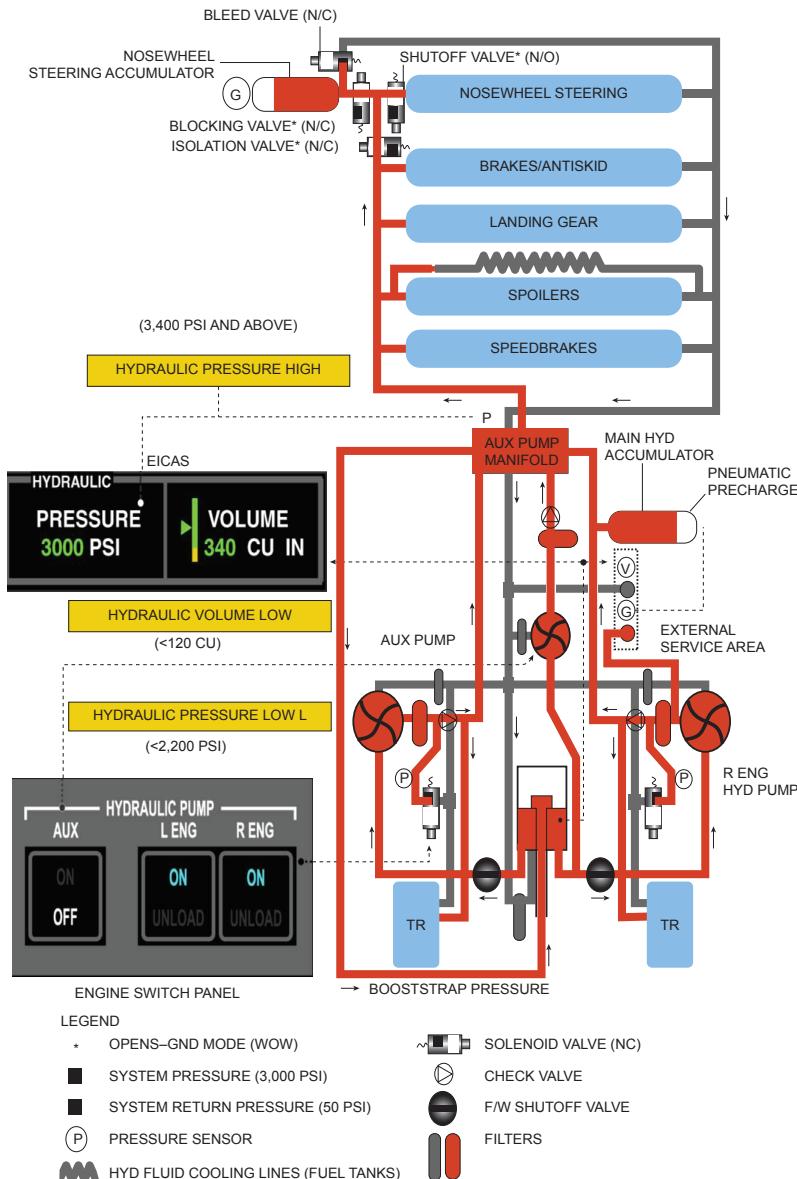
WING ANTI-ICE COLD L AND/OR R**107 WING ANTI-ICE COLD L and/or R**

On the ground, this message is displayed cyan when the respective outboard wing anti-ice (ANTI-ICE WING L or R button) is selected ON and the surface is cold (below 16°C). This message should clear within 2.5 minutes of selecting the button ON; otherwise the message will turn amber.

In flight, this message is displayed cyan if the surface is cold (below 16°C) due to automatic shutoff from a wing anti-ice overheat condition or a wing bleed leak condition.

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HYDRAULICS



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HYDRAULIC PRESSURE HIGH**(108) HYDRAULIC PRESSURE HIGH**

This message is displayed when the hydraulic pressure is greater than or equal to 3400 PSI for longer than 10 seconds..

1. HYDRAULIC PUMP L ENG Button UNLOAD

If Message Does Not Clear

2. HYDRAULIC PUMP L ENG Button ON
3. HYDRAULIC PUMP R ENG Button UNLOAD

If Message Still Does Not Clear

4. HYDRAULIC PUMP R ENG Button ON
5. Land as soon as possible.

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

HYDRAULIC PRESSURE LOW L AND/OR R**(109) HYDRAULIC PRESSURE LOW L and/or R**

This message is displayed when one or both hydraulic pumps are not operating due to failure or crew selection. All hydraulically powered systems will operate normally if only one side's pressure is low.

1. HYDRAULIC PUMP ENG Buttons (both).....CHECK ON

If Message does not Clear**If Both L and R Messages are Displayed**

2. HYDRAULIC PUMP ENG Buttons (both) UNLOAD

CAUTION: Speedbrakes, roll spoilers, thrust reversers, landing gear, nosewheel steering, and brakes will not operate using normal procedures. Be prepared to use alternate or emergency systems. Maximum crosswind limit is 10 knots.

3. Altitude FL410 MAXIMUM
4. Land as soon as practical. Multiply FLAPS 35° Landing Distance by 1.63

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BEFORE LANDING

5. LDG GEAR CONT 1
Circuit Breaker (LP-C11R4) PULL
Anti Skid is inoperative. Landing gear will not retract after blowdown.
6. LANDING GEAR Handle DOWN
7. LANDING GEAR BLOWDOWN Handle PULL
8. Landing Gear CONFIRM 3 GREEN LIGHTS
9. Flaps 35
10. EICAS CHECK
11. Airspeed V_{REF}
12. Autopilot (prior to minimum use height) DISENGAGE
13. Yaw Damper (prior to landing) DISENGAGE

LANDING

14. Throttles IDLE
15. Elevator Control (at touchdown) FORWARD PRESSURE
16. Brake Pedals REMOVE FEET
17. EMERGENCY BRAKE
Handle PULL AND HOLD UNTIL STOPPED
18. Directional Control MAINTAIN WITH NOSEWHEEL STEERING

AFTER LANDING

19. Flaps AS DESIRED
20. Anti-Ice Switches CONFIRM
 - a. PITOT DTATIC Buttons (both) OFF
 - b. ENGINE/STAB Buttons (both) AS REQUIRED
 - c. WING Buttons (both) OFF
21. Exterior Lights AS REQUIRED
22. Stabilizer Position SET TO -6.9
23. APU TEST/START AS DESIRED

WARNING: Operation with APU bleed air on with the cabin door closed will result in a slight positive pressure in the airplane. To avoid potential injury to persons or damage to the cabin door, APU bleed air should be turned off or a cockpit side window opened prior to opening the cabin door.

24. BUS TIE Button (if only one generator) VERIFY CLOSED
PROCEDURE COMPLETED

If Only L or R Message is Displayed

2. HYDRAULIC PUMP L or R ENG Button
(affected side) UNLOAD
3. Land as soon as practical.
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

HYDRAULIC VOLUME LOW

(110) HYDRAULIC VOLUME LOW

This message is displayed when the hydraulic reservoir volume is <120 cubic inches.

1. HYDRAULIC PUMP ENG Buttons (both).....UNLOAD

CAUTION: Speedbrakes, roll spoilers, thrust reversers, landing gear, nosewheel steering, and brakes will not operate using normal procedures. Be prepared to use alternate or emergency systems. Maximum crosswind limit is 10 knots.

2. Land as soon as practical. Multiply FLAPS 35° Landing Distance by 1.63.

BEFORE LANDING

3. AltitudeFL410 MAXIMUM
4. 4. LDG GEAR CONT Circuit Breaker (LP-C11R4).....PULL
5. LANDING GEAR HandleDOWN
6. LANDING GEAR BLOWDOWN Handle.....PULL
7. Landing GearCONFIRM 3 GREEN LIGHTS
8. Flaps.....35
9. EACAS.....CHECK
10. Airspeed.....VREF
11. Autopilot (prior to minimum use height).....DISENGAGE
12. Yaw Damper (prior to landing)DISENGAGE

LANDING

13. ThrottlesIDLE
14. Elevator Control (at touchdown).....FORWARD PRESSURE
15. Brake PedalsREMOVE FEET
16. EMERGENCY BRAKE Handle.....PLL AND HOLD UNTIL STOPPED
 - a. Apply smooth, steady pressure to the emergency brake handle. Repeated application and release will deplete available pneumatic pressure. Antiskid is inoperative. Emergency brake pressure is regulated for optimum braking at heavier weights on most dry surfaces.
17. Directional ControlMAINTAIN WITH NOESWHEEL STEERING

AFTER LANDING

18. Flaps.....AS DESIRED
19. Anti-Ice SwitchesCONFIRM
 - a. PITOT/STATIC Buttons (both).....OFF
 - b. ENGINE/STAB Buttons (both).....AS REQUIRED
 - c. WING Buttons (both).....OFF
20. Exterior LightsAS REQUIRED

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21. Stabilizer Position SET TO -6.9
22. APU..... TEST/START

WARNING: Operation with APU bleed air on with the cabin door closed will result in a slight positive pressure in the airplane. To avoid potential injury to persons or damage to the cabin door, APU bleed air should be turned off or a cockpit side window opened prior to opening the cabin door.

23. BUS TIE Button (if only one generator).....Verify CLOSED
PROCEDURE COMPLETED

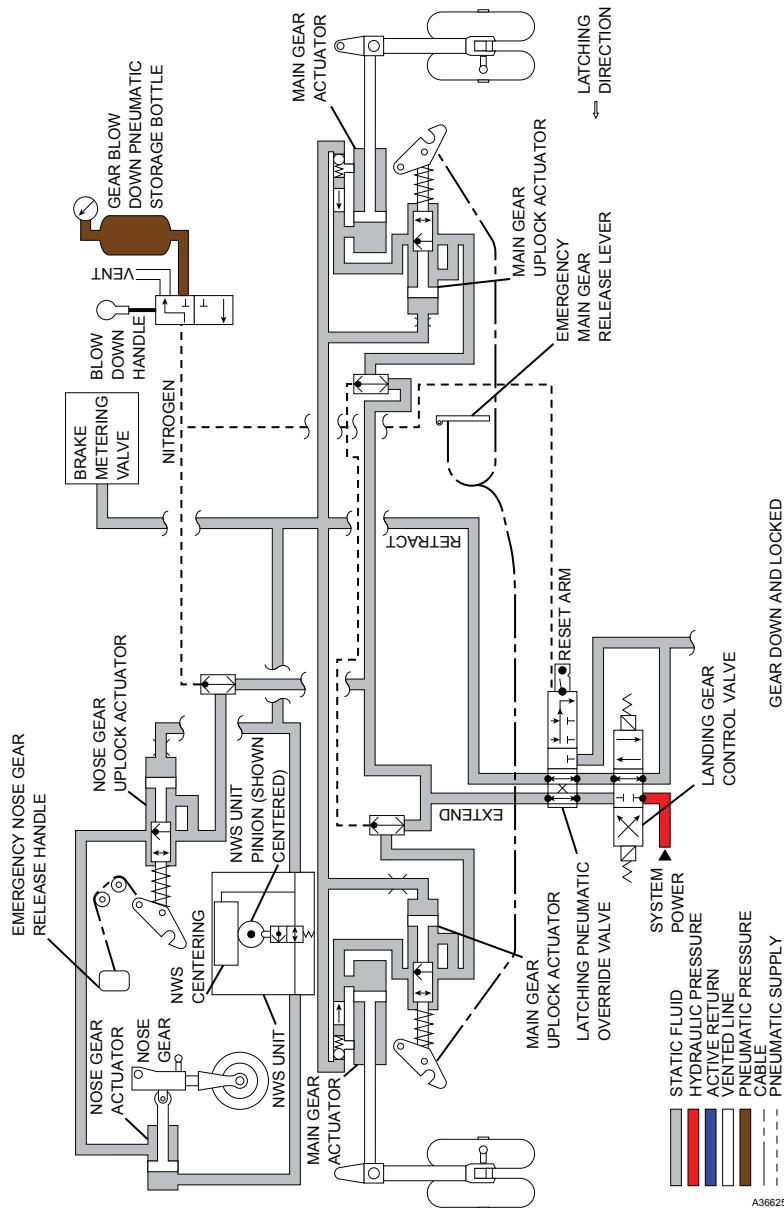
AUX HYDRAULIC PUMP ON

(111) **AUX HYDRAULIC PUMP ON**

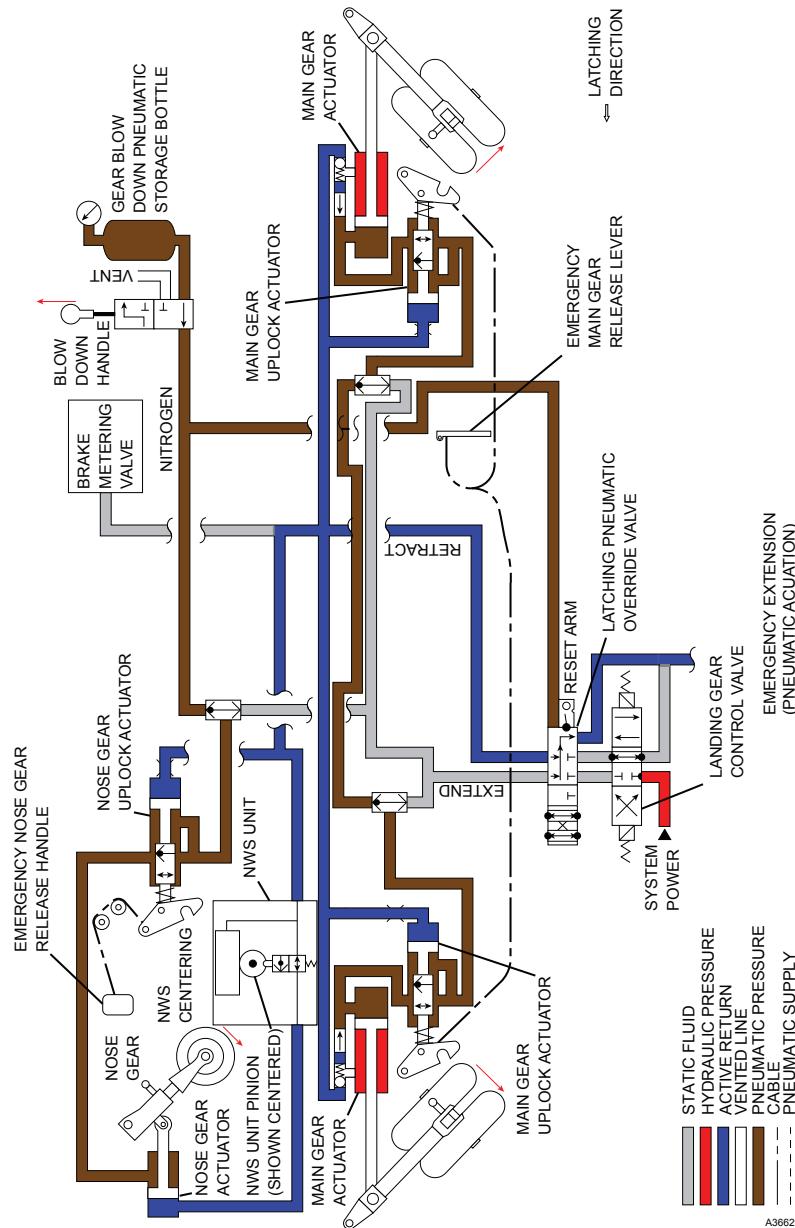
This message indicates that the HYDRAULIC PUMP AUX button has been selected ON. When the use of the pump is not required, the button should be selected OFF to conserve pump life.

CAUTION: Do not select the HYDRAULIC PUMP AUX button ON in flight.

LANDING GEAR EXTENDED



EMERGENCY EXTENSION



UNLOCK

This message is displayed when one or more gear are not locked in the selected position.

If Landing Gear will not Retract

1. Landing Gear Handle DOWN (AIRSPEED BELOW 210 KIAS)
 2. Landing Gear CONFIRM 3 GREEN LIGHTS
 3. Land as soon as practical, do not retract landing gear.

If Landing Gear will not Extend

1. Refer to "Landing Gear Will Not Extend" on page E-153.

HYDRAULIC WHEEL BRAKE FAILURE

1. Brake Pedals REMOVE FEET
 2. EMERGENCY BRAKE Handle. . . . PULL AND HOLD UNTIL STOPPED
 - a. Apply smooth, steady pressure to the emergency brake handle. Repeated application and release will deplete available pneumatic pressure. Anti-skid is inoperative. Emergency brake pressure is regulated for optimum braking at heavier weights on most dry surfaces.
 - b. Flaps 35° landing distance is increased by a factor of 1.37.
 3. Directional Control MAINTAIN WITH NOSEWHEEL STEERING
PROCEDURE COMPLETED

NOSEWHEEL STEERING MALFUNCTION

1. AP/TRIM/NWS DISC button..... PUSH AND HOLD
(To disable nosewheel steering.)
 2. Directional control..... MAINTAIN
Use rudder or differential braking for directional control.

PROCEDURE COMPLETED

ANTISKID FAIL**(112) ANTISKID FAIL**

This message is displayed when an anti-skid fault lasting for more than 1 second has been detected or if the anti-skid system is turned off.

1. ANTI-SKID Switch OFF THEN ON

If Message Does Not Clear

2. ANTI-SKID Switch OFF
3. Multiply FLAPS 35° Landing Distance by 1.29.

CAUTION:

- With anti-skid off, anti-skid touchdown protection is not available. Make sure the brakes are not applied while touching down.
- Apply wheel brakes lightly. Differential power braking operates without antiskid protection. With antiskid inoperative, excessive pressure on the brake pedals will likely cause the wheel brakes to lock, resulting in tire blowout.

PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

WOW MISCOMPARE**(113) WOW MISCOMPARE**

This message is displayed when the weight-on-wheels module has detected a miscompare between the squat switches or the MAU has detected a miscompare between weight-on-wheels modules.

The following systems or equipment may be affected (the required squat switches for operation are in parentheses):

- Anti-skid touchdown protection may not be available (one main gear on ground)
- Baggage heat valve may remain open after landing without posting amber **BAGGAGE HEAT FAIL** message (one main gear on ground)
- Idle speed may set to ground idle (one main gear on ground)
- Landing gear retraction may not be available (nose gear in air and one main gear in air)
- Nosewheel steering may not be available (nose gear and at least one main gear on ground)
- Thrust Reversers are not available (all three gear on ground)
- Taxi lights are not available (all three gear on ground)

PARKING BRAKE LOW PRESSURE**(114) PARKING BRAKE LOW PRESSURE**

This message is displayed when the parking brake handle is not stowed and the pressure switch indicates less than 1,850 PSI.
This message is displayed only on the ground.

1. PARK BRAKE Handle CHECK/SET (IF REQUIRED)
 - a. HYDRAULIC PUMP AUX Button
(if engine(s) not running) ON
(VERIFY 2,400 PSI MINIMUM)
 - b. Brakes APPLY
 - c. PARK BRAKE Handle PULL
 - d. EICAS CHECK AMBER
PARKING BRAKE LOW PRESSURE message clears and cyan
PARKING BRAKE ON message is displayed.
 - e. Brake Pedals RELEASE
 - f. HYDRAULIC PUMP AUX Button OFF
- PROCEDURE COMPLETED

PARKING BRAKE ON**(115) PARKING BRAKE ON**

This message is displayed when the PARK BRAKE handle is not stowed. On the ground, if the PARK BRAKE handle is not stowed and adequate brake pressure is applied, the cyan message is displayed. The cyan message turns amber once a throttle is above the CRU detent. The amber message is displayed in the air.

1. PARK BRAKE Handle DOWN
- PROCEDURE COMPLETED

LANDING GEAR WILL NOT EXTEND

After the gear blowdown has been actuated, the gear cannot be retracted. If the LANDING GEAR BLOWDOWN handle interferes with aircrew duties, the handle may be pushed back in to stow.

1. LDG GEAR CONT 1 Circuit Breaker
(LP-C11R4) PULL
2. LANDING GEAR Handle DOWN
3. LANDING GEAR BLOWDOWN Handle.....PULL
4. Landing Gear CONFIRM 3 GREEN LIGHTS

If Gear Fails to Extend

5. Main Gear Uplock Handle
(if main gear is still up; located in aft cabin)PULL
6. NG UPLOCK "D" Ring (if nose gear is still up;
located under copilot's tilt panel next to
LANDING GEAR BLOWDOWN handle) PULL THEN STOW
7. Landing Gear CONFIRM 3 GREEN LIGHTS
 - a. Yaw airplane left and right as required to engage main gear downlocks.

PROCEDURE COMPLETED

If Gear Extends

PROCEDURE COMPLETED

MAIN WHEEL SPINDOWN FAIL**(116) MAIN WHEEL SPINDOWN FAIL**

This message is displayed 12 seconds after initial gear retraction and indicates that the spindown feature of the anti-skid has failed. The following actions are for subsequent flights. This message is only displayed on airplanes incorporating Epic Phase 3 software.

AFTER TAKEOFF

1. ANTI-SKID Switch OFF
2. Brakes APPLY GENTLY TO STOP WHEEL ROTATION, THEN RELEASE
3. ANTI-SKID Switch ON
4. Landing Gear UP
PROCEDURE COMPLETED

PARKING BRAKE ON**(117) PARKING BRAKE ON**

This message is displayed when the parking brake is on and brake pressure is adequate. The message will be amber when a throttle is advanced on the ground or when the airplane is in the air and the PARK BRAKE handle is not stowed. This message will trigger the NO TAKEOFF warning system.

EMERGENCY DESCENT

118 EMERGENCY DESCENT

This message is displayed when the autopilot enters emergency descent mode. A red EMER DESCENT message will also be displayed on both PFDs.

1. Initiate maximum rate of descent to a safe altitude.
 - a. AP/TRIM/NWS DISC Button PUSH
 - b. Throttles IDLE
 - c. Speedbrakes 100%
 - d. Initial Pitch Attitude 15° DOWN

WARNING: The autopilot emergency descent mode (EDM) cannot achieve maximum rate of descent. It is recommended that the autopilot be disengaged and the airplane hand flown if maximum rate of descent is required.

WARNING: It is the pilot's responsibility to make sure that the autopilot does not turn the airplane into traffic or hazardous weather.

CAUTION: If structural damage is suspected, limit airspeed to a reasonable value and limit maneuvering loads until damage assessment can be made.

NOTE:

- If the airplane is above 31,000 feet MSL and the autopilot is engaged, it will automatically enter EDM when cabin altitude exceeds approximately 14,500 feet. The autopilot will initiate a pitch-down, left-turn (90°) maneuver. The flight crew must retard throttles to idle and extend the speedbrakes. The autopilot will control the descent near the M_{MO}/V_{MO} limit and level off at 15,000 feet MSL. The flight crew must then retract the speedbrakes and apply thrust to resume normal flight. If the airplane slows to stick shaker, the autopilot will disconnect.
- This mode and these messages can only be cancelled by disengaging the autopilot.

2. Airspeed M_{MO}/V_{MO}
3. Altitude 15,000 FEET MSL OR MINIMUM SAFE ALTITUDE

WARNING: It is the pilots responsibility to determine minimum safe altitude.

- a. Refer to the Crew and Passenger Oxygen Duration Charts in AFM, Section III, Operating Information, for the available oxygen supply.
- b. Further descent to 10,000 feet MSL is recommended to increase the available oxygen supply time for the pilot and copilot.
4. Descend (if conditions permit) to 10,000 feet MSL.
5. Passenger Briefing COMPLETE
6. PASS OXY Knob (at or below 10,000 feet MSL) OFF
7. Land as soon as possible.

PROCEDURE COMPLETED

NO TAKEOFF (RED MESSAGE)

(119) NO TAKEOFF

This message is displayed on the ground only when one or more of the No Takeoff conditions is detected with the engines running and throttles in or past the CRU detent. If takeoff is continued, the MASTER WARNING and aural alert will stop at 80 KIAS. The message will clear upon liftoff.

Speed Below V₁ - Takeoff Rejected

1. Takeoff ABORT
2. MFD SELECT NO TAKEOFF WINDOW
3. Refer to the NO TAKEOFF CAS MESSAGE chart to determine the cause. Take appropriate corrective action.

NO TAKEOFF ITEMS	NO TAKEOFF WINDOW DISPLAY	CAS MESSAGE
Cabin door is open	Cabin Door Open	CABIN DOOR OPEN
Parking brake is on	Park Brake on	PARKING BRAKE ON
Pitch Roll Disconnect is engaged	Pitch Roll Disc	PITCH/ROLL DISCONNECT
Flaps are not in takeoff configuration (flaps ≠ 7° ($\pm 1^\circ$) or ≠ 15° ($\pm 1^\circ$))	Flap Config	None
SPEEDBRAKE handle is not stowed	Speedbrakes	None
Gust lock is on	Gust Lock On	GUST LOCK ON
Stabilizer, aileron, or rudder trim not in the takeoff band	Stabilizer Trim Aileron Trim Rudder Trim	None
Parking brake pressure is low	Park Brake Press	PARKING BRAKE LOW PRESSURE
Aileron ratio changer is not in takeoff position	Roll System	ROLL SYSTEM CONTROL FAULT
Rudder bias actuator is not in the takeoff position	Rudder Bias	None
Thrust reverser emergency stow is engaged	T/R Emer Stow L T/R Emer Stow R	None

PROCEDURE COMPLETED

Speed Above V₁ - Takeoff Continued

1. Climb to Safe Altitude.

PROCEDURE COMPLETED

INADVERTENT STALL (STICK SHAKER, BUFFET, AND/OR ROLL-OFF)

NOTE: Pitch attitude should be promptly reduced to at least 0 - 5° nose down. Prompt aileron input may be required to maintain wings level flight.

1. AP/TRIM/NWS DISC Button PUSH
 2. Pitch Attitude REDUCE
 3. Roll Attitude WINGS LEVEL
 4. Throttles TO DETENT
 5. Speedbrakes 0%
 6. When recovery is assured (increasing airspeed and absence of stall indications);
 - a. AIRSPEED INCREASE
 - b. Altitude RETURN TO SAFE ALTITUDE
 - c. Throttles AS REQUIRED
- PROCEDURE COMPLETED

EMERGENCY EVACUATION

1. PARK BRAKE SET
2. Throttles CUTOFF
(throttles cannot be placed in CUTOFF unless the thrust reverser levers are stowed)
3. LH and RH ENG FIRE Buttons (if fire suspected) PUSH
4. Left and Right BOTTLE ARMED Buttons (if fire suspected) PUSH
5. APU SYSTEM STOP Button PUSH
6. EMER LTS Switch ON
7. BATT Buttons (both) OFF
8. Airplane and Immediate Area CHECK
FOR BEST ESCAPE ROUTE AND
DIRECT EVACUATION

If Thru Cabin Door

9. Cabin Door OPEN
 10. Move away from airplane.
- PROCEDURE COMPLETED

If Thru Escape Hatch

9. Escape Hatch REMOVE AND THROW HATCH OUT OF AIRPLANE
 10. Move away from airplane.
- PROCEDURE COMPLETED

DITCHING

The airplane is not certified for ditching under 14 CFR 25.801. Ditching tests were not conducted during certification testing of the airplane. The following procedures will improve the chances of a successful ditching.

PRELIMINARY

1. ELT Switch EMER
2. ENG BLD AIR Selectors (both) OFF
3. PAX SAFETY Button ON
4. Water Barrier IN POSITION
 - a. The water barrier is stowed in the aft bulkhead behind the closet door. Crew members should be familiar with its location and use. Passengers should be briefed.

WARNING: The water barrier must be in position prior to ditching.

5. Passenger Life Jackets ON

APPROACH

6. Landing Gear UP
7. Flaps 35°
(Gear warning horn will sound and cannot be cancelled)
8. Speed V_{REF}
9. Rate of Descent 200 TO 300 FEET PER MINUTE
10. Plan approach to parallel any uniform swell pattern and attempt to touch down along a wave crest or just behind it. If the surface wind is very strong or the water surface is rough and irregular, ditch into the wind on the back side of a wave.

WATER CONTACT

11. Airplane Pitch Attitude SLIGHTLY HIGHER THAN NORMAL LANDING ATTITUDE
12. Decrease airspeed and rate of descent to a minimum but do not stall the airplane.
13. Throttles CUTOFF JUST PRIOR TO WATER CONTACT
14. Water Contact CONTACT WATER ON A CREST OF A SWELL, PARALLEL TO THE MAJOR SWELL

AFTER WATER CONTACT

Under reasonable ditching conditions, the airplane should remain afloat an adequate amount of time to launch and board life rafts in an orderly manner. If possible, the main cabin door should remain closed and evacuation made through the emergency exit. However, the water barrier will allow use of the cabin door as an additional egress route. The water barrier must be in position for ditching and must be installed before the door is opened. The cabin door does not fully open with the water barrier installed.

PROCEDURE COMPLETED

SINGLE-ENGINE APPROACH AND LANDING**APPROACH**

In an icing environment, the amber STAB ANTI-ICE COLD L and /or R message may be displayed under certain flight conditions that require a decreased throttle setting. Ice may accumulate on the leading edge of the horizontal stabilizer.

1. Landing Data CONFIRM
 - a. Airspeed V_{REF}

 V_{REF} (KIAS)

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
15°	95	101	106	110	115	119	124

- b. Landing Distance MULTIPLY FLAPS 35° BY 1.20
- c. Approach Climb Gradient USE FLAPS 15°
APPROACH CLIMB GRADIENT

CAUTION: Avoid landing with a tailwind or downhill runway gradient.

2. Crew Briefing COMPLETE
3. Avionics/Flight Instruments CHECK/SET
4. Transponder TA ONLY
5. TAWS FLAP OVRD ON
6. Minimums (RAD/BARO) SET
7. FUEL CROSSFEED Selector OFF
8. Exterior Lights AS REQUIRED
9. Flaps 7°
10. Passenger Briefing COMPLETE/CHECK
11. Seats/Seat Belts/Shoulder
Harnesses/Aft Divider Doors CHECKED/SECURED/
LATCHED OPEN
12. PAX SAFETY Buttons ON
13. Pressurization ZERO DIFFERENTIAL
AT TOUCHDOWN

BEFORE LANDING

14. Landing Gear DOWN (3 GREEN)
An amber HYDRAULIC PRESSURE LOW message may be displayed on EICAS when one engine is shutdown and other engine is at or below 75% N₂. Gear extension time may be longer than normal. Hydraulic system pressure will recover to normal pressure once landing gear are down and locked or throttle on operating engine is increased.
15. Speedbrakes 0%
16. EICAS CHECK
17. Flaps 15°
18. Airspeed V_{REF}
19. Autopilot (prior to minimum use height) DISENGAGE

continued on next page

continued from previous page

20. Yaw Damper (prior to landing) DISENGAGE
 21. Refer to "Single-Engine Go-Around/Engine Failure on Go-Around" on page E-160 and "Single-Engine Reversing" on page E-160, as applicable.
- PROCEDURE COMPLETED

SINGLE-ENGINE GO-AROUND/ENGINE FAILURE ON GO-AROUND

1. Go-Around Button (either throttle) PUSH
The autopilot disconnect aural tone will sound continuously until the AP/TRIM/NWS DISC button is pushed, which also disengages the yaw damper.
 2. Throttle (operating engine) TO DETENT
 3. Airplane Pitch Attitude 7.5° INITIALLY, THEN AS REQUIRED
 4. Flaps. 15° (MULTI-ENGINE APPROACH) OR 7° (SINGLE-ENGINE APPROACH)
 5. Climb Speed. V_{APP}
 6. Landing Gear UP
The landing gear warning horn will sound continuously until the flaps reach the 15° position, if landing gear retraction is initiated prior to the flaps reaching the 15° position.
 7. ANTI-ICE WING/STAB XFLOW Buttons
(if bleed air anti-ice systems are on) XFLOW
 8. Flaps. UP AT V_{APP} +10 KNOTS
 9. Airspeed (at a safe altitude) INCREASE TO V_{ENR}
 10. Throttle (operating engine) MCT DETENT OR AS REQUIRED
 11. Autopilot and Yaw Damper. AS DESIRED
 12. Land as soon as possible. Refer to "Engine Failure or Precautionary Shutdown" on page E-17 or "Single-Engine Approach and Landing" on page E-159, as required.
- PROCEDURE COMPLETED

SINGLE-ENGINE REVERSING

1. Throttle. IDLE
 2. Brakes APPLY
 3. Speedbrakes 100%
 4. Thrust Reverser Lever (after nosewheel touchdown) DEPLOY
 5. Thrust Reverser Annunciation CHECK FOR DEPLOY INDICATION
 6. Thrust Reverser Lever REVERSE POWER
 7. Thrust Reverser Lever IDLE REVERSE AT 65 KIAS
 - a. Reverse thrust may need to be decreased during crosswind landing on icy runways to prevent airplane from being forced to runway edge.
- PROCEDURE COMPLETED

FLAPS NOT IN LANDING POSITION (35°)**APPROACH**

1. Landing Data CONFIRM
 a. Airspeed V_{REF}

 V_{REF} (KIAS)

FLAPS	WEIGHT - POUNDS						
	18,000	20,000	22,000	24,000	26,000	28,000	30,300
0°	105	110	116	121	126	131	136
7°	100	106	111	116	120	125	130
15°	95	101	106	110	115	119	124

- b. Landing Distance:

- Flaps 0° MULTIPLY FLAPS 35° BY 1.39
 Flaps 7° MULTIPLY FLAPS 35° BY 1.29
 Flaps 15° MULTIPLY FLAPS 35° BY 1.20

CAUTION:

- Avoid landing with a tailwind or downhill runway gradient.
- For flaps 7°, avoid landing at field elevations above 9,000 feet MSL.
- For flaps 0°, avoid landings at field elevations above 5,000 feet MSL.
- If the amber FLAPS FAIL message is latched on, the AOA indications, low-airspeed-awareness, and stick shaker warning default to the flaps 35° values. If flaps are extended less than 35°, AOA and low-airspeed-awareness will indicate an angle of attack higher than actual causing stick shaker warning to activate at a higher than normal airspeed for the actual flap extension.

2. Crew Briefing COMPLETE
 3. Avionics and Flight Instruments CHECK/SET
 4. TAWS FLAP OVRD ON
 5. Minimums (RAD/BARO) SET
 6. FUEL CROSSFEED Selector OFF
 7. Exterior Lights AS REQUIRED
 8. Passenger Briefing COMPLETE
 9. Seats/Seat Belts/Shoulder Harnesses/
 Aft Divider Doors CHECKED/SECURED/LATCHED OPEN
 10. PAX SAFETY Button ON
 11. Pressurization ZERO DIFFERENTIAL AT TOUCHDOWN

continued on next page

continued from previous page

BEFORE LANDING

12. Landing Gear DOWN (3 GREEN)
 13. Speedbrakes 0%
 14. EICAS CHECK
 15. Airspeed V_{REF}
 16. Autopilot (prior to minimum use height) DISENGAGE
 17. Yaw Damper (prior to landing) DISENGAGE
 PROCEDURE COMPLETED

NO TAKEOFF**(120) NO TAKEOFF**

This message is displayed on the ground if any of the no takeoff items are active. This message will turn red when the throttles are advanced. Crews should refer to the NO TAKEOFF window on the MFD to resolve the message prior to takeoff.

NO TAKEOFF ITEMS	NO TAKEOFF WINDOW DISPLAY	CAS MESSAGE
Cabin door is open	Cabin Door Open	CABIN DOOR OPEN
Parking brake is on	Park Brake on	PARKING BRAKE ON
Pitch Roll Disconnect is engaged	Pitch Roll Disc	PITCH/ROLL DISCONNECT
Flaps are not in takeoff configuration (flaps ≠ 7° (±1°) or ≠ 15° (±1°))	Flap Config	None
SPEEDBRAKE handle is not stowed	Speedbrakes	None
Gust lock is on	Gust Lock On	GUST LOCK ON
Stabilizer, aileron, or rudder trim not in the takeoff band	Stabilizer Trim Aileron Trim Rudder Trim	None
Parking brake pressure is low	Park Brake Press	PARKING BRAKE LOW PRESSURE
Aileron ratio changer is not in takeoff position	Roll System	ROLL SYSTEM CONTROL FAULT
Rudder bias actuator is not in the takeoff position	Rudder Bias	None
Thrust reverser emergency stow is engaged	T/R Emer Stow L T/R Emer Stow R	None

AP ENG**(121) AP ENG**

This message is displayed on both PFDs when the autopilot is disengaged either by normal means or an abnormal condition. The autopilot disengage aural tone will also sound. Both the message and the aural tone will remain until cancelled by pressing the AP/TRIM/NWS DISC button.

1. AP/TRIM/NWS DISC Button PUSH
 2. Autopilot or Yaw Damper AS DESIRED
- PROCEDURE COMPLETED

ATT FAIL AND/OR HDG FAIL**(122) ATT FAIL and/or HDG FAIL**

These messages are displayed on the PFD when pitch and roll, and/or heading information from AHRS or IRS is invalid.

If Both Sides

1. Attitude USE STANDBY FLIGHT DISPLAY
 2. Heading USE STANDBY HSI
 3. Land as soon as practical.
- PROCEDURE COMPLETED

If Pilot's Side

1. Standby Flight Instruments MONITOR
 2. Pilot's Reversion ATT/HDG Button PUSH
 3. PFD ADI Displays CONFIRM
- ATT2 IS DISPLAYED ON BOTH PFDS AND
MAG2/TRU2 IS DISPLAYED ON MFD AND PFDS
- PROCEDURE COMPLETED

If Copilot's Side

1. Standby Flight Instruments MONITOR
 2. Copilot's Reversion ATT/HDG Button PUSH
 3. PFD ADI Displays CONFIRM
- ATT1 IS DISPLAYED ON BOTH PFDS AND
MAG1/TRU1 IS DISPLAYED ON MFD AND PFDS
- PROCEDURE COMPLETED

AIRSPEED, ALTITUDE, AND/OR VERTICAL SPEED INDICATORS (RED "X" ON PFD)

A red "X" is displayed in the affected airspeed, altitude, and/or vertical speed area on the PFD when there is a loss of valid air data system information.

If Both Sides

1. Airspeed and Altitude USE STANDBY FLIGHT DISPLAY
PROCEDURE COMPLETED
2. For Airplanes 680-0273, -0290, -0297 thru -0301, and -0303 not incorporating SB680-34-29 or SB680-34-30:
Transponders/TCAS ALT-OFF

If Pilot's Side

1. Pilot's Reversion ADC Button PUSH
2. PFD ADI Displays CONFIRM
ADC2 IS DISPLAYED ON BOTH PFDS
PROCEDURE COMPLETED

If Copilot's Side

1. Copilot's Reversion ADC Button PUSH
2. PFD ADI Displays CONFIRM
ADC1 IS DISPLAYED ON BOTH PFDS
PROCEDURE COMPLETED



CAS MESSAGE AREA (RED "X")

A red "X" is displayed in the CAS area when the CAS message display is lost. This indicates a failure of the monitor warning computers.

- Land as soon as practical. Refer to "MAU 1 and/or 2 and/or 3 and/or 4 FAIL" on page E-176 for a list of other possibly failed equipment.

PROCEDURE COMPLETED



DEVIATION SCALES RED "X" (VERTICAL OR LATERAL)

A red "X" is displayed in the affected lateral and/or vertical deviation scales when navigation data from the selected NAV source is invalid.

- NAV Source SELECT A VALID SOURCE
- PFD ADI Displays CONFIRM VALID LATERAL AND/OR VERTICAL DEVIATION LOC1/LOC2, VOR1/VOR2, FMS1/FMS2 IS DISPLAYED ON BOTH PFDS AND MFD

PROCEDURE COMPLETED



ADC1 OR ADC2**(123) ADC1 or ADC2**

This message is displayed in the top left portion of the ADI in both PFDs when both pilot's and copilot's selected air data sources are the same or are cross-side.

ALT**(124) ALT**

This message is displayed in the top half of the altitude tape in both PFDs when the monitor warning system detects a difference of 200 feet between the pilot's and copilot's altitude information.

1. Altimeter Settings VERIFY
(BOTH PILOT AND COPILOT SET TO CORRECT ALTIMETER SETTING)

If Annunciation Does Not Clear

2. Pilot's and Copilot's Altitude COMPARE WITH STANDBY FLIGHT DISPLAY
3. Reversion ADC Button (faulty side) PUSH
(VERIFY DISPLAYED SOURCE AGREES WITH STANDBY FLIGHT DISPLAY)
4. PFD ADI Displays CONFIRM ADC1 OR ADC2 IS DISPLAYED ON BOTH PFDs

PROCEDURE COMPLETED

If Annunciation Clears

PROCEDURE COMPLETED

AP STAB TRIM INOP**(125) AP STAB TRIM INOP**

This message is displayed when autopilot control of the horizontal stabilizer trim is inoperative.

If Amber RETRIM NOSE UP or DOWN Message is Displayed

WARNING: Do not disengage the autopilot or attempt to retrim the stabilizer until directed to do so in this procedure. The pilot can expect large pitch forces in excess of 50 pounds if the autopilot is disengaged.

1. Autopilot DO NOT DISENGAGE
2. Stabilizer Trim. DO NOT TRIM
Refer to "RETRIM NOSE UP or DOWN" on page E-112.
PROCEDURE COMPLETED

If Amber RETRIM NOSE UP or DOWN Message is Not Displayed

1. Control Wheel. GRIP
2. AP/TRIM/NWS DISC Button PUSH
(Expect pitch force <50 pounds)
3. Stabilizer Trim Switch. RETRIM AS REQUIRED
PROCEDURE COMPLETED

ASCB BUS FAIL**(126) ASCB BUS FAIL**

This message is displayed when any line replaceable unit (LRU) detects an ASCB communication problem. Only the primary buses are checked in flight. The primary and backup buses are checked on the ground. Each LRU is inhibited from triggering the message when its respective bus power is off. Cross-side data may not be available.

ATT**(127) ATT**

This message is displayed in the top right portion of the ADI in both PFDs when the monitor warning system detects a difference of $\pm 5^\circ$ pitch or $\pm 6^\circ$ roll between the pilot's and copilot's attitude information.

1. AP/TRIM/NWS DISC Button PUSH
2. Pilot's and Copilot's Attitude Indicators. COMPARE WITH STANDBY FLIGHT DISPLAY
3. Reversion ATT/HDG Button
(faulty side). PUSH
(VERIFY DISPLAYED SOURCE AGREES
WITH STANDBY FLIGHT DISPLAY)
4. PFD ADI Displays..... CONFIRM ATT1 OR ATT2
IS DISPLAYED IN BOTH PFDS AND
MAG1/TRU1 OR MAG2/TRU2 IN BOTH PFDS AND MFD
PROCEDURE COMPLETED

ATT1 OR ATT2**(128) ATT1 or ATT2**

This message is displayed in the top left portion of the ADI on both PFDs when both pilot's and copilot's displayed attitude sources are the same or are cross-side. MAG1/TRU1 or MAG2/TRU2 will also be displayed.

CAT 2**(129) CAT 2**

This message indicates that the Category II approach mode criteria are not met. Category II approach minimums are not authorized. This message is only displayed on airplanes equipped for Category II operations when the RAD/BARO knob is selected to RAD and the minimums are set to less than 200 feet.

1. Execute missed approach procedure.
or
1. RAD/BARO Knob..... SELECT BARO, SET CATEGORY I MINIMUMS
2. Approach CONTINUE TO CATEGORY I MINIMUMS
PROCEDURE COMPLETED

CHECK DU 1 AND/OR 2 AND/OR 3 AND/OR 4**(130) CHECK DU 1 and/or 2 and/or 3 and/or 4**

This message is displayed when the display unit wrap-around monitor has failed. The affected display unit may be presenting misleading information. DUs are numbered left to right.

1. Affected Display Unit VERIFY INFORMATION DISPLAYED USING OTHER AVAILABLE SOURCES

If DU 1 or 4

2. PFD DIM Knob
(affected side, outer concentric knob) OFF/REV
(IF REQUIRED)

PROCEDURE COMPLETED

If DU 2 and/or 3

2. EICAS Button SELECT OPPOSITE SIDE
(IF REQUIRED)

PROCEDURE COMPLETED

CONFIGURATION MISMATCH**(131) CONFIGURATION MISMATCH**

This message is displayed when a configuration monitor function detects that the software and/or hardware versions are not in a certified configuration. This message is displayed on the ground only.

DGR(132) **DGR**

This message is displayed in the lower right portion of the HSI on both PFD's if the estimated position uncertainty (EPU) is greater than the current RNP or if the horizontal integrity limit (HIL) is greater than the integrity alarm.. The amber MSG annunciation will also be displayed along with a white UNABLE RNP FMS MCDU scratchpad message.

1. Check FMS position sensors reception.
2. RNP navigation is prohibited (except when executing a missed approach from an RNP approach procedure following loss of GNSS navigation).
3. FMS terminal and approach navigation is prohibited.

PROCEDURE COMPLETED

DR(133) **DR**

This message is displayed in the lower right portion of the HSI on both PFDs if the FMS is operating in dead reckoning mode. The amber MSG annunciation will also be displayed along with a white UNABLE RNP FMS MCDU scratchpad message.

1. Navigation USE OTHER SOURCES
2. Check FMS position sensors reception.

PROCEDURE COMPLETED

DU 1 AND/OR 2 AND/OR 3 AND/OR 4 O'TEMP**(134) DU 1 and/or 2 and/or 3 and/or 4 O'TEMP**

This message is displayed when the respective display unit detects an overtemperature and will shutdown due to the overtemperature.

If DU 1 or 4 (PFD)

1. PFD DIM Knob
(affected side, outer concentric knob) OFF/REV

If Message Does Not Clear

2. DU Circuit Breaker
(affected display, LP-C8R6 or RP-C5R6) PULL
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

If DU 2

1. EICAS Button RIGHT
2. Electrical EICAS Button OFF
PROCEDURE COMPLETED

If DU 3

1. EICAS Button LEFT
2. DU 3 Circuit Breaker (LP-C7R6) PULL
PROCEDURE COMPLETED

EICAS**(135) EICAS**

This message is displayed in the top right portion of the HSI in both PFDs when the monitor warning system has detected a mismatch of the cyclic redundancy check (CRC) or the CRC is not received by the MWS.

1. EICAS Engine Indicators COMPARE WITH STANDBY ENGINE INSTRUMENTS
2. If EICAS and Standby Engine Indicators disagree USE STANDBY ENGINE INSTRUMENTS
PROCEDURE COMPLETED

FD MODE OFF**(136) FD MODE OFF**

This message is displayed when the AFCS has dropped the selected modes and reverted to basic pitch and roll modes.

1. Guidance Controller SELECT DESIRED MODES
PROCEDURE COMPLETED

FD FAIL**(137) FD FAIL**

This message is displayed in the top portion of both PFDs when valid pitch or roll data from the AFCS is lost.

1. Flight Guidance Computer SELECT OPPOSITE CHANNEL
 - a. MCDU MENU Button PUSH
 - b. FGC Line Select Key..... SELECT OPPOSITE CHANNEL
PROCEDURE COMPLETED

FMS 1 AND/OR 2 GPS MISCOMPARE**(138) FMS 1 and/or 2 GPS MISCOMPARE**

This message is displayed when the FMS calculated position does not agree with the GNSS sensor position.

1. Do not use the affected FMS for navigation.
PROCEDURE COMPLETED

GPS 1 AND/OR 2 INACTIVE**(139) GPS 1 and/or 2 INACTIVE**

This message is displayed when one or both GNSS sensors become inactive. FMS position will continue to be computed from the remaining GNSS sensor, DME/DME, VOR/DME or optional IRS information.

If Both GNSS Sensors are Inactive

1. Do not use FMS navigation for approach.
2. Execute missed approach procedure if on an RNAV (GPS) or RNAV (RNP) approach procedure.
PROCEDURE COMPLETED

If One GNSS Sensor is Inactive

1. Monitor GNSS sensor status.
PROCEDURE COMPLETED

GS(140) **GS**

This message is displayed in the bottom right portion of the ADI on both PFDs when the monitor warning system detects a difference of $\frac{1}{2}$ dot between the pilot's and copilot's glideslope information. This message is active only when both NAV receivers are tuned to the same frequency.

1. Glideslope DataCROSSCHECK; DISREGARD GLIDESLOPE DATA IF UNABLE TO CONFIRM A VALID SOURCE.
PROCEDURE COMPLETED

HDG(141) **HDG**

This message is displayed in the upper right portion of the HSI on both PFDs when the monitor warning system detects a difference of $\pm 10^\circ$ between the pilot's and copilot's heading information.

1. L and R AHRS SLAVE Switches
(airplanes with AHRS)VERIFY AUTO

If Message Does Not Clear

2. PFD Heading DisplaysCOMPARE WITH STANDBY HSI
3. Reversion ATT/HDG Button
(Faulty side).....PUSH
(VERIFY DISPLAYED SOURCE AGREES WITH STANDBY HSI)
4. PFD HSI and MFDCONFIRM MAG1/TRU1 OR MAG2/TRU2 IS DISPLAYED IN BOTH PFDs AND MFD AND ATT 1 OR ATT2 IS DISPLAYED IN BOTH PFDs
PROCEDURE COMPLETED

If Message Clears

PROCEDURE COMPLETED

IAS**(142) IAS**

This message is displayed in the top left portion of the airspeed indicator when the monitor warning system detects a difference of ± 20 knots between the pilot's and copilot's airspeed indicators.

1. Pilot's and Copilot's Airspeeds COMPARE WITH STANDBY FLIGHT DISPLAY
 2. Reversion ADC Button (faulty side) PUSH (verify displayed source agrees with standby flight display)
 3. PFD ADI Displays CONFIRM ADC1 OR ADC2 IS DISPLAYED IN BOTH PFDS
- PROCEDURE COMPLETED

IRS POSITION FAULT**(143) IRS POSITION FAULT**

This message is displayed when the IRS position is not entered (FMS position not initialized) or there is an IRS alignment fault. This message is only displayed if the optional IRS is installed.

1. FMS Position INITIALIZED
- PROCEDURE COMPLETED

IRS NOT READY**(144) IRS NOT READY**

This message is displayed on the ground only when there is excessive motion of the airplane before IRS alignment is complete. This message is only displayed if the optional IRS is installed.

1. Airplane STOP
 2. IRS Alignment COMPLETE
- PROCEDURE COMPLETED

IRS FAIL L AND/OR R**(145) IRS FAIL L and/or R**

This message is displayed when the IRS has detected an internal failure. The red ATT and HDG messages may also be displayed on the affected side PFD and MFD. This message is only displayed if the optional IRS is installed.

1. Reversion ATT/HDG Switch (faulty side) PUSH
2. PFD ADI and MFD CONFIRM ATT1 OR ATT2 IS DISPLAYED
ON BOTH PFDS AND MAG1/TRU1 OR MAG2/TRU2
IS DISPLAYED ON BOTH PFDS AND THE MFD
PROCEDURE COMPLETED

LOC**(146) LOC**

This message is displayed in the top right portion of the HSI on both PFDs when the monitor warning system detects a difference of $\frac{1}{2}$ dot between the pilot's and copilot's localizer information. This message is active only when both NAV receivers are tuned to the same frequency.

1. NAV Sources DETERMINE VALID SOURCE
2. Display Controller..... SELECT VALID NAV SOURCE
ON BOTH PFDS

If Unable to Determine Valid Source

3. Execute missed approach (unless runway in sight).
PROCEDURE COMPLETED

MAG1 OR MAG2**(147) MAG1 or MAG2**

This message is displayed in the top left portion of the HSI on both PFDs and the MFD when both pilot's and copilot's displayed heading sources are the same or are cross-side. Amber ATT1 or ATT2 will also be displayed.

MAU 1 AND/OR 2 AND/OR 3 AND/OR 4 FAIL

(148) MAU 1 and/or 2 and/or 3 and/or 4 FAIL

This message is displayed when the system detects a loss of ASCB traffic from the affected MAU or a loss of selected functions within the MAU.

1. Exit icing conditions (if MAU 3 and/or 4 FAIL message).

PROCEDURE COMPLETED

The following is a list of additional failures to expect with the respective MAU(s) failed:

Associated MAU	CAS Messages	Resulting in Potential Loss of
MAU 1 FAIL:	AMBER MONITOR WARNING FAIL L, CYAN AP FAIL A or AP FAIL A-B, CYAN YD FAIL A or YD FAIL A-B.	Air Data 1, ATT/HDG 1, TAWS (without charts and maps option), EICAS DU Reversion Control.
MAU 2 FAIL:	AMBER MONITOR WARNING FAIL R, CYAN AP FAIL B or AP FAIL A-B, CYAN YD FAIL B or FAIL A-B.	FMS 2, Air Data 2, ATT/HDG 2, TAWS (with charts and maps option)
MAU 3 FAIL:	AMBER MONITOR WARNING FAIL L.	Left side T/R Indications, Left side Engine Instruments, Left side Fuel Quantity, Left side Power Distribution System Indications, Left side Anti-Ice Monitoring, FMS 1, Air Data 1, EICAS DU Reversion Control.
MAU 4 FAIL:	AMBER MONITORING FAIL R.	Right side T/R Indications, Right side Engine Instruments, Right side Fuel Quantity, Right side Power Distribution System Indications, Right side Anti-Ice Monitoring, Engine Vibration Monitoring for Both Engines, Air Data 2.
MAU 1 and 4 FAIL:	Loss of EAICAS message display	Air Data 1 and 2, ATT/HDG 1, TAWS (without charts and maps option), EICAS DU Reversion Control, Right Side T/R Indications, Right Side Engine Instruments, Right Side Fuel Quantity, Right Side Power Distribution System Indications, Right Side Anti-Ice Monitoring, Engine Vibration Monitoring for both engines.
MAU 2 and 3 FAIL:	AMBER MONITOR WARNING FAIL L-R, CYAN AP FAIL B or AP FAIL A-B, CYAN YD FAIL B or YD FAIL A-B.	All Guidance Panel Functions, Aural Warnings except TCAS, Gear Horn and Overspeed Horn, All Display Controllers, All MCDU Functions, FMS 1 and 2, Air Data 1 and 2, ATT/HDG 2, TAWS (with charts and maps option), Left side Engine Instruments, Left side Fuel Quantity, Left side Power Distribution System Indications, Left side Anti-ice Monitoring, EICAS DU Reversion Control.

MAU 1 AND/OR 2 AND/OR 3 AND/OR 4 O'TEMP**(149) MAU 1 and/or 2 and/or 3 and/or 4 O'TEMP**

This message is displayed when the main MAU power supply detects an overheat situation and is about to shut down.

1. Refer to "MAU 1 and/or 2 and/or 3 and/or 4 FAIL" on page E-176 for a list of affected functions and equipment.

PROCEDURE COMPLETED

MAX SPEED**(150) MAX SPEED**

This message is displayed in the left center portion of the ADI in both PFDs when the automatic flight control system's overspeed protection mode is active.

1. Reduce speed.

PROCEDURE COMPLETED

MIN**(151) MIN**

This message is displayed in the top left portion of the ADI in the respective PFD when the airplane has descended to the preset barometric or radio altitude minimum selected on the associated display controller.

MONITOR WARNING FAIL L AND/OR R**(152) MONITOR WARNING FAIL L and/or R**

This message is displayed when the monitor warn function in either MAU 1 or MAU 4, the aural function in MAU 2 or MAU 3, or the comparison monitor function in MAU 1 or MAU 4 has failed. This indicates a loss in redundancy only. If both monitor warning functions in MAU 1 and MAU 4 fail, the CAS message display will be lost (red "X" in CAS display area). Refer to "CAS Message Area (Red "X")" on page E-165.

MSG**(153) MSG**

This message is displayed in the lower right portion of the HSI on both PFDs and indicates an "Alerting" message, which requires pilot awareness and may require pilot action, is displayed in the FMS MCDU scratchpad.

1. MCDU Scratchpad CHECK MESSAGE(S) AND RESOLVE
(REFER TO AFM, SECTION 11, MESSAGES, HONEYWELL PRIMUS EPIC® FMS PILOT'S GUIDE)
PROCEDURE COMPLETED

MW1 OR MW2(154) **MW1 or MW2**

This message is displayed in the EICAS message status line when there is a miscompare between the monitor warning systems.

1. EICAS Message Display NOTE MESSAGES
 2. Monitor Warning System SELECT OPPOSITE SIDE
 - a. Either MCDU SELECT MENU
 - b. MENU Page SELECT DISPLAY SETUP
 - c. MW1 or MW2 SELECT OPPOSITE SIDE
 3. EICAS Message Display NOTE MESSAGES
 4. EICAS Message Display DETERMINE VALIDITY OF DIFFERING MESSAGES
 5. Monitor Warning System SELECT VALID SIDE
 6. CAS Messages TAKE APPROPRIATE ACTION
- PROCEDURE COMPLETED

PIT(155) **PIT**

This message is displayed in the top right portion of the ADI in both PFDs when the monitor warning system detects a difference of $\pm 5^\circ$ pitch between the pilot's and copilot's attitude information.

1. AP/TRIM/NWS DISC Button PUSH
 2. Pilot's and Copilot's Attitude Indicators COMPARE WITH STANDBY FLIGHT DISPLAY
 3. Reversion ATT/HDG Button (faulty side) PUSH
(VERIFY DISPLAYED SOURCE AGREES WITH STANDBY FLIGHT DISPLAY)
 4. PFD ADI Displays CONFIRM ATT1 OR ATT2 IS DISPLAYED IN BOTH PFDS AND MAG1/TRU1 OR MAG2/TRU2 IS DISPLAYED ON BOTH PFDS AND THE MFD
- PROCEDURE COMPLETED

-RA-(156) **-RA-**

This message is displayed in the bottom center portion of the ADI in both PFDs when the monitor warning system detects the radio altimeter is inoperative. TCAS and TAWS may also indicate failed.

1. MINIMUMS RAD/BARO..... SELECT BARO, SET AS APPROPRIATE
PROCEDURE COMPLETED

RAD(157) **RAD**

This message is displayed in the bottom center portion of the ADI in both PFDs when the monitor warning system detects a difference between the pilot's and copilot's displayed radio altimeter information.

1. MINIMUMS RAD/BARO..... SELECT BARO, SET AS APPROPRIATE
PROCEDURE COMPLETED

ROL(158) **ROL**

This message is displayed in the top right portion of the ADI in both PFDs when the monitor warning system detects a difference of $\pm 6^\circ$ roll between the pilot's and copilot's attitude information.

1. AP/TRIM/NWS DISC Button PUSH
2. Pilot's and Copilot's Attitude Indicators. COMPARE
WITH STANDBY FLIGHT DISPLAY
3. Reversion ATT/HDG Button (faulty side) PUSH
(verify displayed source agrees
with standby flight display)
4. PFD ADI Displays..... CONFIRM ATT1 OR ATT2
IS DISPLAYED IN BOTH PFDS AND MAG1/TRU1 OR
MAG2/TRU2 IS DISPLAYED IN BOTH PFDS AND MFD
PROCEDURE COMPLETED

TCAS FAIL**(159) TCAS FAIL**

This message is displayed in the TCAS window on the MFD when TCAS has failed due to an internal fault or a failure of one or more of the components required for TCAS operation (i.e., AHRS, IRS, radio altimeter, or transponder) has been detected.

If HDG FAIL, ATT FAIL, or RA Messages are Displayed

1. Refer to the appropriate procedure for the displayed message.
PROCEDURE COMPLETED

If HDG FAIL, ATT FAIL, or RA Messages are NOT Displayed

1. Transponder SELECT OTHER SOURCE
PROCEDURE COMPLETED

TRU1 OR TRU2**(160) TRU1 or TRU2**

This message is displayed in the top left portion of the HSI on both PFDs and the MFD when both pilot's and copilot's displayed heading sources are the same or are cross-side and true heading is in use. Amber ATT1 or ATT2 will also be displayed.

VSPD**(161) VSPD**

This message is displayed below the airspeed indicator in both PFDs when the crew has not set and selected the takeoff airspeed values.

1. Enter appropriate takeoff speeds.
PROCEDURE COMPLETED

WX**(162) WX**

This message is displayed at the 3 o'clock position on the weather radar or terrain display and indicates the selected image is not reaching the display.

WX FAIL(163) **WX FAIL**

This message is displayed as FAIL in the Weather Radar mode window on the MFD and indicates the weather radar has detected an internal fault and is failed.

DISPLAY UNIT FAILURE**If PFD**

1. PFD DIM Knob (affected side, outer concentric knob) OFF/REV

NOTE:

- With the pilot's PFD reverted to DU2, the EICAS display will automatically move to DU3 and the MFD presentation will not be available.
- With the copilot's PFD reverted to DU3, the MFD presentation will not be available.
- The EICAS display cannot be moved using the EICAS LEFT/RIGHT button until the PFD is returned to its normal DU position.

PROCEDURE COMPLETED

If MFD

1. No MFD backup mode available.

PROCEDURE COMPLETED

If EICAS

1. EICAS Display Button . . SELECT LEFT OR RIGHT (FUNCTIONAL DU)
2. CAS Message Display CHECK

PROCEDURE COMPLETED

AUTOPILOT AURAL WARNING FAILS TO CANCEL

Failure of the autopilot aural warning to cancel with the AP/TRIM/NWS DISC button could be an indication of a possible guidance control panel failure. Even though the MASTER WARNING light will not be illuminated, pressing the switch will cancel the aural warning.

1. MASTER WARNING Button PUSH

PROCEDURE COMPLETED

LOSS OF RADIO AUDIO FUNCTIONS

1. Audio Panel EMER Button (affected side) PUSH
 - a. The onside microphone is connected directly to COM 1.
 - b. The onside headphone will have only COM 1 audio and the other controls on the audio panel will be inoperative for controlling headphone audio.
 - c. The cockpit speaker is not affected by the Audio Panel EMER switch and the other controls on the audio panel can continue to be used for controlling the speaker.

PROCEDURE COMPLETED

LOSS OF RADIO TUNING FUNCTIONS

1. MCDU Backup Radio Page (affected side) SELECT
 - a. MCDU MENU Key PUSH
 - b. MCDU NEXT Key PUSH (SELECTS MENU 2/2 PAGE)
 - c. BK UP Line Select Key PUSH
2. COMM 1 Radio TUNE AS REQUIRED
3. NAV 1 Radio TUNE AS REQUIRED

If Radio Tuning is Still not Available

4. Reversionary Controller EMER COMM Button EMER
 - a. Radio transmissions will be made on emergency frequency 121.5 via COMM 1 radio.

PROCEDURE COMPLETED

If Radio Tuning is Available

PROCEDURE COMPLETED

DEVIATION SCALE FLASHING AMBER MESSAGE (LATERAL OR VERTICAL)

This indicates that the localizer or glideslope limit for a Category II approach has been exceeded. Only displayed on airplanes equipped for Category II operations.

1. Go-Around Procedure INITIATE
 2. Category II Approach (if desired) REINITIATE
- PROCEDURE COMPLETED

AP FAIL A AND/OR B**(164) AP FAIL A and/or B**

This message indicates the autopilot has failed. A loss of the guidance panel, aileron servo, or elevator servo will also cause the message to be displayed. The AFCS will automatically select the other side if it is available.

AHRS BASIC L AND/OR R**(165) AHRS BASIC L and/or R**

This message indicates that the respective AHRS has lost air data information and has entered a reversionary mode. This mode may result in degradation in pitch and roll accuracy in certain flight conditions.

FDR FAIL**(166) FDR FAIL**

This message indicates the flight data recorder has failed.

GROUND PROX FAIL**(167) GROUND PROX FAIL**

This message indicates the TAWS computer has detected a fault or a required airplane system input has been lost. All TAWS functions will be inoperative and the annunciations will be inhibited. If the cyan TAWS FLAP OVERRIDE message is also displayed and the airspeed is over 250 KIAS, verify TAWS FLAP OVRD is selected OFF.

IRS ALIGNING L AND/OR R**(168) IRS ALIGNING L and/or R**

This message is displayed when the IRS is aligning. This message is only displayed if the optional IRS is installed.

PHONE CALL**(169) PHONE CALL**

This message indicates that there is an incoming phone call to the airplane.

RAAS FAIL**(170) RAAS FAIL**

This message is displayed when the optional runway awareness advisory system (RAAS) is enabled but the function is inoperative.

RAAS INHIB**(171) RAAS INHIB**

This message is displayed when the optional RAAS is enabled but advisories are inhibited because TAWS MUTE is selected ON.

RAAS NOT AVAIL**(172) RAAS NOT AVAIL**

This message is displayed when the optional RAAS is enabled but the system either has no position information or the airplane is at an airport that has not been validated.

SELCAL VHF 1 AND/OR VHF 2 AND/OR HF 1 AND/OR HF 2

(173) SELCAL VHF 1 and/or VHF 2 and/or HF 1 and/or HF 2

This message is displayed when the SELCAL system receives a VHF or HF radio transmission with the airplane specific tone sequence.

NOTE: After receiving a SELCAL call, the MIC switch must be keyed on the corresponding radio in order to clear the message. Another SELCAL call cannot be received until the first call is cleared.

STEEP APPROACH MODE

(174) STEEP APPROACH MODE

This message is displayed when the steep approach mode has been selected ON.

TAWS AUDIO INHIBIT

(175) TAWS AUDIO INHIBIT

This message is displayed when TAWS MUTE is selected ON. The windshear (Mode 7) function remains active.

TAWS FLAP OVERRIDE

(176) TAWS FLAP OVERRIDE

This message is displayed when TAWS FLAP OVRD is selected ON.

TAWS GLIDESLOPE CANCEL**(177) TAWS GLIDESLOPE CANCEL**

This message is displayed when TAWS G/S CANCEL is selected ON.

TERR FAIL**(178) TERR FAIL**

This message is displayed when the TAWS is unable to display terrain and obstacles or provide enhanced mode alert warnings. Basic TAWS (Modes 1-6) and windshear (Mode 7) functions remain active.

TERRAIN INHIBITED**(179) TERRAIN INHIBITED**

This message is displayed when the TAWS TERR INHIB is selected ON. Basic TAWS (Modes 1-6) and windshear (Mode 7) remain active.

WINDSHEAR FAIL**(180) WINDSHEAR FAIL**

This message is displayed when the windshear warning system computer has detected a fault or a required airplane system input has been lost. All windshear warning and caution functions will be inoperative and the annunciations will be inhibited.

ADVISORY (CYAN) MESSAGES

- (42) AC BEARING L or R
- (165) AHRS BASIC L and/or R
- (100) ANTI-ICE ON ALL
- (101) ANTI-ICE ON ENGINE/STAB
- (164) AP FAIL A and/or B
- (21) APU ON
- (111) AUX HYDRAULIC PUMP ON
- (66) BAGGAGE HEAT FAIL
- (43) BATTERY OFF L and/or R
- (67) BLEED SELECT NOT NORM L and/or R
- (44) BUS TIE CLOSED
- (68) CABIN ALTITUDE
- (102) ENG ANTI-ICE COLD L and/or R
- (13) ENGINE DISPATCH LIMIT L and/or R
- (14) ENGINE SHUTDOWN L and/or R
- (166) FDR FAIL
- (69) FIRE BOTTLE LOW BAG-APU
- (70) FIRE BOTTLE LOW BAGGAGE
- (30) FUEL BOOST PUMP ON L and/or R
- (31) FUEL CROSS FEED
- (32) FUEL FW SHUTOFF L and/or R
- (167) GROUND PROX FAIL
- (83) GUST LOCK ON

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- (103) INBD WING A/I COLD L and/or R
- (168) IRS ALIGNING L and/or R
- (116) MAIN WHEEL SPINDOWN FAIL
- (120) NO TAKEOFF
- (15) OIL FILTER BYPASS L and/or R
- (16) OIL LEVEL LOW L and/or R
- (117) PARKING BRAKE ON
- (169) PHONE CALL
- (104) PITOT/STATIC COLD L and/or R and/or STBY
- (170) RAAS FAIL
- (171) RAAS INHIB
- (172) RAAS NOT AVAIL
- (173) SELCAL VHF 1 and/or VHF 2 and/or HF 1 and/or HF 2
- (105) STAB ANTI-ICE COLD L and/or R
- (174) STEEP APPROACH MODE
- (175) TAWS AUDIO INHIBIT
- (176) TAWS FLAP OVERRIDE
- (177) TAWS GLIDESLOPE CANCEL
- (178) TERR FAIL
- (179) TERRAIN INHIBITED
- (180) WINDSHEAR FAIL
- (106) WING A/I CROSSFLOW OPEN
- (107) WING ANTI-ICE COLD L and/or R
- (84) YD FAIL A and/or B

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CAUTION (AMBER) MESSAGES

- (47) **ACM BLEED LEAK**
- (48) **ACM O'TEMP**
- (123) **ADC1 or ADC2**
- (124) **ALT**
- (112) **ANTISKID FAIL**
- (85) **AOA HEAT FAIL L and/or R**
- (71) **AOA/STALL WARN FAIL L and/or R**
- (125) **AP STAB TRIM INOP**
- (18) **APU FIRE DETECT FAIL**
- (19) **APU ON**
- (20) **APU SYS FAIL**
- (126) **ASCB BUS FAIL**
- (127) **ATT**
- (128) **ATT1 or ATT2**
- (49) **BAGGAGE DOOR OPEN**
- (50) **BAGGAGE HEAT FAIL**
- (35) **BATTERY O'CURRENT L and/or R**
- (36) **BATTERY OFF L and/or R**
- (51) **BLEED AIR MONITOR FAIL**
- (52) **BLEED AIR O'TEMP L and/or R**
- (53) **BLEED SELECT NOT NORM L and/or R**
- (37) **BUS TIE CLOSED**
- (54) **CABIN ALTITUDE**

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- (55) CABIN DOOR OPEN
- (129) CAT 2
- (130) CHECK DU 1 and/or 2 and/or 3 and/or 4
- (131) CONFIGURATION MISMATCH
- (38) DC EMER BUS L and/or R
- (39) DC GEN O'CURRENT L and/or R and/or APU
- (40) DC GEN OFF L and/or R and/or APU
- (132) DGR
- (133) DR
- (134) DU 1 and/or 2 and/or 3 and/or 4 O'TEMP
- (56) DUCT O'TEMP CABIN
- (57) DUCT O'TEMP COCKPIT
- (135) EICAS
- (58) EMERGENCY EXIT OPEN
- (59) EMERGENCY PRESSURIZATION
- (86) ENG ANTI-ICE COLD L and/or R
- (87) ENG ANTI-ICE O'TEMP L and/or R
- (5) ENG FIRE BOTTLE LOW 1 and/or 2
- (6) ENG FIRE DETECT FAIL L and/or R
- (7) ENGINE CHIP DETECT L and/or R
- (8) ENGINE CONTROL FAULT L and/or R
- (137) FD FAIL
- (136) FD MODE OFF
- (72) FLAPS FAIL

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- (138) FMS 1 and/or 2 GPS MISCOMPARE
- (22) FUEL BOOST PUMP ON L and/or R
- (23) FUEL CROSS FEED
- (24) FUEL CROSS FEED TRANSIT
- (25) FUEL FILTER BYPASS L and/or R
- (26) FUEL FW S/O TRANSIT L and/or R
- (27) FUEL LEVEL LOW L and/or R
- (28) FUEL MOTIVE VLV FAIL L and/or R
- (29) FUEL PRESSURE LOW L and/or R
- (139) GPS 1 and/or 2 INACTIVE
- (9) GROUND IDLE L and/or R
- (140) GS
- (141) HDG
- (60) HP VALVE FAIL L and/or R
- (108) HYDRAULIC PRESSURE HIGH
- (109) HYDRAULIC PRESSURE LOW L and/or R
- (110) HYDRAULIC VOLUME LOW
- (142) IAS
- (88) INBD WING A/I COLD L and/or R
- (145) IRS FAIL L and/or R
- (144) IRS NOT READY
- (143) IRS POSITION FAULT
- (61) LAVATORY DOOR
- (146) LOC

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- (73) MACH TRIM FAIL
- (147) MAG1 or MAG2
- (148) MAU 1 and/or 2 and/or 3 and/or 4 FAIL
- (149) MAU 1 and/or 2 and/or 3 and/or 4 O'TEMP
- (150) MAX SPEED
- (151) MIN
- (152) MONITOR WARNING FAIL L and/or R
- (153) MSG
- (154) MW1 or MW2
- (62) NOSE DOOR OPEN L and/or R
- (10) OIL LEVEL LOW L and/or R
- (114) PARKING BRAKE LOW PRESSURE
- (115) PARKING BRAKE ON
- (155) PIT
- (74) PITCH/ROLL DISCONNECT
- (89) PITOT/STATIC COLD L and/or R and/or STBY
- (63) PRESS SOURCE NOT NORM
- (75) PRIMARY STAB TRIM FAIL
- (156) -RA-
- (157) RAD
- (90) RAT HEAT FAIL L and/or R
- (41) REMOTE CB TRIPPED
- (76) RETRIM L or R WING DOWN
- (77) RETRIM NOSE UP or DOWN

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- (158) **ROL**
 - (78) **ROLL SYSTEM CONTROL FAULT**
 - (79) **RUDDER BIAS FAULT**
 - (80) **SECONDARY STAB TRIM FAIL**
 - (81) **SPEED BRAKES**
 - (91) **STAB ANTI-ICE COLD L and/or R**
 - (92) **STAB ANTI-ICE O'TEMP L and/or R**
 - (93) **STAB BLEED LEAK**
 - (82) **STAB TRIM MONITOR WARNING**
 - (94) **SUPPLY BLEED LEAK L and/or R**
 - (11) **T/R ARMED L and/or R**
 - (12) **T/R UNLOCK L and/or R**
 - (64) **TAILCONE DOOR OPEN**
 - (159) **TCAS FAIL**
 - (160) **TRU1 or TRU2**
 - (161) **VSPD**
 - (95) **WINDSHIELD HEAT INOP L and/or R**
 - (96) **WINDSHIELD OVERTEMP L and/or R**
 - (97) **WING A/I CROSSFLOW OPEN**
 - (98) **WING ANTI-ICE COLD L and/or R**
 - (99) **WING ANTI-ICE O'TEMP L and/or R**
 - (65) **WING BLEED LEAK L and/or R**
 - (113) **WOW MISCOMPARE**
 - (162) **WX**
 - (163) **WX FAIL**
-

WARNING (RED) MESSAGES

- (121) AP ENG
- (17) APU FIRE
- (122) ATT FAIL and/or HDG FAIL
- (45) BAGGAGE FIRE
- (33) BATTERY O'TEMP L and/or R
- (46) CABIN ALTITUDE
- (34) DC GEN OFF L and/or R and/or APU
- (1) DPLY and EMER STOW
- (118) EMERGENCY DESCENT
- (2) ENGINE FIRE L and/or R
- (3) ENGINE VIBRATION L and/or R
- (119) NO TAKEOFF
- (4) OIL PRESSURE LOW L and/or R