



# 777-200/-300

## Quick Reference Handbook

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**Ditching**

---

Condition: Airplane ditching and evacuation are needed.

- 1 Plan to jettison fuel as needed to reduce VREF speeds.
- 2 **Checklist Complete Except Deferred Items**

---

**Deferred Items**

---

**Below 5,000 feet**

GND PROX GEAR OVRD switch . . . . . OVRD  
GND PROX TERR OVRD switch . . . . . OVRD  
PACK switches (both) . . . . . Off  
OUTFLOW VALVE switches (both) . . . . . MAN  
OUTFLOW VALVE MANUAL  
switches (both). . . . . Hold in CLOSE  
until the outflow valve  
indications show fully closed  
PASS SIGNS selectors (both) . . . . . ON

Do **not** accomplish the following checklists:

PACK L  
PACK R  
CABIN ALTITUDE AUTO

---

**On final approach (omit Landing checklist)**

Landing gear lever . . . . . UP  
Flaps . . . . . 30

▼ Continued on next page ▼

▼ Ditching continued ▼

Advise the cabin of imminent touchdown.

Maintain airspeed at VREF 30 to touchdown. Flare the airplane to achieve the minimum rate of descent at touchdown.

---

**After impact**

FUEL CONTROL switches (both) . . . . . CUTOFF

APU fire switch . . . . . Override and pull



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## Overweight Landing

Condition: A landing at greater than the maximum landing weight is needed.

1 Choose one:

◆ **One engine is inoperative or at reduced thrust:**

GND PROX FLAP OVRD switch . . . . .OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around. This gives greater climb capability.

▶▶ **Go to step 6**

◆ **Both engines are running normally:**

▶▶ **Go to step 2**

2 Refer to the Approach or Landing Climb Limited Weight table in the Performance Inflight chapter or other approved source.

▼ Continued on next page ▼

**▼ Overweight Landing continued ▼**

3 Choose one:

◆ Landing gross weight is **greater than** the Approach or Landing Climb Limited Weight:

GND PROX FLAP OVRD switch . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around. This gives greater climb capability.

▶▶ **Go to step 6**

◆ Landing gross weight is **less than or equal to** the Approach or Landing Climb Limited Weight:

▶▶ **Go to step 4**

4 Enter the landing gross weight on the APPROACH REF page.

**▼ Continued on next page ▼**

▼ Overweight Landing continued ▼

5 Choose one:

◆ VREF 30 + additives (wind and gusts, 5 knots minimum) is **at or below** 160 knots:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.



◆ VREF 30 + additives (wind and gusts, 5 knots minimum) is **above** 160 knots:

**Note:** Use flaps 25 and VREF 25 for landing and flaps 20 for go-around. This gives greater margin to the flap placard speed.

▶▶ Go to step 6

6 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____ or <b>VREF 25</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

▼ Continued on next page ▼

**▼ Overweight Landing continued ▼****Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked		ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>20 or 25</b>	ALL





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## Bomb Warning

Condition: One or more of these occur:

- A bomb warning is received while on ground or in flight.
- Positive threat identified.

Objective: To avoid the activation of an altitude-sensitive bomb.

To reduce the effect of the explosion.

1 Assess bomb warning validity.

2 Request information from OCC.

Obtain expert advice from explosive specialist.

3 Choose one:

◆ On the **ground**:

The aircraft shall be moved to the spot designated by the ATC.

**Go to step 4**

◆ In flight:

Bomb Warning is received **and** the threat is **Specific, or** explosive devices are **found** in the aircraft:

▶▶ **Go to step 7**

▼ ▼ ▼ Continued on next page ▼ ▼ ▼

▼ ▼ ▼ Bomb Warning continued ▼ ▼ ▼

4 Choose one:

◆ Bomb Warning is **received**:

Deplane all the persons from the aircraft when it was told by the authority concerned and support the authority personnel if they request cooperation.

Even though it was told by the authority that deplaning and cabin search are not needed due to the lack of credibility of the threat information, the PIC must be in cooperation with the station manager and OCC and complete the pre-flight check according to the 'Standard Pre-flight Security Checklist' before the flight operation for the safety of people and aircraft.

■ ■ COMPLETE ■ ■

◆ Explosive Devices were **found** in the aircraft:

The PIC who was informed of bomb onboard from cabin crew shall give a direction to all cabin crews so that they can evacuate all the personnel in the aircraft and move to safe areas.

▶▶ **Go to step 5**

- 5 If possible, report the cabin situation to OCC and ATC through available communication devices. The report should include the following items:  
shape, size, type, quantity, location and other information of the bomb.

▼ ▼ ▼ Continued on next page ▼ ▼ ▼

▼ ▼ ▼ Bomb Warning continued ▼ ▼ ▼

- 6 All passengers and crew members shall be deplaned and standby at the designated sterile area of the airport. For further matters after deplaning, take action according to the directions of appropriate airport authority and the station manager.

■ ■ COMPLETE ■ ■

- 7 **If** airplane is **climbing**:

Altitude HOLD or

FLCH switch. . . . . Push to level off the airplane in order to avoid the activation of an altitude bomb trigger

- 8 Cabin Crew . . . . . Advise

The captain shall alert all crew of the threat through the purser.

**Passenger;**

- 9 PASS SIGNS selector (both) . . . . . ON

**Freighter;**

- 10 SEAT BELTS selector . . . . . ON

- 11 Transponder . . . . . Set 7700

- 12 ATC . . . . . Advise

Communicate with ATC to obtain maximum information.

▼ ▼ ▼ Continued on next page ▼ ▼ ▼



▼ ▼ ▼ Bomb Warning continued ▼ ▼ ▼

**Caution! Maintain present cabin altitude. If Explosive Devices were found, it is recommended to relocate a suspicious article only after reaching differential pressure zero.**

**777-200ER;**  
**The least risk bomb location (LRBL) for airplane structure and system is DOOR R4.**

**777-300 & 777-300ER;**  
**The least risk bomb location (LRBL) for airplane structure and system is DOOR R5.**

**Refer to FOM Chapter 12.2 for bomb threat in detail.**

13 LDG ALT selector . . . . . PULL ON  
MAN landing altitude mode shows on EICAS.

14 LDG ALT selector . . Set the existing cabin altitude

15 Plan to land at the nearest suitable airport.  
Airport altitude should not be higher than present cabin altitude to prevent triggering an altitude fuse.

**Note:** Required fuel for diversion should be calculated at a flight altitude identical to selected cabin altitude.  
Cruise Altitude on FMS CDU should be replaced by the selected cabin altitude.

16 Descent to the lowest safe altitude or selected cabin altitude, whichever is higher.

▼ ▼ ▼ Continued on next page ▼ ▼ ▼

## ▼ ▼ ▼ Bomb Warning continued ▼ ▼ ▼

17 Avoid any sharp maneuvers, which might result in a displacement of the bomb.

18 Do not use speedbrakes.

19 **When** level off **and** cabin differential pressure is **zero**:

OUTFLOW VALVE

switches (BOTH) . . . . . MAN

OUTFLOW VALVE MANUAL

switches (BOTH) . . . . . Move to OPEN until the outflow valve indications show fully OPEN to depressurize the airplane.

When aircraft and cabin altitude are the same, structure damage from an explosion will be reduced as the aircraft is depressurized.

20 Do **not** accomplish the following checklists:

CABIN ALTITUDE AUTO

LANDING ALTITUDE

21 If circumstances **allow**:

Establish landing configuration except for flight over water if fuel is adequate to reach the nearest suitable airport.

Do **not** use FMC fuel predictions with the flaps and/or gear extended. The detonation could damage the landing gear system. Therefore, if fuel permits, configure the aircraft for landing as soon as possible except for flight over water. Reducing the speed will minimize stress on the aircraft structure.

## ▼ ▼ ▼ Continued on next page ▼ ▼ ▼



▼ ▼ ▼ Bomb Warning continued ▼ ▼ ▼

22 Choose one:

◆ **30 minutes or less** from landing :

▶▶ **Go to step 26**

◆ **More than 30 minutes** from landing :

▶▶ **Go to step 23**

23 Cabin Crew . . . . . Advise

Inform the purser and advise that he/she makes the PA announcement for cabin search.

Strengthen cockpit access control.

24 Cabin Search . . . . . Initiate

If necessary, the screening of passengers, hand baggage and all other loads including the flight deck and/or crew rest room shall be conducted.

25 **If** location of a suspected device is **confirmed**:

Refer to FOM Chapter 12.2 - Finding of Explosive Devices in the Aircraft.

26 **After** landing:

Disembarkation . . . . . Initiate

Do not use the cabin doors in the vicinity of the bomb.

■ ■ COMPLETE ■ ■

---

**Portable EFB Overheat/Fire**

---

Condition: The Portable Electronic Flight Bag (EFB) is overheated or there is an electrical burning smell, smoke or fire flames from the device.

If necessary, transfer control to the flight crew member on the other side.

1. Portable EFB . . . . . Turn Off  
**PASSENGER**
2. Cockpit/Cabin Communications . . . . . Establish

---

**Caution! consider to wear smoke goggle, protective glove, and/or oxygen mask as necessary.**

---

▼ Continued on next page ▼



▼ Portable EFB Overheat/Fire continued ▼

3 Overheat/Fire Extinguish . . . . . Accomplish

◆ If there is **flame**:

CREW OXY MASK (PF) . . . . . DON

PBE (PM) . . . . . USE

**Note:** Consider to place the Portable EFB on the location to minimize adverse effect to flight instruments.

HALON EXTINGUISHER. . . . . USE

If flames extinguished:

Portable EFB . . . . . Unsecure and  
Remove from Cockpit

▶▶ **Go to step 4**

◆ If there is **no flames**:

Portable EFB . . . . . Unsecure and  
Remove from Cockpit

▶▶ **Go to step 4**

▼ Continued on next page ▼

## ▼ Portable EFB Overheat/Fire continued ▼

4. Instruct the Cabin to accomplish Lithium Battery OVHT/FIRE Procedure or if cabin crew not available Accomplish items below;

- Total immersion of the Portable EFB will prevent fire re-ignition.
- Use the Fire containment bag.  
If the fire containment bag is not available, fill a suitable container with water or Non-Alcoholic Liquid and immerse the device.
- Stored Portable EFB should be monitored for the remainder of the flight.

5. Consider new course of action:

◆ If Overheat/Fire is **controllable** and can be **extinguished:**

Continue normal operation at the Captain's discretion.

■ ■ COMPLETE ■ ■

◆ At anytime if situation becomes **uncontrollable** or **fire continues:**

Plan to land at the nearest suitable airport.

**Note:** Consider to accomplish Smoke/Fumes Removal Procedure, if necessary.

■ ■ COMPLETE ■ ■



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## Automatic Unlock

Condition: The correct emergency access code is entered.

- 1 FLT DECK DOOR lock selector . . . . . Rotate to DENY and hold for 1 second



## CREW OXYGEN LOW

Condition: Crew oxygen pressure is low.



## [ ] DOOR AFT CARGO

Condition: The aft lower cargo door is not closed and secure.

**Note:** The aft lower cargo door is in a safe configuration as long as cabin pressurization is normal.

- 1 Continue normal operation.



## [ ] DOOR BULK CARGO

Condition: The bulk cargo door is not closed and secure.

**Note:** The bulk cargo door is in a safe configuration as long as cabin pressurization is normal.

- 1 Continue normal operation.



**[ ] DOOR E/E ACCESS**

Condition: The electrical and electronic access door is not closed and secure.

**Note:** The E/E access door is in a safe configuration as long as cabin pressurization is normal.

- 1 Continue normal operation.

**[ ] DOOR ENTRY 1-4L, R**

Condition: An entry door is not closed and secure.

**Note:** The entry door is in a safe configuration as long as cabin pressurization is normal.

- 1 Continue normal operation.

**[ ] DOOR FWD ACCESS**

Condition: The forward access door is not closed and secure.

**Note:** The forward access door is in a safe configuration as long as cabin pressurization is normal.

- 1 Continue normal operation.



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**[ ] DOOR FWD CARGO**

Condition: The forward lower cargo door is not closed and secure.

Objective: To reduce the cabin differential pressure to decrease the risk of door separation.

1 LDG ALT selector . . . . .PULL ON, set 8000

2 Choose one:

◆ Airplane altitude is **at or below** 8,000 feet:

Level off at the lowest safe altitude.

▶▶ **Go to step 3**

◆ Airplane altitude is **above** 8,000 feet:

Descend to the lowest safe altitude or 8,000 feet, whichever is higher.

▶▶ **Go to step 3**

3 **After** level off, allow sufficient time for the cabin altitude to stabilize. This minimizes discomfort when the airplane is depressurized.

▼ Continued on next page ▼

## ▼ DOOR FWD CARGO continued ▼

4 Choose one:

◆ Airplane altitude is **at or below** 10,000 feet:

▶▶ **Go to step 5**

◆ Airplane altitude is **above** 10,000 feet:

Don the oxygen masks.

Establish crew communications.

▶▶ **Go to step 5**

5 OUTFLOW VALVE switches (both) . . . . . MAN

Use momentary actuation of the outflow valve manual switches to avoid large and rapid pressurization changes. Valve can take up to 6 seconds to move the first time.

6  OUTFLOW VALVE

MANUAL switches (both) . . . . . Move to OPEN until the outflow valve indications show fully open to depressurize the airplane

7 **After** the airplane is depressurized, the crew may change altitude as needed.

8 Do **not** accomplish the following checklists:

CABIN ALTITUDE AUTO

LANDING ALTITUDE



**DOORS**

Condition: Two or more doors are not closed and secure.

**[ ] ELT ON****HL7732 - HL8284**

Condition: The emergency locator transmitter is on.

- 1 Notify ATC in the event of erroneous ELT transmission.

**EMER LIGHTS**

Condition: One of these occurs:

- The emergency lights are on
- The emergency lights switch is not ARMED




**Lock Fail**

Condition: One or more of these occur:

- The flight deck access system switch is OFF
- The lock is failed

Objective: To remove electrical power from the lock to prevent possible overheating.

Do **if** conditions allow a crew member to leave the seat.

- 1  FLIGHT DECK ACCESS SYSTEM switch . . . . OFF
- 2 The door can be locked with the deadbolt.

**PASS OXYGEN ON**

Condition: The passenger oxygen system is on.



**Window Damage Fwd L, R**

Condition: The forward flight deck window has one or more of these:

- An electrical arc
- A delamination
- A crack
- Is shattered

Objective: To remove electrical power, if needed, to prevent arcing. To descend, if needed, to minimize forces on the window.

1 **If** the window is arcing, shattered, or cracked:

FWD WINDOW HEAT switch  
(affected window). . . . . Off

Do **not** accomplish the following checklist:

WINDOW HEAT FWD

2 **If** the window is deformed, or an air leak occurs:

Plan to land at the nearest suitable airport.

**If** the airplane altitude is above 10,000 feet:

Descend to the lowest safe altitude or 10,000 feet, whichever is higher.

**Note:** Sustained flight below 10,000 feet is not recommended due to greater risk of bird strike.



**Window Damage Side L, R**

Condition: The side flight deck window has one or more of these:

- An electrical arc
- A delamination
- A crack
- Is shattered

Objective: To remove electrical power, if needed, to prevent arcing. To descend, if needed, to minimize forces on the window.

1 **If** the window is arcing, shattered, or cracked:

SIDE WINDOW HEAT switch  
(affected window) . . . . . Off

Do **not** accomplish the following checklist:

WINDOW HEAT SIDE

2 **If** the window is deformed, or an air leak occurs:

Plan to land at the nearest suitable airport.

**If** the airplane altitude is above 10,000 feet:

Descend to the lowest safe altitude or 10,000 feet, whichever is higher.

**Note:** Sustained flight below 10,000 feet is not recommended due to greater risk of bird strike.



## [] WINDOW FLT DECK L, R

Condition: The side window is not closed and secure.

- 1 Maintain the maneuvering speed for the existing flap setting until the window is closed.
- 2 The force needed to close the window increases with airspeed. It may not be possible to close the window at speeds above 250 knots.
- 3 Close and lock the window.
- 4 Choose one:

◆ Window **locks and** pressurization **is normal**:

**Note:** The window is in a safe configuration as long as cabin pressurization is normal.

Continue normal operation.



◆ Window does **not lock or** pressurization is **not normal**:

Level off at the lowest safe altitude.

The airplane can fly unpressurized and land safely with the window open.



## [] WINDOWS

Condition: The left and right side windows are not closed and secure.

▼ Continued on next page ▼

## ▼ WINDOWS continued ▼

- 1 Maintain the maneuvering speed for the existing flap setting until the windows are closed.
- 2 The force needed to close the windows increases with airspeed. It may not be possible to close the windows at speeds above 250 knots.
- 3 Close and lock the windows.
- 4 Choose one:

◆ Both windows **lock and** pressurization **is normal**:

Continue normal operation.



◆ Any window does **not lock or** pressurization is **not normal**:

Level off at the lowest safe altitude.

The airplane can fly unpressurized and land safely with the windows open.





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-----  
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**[ ] CABIN ALTITUDE**

Condition: Cabin altitude is excessive.

- 1 Don the oxygen masks.
- 2 Establish crew communications.
- 3 Check the cabin altitude and rate.
- 4 **If** the cabin altitude is uncontrollable:  
PASS OXYGEN switch . . . . . Push to ON and  
hold for 1 second

**Without delay**, descend to the lowest safe altitude or 10,000 feet, whichever is higher.

To descend:

Move the thrust levers to idle

Extend the speedbrakes

**If** structural integrity is in doubt, limit airspeed and avoid high maneuvering loads.

Descend at Vmo/Mmo

---

- 5 **If** the cabin altitude is controllable:  
Continue normal operation.



### **BLEED ISLN CLOSED C, L, R**

Condition: One of the following occurs:

- The isolation valve is failed closed
- The bleed isolation switch is off



### **BLEED ISLN OPEN C, L, R**

Condition: The isolation valve is failed open.



### **[ ] BLEED LEAK BODY**

Condition: A bleed air leak occurs in the body area.

- 1 The air supply controller automatically isolates the heat source within approximately 3 minutes by closing the bleed and isolation valves.

---

**Caution! Do not change the APU bleed, engine bleed, or bleed isolation switch positions. Airplane damage can occur.**

---

- 2 Pilot action is needed when a BLEED LOSS message shows.
- 3 Do **not** accomplish the following checklists:

HYD PRESS DEM C1

HYD PRESS DEM C2



**[ ] BLEED LEAK L, R**

Condition: A bleed air leak occurs in the wing or pack bay area.

- 1 The air supply controller automatically isolates the heat source within approximately 5 minutes by closing the bleed and isolation valves.

---

**Caution! Do not change the APU bleed, engine bleed, or bleed isolation switch positions. Airplane damage can occur.**

---

- 2 Pilot action is needed when a BLEED LOSS message shows.
- 3 Do **not** accomplish the following checklists:

PACK

HYD PRESS DEM



**[ ] BLEED LEAK STRUT L, R**

Condition: A bleed air leak occurs in the strut area.

- 1 The air supply controller automatically isolates the heat source by closing the bleed and isolation valves.

---

**Caution! Do not change the APU bleed, engine bleed, or bleed isolation switch positions. Airplane damage can occur.**

---

- 2 Do **not** accomplish the following checklist:

PACK

- 3 **Wait** 1 minute.

- 4 Choose one:

◆ BLEED LEAK STRUT message **blanks**:



◆ BLEED LEAK STRUT message **stays shown**:

▶▶ **Go to step 5**

- 5 A/T ARM switch  
(affected side) . . . . . Confirm . . . . . OFF
- 6 Thrust lever  
(affected side) . . . . . Confirm . . . . . Retard slowly  
until the BLEED LEAK  
STRUT message blanks  
or the thrust lever is at idle

▼ Continued on next page ▼

**▼ BLEED LEAK STRUT L, R continued ▼**

7 Do **not** accomplish the following checklist:  
AUTOTHROTTLE

8 Choose one:

◆ BLEED LEAK STRUT message **blanks**:

**Note:** Run the engine at a thrust setting that keeps the BLEED LEAK STRUT message blank.

▶▶ **Go to step 9**

◆ BLEED LEAK STRUT message **stays shown**:

**Note:** Run the engine at idle for the rest of the flight.

▶▶ **Go to step 9**

9 Transponder mode selector . . . . . TA ONLY

**Note:** Do not use FMC performance predictions with an engine at reduced thrust.

**▼ Continued on next page ▼**

▼ BLEED LEAK STRUT L, R continued ▼

10 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

▶▶ **Go to step 11**

◆ Landing using flaps **30 (if performance allows)**:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.



## 11 Checklist Complete Except Deferred Items

### Deferred Items

#### Descent Checklist

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

#### Approach Checklist

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM

▼ Continued on next page ▼

▼ BLEED LEAK STRUT L, R continued ▼

TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ___	InHg/hPa SET & X-Checked	ALL

### Before Landing Checklist

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	.20	ALL



**[ ] BLEED LOSS BODY**

**Condition:** Bleed air from the left and right body ducts is not available.

- 1 C1 and C2 AIR DEMAND pump selectors . . . . OFF

**Caution! Do not change the APU bleed, engine bleed, or bleed isolation switch positions. Airplane damage can occur.**

**Note:** Gear retraction time increases to approximately 3 minutes due to reduced center hydraulic system capacity. HYD PRESS SYS C and GEAR DISAGREE messages show during retraction.

- 2 Do **not** accomplish the following checklists:

HYD PRESS DEM C1

HYD PRESS DEM C2



**[ ] BLEED LOSS BODY L**

Condition: Bleed air from the left body duct is not available.

- 1 C1 AIR DEMAND pump selector . . . . . OFF

---

**Caution! Do not change the APU bleed, engine bleed, or bleed isolation switch positions. Airplane damage can occur.**

---

- 2 Do **not** accomplish the following checklist:

HYD PRESS DEM C1



**[ ] BLEED LOSS BODY R**

Condition: Bleed air from the right body duct is not available.

- 1 C2 AIR DEMAND pump selector . . . . . OFF

---

**Caution! Do not change the APU bleed, engine bleed, or bleed isolation switch positions. Airplane damage can occur.**

---

- 2 Do **not** accomplish the following checklist:

HYD PRESS DEM C2



**[ ] BLEED LOSS WING L, R**

Condition: Bleed air from the wing duct is not available.

Objective: To prevent possible asymmetrical ice buildup on the wings.

- 1 WING ANTI-ICE selector . . . . . OFF

---

**Caution! Do not change the APU bleed, engine bleed, or bleed isolation switch positions. Airplane damage can occur.**

---

- 2 Do **not** accomplish the following checklist:

PACK

**BLEED OFF APU**

Condition: One of the following occurs:

- The APU bleed valve is closed because of a system fault
- The APU bleed switch is off



**[ ] BLEED OFF ENG L, R**

Condition: One of the following occurs:

- The engine bleed valve is closed because of a system fault
- The engine bleed switch is off

1 Choose one:

◆ On the **ground**:

▶▶ **Go to step 2**

◆ In **flight**:

▶▶ **Go to step 6**

2 Choose one:

◆ OAT is **more than** 10 degrees C:

▶▶ **Go to step 3**

◆ OAT is **less than or equal to** 10 degrees C:

▶▶ **Go to step 6**

Attempt only one reset per flight.

3  ENG BLEED AIR switch (affected side). . . . . Off, then ON

4 Wait one minute.

▼ Continued on next page ▼

**▼ BLEED OFF ENG L, R continued ▼**

5 Choose one:

◆ BLEED OFF ENG message is **blank**:◆ BLEED OFF ENG message **shows**:**▶▶ Go to step 6**

6 ENG BLEED AIR switch

(affected side) . . . . . Off



**[ ] CABIN ALTITUDE AUTO**

Condition: One of these occurs:

- Automatic pressurization control is failed
- Both outflow valve switches are in manual

1 OUTFLOW VALVE switches (both) . . . . .MAN

Use momentary actuation of the outflow valve manual switches to avoid large and rapid pressurization changes. Valves can take up to 6 seconds to move the first time.

2 OUTFLOW VALVE MANUAL switches (both) . . . . . Move to OPEN or CLOSE as needed to control cabin rate and altitude

**Note:** The recommended cabin rate is approximately 500 FPM for climbs and descents.

Recommended cabin altitude in cruise is:

FLIGHT LEVEL	CABIN ALTITUDE
Up to 230	Landing Field Elevation
Up to 260	2000
Up to 300	4000
Up to 350	6000
above 350	8000

**3 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .CHECKED PM

▼ Continued on next page ▼

## ▼ CABIN ALTITUDE AUTO continued ▼

AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA . . . . .	SET	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew . . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS . . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ___ InHg/hPa SET & X-Checked		ALL

**At pattern altitude**

Use momentary actuation of the outflow valve manual switches to avoid large and rapid pressurization changes.

**OUTFLOW VALVE MANUAL**

switches (both) . . . . . Move to OPEN until the outflow valve indications show fully open to depressurize the airplane

▼ Continued on next page ▼



▼ CABIN ALTITUDE AUTO continued ▼

**Before Landing Checklist**

- LANDING GEAR . . . . . DOWN ALL
- SPEEDBRAKE LEVER . . . . . ARMED PF
- FLAPS . . . . . \_\_\_\_\_ ALL





Intentionally  
Blank

**Cabin Temp Cold**

Condition: Flight deck or cabin temperature is excessively cold. The temperature can cause incapacitation.

Objective: To regain temperature control or to descend and configure for manual ventilation.

1 AIR COND RESET switch . . . . . Push and hold for 1 second

2 **Wait** 2 minutes.

3 Choose one:

◆ Outlet air is **becoming warmer**:



◆ Outlet air is **excessively cold**:

▶▶ **Go to step 4**

4 TRIM AIR switches (both) . . . . . Off

5 **Wait** 1 minute.

6 Choose one:

◆ Outlet air is **becoming warmer**:

▶▶ **Go to step 29**

◆ Outlet air is **excessively cold**:

▶▶ **Go to step 7**

7 TRIM AIR switches (both) . . . . . ON

8 L PACK switch . . . . . Off

▼ **Continued on next page** ▼

## ▼ Cabin Temp Cold continued ▼

9 **Wait** 1 minute.

10 Choose one:

◆ Outlet air is **becoming warmer**:

▶▶ **Go to step 29**

◆ Outlet air is **excessively cold**:

▶▶ **Go to step 11**

11 L PACK switch . . . . . AUTO

12 R PACK switch . . . . . Off

13 **Wait** 1 minute.

14 Choose one:

◆ Outlet air is **becoming warmer**:

▶▶ **Go to step 29**

◆ Outlet air is **excessively cold**:

▶▶ **Go to step 15**

15 R PACK switch . . . . . AUTO

16 If needed to change flight deck temperature, open the flight deck door. It can take up to 5 minutes for the flight deck temperature to change.

▼ Continued on next page ▼

▼ Cabin Temp Cold continued ▼

17 Choose one:

◆ Flight deck or cabin temperature is **becoming warmer**:

▶▶ **Go to step 29**

◆ Flight deck or cabin temperature is **excessively cold**:

▶▶ **Go to step 18**

18 Start a descent to the lowest safe altitude or 10,000 feet, whichever is higher.

19 Plan to land at the nearest suitable airport.

20 **When** at level off:

▶▶ **Go to step 21**

21 Maintain airspeed between 280 and 320 knots to ensure air circulation.

22 Choose one:

◆ Airplane altitude is **at or below** 10,000 feet:

▶▶ **Go to step 23**

◆ Airplane altitude is **above** 10,000 feet:

Don the oxygen masks.

Establish crew communications.

▶▶ **Go to step 23**

23 PACK switches (both) . . . . . Off


▼ Continued on next page ▼

▼ Cabin Temp Cold continued ▼

24 Passenger body heat and airplane electronics will slowly raise the temperature.

25 OUTFLOW VALVE switches (both) . . . . . MAN

Use momentary actuation to avoid rapid pressure changes.

26  FWD OUTFLOW VALVE MANUAL switch . . . . . Move to OPEN until valve is fully open to depressurize the airplane

If indication is blank, hold the switch in OPEN for 30 seconds.

**Note:** For the rest of the flight, control the temperature with the aft outflow valve:

- If the temperature becomes too hot, open the aft outflow valve
- If the temperature becomes too cold, close the aft outflow valve

27 The following notes are applicable:

▼ Continued on next page ▼

▼ Cabin Temp Cold continued ▼

**Note:** The following items have a minor effect on temperature:

- UPPER RECIRC FANS switch
- IFE/PASS SEATS power switch
- CABIN/UTILITY power switch
- SHOULDER and FOOT HEATERS controls
- Flight deck lighting intensity
- Flight deck sunvisors
- Cabin lighting
- Cabin window shades
- Opened or closed flight deck door

If the IFE/PASS SEATS switch is off for temperature control, to move powered passenger seats for landing or another reason, select the IFE/PASS SEATS switch ON. Once seats are positioned, select the IFE/PASS SEATS switch off, if needed.

28 Do **not** accomplish the following checklists:

CABIN ALTITUDE AUTO

OUTFLOW VALVE AFT

OUTFLOW VALVE FWD

29 Do **not** accomplish the following checklists:

PACK L

PACK R

PACK L+R

▼ Continued on next page ▼

**▼ Cabin Temp Cold continued ▼**

TRIM AIR L

TRIM AIR R



### Cabin Temp Hot

Condition: Flight deck or cabin temperature is excessively hot. The temperature can cause incapacitation.

Objective: To regain temperature control or to descend and configure for manual ventilation.

1 AIR COND RESET switch . . . . . Push and hold for 1 second

2 **Wait** 2 minutes.

3 Choose one:

◆ Outlet air is **becoming cooler**:



◆ Outlet air is **excessively hot**:

▶▶ **Go to step 4**

4 TRIM AIR switches (both) . . . . . Off

5 **Wait** 1 minute.

6 Choose one:

◆ Outlet air is **becoming cooler**:

▶▶ **Go to step 35**

◆ Outlet air is **excessively hot**:

▶▶ **Go to step 7**

7 TRIM AIR switches (both) . . . . . ON

8 L PACK switch . . . . . Off

▼ **Continued on next page** ▼

**▼ Cabin Temp Hot continued ▼**

9 **Wait** 1 minute.

10 Choose one:

◆ Outlet air is **becoming cooler**:

▶▶ **Go to step 35**

◆ Outlet air is **excessively hot**:

▶▶ **Go to step 11**

11 L PACK switch . . . . . AUTO

12 R PACK switch . . . . . Off

13 **Wait** 1 minute.

14 Choose one:

◆ Outlet air is **becoming cooler**:

▶▶ **Go to step 35**

◆ Outlet air is **excessively hot**:

▶▶ **Go to step 15**

15 R PACK switch . . . . . AUTO

16 If needed to change flight deck temperature, open the flight deck door. It can take up to 5 minutes for the flight deck temperature to change.

**▼ Continued on next page ▼**

▼ Cabin Temp Hot continued ▼

17 Choose one:

◆ Flight deck or cabin temperature is **becoming cooler**:

▶▶ **Go to step 35**

◆ Flight deck or cabin temperature is **excessively hot**:

▶▶ **Go to step 18**

18 Start a descent to the lowest safe altitude or 10,000 feet, whichever is higher.

19 Plan to land at the nearest suitable airport.

20 UPPER RECIRC FANS switch . . . . . Off

21 SHOULDER and FOOT HEATERS controls (all) . . . . . OFF

22 Minimize flight deck lighting intensity.

23 During daylight, install the flight deck sunvisors.

24 **When** at level off:

▶▶ **Go to step 25**

25 Maintain airspeed between 280 and 320 knots to ensure air circulation.

▼ Continued on next page ▼

▼ Cabin Temp Hot continued ▼

26 Choose one:

◆ Airplane altitude is **at or below** 10,000 feet:

▶▶ **Go to step 27**

◆ Airplane altitude is **above** 10,000 feet:

Don the oxygen masks.

Establish crew communications.

▶▶ **Go to step 27**

27 PACK switches (both) . . . . . Off

28 OUTFLOW VALVE switches (both) . . . . . MAN

Use momentary actuation to avoid rapid pressure changes.

29  OUTFLOW VALVE MANUAL

switches (both) . . . . . Move to OPEN until valves are fully open to depressurize the airplane

If indications are blank, hold the switches in OPEN for 30 seconds.

**Note:** For the rest of the flight, control the temperature with the aft outflow valve:

- If the temperature becomes too cold, close the aft outflow valve
- If the temperature becomes too hot, open the aft outflow valve

▼ Continued on next page ▼

▼ Cabin Temp Hot continued ▼

30 Advise the cabin to:

- Reduce cabin lighting to minimum needed
- Close cabin window shades during daylight

31 **When** cabin window shades are closed:

▶▶ **Go to step 32**

32 IFE/PASS SEATS power switch . . . . . Off

33 CABIN/UTILITY power switch . . . . . Off

**Note:** The following items have a minor effect on temperature:

- UPPER RECIRC FANS switch
- IFE/PASS SEATS power switch
- CABIN/UTILITY power switch
- SHOULDER and FOOT HEATERS controls
- Flight deck lighting intensity
- Flight deck sunvisors
- Cabin lighting
- Cabin window shades
- Opened or closed flight deck door

To move powered passenger seats for landing or another reason, select the IFE/PASS SEATS switch ON. Once seats are positioned, select the IFE/PASS SEATS switch off, if needed.

▼ Continued on next page ▼

**▼ Cabin Temp Hot continued ▼**

34 Do **not** accomplish the following checklists:

CABIN ALTITUDE AUTO

OUTFLOW VALVE AFT

OUTFLOW VALVE FWD

35 Do **not** accomplish the following checklists:

PACK L

PACK R

PACK L+R

TRIM AIR L

TRIM AIR R

**CARGO HEAT AFT**

Condition: One of these occurs:

- Aft lower cargo heat is inoperative
- The aft cargo temperature selector is OFF

**CARGO HEAT BULK**

Condition: One of these occurs:

- Bulk cargo heat is inoperative
- The bulk cargo temperature selector is OFF



**EQUIP COOLING**

Condition: The forward equipment cooling system is failed.



**[ ] EQUIP COOLING OVRD**

Condition: The equipment cooling system is in override mode.

- 1 **Wait** 2 minutes. This allows time for any smoke in the system to clear.
- 2 EQUIP COOLING switch . . . . . Off, then AUTO  
The EQUIP COOLING OVRD message blanks.
- 3 **Wait** 1 minute. This allows time for the system to reset.
- 4 Choose one:

◆ EQUIP COOLING OVRD message **stays blank**:



◆ EQUIP COOLING OVRD message **shows again**:

**Note:** After 30 minutes of operation at low altitude and low cabin differential pressure, electronic equipment and displays may fail.



**[ ] LANDING ALTITUDE**

Condition: One of these occurs:

- The FMC does not supply a landing altitude
- The landing altitude selector is pulled

1 LDG ALT selector . . . . . PULL ON, set manually



**[ ] OUTFLOW VALVE AFT, FWD**

Condition: One of these occurs:

- Automatic control of the outflow valve is inoperative
- The outflow valve switch is in manual

Objective: To allow the operable outflow valve to control cabin pressure.

- 1 OUTFLOW VALVE switch (affected side) . . . . .MAN
- 2 OUTFLOW VALVE MANUAL switch (affected side) . . . . . Hold in CLOSE until the outflow valve indication shows fully closed

**3 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA . . . . .	SET	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew . . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
--------------------------	----	----

▼ Continued on next page ▼

## 777 Flight Crew Operations Manual Supplement

## ▼ OUTFLOW VALVE AFT, FWD continued ▼

R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ___ InHg/hPa SET & X-Checked		ALL

**At pattern altitude**

Use momentary actuation of the outflow valve manual switch to avoid large and rapid pressurization changes.

**OUTFLOW VALVE MANUAL**

switch (affected side). . . . . Move to OPEN until the outflow valve indications show fully open

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	___	ALL



**[ ] PACK L**

Condition: The left pack is inoperative.

- 1 **Wait** 2 minutes. This allows time for an overheat condition to cool.
- 2 AIR COND RESET switch . . . . . Push and hold for 1 second
- 3 **Wait** 2 minutes.
- 4 Choose one:

◆ PACK L message **stays blank:**



◆ PACK L message **shows again:**

L PACK switch . . . . . Off



**[ ] PACK L+R**

Condition: Both packs are inoperative.

Objective: To prevent excessive cabin altitude and temperature by descending and increasing ventilation.

- 1 **Wait** 2 minutes. This allows time for an overheat condition to cool.
- 2 AIR COND RESET switch . . . . . Push and hold for 1 second
- 3 **Wait** 2 minutes unless the PACK L+R message shows again.
- 4 Choose one:
  - ◆ PACK L+R message **stays blank**:  
  ■ ■ ■ ■
  - ◆ PACK L+R message **shows again**:  
                                  ▶▶ **Go to step 5**
- 5 Descend to the lowest safe altitude or 10,000 feet, whichever is higher.

**If** needed to prevent excessive cabin altitude, descend with speedbrakes extended at Vmo/Mmo
- 6 **When** at level off:  
                                  ▶▶ **Go to step 7**

▼ Continued on next page ▼

▼ PACK L+R continued ▼

7 Choose one:

◆ Airplane altitude is **at or below** 10,000 feet:

▶▶ **Go to step 8**

◆ Airplane altitude is **above** 10,000 feet:

Don the oxygen masks.

Establish crew communications.

▶▶ **Go to step 8**

8 OUTFLOW VALVE switches (both) . . . . . MAN

9 OUTFLOW VALVE MANUAL switches (both) . . . . . Hold in OPEN for 30 seconds

10 UPPER RECIRC FANS switch . . . . . Off

11 IFE/PASS SEATS power switch . . . . . Off

12 CABIN/UTILITY power switch . . . . . Off

13 SHOULDER and FOOT HEATERS (all) . . . . . OFF

14 Minimize the flight deck lighting intensity.

15 Open the flight deck door.

16 **During** daylight:

Install the flight deck sunvisors.

Advise the cabin to close the cabin window shades.

17 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

## ▼ PACK L+R continued ▼

**Note:** To move powered passenger seats for landing or another reason, select the IFE/passenger seats switch ON. Once seats are positioned, select the IFE/passenger seats switch Off.

18 Do **not** accomplish the following checklist:

CABIN ALTITUDE AUTO



**[ ] PACK MODE L, R**

Condition: The pack is in the standby mode.

**Note:** At lower altitudes or higher outside air temperatures, the pack may shut down.



**[ ] PACK R**

Condition: The right pack is inoperative.

- 1 **Wait** 2 minutes. This allows time for an overheat condition to cool.
- 2 AIR COND RESET switch . . . . . Push and hold for 1 second

3 **Wait** 2 minutes.

4 Choose one:

◆ PACK R message **stays blank:**



◆ PACK R message **shows again:**

R PACK switch . . . . . Off



**[ ] TRIM AIR L, R**

Condition: The trim air valve is closed.

- 1 **Wait** 2 minutes. This allows time for an overheat condition to cool.
- 2 AIR COND RESET switch . . . . . Push and hold for 1 second
- 3 **Wait** 2 minutes.
- 4 Choose one:
  - ◆ TRIM AIR message **stays blank:**  
  ■ ■ ■ ■
  - ◆ TRIM AIR message **shows again:**  
                                  TRIM AIR switch (affected side). . . . . Off  
  ■ ■ ■ ■

Intentionally  
Blank



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Intentionally  
Blank

**[ ] ANTI-ICE ENG L, R**

Condition: The engine anti-ice valve is closed when commanded open.

1 Choose one:

◆ On the **ground**:

▶▶ **Go to step 2**

◆ In **flight**:

▶▶ **Go to step 6**

2 Thrust lever

(affected side) . . . . . Advance until N1 is approximately 3% above idle

3 Choose one:

◆ ANTI-ICE ENG message **blanks**:

■ ■ ■ ■

◆ ANTI-ICE ENG message **stays shown**:

ENGINE ANTI-ICE selector

(affected side). . . . . OFF, then ON

▶▶ **Go to step 4**

4 Choose one:

◆ ANTI-ICE ENG message **blanks**:

■ ■ ■ ■

◆ ANTI-ICE ENG message **stays shown**:

▶▶ **Go to step 5**

▼ **Continued on next page** ▼

▼ ANTI-ICE ENG L, R continued ▼

5 ENGINE ANTI-ICE selector  
(affected side) . . . . . OFF

**Note:** Avoid icing conditions.



6 ENGINE ANTI-ICE selector  
(affected side) . . . . . OFF, then ON

7 Choose one:

◆ ANTI-ICE ENG message **blanks:**

**Note:** Run the affected engine anti-ice system manually.



◆ ANTI-ICE ENG message **stays shown:**

▶▶ **Go to step 8**

8 ENGINE ANTI-ICE selector  
(affected side) . . . . . OFF

**Note:** Avoid icing conditions.



**[ ] ANTI-ICE LEAK ENG L, R**

Condition: A bleed air leak occurs in the engine anti-ice duct.

Objective: To reduce the flow of bleed air through the leak.

- 1 The engine anti-ice system automatically isolates the heat source within approximately 2 minutes by closing the engine anti-ice valve.

**Note:** Avoid icing conditions.

- 2 **Wait** 2 minutes.

- 3 Choose one:

◆ ANTI-ICE LEAK ENG message **blanks:**



◆ ANTI-ICE LEAK ENG message **stays shown:**

▶▶ **Go to step 4**

- 4 A/T ARM switch  
(affected side) . . . . . Confirm . . . . . OFF

- 5 Thrust lever  
(affected side) . . . . . Confirm . . . . . Retard slowly  
until the ANTI-ICE  
LEAK ENG message blanks  
or the thrust lever is at idle

- 6 Do **not** accomplish the following checklist:

AUTOTHROTTLE

▼ Continued on next page ▼

▼ ANTI-ICE LEAK ENG L, R continued ▼

7 Choose one:

◆ ANTI-ICE LEAK ENG message **blanks**:

**Note:** Run the engine at a thrust setting that keeps the ANTI-ICE LEAK ENG message blank.

▶▶ **Go to step 8**

◆ ANTI-ICE LEAK ENG message **stays shown**:

**Note:** Run the engine at idle for the rest of the flight.

▶▶ **Go to step 8**

8 Transponder mode selector . . . . . TA ONLY

**Note:** Do not use FMC performance predictions with an engine at reduced thrust.

9 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

▶▶ **Go to step 10**

◆ Landing using flaps **30 (if performance allows)**:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.



▼ Continued on next page ▼

▼ ANTI-ICE LEAK ENG L, R continued ▼

10 Checklist Complete Except Deferred Items

**Deferred Items**

**Descent Checklist**

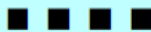
RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



**ANTI-ICE LOSS ENG L, R**

Condition: Anti-ice bleed air for the engine is not available.



**[ ] ANTI-ICE ON**

Condition: All of these occur:

- An anti-ice selector is ON
- TAT is more than 10 degrees C
- Ice is not detected

- 1 ENGINE ANTI-ICE selectors (both) . . . . . AUTO or OFF
- 2 WING ANTI-ICE selector . . . . . AUTO or OFF



**[ ] ANTI-ICE VLV WING L, R**

Condition: The affected wing anti-ice valve is not closed on the ground.

- 1 WING ANTI-ICE selector . . . . . OFF
- 2 ENG BLEED AIR switch (affected side). . . . . Off
- 3 BLEED AIR ISLN switch (affected side) . . . . . Off
- 4 PACK switch (affected side) . . . . . Off
- 5 Do **not** accomplish the following checklists:

BLEED OFF ENG

BLEED LOSS WING

PACK



**[ ] ANTI-ICE WING**

Condition: One or both wing anti-ice valves are failed closed.

1 WING ANTI-ICE selector . . . . . OFF, then ON

2 Choose one:

◆ ANTI-ICE WING message **blanks**:

Run wing anti-ice manually.



◆ ANTI-ICE WING message **stays shown**:

WING ANTI-ICE selector . . . . . OFF

**[ ] HEAT PITOT C**

Condition: The center pitot probe heat is failed.

**Note:** The standby air data is unreliable in icing conditions.

**[ ] HEAT PITOT L**

Condition: The left pitot probe heat is failed.

**Note:** The PFD air data is not affected by a single pitot heat failure. Ensure that the right AIR DATA/ATT source switch stays off.



**[ ] HEAT PITOT L+C+R**

Condition: The left, center and right pitot probe heat are failed.

**Note:** The air data is unreliable in icing conditions.

**[ ] HEAT PITOT R**

Condition: The right pitot probe heat is failed.

**Note:** The PFD air data is not affected by a single pitot heat failure. Ensure that the left AIR DATA/ATT source switch stays off.



## Ice Crystal Icing

Condition: Engine ice crystal icing or TAT probe icing is suspected. Ice crystal icing conditions exist when in visible moisture, and one or more of the following indications are present:

- Amber or red weather radar returns below the airplane
- Appearance of liquid water on the windshield at temperatures too cold for rain (the sound is different than rain)
- The autothrottle disconnects or is unable to maintain the selected airspeed
- TAT indication on EICAS stays near 0 degrees C

(Additional items that can indicate ice crystal icing are listed in the Additional Information section.)

Objective: To exit the ice crystal icing conditions and reduce the operational effects of the icing.

▼ Continued on next page ▼

▼ Ice Crystal Icing continued ▼

**Note:** TAT probe icing can cause one or more of the following non-normal engine indications:

- Reference/target EPR indications or reference EPR blank
- Maximum EPR lines (amber) or reference/target EPR indications decrease while flying at a constant altitude and airspeed
- Thrust levers or actual EPR indications are not aligned
- Unable to achieve maximum continuous thrust or maximum climb thrust

- 1 Minimize time above amber and red weather radar returns.
- 2 If conditions allow, exit the ice crystal icing conditions laterally. Climbing or descending to exit ice crystal icing conditions is not recommended.

3 Choose one:

◆ TAT **or** engine indications are **normal**:

▶▶ **Go to step 14**

◆ TAT indication stays near 0 degrees C **and** engine indications are **not** normal:

▶▶ **Go to step 4**

- 4 A/T ARM switches (both) . . . . . OFF
- 5 Thrust levers (both) . . . . . Set to maintain airspeed and airplane flight path

▼ Continued on next page ▼

**▼ Ice Crystal Icing continued ▼**

6 Choose one:

◆ Airspeed and airplane flight path **can** be maintained with manual thrust:

▶▶ **Go to step 14**

◆ Airspeed and airplane flight path **cannot** be maintained with manual thrust:

▶▶ **Go to step 7**

7 Thrust levers (both) . . . . . Retard to mid position

This prevents exceeding thrust limits when switching to the alternate mode.

Push one switch at a time.

8  ENGINE EEC MODE switches (both) . . . . . Off

9 Do **not** accomplish the following checklist:

ENG EEC MODE

10 Maximum thrust limiting is not available. N1 can be used to set thrust.

11 Do **not** activate the autothrottle.

12 The ENG LIMIT PROT messages can show due to incorrect maximum N1 lines. Set thrust to maintain the needed airspeed and airplane flight path. Maintain EGT below the amber band.

**▼ Continued on next page ▼**

▼ Ice Crystal Icing continued ▼

13 Do **not** accomplish the following checklist:

ENG LIMIT PROT

14 When in ice crystal icing conditions, the following can be unreliable:

In EEC normal mode:

Reference/target EPR indications and reference EPR

Maximum EPR lines (amber)

TAS, TAT, SAT, ECON SPD, and LRC

In EEC alternate mode:

Reference/target N1 indications and reference N1

Maximum N1 lines (amber)

TAS, TAT, SAT, ECON SPD, and LRC

15 **When** ice crystal icing conditions are no longer present:

ENGINE EEC MODE switches (both) . . . . . NORM

The autothrottle can be activated, if needed.



▼ Continued on next page ▼

## ▼ Ice Crystal Icing continued ▼

**Additional Information**

One or more of the following can indicate ice crystal icing:

- Light to moderate turbulence
- Static discharge around the windshield (St. Elmo's fire)
- Smell of sulfur
- Smell of ozone
- Humidity increase

An erroneous TAT indication can occur as a result of ice crystals blocking the sensor. The erroneous indication can last from one minute to more than 20 minutes. TAT normally should increase approximately 2 degrees Celsius per 1000 ft of descent.

**[ ] ICE DETECTORS**

Condition: The ice detectors are failed.

**Note:** Run the engine and wing anti-ice systems manually.

**ICING ENG**

Condition: Ice is detected and an engine anti-ice selector is OFF.



## ICING WING

Condition: Ice is detected and one of these occurs:

- The wing anti-ice selector is OFF
- The wing anti-ice takeoff inhibit is active



## WINDOW HEAT

Condition: Two or more window heats are off.



## [ ] WINDOW HEAT L, R FWD

Condition: Primary window heat for the forward window is inoperative.

Objective: To reset the system or remove power to prevent arcing.

1 Choose one:

◆ Affected window is **arc**ing, **shattered**, or **cracked**:

▶▶ **Go to the Window Damage Fwd L, R checklist on page 1.8**



◆ Affected window is **not** arcing, **shattered**, or **cracked**:

▶▶ **Go to step 2**

▼ Continued on next page ▼

**▼ WINDOW HEAT L, R FWD continued ▼**

2 FWD WINDOW HEAT  
switch (affected side) . . . . . Off

3 **Wait** 10 seconds.

4 FWD WINDOW HEAT  
switch (affected side) . . . . . ON

5 Choose one:

◆ WINDOW HEAT FWD message **blanks**:



◆ WINDOW HEAT FWD message **stays shown**:

FWD WINDOW HEAT  
switch (affected side) . . . . . Off

The window is defogged by the backup  
system.



**[ ] WINDOW HEAT L, R SIDE**

Condition: Window heat for the side window is inoperative.

Objective: To reset the system or remove power to prevent arcing.

1 Choose one:

◆ Affected window is **arcing, shattered, or cracked**:

▶▶ **Go to the Window Damage Side L, R checklist on page 1.9**



◆ Affected window is **not** arcing, shattered, or damaged:

▶▶ **Go to step 2**

2 SIDE WINDOW HEAT switch (affected side) . . . . . Off

3 **Wait** 10 seconds.

4 SIDE WINDOW HEAT switch (affected side) . . . . . ON

5 Choose one:

◆ WINDOW HEAT SIDE message **blanks**:



◆ WINDOW HEAT SIDE message **stays shown**:

SIDE WINDOW HEAT switch (affected side) . . . . . Off





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## Table of Contents

Intentionally  
Blank

**AUTOPILOT**

Condition: One or more of these occur:

- The autopilot is in a degraded mode other than the selected mode
- The engaged roll mode is failed
- The engaged pitch mode is failed
- The autopilot is in flight envelope protection

**AUTOPILOT DISC**

Condition: All autopilots are disengaged.

**AUTOTHROTTLE DISC**

Condition: Both autothrottles are disconnected.

**[ ] AUTOTHROTTLE L, R**

Condition: The autothrottle is inoperative.

- 1 A/T ARM switch  
(affected side) . . . . . Confirm . . . . . OFF
- 2 The other autothrottle may be activated if needed.



**NO AUTOLAND**

Condition: The autoland system is not available.

**NO LAND 3**

Condition: The autoland system does not have redundancy for a triple channel autoland.





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Intentionally  
Blank

**DATALINK LOST**

Condition: The ACARS datalink is temporarily lost.

**DATALINK SYS**

Condition: The datalink system is failed.

**[ ] RADIO TRANSMIT**

Condition: A microphone switch is on and causes a radio to transmit for 30 seconds or more.

Objective: To identify and isolate the stuck microphone switch.

- 1 Transmitter select switches  
(all audio control panels) . . . . .FLT interphone
- 2 The microphone with the stuck switch transmits on the flight interphone rather than over a radio.

**Note:** The affected audio control panel should stay on FLT interphone. All other audio panels may be used normally.

**SATCOM**

Condition: The SATCOM system is failed.



**SATCOM DATALINK**

Condition: The SATCOM datalink is failed.

**SATCOM VOICE**

Condition: SATCOM voice communication is failed.

**SATVOICE LOST**

Condition: SATCOM voice communication is temporarily lost.

**VHF DATALINK**

Condition: The VHF datalink is failed.





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## Table of Contents

Intentionally  
Blank

**[ ] ELEC AC BUS L, R**

Condition: The AC bus is not energized.

Objective: To restore power or use the APU to supply another source of power.

Attempt only one reset per flight.

1  GEN CTRL switch  
(affected side) . . . . . Off, then ON

2 Choose one:

◆ ELEC AC BUS message **blanks**:



◆ ELEC AC BUS message **stays shown**:

APU selector

(if APU available) . . . . . START, then ON

Do **not** accomplish the following checklist:

ELEC GEN OFF

**When** the APU is running:

▶▶ **Go to step 3**

3 Choose one:

◆ ELEC AC BUS message **blanks**:



◆ ELEC AC BUS message **stays shown**:

▶▶ **Go to step 4**

▼ Continued on next page ▼

▼ ELEC AC BUS L, R continued ▼

Attempt only one reset per flight.

4 BUS TIE switch (affected side). . . . . Off, then AUTO

5 Choose one:

◆ ELEC AC BUS message **blanks**:



◆ ELEC AC BUS message **stays shown**:

Do **not** accomplish the following checklists:

WINDOW HEAT

HYD PRESS PRI



**[ ] ELEC BACKUP GEN L, R**

Condition: The backup generator is failed.

Attempt only one reset per flight.

1 BACKUP GEN switch (affected side). . . . . Off, then ON



**[ ] ELEC BACKUP SYS**

Condition: The backup power system is failed.

Attempt only one reset per flight.

1  L BACKUP GEN switch . . . . . Off, then ON

Attempt only one reset per flight.

2  R BACKUP GEN switch . . . . . Off, then ON

**ELEC BATTERY OFF**

Condition: The battery switch is OFF.

**ELEC BUS ISLN L, R**

Condition: The bus tie breaker is open.

**ELEC CABIN/UTIL OFF**


Condition: The cabin/utility power switch is OFF.



**[ ] ELEC GEN DRIVE L, R**

Condition: A generator drive fault occurs.

Action is irreversible.

- 1  DRIVE DISC switch (affected side). . . . . Confirm. . . . . Push and hold for 1 second
- 2 APU selector (if APU available) . . . . . START, then ON
- 3 Do **not** accomplish the following checklist:

ELEC GEN OFF



**[ ] ELEC GEN OFF APU**

Condition: The generator control breaker is open.

Attempt only one reset per flight.

- 1  APU GEN switch. . . . . Off, then ON



**[ ] ELEC GEN OFF L, R**

Condition: The generator control breaker is open.

Objective: To reset the generator or use the APU to supply another source of power.

Attempt only one reset per flight.

1  GEN CTRL switch  
(affected side) . . . . . Off, then ON

2 Choose one:

◆ ELEC GEN OFF message **blanks**:

■ ■ ■ ■

◆ ELEC GEN OFF message **stays shown**:

APU selector  
(if APU available) . . . . . START, then ON

■ ■ ■ ■

**ELEC GND HDLG BUS**

Condition: A fault occurs in the ground handling bus.

■ ■ ■ ■

**ELEC IFE/SEATS OFF**

Condition: The IFE/passenger seats power switch is OFF.

■ ■ ■ ■

**ELEC STANDBY SYS**

Condition: A standby power system failure occurs.

**[ ] MAIN BATTERY DISCH**

Condition: One of these occurs:

- The main battery is discharging
- The hot battery bus is not energized

**Note:** The main battery can power the standby system for a minimum of 5 minutes.





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**Aborted Engine Start L, R**

Condition: On the ground, an aborted engine start is needed.

- 1 FUEL CONTROL switch  
(affected side) . . . . . CUTOFF
- 
- 2 START/IGNITION selector  
(affected side) . . . . . START
- 3 Motor the engine for 30 seconds.
- 4 START/IGNITION selector  
(affected side) . . . . . NORM



**Dual Eng Fail/Stall**

Condition: Engine speed for both engines is below idle.

- 1 FUEL CONTROL switches (both) . . . . . CUTOFF, then RUN
- 2 RAM AIR TURBINE switch . . . . . Push and hold for 1 second

- 
- 3 Set airspeed above 240 knots.
  - 4 APU selector (if APU available) . . . . . START, then ON
  - 5 **If** volcanic ash is suspected:

**▶▶ Go to the Volcanic Ash checklist on page 7.40, if not already done, and return to this checklist when directed.**

- 6 Engines can accelerate to idle very slowly, especially at high altitudes. If N2 is steadily increasing and EGT stays within limits, do not interrupt the start.

- 7 **When** one engine is running:

**▶▶ Go to step 8**

- 8 FUEL CENTER PUMPS switches (both) . . . . . Off
- 9 **Wait** 5 seconds.

▼ Continued on next page ▼

**▼ Dual Eng Fail/Stall continued ▼**

10 Choose one:

◆ FUEL IN CENTER message is **blank**:▶▶ **Go to step 11**◆ FUEL IN CENTER message **shows**:FUEL CENTER PUMPS  
switches (both) . . . . . ON▶▶ **Go to step 11**11 **When** the HEAT PITOT L+C+R message blanks:PRIMARY FLIGHT COMPUTERS  
disconnect switch . . . . . DISC,  
then AUTO

This step restores the flight control normal mode.

Re-engage the autopilot as needed when the flight control normal mode is restored.



**[ ] ENG AUTOSTART L, R**

Condition: One of these occurs:

- Autostart did not start the engine
- Fuel control switch is in RUN at low engine RPM with the autostart switch OFF

1 FUEL CONTROL switch  
(affected side) . . . . . Confirm . . . . . CUTOFF



2 Choose one:

◆ In **flight**:



◆ On the **ground**:

▶▶ **Go to step 3**

3 START/IGNITION selector  
(affected side) . . . . . START

4 Motor the engine for 30 seconds.

5 START/IGNITION selector  
(affected side) . . . . . NORM



**Eng Lim/Surge/Stall L, R**

Condition: One or more of these occur:

- Engine indications are abnormal
- Engine indications are quickly nearing or show an exceedance
- Abnormal engine noises are heard, possibly with airframe vibration
- There is no response to thrust lever movement or the response is abnormal
- Flames in the engine inlet or exhaust are reported

- 1 A/T ARM switch  
(affected side) . . . Confirm . . . . . OFF
- 2 Thrust lever  
(affected side) . . . Confirm . . . . . Retard until  
engine indications  
stay within limits or  
the thrust lever is at idle



▼ Continued on next page ▼

▼ Eng Lim/Surge/Stall L, R continued ▼

3 Choose one:

◆ Engine indications are **stabilized and** EGT is **stabilized or decreasing**:

▶▶ **Go to step 4**

◆ Engine indications are **abnormal or** EGT continues to **increase**:

FUEL CONTROL switch

(affected side) . . . . . Confirm . . CUTOFF

APU selector

(if APU available) . . . . . START, then ON

Transponder mode selector . . . . . TA ONLY

Plan to land at the nearest suitable airport.

▶▶ **Go to step 6**

Check that RPM and EGT follow thrust lever movement.

4  Thrust lever

(affected side) . . . . . Advance slowly

**Note:** Run the engine normally or at a reduced thrust setting that is surge and stall free.

▼ Continued on next page ▼

**▼ Eng Lim/Surge/Stall L, R continued ▼**

5 Choose one:

◆ Engine runs **normally**:◆ Engine runs at **reduced** thrust:

Transponder mode selector . . . . . TA ONLY

**Note:** Do not use FMC performance predictions with an engine at reduced thrust.

**▶▶ Go to step 6**6 Do **not** accomplish the following checklist:

AUTOTHROTTLE

**▼ Continued on next page ▼**

▼ Eng Lim/Surge/Stall L, R continued ▼

7 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . .OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L,R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 8**

◆ Landing using flaps **30 (if performance allows)**:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L,R in the Performance Inflight-QRH chapter or other approved source.



**8 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .CHECKED PM

AUTOBRAKE . . . . .AS REQUIRED PF

▼ Continued on next page ▼

**▼ Eng Lim/Surge/Stall L, R continued ▼**

LANDING DATA. . . . .	<b>VREF 20</b> ____ ,	
	<b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked		ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



## Eng Svr Damage/Sep L, R

Condition: One or more of these occur:

- Airframe vibrations with abnormal engine indications
- Engine separation

- 1 A/T ARM switch  
(affected side) . . . . . Confirm . . . . . OFF
- 2 Thrust lever  
(affected side) . . . . . Confirm . . . . . Idle
- 3 FUEL CONTROL switch  
(affected side) . . . . . Confirm . . . . . CUTOFF
- 4 Engine fire switch  
(affected side) . . . . . Confirm . . . . . Pull

- 5 **If** high airframe vibration occurs and continues after engine shutdown:

Without delay, reduce airspeed and descend to a safe altitude which results in an acceptable vibration level.

**If** high vibration returns and further airspeed reduction and descent are not practical, increasing the airspeed may reduce the vibration.

- 6 APU selector  
(if APU available) . . . . . START, then ON
- 7 Transponder mode selector . . . . . TA ONLY
- 8 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ Eng Svr Damage/Sep L, R continued ▼

9 Do **not** accomplish the following checklists:

AUTOTHROTTLE

ENG FAIL

10 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 11**

◆ Landing using flaps **30 (if performance allows)**:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.



**11 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Eng Svr Damage/Sep L, R continued ▼

## Deferred Items

### Descent Checklist

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

### Approach Checklist

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

### Before Landing Checklist

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



### [ ] APU LIMIT

Condition: An APU limit exceedance occurs.

1 APU selector . . . . .	OFF
--------------------------	-----



**[ ] APU SHUTDOWN**

Condition: An APU automatic shutdown occurs.

Objective: To reset the APU controller.

- 1 APU selector . . . . . OFF
- 2 APU selector . . . . . START, then ON

**ENG AUTOSTART OFF**

Condition: The engine autostart switch is OFF.

**ENG CONTROL L, R**

Condition: An EEC system fault occurs.



**[ ] ENG EEC MODE L, R**


Condition: An EEC is in the alternate control mode.

Objective: To run both engines in the alternate mode.

- 1 Autothrottle disconnect switch . . . . . Push
- 2 Thrust levers (both) . . . . . Retard to mid position

This step prevents exceeding the thrust limits when switching to the alternate mode.

Push one switch at a time.

- 3  ENGINE EEC MODE switches (both) . . . . . Off
- 4 Activate the autothrottle.

**Note:** Maximum thrust limiting is not available with autothrottle disconnected. Alternate thrust setting information shows on the N1 indication.

- 5 Resume normal thrust management. Observe thrust limits.
- 6 Do **not** accomplish the following checklist:  
ENG EEC MODE (for other engine)



Intentionally  
Blank

**[ ] ENG FAIL L, R**

Condition: Engine speed is below idle.

Objective: To restart the engine if needed, or configure for single engine operation.

1 **If** thrust is lost on **both** engines:

**▶▶ Go to the Dual Eng Fail/Stall checklist on page 7.2**



2 **If** airframe vibrations with abnormal engine indications exist:

**▶▶ Go to the Eng Svr Damage/Sep L, R checklist on page 7.10**



3 **If** an engine has separated:

**▶▶ Go to the Eng Svr Damage/Sep L, R checklist on page 7.10**



4 A/T ARM switch  
(affected side) . . . . . Confirm. . . . . OFF

5 Thrust lever  
(affected side) . . . . . Confirm. . . . . Idle

6 FUEL CONTROL switch  
(affected side) . . . . . Confirm. . . . . CUTOFF

**▼ Continued on next page ▼**

**▼ ENG FAIL L, R continued ▼**

7 Do **not** accomplish the following checklist:

**AUTOTHROTTLE**

8 A restart can be attempted if there is no abnormal airframe vibration.

9 Choose one:

◆ Restart **is** needed:

▶▶ **Go to step 10**

◆ Restart is **not** needed:

▶▶ **Go to step 20**

10 Engine can accelerate to idle very slowly, especially at high altitudes. If N2 is steadily increasing and EGT stays within limits, do not interrupt the start.

11 Choose one:

◆ Crossbleed indication (X-BLD or XB) **shows**:

START/IGNITION selector  
(affected side). . . . . START

▶▶ **Go to step 12**

◆ Crossbleed indication (X-BLD or XB) is **blank**:

▶▶ **Go to step 12**

**▼ Continued on next page ▼**

▼ENG FAIL L, R continued▼

12 Choose one:

◆ Autostart is **on**:

▶▶ **Go to step 13**

◆ Autostart is **off**:

▶▶ **Go to step 15**

13 Do not interrupt autostart. Only abort the start if:

There is no oil pressure indication after the EGT increases.

EGT does not increase in 30 seconds.

N2 is not increasing.

No further autostart attempts are needed.

14 FUEL CONTROL switch

(affected side) . . . . . RUN

▶▶ **Go to step 17**

15 Abort the start if:

EGT does not rise within 30 seconds after selecting RUN.

There is no oil pressure indication after EGT increases.

N2 is not increasing.

There is no N1 rotation indicated by 40% N2.

EGT quickly nears or exceeds the start limit.

▼ Continued on next page ▼

**▼ ENG FAIL L, R continued ▼**

16 Choose one:

◆ Crossbleed indication (X-BLD or XB) **shows:****When** at a minimum of 15% N2:

FUEL CONTROL switch

(affected side) . . . . . RUN

**▶▶ Go to step 17**◆ Crossbleed indication (X-BLD or XB) is **blank:**

FUEL CONTROL switch

(affected side). . . . . RUN

**▶▶ Go to step 17**

17 Choose one:

◆ Engine **starts** and runs **normally:**◆ Engine stays **failed:****▶▶ Go to step 18**

18 FUEL CONTROL switch

(affected side) . . . . . Confirm. . . . . CUTOFF

19 START/IGNITION selector

(affected side) . . . . . NORM

20 APU selector

(if APU available) . . . . . START, then ON

21 Transponder mode selector . . . . . TA ONLY

**▼ Continued on next page ▼**

▼ ENG FAIL L, R continued ▼

22 Plan to land at the nearest suitable airport.

23 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . .OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 24**

◆ Landing using flaps **30 (if performance allows)**:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.



## 24 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ENG FAIL L, R continued▼

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



**[ ] ENG FUEL FILTER L, R**

Condition: Fuel contamination can cause fuel to bypass the engine fuel filter.

1 Choose one:

◆ **Only one** ENG FUEL FILTER message, left or right, has shown during the flight:

**Note:** Erratic engine operation and flameout may occur on the affected engine due to fuel contamination.



◆ ENG FUEL FILTER messages for **both** engines show or have shown at any time during the flight (either separately or at the same time):

▶▶ **Go to step 2**

2 Plan to land at the nearest suitable airport.

**Note:** Erratic engine operation and flameout may occur on either or both engines due to fuel contamination.



**[ ] ENG FUEL VALVE L, R**

Condition: One or more of these occur:

- The engine fuel valve is not in the commanded position
- The fuel spar valve is not in the commanded position

- 1 **If** the ENG FUEL VALVE message shows when the fuel control switch is moved to CUTOFF, the engine may continue to run for approximately 1 minute.
- 2 **If** on the ground:

Do not attempt engine start.

**ENG IDLE DISAGREE**

Condition: One engine is at approach idle and the other engine is at minimum idle.



## Eng In-Flight Start L, R

Condition: An engine start is needed and both of the following are true:

- There was **no** engine fire
- There is **no** abnormal airframe vibration

1 Engine can accelerate to idle very slowly, especially at high altitudes. If N2 is steadily increasing and EGT stays within limits, do not interrupt the start.

2 Choose one:

◆ Crossbleed indication (X-BLD or XB) **shows**:

START/IGNITION selector  
(affected side) . . . . . START

▶▶ **Go to step 3**

◆ Crossbleed indication (X-BLD or XB) is **blank**:

▶▶ **Go to step 3**

3 Choose one:

◆ Autostart is **on**:

▶▶ **Go to step 4**

◆ Autostart is **off**:

▶▶ **Go to step 6**

4 Do not interrupt autostart. Only abort the start if:

There is no oil pressure indication after the EGT increases.

EGT does not increase in 30 seconds.

▼ **Continued on next page** ▼

**▼ Eng In-Flight Start L, R continued ▼**

N2 is not increasing.

No further autostart attempts are needed.

- 5 FUEL CONTROL switch  
(affected side) . . . . . RUN

**▶▶ Go to step 8**

- 6 Abort the start if:

EGT does not rise within 30 seconds after selecting RUN.

There is no oil pressure indication after EGT increases.

N2 is not increasing.

There is no N1 rotation indicated by 40% N2.

EGT quickly nears or exceeds the start limit.

- 7 Choose one:

◆ Crossbleed indication (X-BLD or XB) **shows:**

**When** at a minimum of 15% N2:

FUEL CONTROL switch  
(affected side) . . . . . RUN

**▶▶ Go to step 8**

◆ Crossbleed indication (X-BLD or XB) is **blank:**

FUEL CONTROL switch  
(affected side). . . . . RUN

**▶▶ Go to step 8****▼ Continued on next page ▼**

▼ Eng In-Flight Start L, R continued ▼

8 Choose one:

◆ Engine **starts** and runs normally:

GND PROX FLAP OVRD switch . . . . . Off

Transponder mode selector . . . . . TA/RA



◆ Engine **fails** to start:

FUEL CONTROL switch  
(affected side) . . . . . Confirm . . CUTOFF

START/IGNITION selector  
(affected side) . . . . . NORM

Plan to land at the nearest suitable airport.

**Note:** Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.



**[ ] ENG LIMIT PROT L, R**

Condition: The EEC is in the alternate mode and the commanded N1 exceeds the limit.

- 1 Thrust lever  
(affected side) . . . . . Confirm . . . . . Retard until  
N1 stays below  
the amber line

**Note:** Do not use FMC performance predictions with an engine at reduced thrust.

- 2 Transponder mode selector . . . . . TA ONLY

**ENG OIL FILTER L, R**

Condition: Primary engine oil filter contamination approaching a bypass condition, oil will be filtered through the secondary filter.



**[ ] ENG OIL PRESS L, R**

Condition: The engine oil pressure is low.

- 1 A/T ARM switch  
(affected side) . . . . . Confirm. . . . . OFF
- 2 Thrust lever  
(affected side) . . . . . Confirm. . . . . Idle
- 3 FUEL CONTROL switch  
(affected side) . . . . . Confirm. . . . . CUTOFF
- 4 APU selector  
(if APU available) . . . . . START, then ON
- 5 Transponder mode selector . . . . . TA ONLY
- 6 Plan to land at the nearest suitable airport.
- 7 Do **not** accomplish the following checklist:  
AUTOTHROTTLE

▼ Continued on next page ▼

**▼ ENG OIL PRESS L, R continued ▼**

8 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 9**◆ Landing using flaps **30 (if performance allows)**:**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

**9 Checklist Complete Except Deferred Items****▼ Continued on next page ▼**

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 ▼ ENG OIL PRESS L, R continued ▼
 

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**Deferred Items**


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**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

---

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

---

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



Intentionally  
Blank

**[ ] ENG OIL TEMP L, R**

Condition: The engine oil temperature is high.

- 1 A/T ARM switch  
(affected side) . . . . . Confirm. . . . . OFF
- 2 Thrust lever  
(affected side) . . . . . Confirm. . . . . Retard  
slowly until the  
ENG OIL TEMP message  
blanks or the thrust lever is at idle

This allows the oil to cool.

- 3 Do **not** accomplish the following checklist:  
AUTOTHROTTLE

- 4 Choose one:

◆ Oil temperature is **at or above** the red line limit:

▶▶ **Go to step 7**

◆ Oil temperature is **below** the red line limit:

▶▶ **Go to step 5**

- 5 Wait until one of these occurs:

Oil temperature is at or above the red line limit

Oil temperature is in the amber band for 20  
minutes

Oil temperature is in the normal operating range

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

6 Choose one:

◆ Oil temperature is **at or above the red line limit:**

▶▶ **Go to step 7**

◆ Oil temperature is in the **amber band for 20 minutes:**

▶▶ **Go to step 7**

◆ Oil temperature is in the **normal operating range:**

**Note:** Run the affected engine at a thrust setting that keeps the oil temperature in the normal operating range.

Do not use FMC performance predictions with an engine at reduced thrust.

If at any time the oil temperature is at or above the red line limit, restart the ENG OIL TEMP L, R checklist.

Transponder mode selector . . . . . TA ONLY

▶▶ **Go to step 12**

7 Thrust lever

(affected side) . . . . . Confirm. . . . . Idle

8 FUEL CONTROL switch

(affected side) . . . . . Confirm. . . . . CUTOFF

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

- 9 APU selector  
(if APU available) . . . . . START, then ON
- 10 Transponder mode selector . . . . . TA ONLY
- 11 Plan to land at the nearest suitable airport.
- 12 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 13**

◆ Landing using flaps **30 (if performance allows)**:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.



**13 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked		ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



**[ ] ENG REV LIMITED L, R**

Condition: The engine reverser operation is limited.

**Note:** On landing, the affected thrust reverser will not deploy or affected reverse thrust will be limited to idle.



**ENG REVERSER L, R**

Condition: A fault occurs in the thrust reverser system.

**ENG RPM LIMITED L, R**

Condition: Engine thrust is at the N1 or N2 red line limit.

**ENG SHUTDOWN**

Condition: Both engines were shut down by the fuel control switches or the engine fire switches.

**ENG SHUTDOWN L, R**

Condition: The engine was shut down by the fuel control switch or the engine fire switch.



**[ ] ENG START VALVE L, R**

Condition: The start valve is not in the commanded position.

- 1 Ground or in-flight start using a bleed air source may be unsuccessful.
- 2 Choose one:

◆ On the **ground**:

FUEL CONTROL switch  
(affected side) . . . . . CUTOFF

START/IGNITION selector  
(affected side) . . . . . NORM

■ ■ ■ ■

◆ In **flight**:

▶▶ **Go to step 3**

- 3 START/IGNITION selector  
(affected side) . . . . . NORM
- 4 Increase airspeed until the crossbleed indication  
(X-BLD or XB) blanks.

■ ■ ■ ■

**[ ] ENG STARTER CUTOUT L, R**

Condition: One of these occurs:

- The start valve fails to close
- The start selector stays in start

Objective: To ensure start selector is in normal or to remove bleed air source from the starter and prevent possible asymmetrical ice buildup on the wings.

1 START/IGNITION selector (affected side) . . . . . NORM

2 Choose one:

◆ ENG STARTER CUTOUT message **blanks**:



◆ ENG STARTER CUTOUT message **stays shown**:

▶▶ **Go to step 3**

3 ENG BLEED switch (affected side). . . . . Off

4 BLEED AIR ISLN switch (affected side) . . . . . Off

5 **If** on the ground:

Disconnect the ground air source if it is in use.

6 WING ANTI-ICE selector . . . . . OFF

7 Do **not** accomplish the following checklists:

BLEED LOSS WING

BLEED OFF ENG

PACK



**ENG THRUST L, R**

Condition: The engine thrust is less than the commanded thrust.



## Volcanic Ash

Condition: Volcanic ash is suspected when one or more of these occur:

- A static discharge around the windshield
- A bright glow in the engine inlets
- Smoke or dust on the flight deck
- An acrid odor

- 1 Exit the volcanic ash as quickly as possible. Consider a 180 degree turn. Consider a descending turn.
- 2 Don the oxygen masks and smoke goggles, if needed.
- 3 Establish crew communications, if needed.
- 4 Do **not** do the Dual Eng Fail/Stall checklist until directed.
- 5 **If** at any time during this checklist both engines fail:

Move both fuel control switches to CUTOFF, then RUN.

Push the ram air turbine switch and hold for 1 second.

- 6 Do **not** do the ENG FAIL checklist until directed.
- 7 **When** in volcanic ash:
 

Minimize thrust if practical. This reduces EGT and engine damage.

8 ENGINE ANTI-ICE selectors (both) . . . . . ON

9 WING ANTI-ICE selector . . . . . ON

▼ Continued on next page ▼

**▼ Volcanic Ash continued ▼**

10 RECIRC FANS switches (both) . . . . . Off

11 APU selector  
(if APU available) . . . . . START, then ON

**Note:** Volcanic ash can cause non-normal system reactions such as:

- Engine malfunctions, increasing EGT, engine stall, or flameout
- Decrease or loss of airspeed indications
- EQUIP COOLING OVRD message
- FIRE CARGO FWD or AFT messages

12 Do **not** accomplish the following checklists:

EQUIP COOLING OVRD

ANTI-ICE ON

13 Choose one:

◆ **Both engines are failed:**

▶▶ **Go to the Dual Eng Fail/Stall checklist on page 7.2**



◆ **A single engine is failed:**

▶▶ **Go to the ENG FAIL L, R checklist on page 7.16**



◆ **Both engines are running:**

▶▶ **Go to step 14**

**▼ Continued on next page ▼**

**▼ Volcanic Ash continued ▼**

14 Plan to land at the nearest suitable airport.





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**Fire Eng Tailpipe L, R ..... 8.7**

**Smoke, Fire or Fumes ..... 8.8**

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DET FIRE APU ..... 8.13

DET FIRE CARGO AFT, FWD ..... 8.13

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**FIRE APU ..... 8.1**

FIRE CARGO AFT ..... 8.14

FIRE CARGO FWD ..... 8.17

**FIRE ENG L, R ..... 8.2**

Fire Eng on Ground L, R ..... ►► Back Cover.2

**Fire Eng Tailpipe L, R ..... 8.7**

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**Smoke, Fire or Fumes ..... 8.8**

**[ ] FIRE APU**

Condition: Fire is detected in the APU.

- 1 APU fire switch. . . . . Confirm . . . . . Pull, rotate to the stop and hold for 1 second
- 2 Choose one:
  - ◆ FIRE APU message **stays shown**:
    - Plan to land at the nearest suitable airport.
    - ▶▶ **Go to step 3**
  - ◆ FIRE APU message **blanks**:
    - ▶▶ **Go to step 3**
- 3 Do **not** accomplish the following checklist:  
APU SHUTDOWN



**[ ] FIRE ENG L, R**

Condition: Fire is detected in the affected engine.

1 Choose one:

◆ On the **ground**:

▶▶ **Go to step 13**

◆ In **flight**:

▶▶ **Go to step 2**

2 A/T ARM switch

(affected side) . . . . . Confirm. . . . . OFF

3 Thrust lever

(affected side) . . . . . Confirm. . . . . Idle

4 FUEL CONTROL switch

(affected side) . . . . . Confirm. . . . . CUTOFF

5 Engine fire switch

(affected side) . . . . . Confirm. . . . . Pull

6 **If** the FIRE ENG message shows:

Engine fire switch

(affected side) . . . . . Rotate to the stop  
and hold for 1 second



7 **If** after 30 seconds, the FIRE ENG message shows:

Engine fire switch

(affected side) . . . . . Rotate to the  
other stop and  
hold for 1 second

▼ Continued on next page ▼

**▼ FIRE ENG L, R continued ▼**

- 8 APU selector  
(if APU available) . . . . . START, then ON
- 9 Transponder mode selector . . . . . TA ONLY
- 10 Plan to land at the nearest suitable airport.
- 11 Do **not** accomplish the following checklist:  
AUTOTHROTTLE

**▼ Continued on next page ▼**

▼ FIRE ENG L, R continued ▼

12 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 22**

◆ Landing using flaps **30 (if performance allows)**:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.



13 Thrust levers (both) . . . . . Idle C

14 PARKING BRAKE . . . . . Set C

15 Advise the cabin. C

16 FUEL CONTROL switch (affected side) . . . . . CUTOFF C

▼ Continued on next page ▼

**▼ FIRE ENG L, R continued ▼**

17 Engine fire switch  
(affected side) . . . . . Pull F/O

18 **If** the FIRE ENG message shows:

Engine fire switch  
(affected side) . . . . Rotate to the stop  
and hold for 1 second F/O

19 Choose one:

◆ Evacuation is **needed**:

**▶▶ Go to the Evacuation checklist on  
page Back Cover.4**



◆ Evacuation is **not** needed:

**▶▶ Go to step 20**

20 Advise the cabin. C

21 Advise ATC. F/O



**22 Checklist Complete Except Deferred Items**

**▼ Continued on next page ▼**

▼ FIRE ENG L, R continued ▼

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> __	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . __ InHg/hPa	SET & X-Checked	ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



**Fire Eng Tailpipe L, R**

Condition: An engine tailpipe fire occurs on the ground with no engine fire warning.

1 FUEL CONTROL switch  
(affected side) . . . . . CUTOFF

2 Advise the cabin.

3 Choose one:

◆ Bleed air is **available**:

▶▶ **Go to step 4**

◆ Bleed air is **not** available:

Advise ATC.



4 START/IGNITION selector  
(affected side) . . . . . START

5 Advise ATC.

6 **When** the tailpipe fire is extinguished:

START/IGNITION selector  
(affected side) . . . . . NORM



**Smoke, Fire or Fumes**

Condition: Smoke, fire or fumes occurs.

Objective: To remove power from the ignition source.  
To land the airplane as soon as possible, if needed.

- 1 Diversion may be needed.
- 2 Don oxygen masks and smoke goggles, if needed.
- 3 Establish crew and cabin communications.
- 4 IFE/PASS SEATS switch . . . . . OFF
- 5 RECIRC FANS switches (both) . . . . . Off
- 6 APU BLEED AIR switch . . . . . Off
- 7 **Any time** the smoke or fumes becomes the greatest threat:

**▶▶ Go to the Smoke or Fumes Removal checklist on page 8.28**

▼ Continued on next page ▼

## ▼ Smoke, Fire or Fumes continued ▼

8 Choose one:

- ◆ Source of the smoke, fire or fumes **is** obvious **and can** be extinguished quickly:

Isolate and extinguish the source of the smoke, fire, or fumes.

If practical, remove power from the affected equipment by switch or circuit breaker in the flight deck or cabin.

▶▶ **Go to step 9**

- ◆ Source of the smoke, fire or fumes is **not** obvious **or cannot** be extinguished quickly:

▶▶ **Go to step 10**

9 Choose one:

- ◆ Source **is** visually confirmed to be extinguished **and** smoke or fumes are **decreasing**:

Continue the flight at the captain's discretion.

Restore unpowered items at the captain's discretion.

▶▶ **Go to the Smoke or Fumes Removal checklist on page 8.28, if needed.**



- ◆ Source **is not** visually confirmed extinguished **or** smoke or fumes **continue**:

▶▶ **Go to step 10**

## ▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

10 Advise the cabin that the main cabin lighting will be turned off.

11 CABIN/UTILITY switch . . . . . OFF

12 Initiate a diversion to the nearest suitable airport while continuing the checklist.

13 Consider an immediate landing if the smoke, fire or fumes situation becomes uncontrollable.

14 Do not delay landing in an attempt to complete the following steps.

15 C BLEED AIR ISLN switch . . . . . Off

16 L PACK switch . . . . . Off

17 L TRIM AIR switch . . . . . Off

18 Do **not** accomplish the following checklists:

PACK L

TRIM AIR L

19 **Wait** 2 minutes unless the smoke or fumes are increasing.

▼ Continued on next page ▼

**▼ Smoke, Fire or Fumes continued ▼**

20 Choose one:

◆ Smoke or fumes **continue or are increasing**:

L PACK switch . . . . . AUTO

L TRIM AIR switch . . . . . ON

R PACK switch . . . . . Off

R TRIM AIR switch . . . . . Off

▶▶ **Go to step 21**◆ Smoke or fumes are **decreasing**:▶▶ **Go to the Smoke or Fumes Removal  
checklist on page 8.28, if needed.**21 Do **not** accomplish the following checklists:

PACK R

TRIM AIR R

22 **Wait** 2 minutes unless the smoke or fumes are increasing.**▼ Continued on next page ▼**

▼ Smoke, Fire or Fumes continued ▼

23 Choose one:

◆ Smoke or fumes **continue or are increasing**:

C BLEED AIR ISLN switch . . . . . AUTO

R PACK switch . . . . . AUTO

R TRIM AIR switch . . . . . ON

Consider an immediate landing.

▶▶ **Go to the Smoke or Fumes Removal checklist on page 8.28, if needed.**



◆ Smoke or fumes are **decreasing**:

▶▶ **Go to the Smoke or Fumes Removal checklist on page 8.28, if needed.**



**BOTTLE 1, 2 DISCH ENG**

Condition: The engine fire extinguisher bottle pressure is low.



**BOTTLE DISCH APU**

Condition: The APU fire extinguisher bottle pressure is low.



**BOTTLE DISCH CARGO**

Condition: Both rapid discharge cargo fire extinguisher bottle pressures are low.

**[ ] DET FIRE APU**

Condition: APU fire detection is failed.

1. Choose one:

◆ APU **is** running:

Plan to shut down the APU as soon as practical.



◆ APU is **not** running:

**Note:** Do not start the APU unless use is needed.

**DET FIRE CARGO AFT, FWD**

Condition: Lower cargo compartment smoke detection is failed.

**DET FIRE ENG L, R**

Condition: Engine fire and overheat detection is failed.



**[ ] FIRE CARGO AFT**

Condition: Smoke is detected in the aft lower cargo compartment.

- 1 AFT CARGO FIRE ARM switch . . . . . Confirm . . . . . ARMED
- 2 CARGO FIRE DISCH switch . . . . . Push and hold for 1 second
- 3 Choose one:

◆ On the **ground**:

**Warning! Inform ground personnel NOT to open any cargo door until all passengers and crew have exited the airplane and fire fighting equipment is nearby.**



◆ In flight:

▶▶ **Go to step 4**

- 4 LDG ALT selector . . . . . PULL ON, set 8000  
HL7700 - HL7791
- 5 Establish cabin communications. Advise the cabin to:

Evacuate the lower crew rest compartment.  
Close the hatches.

▼ Continued on next page ▼

**▼ FIRE CARGO AFT continued ▼**

- 6 Plan to land at the nearest suitable airport.
- 7 Do **not** accomplish the following checklist:  
LANDING ALTITUDE
- 8 **When** leaving cruise altitude for landing:  
LDG ALT selector . . . . . Push off
- 9 **Checklist Complete Except Deferred Items**

**▼ Continued on next page ▼**

▼ FIRE CARGO AFT continued ▼

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA . . . . .	SET	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew . . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS . . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ___ InHg/hPa	SET & X-Checked	ALL

**Warning! Inform ground personnel NOT to open any cargo door after landing until all passengers and crew have exited the airplane and fire fighting equipment is nearby.**

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	___	ALL



**[ ] FIRE CARGO FWD**

Condition: Smoke is detected in the forward lower cargo compartment.

- 1 FWD CARGO FIRE ARM switch . . . . . Confirm. . . . . ARMED
- 2 CARGO FIRE DISCH switch . . . . . Push and hold for 1 second
- 3 Choose one:

◆ On the **ground**:

**Warning! Inform ground personnel NOT to open any cargo door until all passengers and crew have exited the airplane and fire fighting equipment is nearby.**



◆ In flight:

▶▶ **Go to step 4**

- 4 LDG ALT selector . . . . . PULL ON, set 8000
- 5 Plan to land at the nearest suitable airport.

**Note:** Equipment cooling normal mode is inoperative. After 30 minutes of operation at low altitude and low cabin differential pressure, electronic equipment and displays may fail.

▼ **Continued on next page** ▼

▼ FIRE CARGO FWD continued ▼

- 6 Do **not** accomplish the following checklists:  
 EQUIP COOLING OVRD  
 LANDING ALTITUDE
- 7 **When** leaving cruise altitude for landing:  
 LDG ALT selector . . . . . Push off

8 **Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA . . . . .	SET	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew . . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS . . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ___ InHg/hPa	SET & X-Checked	ALL

▼ Continued on next page ▼

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**▼ FIRE CARGO FWD continued ▼**

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**Warning! Inform ground personnel NOT to open any cargo door after landing until all passengers and crew have exited the airplane and fire fighting equipment is nearby.**

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**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	___	ALL



**[ ] FIRE WHEEL WELL**

Condition: Fire is detected in a main wheel well.

- 1 Do not exceed the gear EXTEND limit speed (270K/.82M).
- 2 Landing gear lever . . . . .DN

This attempts to remove and extinguish the fire source.

- 3 Plan to land at the nearest suitable airport.
- 4 Flight with the gear down increases fuel consumption and decreases climb performance. Refer to the Gear Down performance tables in the Performance Inflight chapter for flight planning.

5 Choose one:

◆ Gear **must be retracted** for airplane performance:

▶▶ **Go to step 6**

◆ Gear can **stay extended**:



6 **When** the FIRE WHEEL WELL message blanks:

**Wait** 20 minutes. This ensures the fire is extinguished.

Landing gear lever . . . . . UP





Intentionally  
Blank

**[ ] OVERHEAT ENG L, R**

Condition: An overheat is detected in the engine.

- 1 ENG BLEED AIR switch  
(affected side) . . . . . Off
- 2 A/T ARM switch  
(affected side) . . . . . Confirm . . . . . OFF
- 3 Thrust lever  
(affected side) . . . . . Confirm . . . . . Retard  
slowly until the  
OVERHEAT ENG message  
blanks or the thrust lever is at idle
- 4 Do **not** accomplish the following checklist:  
AUTOTHROTTLE  
BLEED OFF ENG
- 5 Choose one:

◆ OVERHEAT ENG message **blanks**:

**Note:** Run the engine at a thrust setting that keeps the OVERHEAT ENG message blank.

Do not use FMC performance predictions with an engine at reduced thrust.

▶▶ **Go to step 9**

◆ OVERHEAT ENG message **stays shown**:

▶▶ **Go to step 6**

▼ Continued on next page ▼

**▼ OVERHEAT ENG L, R continued ▼**

- 6 FUEL CONTROL switch  
(affected side) . . . . . Confirm. . . . . CUTOFF
- 7 APU selector  
(if APU available) . . . . . START, then ON
- 8 Plan to land at the nearest suitable airport.
- 9 Transponder mode selector . . . . . TA ONLY

**▼ Continued on next page ▼**

▼ OVERHEAT ENG L, R continued ▼

10 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . .OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 11**

◆ Landing using flaps **30 (if performance allows)**:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.



**11 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ OVERHEAT ENG L, R continued ▼

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



**SMOKE CREW REST F/D**

HL7700, HL7732, HL7775, HL7791

Condition: Smoke is detected in the crew rest area.



**[ ] SMOKE CREW REST LWR**

**HL7700 - HL7791**

Condition: Smoke is detected in the crew rest area.

Objective: To coordinate with the cabin to locate and remove the source of the smoke.

- 1 Establish cabin communications.
- 2 Choose one:

◆ Smoke is **persistent**:

Plan to land at the nearest suitable airport.



◆ Smoke is **cleared**:



**SMOKE LAVATORY**

Condition: Smoke is detected in one or more lavatories.



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Blank

**Smoke or Fumes Removal**

Condition: Smoke or fumes removal is needed.

- 1 Do this checklist **only** when directed by the Smoke, Fire or Fumes checklist.
- 2 Do not delay landing in an attempt to complete the following steps.
- 3 Close the flight deck door.
- 4 EQUIP COOLING switch . . . . . Off

**Note:** After 30 minutes of operation at low altitude and low cabin differential pressure, electronic equipment and displays may fail.

- 5 Do **not** accomplish the following checklist:  
EQUIP COOLING OVRD

- 6 Choose one:

◆ Most smoke or fumes are in the cabin **forward** of mid-wing:

▶▶ **Go to step 7**

◆ Most smoke or fumes are in the cabin **aft** of mid-wing:

▶▶ **Go to step 10**

- 7 AFT OUTFLOW VALVE switch . . . . . MAN
- 8 AFT OUTFLOW VALVE  
MANUAL switch . . . . . Hold in CLOSE until  
the AFT outflow valve  
indication shows fully closed

▼ **Continued on next page** ▼

**▼ Smoke or Fumes Removal continued ▼**

9 Do **not** accomplish the following checklist:

OUTFLOW VALVE AFT

▶▶ **Go to the Smoke, Fire or Fumes checklist on page 8.8 and do the rest of the steps.**



10 FWD OUTFLOW VALVE switch. . . . . MAN

11 FWD OUTFLOW VALVE

MANUAL switch . . . . . Hold in CLOSE until  
the FWD outflow valve  
indication shows fully closed

12 Do **not** accomplish the following checklist:

OUTFLOW VALVE FWD

▶▶ **Go to the Smoke, Fire or Fumes checklist on page 8.8 and do the rest of the steps.**



**[ ] SMOKE REST UPR DR 1**

**HL8254, HL8284**

Condition: Smoke is detected in the crew rest area.

Objective: To coordinate with the cabin to locate and remove the source of the smoke.

- 1 Establish cabin communications.
- 2 Choose one:

◆ Smoke is **persistent**:

Plan to land at the nearest suitable airport.



◆ Smoke is **cleared**:

▶▶ **Go to step 3**

- 3 Instruct a cabin crew member to push and hold the door 1 crew rest main control panel AIRFLOW / SMOKE RESET switch for 2 seconds. This resets airflow to the crew rest area.



**[ ] SMOKE REST UPR DR 3**

**HL8254, HL8284**

Condition: Smoke is detected in the crew rest area.

Objective: To coordinate with the cabin to locate and remove the source of the smoke.

- 1 Establish cabin communications.
- 2 Choose one:

◆ Smoke is **persistent**:

Plan to land at the nearest suitable airport.



◆ Smoke is **cleared**:

▶▶ **Go to step 3**

- 3 Instruct a cabin crew member to push and hold the door 3 crew rest main control panel AIRFLOW / SMOKE RESET switch for 2 seconds. This resets airflow to the crew rest area.



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**[ ] STABILIZER**

Condition: One of these occurs:

- Stabilizer movement without a signal to trim
- The stabilizer is failed

1 STAB cutout switches (both) . . . . . CUTOUT

2 Do not exceed the current airspeed.



3 The stabilizer is inoperative. Pitch trim is available in the normal flight control mode.

4 GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 30 + 20 for landing. This gives sufficient elevator authority for landing.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

5 Do **not** accomplish the following checklist:

FLIGHT CONTROLS

6 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

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 ▼ STABILIZER continued ▼
 

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**Deferred Items**


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**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 30 + 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

---

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

---

**Before Landing Checklist**

LANDING GEAR. . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>20</b>	ALL



**[ ] AUTO SPEEDBRAKE**

Condition: An automatic speedbrake fault occurs.

**Note:** Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

**1 Checklist Complete Except Deferred Item**

▼ Continued on next page ▼

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 ▼ AUTO SPEEDBRAKE continued ▼
 

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**Deferred Items**


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**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA . . . . .	SET	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew . . . . .	Advised	CAPT

---

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS . . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

---

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	<b>DOWN</b>	PF
FLAPS . . . . .	____	ALL





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**[ ] FLAPS DRIVE**

Condition: The flap drive mechanism is failed.

- 1 Do not use alternate flaps. Asymmetry and uncommanded motion protection is not provided in the alternate mode.
- 2 GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Do not use FMC performance predictions with flaps extended.

- 3 Choose one:

◆ Flap position is **5 or less**:

**Note:** Move the FLAP lever to 1 and use VREF 30 + 40 for landing. This ensures the slats are extended.

▶▶ **Go to step 4**

◆ Flap position is **between 5 and 20**:

**Note:** Use current flaps and VREF 30 + 20 for landing.

▶▶ **Go to step 4**

◆ Flap position is **20 or greater**:

**Note:** Use current flaps and VREF 20 for landing.

▶▶ **Go to step 4**

- 4 Do **not** accomplish the following checklist:

FLAPS PRIMARY FAIL

▼ **Continued on next page** ▼

**▼ FLAPS DRIVE continued ▼**

**Note:** Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

**5 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA . . . . .	VREF as directed by checklist, Minimums ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked		ALL

**Before Landing Checklist**

LANDING GEAR. . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	As directed by checklist	ALL



## [] FLAPS PRIMARY FAIL

Condition: The flaps primary mode is failed.

1 GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Plan more time for slower flap operation.

Use flaps 20 and VREF 20 for landing. This gives improved go-around performance.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

2 **Checklist Complete Except Deferred Items**

### Deferred Items

#### Descent Checklist

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> __	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

#### Approach Checklist

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . __ InHg/hPa SET & X-Checked		ALL

▼ Continued on next page ▼

## ▼ FLAPS PRIMARY FAIL continued ▼

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**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



**[ ] FLAP/SLAT CONTROL**

Condition: The flap/slat electronics units are failed.

1 **If** flap retraction is needed:

FLAP lever . . . . . UP

This allows the maximum speed indication on the PFD to increase to Vmo/Mmo after the flaps are fully retracted.

ALTN FLAPS ARM switch . . . . . ALTN

Alternate flaps selector . . . . . RET

Monitor airspeed during retraction.

2 GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Plan to reduce gross weight to less than Maximum Landing Weight before extending flaps. Maneuver margin can be limited while flaps are extending from UP to 5.

Plan more time for alternate slat and flap extension.

Use flaps 20 and VREF 20 for landing. The alternate mode is limited to a maximum of flaps 20.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

3 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FLAP/SLAT CONTROL continued ▼

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked		ALL

**Alternate flaps extension**

- ALTN FLAPS ARM switch. . . . . ALTN
- Alternate flaps selector . . . . . EXT
- Monitor airspeed during extension.

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



**[ ] FLIGHT CONTROL MODE**

Condition: The flight control system is in the secondary mode.

1 PRIMARY FLIGHT COMPUTERS disconnect switch . . . . .DISC, then AUTO

2 Choose one:

◆ FLIGHT CONTROL MODE message **blanks**:



◆ FLIGHT CONTROL MODE message **stays shown**:

▶▶ **Go to step 3**

3 Avoid abrupt control inputs. The airplane response is changed by simplified elevator feel and rudder ratio systems.

4 GND PROX FLAP OVRD switch . . . . .OVRD

**Note: Inoperative Items**

**Autopilot inop**

**Envelope protection functions inop**

▼ Continued on next page ▼

**▼ FLIGHT CONTROL MODE continued ▼**

**Note:** The yaw damper is degraded.

Manual control inputs are needed to compensate for asymmetrical thrust conditions.

Use flaps 20 and VREF 20 for landing. This ensures sufficient pitch trim capability for landing

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

5 Do **not** accomplish the following checklists:

AUTO SPEEDBRAKE

THRUST ASYM COMP

6 **Checklist Complete Except Deferred Items**

**▼ Continued on next page ▼**

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 ▼ FLIGHT CONTROL MODE continued ▼
 

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**Deferred Items**


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**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

---

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

---

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER. . . . .	<b>DOWN</b>	PF
FLAPS . . . . .	<b>20</b>	ALL



Intentionally  
Blank

**[ ] FLIGHT CONTROLS**

Condition: One or more of these occur:

- Two or more flight control surfaces are inoperative
- Other faults in the flight control system are detected

- 1 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.
- 2 Plan to land at the nearest suitable airport.
- 3 GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

- 4 Do **not** accomplish the following checklist:

SPOILERS

- 5 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

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**▼ FLIGHT CONTROLS continued ▼**


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**Deferred Items**


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**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 30 + 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

---

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

---

**Before Landing Checklist**

LANDING GEAR. . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>20</b>	ALL



## FLT CONTROL VALVE

- Condition: One or more of these occur:
- One or more flight control shutoff valves are failed closed
  - One or more flight control shutoff switches are in shutoff



## Jammed Flight Controls

Condition: Flight controls are jammed or restricted in roll, pitch, or yaw.

- 1 Autopilot disconnect switch . . . . . Push
- 2 Autothrottle disconnect switch . . . . . Push
- 3 Overpower the jammed or restricted system.

Use maximum force as needed, including a combined effort of both pilots in the same direction. A maximum two-pilot effort on the controls will not damage the flight controls.

▼ Continued on next page ▼

▼ Jammed Flight Controls continued ▼

4 Choose one:

◆ Controls are **normal**:

▶▶ **Go to step 5**

◆ Controls stay **jammed or restricted**:

**Note:** Control may be limited to one pilot.

If the aileron controls are jammed, use the rudder and rudder trim to counter the effect of the jam.

**Note:** If elevator controls are jammed, use pitch trim to counter the effect of the jam. If more pitch trim authority is needed, select DISC on the primary flight computers disconnect switch. This puts the flight control system in direct mode. In direct mode, pitch trim moves slower than in normal mode.

If the rudder controls are jammed, use aileron and aileron trim to counter the effect of the jam.

Do not make abrupt thrust changes.

Extend or retract speedbrake slowly and smoothly.

Limit bank angle to 15 degrees.

The autopilot and autothrottle may be available to control the airplane.

Do not use autoland.

If the rudder controls are jammed, differential braking may be required for landing.

▶▶ **Go to step 5**

5 Plan to land at the nearest suitable airport.



## [] PITCH DOWN AUTHORITY

Condition: Pitch down authority is restricted.

**Note:** Slower airspeeds assist nose down pitch control. The airplane is approaching its nose down pitch control limit.

Avoid speedbrake use and rapid thrust increases in flight. Only limited elevator authority is available to counter nose up pitch.

Do not arm the speedbrake lever.

Slowly extend the speedbrakes after landing.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

### 1 Checklist Complete Except Deferred Items

#### Deferred Items

#### Descent Checklist

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA . . . . .	SET	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew . . . . .	Advised	CAPT

▼ Continued on next page ▼

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**▼ PITCH DOWN AUTHORITY continued ▼**

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**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ___ InHg/hPa SET & X-Checked		ALL

---

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER. . . . .	<b>DOWN</b>	PF
FLAPS . . . . .	___	ALL



**[ ] PITCH UP AUTHORITY**

Condition: Pitch up and flare authority are restricted.

- 1 Do not extend the flaps any further until on approach. The airplane is approaching its nose up pitch control limit.
- 2 GND PROX FLAP OVRD switch . . . . .OVRD

**Note:** Do not use autoland.

▼ Continued on next page ▼

## ▼ PITCH UP AUTHORITY continued ▼

3 Choose one:

 ◆ Flap position is **15 or less**:

**Note:** Use flaps 5 and VREF 30 + 40 for landing and flaps 5 for go-around. Higher approach speeds give better pitch up control authority.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 4**

 ◆ Flap position is **20 or greater**:

**Note:** Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds give better pitch up control authority.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 4**

**4 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ PITCH UP AUTHORITY continued ▼

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 30 + 40 ____ or VREF 30 + 20 ____, Minimums ____</b>	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

**Before Landing Checklist**


LANDING GEAR. . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>5 or 20</b>	ALL



**[ ] PRI FLIGHT COMPUTERS**

Condition: The flight control system is operating in the direct mode.

Do **not** accomplish this step if direct mode is desired.

- 1  PRIMARY FLIGHT COMPUTERS disconnect switch . . . . . DISC, then AUTO
- 2 Choose one:
  - ◆ PRI FLIGHT COMPUTERS message **blanks**:  
  ■ ■ ■ ■
  - ◆ PRI FLIGHT COMPUTERS message **stays shown**:  
  ▶▶ **Go to step 3**
- 3 Avoid abrupt control inputs. The airplane response is changed by simplified elevator feel and rudder ratio systems.
- 4 GND PROX FLAP OVRD switch . . . . . OVRD

**Note: Inoperative Items****Autopilot inop****Envelope protection functions inop****Yaw damping inop****Rudder manual trim cancel switch inop**

▼ Continued on next page ▼

▼ PRI FLIGHT COMPUTERS continued ▼

**Note:** Manual control inputs are needed to compensate for asymmetrical thrust conditions.

Pitch trim moves slower than in normal mode.

Use flaps 20 and VREF 20 for landing. This ensures sufficient pitch trim capability for landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

5 Do **not** accomplish the following checklists:

AUTO SPEEDBRAKE

THRUST ASYM COMP

6 **Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF

▼ Continued on next page ▼

## ▼ PRI FLIGHT COMPUTERS continued ▼

LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> __	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . __ InHg/hPa	SET & X-Checked	ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER. . . . .	<b>DOWN</b>	PF
FLAPS . . . . .	<b>20</b>	ALL



**[ ] SLATS DRIVE**

Condition: The slat drive mechanism is failed.

- 1 Do not use alternate flaps. Asymmetry and uncommanded motion protection are not provided in alternate mode.
- 2 GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Do not use FMC performance predictions with slats extended.

Do not use autoland.

Use flaps 20 and VREF 30 + 30 for landing. This gives better handling qualities when the slats are not fully extended.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

- 3 Do **not** accomplish the following checklist:  
SLATS PRIMARY FAIL

**4 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 30 + 30</b> _____, <b>Minimums</b> _____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF

▼ Continued on next page ▼

## ▼ SLATS DRIVE continued ▼

Cabin Crew . . . . . Advised      CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked		ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>20</b>	ALL



**[ ] SLATS PRIMARY FAIL**

Condition: The slats primary mode is failed.

**Note:** Plan more time for slower slat operation.

**Note:** The slats will extend beyond midrange when the airspeed is below 239 knots. For go-around, do not exceed 239 knots until the slats retract to midrange.



**SPEEDBRAKE EXTENDED**

Condition: The speedbrakes are extended and one or more of these occur:

- The radio altitude is between 15 and 800 feet
- The flap lever is in a landing setting
- A thrust lever is not at idle

**[ ] SPOILERS**

Condition: One or more spoiler pairs are failed.

**Note:** Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing.

Roll tendencies, yaw tendencies, or airframe buffet can indicate a spoiler failed in the extended position.

Do not use FMC performance predictions with a spoiler panel extended.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source



**[ ] STAB GREENBAND**

Condition: The nose gear pressure sensor disagrees with the computed stabilizer greenband and all doors are closed.

Objective: To verify the stabilizer greenband and airplane loading are correct.

- 1 Verify that takeoff thrust, takeoff flaps, gross weight, and CG are entered correctly.
- 2 Reset stab trim, if needed.
- 3 Choose one:

◆ STAB GREENBAND message **blanks**:



◆ STAB GREENBAND message **stays shown**:

▶▶ **Go to step 4**

- 4 Verify airplane loading.

**[ ] STABILIZER C**

Condition: The center stabilizer control path is failed.

- 1 C STAB cutout switch . . . . . CUTOUT

**Note:** The captain's control wheel pitch trim switches may be inoperative.



**STABILIZER CUTOUT**

Condition: Both stabilizer cutout switches are in CUTOUT.



**[ ] STABILIZER R**

Condition: The right stabilizer control path is failed.

- 1 R STAB cutout switch . . . . . CUTOUT

**Note:** The first officer’s control wheel pitch trim switches may be inoperative.



**[ ] THRUST ASYM COMP**

Condition: Thrust asymmetry compensation is failed or off.

- 1 THRUST ASYM COMP switch. . . . . Off, then AUTO
- 2 Choose one:

◆ THRUST ASYM COMP message **blanks:**



◆ THRUST ASYM COMP message **stays shown:**

**Note:** Manual control inputs are needed to compensate for asymmetric thrust conditions.





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**Airspeed Unreliable..... 10.1**  
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**Airspeed Unreliable**

**Condition:** Airspeed or Mach indications are suspected to be unreliable. (Items which can indicate unreliable airspeed are listed in the Additional Information section.)

**Objective:** To identify a reliable airspeed indication, if possible, or to continue the flight using the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

- 1 Autopilot disconnect switch . . . . . Push
  - 2 A/T ARM switches (both) . . . . . OFF
  - 3 F/D switches (both) . . . . . OFF
  - 4 Set the following gear up pitch attitude and thrust:  
    Flaps extended . . . . . 10 degrees and 85% N1  
    Flaps up . . . . . 4 degrees and 70% N1
- 
- 5 **If** the airplane **cannot** be trimmed to the desired pitch attitude:  
    PRIMARY FLIGHT COMPUTERS  
    disconnect switch . . . . . DISC

**Note:** If, at anytime, the airplane cannot be trimmed to the desired pitch attitude, disconnect the PRIMARY FLIGHT COMPUTERS.

▼ Continued on next page ▼

## ▼ Airspeed Unreliable continued ▼

6 The following are **reliable**:

Attitude

N1

Ground speed

Radio altitude

**Note:** Stick shaker, overspeed warning, and AIRSPEED LOW alerts may sound erroneously or simultaneously.

**Note:** The flight path vector, and pitch limit indicator are unreliable.

7 Refer to the Flight With Unreliable Airspeed table in the Performance Inflight chapter and set the pitch attitude and thrust setting for the current airplane configuration and phase of flight.

8 **When** in trim and stabilized:

Cross check the captain, first officer, and standby airspeed indicators.

An airspeed indication that differs by more than 20 knots or .03 Mach from the airspeed shown in the table should be considered **unreliable**.

▼ Continued on next page ▼

**▼ Airspeed Unreliable continued ▼**

9 Choose one:

◆ Reliable airspeed indication can be **determined**:

Use the most reliable airspeed source for the rest of the flight.

▶▶ **Go to step 11**

◆ Reliable airspeed indication **cannot** be determined:

▶▶ **Go to step 10**

10 Set pitch attitude and thrust from the Flight With Unreliable Airspeed table in the Performance Inflight chapter for the airplane configuration and phase of flight, as needed.

11 GND PROX FLAP OVRD switch . . . . . OVRD

**▼ Continued on next page ▼**

▼ **Airspeed Unreliable continued** ▼

**Note:** Maintain visual conditions if possible.

Plan to reduce gross weight to less than Maximum Landing Weight before extending flaps. Maneuver margin can be limited while flaps are extending from UP to 5.

Plan more time for alternate slat and flap extension.

Use flaps 20 and VREF 20 for landing. The alternate mode is limited to a maximum of flaps 20.

Establish landing configuration early.

Radio altitude reference is available below 2,500 feet AGL.

Use electronic and visual glideslope indicators, where available, for approach and landing.

Do not use the autopilot, autothrottle, or flight directors.

Do not use TO/GA for a go-around or missed approach.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

12 Transponder mode selector . . . . . TA ONLY

▼ **Continued on next page** ▼

**▼ Airspeed Unreliable continued ▼**

13 Choose one:

◆ Altitude is reliable:

▶▶ **Go to step 14**

◆ Altitude is unreliable:

Transponder mode selector . . . . ALT OFF

▶▶ **Go to step 14**

**14 Checklist Complete Except Deferred Items**

**▼ Continued on next page ▼**

▼ Airspeed Unreliable continued ▼

## Deferred Items

### Descent Checklist

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

### Approach Checklist

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

### Alternate flaps extension

ALTN FLAPS ARM switch . . . . .	ALTN
Alternate flaps selector . . . . .	EXT

Do **not** accomplish the following checklist:

FLAP/SLAT CONTROL

### Before Landing Checklist

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



▼ Continued on next page ▼

▼ **Airspeed Unreliable continued** ▼**Additional Information**

One or more of the following may be evidence of unreliable airspeed or Mach indications:

- Speed/altitude information not consistent with pitch attitude and thrust setting
- Airspeed or Mach failure flags
- PFD current airspeed box amber
- An amber line through one or more PFD flight mode annunciations
- Blank or fluctuating airspeed display
- Variation between captain and first officer airspeed displays
- Radome damage or loss
- Overspeed warning
- Simultaneous overspeed and stall warnings

One or more of the following EICAS messages may show:

AIRSPEED LOW  
GND PROX SYS  
HEAT PITOT C  
HEAT PITOT L  
HEAT PITOT R  
HEAT PITOT L+C+R  
OVERSPEED  
SGL SOURCE AIR DATA  
SGL SOURCE DISPLAYS  
WINDSHEAR SYS  
AIR DATA SYS

**[ ] ALTN ATTITUDE**

Condition: Both pilots' AIR DATA/ATT source switches are in ALTN.

**Note:** Both PFDs show the SAARU attitude information.

**BARO SET DISAGREE**

Condition: The captain's and first officer's barometric settings disagree.

**[ ] CHKL INCOMPLETE NORM**

Condition: A normal checklist needs to be completed.

**[ ] CHKL NON-NORMAL**

Condition: There is a hidden non-normal checklist. All of these occur:

- A non-normal checklist is not complete
- The ECL is not displayed
- The related EICAS message is not shown



**DISPLAY SELECT PNL**

Condition: Left, center, or right CDU control of the display select panel is used.

**[ ] EFIS CONTROL PNL L, R**

Condition: One of these occurs:

- The EFIS control panel is failed
- CDU control of the EFIS is used

**Note:** Backup control of the EFIS is accessed from the CDU menu page.

**SGL SOURCE AIR DATA**

Condition: Both PFDs use the same air data source.



**[ ] SGL SOURCE DISPLAYS**

Condition: Some or all display units use a single source of display data.

**Note:** Both PFDs and NDs or just both NDs show information generated from a single source. The lower center display unit may be blank or may not be capable of showing all normal formats. The left EFIS control panel controls either the right PFD and ND or the right ND only.

**[ ] SGL SOURCE RAD ALT**

Condition: Both PFDs use the same radio altimeter source.

**Note:** Autothrottle retard during flare is inoperative.

**SINGLE SOURCE F/D**

Condition: Both PFDs use the same flight director source.





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**[ ] ADS-B OUT L**

Condition: Position data is not available to the left transponder.

**Note:** If ADS-B operation is needed, select the right transponder.

**[ ] ADS-B OUT R**

Condition: Position data is not available to the right transponder.

**Note:** If ADS-B operation is needed, select the left transponder.



**[ ] AIR DATA SYS**

Condition: The three air data sources disagree.

- 1 Avoid abrupt control inputs. Airplane response is changed by simplified elevator feel and rudder ratio systems.
- 2 Crosscheck airspeed and altitude on the PFDs and standby flight instruments for accuracy. Each display is receiving data from an independent source.

**Note:** Normal pitch attitude and thrust settings are available in the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

Select alternate air data/attitude source if airspeed or altitude on respective PFD is determined to be in error and airspeed or altitude on opposite side PFD is verified to be correct.

- 3 GND PROX FLAP OVRD switch . . . . .OVRD

**Note: Inoperative Items**

**Envelope protection functions inop**

**Autopilot inop**

**Flight directors inop**

**Autothrottles inop**

**PFD flap maneuvering speeds inop**

Refer to the Flap Maneuver Speed table below:

▼ Continued on next page ▼

## ▼ AIR DATA SYS continued ▼

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

▼ Continued on next page ▼

▼ AIR DATA SYS continued ▼

**Note:** Yaw damper is degraded.

Manual control inputs are needed to compensate for asymmetric thrust conditions.

Do **not** use the flight path vector.

Use flaps 20 and VREF 20 for landing. This ensures sufficient pitch control for landing.

Do not arm speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

Some or all ground proximity alerts are not available. Ground proximity alerts that occur are valid.

Some or all windshear alerts are not available. Windshear alerts that occur are valid.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

4 Do **not** accomplish the following checklists:

AUTO SPEEDBRAKE

FLIGHT CONTROL MODE

THRUST ASYM COMP

WINDSHEAR SYS

▼ Continued on next page ▼

## ▼ AIR DATA SYS continued ▼

## GND PROX SYS

**5 Checklist Complete Except Deferred Items**
**Deferred Items**
**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> __	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . __ InHg/hPa	SET & X-Checked	ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER. . . . .	<b>DOWN</b>	PF
FLAPS . . . . .	<b>20</b>	ALL



**[ ] FMC**

Condition: One of these occurs:

- The FMC selector is in L and the left FMC is failed
- The FMC selector is in R and the right FMC is failed
- Both FMCs are failed

1 LNAV and VNAV modes are inoperative. Select different autopilot roll and pitch modes.

**Note:** LNAV can be re-engaged. Plan to enter new waypoints by latitude and longitude into any CDU.

Manually tune navigation radios through the CDUs.

Refer to the Flap Maneuver Speed table below:

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

2 LDG ALT selector . . . . . PULL ON, set manually

3 Do **not** accomplish the following checklist:

LANDING ALTITUDE



**FMC L, R**

Condition: An FMC is failed.

**FMC MESSAGE**

Condition: An alerting message is in the FMC scratchpad.

**FMC RUNWAY DISAGREE**

HL8284

Condition: Airplane is not on the FMC origin runway when takeoff is attempted.

**[ ] GPS**

Condition: Both GPS receivers are failed.

**Note:** The FMC uses inertial inputs only, unless radio updating is enabled.

ADS-B is inoperative.

If radio updating is allowed:

- Select the FMC REF NAV DATA page
- Select OFF for RAD NAV INHIBIT



**[ ] GPS L**

Condition: The left GPS receiver is failed.

- 1 XPNDR switch . . . . . RIGHT
- ■ ■ ■

**[ ] GPS R**

Condition: The right GPS receiver is failed.

- 1 XPNDR switch . . . . . LEFT
- ■ ■ ■



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**GPS Data Unreliable**

Condition: Erroneous or invalid GPS data is suspected.

**Caution! GPS interference can alter the airplane flight path without obvious flight deck indications or effects.**

- 1 If at any time, any of these messages show, do the checklist, then return to this checklist:

GPS

GPS L

GPS R

- 2 Choose one:

◆ On the **ground**:

Use Supplementary Procedures or operator-originated standard operating procedures for intentional operations in areas of known GPS interference.



◆ In **flight**:

▶▶ **Go to step 3**

▼ Continued on next page ▼

**▼ GPS Data Unreliable continued ▼****3 One or more of the following can indicate unreliable GPS data:**

PULL UP alert that occurs with sufficient, immediately verifiable terrain clearance

Slow increase in ANP

VERIFY POSITION scratchpad message

Change in terrain data on the ND that does not match aeronautical charts

FMC position status on the ND changes to DME-DME or INERTIAL

Inaccurate UTC TIME/DATE and FMC-generated ETA

Excessive lateral deviation when intercepting the localizer or final approach course

Unable to log on to ATC datalink with inaccurate UTC TIME/DATE

Inaccurate fuel predictions

**4 The following alerts can occur and must be considered valid:**

ADIRU/GPS DISAGREE

ADS-B OUT

GND PROX SYS

NAV UNABLE RNP

TERR POS

**▼ Continued on next page ▼**

▼ GPS Data Unreliable continued ▼

5 Choose one:

◆ Indications of unreliable GPS data **occur**:

▶▶ **Go to step 6**

◆ Indications of unreliable GPS data do **not** occur:

■ ■ ■ ■

6 GPS FMC position updating and GPWS terrain look-ahead functions can be temporarily inhibited.

7 Choose one:

◆ GPS FMC position updating inhibit is **needed**:

▶▶ **Go to step 8**

◆ GPS FMC position updating inhibit is **not** needed:

▶▶ **Go to step 16**

8 INIT REF key . . . . .Select

9 INDEX key . . . . .Select

10 POS . . . . .Select

11 POS REF page 3 . . . . .Select

12 GPS NAV . . . . . OFF

13 On the CDU, go to the REF NAV DATA page.

14 RAD NAV INHIBIT . . . . . OFF

▼ Continued on next page ▼

**▼ GPS Data Unreliable continued ▼**

15 Monitor GPS FMC position updating for recovery.

**Note:** GPS data recovery can be indicated by verifying both of these after selecting POS REF page 3:

- GPS data shows for GPS L or GPS R.
- Distance shown for GPS L or GPS R is less than current ANP, based on INERTIAL or RADIO FMC position update status.

If GPS data appears to recover, turn GPS NAV ON at Captain's discretion.

16 Choose one:

◆ GPWS terrain look-ahead function inhibit is **needed**:

▶▶ **Go to step 17**

◆ GPWS terrain look-ahead function inhibit is **not** needed:

▶▶ **Go to step 18**

17 GND PROX TERR OVRD switch . . . . . OVRD

**Note:** GPWS alerts that occur are valid.

**Note:** Erroneous GPWS alerts can occur for the rest of the flight if TERR OVRD is selected off after flying through areas of unreliable GPS data.

18 Advise ATC of suspected GPS interference and degraded navigation and satellite communication capability.



## [] ILS ANTENNA

Condition: Two or more ILS receivers do not use the correct antenna.

**Note:** AFDS may have difficulty capturing or tracking localizer or glideslope. The airplane path may be lower than indicated by the glideslope pointer.



## [] INSUFFICIENT FUEL

Condition: FMC estimated fuel at the destination is less than the entered RESERVES fuel.

- 1 The INSUFFICIENT FUEL message may be caused by a fuel leak.
- 2 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

One main tank is abnormally low compared to the other main tank and to the expected fuel remaining in the tanks.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

▼ Continued on next page ▼

**▼ INSUFFICIENT FUEL continued ▼**

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

3 **If** a fuel leak is suspected:

▶▶ **Go to the Fuel Leak checklist on page 12.18**

4 Verify that the active route and FMC data are correct.

5 Verify that there is sufficient fuel to complete the flight.



**[ ] NAV ADIRU INERTIAL**

Condition: The ADIRU cannot supply correct attitude, position, heading, track, and groundspeed data.

- 1 Heading information shows for 3 minutes after the NAV ADIRU INERTIAL message shows. If the airplane is in the polar region, heading information is removed immediately.
- 2 GPS continues to give position and track information.
- 3 XPNDR switch . . . . . RIGHT

**Note: Inoperative Items**

**FMC VNAV pages inop**

**FMC performance predictions inop**

**ND wind direction/speed and wind arrow inop**

**Autobrake inop**

**PFD flap maneuvering speeds inop**

Refer to the Flap Maneuver Speed table below:

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

▼ Continued on next page ▼

## ▼ NAV ADIRU INERTIAL continued ▼

**Note: Inoperative AFDS Modes**

- LNAV
- VNAV
- TO/GA
- LOC
- GS
- FPA
- TRK HOLD/SEL

- 4 **When** the heading blanks and the SET HDG line shows on POS INIT page 1:

Enter the heading.

Re-engage the autopilot.

**Note:** Crosscheck heading periodically for drift with the magnetic compass and update heading as necessary. If magnetic compass information is unreliable or unavailable, track information may be used.

VOR course deviation is available in the ND VOR mode. ILS localizer and glideslope deviation raw data is available on both the PFD and the ND.

▼ Continued on next page ▼



▼ NAV ADIRU INERTIAL continued ▼

**Note:** If GPS is not available, the following additional items are inoperative:

- ND map mode
- active leg course and distance
- direct to waypoint function
- alternate page DIVERT NOW function
- navigation radio autotuning

**5 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	<b>OFF</b>	PF
LANDING DATA . . . . .	SET	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew . . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS . . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ___ InHg/hPa SET & X-Checked		ALL

▼ Continued on next page ▼

**▼ NAV ADIRU INERTIAL continued ▼****Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	___	ALL



**[ ] NAV UNABLE RNP**

Condition: The actual navigational performance is not sufficient.

1 Choose one:

◆ On the **ground**:

Message may show with GPS disabled.



◆ In **flight**:

▶▶ **Go to step 2**

2 Choose one:

◆ On a procedure or an airway **with** an RNP alerting requirement:

▶▶ **Go to step 3**

◆ On a procedure or an airway **without** an RNP alerting requirement:

▶▶ **Go to step 4**

3 Select alternate procedure or airway. During an approach, start a go-around unless suitable visual references can be established and maintained.

**Note:** The FMC uses inertial inputs only, unless radio updating is enabled.

If radio updating is allowed, consider doing the following steps:

Select the FMC REF NAV DATA page

Select OFF for RAD NAV INHIBIT

▼ **Continued on next page** ▼

## ▼ NAV UNABLE RNP continued ▼



## 4 Verify Position.

**Note:** The FMC uses inertial inputs only, unless radio updating is enabled.

If radio updating is allowed, consider doing the following steps:

Select the FMC REF NAV DATA page

Select OFF for RAD NAV INHIBIT

**SINGLE SOURCE ILS**

Condition: Both pilots' displays use the same ILS source.

**TRANSPONDER L, R**

Condition: A transponder fault occurs.



**[ ] VNAV STEP CLIMB**

Condition: An FMC-predicted or manually-entered VNAV step climb point has sequenced and a climb has not started.

Objective: To update the VNAV profile so the FMC fuel and ETA predictions are accurate.

1 Choose one:

◆ Current altitude is the **final** cruise altitude:

Enter a step size of 0 on the VNAV CRZ page and delete all planned step climb altitudes from the RTE LEGS page.

▶▶ **Go to step 2**

◆ Step climb is needed **now**:

Start a step climb.



◆ Step climb is needed **later**:

Enter a planned step climb altitude on the RTE LEGS page.

▶▶ **Go to step 2**

2 Enter the current altitude as the cruise altitude on the VNAV CRZ page, even if it is already shown. This step updates the FMC predictions.





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Intentionally  
Blank

**[ ] FUEL AUTO JETTISON**

Condition: One of these occurs:

- The total fuel quantity is less than or equal to the fuel to remain and a jettison nozzle valve is open
- The fuel jettison automatic shutoff is failed

Objective: To manually close the fuel jettison nozzle valves when fuel jettison is complete.

1 Choose one:

◆The total fuel quantity is **less than or equal to** the FUEL to REMAIN:

FUEL JETTISON NOZZLE  
valve switches (both) . . . . . Off  
FUEL JETTISON ARM switch . . . . . Off



◆The total fuel quantity is **greater than** the FUEL to REMAIN:

▶▶ **Go to step 2**

▼ Continued on next page ▼

▼ FUEL AUTO JETTISON continued ▼

2 Choose one:

◆ One or more tank quantity displays are **blank**:

Determine the approximate jettison time using the following rates:

Fuel in center tank: 5400 lbs/minute

Center tank empty: 3100 lbs/minute

▶▶ **Go to step 3**

◆ All tank quantity displays **stay shown**:

▶▶ **Go to step 3**

3 FUEL JETTISON NOZZLE

valve switches (both) . . . . . ON

4 **When** fuel jettison is complete:

FUEL JETTISON NOZZLE

valve switches (both) . . . . . Off

FUEL JETTISON ARM switch . . . . . Off

▼ Continued on next page ▼

## ▼ FUEL AUTO JETTISON continued ▼

5 Choose one:

◆ FUEL line on PERF INIT page is **blank**:

**Wait** 5 minutes. Manual entry of fuel quantity is not possible until 5 minutes after jettison is complete.

Enter the current estimated total fuel in the FUEL line box prompts on the PERF INIT page. This gives gross weight data for FMC performance calculations and allows VNAV to be re-engaged.

▶▶ **Go to step 6**

◆ FUEL line on PERF INIT page **shows a fuel quantity**:

▶▶ **Go to step 6**

6 Do **not** accomplish the following checklist:

Fuel Jettison



**[ ] FUEL CROSSFEED AFT**

Condition: The aft fuel crossfeed valve is not in the commanded position.

1 Choose one:

◆ AFT FUEL CROSSFEED switch is **on**:

FWD FUEL CROSSFEED switch . . . . . On



◆ AFT FUEL CROSSFEED switch is **off**:



**[ ] FUEL CROSSFEED FWD**

Condition: The forward fuel crossfeed valve is not in the commanded position.

1 Choose one:

◆ FWD FUEL CROSSFEED switch is **on**:

AFT FUEL CROSSFEED switch . . . . . On



◆ FWD FUEL CROSSFEED switch is **off**:



Intentionally  
Blank

**[ ] FUEL DISAGREE**

Condition: The totalizer fuel quantity and the FMC calculated fuel quantity disagree.

Objective: To decide if a fuel leak is suspected. To select the most accurate fuel value if a fuel leak is not suspected.

- 1 The FUEL DISAGREE message may be caused by a fuel leak.
- 2 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

One main tank is abnormally low compared to the other main tank and to the expected fuel remaining in the tanks.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

▼ Continued on next page ▼


## ▼ FUEL DISAGREE continued ▼

3 **If** a fuel leak is suspected:

▶▶ **Go to the Fuel Leak checklist on page 12.18**

4 Select PROGRESS page 2.

Select TOTALIZER unless it is inaccurate.

5  TOTALIZER or CALCULATED ..... Select the most accurate value



**[ ] FUEL FLOW ENG L, R**

Condition: Engine fuel flow is abnormally high.

Objective: To confirm if there is an engine fuel leak. If confirmed, to shut down the engine.

- 1 A diversion may be needed.
- 2 Fuel L PUMPS and R PUMPS switches (all) . . . . . ON
- 3 FUEL CROSSFEED switches (both) . . . . . Off
- 4 Fuel CENTER PUMPS switches (both). . . . . Off

The FUEL IN CENTER message may show.

**5 The following steps check for an engine fuel leak**

- 6 Record the main tank fuel quantities and the current time.
- 7 An engine fuel leak is confirmed if one or both of the following are true:

- Fuel spray is observed from an engine
- A change in fuel imbalance of 1,000 lbs within 30 minutes or less

▼ Continued on next page ▼

**▼ FUEL FLOW ENG L, R continued ▼**

8 Choose one:

◆ Engine fuel leak is **confirmed**:▶▶ **Go to step 9**◆ Engine fuel leak is **not** confirmed:

Resume normal fuel management.

**9 The following steps shut down the engine to stop an engine fuel leak**10 A/T ARM switch  
(affected engine) . . . . . Confirm . . . . . OFF11 Thrust lever  
(affected engine) . . . . . Confirm . . . . . Idle12 FUEL CONTROL switch  
(affected engine) . . . . . Confirm . . . . . CUTOFF

This closes the spar valve and stops an engine fuel leak.

13 APU selector  
(if APU available) . . . . . START, then ON

14 Transponder mode selector . . . . . TA ONLY

**▼ Continued on next page ▼**

▼ FUEL FLOW ENG L, R continued ▼

15 Choose one:

◆ FUEL IN CENTER message **shows**:

Fuel CENTER PUMPS  
switches (both) . . . . . ON

▶▶ **Go to step 16**

◆ FUEL IN CENTER message **is blank**:

▶▶ **Go to step 16**

16 Plan to land at the nearest suitable airport.

**Note:** Do **not** accomplish the Fuel Leak checklist.

All remaining fuel can be used for the running engine. Use normal fuel management. When the FUEL IMBALANCE message shows, do the FUEL IMBALANCE checklist.

The engine fuel leak indicated by the FUEL FLOW ENG message is a leak after the fuel flow sensors. The FUEL DISAGREE message will not show.

17 Do **not** accomplish the following checklists:

Fuel Leak

AUTOTHROTTLE

▼ Continued on next page ▼

## ▼ FUEL FLOW ENG L, R continued ▼

18 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 19**◆ Landing using flaps **30 (if performance allows)**:**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.

Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

**19 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

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 ▼ FUEL FLOW ENG L, R continued ▼
 

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**Deferred Items**


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**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

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**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

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**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



**[ ] FUEL IMBALANCE**

Condition: There is a fuel imbalance between the main tanks.

Objective: To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

- 1 **If** an engine has low fuel flow and unusual engine indications, the FUEL IMBALANCE message may show due to an engine malfunction instead of a fuel leak.
- 2 The FUEL IMBALANCE message may be caused by a fuel leak or fuel imbalance.
- 3 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

▼ Continued on next page ▼

▼ FUEL IMBALANCE continued ▼

4 **If** a fuel leak is suspected:

▶▶ **Go to the Fuel Leak checklist on page 12.18**

5 FUEL CROSSFEED switch (either) . . . . . On

6 Choose one:

◆ **Left** main tank quantity is low:

L fuel PUMPS FWD and AFT switches (both) . . . . . Off

This allows fuel from the higher quantity tank to feed both engines.

Do **not** accomplish the following checklists:

FUEL PUMP L AFT

FUEL PUMP L FWD

▶▶ **Go to step 9**

◆ **Right** main tank quantity is low:

▶▶ **Go to step 7**

7 R fuel PUMPS FWD and AFT switches (both) . . . . . Off

This allows fuel from the higher quantity tank to feed both engines.

8 Do **not** accomplish the following checklists:

FUEL PUMP R AFT

▼ Continued on next page ▼

**▼ FUEL IMBALANCE continued ▼****FUEL PUMP R FWD**

9 **When** fuel balancing is complete:

Fuel PUMPS FWD and AFT  
switches (all) . . . . . ON

FUEL CROSSFEED switches (both) . . . . . Off

**FUEL IN CENTER**

Condition: The center tank fuel quantity is at the level where the pump switches must be ON.

**FUEL JETT NOZZLE L, R**

Condition: A jettison nozzle valve is not in the commanded position.



**Fuel Jettison**

Condition: Fuel jettison is needed.

1 FUEL JETTISON ARM switch . . . . . ARMED

2 Choose one:

◆ FUEL TO REMAIN is **acceptable**:

▶▶ **Go to step 4**

◆ FUEL TO REMAIN must be **changed**:

▶▶ **Go to step 3**

3 FUEL TO REMAIN selector . . . . . PULL ON, set manually

4 FUEL JETTISON NOZZLE valve switches (both) . . . . . ON

5 Do **not** accomplish the following checklists:

- FUEL PUMP CENTER L
- FUEL PUMP CENTER R
- FUEL SCAVENGE SYS

6 **When** fuel jettison is complete:

FUEL JETTISON NOZZLE valve switches (both) . . . . . Off

FUEL JETTISON ARM switch . . . . . Off



**[ ] FUEL JETTISON MAIN**

Condition: The main tank fuel jettison system is failed.

- 1 Fuel jettison can occur only from the center tank.
- 2 Do **not** accomplish the following checklist:

Fuel Jettison

- 3 **When** the center fuel tank is empty or the FUEL TO REMAIN quantity is reached:

FUEL JETTISON NOZZLE

valve switches (both) . . . . . Off

FUEL JETTISON ARM switch . . . . . Off

**[ ] FUEL JETTISON SYS**

Condition: The fuel jettison system is failed.

- 1 FUEL JETTISON NOZZLE  
valve switches (both) . . . . . Off
- 2 FUEL JETTISON ARM switch . . . . . Off
- 3 Do **not** accomplish the following checklist:

Fuel Jettison



**Fuel Leak**

Condition: A fuel leak is suspected for the reasons listed in the Additional Information section of this checklist.

Objective: To confirm there is a fuel leak. If confirmed, to isolate the leak to one of the following:

- engine
- main tank
- center tank

- 1 A diversion may be needed.
- 2 Fuel L PUMPS and R PUMPS switches (all) . . . . . ON
- 3 FUEL CROSSFEED switches (both) . . . . . Off
- 4 Fuel CENTER PUMPS switches (both). . . . . Off

The FUEL IN CENTER message may show.

**5 The following steps check for an engine or main tank leak**

- 6 Record the main tank fuel quantities and the current time.
- 7 An engine/main tank leak is confirmed if one or both of the following are true:

Fuel spray is observed from an engine, strut, or wing

A change in fuel imbalance of 1,000 lbs within 30 minutes or less

▼ Continued on next page ▼

**▼ Fuel Leak continued ▼**

8 Choose one:

◆ Engine/main tank leak is **confirmed**:▶▶ **Go to step 19**◆ Engine/main tank leak is **not** confirmed:▶▶ **Go to step 9**

9 Choose one:

◆ FUEL IN CENTER message is **blank**:

Resume normal fuel management.

◆ FUEL IN CENTER message **shows**:▶▶ **Go to step 10****10 The following steps check for a center tank leak**

11 Fuel CENTER PUMPS

switches (both) . . . . . ON

12 Select PROGRESS page 2.

13 Record the totalizer and calculated fuel quantities, and the current time.

14 A center tank leak is confirmed if the difference between calculated and totalizer increases by 1,000 lbs within 30 minutes or less.

**▼ Continued on next page ▼**

▼ Fuel Leak continued ▼

15 Choose one:

◆ Center tank leak is **confirmed**:

▶▶ **Go to step 16**

◆ Center tank leak is **not** confirmed:

Resume normal fuel management.



16 Continue to use all center tank fuel.

17 Verify that sufficient fuel is available in the left and right main tanks to complete the flight.

**Note:** If the FUEL DISAGREE message shows at any time, go to PROGRESS page 2 and select the TOTALIZER fuel quantity.

18 Do **not** accomplish the following checklist:

FUEL DISAGREE



19 **An engine/main tank leak is confirmed. The following steps shut down the engine to stop an engine fuel leak**

20 The affected engine is on the side where the fuel quantity decreased faster.

21 A/T ARM switch

(affected engine) . . . . . Confirm . . . . . OFF

22 Thrust lever

(affected engine) . . . . . Confirm . . . . . Idle

▼ Continued on next page ▼

**▼ Fuel Leak continued ▼**

23 FUEL CONTROL switch  
(affected engine) . . . . . Confirm . . . . . CUTOFF

This closes the spar valve and stops an engine fuel leak.

24 APU selector  
(if APU available) . . . . . START, then ON

25 Transponder mode selector . . . . . TA ONLY

26 Do **not** accomplish the following checklists:

AUTOTHROTTLE

FUEL DISAGREE

27 Choose one:

◆ FUEL QTY LOW message **shows**:

FUEL CROSSFEED

switch (either) . . . . . On

This ensures that all fuel is available to the running engine.

▶▶ **Go to step 28**

◆ FUEL QTY LOW message **is blank**:

▶▶ **Go to step 28**

**▼ Continued on next page ▼**

▼ Fuel Leak continued ▼

28 Choose one:

◆ FUEL IN CENTER message **shows:**

Fuel CENTER PUMP  
switch (**on side with  
running engine**) . . . . .ON

▶▶ **Go to step 29**

◆ FUEL IN CENTER message **is blank:**

▶▶ **Go to step 29**

29 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

30 Choose one:

◆ Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.  
Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 31**

◆ Landing using flaps **30 (if performance allows)**:

**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.  
Check the Non-Normal Configuration Landing Distance tables for ENG SHUTDOWN L, R in the Performance Inflight-QRH chapter or other approved source.

▶▶ **Go to step 31**

**31 The following steps check for a main tank leak**

32 Select PROGRESS page 2.

▼ Continued on next page ▼

**▼ Fuel Leak continued ▼**

33 Record the totalizer and calculated fuel quantities, and the current time.

34 A main tank leak is confirmed if the difference between calculated and totalizer increases by 1,000 lbs within 30 minutes or less.

35 Choose one:

◆ Main tank leak is **confirmed**:

▶▶ **Go to step 36**

◆ Main tank leak is **not** confirmed:

▶▶ **Go to step 39**

36 The leak is not an engine fuel leak. The engine may be re-started.

37 For a long diversion, range may be improved by re-starting the engine and climbing.

**Note:** Do **not** balance fuel.

If the FUEL QTY LOW message shows at any time, do the FUEL QTY LOW checklist.

38 Do **not** accomplish the following checklist:

FUEL IMBALANCE

**Note:** If the FUEL DISAGREE message shows at any time, go to PROGRESS page 2 and select the TOTALIZER fuel quantity.

▶▶ **Go to step 40**

**▼ Continued on next page ▼**

**▼ Fuel Leak continued ▼**

39 The leak was an engine fuel leak.

**Note:** All remaining fuel can be used for the running engine. Use normal fuel management. When the FUEL IMBALANCE message shows, do the FUEL IMBALANCE checklist.

**Note:** If the FUEL DISAGREE message shows at any time, go to PROGRESS page 2 and select the TOTALIZER fuel quantity.

**40 Checklist Complete Except Deferred Items****▼ Continued on next page ▼**

▼ Fuel Leak continued ▼

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20 ____ or VREF 30 ____, Minimums ____</b>	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

**Before Landing Checklist**

LANDING GEAR. . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>20 or 30</b>	ALL



▼ Continued on next page ▼

**▼ Fuel Leak continued ▼****Additional Information**

Reasons that a fuel leak should be suspected:

- A visual observation of fuel spray
- The total fuel quantity is decreasing at an abnormal rate
- An engine has excessive fuel flow
- The FUEL DISAGREE message shows on EICAS
- The FUEL IMBALANCE message shows on EICAS
- The FUEL QTY LOW message shows on EICAS
- The INSUFFICIENT FUEL message shows on EICAS

**FUEL LOW CENTER**

Condition: The center tank fuel quantity is at the level where the pump switches must be off.



**[ ] FUEL PRESS ENG L, R**

Condition: The affected engine is on suction feed.

Objective: To fly at an altitude that ensures a sufficient supply of fuel to the engine.

1 Choose one:

◆ Airplane altitude is **at or below** 38,000 feet:

▶▶ **Go to step 6**

◆ Airplane altitude is **above** 38,000 feet:

▶▶ **Go to step 2**

2 FUEL CROSSFEED switch (either) . . . . . On

This allows fuel from the operative pump side to feed both engines.

3 Descend to 38,000 feet or lower.

4 Do **not** accomplish the following checklists:

FUEL PUMP AFT

FUEL PUMP FWD

5 **When** airplane altitude is at or below 38,000 feet:

▶▶ **Go to step 6**

6 FUEL CROSSFEED switches (both) . . . . . Off

This restores main tank-to-engine fuel feed. The FUEL PRESS ENG message may show again.

▼ **Continued on next page** ▼

## ▼ FUEL PRESS ENG L, R continued ▼

**Note:** Do not climb above 38,000 feet for the rest of the flight.

Continue suction feed. Do not open the crossfeed valves unless an engine restart is needed.

If engine flameout occurs at any time, immediately open a fuel crossfeed valve. Close the crossfeed valves when the engine is operating normally.

Do not balance fuel.

**Note:** 500 lbs of fuel in the affected main tank is unusable.

- 7 Select the PERF INIT page.
- 8 Add 500 lbs to the required RESERVES.
- 9 Do **not** accomplish the following checklist:

## FUEL IMBALANCE



**FUEL PRESS ENG L+R**

Condition: Fuel pressure to both engines is low on the ground with the engines shut down.



**[ ] FUEL PUMP CENTER L, R**

Condition: The center fuel pump pressure is low.

- 1 FUEL CROSSFEED switch (either) . . . . . On
- 2 Fuel CENTER PUMP switch (affected pump) . . . Off
- 3 Choose one:

◆ **At least one** center fuel pump output pressure is **normal**:



◆ **Both** center fuel pump output pressures are **low**:

▶▶ **Go to step 4**

- 4 FUEL CROSSFEED switches (both) . . . . . Off
- 5 Check that available left and right main tank quantity is sufficient for the planned flight. The center tank fuel is not available.



**[ ] FUEL PUMP L AFT, FWD**

Condition: The left fuel pump pressure is low.

- 1 Fuel PUMP switch (affected pump) . . . . . Off



**[ ] FUEL PUMP R AFT, FWD**

Condition: The right fuel pump pressure is low.

- 1 Fuel PUMP switch (affected pump) . . . . . Off



## [] FUEL QTY LOW

**Condition:** The fuel quantity is low in a main tank.

**Objective:** To decide if a fuel leak is suspected. To ensure that all fuel is available for use if a fuel leak is not suspected.

**Note:** Avoid high nose up attitude. Make thrust changes slowly and smoothly. This reduces the possibility of uncovering fuel pumps.

- 1 The FUEL QTY LOW message may be caused by a fuel leak or low fuel.
- 2 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

One main tank is abnormally low compared to the other main tank and to the expected fuel remaining in the tanks.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

▼ Continued on next page ▼

▼ FUEL QTY LOW continued ▼

3 **If** a fuel leak is suspected:

▶▶ **Go to the Fuel Leak checklist on page 12.18, then finish this checklist.**

4 FUEL CROSSFEED switch (either) . . . . . On

This ensures that fuel is available to both engines if the low tank empties.

5 Fuel PUMPS switches (all) . . . . . ON

This ensures that all fuel is available for use.

6 Plan to land at the nearest suitable airport.

7 GND PROX FLAP OVRD switch . . . . . OVRD

**Note:** Use flaps 20 and VREF 20 for landing. Increased speed gives improved elevator control for landing flare in the event of a dual engine flameout.

8 **Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 20</b> ____,	
	<b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

▼ Continued on next page ▼

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**▼ FUEL QTY LOW continued ▼**

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**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa	SET & X-Checked	ALL

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**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



**[ ] FUEL SCAVENGE SYS**

Condition: The fuel scavenge system is failed.

1 Choose one:

◆ Center tank fuel quantity indication is **available**:

Select the PERF INIT page.

Add the center tank fuel quantity to the required RESERVES

▶▶ **Go to step 4**

◆ Center tank fuel quantity indication is **unavailable**:

▶▶ **Go to step 2**

2 Select the PERF INIT page.

3 Add 2,400 lbs to the required RESERVES.

4 Select the PROGRESS page.

5 Check the DESTINATION FUEL ESTIMATE. Verify that adequate fuel is available in the left and right main tanks to complete the flight.

**Note:** Remaining center tank fuel is unusable.



**[ ] FUEL TEMP LOW**

Condition: Fuel temperature is near the minimum.

- 1 Increase airspeed, change altitude or deviate to a warmer air mass to achieve a TAT equal to or higher than the fuel temperature limit (3 degrees C above the fuel freeze point).
- 2 TAT increases approximately 0.5 to 0.7 degrees C for each .01 Mach increase in airspeed. In extreme conditions it may be necessary to descend as low as 25,000 feet.

**[ ] FUEL VALVE APU**

Condition: The APU fuel valve is not in the commanded position.

- 1 Do not start the APU.

This prevents a potential fire hazard.

**Note:** The APU is not available for the rest of the flight.

- 2 Do **not** accomplish the following checklist:

APU SHUTDOWN



Intentionally  
Blank



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**[ ] HYD AUTO CONTROL C**

Condition: Both of the following occur:

- Automatic control of both center demand pumps fails
- System indications fail

1 C1 AIR DEMAND pump selector . . . . . ON

**[ ] HYD AUTO CONTROL L, R**

Condition: Both of the following occur:

- Automatic control of demand pump fails
- System indications fail

1 ELEC DEMAND pump selector  
(affected system) . . . . . ON

**[ ] HYD OVERHEAT DEM C1, C2, L, R**

Condition: The pump temperature is high.

1 DEMAND pump selector  
(affected pump) . . . . . OFF

2 Do **not** accomplish the following checklist:

HYD PRESS DEM



**[ ] HYD OVERHEAT PRI C1, C2**

Condition: The pump temperature is high.

- 1 ELEC PRIMARY pump switch  
(affected pump) . . . . . Off
- 2 Do **not** accomplish the following checklist:  
HYD PRESS PRI



**[ ] HYD OVERHEAT PRI L**

Condition: The left pump temperature is high.

- 1 L ENG PRIMARY pump switch . . . . . Off
- Note:** Left thrust reverser may be inoperative.
- 2 Do **not** accomplish the following checklist:

HYD PRESS PRI L



**[ ] HYD OVERHEAT PRI R**

Condition: The right pump temperature is high.

- 1 R ENG PRIMARY pump switch . . . . . Off
- 2 The right hydraulic demand pump may not provide sufficient pressure for all systems during the landing phase.

**Note:** Right thrust reverser may be inoperative.

Autobrake may be inoperative. Manual braking is available.

Normal brakes may be inoperative. Alternate brakes are available.

Speedbrake effectiveness may be reduced during landing.

Check the Non-Normal Configuration Landing Distance tables for HYD PRESS SYS R in the Performance Inflight-QRH chapter or other approved source.

- 3 Do **not** accomplish the following checklist:

HYD PRESS PRI R



**[ ] HYD PRESS DEM C1, C2, L, R**

Condition: The demand pump output pressure is low when commanded on.

- 1 DEMAND pump selector (affected pump) . . . . . ON
- 2 Choose one:

◆ HYD PRESS DEM message **blanks**:



◆ HYD PRESS DEM message **stays shown**:

DEMAND pump selector (affected pump). . . . . OFF



**[ ] HYD PRESS PRI C1, C2**

Condition: The pump pressure is low.

- 1 ELEC PRIMARY pump switch (affected pump) . . . . . Off



**[ ] HYD PRESS PRI L**

Condition: The left primary pump pressure is low.

- 1 L ENG PRIMARY pump switch . . . . . Off

**Note:** Left thrust reverser may be inoperative.



**[ ] HYD PRESS PRI R**

Condition: The right primary pump pressure is low.

- 1 R ENG PRIMARY pump switch . . . . . Off
- 2 The right hydraulic demand pump may not provide sufficient pressure for all systems during the landing phase.

**Note:** Right thrust reverser may be inoperative.

Autobrake may be inoperative. Manual braking is available.

Normal brakes may be inoperative. Alternate brakes are available.

Speedbrake effectiveness may be reduced during landing.

Check the Non-Normal Configuration Landing Distance tables for HYD PRESS SYS R in the Performance Inflight-QRH chapter or other approved source.



**[ ] HYD PRESS SYS C**

Condition: The center hydraulic system pressure is low.

Objective: To restore system pressure and configure for landing using alternate systems, if needed.

1 C1 or C2 AIR DEMAND pump selector . . . . . ON

2 Choose one:

◆ HYD PRESS SYS C message **blanks**:



◆ HYD PRESS SYS C message **stays shown**:

▶▶ **Go to step 3**

3 C2 ELEC PRIMARY pump switch . . . . . Off

4 C1 and C2 AIR DEMAND pump selectors . . . . OFF

5 GND PROX FLAP OVRD switch . . . . . OVRD

6 Do **not** accomplish the following checklists:

AUTO SPEEDBRAKE

SPOILERS

**Note: Inoperative Items**

**Primary flap and slat operation inop**

Plan more time for slower flap and slat operation.

**Main landing gear hydraulic operation inop**

Alternate gear extension is needed.

**Main gear steering inop**

Tires may scrub during turns.

▼ Continued on next page ▼

**▼ HYD PRESS SYS C continued ▼**

**Note:** The slats will extend beyond midrange when the airspeed is below 239 knots. For go-around, do not exceed 239 knots until the slats retract to midrange.

**Note:** Use flaps 20 and VREF 20 for landing. This ensures adequate go-around performance due to slower slat/flap operation in secondary mode.

The roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

For go-around, do not exceed the gear EXTEND limit speed (270K/.82M).

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

**7 Checklist Complete Except Deferred Items****Deferred Items****Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF

**▼ Continued on next page ▼**

▼ HYD PRESS SYS C continued ▼

LANDING DATA. . . . .	<b>VREF 20</b> ____		
	<b>Minimums</b> ____		ALL
LANDING BRIEFING. . . . .	COMPLETED		PF
Cabin Crew . . . . .	Advised		CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON		PM
R/W TURNOFF LIGHTS. . . . .	ON		PM
TAXI LIGHT . . . . .	ON		PM
PAX SIGNS . . . . .	ON		PM
ALTIMETER. . . ____	InHg/hPa SET & X-Checked		ALL

**Flap extension**

Start flap extension as needed.

Do **not** accomplish the following checklists:

- FLAPS PRIMARY FAIL
- SLATS PRIMARY FAIL

▼ Continued on next page ▼

## ▼HYD PRESS SYS C continued▼

**Alternate gear extension**

Landing gear lever . . . . .DN

ALTN GEAR

extend switch . . . . .Push to DOWN  
and hold until all gear  
show down or in transitA reduction of airspeed to below 240 knots may be  
necessary for the landing gear to lock down.Do **not** accomplish the following checklist:

GEAR DOOR

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	<b>DOWN</b>	PF
FLAPS . . . . .	<b>20</b>	ALL



**[ ] HYD PRESS SYS L**

Condition: The left hydraulic system pressure is low.

1 L ELEC DEMAND pump selector . . . . .ON

2 Choose one:

◆HYD PRESS SYS L message **blanks**:



◆HYD PRESS SYS L message **stays shown**:

▶▶ **Go to step 3**

3 L ENG PRIMARY pump switch . . . . .Off

4 L ELEC DEMAND pump selector . . . . . OFF

**Note:** The left thrust reverser is inoperative.

Roll rate may be reduced in flight.  
Speedbrake effectiveness may be reduced in flight and during landing.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

5 Do **not** accomplish the following checklist:

SPOILERS



**[ ] HYD PRESS SYS L+C**

Condition: The left and center hydraulic system pressures are low.

Objective: To restore system pressure and configure for landing using alternate systems, if needed.

- 1 L ELEC DEMAND pump selector . . . . . ON
- 2 C1 or C2 AIR DEMAND pump selector . . . . . ON
- 3 Choose one:
  - ◆ HYD PRESS SYS L+C message **blanks**:  
  ■ ■ ■ ■
  - ◆ HYD PRESS SYS L+C message **stays shown**:  
  ▶▶ **Go to step 4**
- 4 L ENG PRIMARY pump switch . . . . . Off
- 5 C2 ELEC PRIMARY pump switch . . . . . Off
- 6 L ELEC DEMAND pump selector . . . . . OFF
- 7 C1 and C2 AIR DEMAND pump selectors . . . . OFF
- 8 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.
- 9 Plan to land at the nearest suitable airport.
- 10 GND PROX FLAP OVRD switch . . . . . OVRD

▼ Continued on next page ▼

## ▼ HYD PRESS SYS L+C continued ▼

11 Do **not** accomplish the following checklists:

AUTO SPEEDBRAKE

FLIGHT CONTROLS

SPOILERS

**Note: Inoperative Items****Multiple flight control surfaces inop**

Handling qualities are degraded.

**Primary flap and slat operation inop**

Plan more time for slower flap and slat operation.

**Main landing gear hydraulic operation inop**

Alternate gear extension is needed.

**Left thrust reverser inop**

Right thrust reverser is available.

**Main gear steering inop**

Tires may scrub during turns.

**Note:** The slats will extend beyond midrange when the airspeed is below 239 knots. For go-around, do not exceed 239 knots until the slats retract to midrange.

▼ Continued on next page ▼

▼ HYD PRESS SYS L+C continued ▼

**Note:** Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

For go-around, do not exceed the gear EXTEND limit speed (270K/.82M).

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

**12 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 30 + 20</b> ____, <b>Minimums</b> __	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF

▼ Continued on next page ▼

▼ HYD PRESS SYS L+C continued ▼

Cabin Crew. . . . . Advised      CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked		ALL

**Flap extension**

Start flap extension as needed.

Do **not** accomplish the following checklists:

- FLAPS PRIMARY FAIL
- SLATS PRIMARY FAIL

▼ Continued on next page ▼

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**▼ HYD PRESS SYS L+C continued ▼**

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**Alternate gear extension**

Landing gear lever . . . . .DN

ALTN GEAR

extend switch . . . . .Push to DOWN  
and hold until all gear  
show down or in transitReduction of airspeed to below 240 knots may be  
necessary for landing gear to lock down.Do **not** accomplish the following checklist:

GEAR DOOR

---

**Before Landing Checklist**

LANDING GEAR. . . . . DOWN ALL

SPEEDBRAKE LEVER. . . . . **DOWN** PFFLAPS . . . . . **20** ALL

---

**HYD PRESS SYS L+C+R**

---

Condition: All hydraulic system pressures are low.



**[ ] HYD PRESS SYS L+R**

Condition: The left and right hydraulic system pressures are low.

Objective: To restore system pressure and configure for landing using alternate systems, if needed.

1 L ELEC DEMAND pump selector . . . . . ON

2 R ELEC DEMAND pump selector . . . . . ON

3 Choose one:

◆ HYD PRESS SYS L+R message **blanks**:



◆ HYD PRESS SYS L+R message **stays shown**:

▶▶ **Go to step 4**

4 L ENG PRIMARY pump switch . . . . . Off

5 R ENG PRIMARY pump switch . . . . . Off

6 L ELEC DEMAND pump selector . . . . . OFF

7 R ELEC DEMAND pump selector . . . . . OFF

8 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.

9 Plan to land at the nearest suitable airport.

10 GND PROX FLAP OVRD switch . . . . . OVRD

▼ **Continued on next page** ▼

## ▼ HYD PRESS SYS L+R continued ▼

**Note: Inoperative Items****Multiple flight control surfaces inop**

Handling qualities are degraded.

**Left and right thrust reversers inop**

Manual braking is available.

**Autobrake inop**

Manual braking is available.

**Normal brakes inop**

Alternate brakes are available.

**Note:** Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

11 Do **not** accomplish the following checklists:

FLIGHT CONTROLS

SPOILERS

**12 Checklist Complete Except Deferred Items**

————— **Deferred Items** —————

**Descent Checklist**

RECALL & NOTES . . . . . CHECKED PM

▼ Continued on next page ▼



▼ HYD PRESS SYS L+R continued ▼

AUTOBRAKE. . . . .	<b>OFF</b>	PF
LANDING DATA . . . .	<b>VREF 30 + 20</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____	InHg/hPa SET & X-Checked	ALL

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	<b>.20</b>	ALL



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**[ ] HYD PRESS SYS R**

Condition: The right hydraulic system pressure is low.

1 R ELEC DEMAND pump selector . . . . . ON

2 Choose one:

◆ HYD PRESS SYS R message **blanks**:



◆ HYD PRESS SYS R message **stays shown**:

▶▶ **Go to step 3**

3 R ENG PRIMARY pump switch. . . . . Off

4 R ELEC DEMAND pump selector . . . . . OFF

**Note: Inoperative Items**

**Right thrust reverser inop**

Left thrust reverser is available.

**Autobrake inop**

Manual braking is available.

**Normal brakes inop**

Alternate brakes is available.

**Note:** Roll rate may be reduced in flight.  
Speedbrake effectiveness may be reduced in flight and during landing.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

5 Do **not** accomplish the following checklist:

SPOILERS

▼ Continued on next page ▼

▼ HYD PRESS SYS R continued ▼

## 6 Checklist Complete Except Deferred Items

### Deferred Items

#### Descent Checklist

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE. . . . .	<b>OFF</b>	PF
LANDING DATA. . . . .	SET	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew . . . . .	Advised	CAPT

#### Approach Checklist

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ___ InHg/hPa SET & X-Checked		ALL

#### Before Landing Checklist

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	___	ALL



**[ ] HYD PRESS SYS R+C**

Condition: The right and center hydraulic system pressures are low.

Objective: To restore system pressure and configure for landing using alternate systems, if needed.

- 1 C1 or C2 AIR DEMAND pump selector . . . . . ON
- 2 R ELEC DEMAND pump selector . . . . . ON
- 3 Choose one:
  - ◆ HYD PRESS SYS R+C message **blanks**:  

■ ■ ■ ■
  - ◆ HYD PRESS SYS R+C message **stays shown**:  

▶▶ **Go to step 4**
- 4 STAB cutout switches (both) . . . . . CUTOUT  
 This keeps the STABILIZER message blank.
- 5 Do not exceed current airspeed. Nose down elevator authority is limited.
- 6 C2 ELEC PRIMARY pump switch . . . . . Off
- 7 R ENG PRIMARY pump switch. . . . . Off
- 8 C1 and C2 AIR DEMAND pump selectors . . . . OFF
- 9 R ELEC DEMAND pump selector . . . . . OFF
- 10 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.

▼ Continued on next page ▼

**▼HYD PRESS SYS R+C continued▼**

- 11 Plan to land at the nearest suitable airport.
- 12 GND PROX FLAP OVRD switch . . . . . OVRD
- 13 Do **not** accomplish the following checklists:
  - AUTO SPEEDBRAKE
  - FLIGHT CONTROLS
  - SPOILERS

**Note: Inoperative Items****Multiple flight control surfaces inop**

Handling qualities are degraded.

**Stabilizer inop**

Pitch trim is available in the normal flight control mode.

**Primary flap and slat operation inop**

Plan more time for slower flap and slat operation.

**Main landing gear hydraulic operation inop**

Alternate gear extension is needed.

**Right thrust reverser inop**

Left thrust reverser is available.

**Autobrake inop**

Manual braking is available.

**Normal brakes and alternate brakes from center hydraulic source are inop**

Alternate brakes from the reserve hydraulic source are available.

**Main gear steering inop**

Tires may scrub during turns.

**▼ Continued on next page ▼**

▼HYD PRESS SYS R+C continued▼

**Note:** The slats will extend beyond midrange when the airspeed is below 239 knots. For go-around, do not exceed 239 knots until the slats retract to midrange.

**Note:** Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

For go-around, do not exceed the gear EXTEND limit speed (270K/.82M).

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

**14 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	<b>OFF</b>	PF

▼ Continued on next page ▼

▼ HYD PRESS SYS R+C continued ▼

LANDING DATA. . . . . <b>VREF 30 + 20</b> _____,	
<b>Minimums</b> _____	ALL
LANDING BRIEFING. . . . . COMPLETED	PF
Cabin Crew. . . . . Advised	CAPT

### Approach Checklist

LANDING LIGHTS . . . . . ON	PM
R/W TURNOFF LIGHTS . . . . . ON	PM
TAXI LIGHT . . . . . ON	PM
PAX SIGNS . . . . . ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked	ALL

### Flap extension

Start flap extension as needed.

Do **not** accomplish the following checklists:

FLAPS PRIMARY FAIL

SLATS PRIMARY FAIL

### Alternate gear extension

Landing gear lever . . . . . DN

▼ Continued on next page ▼

▼HYD PRESS SYS R+C continued▼

ALTN GEAR

extend switch . . . . . Push to DOWN and hold until all gear show down or in transit

Reduction of airspeed to below 240 knots may be necessary for landing gear to lock down.

Do **not** accomplish the following checklist:

GEAR DOOR

Before Landing Checklist

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	<b>DOWN</b>	PF
FLAPS . . . . .	<b>20</b>	ALL



**[ ] HYD QTY LOW C**

Condition: The center hydraulic quantity is low.

**Note:** Nose wheel steering may be slow to react. Excessive force on the nose wheel steering tiller may cause abrupt tiller movement in the opposite direction.



**HYD QTY LOW L, R**

Condition: The hydraulic quantity is low.



**[ ] HYD QTY LOW L+C**

Condition: The left and center hydraulic quantities are low.

- 1 Plan to land at the nearest suitable airport.

**Note:** Nose wheel steering may be slow to react. Excessive force on the nose wheel steering tiller may cause abrupt tiller movement in the opposite direction.

**[ ] HYD QTY LOW L+C+R**

Condition: All three hydraulic quantities are low.

- 1 Plan to land at the nearest suitable airport.

**Note:** Nose wheel steering may be slow to react. Excessive force on the nose wheel steering tiller may cause abrupt tiller movement in the opposite direction.

**[ ] HYD QTY LOW L+R**

Condition: The left and right hydraulic quantities are low.

- 1 Plan to land at the nearest suitable airport.





**[ ] HYD QTY LOW R+C**

Condition: The right and center hydraulic quantities are low.

Objective: To prevent fluid loss through the brake system.

- 1 C1 ELEC PRIMARY pump switch . . . . . Off
- 2 Plan to land at the nearest suitable airport.

**Note:** Nose wheel steering may be slow to react. Excessive force on the nose wheel steering tiller may cause abrupt tiller movement in the opposite direction.

Do not taxi with loss of steering.

- 3 Do **not** accomplish the following checklists:  
RESERVE BRAKES/STRG

**Note: Inoperative Items**

**Nose landing gear hydraulic operation inop**  
Alternate gear extension is needed.

**4 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA . . . . .	SET	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF

▼ Continued on next page ▼

## ▼HYD QTY LOW R+C continued ▼

Cabin Crew . . . . . Advised      CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked		ALL

**Alternate gear extension**

Landing gear lever . . . . . DN

ALTN GEAR

 extend switch . . . . . Push to DOWN  
 and hold until all gear  
 show down or in transit

Reduction of airspeed to below 240 knots may be necessary for landing gear to lock down.

Do **not** accomplish the following checklist:

GEAR DOOR

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	____	ALL

▼ Continued on next page ▼

▼HYD QTY LOW R+C continued▼

**Before landing**

C1 ELEC PRIMARY pump switch . . . . .ON

This step restores alternate brakes from the reserve hydraulic source and may restore steering.

**Note:** In the event of a go-around or missed approach, consider turning off the C1 ELEC PRIMARY pump.



**[ ] RAT UNLOCKED**

Condition: The ram air turbine is not stowed and locked.

**Note:** The RAT provides hydraulic and electrical power for the rest of the flight.

**Note:** The battery is not being discharged while the RAT is providing electrical power.

**Note:** Fuel burn rate increases up to 2% with the RAT deployed. Verify sufficient fuel is available to complete the flight.

**Note:** Do not use FMC performance predictions with the RAT deployed.





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**[ ] ANTISKID**

Condition: An antiskid system fault occurs.

- 1 AUTOBRAKE selector. . . . . OFF

**Note:** The autobrake system is inoperative.

Use minimum braking consistent with runway length and conditions to reduce the possibility of tire blowout.

Do not apply the brakes until the nose wheel is on the ground and the speedbrakes have extended.

Brake initially using light steady pedal pressure. Increase pressure as ground speed decreases. Do not pump the brakes.

Check the Non-Normal Configuration Landing Distance tables in the Performance Inflight-QRH chapter or other approved source.

- 2 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

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 ▼ ANTISKID continued ▼
 

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---

**Deferred Items**


---

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	<b>OFF</b>	PF
LANDING DATA . . . . .	SET	ALL
LANDING BRIEFING . . . . .	COMPLETED	PF
Cabin Crew . . . . .	Advised	CAPT

---

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS . . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER . . . ___ InHg/hPa	SET & X-Checked	ALL

---

**Before Landing Checklist**

LANDING GEAR . . . . .	DOWN	ALL
SPEEDBRAKE LEVER . . . . .	ARMED	PF
FLAPS . . . . .	___	ALL



**AUTOBRAKE**

Condition: One of these occurs:

- The autobrake system is disarmed
- The autobrake system is failed

**[ ] BRAKE SOURCE**

Condition: Normal and alternate brake system pressures are low, and reserve hydraulic source for alternate brake system is low.

**Note:** Only accumulator pressure is available for braking. During landing rollout, apply steady, increasing brake pressure and hold to a full stop. Do not taxi.



**[ ] BRAKE TEMP**

Condition: One or more brake temperatures are high.

1 Choose one:

◆ On the **ground**:

▶▶ **Go to step 2**

◆ In **flight**:

▶▶ **Go to step 6**

2 Minimize taxiing.

3 Unless needed, do not set the parking brake.

4 Wheel fuse plugs can melt.

5 Refer to the Recommended Brake Cooling Schedule table in the Performance Inflight chapter for the needed cooling time and precautions.



6 Do not exceed the gear EXTEND limit speed (270K/.82M).

7 Landing gear lever . . . . . DN

8 **When** the BRAKE TEMP message blanks:

**Wait** 8 minutes.

Landing gear lever . . . . . UP



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**[ ] GEAR DISAGREE**

Condition: The gear position disagrees with the landing gear lever position.

Objective: To extend the gear using alternate gear extension, or land on the available gear.

**Note:** Do not exceed the gear EXTEND limit speed (270K/.82M).

1 Choose one:

◆ Landing gear lever **UP**:

**Note:** Flight with the gear down increases fuel consumption and decreases climb performance. Refer to the Gear Down tables in the Performance Inflight chapter for flight planning.

Do **not** accomplish the following checklists:

AUTO SPEEDBRAKE

GEAR DOOR



◆ Landing gear lever **DN**:

▶▶ **Go to step 2**

2 **ALTN GEAR**

extend switch. . . . . Push to **DOWN**  
and hold until all gear  
show down or in transit

▼ **Continued on next page** ▼

## ▼ GEAR DISAGREE continued ▼

3 Reduction of airspeed to below 240 knots may be necessary for the gear to lock down.

4 Do **not** accomplish the following checklist:

GEAR DOOR

5 **Wait** 30 seconds.

6 Choose one:

◆ **All** gear indicate **DN**:



◆ **Any** gear indicate **UP or in transit**:

▶▶ **Go to step 7**

7 Plan to land on the available gear.

8 GND PROX GEAR OVRD switch . . . . . OVRD

**Note:** Use flaps 30 for landing. This gives the slowest landing speed.

Do not arm the speedbrake lever.

When stopping distance is critical, extend the speedbrakes after all gear, or the nose, or the engine nacelle have contacted the runway.

Do not use the thrust reversers unless stopping distance is critical.

9 **Checklist Complete Except Deferred Items**

## ▼ Continued on next page ▼

▼ GEAR DISAGREE continued ▼

## Deferred Items

### Descent Checklist

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 30</b> ____, <b>Minimums</b> __	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

### Approach Checklist

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . __ InHg/hPa SET & X-Checked		ALL

### At pattern altitude

OUTFLOW VALVE switches (both) . . . . . MAN

Use momentary actuation of the outflow valve manual switches to avoid large and rapid pressurization changes. Valves can take up to 6 seconds to move the first time.



#### OUTFLOW VALVES MANUAL

switches (both) . . . . . Move to OPEN until the outflow valve indications show fully open to depressurize the airplane

▼ Continued on next page ▼

## ▼ GEAR DISAGREE continued ▼

Fuel PUMPS switches (all) . . . . . Off

Do **not** accomplish the following checklists:

- CABIN ALTITUDE AUTO
- FUEL PRESS ENG L
- FUEL PRESS ENG R

**Before Landing Checklist**

LANDING GEAR . . . . . DOWN ALL  
 SPEEDBRAKE LEVER . . . . . **DOWN** PF  
 FLAPS . . . . . **30** ALL



[ ] GEAR DOOR

Condition: One or more gear doors are not closed.

**Note:** Do not exceed the gear EXTEND limit speed (270K/.82M).



Gear Lever Locked Down

Condition: The landing gear lever cannot move to UP.

- 1 Landing gear lever  
 LOCK OVRD switch . . . . . Push and hold
- 2 Landing gear lever . . . . . UP



**[ ] MAIN GEAR BRACE L, R**

Condition: The main gear is down with one brace unlocked.

1 GND PROX GEAR OVRD switch . . . . . OVRD

**Note:** Use flaps 30 for landing. This gives the slowest landing speed.

Do not arm the speedbrake lever.

Manually extend the speedbrakes after landing.

**2 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

RECALL & NOTES . . . . .	CHECKED	PM
AUTOBRAKE . . . . .	AS REQUIRED	PF
LANDING DATA. . . . .	<b>VREF 30</b> ____, <b>Minimums</b> ____	ALL
LANDING BRIEFING. . . . .	COMPLETED	PF
Cabin Crew. . . . .	Advised	CAPT

**Approach Checklist**

LANDING LIGHTS . . . . .	ON	PM
R/W TURNOFF LIGHTS. . . . .	ON	PM
TAXI LIGHT . . . . .	ON	PM
PAX SIGNS . . . . .	ON	PM
ALTIMETER. . . ____ InHg/hPa SET & X-Checked		ALL

▼ Continued on next page ▼

**▼ MAIN GEAR BRACE L, R continued ▼****At pattern altitude**

Fuel PUMPS switches (all) . . . . . Off

Do **not** accomplish the following checklists:

FUEL PRESS ENG L

FUEL PRESS ENG R

**Before Landing Checklist**

LANDING GEAR . . . . . DOWN ALL

SPEEDBRAKE LEVER . . . . . **DOWN** PFFLAPS . . . . . **30** ALL**MAIN GEAR STEERING**

Condition: Main gear steering does not lock.



**[ ] RESERVE BRAKES/STRG**

Condition: One or more of these are possibly not available:

- Alternate brakes from the reserve hydraulic source
- Normal nose gear extension
- Nose wheel steering

**Note:** Plan for possible alternate gear extension. Do not taxi with loss of steering.

**[ ] TIRE PRESS**

Condition: One or more tire pressures are not normal.

**Note:** If it can be determined that a main gear tire is flat, do not use the autobrake.





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**AIRSPPEED LOW**

Condition: Airspeed is less than minimum maneuvering speed.

**ALTITUDE ALERT**

Condition: A deviation from the MCP set altitude occurs.

**ALTITUDE CALLOUTS**

Condition: Altitude and minimums voice callouts during approach are not available.

**CONFIG DOORS**

Condition: An entry, forward cargo, or aft cargo door is not closed and latched and locked during takeoff.

**CONFIG FLAPS**

Condition: The flaps are not in a takeoff position during takeoff.



**CONFIG GEAR**

Condition: A landing gear is not down and locked and one of these occurs:

- Below 800 feet radio altitude and a thrust lever is at or near idle
- The flaps are in a landing position

**CONFIG GEAR STEERING**

Condition: Main gear steering is not locked during takeoff.

**CONFIG PARKING BRAKE**

Condition: The parking brake is set during takeoff.

**CONFIG RUDDER**

Condition: Rudder trim is not centered during takeoff.



## CONFIG SPOILERS

Condition: One of these occurs:

- The speedbrake lever is not down during takeoff
- The speedbrake lever is extended beyond ARMED in flight with climb thrust or greater



## CONFIG STABILIZER

Condition: The stabilizer is not in the greenband during takeoff.



## [ ] CONFIG WARNING SYS

Condition: A configuration warning system fault occurs.

**Note:** Radio altitude voice callouts and other aural alerts may not be available.



## [ ] GND PROX SYS

Condition: A ground proximity warning system fault occurs.

**Note:** Some or all ground proximity alerts are not available. Ground proximity alerts that occur are valid.



**OVERSPEED**

Condition: Airspeed is more than Vmo/Mmo.



**PILOT RESPONSE**

Condition: Pilot action is not detected during a specified time.




**[ ] TAIL STRIKE**

Condition: The tail hits the runway.

**Caution! Continued pressurization of the airplane can cause further structural damage.**

1 OUTFLOW VALVE switches (both) . . . . .MAN

Use momentary actuation of the outflow valves manual switches to avoid large and rapid pressurization changes. Valves can take up to 6 seconds to move the first time.

2  OUTFLOW VALVES MANUAL switches (both) . . . . . Move to OPEN until the outflow valve indications show fully open to depressurize the airplane

3 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

**▼TAIL STRIKE continued▼**

4 Do **not** accomplish the following checklist:

CABIN ALTITUDE AUTO


**Tail Strike**

Condition: A tail strike is suspected or confirmed.

**Caution! Continued pressurization of the airplane can cause further structural damage.**

1 OUTFLOW VALVE switches (both) . . . . . MAN

Use momentary actuation of the outflow valves manual switches to avoid large and rapid pressurization changes. Valves can take up to 6 seconds to move the first time.

2  OUTFLOW VALVES MANUAL switches (both) . . . . . Move to OPEN until the outflow valve indications show fully open to depressurize the airplane

3 Plan to land at the nearest suitable airport.

4 Do **not** accomplish the following checklist:

CABIN ALTITUDE AUTO



**TCAS**

Condition: TCAS is failed.

**TCAS OFF**

Condition: TCAS modes TA or TA/RA are not selected.

**TCAS RA CAPTAIN, F/O**

Condition: TCAS cannot show RA guidance on the PFD.

**TERR OVRD**

Condition: The ground proximity terrain override switch is in OVRD.

**[ ] TERR POS**

Condition: Terrain position data is lost.

**Note:** Position data for the ND terrain map and look-ahead terrain alerts are lost. Ground proximity alerts that occur are valid.



**[ ] WINDSHEAR SYS**

Condition: A windshear system fault occurs.

**Note:** Some or all windshear alerts are not available. Windshear alerts that occur are valid.





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**Operational Information**

**Chapter OI**

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All Engine Takeoff Climb Gradient  
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(777-200ER/PW4090). . . . . OI.2.5S1



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## **Smoke, Fire or Fumes**

### **Introduction**

Addresses unannunciated smoke/fire/fumes events, i.e., smoke/fire/fumes events not annunciated to the flight crew by airplane detection systems.

Does not replace annunciated checklist (e.g., cargo fire) or address multiple smoke/fire/fumes event.

### **Definition of fumes**

Gases, smoke or vapors, particularly when they are unpleasant or harmful. In the aviation industry the term generally applies to smells such as jet fuel, oil, hydraulic fluid, electrical burning smells etc.

Fumes may be present before smoke or fire is visible:

- Smoke accompanied with jet fuel, oil, hydraulic fluid looks usually black in color.
- Smoke accompanied with electrical burning looks usually light grey or white, with a bluish tinge.

The term is not typically applied to things like burnt coffee or food smell, lavatory odors, etc.

### **Sense of smell**

If the smell similar to that of orange peels, suspect a toxic leak of rain repellent fluid. If the smell is similar to that of pine needles, suspect a non-toxic leak.

The following abnormal odors may indicate the presence of smoke:

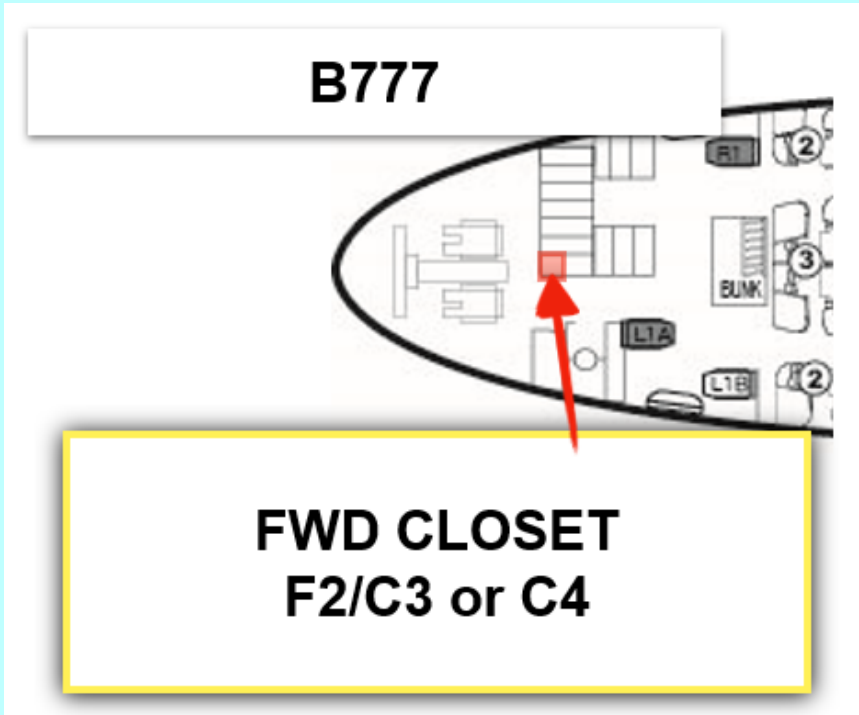


DESCRIPTION OF ODORS.	PRIMARY CAUSE.
Acrid.	Electrical Equipment/IFE, Engine Oil Leak.
Burning.	Electrical/Galley Equipment, Bird Ingestion.
Chemical.	Contaminated Bleed Cuts, APU Ingestion.
Chlorine.	Smoke Hood, Blocked Door Area Drain
Electrical.	Electrical Equipment.
Dirty Socks.	APU or Engine Oil Leaks.
Foul.	Lavatories.
Fuel.	APU FCU/Fuel Line.
Oil.	Engine or APU Oil Leak.
Skydrol.	Engine Hydraulic.
Sulphur.	Wiring, Avionics Filter Water Contamination, Light Bulb.

Another possible sign of a fire onboard may be passenger or crewmembers suddenly developing :

- Eye irritation
- Sore throats
- Headaches

## Position of Fire Containment Bag





**777 Flight Crew Operations Manual Supplement**

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## Introduction

This chapter contains information from the Flight Operations Engineering Team to supplement performance data in the QRH PI Section.

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## All Engine Takeoff Climb Gradient

The all engine climb gradient tables are provided as advisory information in compliance with ICAO recommendation. The gradient data is based on the conditions given in the tables and with gear up and zero bank angle.

To determine the reference climb gradient, enter the appropriate table with pressure altitude and OAT. Adjust the reference climb gradient according to the adjustment to account for the airplane weight.

## Required Landing Field Length

For a dry runway the required runway length is 167% of the demonstrated stopping distance that is to a complete stop from a point 50 feet above the runway threshold at  $V_{ref}$ , based on maximum braking, speed brakes extended, and no reverse thrust. For a wet runway and/or low visibility (less than 1200m), the required length is 115% of the dry runway.

## Autoland Landing Distance

The Landing Distance Table is provided in Performance In-flight Section as advisory information to assist en-route landing performance calculation.

For autoland, refer to OI 2.3 to increase landing distance.

## Diversion Planning Chart

Refer to Flight Crew Reference Manual (FCRM) 2.3 for the usage of the Diversion Planning Chart.

## Go-Around Climb Gradient

Enter the Reference Go-around Gradient table with airport OAT and pressure altitude to determine the reference Go-Around Gradient. Then adjust the reference gradient for airplane weight and speed using the tables provided to determine the weight and speed adjusted Go-Around Gradient. Apply the necessary corrections for A/C and icing conditions as noted.

All engine Go-around climb gradient data are also provided for reference.



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## ALL ENGINE TAKEOFF CLIMB GRADIENT

777-200ER/PW4090

### Max Takeoff Thrust

#### Flaps 5

Based on Weight 645,000 LB, V2+15KT, Zero Wind, Engine Bleed for Packs On, Anti-ice Off

PRESSURE ALTITUDE [FT]	REFERENCE CLIMB GRADIENT ( % )										
	OAT ( )										
	≤ 10	20	22	24	26	28	30	32	34	36	38
0	14.01	13.99	13.99	13.98	13.98	13.97	13.97	13.66	13.35	12.98	12.55
2000	12.71	12.69	12.69	12.69	12.59	12.41	12.22	11.97	11.65	11.30	10.91
4000	11.44	11.27	11.18	11.08	10.98	10.83	10.62	10.41	10.09	9.74	9.36
6000	10.09	9.72	9.63	9.53	9.42	9.30	9.09	8.89	8.63	8.31	7.96
8000	8.64	8.23	8.15	8.06	7.92	7.77	7.62	7.45	7.29	6.97	6.62

### Adjustment for Weight

GRADIENT INCREMENT ( % )								
WEIGHT ( 1000 LB )								
645	640	630	620	610	600	590	580	570
0.00	0.12	0.38	0.64	0.91	1.19	1.49	1.79	2.11

### Max Climb Thrust

#### Flaps 5

Based on Weight 645,000 LB, V2+15KT, Zero Wind, Engine Bleed for Packs On, Anti-ice Off

PRESSURE ALTITUDE [FT]	REFERENCE CLIMB GRADIENT ( % )										
	OAT ( )										
	≤ 10	20	22	24	26	28	30	32	34	36	38
0	9.10	9.08	9.07	9.07	9.06	9.05	9.05	8.76	8.47	8.17	7.89
2000	8.37	8.35	8.34	8.34	8.33	8.06	7.79	7.53	7.26	6.99	6.72
4000	7.66	7.64	7.63	7.38	7.11	6.84	6.59	6.34	6.09	5.84	5.60
6000	6.94	6.69	6.43	6.18	5.94	5.69	5.47	5.23	5.00	4.78	4.57
8000	6.26	5.55	5.32	5.09	4.86	4.64	4.42	4.22	4.02	3.82	3.63

### Adjustment for Weight

GRADIENT INCREMENT ( % )								
WEIGHT ( 1000 LB )								
645	640	630	620	610	600	590	580	570
0.00	0.09	0.27	0.46	0.66	0.87	1.08	1.30	1.54

### Max Climb Thrust

#### Clean Configuration

Based on 250KIAS, ≤ ISA+15 , Zero Wind, Engine Bleed for Packs On, Anti-ice Off

PRESSURE ALTITUDE [FT]	CLIMB GRADIENT ( % )							
	WEIGHT ( 1000 LB )							
	640	630	620	610	600	590	580	570
4000	8.23	8.45	8.68	8.91	9.16	9.40	9.66	9.92
6000	7.59	7.80	8.02	8.24	8.47	8.70	8.94	9.19
8000	6.98	7.18	7.39	7.60	7.82	8.04	8.27	8.51
10000	6.37	6.56	6.76	6.95	7.16	7.37	7.59	7.81



**ALL ENGINE TAKEOFF CLIMB GRADIENT**

777-200ER/PW4090

**Max Takeoff Thrust**

**Flaps 15**

Based on Weight 645,000 LB, V2+15KT, Zero Wind, Engine Bleed for Packs On, Anti-ice Off

PRESSURE ALTITUDE [FT]	REFERENCE CLIMB GRADIENT ( % )										
	OAT ( )										
	≤ 10	20	22	24	26	28	30	32	34	36	38
0	13.65	13.63	13.63	13.63	13.62	13.62	13.62	13.31	12.99	12.63	12.19
2000	12.35	12.34	12.33	12.33	12.24	12.06	11.86	11.61	11.29	10.94	10.55
4000	11.06	10.89	10.79	10.70	10.60	10.47	10.27	10.07	9.74	9.39	9.01
6000	9.68	9.32	9.23	9.14	9.04	8.94	8.74	8.55	8.31	7.98	7.63
8000	8.23	7.82	7.74	7.66	7.53	7.39	7.25	7.10	6.95	6.63	6.28

**Adjustment for Weight**

GRADIENT INCREMENT ( % )									
WEIGHT ( 1000 LB )									
645	640	630	620	610	600	590	580	570	
0.00	0.12	0.37	0.64	0.91	1.19	1.48	1.78	2.11	

**Max Climb Thrust**

**Flaps 15**

Based on Weight 645,000 LB, V2+15KT, Zero Wind, Engine Bleed for Packs On, Anti-ice Off

PRESSURE ALTITUDE [FT]	REFERENCE CLIMB GRADIENT ( % )										
	OAT ( )										
	≤ 10	20	22	24	26	28	30	32	34	36	38
0	8.65	8.62	8.62	8.61	8.60	8.60	8.59	8.30	8.01	7.71	7.43
2000	7.91	7.89	7.88	7.88	7.88	7.61	7.33	7.06	6.80	6.52	6.26
4000	7.23	7.21	7.21	6.95	6.68	6.41	6.16	5.91	5.66	5.40	5.16
6000	6.54	6.29	6.02	5.76	5.53	5.28	5.05	4.82	4.58	4.36	4.14
8000	5.86	5.14	4.91	4.68	4.45	4.22	4.00	3.80	3.60	3.39	3.19

**Adjustment for Weight**

GRADIENT INCREMENT ( % )									
WEIGHT ( 1000 LB )									
645	640	630	620	610	600	590	580	570	
0.00	0.09	0.28	0.47	0.67	0.87	1.08	1.31	1.54	

**Max Climb Thrust**

**Clean Configuration**

Based on 250KIAS, ≤ ISA+15 , Zero Wind, Engine Bleed for Packs On, Anti-ice Off

PRESSURE ALTITUDE [FT]	CLIMB GRADIENT ( % )							
	WEIGHT ( 1000 LB )							
	640	630	620	610	600	590	580	570
4000	8.23	8.45	8.68	8.91	9.16	9.40	9.66	9.92
6000	7.59	7.80	8.02	8.24	8.47	8.70	8.94	9.19
8000	6.98	7.18	7.39	7.60	7.82	8.04	8.27	8.51
10000	6.37	6.56	6.76	6.95	7.16	7.37	7.59	7.81



## ALL ENGINE TAKEOFF CLIMB GRADIENT

777-200ER/PW4090

### Max Takeoff Thrust

#### Flaps 20

Based on Weight 645,000 LB, V2+15KT, Zero Wind, Engine Bleed for Packs On, Anti-ice Off

PRESSURE ALTITUDE [FT]	REFERENCE CLIMB GRADIENT ( % )										
	OAT ( ° )										
	≤ 10	20	22	24	26	28	30	32	34	36	38
0	13.20	13.18	13.18	13.18	13.17	13.17	13.16	12.86	12.55	12.18	11.74
2000	11.90	11.88	11.88	11.88	11.79	11.60	11.40	11.15	10.83	10.49	10.10
4000	10.59	10.42	10.32	10.23	10.14	10.00	9.80	9.60	9.28	8.93	8.54
6000	9.20	8.84	8.75	8.67	8.58	8.48	8.29	8.11	7.87	7.54	7.19
8000	7.74	7.34	7.26	7.18	7.06	6.93	6.79	6.65	6.51	6.19	5.84

#### Adjustment for Weight

GRADIENT INCREMENT ( % )								
WEIGHT ( 1000 LB )								
645	640	630	620	610	600	590	580	570
0.00	0.12	0.37	0.63	0.90	1.18	1.46	1.75	2.07

### Max Climb Thrust

#### Flaps 20

Based on Weight 645,000 LB, V2+15KT, Zero Wind, Engine Bleed for Packs On, Anti-ice Off

PRESSURE ALTITUDE [FT]	REFERENCE CLIMB GRADIENT ( % )										
	OAT ( ° )										
	≤ 10	20	22	24	26	28	30	32	34	36	38
0	8.13	8.11	8.10	8.09	8.09	8.08	8.08	7.79	7.49	7.20	6.91
2000	7.40	7.37	7.37	7.36	7.36	7.09	6.82	6.55	6.28	6.00	5.74
4000	6.72	6.70	6.69	6.43	6.16	5.90	5.65	5.39	5.14	4.89	4.64
6000	6.05	5.80	5.53	5.27	5.04	4.79	4.56	4.33	4.09	3.86	3.63
8000	5.38	4.65	4.42	4.19	3.97	3.73	3.52	3.31	3.11	2.90	2.70

#### Adjustment for Weight

GRADIENT INCREMENT ( % )								
WEIGHT ( 1000 LB )								
645	640	630	620	610	600	590	580	570
0.00	0.09	0.27	0.46	0.65	0.85	1.06	1.27	1.50

### Max Climb Thrust

#### Clean Configuration

Based on 250KIAS, ≤ ISA+15 , Zero Wind, Engine Bleed for Packs On, Anti-ice Off

PRESSURE ALTITUDE [FT]	CLIMB GRADIENT ( % )							
	WEIGHT ( 1000 LB )							
	640	630	620	610	600	590	580	570
4000	8.23	8.45	8.68	8.91	9.16	9.40	9.66	9.92
6000	7.59	7.80	8.02	8.24	8.47	8.70	8.94	9.19
8000	6.98	7.18	7.39	7.60	7.82	8.04	8.27	8.51
10000	6.37	6.56	6.76	6.95	7.16	7.37	7.59	7.81



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## Required Landing Field Length

### 777-200ER/PW4090

#### Flaps 30 Dry Runway

L/D WT (LB)	AIRPORT PRESSURE ALTITUDE (FT)									
	- 1000	0	1000	2000	3000	4000	5000	6000	7000	8000
460,000	5091	5211	5334	5462	5594	5730	5871	6018	6170	6328
450,000	5006	5124	5245	5370	5499	5633	5771	5915	6065	6219
440,000	4920	5036	5154	5277	5404	5535	5671	5812	5959	6111
430,000	4834	4947	5064	5184	5309	5438	5571	5709	5853	6002
420,000	4748	4859	4973	5091	5213	5340	5470	5606	5747	5893
410,000	4661	4770	4882	4998	5118	5241	5369	5502	5640	5784
400,000	4575	4681	4791	4904	5021	5143	5268	5398	5534	5674
390,000	4487	4592	4699	4810	4925	5044	5167	5294	5426	5564
380,000	4400	4502	4607	4716	4828	4945	5065	5189	5319	5454
370,000	4355	4413	4515	4621	4731	4845	4963	5084	5211	5343
360,000	4350	4390	4430	4527	4634	4745	4860	4979	5103	5232
350,000	4345	4385	4425	4465	4536	4645	4757	4873	4994	5120
340,000	4339	4379	4419	4460	4500	4544	4654	4767	4886	5008
330,000	4333	4373	4413	4454	4495	4536	4579	4661	4776	4896
320,000	4327	4367	4407	4448	4489	4531	4573	4616	4666	4784

#### Corrections;

Winds : Add 102 ft per 1 kt tailwind. Subtract 24 ft per 1 kt headwind.

Wet : Wet Req. Landing Field Length = Dry Req. Landing Field Length X 1.15

- Note:** 1) Req. Landing Field Length includes Air Distance from a point 50 feet above the runway threshold at  $V_{ref}$  and based on Max. Manual Braking, No Reverse Thrust, Automatic Spoiler, Antiskid Operative.
- 2) When the runway is wet or slippery, or visibility is less than 1,200m (3/4SM), RVR less than 1,200m (4,000ft), flight crews must comply with the required wet landing field length.
- 3) Landing runway for non-normal configuration must be greater than required landing field length for normal landing configuration based on runway condition (dry or wet) or non-normal actual landing distance, whichever is longer.



**Required Landing Field Length**  
**777-200ER/PW4090**

**Flaps 25**  
**Dry Runway**

L/D WT (LB)	AIRPORT PRESSURE ALTITUDE (FT)									
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
460,000	5435	5564	5696	5833	5974	6121	6272	6429	6593	6762
450,000	5344	5470	5600	5734	5873	6016	6165	6319	6480	6646
440,000	5252	5375	5503	5635	5771	5912	6057	6209	6366	6529
430,000	5159	5281	5406	5535	5668	5807	5950	6098	6252	6412
420,000	5067	5186	5308	5435	5566	5701	5842	5987	6138	6295
410,000	4974	5091	5211	5335	5463	5596	5733	5876	6024	6178
400,000	4881	4995	5113	5234	5360	5490	5625	5764	5909	6060
390,000	4787	4899	5015	5134	5257	5384	5516	5652	5794	5942
380,000	4694	4803	4916	5032	5153	5277	5406	5540	5679	5823
370,000	4600	4707	4817	4931	5049	5170	5297	5427	5563	5704
360,000	4505	4610	4718	4829	4944	5063	5186	5314	5447	5585
350,000	4411	4513	4618	4727	4839	4956	5076	5201	5331	5466
340,000	4323	4415	4518	4624	4734	4848	4965	5087	5214	5345
330,000	4316	4357	4418	4521	4628	4739	4854	4972	5096	5225
320,000	4310	4350	4390	4431	4522	4630	4742	4858	4979	5104

**Corrections;**

Winds : Add 104 ft per 1 kt tailwind. Subtract 25 ft per 1 kt headwind.

Wet : Wet Req. Landing Field Length = Dry Req. Landing Field Length X 1.15

- Note:** 1) Req. Landing Field Length includes Air Distance from a point 50 feet above the runway threshold at Vref and based on Max. Manual Braking, No Reverse Thrust, Automatic Spoiler, Antiskid Operative.
- 2) When the runway is wet or slippery, or visibility is less than 1,200m (3/4SM), RVR less than 1,200m (4,000ft), flight crews must comply with the required wet landing field length.
- 3) Landing runway for non-normal configuration must be greater than required landing field length for normal landing configuration based on runway condition (dry or wet) or non-normal actual landing distance, whichever is longer.



## **AUTOLAND LANDING DISTANCE**

For autoland, increase 637 ft to reference landing distance of Performance In-flight Landing Distance for all landing configurations and Braking Actions.



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## Diversion Planning Chart

### 777-200ER/PW4090

#### MAP to Alternate

FUEL & TIME REQUIRED ( LB, H:MIN )							
DIST (NM)	CRUISE ALTITUDE (1000 FT)						
	5	10	15	20	25	29	35
700				33600 2:01	31800 1:53	30600 1:46	29500 1:40
600				30200 1:44	28700 1:37	27800 1:32	26900 1:26
500			28400 1:33	26800 1:28	25600 1:22	25000 1:17	24400 1:13
400			24600 1:16	23400 1:11	22500 1:07	22100 1:04	21800 1:01
300		21900 1:01	20700 0:58	20000 0:55	19500 0:52	19300 0:49	19200 0:47
200	18400 0:44	17600 0:42	16900 0:40	16500 0:38	16400 0:37	16400 0:35	
180	17400 0:40	16800 0:38	16100 0:36	15900 0:35	15800 0:33	15800 0:32	
160	16500 0:36	15900 0:34	15400 0:32	15200 0:31	15100 0:30	15300 0:30	
140	15600 0:32	15100 0:31	14600 0:29	14500 0:28	14500 0:27		
120	14600 0:28	14200 0:26	13800 0:26	13800 0:25			
100	13700 0:23	13300 0:23	13000 0:22				
80	12700 0:19	12500 0:19	12300 0:19				
70	12200 0:17	12000 0:17					
50 LESS	11300 0:13						

#### Assumption

##### 1. No wind:

Add 2% (subtract 1%) fuel burn per 10 kts of headwind (tailwind) at cruise altitude, respectively

##### 2. Landing weight 400,000 lbs at origin destination:

Add (subtract) 1.0% fuel burn for each 20,000 lbs for landing weight more (less) than 400,000 lbs

##### 3. Basis:

- All engine operating
- Normal air conditioning
- Anti-ice off
- Begins at MAP
- Climb at 250/310/M.84
- Cruise at LRC
- Descend at M.84/310/250
- Straight in approach
- Includes minimum fuel upon arrival (8,000 lbs)
- Distance reflects air miles.



**Diversion Planning Chart**  
**777-200ER/PW4090**

**Holding to Destination or Alternate**

FUEL & TIME REQUIRED ( LB, H:MIN )							
DIST (NM)	CRUISE ALTITUDE (1000 FT)						
	15	17	20	23	25	29	35
700					29200 1:51	28100 1:44	26800 1:37
600				26900 1:38	26100 1:36	25200 1:30	24300 1:25
500			24400 1:26	23700 1:23	23100 1:20	22400 1:16	21700 1:11
400		21600 1:13	20900 1:10	20500 1:07	20000 1:05	19500 1:02	19100 0:59
300	18300 0:56	17900 0:55	17500 0:53	17200 0:51	16900 0:50	16700 0:48	16500 0:46
200	14500 0:39	14200 0:38	14000 0:37	13900 0:35	13800 0:35	13800 0:34	14000 0:33
180	13700 0:35	13500 0:34	13300 0:34	13200 0:32	13200 0:32	13200 0:31	
160	12900 0:32	12800 0:31	12600 0:30	12600 0:29	12600 0:29	12600 0:28	
140	12100 0:28	12000 0:28	11900 0:27	11900 0:26	11900 0:26		
120	11400 0:25	11300 0:24	11300 0:23	11300 0:23	11300 0:23		
100	10600 0:21	10600 0:21	10600 0:20				
80	9800 0:17	9800 0:17					
70 LESS	9400 0:16	9400 0:16					

**Assumption**

**1. No wind:**

Add 2% (subtract 1%) fuel burn per 10 kts of headwind (tailwind) at cruise altitude, respectively

**2. Landing weight 400,000 lbs at origin destination:**

Add (subtract) 1.0% fuel burn for each 20,000 lbs for landing weight more (less) than 400,000 lbs

**3. Basis:**

- All engine operating
- Normal air conditioning
- Anti-ice off
- Begins at 15,000 MSL
- Climb at 310/M.84
- Cruise at LRC
- Descend at M.84/310/250
- Straight in approach
- Includes minimum fuel upon arrival (8,000 lbs)
- Distance reflects air miles.



## Engine Inoperative Go-Around Climb Gradient

777-200ER/PW4090

### Flaps 20, Gear Up

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.

OAT ( )	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
54	5.84	4.68				
50	6.79	5.56	4.37			
46	7.72	6.41	5.20	4.06		
42	8.56	7.23	5.98	4.77	3.66	
38	9.09	8.01	6.71	5.41	4.31	3.24
34	9.09	8.69	7.29	6.01	4.82	3.72
30	9.10	9.16	7.73	6.42	5.20	3.99
26	9.11	9.16	8.03	6.65	5.41	4.18
22	9.12	9.17	8.10	6.81	5.55	4.33
18	9.13	9.18	8.11	6.96	5.69	4.46
14	9.14	9.18	8.11	7.01	5.83	4.59
10	9.15	9.19	8.12	7.02	5.91	4.72

### Gradient Adjustment for Weight (%)

WEIGHT (1000 LB)	REFERENCE GO-AROUND GRADIENT (%)							
	3	4	5	6	7	8	9	10
600	-4.12	-4.52	-4.89	-5.26	-5.62	-5.97	-6.32	-6.69
550	-3.42	-3.74	-4.05	-4.35	-4.65	-4.93	-5.22	-5.52
500	-2.53	-2.77	-3.00	-3.22	-3.44	-3.65	-3.87	-4.08
450	-1.42	-1.55	-1.68	-1.80	-1.93	-2.05	-2.16	-2.28
400	0	0	0	0	0	0	0	0
350	1.83	1.99	2.15	2.32	2.48	2.66	2.85	3.05
300	4.30	4.66	5.05	5.44	5.85	6.28	6.72	7.14

### Gradient Adjustment for Speed (%)

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)									
	-2	0	2	4	6	8	10	12	14	16
VREF30	-0.25	-0.27	-0.29	-0.30	-0.32	-0.32	-0.32	-0.30	-0.29	-0.33
VREF30+5	0	0	0	0	0	0	0	0	0	0
VREF30+10	0.19	0.18	0.18	0.19	0.19	0.18	0.17	0.16	0.15	0.14
VREF30+20	0.42	0.41	0.40	0.39	0.35	0.30	0.25	0.21	0.18	0.13
VREF30+30	0.45	0.49	0.46	0.36	0.26	0.15	0.06	0.00	-0.05	-0.15

With engine bleed for packs off, increase gradient by 0.1%.

With engine and wing anti-ice on, decrease gradient by 0.1%.

When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C decrease gradient by 0.6%.

## All Engine Go-Around Climb Gradient

### Flaps 20, Gear Up

Based on ISA+20 , Vref 30+5, Engine bleed for packs on and anti-ice off

WEIGHT (1000 LB)	GO-AROUND GRADIENT (%)		
	PRESSURE ALTITUDE (FT)		
	0	4000	8000
630	12.80	10.40	7.58
460	22.08	18.43	14.35



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**777 Flight Crew Operations Manual**

**Performance Inflight - QRH**

**Chapter PI-QRH**

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777-200ER PW4090 LB FT FAA TO1-10 TO2-20 TALPA

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## General

The table below shows the airplanes that have been identified with the following performance package. Note, some airplanes may be identified with more than one performance package. This configuration table information reflects the Boeing delivered configuration updated for service bulletin incorporations in conformance with the policy stated in the introduction section of the FCOM. The performance data is prepared for the owner/operator named on the title page. The intent of this information is to assist flight crews and airlines in knowing which performance package is applicable to a given airplane. The performance package model identification information is based on Boeing's knowledge of the airline's fleet at a point in time approximately three months prior to the page date. Notice of Errata (NOE) will not be provided to airlines to identify airplanes that are moved between performance packages within this manual or airplanes added to the airline's fleet whose performance packages are already represented in this manual. These types of changes will be updated in the next block revision. Owners/operators are responsible for ensuring the operational documentation they are using is complete and matches the current configuration of their airplanes, and the accuracy and validity of all information furnished by the owner/operator or any other party. Owners/operators receiving active revision service are responsible to ensure that any modifications to the listed airplanes are properly reflected in this manual.

Airplane number is supplied by the operator. Registry number is supplied by the national regulatory agency. Serial and tabulation numbers are supplied by Boeing.

Airplane Number	Registry Number	Serial Number	Tabulation Number
116	HL7700	30859	WC114
117	HL7732	29174	WC115
118	HL7739	29175	WC116
119	HL7755	30861	WC118
120	HL7756	30860	WC119
121	HL7775	30862	WC120
122	HL7791	35525	WC581
123	HL8254	40198	WC586
124	HL8284	40199	WC587



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## Performance Inflight - QRH

## Chapter PI-QRH

## General

## Section 10

**Flight With Unreliable Airspeed / Turbulent Air Penetration**

Altitude and/or vertical speed indications may also be unreliable.

**Climb****Flaps Up, Set Max Climb Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)			
		350	450	550	650
40000 (.82M)	<b>PITCH ATT</b>	<b>3.5</b>	<b>3.5</b>		
	V/S (FT/MIN)	1300	500		
30000 (280 KIAS)	<b>PITCH ATT</b>	<b>4.5</b>	<b>4.0</b>	<b>4.0</b>	<b>4.5</b>
	V/S (FT/MIN)	2300	1500	1000	500
20000 (270 KIAS)	<b>PITCH ATT</b>	<b>7.0</b>	<b>6.5</b>	<b>6.0</b>	<b>6.5</b>
	V/S (FT/MIN)	3500	2500	1800	1200
10000 (270 KIAS)	<b>PITCH ATT</b>	<b>10.0</b>	<b>8.5</b>	<b>8.0</b>	<b>8.0</b>
	V/S (FT/MIN)	4600	3400	2600	2000
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b>	<b>13.0</b>	<b>11.0</b>	<b>10.0</b>	<b>9.5</b>
	V/S (FT/MIN)	5500	4100	3200	2500

**Cruise****Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)			
		350	450	550	650
40000 (.82M)	<b>PITCH ATT</b>	<b>2.0</b>	<b>2.5</b>		
	EPR (Alt Mode %N1)	1.115 (80.2)	1.291 (86.4)		
35000 (280 KIAS)	<b>PITCH ATT</b>	<b>1.5</b>	<b>2.0</b>	<b>2.5</b>	
	EPR (Alt Mode %N1)	1.044 (77.7)	1.113 (80.4)	1.240 (85.0)	
30000 (280 KIAS)	<b>PITCH ATT</b>	<b>1.5</b>	<b>2.0</b>	<b>3.0</b>	<b>3.5</b>
	EPR (Alt Mode %N1)	0.993 (74.2)	1.042 (76.9)	1.112 (80.2)	1.229 (85.1)
25000 (280 KIAS)	<b>PITCH ATT</b>	<b>1.5</b>	<b>2.5</b>	<b>3.0</b>	<b>4.0</b>
	EPR (Alt Mode %N1)	0.967 (70.7)	0.999 (73.1)	1.046 (76.4)	1.117 (80.2)
20000 (270 KIAS)	<b>PITCH ATT</b>	<b>1.5</b>	<b>2.5</b>	<b>3.5</b>	<b>4.5</b>
	EPR (Alt Mode %N1)	0.963 (66.5)	0.985 (68.7)	1.021 (72.0)	1.074 (76.4)
15000 (270 KIAS)	<b>PITCH ATT</b>	<b>1.5</b>	<b>2.5</b>	<b>3.5</b>	<b>4.5</b>
	EPR (Alt Mode %N1)	0.962 (63.7)	0.978 (65.5)	1.002 (68.3)	1.039 (71.9)

## Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

### Descent

#### Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)			
		350	450	550	650
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -2600	<b>-0.5</b> -2500		
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -2200	<b>-0.5</b> -1900	<b>0.5</b> -1800	<b>1.0</b> -1900
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -1800	<b>0.0</b> -1600	<b>1.0</b> -1600	<b>2.0</b> -1600
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -1800	<b>-0.5</b> -1500	<b>0.5</b> -1500	<b>1.5</b> -1500
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-2.0</b> -1600	<b>-0.5</b> -1400	<b>0.5</b> -1300	<b>1.5</b> -1300

### Holding

#### Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)			
		350	450	550	650
10000	<b>PITCH ATT</b>	<b>4.0</b>	<b>5.0</b>	<b>5.0</b>	<b>5.0</b>
	EPR	0.997	1.009	1.018	1.029
	(Alt Mode %N1) KIAS	(51.9) 200	(58.6) 217	(63.8) 238	(68.3) 259
5000	<b>PITCH ATT</b>	<b>4.0</b>	<b>4.5</b>	<b>5.0</b>	<b>5.0</b>
	EPR	0.995	1.004	1.010	1.017
	(Alt Mode %N1) KIAS	(48.2) 200	(54.1) 217	(59.8) 237	(64.3) 258

### Terminal Area (5000 FT)

#### Set Thrust for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)			
		350	450	550	650
FLAPS UP GEAR UP (VREF30+80)	<b>PITCH ATT</b>	<b>4.0</b>	<b>5.0</b>	<b>5.5</b>	<b>6.0</b>
	EPR	0.991	1.001	1.013	1.026
	(Alt Mode %N1) KIAS	(48.2) 203	(53.9) 216	(59.5) 231	(64.3) 245
FLAPS 1 GEAR UP (VREF30+60)	<b>PITCH ATT</b>	<b>5.5</b>	<b>6.5</b>	<b>7.0</b>	<b>7.5</b>
	EPR	1.005	1.017	1.031	1.049
	(Alt Mode %N1) KIAS	(48.6) 183	(54.6) 196	(60.5) 211	(65.7) 225
FLAPS 5 GEAR UP (VREF30+40)	<b>PITCH ATT</b>	<b>4.5</b>	<b>5.5</b>	<b>6.0</b>	<b>6.0</b>
	EPR	1.018	1.034	1.051	1.072
	(Alt Mode %N1) KIAS	(49.3) 163	(55.9) 176	(62.1) 191	(67.0) 205
FLAPS 15 GEAR UP (VREF30+20)	<b>PITCH ATT</b>	<b>5.5</b>	<b>6.5</b>	<b>6.5</b>	<b>7.0</b>
	EPR	1.033	1.053	1.077	1.102
	(Alt Mode %N1) KIAS	(51.3) 143	(58.7) 156	(64.4) 171	(69.5) 185
FLAPS 20 GEAR DOWN (VREF30+20)	<b>PITCH ATT</b>	<b>4.0</b>	<b>4.5</b>	<b>5.0</b>	<b>5.0</b>
	EPR	1.056	1.085	1.118	1.154
	(Alt Mode %N1) KIAS	(57.9) 143	(64.7) 156	(70.4) 171	(75.4) 185

### Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

#### Final Approach (1500 FT)

#### Gear Down, Set Thrust for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)			
		350	450	550	650
FLAPS 20 (VREF20+10)	<b>PITCH ATT</b>	<b>1.0</b>	<b>1.5</b>	<b>1.5</b>	<b>1.5</b>
	EPR	1.002	1.006	1.010	1.015
	(Alt Mode %N1)	(38.8)	(43.3)	(47.6)	(51.3)
	KIAS	140	158	174	188
FLAPS 25 (VREF25+10)	<b>PITCH ATT</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>
	EPR	1.030	1.039	1.050	1.064
	(Alt Mode %N1)	(48.3)	(53.9)	(58.7)	(62.9)
	KIAS	136	153	169	182
FLAPS 30 (VREF30+10)	<b>PITCH ATT</b>	<b>0.5</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>
	EPR	1.048	1.060	1.079	1.101
	(Alt Mode %N1)	(54.0)	(58.7)	(63.8)	(68.6)
	KIAS	133	146	161	175

### Go-Around

#### Flaps 20, Gear Up, Set Go-Around Thrust

#### Normal Mode

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)			
		350	450	550	650
10000	<b>PITCH ATT</b>	<b>16.0</b>	<b>12.5</b>	<b>10.5</b>	<b>9.0</b>
	V/S (FT/MIN)	3500	2600	1900	1500
	KIAS	140	157	171	185
5000	<b>PITCH ATT</b>	<b>19.5</b>	<b>15.5</b>	<b>12.5</b>	<b>10.5</b>
	V/S (FT/MIN)	4200	3200	2500	2000
	KIAS	140	157	171	185
SEA LEVEL	<b>PITCH ATT</b>	<b>22.5</b>	<b>18.0</b>	<b>14.5</b>	<b>12.5</b>
	V/S (FT/MIN)	4900	3800	3000	2500
	KIAS	143	156	171	185

#### Alternate Mode EEC

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)			
		350	450	550	650
10000	<b>PITCH ATT</b>	<b>15.5</b>	<b>12.0</b>	<b>10.0</b>	<b>8.5</b>
	V/S (FT/MIN)	3400	2500	1800	1400
	KIAS	140	157	171	185
5000	<b>PITCH ATT</b>	<b>19.0</b>	<b>15.0</b>	<b>12.5</b>	<b>10.5</b>
	V/S (FT/MIN)	4100	3100	2400	1900
	KIAS	140	157	171	185
SEA LEVEL	<b>PITCH ATT</b>	<b>22.0</b>	<b>17.5</b>	<b>14.0</b>	<b>12.0</b>
	V/S (FT/MIN)	4700	3600	2900	2300
	KIAS	143	156	171	185

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**Max Climb EPR**

**Based on engine bleed for packs on and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (IAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	.84	.84	.84
60	1.148	1.134	1.141	1.151	1.154	1.104	1.100	1.171	1.186	1.201
50	1.186	1.171	1.158	1.151	1.154	1.104	1.100	1.171	1.186	1.201
40	1.210	1.212	1.198	1.186	1.161	1.104	1.100	1.171	1.186	1.201
30	1.210	1.234	1.252	1.241	1.209	1.153	1.113	1.171	1.186	1.201
20	1.210	1.234	1.264	1.301	1.277	1.248	1.223	1.193	1.186	1.201
10	1.210	1.234	1.264	1.301	1.330	1.382	1.338	1.294	1.281	1.289
0	1.210	1.234	1.264	1.301	1.330	1.410	1.441	1.401	1.384	1.384
-10	1.210	1.234	1.264	1.301	1.330	1.410	1.458	1.487	1.474	1.472
-15 & BELOW	1.210	1.234	1.264	1.301	1.330	1.410	1.458	1.503	1.505	1.504

**EPR Adjustments for Engine Bleed**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	40	43
ENGINE ONLY	-0.016	-0.015	-0.017	-0.019	-0.019	-0.021
ENGINE & WING*	-0.022	-0.025	-0.030	-0.034	-0.038	-0.042
ENGINE & WING**	-0.029	-0.035	-0.043	-0.048	-0.056	-0.063

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, packs off, 1 bleed source.



777 Flight Crew Operations Manual

**Go-around EPR**

Based on engine bleed for packs on and anti-ice off

REPORTED OAT		TAT	AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	°C	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000
56	133	60	1.276	1.274	1.275	1.276	1.278	1.279	1.281	1.283	1.284	1.286	1.289
51	124	55	1.309	1.306	1.306	1.303	1.305	1.308	1.310	1.313	1.315	1.318	1.322
46	115	50	1.346	1.345	1.344	1.341	1.341	1.339	1.340	1.343	1.345	1.350	1.355
41	106	45	1.387	1.387	1.387	1.385	1.383	1.382	1.381	1.380	1.377	1.382	1.388
36	97	40	1.401	1.433	1.430	1.430	1.429	1.426	1.430	1.427	1.427	1.426	1.421
31	88	35	1.401	1.472	1.471	1.470	1.468	1.470	1.469	1.467	1.468	1.459	1.454
26	79	30	1.401	1.481	1.494	1.500	1.495	1.496	1.493	1.492	1.490	1.481	1.472
21	70	25	1.401	1.481	1.494	1.507	1.514	1.512	1.510	1.508	1.506	1.499	1.492
16	61	20	1.401	1.481	1.494	1.507	1.517	1.527	1.526	1.524	1.522	1.515	1.507
11	52	15	1.401	1.481	1.494	1.507	1.517	1.527	1.533	1.539	1.538	1.531	1.524
7	45	10	1.401	1.481	1.494	1.507	1.517	1.527	1.533	1.539	1.545	1.546	1.541
2 & BELOW	36 & BELOW	5 & BELOW	1.401	1.481	1.494	1.507	1.517	1.527	1.533	1.539	1.545	1.546	1.546

**EPR Adjustments for Engine Bleed**

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)						
	-1000	0	2000	4000	6000	8000	10000
PACKS OFF	0.013	0.013	0.014	0.016	0.017	0.018	0.020
2 PACKS ON - 2 BLEED SOURCES	0	0	0	0	0	0	0
2 PACKS ON - 1 BLEED SOURCE	-0.013	-0.014	-0.015	-0.016	-0.016	-0.018	-0.020
1 PACK ON - 2 BLEED SOURCES	-0.013	-0.014	-0.015	-0.016	-0.016	-0.018	-0.020
1 PACK ON - 1 BLEED SOURCE	-0.013	-0.014	-0.015	-0.016	-0.016	-0.018	-0.020
WING ANTI-ICE ON	-0.006	-0.006	-0.008	-0.008	-0.008	-0.009	-0.010

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**VREF**

**Flaps 30**

WEIGHT (1000 LB)	VREF (KIAS)					
	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
680	167	167	167	168	167	169
640	162	162	162	162	163	164
600	157	157	157	157	158	158
560	152	152	153	153	153	153
520	147	147	147	147	147	147
480	141	141	141	141	141	141
440	135	135	135	135	135	135
400	129	129	129	129	129	129
360	123	122	122	122	122	122
320	123	121	118	116	115	115

**Flaps 25**

WEIGHT (1000 LB)	VREF (KIAS)					
	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
680	175	175	175	174	176	175
640	170	170	170	170	170	170
600	165	165	165	165	165	165
560	160	160	160	160	160	161
520	154	154	154	154	154	155
480	148	148	148	148	148	148
440	142	142	142	142	142	142
400	135	135	135	135	135	135
360	128	128	128	128	128	128
320	123	121	121	121	121	121

**Flaps 20**

WEIGHT (1000 LB)	VREF (KIAS)					
	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
680	181	180	181	182	182	183
640	176	176	176	176	177	178
600	171	171	171	171	171	172
560	165	166	166	166	166	166
520	159	159	160	160	160	160
480	153	153	153	153	153	154
440	147	147	147	147	147	147
400	140	140	140	140	140	140
360	132	132	132	133	133	133
320	125	125	125	125	125	125



## Performance Inflight - QRH

## Chapter PI-QRH

## Advisory Information

## Section 11

## ADVISORY INFORMATION

## Runway Surface Condition Correlation

RUNWAY CONDITION CODE	RUNWAY SURFACE CONDITION DESCRIPTION	REPORTED BRAKING ACTION
6	Dry	Dry
5	Wet (Smooth, Grooved or PFC) or Frost 3 mm (0.12 inches) or less of: Water, Slush, Dry Snow or Wet Snow	Good
4	Compacted Snow at or below -15°C OAT	Good to Medium
3	Wet (Slippery), Dry Snow or Wet Snow (any depth) over Compacted Snow Greater than 3 mm (0.12 inches) of : Dry Snow or Wet Snow Compacted Snow at OAT warmer than -15°C	Medium
2	Greater than 3 mm (0.12 inches) of: Water or Slush	Medium to Poor
1	Ice	Poor
0	Wet Ice, Water on top of Compacted Snow, Dry Snow or Wet Snow over Ice	Nil

**ADVISORY INFORMATION**

**Normal Configuration Landing Distance**

**Flaps 30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF30	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3880	80/-30	70	-140/470	30/-30	70/-70	130	60	140
AUTOBRAKE MAX	5010	70/-50	100	-200/660	0/0	100/-100	240	0	0
AUTOBRAKE 4	6050	90/-60	140	-260/920	0/-20	150/-150	300	0	0
AUTOBRAKE 3	7120	120/-80	170	-330/1150	30/-50	180/-180	350	0	0
AUTOBRAKE 2	7770	140/-100	220	-380/1320	90/-140	210/-200	320	140	140
AUTOBRAKE 1	8250	150/-130	240	-430/1470	160/-200	220/-220	320	490	530

**Good Reported Braking Action**

MAX MANUAL	5080	70/-60	120	-220/790	120/-90	100/-100	180	240	560
AUTOBRAKE MAX	5410	80/-60	130	-230/830	90/-70	120/-120	230	250	580
AUTOBRAKE 4	6070	90/-60	140	-260/940	30/-20	150/-150	300	20	90
AUTOBRAKE 3	7120	120/-80	170	-330/1150	30/-50	180/-180	350	0	0
AUTOBRAKE 2	7770	140/-100	220	-380/1320	90/-140	210/-200	320	140	140
AUTOBRAKE 1	8250	150/-130	240	-430/1470	160/-200	220/-220	320	490	530

**Good To Medium Reported Braking Action**

MAX MANUAL	5850	90/-70	150	-280/1050	200/-160	130/-130	210	450	1100
AUTOBRAKE MAX	6030	100/-70	160	-290/1070	180/-130	140/-140	250	440	1090
AUTOBRAKE 4	6430	100/-70	160	-310/1130	140/-100	160/-160	290	320	860
AUTOBRAKE 3	7270	120/-90	180	-360/1280	110/-90	180/-180	350	150	550
AUTOBRAKE 2	7860	140/-110	220	-400/1410	150/-170	210/-200	320	220	470
AUTOBRAKE 1	8290	150/-130	240	-430/1520	210/-220	220/-220	320	530	720

**Medium Reported Braking Action**

MAX MANUAL	6610	120/-90	180	-350/1300	280/-220	160/-150	230	660	1630
AUTOBRAKE MAX	6660	120/-80	180	-360/1310	260/-180	160/-160	280	620	1600
AUTOBRAKE 4	6790	120/-80	180	-360/1320	250/-170	160/-160	290	620	1620
AUTOBRAKE 3	7430	120/-90	200	-390/1410	180/-130	180/-180	350	300	1090
AUTOBRAKE 2	7950	140/-120	220	-410/1500	210/-200	210/-210	320	300	810
AUTOBRAKE 1	8330	150/-130	240	-440/1580	250/-240	220/-220	320	580	910

**ADVISORY INFORMATION**

**Normal Configuration Landing Distance  
 Flaps 30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF30	ONE REV	NO REV

**Medium To Poor Reported Braking Action**

MAX MANUAL	7450	140/-110	220	-430/1670	450/-320	180/-180	250	1020	2730
AUTOBRAKE MAX	7490	140/-100	220	-440/1670	450/-300	180/-180	280	1010	2710
AUTOBRAKE 4	7570	140/-100	220	-440/1680	440/-300	190/-180	280	1010	2740
AUTOBRAKE 3	7980	140/-110	220	-460/1740	390/-250	200/-200	340	790	2420
AUTOBRAKE 2	8380	160/-130	240	-480/1800	400/-290	220/-210	320	700	2130
AUTOBRAKE 1	8670	160/-130	260	-490/1860	420/-320	220/-220	320	900	2090

**Poor Reported Braking Action**

MAX MANUAL	8290	160/-130	250	-520/2040	630/-410	210/-210	260	1380	3820
AUTOBRAKE MAX	8310	160/-130	250	-520/2040	640/-430	210/-210	280	1390	3830
AUTOBRAKE 4	8360	160/-130	250	-520/2050	630/-430	220/-210	260	1400	3860
AUTOBRAKE 3	8530	160/-130	250	-530/2070	600/-370	220/-220	330	1280	3750
AUTOBRAKE 2	8810	170/-140	260	-540/2100	590/-390	230/-220	310	1100	3450
AUTOBRAKE 1	9020	170/-140	280	-550/2140	590/-400	230/-230	320	1230	3280

Reference distance is based on sea level, standard day, no wind or slope, VREF30, two-engine maximum reverse thrust, and auto speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 220 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 180 ft.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

All reference distances and adjustments shown have been increased by 15%.

**ADVISORY INFORMATION**

**Normal Configuration Landing Distance  
Flaps 25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4030	90/-50	70	-140/480	50/-30	70/-70	130	70	160
AUTOBRAKE MAX	5310	70/-70	120	-210/690	0/0	120/-120	240	0	0
AUTOBRAKE 4	6470	90/-90	160	-280/950	10/-20	160/-160	310	0	0
AUTOBRAKE 3	7620	130/-130	200	-350/1200	50/-80	200/-200	330	10	10
AUTOBRAKE 2	8260	150/-150	240	-400/1370	130/-160	220/-220	320	280	280
AUTOBRAKE 1	8690	170/-160	260	-440/1520	200/-220	240/-230	320	680	780

**Good Reported Braking Action**

MAX MANUAL	5310	80/-80	130	-230/820	120/-100	120/-120	180	290	660
AUTOBRAKE MAX	5670	80/-80	130	-240/850	90/-60	130/-130	240	280	670
AUTOBRAKE 4	6490	100/-90	160	-290/980	30/-20	160/-160	310	20	90
AUTOBRAKE 3	7620	130/-130	200	-350/1200	50/-80	200/-200	330	10	10
AUTOBRAKE 2	8260	150/-150	240	-400/1370	130/-160	220/-220	320	280	280
AUTOBRAKE 1	8690	170/-160	260	-440/1520	200/-220	240/-230	320	680	780

**Good To Medium Reported Braking Action**

MAX MANUAL	6110	100/-100	160	-290/1070	200/-160	140/-140	210	520	1280
AUTOBRAKE MAX	6330	100/-100	160	-300/1090	180/-130	150/-140	260	500	1270
AUTOBRAKE 4	6830	120/-100	180	-330/1170	130/-100	170/-170	300	330	960
AUTOBRAKE 3	7790	130/-130	200	-370/1330	120/-120	200/-200	330	160	600
AUTOBRAKE 2	8340	150/-150	240	-410/1450	180/-190	220/-220	320	350	630
AUTOBRAKE 1	8740	170/-170	260	-440/1560	240/-240	240/-230	320	720	980

**Medium Reported Braking Action**

MAX MANUAL	6910	130/-120	200	-360/1320	280/-220	160/-160	230	750	1910
AUTOBRAKE MAX	6980	130/-120	200	-360/1330	260/-200	170/-160	280	720	1860
AUTOBRAKE 4	7160	130/-120	200	-370/1360	230/-170	170/-170	300	630	1830
AUTOBRAKE 3	7950	130/-130	210	-400/1460	180/-160	210/-200	330	310	1200
AUTOBRAKE 2	8430	150/-150	240	-430/1540	240/-220	220/-220	320	430	990
AUTOBRAKE 1	8790	170/-170	260	-450/1610	290/-260	240/-230	320	770	1180

**ADVISORY INFORMATION**

**Normal Configuration Landing Distance  
 Flaps 25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	ONE REV	NO REV

**Medium To Poor Reported Braking Action**

MAX MANUAL	7770	150/-140	230	-440/1700	450/-320	190/-180	250	1150	3170
AUTOBRAKE MAX	7820	150/-140	240	-440/1700	450/-310	200/-190	280	1140	3150
AUTOBRAKE 4	7940	150/-140	240	-450/1710	440/-300	200/-200	290	1100	3150
AUTOBRAKE 3	8470	150/-140	240	-470/1780	390/-270	220/-210	330	830	2730
AUTOBRAKE 2	8840	170/-160	260	-490/1840	420/-310	230/-220	320	850	2480
AUTOBRAKE 1	9130	180/-180	280	-510/1900	440/-350	250/-240	320	1100	2500

**Poor Reported Braking Action**

MAX MANUAL	8640	170/-160	260	-530/2070	630/-430	220/-210	260	1550	4430
AUTOBRAKE MAX	8660	170/-160	280	-530/2070	640/-430	220/-220	280	1560	4440
AUTOBRAKE 4	8720	170/-160	280	-530/2070	640/-430	220/-220	280	1580	4470
AUTOBRAKE 3	8990	170/-160	260	-540/2100	590/-380	230/-230	320	1350	4260
AUTOBRAKE 2	9260	180/-170	290	-550/2140	600/-400	240/-230	310	1280	3970
AUTOBRAKE 1	9480	180/-180	300	-560/2190	600/-430	250/-240	320	1430	3820

Reference distance is based on sea level, standard day, no wind or slope, VREF25, two-engine maximum reverse thrust, and auto speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 230 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 200 ft.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

All reference distances and adjustments shown have been increased by 15%.

**ADVISORY INFORMATION**

**Normal Configuration Landing Distance  
Flaps 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4160	90/-50	80	-140/490	50/-30	80/-80	140	80	180
AUTOBRAKE MAX	5540	80/-80	120	-210/700	0/0	130/-130	240	0	0
AUTOBRAKE 4	6800	100/-120	160	-290/990	0/-10	170/-170	330	0	0
AUTOBRAKE 3	8070	130/-140	210	-370/1240	30/-80	210/-210	360	10	10
AUTOBRAKE 2	8770	160/-170	250	-410/1410	120/-170	240/-230	350	250	250
AUTOBRAKE 1	9270	180/-180	290	-460/1580	200/-230	250/-250	350	710	770

**Good Reported Braking Action**

MAX MANUAL	5550	80/-80	140	-240/840	130/-100	130/-130	200	320	750
AUTOBRAKE MAX	5900	90/-90	140	-250/870	90/-70	140/-130	250	310	760
AUTOBRAKE 4	6820	100/-120	160	-300/1010	20/-20	170/-170	330	20	100
AUTOBRAKE 3	8070	130/-140	210	-370/1240	30/-80	210/-210	360	10	10
AUTOBRAKE 2	8770	160/-170	250	-410/1410	120/-170	240/-230	350	250	250
AUTOBRAKE 1	9270	180/-180	290	-460/1580	200/-230	250/-250	350	710	770

**Good To Medium Reported Braking Action**

MAX MANUAL	6420	100/-100	170	-300/1100	210/-170	160/-150	220	590	1480
AUTOBRAKE MAX	6620	120/-110	170	-310/1120	190/-140	160/-150	260	560	1450
AUTOBRAKE 4	7180	120/-120	180	-340/1200	140/-100	180/-180	330	390	1120
AUTOBRAKE 3	8230	130/-140	210	-390/1370	110/-120	210/-210	360	180	710
AUTOBRAKE 2	8870	160/-170	260	-430/1500	170/-200	240/-240	350	330	680
AUTOBRAKE 1	9320	180/-190	290	-470/1620	240/-250	260/-250	350	760	1000

**Medium Reported Braking Action**

MAX MANUAL	7290	130/-130	210	-370/1370	300/-240	180/-170	240	850	2210
AUTOBRAKE MAX	7340	140/-130	210	-370/1370	290/-210	180/-170	280	820	2150
AUTOBRAKE 4	7540	130/-130	210	-380/1390	250/-170	180/-180	320	750	2130
AUTOBRAKE 3	8400	140/-150	220	-410/1510	180/-160	220/-220	360	350	1410
AUTOBRAKE 2	8960	160/-170	260	-450/1590	230/-220	240/-240	350	410	1100
AUTOBRAKE 1	9360	180/-200	290	-470/1670	290/-280	260/-250	350	810	1230

**ADVISORY INFORMATION**

**Normal Configuration Landing Distance  
 Flaps 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

**Medium To Poor Reported Braking Action**

MAX MANUAL	8230	160/-160	250	-460/1750	490/-350	210/-200	260	1320	3690
AUTOBRAKE MAX	8260	160/-160	250	-460/1750	490/-330	210/-200	280	1300	3670
AUTOBRAKE 4	8400	160/-160	250	-470/1770	470/-320	210/-210	310	1270	3670
AUTOBRAKE 3	8960	160/-170	250	-490/1830	400/-290	240/-230	350	950	3210
AUTOBRAKE 2	9400	180/-180	290	-510/1900	430/-320	250/-250	340	910	2900
AUTOBRAKE 1	9720	200/-200	300	-530/1960	470/-360	270/-260	350	1180	2830

**Poor Reported Braking Action**

MAX MANUAL	9170	180/-180	300	-550/2130	680/-460	240/-230	290	1780	5180
AUTOBRAKE MAX	9190	180/-180	300	-550/2130	690/-460	240/-230	290	1780	5190
AUTOBRAKE 4	9250	200/-180	300	-550/2140	680/-460	240/-230	300	1790	5220
AUTOBRAKE 3	9530	180/-180	290	-560/2160	620/-410	250/-240	350	1560	5010
AUTOBRAKE 2	9830	200/-200	310	-580/2210	630/-430	260/-250	330	1410	4690
AUTOBRAKE 1	10070	210/-210	320	-590/2250	640/-450	280/-260	350	1560	4430

Reference distance is based on sea level, standard day, no wind or slope, VREF20, two-engine maximum reverse thrust, and auto speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 240 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 200 ft.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

All reference distances and adjustments shown have been increased by 15%.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**ADIRU/GPS DISAGREE (Flaps 25)**

**VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE NO REV REV

**Dry Runway**

MAX MANUAL	4160	100/-50	90	-170/580	70/-60	80/-80	140	160	350
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good Reported Braking Action**

MAX MANUAL	5460	90/-90	140	-270/960	170/-140	130/-120	190	470	1150
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good To Medium Reported Braking Action**

MAX MANUAL	6120	110/-100	170	-320/1210	270/-210	150/-140	200	720	1880
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Medium Reported Braking Action**

MAX MANUAL	6780	130/-120	200	-380/1460	370/-270	170/-160	220	980	2620
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Medium To Poor Reported Braking Action**

MAX MANUAL	7700	160/-140	240	-490/1940	740/-410	200/-190	230	1530	4620
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Poor Reported Braking Action**

MAX MANUAL	8620	180/-170	280	-590/2430	1100/-550	220/-210	250	2090	6620
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**ADIRU/GPS DISAGREE (Flaps 30)**

**VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)									
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ		
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV	

**Dry Runway**

MAX MANUAL	3990	90/-40	80	-160/570	70/-60	80/-80	140	130	300
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good Reported Braking Action**

MAX MANUAL	5220	80/-60	130	-260/950	170/-140	120/-120	190	410	980
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good To Medium Reported Braking Action**

MAX MANUAL	5860	100/-80	160	-320/1190	270/-200	140/-140	200	630	1610
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Medium Reported Braking Action**

MAX MANUAL	6490	120/-90	190	-380/1430	360/-270	160/-160	220	860	2250
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Medium To Poor Reported Braking Action**

MAX MANUAL	7390	150/-120	230	-480/1920	730/-410	190/-180	230	1370	4000
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Poor Reported Braking Action**

MAX MANUAL	8290	170/-140	260	-580/2400	1090/-550	210/-210	250	1880	5760
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**AIR DATA SYS (Flaps 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4080	80/-50	80	-140/480	50/-40	80/-80	150	100	210
AUTOBRAKE MAX	4820	70/-70	100	-180/610	0/0	110/-110	210	0	0
AUTOBRAKE 2	7880	130/-150	210	-370/1260	10/-70	220/-220	400	10	10

**Good Reported Braking Action**

MAX MANUAL	5420	80/-90	140	-230/800	130/-110	120/-120	210	370	870
AUTOBRAKE MAX	5400	90/-90	140	-230/800	120/-100	120/-120	230	350	840
AUTOBRAKE 2	7880	130/-150	210	-370/1260	10/-70	220/-220	400	10	10

**Good To Medium Reported Braking Action**

MAX MANUAL	6240	110/-110	180	-290/1040	220/-180	150/-150	240	670	1720
AUTOBRAKE MAX	6210	110/-110	180	-290/1040	230/-180	150/-150	250	650	1700
AUTOBRAKE 2	7990	140/-150	220	-390/1340	90/-110	220/-220	390	120	790

**Medium Reported Braking Action**

MAX MANUAL	7060	130/-130	210	-350/1280	310/-240	180/-170	270	960	2570
AUTOBRAKE MAX	7020	130/-130	210	-350/1280	330/-260	180/-170	270	950	2550
AUTOBRAKE 3	7470	130/-130	200	-370/1330	220/-100	190/-190	370	590	2220

**Medium To Poor Reported Braking Action**

MAX MANUAL	7940	160/-160	250	-440/1630	500/-350	210/-200	290	1460	4330
AUTOBRAKE MAX	7930	160/-160	260	-440/1630	530/-370	210/-200	290	1460	4330
AUTOBRAKE 3	8180	160/-150	250	-450/1650	460/-260	220/-210	360	1270	4150

**Poor Reported Braking Action**

MAX MANUAL	8820	190/-180	290	-520/1970	690/-460	230/-220	310	1960	6090
AUTOBRAKE MAX	8840	190/-180	300	-520/1970	720/-480	240/-220	310	1970	6100
AUTOBRAKE 3	8880	190/-170	300	-520/1970	700/-410	240/-230	350	1940	6080

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.



**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**Airspeed Unreliable (Flaps 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4390	80/-60	90	-150/500	50/-50	90/-90	N/A	120	260
AUTOBRAKE MAX	5250	70/-80	120	-190/650	0/0	120/-120	N/A	0	0
AUTOBRAKE 2	8680	150/-160	250	-390/1330	50/-120	240/-240	N/A	100	100

**Good Reported Braking Action**

MAX MANUAL	5840	90/-90	150	-240/830	140/-120	140/-130	N/A	430	1020
AUTOBRAKE MAX	5860	90/-90	150	-240/840	130/-110	140/-140	N/A	420	990
AUTOBRAKE 2	8680	150/-160	250	-390/1330	50/-120	240/-240	N/A	100	100

**Good To Medium Reported Braking Action**

MAX MANUAL	6720	110/-120	190	-310/1080	240/-190	170/-160	N/A	750	1950
AUTOBRAKE MAX	6710	110/-120	190	-300/1080	240/-200	170/-160	N/A	740	1930
AUTOBRAKE 2	8770	150/-160	250	-410/1410	130/-150	240/-240	N/A	210	890

**Medium Reported Braking Action**

MAX MANUAL	7590	140/-140	230	-370/1330	330/-260	200/-190	N/A	1080	2880
AUTOBRAKE MAX	7560	140/-140	240	-370/1320	350/-280	200/-190	N/A	1070	2860
AUTOBRAKE 3	8200	140/-140	230	-390/1400	210/-120	220/-220	N/A	570	2370

**Medium To Poor Reported Braking Action**

MAX MANUAL	8520	170/-160	280	-450/1670	520/-370	220/-220	N/A	1600	4730
AUTOBRAKE MAX	8510	170/-160	280	-450/1670	550/-390	230/-220	N/A	1600	4730
AUTOBRAKE 3	8890	160/-160	270	-470/1710	450/-270	240/-230	N/A	1310	4450

**Poor Reported Braking Action**

MAX MANUAL	9440	200/-190	320	-530/2020	720/-480	250/-240	N/A	2130	6590
AUTOBRAKE MAX	9450	200/-190	330	-530/2020	740/-500	260/-250	N/A	2130	6600
AUTOBRAKE 3	9580	190/-190	320	-540/2030	690/-430	260/-250	N/A	2050	6530

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**ANTISKID (Flaps 25)**

**VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	6010	110/-100	170	-310/1150	240/-190	140/-140	200	650	1660
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good Reported Braking Action**

MAX MANUAL	6010	110/-100	170	-310/1150	240/-190	140/-140	200	650	1660
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good To Medium Reported Braking Action**

MAX MANUAL	6760	130/-120	200	-390/1480	400/-280	170/-160	220	1000	2760
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Medium Reported Braking Action**

MAX MANUAL	7510	150/-140	230	-460/1800	550/-370	190/-180	230	1350	3850
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Medium To Poor Reported Braking Action**

MAX MANUAL	8790	190/-180	280	-630/2670	1240/-630	230/-220	250	2470	9930
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Poor Reported Braking Action**

MAX MANUAL	10060	220/-210	330	-790/3530	1920/-880	260/-250	260	3580	16010
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**ANTISKID (Flaps 30)**

**VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)									
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ		
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV	

**Dry Runway**

MAX MANUAL	5750	100/-80	160	-300/1130	240/-190	140/-130	200	570	1420
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good Reported Braking Action**

MAX MANUAL	5750	100/-80	160	-300/1130	240/-190	140/-130	200	570	1420
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good To Medium Reported Braking Action**

MAX MANUAL	6480	120/-100	190	-380/1450	400/-280	160/-160	220	890	2370
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Medium Reported Braking Action**

MAX MANUAL	7210	140/-110	220	-450/1770	550/-360	180/-180	230	1200	3320
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Medium To Poor Reported Braking Action**

MAX MANUAL	8450	180/-150	270	-620/2630	1220/-620	220/-210	250	2240	8790
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Poor Reported Braking Action**

MAX MANUAL	9690	210/-180	310	-780/3490	1880/-870	250/-240	260	3280	14260
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**ENG SHUTDOWN L, R (Flaps 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

**Dry Runway**

MAX MANUAL	3670	90/-50	70	-130/440	40/-40	70/-70	120	0	80
AUTOBRAKE MAX	4820	70/-70	100	-180/610	0/0	110/-110	210	0	0
AUTOBRAKE 2	7830	130/-140	210	-370/1250	30/-50	220/-220	400	0	0

**Good Reported Braking Action**

MAX MANUAL	5050	80/-80	120	-220/770	130/-110	120/-120	180	0	360
AUTOBRAKE MAX	5360	80/-80	130	-230/800	110/-90	120/-120	220	0	370
AUTOBRAKE 2	7830	130/-140	210	-370/1250	30/-50	220/-220	400	0	0

**Good To Medium Reported Braking Action**

MAX MANUAL	6000	100/-110	160	-290/1040	240/-190	150/-150	220	0	730
AUTOBRAKE MAX	6160	110/-110	170	-300/1060	230/-170	150/-150	250	0	730
AUTOBRAKE 2	7950	140/-150	220	-390/1350	120/-90	220/-220	400	0	260

**Medium Reported Braking Action**

MAX MANUAL	6940	120/-130	200	-360/1310	340/-270	180/-180	250	0	1100
AUTOBRAKE MAX	6950	130/-130	200	-360/1310	340/-240	180/-180	280	0	1080
AUTOBRAKE 3	7490	130/-130	210	-380/1370	260/-160	200/-200	340	0	830

**Medium To Poor Reported Braking Action**

MAX MANUAL	8060	160/-160	250	-460/1710	610/-420	220/-220	280	0	1890
AUTOBRAKE MAX	8080	160/-160	250	-460/1710	620/-410	220/-220	290	0	1880
AUTOBRAKE 3	8400	160/-160	260	-470/1750	580/-360	230/-230	330	0	1770

**Poor Reported Braking Action**

MAX MANUAL	9180	190/-180	290	-560/2110	870/-560	250/-250	300	0	2670
AUTOBRAKE MAX	9200	190/-190	290	-560/2110	890/-570	260/-250	300	0	2670
AUTOBRAKE 3	9310	190/-190	300	-560/2120	890/-550	260/-250	310	0	2710

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance  
 ENG SHUTDOWN L, R (Flaps 30)  
 VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3400	70/-30	60	-120/410	40/-30	60/-60	120	0	60
AUTOBRAKE MAX	4360	60/-40	90	-170/570	0/0	90/-90	200	0	0
AUTOBRAKE 2	6860	110/-80	180	-340/1160	30/-40	180/-180	360	0	0

**Good Reported Braking Action**

MAX MANUAL	4580	70/-50	100	-200/730	110/-100	100/-100	170	0	260
AUTOBRAKE MAX	4870	70/-50	110	-220/760	100/-80	110/-110	210	0	270
AUTOBRAKE 2	6860	110/-80	180	-340/1160	30/-40	180/-180	360	0	0

**Good To Medium Reported Braking Action**

MAX MANUAL	5390	90/-70	140	-270/980	210/-170	130/-130	200	0	530
AUTOBRAKE MAX	5550	90/-70	140	-280/1000	200/-140	140/-140	240	0	530
AUTOBRAKE 2	6980	120/-80	190	-360/1260	110/-80	190/-190	360	0	190

**Medium Reported Braking Action**

MAX MANUAL	6190	110/-80	170	-330/1230	300/-230	150/-150	230	0	790
AUTOBRAKE MAX	6220	110/-80	170	-340/1230	290/-200	160/-160	270	0	780
AUTOBRAKE 3	6620	110/-80	180	-350/1280	250/-150	170/-170	310	0	610

**Medium To Poor Reported Braking Action**

MAX MANUAL	7150	140/-110	210	-430/1610	540/-360	190/-180	250	0	1350
AUTOBRAKE MAX	7170	140/-110	210	-430/1610	540/-350	190/-190	270	0	1340
AUTOBRAKE 3	7420	140/-110	220	-440/1640	520/-320	200/-200	300	0	1270

**Poor Reported Braking Action**

MAX MANUAL	8100	160/-130	240	-520/1990	770/-490	220/-210	270	0	1900
AUTOBRAKE MAX	8120	160/-130	250	-520/1990	780/-500	220/-220	270	0	1900
AUTOBRAKE 3	8210	160/-130	250	-520/2000	780/-480	220/-220	280	0	1930

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**FLAP / SLAT CONTROL (Flaps 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3600	80/-40	70	-120/420	40/-30	70/-70	110	70	150
AUTOBRAKE MAX	4820	70/-70	100	-180/610	0/0	110/-110	210	0	0
AUTOBRAKE 2	7560	140/-150	220	-360/1220	120/-150	200/-200	290	270	270

**Good Reported Braking Action**

MAX MANUAL	4790	70/-70	110	-200/720	100/-90	110/-100	160	270	630
AUTOBRAKE MAX	5120	80/-80	120	-220/760	70/-50	110/-110	220	250	630
AUTOBRAKE 2	7560	140/-150	220	-360/1220	120/-150	200/-200	290	270	270

**Good To Medium Reported Braking Action**

MAX MANUAL	5530	90/-90	150	-260/950	180/-150	130/-130	190	500	1230
AUTOBRAKE MAX	5720	100/-100	150	-270/970	160/-120	140/-130	230	470	1210
AUTOBRAKE 2	7640	140/-150	220	-380/1300	170/-180	210/-200	290	340	610

**Medium Reported Braking Action**

MAX MANUAL	6260	110/-110	180	-320/1180	250/-200	150/-150	210	720	1830
AUTOBRAKE MAX	6320	110/-110	180	-320/1180	240/-180	160/-150	240	690	1780
AUTOBRAKE 3	7250	120/-130	190	-360/1300	160/-140	190/-190	300	290	1130

**Medium To Poor Reported Braking Action**

MAX MANUAL	7060	140/-130	220	-400/1510	420/-300	180/-180	230	1100	3050
AUTOBRAKE MAX	7100	140/-130	220	-400/1510	420/-290	190/-180	240	1090	3030
AUTOBRAKE 3	7730	140/-150	220	-420/1590	350/-250	210/-200	300	780	2620

**Poor Reported Braking Action**

MAX MANUAL	7860	160/-150	250	-470/1830	580/-390	200/-200	240	1480	4270
AUTOBRAKE MAX	7880	160/-150	250	-470/1840	590/-390	210/-200	240	1490	4280
AUTOBRAKE 3	8200	160/-160	250	-480/1870	530/-350	220/-210	290	1270	4100

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**FLAPS DRIVE (Flaps ≤ 5)**

**VREF30 + 40**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4290	120/-50	90	-140/490	50/-40	90/-90	130	130	300
AUTOBRAKE MAX	6100	80/-50	140	-210/710	0/0	150/-150	250	0	0
AUTOBRAKE 2	9680	170/-150	320	-420/1400	180/-230	280/-270	320	820	820

**Good Reported Braking Action**

MAX MANUAL	5620	80/-60	150	-220/780	120/-100	130/-130	160	410	990
AUTOBRAKE MAX	6320	80/-50	160	-240/850	50/-40	150/-150	250	240	800
AUTOBRAKE 2	9680	170/-150	320	-420/1400	180/-230	280/-270	320	820	820

**Good To Medium Reported Braking Action**

MAX MANUAL	6560	110/-80	190	-290/1030	200/-170	160/-160	190	760	1990
AUTOBRAKE MAX	6970	110/-80	200	-300/1070	160/-120	180/-170	250	660	1870
AUTOBRAKE 2	9760	180/-150	320	-430/1480	230/-260	280/-270	320	890	1280

**Medium Reported Braking Action**

MAX MANUAL	7490	130/-100	230	-350/1270	280/-230	190/-190	210	1100	2990
AUTOBRAKE MAX	7610	130/-100	240	-350/1280	260/-200	200/-190	240	1080	2930
AUTOBRAKE 3	9340	150/-130	280	-420/1470	190/-210	260/-250	320	520	1740

**Medium To Poor Reported Braking Action**

MAX MANUAL	8490	160/-130	280	-440/1620	460/-340	230/-220	240	1690	5120
AUTOBRAKE MAX	8570	160/-130	290	-440/1630	460/-320	230/-220	250	1680	5100
AUTOBRAKE 3	9790	170/-150	310	-480/1760	390/-310	270/-260	320	1170	4270

**Poor Reported Braking Action**

MAX MANUAL	9490	190/-150	330	-520/1970	640/-440	260/-240	260	2270	7240
AUTOBRAKE MAX	9530	190/-150	330	-520/1970	650/-440	260/-250	260	2270	7260
AUTOBRAKE 3	10230	190/-160	340	-540/2040	580/-400	280/-270	320	1820	6800

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**FLAPS DRIVE (5 < Flaps < 20)**

**VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3790	90/-30	70	-130/440	40/-40	70/-70	120	90	200
AUTOBRAKE MAX	5180	70/-40	110	-190/640	0/0	120/-120	220	0	0
AUTOBRAKE 2	8220	150/-120	250	-380/1280	120/-180	230/-220	310	400	400

**Good Reported Braking Action**

MAX MANUAL	5080	70/-60	130	-210/750	110/-100	110/-110	170	340	820
AUTOBRAKE MAX	5440	80/-50	130	-220/780	70/-50	130/-120	220	300	800
AUTOBRAKE 2	8220	150/-120	250	-380/1280	120/-180	230/-220	310	400	400

**Good To Medium Reported Braking Action**

MAX MANUAL	5880	100/-80	170	-270/980	190/-160	140/-140	200	630	1630
AUTOBRAKE MAX	6090	100/-70	170	-280/1000	170/-130	150/-140	230	590	1600
AUTOBRAKE 2	8300	150/-130	260	-400/1360	170/-200	230/-220	310	470	850

**Medium Reported Braking Action**

MAX MANUAL	6670	120/-90	200	-330/1210	260/-210	170/-160	220	910	2440
AUTOBRAKE MAX	6730	120/-90	200	-330/1220	260/-200	170/-160	230	870	2400
AUTOBRAKE 3	7900	130/-100	220	-380/1360	150/-160	210/-210	310	350	1560

**Medium To Poor Reported Braking Action**

MAX MANUAL	7520	150/-110	240	-410/1550	430/-310	200/-190	240	1380	4100
AUTOBRAKE MAX	7580	150/-110	240	-410/1550	440/-310	200/-190	250	1370	4100
AUTOBRAKE 3	8370	150/-120	250	-440/1650	350/-270	220/-220	310	960	3550

**Poor Reported Braking Action**

MAX MANUAL	8370	170/-130	280	-490/1880	600/-400	220/-210	250	1850	5750
AUTOBRAKE MAX	8420	170/-130	280	-490/1880	610/-410	220/-210	260	1860	5790
AUTOBRAKE 3	8830	170/-130	280	-500/1930	540/-370	230/-230	300	1570	5540

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**FLAPS DRIVE (Flaps ≥ 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3620	80/-40	70	-120/430	40/-30	70/-70	120	70	160
AUTOBRAKE MAX	4820	70/-70	100	-180/610	0/0	110/-110	210	0	0
AUTOBRAKE 2	7630	140/-150	220	-360/1230	100/-150	210/-200	300	220	220

**Good Reported Braking Action**

MAX MANUAL	4830	70/-70	120	-210/730	110/-90	110/-110	170	280	650
AUTOBRAKE MAX	5130	80/-80	120	-220/760	80/-60	120/-110	220	270	660
AUTOBRAKE 2	7630	140/-150	220	-360/1230	100/-150	210/-200	300	220	220

**Good To Medium Reported Braking Action**

MAX MANUAL	5590	90/-90	150	-270/960	190/-150	140/-130	190	510	1290
AUTOBRAKE MAX	5760	100/-100	150	-270/980	170/-120	140/-130	230	490	1270
AUTOBRAKE 2	7710	140/-150	230	-380/1310	150/-170	210/-210	300	290	590

**Medium Reported Braking Action**

MAX MANUAL	6340	110/-110	180	-320/1190	260/-210	160/-150	210	740	1920
AUTOBRAKE MAX	6380	120/-110	180	-320/1190	250/-180	160/-150	240	710	1870
AUTOBRAKE 3	7300	120/-130	190	-360/1310	160/-140	190/-190	310	300	1230

**Medium To Poor Reported Braking Action**

MAX MANUAL	7160	140/-140	220	-400/1520	430/-310	190/-180	230	1150	3210
AUTOBRAKE MAX	7190	140/-140	220	-400/1520	430/-290	190/-180	250	1130	3190
AUTOBRAKE 3	7800	140/-150	220	-430/1600	350/-250	210/-200	310	830	2800

**Poor Reported Braking Action**

MAX MANUAL	7970	160/-160	260	-480/1850	590/-400	210/-200	250	1550	4500
AUTOBRAKE MAX	7990	160/-160	260	-480/1850	600/-400	210/-200	250	1550	4510
AUTOBRAKE 3	8290	160/-160	250	-490/1880	540/-360	220/-210	300	1360	4360

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**FLAPS PRIMARY FAIL (Flaps 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4000	80/-50	80	-140/470	40/-40	80/-80	140	90	190
AUTOBRAKE MAX	4820	70/-70	100	-180/610	0/0	110/-110	210	0	0
AUTOBRAKE 2	7830	140/-150	220	-370/1250	30/-100	210/-210	360	70	70

**Good Reported Braking Action**

MAX MANUAL	5280	80/-80	130	-220/780	120/-100	120/-120	200	330	780
AUTOBRAKE MAX	5320	80/-80	130	-230/790	110/-100	120/-120	220	330	770
AUTOBRAKE 2	7830	140/-150	220	-370/1250	30/-100	210/-210	360	70	70

**Good To Medium Reported Braking Action**

MAX MANUAL	6070	100/-100	170	-280/1020	210/-170	150/-140	230	600	1530
AUTOBRAKE MAX	6070	110/-100	170	-290/1020	210/-170	150/-150	240	600	1520
AUTOBRAKE 2	7920	140/-150	220	-390/1330	110/-130	220/-210	360	160	640

**Medium Reported Braking Action**

MAX MANUAL	6850	120/-120	200	-340/1250	290/-230	170/-160	250	870	2280
AUTOBRAKE MAX	6810	130/-120	200	-340/1250	310/-240	170/-170	250	860	2260
AUTOBRAKE 3	7410	130/-130	200	-370/1320	190/-110	190/-190	360	430	1810

**Medium To Poor Reported Braking Action**

MAX MANUAL	7700	150/-150	240	-420/1590	470/-330	200/-190	270	1320	3800
AUTOBRAKE MAX	7680	160/-150	240	-420/1590	490/-350	200/-200	270	1320	3800
AUTOBRAKE 3	8040	160/-150	240	-440/1630	410/-250	210/-210	350	1070	3550

**Poor Reported Braking Action**

MAX MANUAL	8540	180/-170	280	-500/1930	650/-430	220/-210	280	1770	5320
AUTOBRAKE MAX	8550	180/-170	280	-500/1930	670/-450	230/-220	280	1770	5330
AUTOBRAKE 3	8670	180/-170	280	-510/1940	620/-390	230/-220	340	1700	5280

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**FLIGHT CONTROL MODE (Flaps 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4080	80/-50	80	-140/480	50/-40	80/-80	150	100	210
AUTOBRAKE MAX	4820	70/-70	100	-180/610	0/0	110/-110	210	0	0
AUTOBRAKE 2	7880	130/-150	210	-370/1260	10/-70	220/-220	400	10	10

**Good Reported Braking Action**

MAX MANUAL	5420	80/-90	140	-230/800	130/-110	120/-120	210	370	870
AUTOBRAKE MAX	5400	90/-90	140	-230/800	120/-100	120/-120	230	350	840
AUTOBRAKE 2	7880	130/-150	210	-370/1260	10/-70	220/-220	400	10	10

**Good To Medium Reported Braking Action**

MAX MANUAL	6240	110/-110	180	-290/1040	220/-180	150/-150	240	670	1720
AUTOBRAKE MAX	6210	110/-110	180	-290/1040	230/-180	150/-150	250	650	1700
AUTOBRAKE 2	7990	140/-150	220	-390/1340	90/-110	220/-220	390	120	790

**Medium Reported Braking Action**

MAX MANUAL	7060	130/-130	210	-350/1280	310/-240	180/-170	270	960	2570
AUTOBRAKE MAX	7020	130/-130	210	-350/1280	330/-260	180/-170	270	950	2550
AUTOBRAKE 3	7470	130/-130	200	-370/1330	220/-100	190/-190	370	590	2220

**Medium To Poor Reported Braking Action**

MAX MANUAL	7940	160/-160	250	-440/1630	500/-350	210/-200	290	1460	4330
AUTOBRAKE MAX	7930	160/-160	260	-440/1630	530/-370	210/-200	290	1460	4330
AUTOBRAKE 3	8180	160/-150	250	-450/1650	460/-260	220/-210	360	1270	4150

**Poor Reported Braking Action**

MAX MANUAL	8820	190/-180	290	-520/1970	690/-460	230/-220	310	1960	6090
AUTOBRAKE MAX	8840	190/-180	300	-520/1970	720/-480	240/-220	310	1970	6100
AUTOBRAKE 3	8880	190/-170	300	-520/1970	700/-410	240/-230	350	1940	6080

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**FLIGHT CONTROLS (Flaps 20)**

**VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4420	70/-30	100	-150/510	70/-60	90/-90	200	160	370
AUTOBRAKE MAX	5180	70/-40	110	-190/640	0/0	120/-120	220	0	30
AUTOBRAKE 2	8580	140/-110	240	-390/1320	30/-100	240/-240	400	60	60

**Good Reported Braking Action**

MAX MANUAL	5940	90/-60	160	-250/850	170/-150	140/-140	260	530	1320
AUTOBRAKE MAX	5940	90/-60	160	-250/850	160/-140	150/-140	260	490	1260
AUTOBRAKE 2	8580	140/-110	240	-390/1320	30/-100	240/-240	400	60	60

**Good To Medium Reported Braking Action**

MAX MANUAL	6820	120/-90	200	-310/1100	270/-220	170/-170	280	900	2410
AUTOBRAKE MAX	6820	120/-90	210	-310/1100	270/-220	180/-170	280	880	2380
AUTOBRAKE 2	8690	140/-110	250	-410/1410	100/-140	240/-240	400	230	1290

**Medium Reported Braking Action**

MAX MANUAL	7700	150/-110	250	-380/1350	370/-290	200/-200	300	1260	3510
AUTOBRAKE MAX	7700	150/-110	250	-380/1350	380/-300	210/-200	300	1260	3510
AUTOBRAKE 3	8120	140/-90	230	-390/1400	240/-120	220/-210	390	930	3210

**Medium To Poor Reported Braking Action**

MAX MANUAL	8610	170/-130	290	-460/1700	570/-400	230/-220	320	1820	5580
AUTOBRAKE MAX	8620	180/-130	290	-460/1700	580/-420	230/-220	320	1830	5590
AUTOBRAKE 3	8850	170/-120	280	-470/1720	510/-280	240/-230	380	1650	5430

**Poor Reported Braking Action**

MAX MANUAL	9520	200/-160	340	-540/2040	770/-520	260/-250	330	2380	7650
AUTOBRAKE MAX	9540	210/-160	340	-540/2050	790/-530	260/-250	330	2390	7670
AUTOBRAKE 3	9570	200/-140	340	-540/2050	770/-440	260/-250	370	2360	7650

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**HYD PRESS SYS C (Flaps 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4000	80/-50	80	-140/470	40/-40	80/-80	140	90	190
AUTOBRAKE MAX	4820	70/-70	100	-180/610	0/0	110/-110	210	0	0
AUTOBRAKE 2	7830	140/-150	220	-370/1250	30/-100	210/-210	360	70	70

**Good Reported Braking Action**

MAX MANUAL	5280	80/-80	130	-220/780	120/-100	120/-120	200	330	780
AUTOBRAKE MAX	5320	80/-80	130	-230/790	110/-100	120/-120	220	330	770
AUTOBRAKE 2	7830	140/-150	220	-370/1250	30/-100	210/-210	360	70	70

**Good To Medium Reported Braking Action**

MAX MANUAL	6070	100/-100	170	-280/1020	210/-170	150/-140	230	600	1530
AUTOBRAKE MAX	6070	110/-100	170	-290/1020	210/-170	150/-150	240	600	1520
AUTOBRAKE 2	7920	140/-150	220	-390/1330	110/-130	220/-210	360	160	640

**Medium Reported Braking Action**

MAX MANUAL	6850	120/-120	200	-340/1250	290/-230	170/-160	250	870	2280
AUTOBRAKE MAX	6810	130/-120	200	-340/1250	310/-240	170/-170	250	860	2260
AUTOBRAKE 3	7410	130/-130	200	-370/1320	190/-110	190/-190	360	430	1810

**Medium To Poor Reported Braking Action**

MAX MANUAL	7700	150/-150	240	-420/1590	470/-330	200/-190	270	1320	3800
AUTOBRAKE MAX	7680	160/-150	240	-420/1590	490/-350	200/-200	270	1320	3800
AUTOBRAKE 3	8040	160/-150	240	-440/1630	410/-250	210/-210	350	1070	3550

**Poor Reported Braking Action**

MAX MANUAL	8540	180/-170	280	-500/1930	650/-430	220/-210	280	1770	5320
AUTOBRAKE MAX	8550	180/-170	280	-500/1930	670/-450	230/-220	280	1770	5330
AUTOBRAKE 3	8670	180/-170	280	-510/1940	620/-390	230/-220	340	1700	5280

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**HYD PRESS SYS L (Flaps 25)**

**VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

**Dry Runway**

MAX MANUAL	3710	80/-40	70	-130/450	50/-40	70/-70	140	0	90
AUTOBRAKE MAX	4620	60/-60	100	-180/600	0/0	100/-100	210	0	0
AUTOBRAKE 2	7480	120/-120	200	-360/1220	10/-30	200/-200	400	0	0

**Good Reported Braking Action**

MAX MANUAL	5110	80/-70	130	-230/800	140/-120	120/-120	200	0	390
AUTOBRAKE MAX	5320	80/-80	130	-230/820	120/-100	120/-120	230	0	400
AUTOBRAKE 2	7480	120/-120	200	-360/1220	10/-30	200/-200	400	0	0

**Good To Medium Reported Braking Action**

MAX MANUAL	6080	100/-100	170	-310/1090	260/-210	150/-150	240	0	810
AUTOBRAKE MAX	6190	100/-100	170	-310/1100	260/-200	160/-150	250	0	810
AUTOBRAKE 2	7650	130/-130	210	-390/1340	120/-90	210/-210	400	0	370

**Medium Reported Braking Action**

MAX MANUAL	7050	120/-120	210	-380/1370	380/-290	180/-180	270	0	1220
AUTOBRAKE MAX	7050	120/-120	210	-380/1370	390/-300	190/-180	270	0	1220
AUTOBRAKE 3	7370	130/-120	210	-390/1400	330/-210	190/-190	330	0	1150

**Medium To Poor Reported Braking Action**

MAX MANUAL	8250	150/-150	270	-490/1830	710/-460	220/-220	300	0	2130
AUTOBRAKE MAX	8260	150/-150	270	-490/1830	730/-470	230/-220	300	0	2130
AUTOBRAKE 3	8470	160/-150	270	-500/1850	680/-430	230/-230	330	0	2110

**Poor Reported Braking Action**

MAX MANUAL	9440	180/-170	320	-600/2290	1040/-630	260/-250	320	0	3030
AUTOBRAKE MAX	9460	180/-170	320	-600/2290	1060/-640	260/-260	320	0	3040
AUTOBRAKE 3	9560	190/-180	320	-600/2300	1030/-640	270/-260	320	0	3070

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**HYD PRESS SYS L (Flaps 30)**

**VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3560	70/-30	70	-130/440	40/-40	70/-70	140	0	80
AUTOBRAKE MAX	4360	60/-40	90	-170/570	0/0	90/-90	210	0	0
AUTOBRAKE 2	6950	110/-80	180	-340/1170	0/-30	180/-180	380	0	0

**Good Reported Braking Action**

MAX MANUAL	4880	70/-50	120	-220/780	140/-120	110/-110	200	0	340
AUTOBRAKE MAX	5050	70/-50	120	-230/800	110/-100	120/-120	230	0	330
AUTOBRAKE 2	6950	110/-80	180	-340/1170	0/-30	180/-180	380	0	0

**Good To Medium Reported Braking Action**

MAX MANUAL	5810	100/-70	160	-300/1060	260/-210	140/-140	240	0	700
AUTOBRAKE MAX	5900	100/-70	160	-300/1070	250/-200	150/-150	250	0	690
AUTOBRAKE 2	7130	120/-80	190	-370/1290	120/-90	190/-190	380	0	360

**Medium Reported Braking Action**

MAX MANUAL	6740	120/-90	190	-370/1340	380/-290	170/-170	270	0	1050
AUTOBRAKE MAX	6740	120/-90	200	-370/1340	390/-290	180/-170	270	0	1050
AUTOBRAKE 3	6960	120/-80	200	-380/1370	350/-220	180/-180	320	0	1060

**Medium To Poor Reported Braking Action**

MAX MANUAL	7890	150/-120	250	-480/1800	710/-450	210/-210	300	0	1850
AUTOBRAKE MAX	7910	150/-120	250	-480/1800	720/-460	220/-210	300	0	1850
AUTOBRAKE 3	8060	150/-110	250	-490/1820	690/-430	220/-220	320	0	1870

**Poor Reported Braking Action**

MAX MANUAL	9040	170/-140	300	-590/2260	1030/-610	250/-240	320	0	2640
AUTOBRAKE MAX	9070	170/-140	300	-590/2260	1050/-630	250/-240	320	0	2650
AUTOBRAKE 3	9160	180/-140	300	-590/2270	1020/-630	250/-250	320	0	2680

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**HYD PRESS SYS L+C (Flaps 20)**

**VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

**Dry Runway**

MAX MANUAL	4530	80/-30	100	-160/530	60/-60	90/-90	180	0	150
AUTOBRAKE MAX	5180	70/-40	110	-190/640	0/0	120/-120	220	0	0
AUTOBRAKE 2	8630	140/-90	240	-390/1330	0/0	240/-240	460	0	0

**Good Reported Braking Action**

MAX MANUAL	6310	90/-60	170	-270/920	190/-160	150/-150	260	0	620
AUTOBRAKE MAX	6260	90/-60	170	-270/920	180/-150	160/-160	280	0	590
AUTOBRAKE 2	8630	140/-90	240	-390/1330	0/0	240/-240	460	0	0

**Good To Medium Reported Braking Action**

MAX MANUAL	7520	120/-90	220	-360/1240	350/-280	200/-190	300	0	1260
AUTOBRAKE MAX	7480	120/-90	230	-360/1240	360/-280	200/-200	320	0	1240
AUTOBRAKE 2	8860	150/-100	260	-420/1460	200/-80	250/-250	460	0	790

**Medium Reported Braking Action**

MAX MANUAL	8730	150/-110	270	-440/1550	510/-390	240/-230	340	0	1890
AUTOBRAKE MAX	8700	150/-110	280	-440/1550	540/-410	240/-230	350	0	1880
AUTOBRAKE 3	8790	160/-110	280	-440/1560	520/-310	240/-240	370	0	1910

**Medium To Poor Reported Braking Action**

MAX MANUAL	10200	190/-150	340	-570/2060	920/-600	290/-280	380	0	3290
AUTOBRAKE MAX	10200	190/-150	350	-570/2060	960/-630	290/-280	380	0	3290
AUTOBRAKE 3	10250	200/-150	350	-570/2060	940/-570	290/-290	400	0	3310

**Poor Reported Braking Action**

MAX MANUAL	11670	230/-180	410	-690/2560	1330/-810	330/-320	410	0	4690
AUTOBRAKE MAX	11690	230/-180	420	-690/2560	1370/-840	340/-330	410	0	4700
AUTOBRAKE 3	11710	230/-180	420	-690/2560	1360/-820	340/-330	420	0	4710

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.



**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**HYD PRESS SYS L+R (Flaps 20)**

**VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4890	70/-40	110	-190/630	100/-90	110/-110	210	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good Reported Braking Action**

MAX MANUAL	7390	110/-70	200	-340/1170	350/-280	200/-200	320	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good To Medium Reported Braking Action**

MAX MANUAL	9370	150/-100	280	-480/1670	760/-530	270/-270	390	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Medium Reported Braking Action**

MAX MANUAL	11340	180/-130	360	-610/2170	1170/-770	330/-330	450	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Medium To Poor Reported Braking Action**

MAX MANUAL	14320	230/-170	500	-860/3150	3050/-1370	440/-440	500	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Poor Reported Braking Action**

MAX MANUAL	17290	270/-200	630	-1110/4120	4920/-1960	540/-540	550	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**HYD PRESS SYS R (Flaps 25)**

**VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4030	60/-50	80	-150/530	60/-60	80/-80	150	0	140
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good Reported Braking Action**

MAX MANUAL	5560	90/-80	140	-260/920	180/-150	130/-130	220	0	540
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good To Medium Reported Braking Action**

MAX MANUAL	6570	120/-110	190	-340/1240	340/-260	170/-170	250	0	1040
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Medium Reported Braking Action**

MAX MANUAL	7580	140/-130	230	-420/1560	490/-360	200/-200	280	0	1530
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Medium To Poor Reported Braking Action**

MAX MANUAL	8790	170/-160	290	-540/2080	930/-550	240/-240	300	0	2570
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Poor Reported Braking Action**

MAX MANUAL	9990	200/-190	340	-660/2600	1370/-730	280/-270	320	0	3610
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.



**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**HYD PRESS SYS R (Flaps 30)**

**VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)									
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ		
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV	

**Dry Runway**

MAX MANUAL	3850	50/-30	80	-150/510	60/-50	80/-80	150	0	120
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good Reported Braking Action**

MAX MANUAL	5250	80/-60	130	-250/890	170/-140	120/-120	210	0	440
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good To Medium Reported Braking Action**

MAX MANUAL	6190	100/-80	170	-330/1200	320/-240	160/-150	240	0	850
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Medium Reported Braking Action**

MAX MANUAL	7120	120/-100	210	-410/1510	460/-330	190/-180	270	0	1250
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Medium To Poor Reported Braking Action**

MAX MANUAL	8240	150/-120	260	-530/2020	880/-510	230/-220	290	0	2100
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Poor Reported Braking Action**

MAX MANUAL	9360	180/-140	310	-640/2530	1300/-690	260/-250	310	0	2940
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**HYD PRESS SYS R+C (Flaps 20)**

**VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	5500	70/-50	130	-210/720	120/-110	130/-130	240	0	360
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good Reported Braking Action**

MAX MANUAL	7640	120/-90	220	-350/1230	340/-270	200/-200	320	0	1230
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Good To Medium Reported Braking Action**

MAX MANUAL	9000	160/-120	290	-460/1630	600/-430	250/-240	360	0	2240
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

**Medium Reported Braking Action**

MAX MANUAL	10360	190/-150	350	-560/2030	860/-590	290/-280	390	0	3250
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Medium To Poor Reported Braking Action**

MAX MANUAL	11920	230/-180	430	-710/2680	1670/-870	340/-330	420	0	5300
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

**Poor Reported Braking Action**

MAX MANUAL	13470	270/-210	510	-860/3320	2480/-1150	390/-380	440	0	7340
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**NAV AIR DATA SYS (Flaps 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4080	80/-50	80	-140/480	50/-40	80/-80	150	100	210
AUTOBRAKE MAX	4820	70/-70	100	-180/610	0/0	110/-110	210	0	0
AUTOBRAKE 2	7880	130/-150	210	-370/1260	10/-70	220/-220	400	10	10

**Good Reported Braking Action**

MAX MANUAL	5420	80/-90	140	-230/800	130/-110	120/-120	210	370	870
AUTOBRAKE MAX	5400	90/-90	140	-230/800	120/-100	120/-120	230	350	840
AUTOBRAKE 2	7880	130/-150	210	-370/1260	10/-70	220/-220	400	10	10

**Good To Medium Reported Braking Action**

MAX MANUAL	6240	110/-110	180	-290/1040	220/-180	150/-150	240	670	1720
AUTOBRAKE MAX	6210	110/-110	180	-290/1040	230/-180	150/-150	250	650	1700
AUTOBRAKE 2	7990	140/-150	220	-390/1340	90/-110	220/-220	390	120	790

**Medium Reported Braking Action**

MAX MANUAL	7060	130/-130	210	-350/1280	310/-240	180/-170	270	960	2570
AUTOBRAKE MAX	7020	130/-130	210	-350/1280	330/-260	180/-170	270	950	2550
AUTOBRAKE 3	7470	130/-130	200	-370/1330	220/-100	190/-190	370	590	2220

**Medium To Poor Reported Braking Action**

MAX MANUAL	7940	160/-160	250	-440/1630	500/-350	210/-200	290	1460	4330
AUTOBRAKE MAX	7930	160/-160	260	-440/1630	530/-370	210/-200	290	1460	4330
AUTOBRAKE 3	8180	160/-150	250	-450/1650	460/-260	220/-210	360	1270	4150

**Poor Reported Braking Action**

MAX MANUAL	8820	190/-180	290	-520/1970	690/-460	230/-220	310	1960	6090
AUTOBRAKE MAX	8840	190/-180	300	-520/1970	720/-480	240/-220	310	1970	6100
AUTOBRAKE 3	8880	190/-170	300	-520/1970	700/-410	240/-230	350	1940	6080

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance  
PITCH DOWN AUTHORITY (Flaps 25)  
VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3980	80/-40	70	-140/470	40/-40	70/-70	140	50	110
AUTOBRAKE MAX	4620	70/-60	100	-180/600	0/0	100/-100	210	0	0
AUTOBRAKE 2	7390	130/-130	210	-350/1210	50/-90	200/-190	330	110	110

**Good Reported Braking Action**

MAX MANUAL	5110	70/-70	120	-220/760	110/-90	110/-110	190	220	510
AUTOBRAKE MAX	5150	70/-70	120	-220/770	110/-100	110/-110	210	230	520
AUTOBRAKE 2	7410	130/-130	210	-350/1210	60/-100	200/-190	340	110	110

**Good To Medium Reported Braking Action**

MAX MANUAL	5810	90/-90	140	-270/980	180/-150	130/-130	200	420	1030
AUTOBRAKE MAX	5820	90/-90	150	-270/980	190/-150	130/-130	220	420	1040
AUTOBRAKE 2	7520	130/-130	210	-370/1290	130/-130	200/-200	330	180	430

**Medium Reported Braking Action**

MAX MANUAL	6510	110/-100	170	-330/1210	250/-200	150/-150	220	620	1560
AUTOBRAKE MAX	6490	110/-110	180	-330/1200	270/-210	160/-150	240	620	1560
AUTOBRAKE 3	7070	110/-110	180	-360/1280	170/-100	180/-180	350	260	1020

**Medium To Poor Reported Braking Action**

MAX MANUAL	7260	130/-120	210	-400/1530	410/-290	180/-170	240	960	2640
AUTOBRAKE MAX	7270	130/-120	210	-400/1530	430/-300	180/-170	250	960	2640
AUTOBRAKE 3	7630	130/-130	210	-420/1580	360/-230	190/-190	330	710	2300

**Poor Reported Braking Action**

MAX MANUAL	8020	150/-140	240	-480/1850	570/-380	200/-190	250	1310	3720
AUTOBRAKE MAX	8040	150/-140	240	-480/1850	590/-400	200/-200	250	1310	3730
AUTOBRAKE 3	8190	150/-140	240	-480/1870	550/-350	210/-210	310	1170	3580

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance  
 PITCH DOWN AUTHORITY (Flaps 30)**

**VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3820	70/-30	70	-130/460	40/-40	70/-70	140	40	90
AUTOBRAKE MAX	4360	60/-40	90	-170/570	10/0	90/-90	210	0	0
AUTOBRAKE 2	6930	120/-90	180	-340/1170	20/-60	180/-180	340	30	30

**Good Reported Braking Action**

MAX MANUAL	4880	70/-50	110	-210/740	100/-90	100/-100	190	190	430
AUTOBRAKE MAX	4920	70/-50	110	-210/750	110/-100	100/-100	210	190	440
AUTOBRAKE 2	6950	120/-80	190	-340/1170	30/-70	180/-180	350	30	30

**Good To Medium Reported Braking Action**

MAX MANUAL	5550	80/-60	130	-270/960	180/-140	120/-120	200	360	880
AUTOBRAKE MAX	5560	90/-60	140	-270/970	190/-150	130/-120	220	360	880
AUTOBRAKE 2	7050	120/-90	190	-350/1250	100/-110	180/-180	340	100	330

**Medium Reported Braking Action**

MAX MANUAL	6210	100/-80	160	-320/1180	250/-200	140/-140	220	540	1330
AUTOBRAKE MAX	6200	100/-80	160	-320/1180	260/-200	150/-140	240	530	1320
AUTOBRAKE 3	6600	110/-70	170	-340/1240	180/-90	170/-160	350	260	950

**Medium To Poor Reported Braking Action**

MAX MANUAL	6940	120/-90	190	-400/1500	400/-280	170/-160	240	850	2260
AUTOBRAKE MAX	6950	120/-90	200	-390/1500	420/-300	170/-160	240	850	2260
AUTOBRAKE 3	7180	120/-90	200	-410/1540	370/-220	180/-180	330	680	2050

**Poor Reported Braking Action**

MAX MANUAL	7670	140/-110	220	-470/1820	560/-370	190/-180	250	1160	3200
AUTOBRAKE MAX	7690	140/-110	230	-470/1820	580/-390	190/-190	250	1160	3200
AUTOBRAKE 3	7750	140/-100	230	-470/1830	560/-350	200/-190	300	1100	3150

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**PITCH UP AUTHORITY (Flaps ≤ 15)**

**VREF30 + 40**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4210	110/-40	90	-140/480	40/-40	90/-90	120	120	260
AUTOBRAKE MAX	6100	80/-50	140	-210/710	0/0	150/-150	250	0	0
AUTOBRAKE 2	9210	170/-140	300	-400/1350	210/-220	260/-250	270	920	1130

**Good Reported Braking Action**

MAX MANUAL	5550	80/-60	140	-220/780	110/-100	130/-130	150	380	900
AUTOBRAKE MAX	6340	80/-50	160	-250/850	60/-50	150/-150	250	210	700
AUTOBRAKE 2	9210	170/-140	300	-400/1350	210/-220	260/-250	270	920	1130

**Good To Medium Reported Braking Action**

MAX MANUAL	6420	100/-80	180	-280/1020	190/-160	160/-160	180	680	1730
AUTOBRAKE MAX	6940	110/-80	200	-300/1060	150/-130	170/-170	240	590	1630
AUTOBRAKE 2	9290	170/-150	300	-420/1430	250/-250	260/-260	270	990	1490

**Medium Reported Braking Action**

MAX MANUAL	7280	120/-100	220	-340/1250	270/-220	190/-180	200	970	2550
AUTOBRAKE MAX	7530	130/-100	230	-350/1270	240/-200	190/-190	230	970	2560
AUTOBRAKE 3	8970	150/-130	270	-410/1440	240/-220	250/-240	270	680	1610

**Medium To Poor Reported Braking Action**

MAX MANUAL	8190	150/-120	260	-420/1590	440/-320	220/-210	220	1450	4170
AUTOBRAKE MAX	8360	160/-120	270	-430/1600	420/-300	220/-220	240	1430	4170
AUTOBRAKE 3	9390	170/-140	300	-470/1720	410/-310	260/-250	270	1180	3470

**Poor Reported Braking Action**

MAX MANUAL	9090	180/-140	300	-500/1920	600/-410	240/-230	230	1920	5790
AUTOBRAKE MAX	9180	180/-140	310	-500/1930	600/-400	250/-240	250	1890	5780
AUTOBRAKE 3	9810	180/-150	320	-520/1990	580/-400	270/-260	270	1680	5330

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**PITCH UP AUTHORITY (Flaps ≥ 20)**

**VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3720	90/-30	70	-120/430	40/-30	70/-70	120	70	160
AUTOBRAKE MAX	5180	70/-40	110	-190/640	0/0	120/-120	220	0	0
AUTOBRAKE 2	8000	140/-120	240	-370/1260	150/-170	220/-210	270	470	490

**Good Reported Braking Action**

MAX MANUAL	4960	70/-50	120	-210/730	100/-90	110/-110	150	280	640
AUTOBRAKE MAX	5460	80/-50	130	-220/780	70/-50	130/-120	230	200	590
AUTOBRAKE 2	8000	140/-120	240	-370/1260	150/-170	220/-210	270	470	490

**Good To Medium Reported Braking Action**

MAX MANUAL	5740	90/-70	160	-270/960	180/-150	140/-140	180	510	1260
AUTOBRAKE MAX	6060	100/-70	160	-280/1000	150/-120	150/-140	230	460	1220
AUTOBRAKE 2	8080	150/-120	240	-390/1340	200/-200	220/-220	270	540	800

**Medium Reported Braking Action**

MAX MANUAL	6510	110/-90	190	-330/1190	250/-200	160/-160	200	730	1870
AUTOBRAKE MAX	6660	120/-90	190	-330/1210	230/-180	170/-160	230	720	1840
AUTOBRAKE 3	7730	130/-100	220	-370/1340	190/-170	200/-200	280	350	1090

**Medium To Poor Reported Braking Action**

MAX MANUAL	7340	140/-110	230	-410/1520	420/-300	190/-190	220	1130	3100
AUTOBRAKE MAX	7430	140/-110	230	-410/1540	410/-280	200/-190	240	1120	3080
AUTOBRAKE 3	8190	150/-120	250	-440/1620	370/-270	220/-210	280	800	2560

**Poor Reported Braking Action**

MAX MANUAL	8170	160/-130	260	-480/1850	580/-390	210/-210	230	1520	4320
AUTOBRAKE MAX	8200	160/-130	260	-480/1860	580/-380	220/-210	250	1510	4320
AUTOBRAKE 3	8640	160/-130	270	-500/1900	540/-370	230/-220	280	1240	4030

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**PRI FLIGHT COMPUTERS (Flaps 20)**

**VREF20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4080	80/-50	80	-140/480	50/-40	80/-80	150	100	210
AUTOBRAKE MAX	4820	70/-70	100	-180/610	0/0	110/-110	210	0	0
AUTOBRAKE 2	7880	130/-150	210	-370/1260	10/-70	220/-220	400	10	10

**Good Reported Braking Action**

MAX MANUAL	5420	80/-90	140	-230/800	130/-110	120/-120	210	370	870
AUTOBRAKE MAX	5400	90/-90	140	-230/800	120/-100	120/-120	230	350	840
AUTOBRAKE 2	7880	130/-150	210	-370/1260	10/-70	220/-220	400	10	10

**Good To Medium Reported Braking Action**

MAX MANUAL	6240	110/-110	180	-290/1040	220/-180	150/-150	240	670	1720
AUTOBRAKE MAX	6210	110/-110	180	-290/1040	230/-180	150/-150	250	650	1700
AUTOBRAKE 2	7990	140/-150	220	-390/1340	90/-110	220/-220	390	120	790

**Medium Reported Braking Action**

MAX MANUAL	7060	130/-130	210	-350/1280	310/-240	180/-170	270	960	2570
AUTOBRAKE MAX	7020	130/-130	210	-350/1280	330/-260	180/-170	270	950	2550
AUTOBRAKE 3	7470	130/-130	200	-370/1330	220/-100	190/-190	370	590	2220

**Medium To Poor Reported Braking Action**

MAX MANUAL	7940	160/-160	250	-440/1630	500/-350	210/-200	290	1460	4330
AUTOBRAKE MAX	7930	160/-160	260	-440/1630	530/-370	210/-200	290	1460	4330
AUTOBRAKE 3	8180	160/-150	250	-450/1650	460/-260	220/-210	360	1270	4150

**Poor Reported Braking Action**

MAX MANUAL	8820	190/-180	290	-520/1970	690/-460	230/-220	310	1960	6090
AUTOBRAKE MAX	8840	190/-180	300	-520/1970	720/-480	240/-220	310	1970	6100
AUTOBRAKE 3	8880	190/-170	300	-520/1970	700/-410	240/-230	350	1940	6080

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**SLATS DRIVE (Flaps 20)**

**VREF30 + 30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	4100	90/-30	80	-140/470	50/-40	80/-80	120	100	220
AUTOBRAKE MAX	5630	70/-40	130	-200/680	10/0	130/-130	250	0	0
AUTOBRAKE 2	8760	150/-130	270	-390/1320	170/-190	250/-240	280	590	640

**Good Reported Braking Action**

MAX MANUAL	5500	80/-60	140	-220/790	120/-110	130/-130	170	360	840
AUTOBRAKE MAX	5960	80/-50	150	-240/830	80/-60	140/-140	240	300	810
AUTOBRAKE 2	8760	150/-130	270	-390/1320	170/-190	250/-240	280	590	640

**Good To Medium Reported Braking Action**

MAX MANUAL	6350	110/-80	180	-290/1030	210/-170	160/-160	200	630	1580
AUTOBRAKE MAX	6640	110/-80	190	-300/1050	170/-140	170/-160	250	590	1540
AUTOBRAKE 2	8840	160/-130	270	-410/1400	220/-220	250/-240	280	670	1030

**Medium Reported Braking Action**

MAX MANUAL	7190	130/-100	220	-350/1260	290/-230	190/-180	220	900	2320
AUTOBRAKE MAX	7310	130/-100	220	-350/1270	260/-210	190/-180	250	880	2270
AUTOBRAKE 3	8460	140/-110	240	-400/1410	220/-190	230/-220	290	470	1440

**Medium To Poor Reported Braking Action**

MAX MANUAL	8070	160/-120	260	-430/1600	460/-330	220/-210	240	1340	3750
AUTOBRAKE MAX	8150	160/-120	260	-430/1610	450/-320	220/-210	260	1330	3720
AUTOBRAKE 3	8950	160/-130	280	-460/1700	410/-300	250/-240	290	980	3150

**Poor Reported Braking Action**

MAX MANUAL	8950	180/-140	300	-510/1930	630/-430	240/-230	250	1780	5170
AUTOBRAKE MAX	8980	180/-140	300	-510/1940	640/-430	240/-230	260	1780	5170
AUTOBRAKE 3	9440	180/-140	310	-520/1980	600/-400	260/-250	290	1490	4850

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**SPOILERS (Flaps 25)**

**VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3600	70/-40	70	-120/430	40/-40	70/-70	130	70	160
AUTOBRAKE MAX	4620	60/-60	100	-180/600	0/0	100/-100	210	0	0
AUTOBRAKE 2	7300	130/-130	210	-350/1200	80/-130	200/-190	300	160	160

**Good Reported Braking Action**

MAX MANUAL	4770	70/-70	120	-210/730	110/-90	110/-100	180	280	660
AUTOBRAKE MAX	5000	80/-70	120	-210/750	90/-70	110/-110	210	280	670
AUTOBRAKE 2	7300	130/-130	210	-350/1200	80/-130	200/-190	300	160	160

**Good To Medium Reported Braking Action**

MAX MANUAL	5490	90/-90	150	-260/960	180/-150	130/-130	200	500	1270
AUTOBRAKE MAX	5610	90/-90	150	-270/970	170/-140	130/-130	220	500	1260
AUTOBRAKE 2	7380	130/-130	210	-360/1280	130/-160	200/-190	300	240	560

**Medium Reported Braking Action**

MAX MANUAL	6210	110/-110	180	-320/1180	260/-210	150/-150	220	730	1880
AUTOBRAKE MAX	6230	110/-110	180	-320/1190	260/-200	150/-150	230	710	1860
AUTOBRAKE 3	6980	120/-110	180	-350/1280	160/-130	180/-180	310	320	1350

**Medium To Poor Reported Braking Action**

MAX MANUAL	6980	130/-130	210	-400/1510	420/-300	180/-170	240	1110	3110
AUTOBRAKE MAX	7000	140/-130	210	-400/1510	430/-300	180/-170	240	1100	3100
AUTOBRAKE 3	7490	140/-130	210	-420/1570	350/-240	190/-190	310	850	2800

**Poor Reported Braking Action**

MAX MANUAL	7760	160/-150	250	-470/1830	590/-390	200/-190	250	1490	4330
AUTOBRAKE MAX	7770	160/-150	250	-470/1840	600/-400	200/-190	250	1500	4340
AUTOBRAKE 3	7990	160/-150	240	-480/1860	540/-350	210/-200	300	1370	4250

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.



**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance  
 SPOILERS (Flaps 30)**

**VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3470	60/-30	60	-120/420	40/-40	60/-60	130	60	140
AUTOBRAKE MAX	4360	60/-40	90	-170/570	10/0	90/-90	210	0	0
AUTOBRAKE 2	6860	120/-90	190	-340/1160	50/-110	180/-180	310	60	60

**Good Reported Braking Action**

MAX MANUAL	4570	70/-50	110	-200/710	110/-90	100/-100	180	240	560
AUTOBRAKE MAX	4770	70/-50	110	-210/740	90/-80	100/-100	200	240	560
AUTOBRAKE 2	6860	120/-90	190	-340/1160	50/-110	180/-180	310	60	60

**Good To Medium Reported Braking Action**

MAX MANUAL	5250	90/-60	140	-260/940	180/-150	120/-120	200	440	1080
AUTOBRAKE MAX	5360	90/-60	140	-260/950	170/-140	120/-120	220	430	1080
AUTOBRAKE 2	6940	120/-90	190	-350/1240	100/-130	180/-180	310	140	440

**Medium Reported Braking Action**

MAX MANUAL	5940	100/-80	170	-310/1160	260/-200	140/-140	220	640	1610
AUTOBRAKE MAX	5950	100/-80	170	-320/1160	260/-200	150/-140	230	630	1600
AUTOBRAKE 3	6530	110/-80	170	-340/1240	170/-110	160/-160	320	330	1240

**Medium To Poor Reported Braking Action**

MAX MANUAL	6690	130/-100	200	-390/1490	420/-290	170/-160	240	980	2660
AUTOBRAKE MAX	6710	130/-100	200	-390/1490	430/-290	170/-160	240	980	2660
AUTOBRAKE 3	7060	130/-90	200	-400/1530	360/-230	180/-180	310	800	2480

**Poor Reported Braking Action**

MAX MANUAL	7440	150/-120	230	-460/1810	580/-380	190/-180	250	1320	3720
AUTOBRAKE MAX	7460	150/-120	230	-460/1810	590/-390	190/-190	250	1330	3730
AUTOBRAKE 3	7590	150/-110	230	-470/1830	560/-350	200/-190	300	1280	3710

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance**

**STABILIZER (Flaps 20)**

**VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	440000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 440000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	3850	90/-30	80	-130/450	40/-40	70/-70	120	90	190
AUTOBRAKE MAX	5180	70/-40	110	-190/640	0/0	120/-120	220	0	0
AUTOBRAKE 2	8140	140/-120	240	-370/1270	140/-170	220/-220	290	390	390

**Good Reported Braking Action**

MAX MANUAL	5150	80/-60	130	-220/760	110/-100	120/-120	170	320	740
AUTOBRAKE MAX	5500	80/-50	130	-230/790	80/-60	130/-130	230	300	740
AUTOBRAKE 2	8140	140/-120	240	-370/1270	140/-170	220/-220	290	390	390

**Good To Medium Reported Braking Action**

MAX MANUAL	5940	100/-80	170	-280/990	190/-160	150/-140	190	570	1430
AUTOBRAKE MAX	6150	100/-70	170	-290/1010	170/-130	150/-150	240	550	1400
AUTOBRAKE 2	8220	150/-120	250	-390/1350	190/-200	230/-220	290	470	780

**Medium Reported Braking Action**

MAX MANUAL	6730	120/-90	200	-330/1220	270/-220	170/-160	210	820	2110
AUTOBRAKE MAX	6800	120/-90	200	-340/1230	260/-190	170/-170	250	790	2060
AUTOBRAKE 3	7830	130/-100	220	-380/1350	190/-160	210/-200	300	360	1320

**Medium To Poor Reported Braking Action**

MAX MANUAL	7570	150/-110	240	-410/1560	440/-320	200/-190	230	1240	3460
AUTOBRAKE MAX	7620	150/-110	240	-420/1560	440/-300	200/-200	250	1220	3440
AUTOBRAKE 3	8320	150/-120	250	-440/1640	380/-270	230/-220	300	880	2950

**Poor Reported Braking Action**

MAX MANUAL	8410	170/-130	270	-490/1890	610/-410	220/-210	250	1650	4800
AUTOBRAKE MAX	8430	170/-130	280	-490/1890	620/-410	220/-220	250	1650	4810
AUTOBRAKE 3	8800	170/-130	280	-500/1930	570/-380	240/-230	290	1390	4570

Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1500 ft from threshold to touchdown.

Actual (unfactored) distances are shown.



**ADVISORY INFORMATION**

**Recommended Brake Cooling Schedule**

**Reference Brake Energy Per Brake (Millions of Foot Pounds)**

WEIGHT (1000 LB)		OAT (°C)		BRAKES ON SPEED (KIAS)																	
				80			100			120			140			160			180		
				PRESSURE ALTITUDE (1000 FT)																	
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8		
640	0	18.5	20.1	21.9	27.4	30.2	33.3	37.7	41.8	46.6	49.1	54.9	61.5	61.4	68.9	77.4	74.0	83.0	92.9		
	10	19.0	20.6	22.5	28.2	31.0	34.3	38.8	43.1	48.1	50.6	56.6	63.4	63.4	71.0	79.8	76.3	85.5	95.7		
	15	19.4	21.0	22.9	28.7	31.6	35.0	39.5	43.9	48.9	51.5	57.6	64.5	64.5	72.2	81.1	77.6	86.8	97.3		
	20	19.7	21.4	23.3	29.2	32.2	35.6	40.2	44.7	49.8	52.4	58.6	65.6	65.6	73.4	82.4	78.8	88.2	98.8		
	30	20.1	21.9	23.9	30.0	33.0	36.5	41.3	45.9	51.1	53.9	60.2	67.4	67.4	75.5	84.6	81.0	90.6	101.5		
	40	20.2	22.0	24.0	30.3	33.4	37.0	41.9	46.6	52.0	54.8	61.3	68.7	68.7	77.0	86.3	82.6	92.4	103.4		
600	0	17.7	19.1	20.8	26.1	28.7	31.6	35.8	39.7	44.1	46.5	51.9	58.1	58.2	65.2	73.2	70.2	78.7	88.5		
	10	18.1	19.6	21.4	26.8	29.5	32.6	36.8	40.9	45.5	48.0	53.6	60.0	60.0	67.3	75.5	72.4	81.1	91.1		
	15	18.5	20.0	21.8	27.3	30.0	33.1	37.5	41.6	46.3	48.9	54.5	61.0	61.1	68.4	76.8	73.6	82.5	92.5		
	20	18.8	20.3	22.2	27.8	30.6	33.7	38.2	42.4	47.2	49.7	55.5	62.1	62.1	69.6	78.0	74.8	83.8	93.9		
	30	19.2	20.8	22.7	28.5	31.3	34.6	39.2	43.5	48.4	51.1	57.0	63.8	63.9	71.5	80.2	76.9	86.1	96.4		
	40	19.3	20.9	22.8	28.8	31.7	35.0	39.7	44.1	49.2	51.9	58.0	65.0	65.1	72.9	81.8	78.5	87.8	98.3		
560	0	16.8	18.2	19.7	24.8	27.1	29.9	33.8	37.5	41.6	43.9	49.0	54.8	54.9	61.5	69.0	66.3	74.3	83.5		
	10	17.3	18.7	20.3	25.5	27.9	30.8	34.9	38.6	42.9	45.3	50.5	56.5	56.6	63.4	71.1	68.3	76.6	86.0		
	15	17.6	19.0	20.7	25.9	28.4	31.3	35.5	39.3	43.7	46.1	51.4	57.5	57.6	64.5	72.4	69.5	77.9	87.4		
	20	17.9	19.3	21.0	26.4	28.9	31.9	36.1	40.0	44.5	46.9	52.3	58.5	58.6	65.6	73.6	70.7	79.2	88.8		
	30	18.3	19.8	21.5	27.0	29.6	32.7	37.1	41.1	45.7	48.2	53.8	60.1	60.3	67.4	75.6	72.7	81.3	91.2		
	40	18.3	19.8	21.6	27.3	30.0	33.1	37.5	41.6	46.4	49.0	54.7	61.2	61.4	68.7	77.1	74.1	83.0	93.0		
520	0	16.0	17.2	18.7	23.4	25.6	28.2	31.9	35.3	39.1	41.3	46.0	51.4	51.5	57.6	64.6	62.2	69.8	78.4		
	10	16.4	17.7	19.2	24.1	26.4	29.0	32.9	36.3	40.3	42.6	47.4	53.0	53.2	59.5	66.7	64.2	71.9	80.8		
	15	16.7	18.0	19.5	24.5	26.8	29.5	33.5	37.0	41.1	43.4	48.3	53.9	54.1	60.5	67.8	65.3	73.2	82.1		
	20	17.0	18.3	19.9	25.0	27.3	30.1	34.1	37.7	41.8	44.1	49.1	54.9	55.1	61.6	69.0	66.4	74.4	83.4		
	30	17.4	18.7	20.3	25.5	28.0	30.8	34.9	38.6	42.9	45.3	50.5	56.4	56.6	63.3	70.9	68.2	76.4	85.7		
	40	17.4	18.8	20.4	25.8	28.2	31.1	35.4	39.2	43.5	46.0	51.3	57.4	57.6	64.4	72.3	69.6	78.0	87.4		
480	0	15.2	16.3	17.6	22.1	24.1	26.5	30.0	33.1	36.6	38.7	43.0	47.9	48.1	53.7	60.2	58.0	65.0	73.0		
	10	15.6	16.7	18.1	22.7	24.8	27.2	30.8	34.0	37.7	39.8	44.3	49.4	49.6	55.4	62.1	59.9	67.1	75.3		
	15	15.8	17.0	18.5	23.1	25.3	27.7	31.4	34.7	38.4	40.6	45.1	50.3	50.5	56.4	63.2	60.9	68.2	76.5		
	20	16.1	17.3	18.8	23.5	25.7	28.2	32.0	35.3	39.1	41.3	45.9	51.2	51.4	57.4	64.3	62.0	69.4	77.8		
	30	16.5	17.7	19.2	24.1	26.3	28.9	32.8	36.2	40.1	42.4	47.1	52.6	52.8	58.9	66.0	63.7	71.3	79.9		
	40	16.5	17.8	19.3	24.3	26.5	29.2	33.1	36.6	40.7	43.0	47.9	53.5	53.7	60.0	67.3	64.9	72.7	81.6		
440	0	14.4	15.4	16.6	20.8	22.6	24.8	28.0	30.8	34.1	36.0	39.9	44.4	44.6	49.7	55.6	53.7	60.1	67.4		
	10	14.7	15.8	17.1	21.3	23.3	25.5	28.8	31.7	35.1	37.1	41.1	45.8	46.0	51.3	57.4	55.4	62.0	69.5		
	15	15.0	16.1	17.4	21.7	23.7	25.9	29.3	32.3	35.7	37.7	41.9	46.6	46.8	52.2	58.4	56.4	63.1	70.7		
	20	15.3	16.4	17.7	22.1	24.1	26.4	29.9	32.9	36.4	38.4	42.6	47.4	47.6	53.1	59.4	57.4	64.2	71.9		
	30	15.6	16.7	18.1	22.6	24.7	27.0	30.6	33.7	37.3	39.4	43.7	48.7	48.9	54.6	61.0	58.9	65.9	73.9		
	40	15.6	16.7	18.1	22.8	24.9	27.3	30.9	34.1	37.8	39.9	44.4	49.5	49.7	55.5	62.2	60.0	67.2	75.4		
400	0	13.6	14.5	15.6	19.4	21.1	23.1	26.0	28.6	31.5	33.2	36.8	40.9	41.0	45.7	51.0	49.2	55.0	61.7		
	10	13.9	14.9	16.0	20.0	21.7	23.7	26.8	29.4	32.5	34.2	37.9	42.1	42.3	47.1	52.6	50.8	56.8	63.6		
	15	14.2	15.2	16.3	20.3	22.1	24.1	27.3	29.9	33.1	34.9	38.6	42.9	43.1	47.9	53.5	51.7	57.8	64.7		
	20	14.4	15.4	16.6	20.7	22.5	24.6	27.7	30.5	33.6	35.5	39.3	43.6	43.8	48.8	54.5	52.6	58.8	65.8		
	30	14.7	15.7	17.0	21.1	23.0	25.1	28.4	31.2	34.5	36.4	40.3	44.8	45.0	50.1	55.9	54.0	60.4	67.6		
	40	14.7	15.8	17.0	21.3	23.2	25.4	28.7	31.6	34.9	36.8	40.9	45.5	45.7	50.9	56.9	55.0	61.5	69.0		

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

**ADVISORY INFORMATION**

**Recommended Brake Cooling Schedule  
Event Adjusted Brake Energy (Millions of Foot Pounds)  
No Reverse Thrust**

EVENT		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	4.5	13.8	22.9	32.0	41.0	50.0	59.2	68.4	77.8
	MAX AUTO	4.5	12.8	21.1	29.4	38.0	46.7	55.7	65.1	74.8
	AUTOBRAKE 4	4.4	12.1	19.8	27.5	35.3	43.4	51.8	60.7	70.1
	AUTOBRAKE 3	4.1	11.4	18.4	25.5	32.7	40.0	47.7	55.9	64.6
	AUTOBRAKE 2	3.9	10.6	17.2	23.6	30.1	36.8	43.7	51.1	59.0
	AUTOBRAKE 1	3.8	10.0	16.0	21.8	27.8	33.8	40.2	46.9	54.0

**Two Engine Reverse Thrust**

EVENT		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	3.9	12.6	21.2	29.5	37.7	45.9	54.0	62.3	70.7
	MAX AUTO	2.1	9.2	16.3	23.5	30.8	38.4	46.3	54.6	63.5
	AUTOBRAKE 4	1.6	7.1	12.7	18.5	24.5	30.9	37.7	45.1	53.1
	AUTOBRAKE 3	0.9	4.9	9.1	13.5	18.2	23.3	28.9	34.9	41.6
	AUTOBRAKE 2	0.2	3.1	6.2	9.5	13.0	16.9	21.2	25.9	31.1
	AUTOBRAKE 1		2.3	4.7	7.2	9.8	12.7	16.0	19.7	23.9

**Cooling Time (Minutes)**

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
		16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE	
GROUND	REQUIRED	11	18	26	42	55	66	73			
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE	

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on EICAS may be used 12 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (Inflight gear extended, the BTMS indications may vary between individual brakes, due to airstream effects, gear tilt, and position of the gear temperature probes.)

**ADVISORY INFORMATION**

**Approach or Landing Climb Limited Weight**

**Valid for approach with flaps 20 and landing with flaps 25 or 30**

AIRPORT OAT		APPROACH OR LANDING CLIMB LIMITED WEIGHT (1000 LB)					
		AIRPORT PRESSURE ALTITUDE (FT)					
		-2000	0	2000	4000	6000	8000
°C	°F						
54	129	549.5	508.8				
52	126	565.6	523.4				
50	122	581.1	537.6	496.9			
48	118	597.7	553.7	511.6			
46	115	614.6	569.1	525.4	485.5		
44	111	630.1	584.0	540.3	498.8		
42	108	646.1	599.2	554.1	511.3	472.8	
40	104	661.2	613.5	567.1	523.6	485.0	
38	100	665.4	626.7	578.8	534.9	495.8	467.9
36	97	665.7	639.5	590.3	546.1	506.3	472.3
34	93	665.9	651.0	600.9	556.0	515.5	476.8
32	90	666.0	660.0	609.8	563.9	522.1	481.2
30	86	666.2	669.1	618.6	571.8	528.8	485.6
28	82	666.4	669.2	624.3	577.6	534.1	489.1
26	79	666.5	669.3	628.7	581.2	536.9	492.8
24	75	666.7	669.4	632.6	584.7	539.7	496.3
22	72	666.8	669.5	632.7	587.7	542.3	498.6
20	68	666.9	669.6	632.8	590.7	544.9	500.9
18	64	667.0	669.7	632.9	593.6	547.5	503.3
16	61	667.1	669.8	633.0	595.7	550.2	505.6
14	57	667.2	669.9	633.1	595.8	552.9	507.9
12	54	667.4	670.1	633.2	595.9	555.5	510.4
10	50	667.6	670.2	633.3	596.0	555.8	512.9
-40	-40	669.9	672.2	635.3	597.9	557.6	518.2

Based on engine bleed for 2 packs on and engine anti-ice off and wing anti-ice off.  
 With engine bleed for packs off, increase weight by 5000 lb.  
 With engine anti-ice on, decrease weight by 600 lb.  
 With engine and wing anti-ice on, decrease weight by 4400 lb.  
 When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C, decrease weight by 43900 lb.

Intentionally  
Blank



## Performance Inflight - QRH

## Chapter PI-QRH

## Engine Inop

## Section 12

## ENGINE INOP

### Initial Max Continuous EPR

Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	1.260	1.236	1.217	1.204	1.193	1.176	1.182	1.192	1.203
15	1.320	1.295	1.272	1.256	1.244	1.224	1.229	1.237	1.245
10	1.376	1.351	1.328	1.311	1.295	1.275	1.280	1.285	1.290
5	1.378	1.404	1.382	1.365	1.352	1.329	1.333	1.335	1.337
0	1.378	1.420	1.431	1.415	1.402	1.381	1.385	1.385	1.384
-5	1.378	1.420	1.460	1.460	1.448	1.429	1.433	1.431	1.430
-10	1.378	1.420	1.460	1.482	1.488	1.472	1.475	1.473	1.472
-15	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-20	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-25	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-30	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-35	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-40	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504

# ENGINE INOP

## Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off

37000 FT to 31000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
150	.48	1.480	1.480	1.480	1.477	1.464	1.445	1.421	1.392	1.359	1.326	1.324	1.324
200	.63	1.495	1.495	1.495	1.495	1.495	1.480	1.453	1.419	1.379	1.336	1.292	1.258
250	.77	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.499	1.460	1.416	1.367	1.316
300	.91	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.434	1.393	1.346
35000 FT PRESS ALT		TAT (°C)											
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
150	.46	1.479	1.479	1.479	1.479	1.464	1.445	1.421	1.392	1.362	1.332	1.323	1.323
200	.60	1.484	1.484	1.484	1.484	1.484	1.473	1.451	1.421	1.385	1.350	1.315	1.283
250	.74	1.528	1.528	1.528	1.528	1.528	1.528	1.528	1.498	1.459	1.413	1.360	1.303
300	.87	1.480	1.480	1.480	1.480	1.480	1.480	1.480	1.480	1.480	1.448	1.404	1.355
33000 FT PRESS ALT		TAT (°C)											
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
150	.44	1.486	1.486	1.486	1.486	1.480	1.460	1.435	1.407	1.375	1.345	1.317	1.317
200	.58	1.493	1.493	1.493	1.493	1.493	1.493	1.471	1.444	1.409	1.372	1.336	1.299
250	.71	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.516	1.478	1.430	1.370	1.301
300	.84	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.460	1.415	1.365
330	.91	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.426	1.383
31000 FT PRESS ALT		TAT (°C)											
CIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
150	.42	1.492	1.492	1.492	1.492	1.478	1.453	1.425	1.393	1.362	1.333	1.315	1.315
200	.55	1.506	1.506	1.506	1.506	1.506	1.497	1.470	1.438	1.400	1.361	1.322	1.284
250	.68	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.498	1.454	1.395	1.326	1.262
300	.81	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.477	1.435	1.386	1.334
330	.88	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.385	1.335

## EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	37	35	33	31
ENGINE ONLY	-0.017	-0.016	-0.017	-0.018
ENGINE & WING*	-0.034	-0.032	-0.032	-0.033
ENGINE & WING**	-0.051	-0.048	-0.047	-0.048

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, packs off.

# ENGINE INOP

## Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off  
 29000 FT to 24000 FT Pressure Altitudes

29000 FT PRESSURE ALTITUDE												TAT (°C)			
KLAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15		
150	.40	1.504	1.504	1.504	1.504	1.488	1.459	1.429	1.394	1.363	1.334	1.326	1.326		
200	.53	1.509	1.509	1.509	1.509	1.509	1.497	1.464	1.427	1.388	1.350	1.313	1.293		
250	.65	1.504	1.504	1.504	1.504	1.504	1.504	1.504	1.457	1.405	1.350	1.294	1.251		
300	.78	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.450	1.397	1.340	1.281		
330	.85	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.406	1.354	1.298		

27000 FT PRESSURE ALTITUDE												TAT (°C)			
KLAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15		
150	.38	1.523	1.523	1.523	1.523	1.523	1.505	1.473	1.440	1.404	1.372	1.343	1.343		
200	.51	1.512	1.512	1.512	1.512	1.512	1.512	1.496	1.458	1.416	1.376	1.341	1.306		
250	.63	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.474	1.423	1.372	1.325	1.285		
300	.75	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.417	1.350	1.288		
330	.81	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.370	1.311		

25000 FT PRESSURE ALTITUDE												TAT (°C)			
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20		
150	.37	1.540	1.540	1.540	1.540	1.540	1.522	1.488	1.451	1.415	1.380	1.360	1.360		
200	.49	1.511	1.511	1.511	1.511	1.511	1.511	1.490	1.447	1.404	1.366	1.332	1.307		
250	.60	1.461	1.461	1.461	1.461	1.461	1.461	1.461	1.451	1.400	1.354	1.315	1.282		
300	.72	1.429	1.429	1.429	1.429	1.429	1.429	1.429	1.429	1.429	1.371	1.302	1.248		
330	.78	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.327	1.260		

24000 FT PRESSURE ALTITUDE												TAT (°C)			
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20		
150	.36	1.536	1.536	1.536	1.536	1.536	1.530	1.494	1.459	1.421	1.387	1.355	1.355		
200	.48	1.507	1.507	1.507	1.507	1.507	1.507	1.497	1.455	1.412	1.372	1.339	1.307		
250	.59	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.453	1.408	1.363	1.324	1.289		
300	.70	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.424	1.381	1.310	1.257		
330	.77	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.375	1.336	1.270		

### EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	29	27	25	24
ENGINE ONLY	-0.020	-0.021	-0.023	-0.022
ENGINE & WING*	-0.035	-0.036	-0.038	-0.037
ENGINE & WING**	-0.050	-0.051	-0.053	-0.051

\*Wing anti-ice on, packs on.  
 \*\*Wing anti-ice on, packs off.

**ENGINE INOP**

**Max Continuous EPR**

Based on engine bleed for packs on or off and anti-ice off  
22000 FT to 16000 FT Pressure Altitudes

22000 FT PRESS ALT		TAT (°C)											
CIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
150	.35	1.529	1.529	1.529	1.529	1.529	1.511	1.474	1.435	1.399	1.367	1.346	1.346
200	.46	1.500	1.500	1.500	1.500	1.500	1.496	1.470	1.428	1.389	1.353	1.322	1.301
250	.57	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.423	1.380	1.339	1.302	1.270
300	.68	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.424	1.387	1.325	1.273	1.234
330	.74	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.386	1.347	1.283	1.228
20000 FT PRESS ALT		TAT (°C)											
CIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
150	.33	1.523	1.523	1.523	1.523	1.523	1.523	1.493	1.453	1.412	1.378	1.347	1.336
200	.44	1.492	1.492	1.492	1.492	1.492	1.492	1.484	1.444	1.404	1.365	1.334	1.305
250	.55	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.435	1.395	1.355	1.317	1.285
300	.65	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.393	1.338	1.291	1.250
330	.71	1.394	1.394	1.394	1.394	1.394	1.394	1.394	1.394	1.394	1.351	1.291	1.238
18000 FT PRESS ALT		TAT (°C)											
CIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
150	.32	1.496	1.496	1.496	1.496	1.496	1.494	1.455	1.415	1.380	1.351	1.322	1.321
200	.42	1.474	1.474	1.474	1.474	1.474	1.471	1.452	1.409	1.369	1.336	1.309	1.283
250	.53	1.498	1.498	1.498	1.498	1.498	1.498	1.485	1.429	1.373	1.325	1.288	1.260
300	.63	1.461	1.461	1.461	1.461	1.461	1.461	1.461	1.461	1.398	1.337	1.285	1.238
330	.69	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.415	1.352	1.293	1.240
16000 FT PRESS ALT		TAT (°C)											
CIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
150	.31	1.473	1.473	1.473	1.473	1.473	1.472	1.456	1.418	1.383	1.353	1.326	1.306
200	.41	1.454	1.454	1.454	1.454	1.454	1.454	1.442	1.412	1.375	1.342	1.314	1.288
250	.51	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.465	1.408	1.354	1.309	1.273
300	.60	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.436	1.375	1.318	1.271
330	.66	1.423	1.423	1.423	1.423	1.423	1.423	1.423	1.423	1.423	1.381	1.321	1.267

**EPR Adjustments for Engine Bleed**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	22	20	18	16
ENGINE ONLY	-0.020	-0.018	-0.014	-0.011
ENGINE & WING*	-0.034	-0.031	-0.026	-0.022
ENGINE & WING**	-0.047	-0.044	-0.038	-0.033

\*Wing anti-ice on, packs on.  
\*\*Wing anti-ice on, packs off.

# ENGINE INOP

## Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off  
 14000 FT to 5000 FT Pressure Altitudes

14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
150	.29	1.446	1.446	1.446	1.446	1.446	1.443	1.417	1.381	1.351	1.325	1.301	1.290
200	.39	1.437	1.437	1.437	1.437	1.437	1.437	1.407	1.372	1.341	1.315	1.291	1.267
250	.49	1.490	1.490	1.490	1.490	1.490	1.490	1.490	1.435	1.379	1.329	1.286	1.252
300	.58	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.410	1.350	1.300	1.256
330	.64	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.416	1.354	1.298	1.250
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
150	.28	1.444	1.444	1.444	1.444	1.444	1.431	1.415	1.388	1.351	1.317	1.285	1.278
200	.38	1.433	1.433	1.433	1.433	1.433	1.430	1.415	1.397	1.367	1.325	1.285	1.247
250	.47	1.478	1.478	1.478	1.478	1.478	1.478	1.462	1.416	1.371	1.329	1.289	1.252
300	.56	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.453	1.393	1.338	1.293	1.254
330	.62	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.403	1.344	1.294	1.251
10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
150	.27	1.425	1.425	1.425	1.425	1.425	1.422	1.403	1.384	1.355	1.320	1.299	1.280
200	.36	1.401	1.401	1.401	1.401	1.401	1.401	1.394	1.380	1.358	1.323	1.291	1.270
250	.45	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.387	1.353	1.318	1.282	1.252
300	.54	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.372	1.323	1.282	1.247
330	.59	1.383	1.383	1.383	1.383	1.383	1.383	1.383	1.383	1.382	1.327	1.285	1.246
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
150	.25	1.385	1.385	1.385	1.385	1.385	1.385	1.377	1.348	1.323	1.302	1.281	1.260
200	.33	1.367	1.367	1.367	1.367	1.367	1.367	1.367	1.353	1.336	1.316	1.291	1.265
250	.41	1.341	1.341	1.341	1.341	1.341	1.341	1.341	1.341	1.326	1.311	1.287	1.253
300	.49	1.333	1.333	1.333	1.333	1.333	1.333	1.333	1.333	1.327	1.289	1.254	1.221
330	.54	1.311	1.311	1.311	1.311	1.311	1.311	1.311	1.311	1.311	1.289	1.252	1.218

### EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	14	12	10	5
ENGINE ONLY	-0.010	-0.013	-0.015	-0.015
ENGINE & WING*	-0.020	-0.023	-0.025	-0.023
ENGINE & WING*	-0.030	-0.033	-0.035	-0.031

\*Wing anti-ice on, packs on.  
 \*\*Wing anti-ice on, packs off.

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	639	281	16400	14900	13300
620	602	273	18000	16600	14900
580	562	264	19300	18300	16800
540	522	255	20900	19900	18800
500	483	246	22800	22300	21000
460	445	236	24800	24700	23500
420	406	226	27100	26800	25800
380	367	215	29400	29000	28200
340	329	204	31800	31300	30700

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Driftdown/LRC Cruise Range Capability Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)					
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)					
100	80	60	40	20			20	40	60	80	100
133	125	118	111	105	100	95	91	87	83	80	
273	255	238	224	211	200	190	181	172	165	158	
412	384	359	337	317	300	285	271	258	246	236	
550	512	478	449	423	400	379	361	344	328	314	
687	639	597	561	529	500	474	451	430	411	393	
822	766	716	673	634	600	569	541	516	493	472	
958	892	835	784	740	700	664	632	603	576	552	
1092	1018	953	896	845	800	759	723	689	659	631	
1227	1144	1071	1007	951	900	854	813	776	742	711	
1361	1269	1189	1119	1056	1000	950	904	863	825	790	
1495	1395	1307	1230	1161	1100	1045	995	949	908	870	
1629	1520	1425	1341	1267	1200	1140	1086	1036	991	950	
1764	1646	1543	1453	1372	1300	1235	1176	1123	1074	1029	
1899	1772	1662	1564	1478	1400	1330	1267	1209	1157	1109	
2034	1899	1781	1676	1583	1500	1425	1357	1296	1240	1188	
2171	2026	1900	1788	1689	1600	1520	1448	1382	1322	1267	
2308	2154	2019	1900	1795	1700	1615	1538	1468	1404	1346	
2446	2282	2139	2013	1900	1800	1710	1628	1554	1486	1424	

### Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)									TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)									
	340	380	420	460	500	540	580	620	660	
100	2.1	2.3	2.5	2.7	2.9	3.1	3.2	3.4	3.6	0:15
200	4.7	5.2	5.7	6.2	6.7	7.1	7.4	7.9	8.5	0:32
300	7.7	8.5	9.3	10.1	10.9	11.7	12.3	13.2	14.2	0:49
400	10.8	11.9	13.0	14.1	15.2	16.4	17.4	18.7	20.0	1:05
500	13.7	15.2	16.6	18.0	19.5	21.0	22.2	23.8	25.5	1:22
600	16.7	18.4	20.1	21.8	23.5	25.4	26.9	28.8	30.8	1:37
700	19.5	21.6	23.5	25.5	27.5	29.7	31.6	33.8	36.1	1:53
800	22.3	24.7	26.9	29.2	31.5	34.0	36.2	38.8	41.3	2:08
900	25.1	27.8	30.3	32.8	35.5	38.3	40.7	43.7	46.5	2:24
1000	27.8	30.8	33.6	36.4	39.4	42.4	45.3	48.5	51.7	2:39
1100	30.5	33.8	36.9	40.0	43.2	46.6	49.7	53.3	56.8	2:54
1200	33.2	36.7	40.1	43.5	47.1	50.7	54.1	58.0	61.8	3:10
1300	35.8	39.6	43.3	47.0	50.8	54.8	58.5	62.7	66.8	3:25
1400	38.4	42.5	46.5	50.4	54.6	58.8	62.8	67.3	71.7	3:41
1500	41.0	45.4	49.6	53.9	58.3	62.8	67.1	71.9	76.5	3:56
1600	43.5	48.2	52.7	57.2	61.9	66.7	71.3	76.4	81.4	4:12
1700	46.0	51.0	55.8	60.6	65.5	70.6	75.5	80.9	86.1	4:29
1800	48.5	53.7	58.8	63.9	69.1	74.5	79.7	85.4	90.9	4:45

**Includes APU fuel burn.**

**Driftdown at optimum driftdown speed and cruise at LRC speed.**

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	13600	12100	8100
620	15000	13700	12400
580	16800	15500	14000
540	18500	17400	15900
500	20100	19100	18000
460	22100	21300	20100
420	24300	24100	22800
380	26900	26600	25500
340	29700	29100	28200

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Control**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
660	EPR	1.260	1.430								
	MACH	.583	.641								
	KIAS	324	325								
	FF/ENG	20263	21796								
620	EPR	1.231	1.366								
	MACH	.572	.625								
	KIAS	318	317								
	FF/ENG	18942	19834								
580	EPR	1.205	1.304	1.385							
	MACH	.560	.600	.632							
	KIAS	311	304	308							
	FF/ENG	17664	17746	18696							
540	EPR	1.182	1.260	1.312	1.401						
	MACH	.547	.582	.603	.637						
	KIAS	304	294	294	299						
	FF/ENG	16446	16193	16492	17509						
500	EPR	1.161	1.226	1.263	1.318	1.412					
	MACH	.534	.569	.583	.605	.641					
	KIAS	296	287	283	283	289					
	FF/ENG	15254	14972	14904	15203	16246					
460	EPR	1.143	1.196	1.226	1.264	1.320	1.417				
	MACH	.519	.554	.569	.583	.605	.642				
	KIAS	288	280	276	272	272	278				
	FF/ENG	14101	13775	13681	13586	13882	14872				
420	EPR	1.124	1.169	1.194	1.224	1.261	1.317	1.413			
	MACH	.503	.538	.552	.567	.581	.603	.640			
	KIAS	278	271	268	265	261	261	266			
	FF/ENG	12956	12626	12465	12359	12260	12536	13427			
380	EPR	1.107	1.146	1.166	1.189	1.219	1.256	1.309	1.400		
	MACH	.485	.520	.534	.549	.564	.579	.599	.634		
	KIAS	268	262	259	256	253	249	248	252		
	FF/ENG	11915	11515	11302	11167	11040	10960	11162	11910		
340	EPR	1.090	1.124	1.141	1.160	1.183	1.211	1.246	1.295	1.376	1.514
	MACH	.464	.500	.515	.529	.544	.559	.575	.592	.624	.676
	KIAS	257	252	249	247	244	241	237	235	237	247
	FF/ENG	10930	10392	10191	10042	9913	9782	9711	9783	10365	11832
300	EPR	1.073	1.103	1.117	1.133	1.152	1.173	1.199	1.232	1.275	1.343
	MACH	.439	.478	.493	.507	.522	.537	.552	.568	.584	.610
	KIAS	243	240	238	236	234	231	228	225	221	222
	FF/ENG	9851	9322	9078	8958	8853	8720	8612	8519	8500	8878

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Long Range Cruise Diversion Fuel and Time Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
283	262	243	226	213		200	190	180	172	164
567	524	486	454	425	400	379	361	344	328	315
852	788	730	681	638	600	569	541	515	492	471
1138	1051	974	908	851	800	759	721	686	655	628
1424	1315	1218	1136	1064	1000	948	901	858	819	784
1711	1580	1463	1364	1277	1200	1138	1081	1029	982	940
1999	1845	1708	1592	1491	1400	1327	1260	1199	1145	1096
2288	2111	1954	1820	1704	1600	1517	1441	1371	1308	1252
2577	2377	2199	2048	1918	1800	1706	1620	1542	1471	1408

### Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)					
	10		14		18	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	8.1	0:39	7.1	0:38	6.4	0:37
300	12.6	0:57	11.4	0:55	10.5	0:53
400	17.1	1:14	15.7	1:12	14.6	1:10
500	21.5	1:32	19.9	1:29	18.6	1:26
600	26.0	1:50	24.1	1:46	22.7	1:43
700	30.4	2:08	28.3	2:04	26.6	2:00
800	34.8	2:26	32.5	2:21	30.6	2:16
900	39.2	2:44	36.6	2:38	34.6	2:33
1000	43.5	3:02	40.8	2:56	38.5	2:50
1100	47.9	3:20	44.9	3:13	42.4	3:07
1200	52.2	3:39	49.0	3:31	46.3	3:24
1300	56.4	3:57	53.0	3:48	50.1	3:41
1400	60.7	4:15	57.1	4:06	54.0	3:57
1500	64.9	4:34	61.1	4:24	57.8	4:15
1600	69.2	4:52	65.1	4:41	61.6	4:32
1700	73.3	5:11	69.0	4:59	65.4	4:49
1800	77.5	5:29	73.0	5:17	69.1	5:06

### Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	300	400	500	600	700
5	-0.7	-0.4	0.0	1.0	3.7
15	-2.7	-1.6	0.0	3.2	10.6
25	-4.7	-2.7	0.0	5.3	16.8
35	-6.7	-3.8	0.0	7.3	22.3
45	-8.7	-4.8	0.0	9.1	27.2
55	-10.7	-5.9	0.0	10.8	31.3
65	-12.7	-6.9	0.0	12.3	34.8
75	-14.7	-7.8	0.0	13.7	37.6
85	-16.8	-8.8	0.0	14.9	39.7
95	-18.8	-9.7	0.0	16.1	41.1

APU fuel included.



**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Holding  
 Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
660	EPR	1.154	1.190	1.258	1.379		
	KIAS	259	260	261	277		
	FF/ENG	17960	17800	18010	19400		
620	EPR	1.139	1.172	1.232	1.328		
	KIAS	251	252	253	262		
	FF/ENG	16750	16580	16690	17410		
580	EPR	1.124	1.154	1.209	1.290		
	KIAS	243	244	245	248		
	FF/ENG	15660	15390	15460	15740		
540	EPR	1.110	1.137	1.186	1.256	1.384	
	KIAS	234	235	236	237	252	
	FF/ENG	14580	14240	14290	14340	15680	
500	EPR	1.097	1.120	1.165	1.226	1.322	
	KIAS	226	226	227	228	235	
	FF/ENG	13520	13170	13120	13090	13750	
460	EPR	1.085	1.104	1.144	1.198	1.277	1.443
	KIAS	218	218	218	219	220	238
	FF/ENG	12470	12200	12010	11920	12120	13720
420	EPR	1.073	1.089	1.122	1.170	1.236	1.351
	KIAS	212	212	212	212	212	220
	FF/ENG	11460	11260	11030	10850	10850	11590
380	EPR	1.061	1.076	1.103	1.143	1.200	1.287
	KIAS	205	205	205	205	205	205
	FF/ENG	10490	10290	10110	9810	9760	9990
340	EPR	1.049	1.062	1.084	1.117	1.165	1.235
	KIAS	203	203	203	203	203	203
	FF/ENG	9660	9460	9320	8970	8870	8960
300	EPR	1.039	1.048	1.068	1.093	1.133	1.189
	KIAS	203	203	203	203	203	203
	FF/ENG	9140	8750	8740	8370	8070	8110

This table includes 5% additional fuel for holding in a racetrack pattern.

**ENGINE INOP**  
**ADVISORY INFORMATION**

**Gear Down Landing Rate of Climb Available**  
**Flaps 20**

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	410	290				
50	470	340	200			
48	520	390	250			
46	570	440	300	170		
44	620	480	350	210		
42	650	530	390	250	110	
40	660	580	430	290	150	
38	660	620	470	320	180	30
36	660	650	500	360	210	40
34	660	680	530	380	230	50
32	670	690	550	400	240	60
30	670	690	570	420	250	80
20	680	710	590	470	300	120
10	700	720	600	480	330	170
0	710	730	620	490	340	170
-20	740	760	640	510	350	180
-40	780	800	670	530	370	190

Rate of climb capability shown is valid for 440000 lb, gear down at VREF20 + 5.  
Decrease rate of climb 40 ft/min per 10000 lb greater than 440000 lb.  
Increase rate of climb 50 ft/min per 10000 lb less than 440000 lb.

**Flaps 30**

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-80	-210				
50	-30	-160	-290			
48	20	-120	-250			
46	60	-70	-210	-340		
44	110	-30	-170	-310		
42	150	10	-130	-270	-410	
40	150	50	-90	-240	-380	
38	150	90	-60	-200	-350	-500
36	150	120	-30	-170	-320	-490
34	150	150	0	-150	-310	-480
32	150	160	10	-130	-290	-470
30	150	160	30	-120	-280	-460
20	160	170	50	-80	-240	-420
10	160	170	50	-80	-220	-390
0	170	180	50	-80	-230	-390
-20	180	180	60	-80	-230	-410
-40	180	190	60	-80	-240	-420

Rate of climb capability shown is valid for 440000 lb, gear down at VREF30 + 5.  
Decrease rate of climb 40 ft/min per 10000 lb greater than 440000 lb.  
Increase rate of climb 50 ft/min per 10000 lb less than 440000 lb.



## Performance Inflight - QRH

## Chapter PI-QRH

## Gear Down

## Section 13

## GEAR DOWN

### 220 KIAS Max Climb EPR

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	0	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35
55	1.204	1.203	1.223	1.231	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
50	1.221	1.215	1.223	1.231	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
45	1.239	1.232	1.223	1.231	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
40	1.258	1.250	1.242	1.239	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
35	1.271	1.270	1.260	1.260	1.257	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
30	1.271	1.293	1.284	1.283	1.282	1.278	1.273	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
25	1.271	1.303	1.311	1.309	1.307	1.304	1.301	1.299	1.284	1.281	1.282	1.274	1.265	1.252	1.238	1.219
20	1.271	1.303	1.339	1.337	1.335	1.334	1.331	1.329	1.316	1.300	1.291	1.274	1.265	1.252	1.238	1.219
15	1.271	1.303	1.343	1.361	1.367	1.368	1.365	1.363	1.348	1.333	1.325	1.299	1.271	1.252	1.238	1.219
10	1.271	1.303	1.343	1.361	1.385	1.404	1.403	1.402	1.386	1.369	1.360	1.334	1.308	1.277	1.243	1.219
5	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.444	1.429	1.410	1.400	1.372	1.345	1.317	1.288	1.253
0	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.471	1.455	1.447	1.413	1.385	1.359	1.332	1.306
-5	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.456	1.426	1.402	1.380	1.359
-10	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.494	1.464	1.441	1.426	1.407
-15	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.494	1.495	1.475	1.463	1.450
-20	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.494	1.495	1.499	1.493	1.484

### Anti-ice Adjustment

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
ENGINE ONLY	-0.016	-0.015	-0.015	-0.009	-0.017	-0.023	-0.019	-0.016
ENGINE AND WING*	-0.022	-0.023	-0.020	-0.020	-0.030	-0.038	-0.034	-0.032
ENGINE AND WING**	-0.029	-0.031	-0.030	-0.030	-0.043	-0.053	-0.048	-0.048

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, packs off, 1 bleed source.

**GEAR DOWN**

**Long Range Cruise Altitude Capability**  
**Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	13700	13600	11100
640	15100	15000	12700
620	16600	16500	14300
600	18000	17900	15900
580	19500	19400	17400
560	20700	20600	18900
540	21800	21800	20300
520	23000	22900	21500
500	24100	24100	22700
480	25300	25200	23900
460	26300	26100	25200
440	27300	27100	26200
420	28400	28100	27300
400	29600	29200	28400
380	30700	30300	29500
360	31600	31300	30700
340	32300	32000	31600
320	33100	32800	32500

**GEAR DOWN**

**Long Range Cruise Control**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
660	EPR	1.213	1.300								
	MACH	.487	.519								
	KIAS	269	262								
	FF/ENG	15836	15777								
620	EPR	1.192	1.267	1.311							
	MACH	.475	.510	.522							
	KIAS	263	257	253							
	FF/ENG	14816	14701	14794							
580	EPR	1.173	1.239	1.274	1.320						
	MACH	.463	.499	.512	.524						
	KIAS	256	251	248	244						
	FF/ENG	13831	13653	13688	13768						
540	EPR	1.155	1.212	1.242	1.280	1.328					
	MACH	.451	.486	.500	.514	.526					
	KIAS	249	245	242	239	235					
	FF/ENG	12868	12637	12613	12650	12716					
500	EPR	1.136	1.187	1.213	1.245	1.283	1.334				
	MACH	.437	.472	.487	.501	.515	.527				
	KIAS	241	237	236	233	230	226				
	FF/ENG	11905	11651	11571	11576	11606	11678				
460	EPR	1.119	1.164	1.186	1.213	1.245	1.285	1.341			
	MACH	.422	.457	.472	.487	.501	.515	.533			
	KIAS	233	230	228	226	224	221	219			
	FF/ENG	11018	10704	10584	10557	10547	10583	10804			
420	EPR	1.102	1.142	1.162	1.184	1.211	1.243	1.286	1.348		
	MACH	.405	.441	.456	.470	.485	.500	.518	.540		
	KIAS	224	221	220	218	217	214	213	213		
	FF/ENG	10124	9763	9648	9589	9578	9553	9649	9994		
380	EPR	1.086	1.120	1.138	1.158	1.180	1.206	1.241	1.287	1.352	
	MACH	.388	.423	.438	.452	.467	.483	.503	.524	.547	
	KIAS	214	212	211	210	208	207	207	207	207	
	FF/ENG	9248	8845	8720	8670	8641	8620	8696	8832	9171	
340	EPR	1.072	1.100	1.115	1.132	1.152	1.175	1.203	1.239	1.285	1.350
	MACH	.369	.403	.417	.432	.449	.467	.487	.507	.529	.552
	KIAS	204	202	201	200	200	200	200	200	200	200
	FF/ENG	8471	8091	7962	7762	7763	7805	7850	7911	8034	8353
300	EPR	1.059	1.082	1.095	1.110	1.127	1.148	1.171	1.198	1.233	1.278
	MACH	.349	.384	.399	.416	.433	.451	.469	.489	.511	.533
	KIAS	192	192	192	192	192	192	192	192	192	192
	FF/ENG	7552	7312	7203	7175	7147	7019	7058	7093	7134	7257

**GEAR DOWN**

**Long Range Cruise Enroute Fuel and Time  
Ground to Air Miles Conversion**

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20	20	40	60	80	100	
327	291	260	236	217	200	188	177	167	159	153
662	589	526	476	435	400	376	355	336	319	305
1003	889	793	716	654	600	565	533	505	479	457
1348	1193	1061	957	873	800	753	711	673	639	609
1697	1500	1331	1199	1093	1000	942	889	841	798	760
2052	1810	1603	1442	1312	1200	1130	1066	1008	956	911
2411	2122	1877	1686	1533	1400	1318	1243	1175	1115	1062
2774	2438	2152	1931	1753	1600	1505	1419	1342	1273	1212
3141	2756	2429	2176	1974	1800	1693	1596	1508	1430	1362
3513	3077	2708	2423	2196	2000	1881	1772	1675	1588	1512
3888	3400	2987	2670	2417	2200	2068	1948	1840	1745	1661
4268	3726	3269	2918	2640	2400	2255	2124	2006	1902	1810
4653	4055	3552	3167	2862	2600	2443	2300	2172	2058	1959
5042	4388	3836	3416	3085	2800	2630	2475	2337	2214	2107
5436	4723	4123	3667	3308	3000	2817	2651	2502	2370	2255
5835	5061	4411	3918	3532	3200	3004	2826	2666	2525	2403
6238	5402	4701	4170	3755	3400	3191	3001	2831	2680	2550
6646	5747	4992	4423	3980	3600	3377	3176	2995	2835	2696
7059	6094	5285	4677	4204	3800	3564	3350	3159	2990	2843
7477	6444	5580	4932	4429	4000	3751	3525	3323	3144	2989

**Reference Fuel and Time Required at Check Point**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	14.6	0:47	13.0	0:45	11.4	0:43	10.4	0:42	10.1	0:41
400	29.0	1:38	26.2	1:33	23.2	1:27	21.7	1:23	20.9	1:19
600	43.4	2:28	39.4	2:21	35.0	2:11	32.9	2:05	31.7	1:57
800	57.8	3:19	52.6	3:08	46.8	2:54	44.2	2:46	42.6	2:36
1000	72.2	4:09	65.8	3:56	58.6	3:38	55.4	3:27	53.4	3:14
1200	85.7	5:03	78.3	4:46	69.8	4:23	65.9	4:09	63.4	3:54
1400	99.2	5:58	90.9	5:37	81.0	5:09	76.4	4:52	73.4	4:34
1600	112.7	6:52	103.4	6:27	92.3	5:55	86.9	5:34	83.4	5:13
1800	126.1	7:46	115.9	7:18	103.5	6:40	97.4	6:17	93.4	5:53
2000	139.6	8:40	128.4	8:08	114.7	7:26	107.9	6:59	103.4	6:33
2200	152.0	9:38	139.9	9:02	125.1	8:14	117.5	7:44	112.6	7:14
2400	164.3	10:36	151.5	9:56	135.6	9:02	127.2	8:28	121.7	7:56
2600	176.7	11:34	163.0	10:49	146.0	9:50	136.9	9:13	130.9	8:37
2800	189.0	12:32	174.6	11:43	156.4	10:38	146.5	9:58	140.0	9:19
3000	201.3	13:29	186.1	12:37	166.9	11:26	156.2	10:42	149.2	10:00
3200	212.7	14:31	196.8	13:34	176.6	12:16	165.2	11:29	157.7	10:44
3400	224.0	15:33	207.5	14:31	186.4	13:07	174.1	12:16	166.2	11:27
3600	235.4	16:35	218.1	15:28	196.2	13:58	183.1	13:03	174.7	12:10
3800	246.7	17:37	228.8	16:25	205.9	14:48	192.1	13:49	183.2	12:54
4000	258.0	18:39	239.5	17:22	215.7	15:39	201.1	14:36	191.8	13:37

**GEAR DOWN**

**Long Range Cruise Enroute Fuel and Time  
 Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	300	350	400	450	500
20	-2.1	-0.9	0.0	2.6	5.9
40	-4.4	-2.0	0.0	4.8	10.9
60	-6.7	-3.2	0.0	6.9	15.4
80	-9.0	-4.4	0.0	8.8	19.6
100	-11.3	-5.5	0.0	10.6	23.4
120	-13.6	-6.7	0.0	12.2	26.8
140	-15.9	-7.8	0.0	13.6	29.8
160	-18.1	-9.0	0.0	14.8	32.4
180	-20.3	-10.1	0.0	15.9	34.7
200	-22.5	-11.2	0.0	16.8	36.6
220	-24.7	-12.3	0.0	17.6	38.0
240	-26.9	-13.4	0.0	18.2	39.1
260	-29.1	-14.5	0.0	18.6	39.8
280	-31.2	-15.6	0.0	18.9	40.2
300	-33.4	-16.7	0.0	19.0	40.1

Based on Long Range Cruise and VREF30+80 descent.

**Descent at VREF30 + 80 KIAS**

PRESSURE ALT (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	40	44	48	52	56	60	64	69	73	77
TIME (MINUTES)	11	12	13	14	14	15	16	17	17	18

**GEAR DOWN**

**Holding  
Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
660	EPR	1.114	1.143	1.197	1.280			
	KIAS	244	244	244	244			
	FF/ENG	15100	14810	14940	15260			
620	EPR	1.103	1.128	1.178	1.251			
	KIAS	239	239	239	239			
	FF/ENG	14300	13980	14040	14210			
580	EPR	1.092	1.115	1.160	1.224	1.336		
	KIAS	235	235	235	235	235		
	FF/ENG	13540	13210	13180	13260	13990		
540	EPR	1.082	1.102	1.142	1.199	1.291		
	KIAS	230	230	230	230	230		
	FF/ENG	12720	12440	12310	12300	12750		
500	EPR	1.073	1.090	1.125	1.176	1.253		
	KIAS	224	224	224	224	224		
	FF/ENG	11900	11700	11500	11400	11620		
460	EPR	1.064	1.079	1.109	1.155	1.220	1.338	
	KIAS	218	218	218	218	218	218	
	FF/ENG	11090	10930	10730	10540	10630	11240	
420	EPR	1.055	1.069	1.095	1.134	1.191	1.283	
	KIAS	212	212	212	212	212	212	
	FF/ENG	10310	10130	9980	9690	9720	10040	
380	EPR	1.047	1.059	1.082	1.115	1.165	1.239	1.391
	KIAS	205	205	205	205	205	205	205
	FF/ENG	9540	9360	9240	8910	8870	9050	9750
340	EPR	1.041	1.051	1.072	1.101	1.145	1.209	1.326
	KIAS	203	203	203	203	203	203	203
	FF/ENG	9060	8880	8870	8570	8330	8440	8840
300	EPR	1.037	1.046	1.065	1.091	1.131	1.188	1.286
	KIAS	203	203	203	203	203	203	203
	FF/ENG	8920	8740	8570	8280	8120	8050	8260

This table includes 5% additional fuel for holding in a racetrack pattern.

**GEAR DOWN**

**Holding  
 Flaps 1**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
660	EPR	1.114	1.142	1.197	1.278	
	KIAS	224	224	224	224	
	FF/ENG	14330	14050	14210	14430	
620	EPR	1.102	1.128	1.178	1.249	1.376
	KIAS	219	219	219	219	219
	FF/ENG	13530	13250	13300	13420	14290
580	EPR	1.092	1.114	1.159	1.222	1.325
	KIAS	215	215	215	215	215
	FF/ENG	12730	12510	12440	12510	13030
540	EPR	1.082	1.101	1.141	1.197	1.283
	KIAS	210	210	210	210	210
	FF/ENG	11900	11750	11600	11590	11850
500	EPR	1.072	1.090	1.124	1.174	1.248
	KIAS	204	204	204	204	204
	FF/ENG	11090	10950	10810	10700	10800
460	EPR	1.063	1.078	1.108	1.152	1.216
	KIAS	198	198	198	198	198
	FF/ENG	10290	10140	10040	9810	9870
420	EPR	1.054	1.068	1.093	1.131	1.186
	KIAS	192	192	192	192	192
	FF/ENG	9500	9350	9270	8980	8990
380	EPR	1.046	1.057	1.080	1.111	1.159
	KIAS	185	185	185	185	185
	FF/ENG	8880	8740	8620	8360	8170
340	EPR	1.040	1.049	1.069	1.097	1.138
	KIAS	183	183	183	183	183
	FF/ENG	8360	8230	8090	7860	7750
300	EPR	1.035	1.044	1.062	1.086	1.123
	KIAS	183	183	183	183	183
	FF/ENG	8030	7900	7760	7530	7400

This table includes 5% additional fuel for holding in a racetrack pattern.



Intentionally  
Blank



## Performance Inflight - QRH

## Chapter PI-QRH

## Gear Down, Engine INOP

## Section 14

## GEAR DOWN

## ENGINE INOP

## MAX CONTINUOUS THRUST

## Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 LB)		VREF30 + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
500	476	223	4500	3300	400
460	438	217	7100	6300	5400
420	399	211	9700	9000	8200
380	364	205	12700	12100	11400
340	325	198	15100	14200	13300

**GEAR DOWN**

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Altitude Capability**

**100 ft/min residual rate of climb**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
500	2700		
480	4200	2700	
460	5700	4600	1400
440	7000	6200	5200
420	8300	7600	6800
400	9700	9100	8300
380	11600	10700	9800
360	12900	12400	11800
340	14100	13300	12700
320	15500	14600	13500



**GEAR DOWN**

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Control**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)					
		5	7	9	11	13	15
480	EPR	1.337					
	MACH	.367					
	KIAS	222					
	FF/ENG	22003					
440	EPR	1.297	1.340				
	MACH	.357	.371				
	KIAS	216	216				
	FF/ENG	19984	20407				
400	EPR	1.262	1.297	1.340	1.399		
	MACH	.347	.360	.374	.388		
	KIAS	210	210	210	210		
	FF/ENG	18239	18411	18820	19442		
360	EPR	1.230	1.260	1.294	1.337	1.396	
	MACH	.336	.349	.362	.376	.390	
	KIAS	203	203	203	203	203	
	FF/ENG	16599	16685	16854	17185	17705	
320	EPR	1.199	1.225	1.254	1.288	1.330	1.388
	MACH	.324	.336	.349	.363	.377	.391
	KIAS	196	196	196	196	196	196
	FF/ENG	15036	15071	15169	15282	15527	15959

**GEAR DOWN**  
**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Diversion Fuel and Time**  
**Ground to Air Miles Conversion**

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20	20	40	60	80	100	
349	305	269	241	219	200	187	174	164	155	147
529	462	406	363	329	300	279	261	245	231	219
709	619	543	485	439	400	372	347	325	306	290
891	777	681	607	550	500	465	434	406	382	361
1073	935	819	730	660	600	558	520	486	457	433
1257	1094	957	853	771	700	650	606	567	533	504
1441	1254	1096	976	881	800	743	692	647	608	575
1626	1414	1235	1099	992	900	836	778	728	683	646
1813	1575	1374	1222	1102	1000	928	864	808	759	717

**Reference Fuel and Time Required at Check Point**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	6		8		10		12	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	15.2	0:54	14.7	0:53	14.4	0:51	14.2	0:50
300	23.1	1:21	22.4	1:19	22.1	1:17	21.8	1:14
400	30.9	1:47	30.2	1:45	29.7	1:42	29.5	1:39
500	38.6	2:15	37.7	2:11	37.1	2:07	36.9	2:04
600	46.3	2:42	45.2	2:37	44.5	2:33	44.2	2:28
700	53.8	3:09	52.6	3:04	51.7	2:58	51.4	2:53
800	61.3	3:36	59.9	3:30	58.9	3:24	58.5	3:18
900	68.7	4:04	67.1	3:57	66.0	3:50	65.5	3:44
1000	76.0	4:32	74.3	4:24	73.0	4:16	72.4	4:09

**Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	300	350	400	450	500
10	-1.3	-0.7	0.0	1.3	2.4
15	-2.0	-1.1	0.0	2.0	3.9
20	-2.8	-1.4	0.0	2.8	5.4
25	-3.5	-1.8	0.0	3.6	6.8
30	-4.2	-2.1	0.0	4.3	8.3
35	-4.9	-2.5	0.0	5.0	9.7
40	-5.6	-2.9	0.0	5.7	11.1
45	-6.3	-3.2	0.0	6.4	12.5
50	-7.0	-3.6	0.0	7.1	13.9
55	-7.6	-3.9	0.0	7.7	15.3
60	-8.3	-4.3	0.0	8.4	16.7
65	-9.0	-4.6	0.0	9.0	18.1
70	-9.6	-5.0	0.0	9.6	19.4
75	-10.3	-5.3	0.0	10.1	20.8
80	-10.9	-5.7	0.0	10.7	22.1

Based on Long Range Cruise and VREF30+80 descent. Includes APU fuel burn.

**GEAR DOWN**

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Holding  
 Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
540	EPR	1.316			
	KIAS	230			
	FF/ENG	25350			
500	EPR	1.283			
	KIAS	224			
	FF/ENG	23400			
460	EPR	1.253	1.313		
	KIAS	218	218		
	FF/ENG	21600	21770		
420	EPR	1.225	1.276	1.392	
	KIAS	212	212	212	
	FF/ENG	19890	19850	21040	
380	EPR	1.198	1.243	1.334	
	KIAS	205	205	205	
	FF/ENG	18230	18090	18670	
340	EPR	1.180	1.222	1.302	
	KIAS	203	203	203	
	FF/ENG	17180	17050	17380	
300	EPR	1.167	1.207	1.280	1.408
	KIAS	203	203	203	203
	FF/ENG	16500	16340	16580	17520

**This table includes 5% additional fuel for holding in a racetrack pattern.**

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**Performance Inflight - QRH****Chapter PI-QRH****Text****Section 15****Introduction**

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

**General****Flight With Unreliable Airspeed / Turbulent Air Penetration**

Body attitude and average EPR information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits. The Climb, Cruise and Descent tables in this section may also be used for turbulent air penetration. The Flight with Unreliable Airspeed - FINAL APPROACH table includes a 10 knot margin for landing.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

**Max Climb EPR**

This table shows Max Climb EPR for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read EPR. EPR adjustments are shown for anti-ice operation.

**Go-Around EPR**

To find Go-Around EPR based on normal engine bleed for packs on and anti-ice off, enter the Go-Around EPR table with airport pressure altitude and reported OAT or TAT and read EPR. EPR adjustments are shown for engine bleeds for various conditions.

---

## VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

---

## Advisory Information

### Runway Surface Condition Correlation

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. A table is provided that correlates runway condition code to runway surface condition description and reported braking action that can then be used to determine the appropriate Normal Configuration Landing Distance or Non-Normal Configuration Landing Distance.

### Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are 115% of the actual landing distance. The Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance of 1500 ft from threshold to touchdown. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, two-engine maximum reverse thrust, and auto speedbrakes.

To use these tables, determine the reference landing distance for the selected braking configuration and reported braking action. Adjust this reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers. Each correction is applied independently to the reference landing distance. A correction for use of manual speedbrakes is provided in the table notes.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" reported braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

---

## Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing. Landing distances and adjustments are provided for dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are representative of the actual landing distance, and are not factored. The Non-Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance of 1500 ft from threshold to touchdown. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, and maximum available reverse thrust.

Tables for Non-Normal Configuration Landing Distance in this section are similar in format and used in the same manner as tables for the Normal Configuration Landing Distance previously described.

For an engine inoperative landing, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

## Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

## Approach or Landing Climb Limited Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, approach or landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read approach or landing climb limited weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

The table "Approach or Landing Climb Limited Weight" presents the data which are the more limiting of Approach Climb Limit Weight and Landing Climb Limit Weight.

---

## Engine Inoperative

### Initial Max Continuous EPR

The Initial Max Continuous EPR setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target EPR setting at the start of driftdown. Once driftdown is established, the Max Continuous EPR table should be used to determine EPR for the given conditions.

## Max Continuous EPR

Power setting is based on one engine operating with one bleed source for pack(s) operating and all anti-ice bleeds off. Enter the table for appropriate pressure altitude with IAS or Mach and TAT to read Max Continuous EPR. Apply the anti-ice corrections below the table as required.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

## Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

## Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

## Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

---

## Long Range Cruise Control

The table provides target EPR, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

## Long Range Cruise Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative. The data is based on single engine Long Range Cruise speed and .84/310/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion Table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

## Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

## Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative landing is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

---

## Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

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**Checklist Instructions**

**Chapter CI**

**Table of Contents**

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**Checklist Instructions**  
**Model Identification****Chapter CI**  
**Section ModID****General**

The airplanes listed in the table below are covered in this QRH. The numbers are used to distinguish data peculiar to one or more, but not all of the airplanes. Where data applies to all airplanes listed, no reference is made to individual airplane numbers.

The table permits flight crew correlation of configuration differences by Registry Number in alpha/numeric order within an operator's fleet for airplanes covered in this handbook. Configuration data reflects the airplane as delivered configuration and is updated for service bulletin incorporations in conformance with the policy stated in the introduction section of chapter 0 of volume 1 of this handbook's associated Flight Crew Operations Manual.

Registry number(s) reflect the most current information supplied by the operator to the Boeing Company through the SRM process and 60 days prior to the subject revision date. Registry numbers received after that date will be incorporated at the next scheduled revision. If a registry number is not provided the FCOM will default to serial number.

Airplane number is supplied by the operator. Registry number is supplied by the national regulatory agency. Serial and tabulation numbers are supplied by Boeing.

<b>Airplane Number</b>	<b>Registry Number</b>	<b>Serial Number</b>	<b>Tabulation Number</b>
116	HL7700	30859	WC114
117	HL7732	29174	WC115
118	HL7739	29175	WC116
119	HL7755	30861	WC118
120	HL7756	30860	WC119
121	HL7775	30862	WC120
122	HL7791	35525	WC581
123	HL8254	40198	WC586
124	HL8284	40199	WC587



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## QRH Revision Transmittal Letter

To: All holders of Asiana Airlines 777 Flight Crew Operations Manual, Boeing Document Number D632W001-AAR.

Subject: Quick Reference Handbook (QRH) Revision.

This revision reflects the most current information available to The Boeing Company 60 days before the subject revision date.

General information below explains the use of revision bars to identify new or revised information. Highlights in the Revision Highlights section explain the revision bar changes in this revision.

## Revision Record

No.	Revision Date	Date Filed
31	June 15, 2015	
33	March 1, 2016	
35	December 15, 2016	
37	December 15, 2017	
39	December 15, 2018	
41	December 15, 2019	
43	December 15, 2020	
45	December 15, 2021	
47	December 15, 2022	
49	December 15, 2023	
51	December 15, 2024	
53	December 15, 2025	

No.	Revision Date	Date Filed
32	December 15, 2015	
34	June 15, 2016	
36	June 15, 2017	
38	June 15, 2018	
40	June 15, 2019	
42	June 15, 2020	
44	June 15, 2021	
46	June 15, 2022	
48	June 15, 2023	
50	June 15, 2024	
52	June 15, 2025	

## General

The Boeing Company issues flight crew operations manual and QRH revisions to provide new or revised procedures and information. Formal revisions also incorporate appropriate information from previously issued flight crew operations manual bulletins.

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The revision date is the approximate date the manual is mailed to the customer.

QRH revisions, part of the formal FCOM revisions, include a QRH Revision Transmittal Letter, a new QRH Revision Record, QRH Revision Highlights, and a current QRH List of Effective Pages. Use the information on the new QRH Revision Record and QRH List of Effective Pages to verify the QRH content.

Pages containing revised technical material have revision bars associated with the changed text or illustration. Editorial revisions (for example, spelling corrections) may have revision bars with no associated highlight.

The record above should be completed by the person incorporating the revision into the manual.

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## QRH Filing Instructions

Consult the QRH List of Effective Pages (CI.LEP). Pages identified with an asterisk (\*) are either replacement pages or new (original) issue pages. Remove corresponding old pages and replace or add new pages. Remove pages that are marked DELETED; there are no replacement pages for deleted pages.

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## QRH Revision Highlights

Be careful when inserting changes not to throw away pages from the manual that are not replaced. Using the QRH List of Effective Pages (CI.LEP) can help determine the correct content of the QRH.

Throughout the QRH, airplane effectivity may be updated to reflect coverage as listed on the Model Identification page (CI.ModID), or to show service bulletin airplane effectivity. Highlights are not supplied for these types of changes.

This QRH is published from a database; the text and illustrations are marked with configuration information. Occasionally, because the editors rearrange the database markers, or mark items with configuration information due to the addition of new database content, some customers may receive revision bars on content that appears to be unchanged. Pages may also be republished without revision bars due to slight changes in the flow of the document.

Most of the 777 section level and package level performance table of contents are updated to a more descriptive entry. This update issues new page dates in the entire affected section(s). Please be sure to review the data for changes.



**Performance Package 10**

**777-200ER PW4090 LB FT FAA TO1-10 TO2-20 TALPA**

**Section 10 - Pkg Model Identification**

777-200ER PW4090 LB FT FAA TO1-10 TO2-20 TALPA was added as Section 10.

**Section 10 - General**

777-200ER PW4090 LB FT FAA TO1-10 TO2-20 TALPA was added as Section 10.

**Section 11 - Advisory Information**

Added section "11".

**Section 12 - Engine Inop**

Added section "12".

**Section 13 - Gear Down**

Added section "13".

**Section 14 - Gear Down, Engine INOP**

Added section "14".

**Section 15 - Text**

Added section "15".

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**Chapter CI - Checklist Instructions**

**Section ModID - Model Identification**

**General**

CI.ModID.1 - Revised to add/change an airplane entry.

CI.ModID.1 - Revised to add/change an airplane entry.

CI.ModID.1 - Revised to add/change an airplane entry.

CI.ModID.1 - Revised to add/change an airplane entry.

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CI.ModID.1 - Revised to add/change an airplane entry.

CI.ModID.1 - Revised to add/change an airplane entry.

## **Section 2 - Non-Normal Checklists**

### **Introduction**

CI.2.1 - Revised sentence, added "of".

### **Non-Normal Checklist Operation**

CI.2.10 - Added information on use of non-normal checklists.

CI.2.10 - Clarified when a circuit breaker may be reset.

CI.2.10 - Clarified when a circuit breaker may be cycled.

### Filling Instruction for Supplement

1. Insert these pages printed in blue page, 'Checklist Instructions, List of Effective Pages', in front of CI.LEP.1 page in the Boeing QRH.
2. For the revision of QRH supplement pages, consult the List of Effective pages for supplement (CI.LEP.S2).
3. Unless specified otherwise in the Supplement LEP below, maintain QRH as indicated by BOEING QRH LEP.



## List of Effective Pages for QRH Supplement

Revision No. : 57, Dated AUG 01, 2025

Page	Date	Remarks
<b>Unannounced (Tab)</b>		
Unann.Index.2.S	August 01, 2025	Insert
<b>0 Miscellaneous (Tab)</b>		
0.6S ~ 0.7S	August 01, 2025	Insert
0.9S ~ 0.14S	August 01, 2025	Insert
0.15S ~ 0.18S	August 01, 2025	Insert
<b>2 Air Systems (Tab)</b>		
2.6S ~ 2.7S	August 01, 2025	Insert
2.12S ~ 2.13S2	August 01, 2025	Insert
2.28S ~ 2.29S	August 01, 2025	Insert
<b>3 Anti-ice, Rain (Tab)</b>		
3.5S	August 01, 2025	Insert
<b>7 Engines, APU (Tab)</b>		
7.8S ~ 7.9S	August 01, 2025	Insert
7.12S	August 01, 2025	Insert
7.21S	August 01, 2025	Insert
7.30S	August 01, 2025	Insert
7.35S	August 01, 2025	Insert
<b>8 Fire Protection (Tab)</b>		
8.4S	August 01, 2025	Insert
8.6S	August 01, 2025	Insert
8.16S	August 01, 2025	Insert
8.18S ~ 8.19S	August 01, 2025	Insert
8.25S	August 01, 2025	Insert
<b>9 Flight Controls (Tab)</b>		
9.2S	August 01, 2025	Insert
9.3S ~ 9.3S2	August 01, 2025	Insert
9.5S ~ 9.7S	August 01, 2025	Insert
9.9S	August 01, 2025	Insert
9.12S	August 01, 2025	Insert
9.15S ~ 9.16S	August 01, 2025	Insert
9.18S ~ 9.19S	August 01, 2025	Insert
9.22S	August 01, 2025	Insert

9.24S ~ 9.27S	August 01, 2025	Insert
<b>10 Flight Instruments, Displays (Tab)</b>		
10.6S	August 01, 2025	Insert
<b>11 Flight Management, Navigation (Tab)</b>		
11.5S	August 01, 2025	Insert
11.18S – 11.19S	August 01, 2025	Insert
<b>12 Fuel (Tab)</b>		
12.12S	August 01, 2025	Insert
12.26S ~ 12.27S	August 01, 2025	Insert
12.32S ~ 12.33S	August 01, 2025	Insert
<b>13 Hydraulics (Tab)</b>		
13.7S ~ 13.9S	August 01, 2025	Insert
13.13S ~ 13.15S	August 01, 2025	Insert
13.17S ~ 13.18S	August 01, 2025	Insert
13.21S	August 01, 2025	Insert
13.24S ~ 13.26S	August 01, 2025	Insert
13.28S ~ 13.29S	August 01, 2025	Insert
<b>14 Landing Gear (Tab)</b>		
14.2S ~ 14.3S	August 01, 2025	Insert
14.8S ~ 14.12S	August 01, 2025	Insert
<b>Operational Information (Tab)</b>		
OI.TOC.1S ~ 2S	August 01, 2025	Insert
OI.1.1S1 ~ S2	August 01, 2025	Insert
OI.1.2S1 ~ S2	August 01, 2025	Insert
OI.2.0S1 ~ S2	August 01, 2025	Insert
OI.2.1S1 ~ S4	August 01, 2025	Insert
OI.2.2S1 ~ S2	August 01, 2025	Insert
OI.2.3S1 ~ S2	August 01, 2025	Insert
OI.2.4S1 ~ S2	August 01, 2025	Insert
OI.2.5S1 ~ S2	August 01, 2025	Insert
<b>Checklist Instructions (Tab)</b>		
CI.TOC.1S ~ 2S	August 01, 2025	Insert
CI.LEP.1S ~ 4S	August 01, 2025	Insert



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ASIANA AIRLINES

**B777 QRH**

**777 Quick Reference Handbook**

**Approved by MOLIT**

**REV NO & DATE**



**REV 53 / 2025.12.15**



## Preface

## QRH List of Effective Pages

## Chapter CI

## Section LEP

**Quick Reference Handbook****Quick Action Index**

\* QA.Index.1-2 December 15, 2025

**EICAS Messages (tab)**

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3.8	December 15, 2022	7.17	December 15, 2020
3.9	December 15, 2022	7.18	December 15, 2024
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3.11	December 15, 2022	7.20	December 15, 2020
3.12	December 15, 2022	7.21	December 15, 2020
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8.14	December 15, 2022	9.26	June 15, 2019
8.15	June 15, 2021	9.27	December 15, 2015
8.16	June 15, 2021	9.28	June 15, 2020
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8.24	June 15, 2021	10.4	December 15, 2017
8.25	June 15, 2021	10.5	December 15, 2017
8.26	December 15, 2022	10.6	June 15, 2017
8.27	June 15, 2021	10.7	June 15, 2019
8.28	June 15, 2021	10.8	June 15, 2019
8.29	June 15, 2021	10.9	June 15, 2019
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9.2	December 12, 2011	11.4	June 15, 2022
9.3	December 13, 2010	11.5	June 15, 2022
9.4	June 15, 2019	11.6	June 15, 2022
9.5	December 15, 2015	11.7	June 15, 2022
9.6	March 1, 2016	11.8	June 15, 2025
9.7	December 15, 2015	11.9	June 15, 2022
9.8	December 15, 2016	11.10	June 15, 2025
9.9	June 15, 2016	11.11	June 15, 2025
9.10	December 13, 2010	11.12	June 15, 2025
9.11	March 1, 2016	11.13	June 15, 2025
9.12	December 12, 2011	11.14	June 15, 2025
9.13	December 13, 2010	11.15	June 15, 2025
9.14	December 15, 2017	11.16	June 15, 2025
9.15	December 12, 2011	11.17	June 15, 2025
9.16	December 15, 2024	11.18	June 15, 2025
9.17	December 15, 2024	11.19	June 15, 2025
9.18	December 15, 2017	11.20	June 15, 2025
9.19	December 15, 2017	11.21	June 15, 2025
9.20	December 15, 2015	11.22	June 15, 2025
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12.4	June 13, 2011	13.12	June 15, 2018
12.5	June 13, 2011	13.13	June 15, 2018
12.6	December 15, 2013	13.14	June 15, 2018
12.7	December 15, 2013	13.15	June 15, 2018
12.8	December 15, 2018	13.16	June 15, 2018
12.9	December 12, 2011	13.17	June 15, 2018
12.10	December 12, 2011	13.18	June 15, 2018
12.11	December 15, 2016	13.19	June 15, 2018
12.12	December 12, 2011	13.20	June 15, 2018
12.13	December 15, 2013	13.21	June 15, 2018
12.14	December 15, 2013	13.22	June 15, 2018
12.15	December 15, 2013	13.23	June 15, 2022
12.16	December 15, 2014	13.24	June 15, 2018
12.17	June 15, 2020	13.25	June 15, 2018
12.18	December 15, 2018	13.26	June 15, 2018
12.19	December 15, 2018	13.27	June 15, 2018
12.20	December 15, 2018	13.28	June 15, 2018
12.21	December 15, 2018	13.29	June 15, 2018
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12.26	December 15, 2018	14.2	December 13, 2010
12.27	December 15, 2018	14.3	December 15, 2019
12.28	December 15, 2015	14.4	December 15, 2019
12.29	December 15, 2018	14.5	December 15, 2019
12.30	December 15, 2018	14.6	December 15, 2019
12.31	December 15, 2018	14.7	December 15, 2019
12.32	December 15, 2018	14.8	December 15, 2019
12.33	December 15, 2018	14.9	December 15, 2019
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* PI-QRH.10.4	December 15, 2025	* PI-QRH.11.39	December 15, 2025
* PI-QRH.10.5	December 15, 2025	* PI-QRH.11.40	December 15, 2025
* PI-QRH.10.6	December 15, 2025	* PI-QRH.11.41	December 15, 2025
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* PI-QRH.11.10	December 15, 2025	* PI-QRH.12.7	December 15, 2025
* PI-QRH.11.11	December 15, 2025	* PI-QRH.12.8	December 15, 2025
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# Checklist Instructions

## Normal Checklists

# Chapter CI

## Section 1

### Introduction

This introduction gives guidelines for use of the printed version of the Normal Checklist (NC) as well as the Electronic Checklist (ECL).

The NC is organized by phase of flight.

The NC is used to verify that critical items have been done.

### Normal Checklist Operation

Normal checklists are used after doing all respective procedural items.

The following table shows which pilot calls for the checklist and which pilot reads the checklist. Both pilots visually verify that each item is in the needed configuration or that the step is done. The far right column shows which pilot gives the response. This is different than the normal procedures where the far right column can show which pilot does the step.

Checklist	Call	Read	Verify	Respond
PREFLIGHT	Captain	First officer	Both	Area of responsibility
BEFORE START	Captain	First officer	Both	Area of responsibility
BEFORE TAXI	Captain	First officer	Both	Area of responsibility
BEFORE TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot flying
AFTER TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot monitoring
DESCENT	Pilot flying	Pilot monitoring	Both	Area of responsibility
APPROACH	Pilot flying	Pilot monitoring	Both	Area of responsibility
LANDING	Pilot flying	Pilot monitoring	Both	Pilot flying
SHUTDOWN	Captain	First officer	Both	Area of responsibility
SECURE	Captain	First officer	Both	Area of responsibility

If the airplane configuration does not agree with the needed configuration:

- stop the checklist
- complete the respective procedure steps
- continue the checklist

If it becomes apparent that a procedure was not completed:

- stop the checklist
- complete the procedure
- do the checklist from the start

Try to do checklists before or after high work load times. The flight crew may need to stop a checklist for a short time to do other tasks. If the interruption is short, continue the checklist with the next step. If a pilot is not sure where the checklist was stopped, do the checklist from the start. If the checklist is stopped for a long time, also do the checklist from the start.

After completion of each checklist, the pilot reading the checklist calls,  
" \_\_\_\_\_ CHECKLIST COMPLETE."

---

## Electronic Checklist Operation

Operation with an electronic normal checklist is the same as with a printed normal checklist except that, there is no need to read aloud or visually confirm items that are complete (green). For the BEFORE TAKEOFF and LANDING checklists, the PM announces " \_\_\_\_ CHECKLIST COMPLETE," the PF visually confirms that the CHECKLIST COMPLETE indication is shown, and the PF announces "CHECKLIST COMPLETE."

Closed loop (sensed) checklist items change from white to green when the action is taken. The PM is responsible to check off any open loop (not sensed) item and to verify that all closed loop items are green. See Chapter 10, Flight Instruments, Displays, for a complete description of the electronic checklist system.

---

## Checklist Content

The checklist has the minimum items needed to operate the airplane safely.

Normal checklists have items that meet any of the following criteria:

- items essential to safety of flight that are not monitored by an alerting system, or
- items essential to safety of flight that are monitored by an alerting system but if not done, would likely result in a catastrophic event if the alerting system fails, or
- needed to meet regulatory requirements, or
- items needed to maintain fleet commonality between the 737, 747, 757, 767, 777, and 787, or
- items that enhance safety of flight and are not monitored by an alerting system (for example the autobrake), or
- during shutdown and secure, items that could result in injury to personnel or damage to equipment if not done

## Checklist Construction

When a checklist challenge does not end with "switch" or "lever", then the challenge refers to system status. For example, "Landing Gear...Down" refers to the status of the landing gear, not just the position of the lever.

When a checklist challenge ends with "switch" or "lever", then the challenge refers to the position of the switch or lever. For example, "FUEL CONTROL switches...CUTOFF" refers to the position of the switches.

Because normal checklists are done routinely, some checklist items are simplified to be more conversational such as "Autobrake...RTO" instead of "AUTOBRAKE selector...RTO".

---

## Electronic Checklist Malfunctions

### Single ECL malfunction

Malfunctions of the electronic checklist system are extremely rare. One possible malfunction is a closed-loop action item that does not turn green. In this case, confirm that the control position or system condition is correct as stated in the checklist step, then use the item override key (ITEM OVRD) to complete the step. Continue to use ECL.

### Multiple ECL malfunctions

If any other malfunction occurs in the ECL, or the ECL content is not correct, discontinue use of the ECL and use the backup checklist (QRH or equivalent) for the remainder of the flight. Use the EICAS alert messages, but disregard the checklist icons on the EICAS message list. Do not combine the use of ECL and QRH.

If the CHKL INCOMPLETE NORM or CHKL NON-NORMAL messages show, confirm that the appropriate checklist has been completed using the QRH or equivalent, then ignore the message.



Intentionally  
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## Introduction

The non-normal checklists chapter contains checklists used by the flight crew to manage non-normal situations. The checklists are grouped in sections which match the system description chapters in Volume 2.

## Annunciated Checklists

Most checklists correspond to an EICAS alert message. The EICAS alert message indicates a non-normal condition, and is the cue to select and do the associated checklist.

## Unannunciated Checklists

Checklists without an EICAS alert message (such as Ditching) are called unannunciated checklists. Most unannunciated checklists are in the associated system section. For example, Fuel Leak is in section 12, Fuel. Unannunciated checklists with no associated system are in section 0, Miscellaneous.

## Icon Checklists

A rectangle icon [ ] precedes all EICAS alert messages that have procedural steps, notes, or other information of which the flight crew should be aware of. The rectangle icon is removed from the EICAS alert message when the checklist has been completed. In the printed non-normal checklists, the titles also have the rectangle icon to agree with the EICAS alert message. EICAS alert messages without rectangle icons are informational, have no procedural steps or notes, or the action is obvious (such as OVERSPEED).

## Quick Action Index

Checklists that need a quick response are listed in the Quick Action Index. In each system section, Quick Action Index checklists are listed first, followed by checklists that are not in the Quick Action Index. The titles of Quick Action Index checklists are printed in **bold** type. Checklist titles in upper case (such as AUTOBRAKE) are annunciated by an EICAS alert message or other indication. Checklist titles in upper and lower case (such as Window Damage L, R) are not annunciated.

## Airplane Effectivity Statement

If a checklist or a step in a checklist is not applicable to all airplanes, airplane effectivity information is included in the checklist. Airplane effectivity can be listed by airplane number, registry number, serial number or tabulation number. If a checklist is applicable to some but not all airplanes, airplane effectivity is centered below the checklist title. If a step in a checklist is applicable to some but not all airplanes, airplane effectivity is included above the step. If a checklist or a step in a checklist is applicable to all airplanes, airplane effectivity information is not included.

## Condition Statement

All checklists have condition statements. The condition statement briefly describes the situation that caused the EICAS alert message. Unannounced checklists also have condition statements to help in understanding the reason for the checklist.

## Objective Statement

Some checklists have objective statements. The objective statement briefly describes the expected result of doing the checklist or briefly describes the reason for steps in the checklist.

## Memory Items vs. Reference Items

Checklists can have both memory and reference items. Memory items are immediate actions that must be done before reading the rest of the checklist. These actions must be done from memory or from an approved, immediately accessible reference such as an Electronic Checklist (ECL) or Quick Reference Checklist (QRC), and need to be done prior to doing reference items. In the printed non-normal checklists, the last memory item is followed by a dashed horizontal line. In the electronic checklists, memory items are not identified. Reference items are actions to be done while reading the checklist.

## Additional Information Section

Some checklists have additional information at the end of the checklist. The additional information provides data the flight crew may wish to consider. The additional information does not need to be read.

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## Electronic Checklist Operation

A non-normal menu is given for the electronic checklist.

The primary purposes of the non-normal menu are to access unannounced checklists and to access the condition statements for EICAS alert messages without rectangle icons.

The non-normal menu is also used to access checklists for EICAS alert messages with rectangle icons to allow review of the checklist. Operation of the electronic checklist is described in section 10; Flight Instruments, Displays.

Closed loop (sensed) checklist items change from white to green when the action is taken. The pilot monitoring must "check off" any open loop (not sensed) items and verify that all closed loop items are green.

## Starting a Checklist without an Icon

Non-normal checklists are typically accomplished based on an EICAS message showing with an icon. But in some cases, a checklist needs to be accomplished when there is no checklist icon. In these cases, the checklist must be opened from the ECL non-normal menu.

These are some cases when a checklist is started without an icon:

- Unannunciated checklist
- A non-normal condition can occur more than one time in a single flight. On the second occurrence, if the checklist is a latched checklist, the EICAS message shows again, but without an icon. The icon does not show because the checklist is latched in the complete state from the first time the message showed. If this occurs, open the checklist from the non-normal menu and restart the checklist by selecting the CHKL RESET key on the ECL screen. There is no indication on ECL of which checklists are latched.
- Checklist is opened only for review without the intent to accomplish it (see section Using CHKL OVRD)
- Checklist is opened accidentally (see section Using CHKL OVRD)

## Using CHKL OVRD

The flight crew can decide not to accomplish a checklist after it has been opened.

The three most common reasons for this are:

- The condition addressed by the checklist no longer exists and the checklist does not need to be accomplished
- The checklist was opened only for review without the intent to accomplish it
- The checklist was opened accidentally

If the flight crew decides not to do the checklist, select the CHKL OVRD key on the bottom of the checklist page before closing ECL and before selecting another checklist. This forces the checklist back to the inactive state. Otherwise, the checklist can remain active.

Using CHKL OVRD also removes the following items associated with the overridden checklist:

- Notes collected on the Notes page
- Inhibited checklists
- Deferred items added to the end of normal checklists

If the flight crew wants to pause the checklist and complete it later, do not use CHKL OVRD. In this case, the flight crew can close ECL or navigate to another checklist. The in-progress checklist stays active and continues to be available in the checklist queue or via the NON-NORMAL key. The CHKL NON-NORMAL advisory message may show on EICAS to remind the crew of the active checklist.

## Using CHKL RESET

If a checklist that is in progress needs to be restarted, select the CHKL RESET key on the bottom of the checklist page. This resets the checklist to the beginning and keeps it active.

## Using ITEM OVRD

A flight crew can decide not to accomplish an individual line item in an ECL checklist, either because an airplane system malfunction does not allow the line item to be completed or based on captain's discretion. When that line item is the current line item in ECL, select the ITEM OVRD key at the bottom of the ECL screen. The line item changes to cyan and the current line item box advances to the next incomplete line item. ECL treats the overridden line item as complete.

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## Non-Normal Checklist Operation

Non-normal checklists start with steps to correct the situation. If needed, information for planning the rest of the flight is included. In the printed non-normal checklists, when special items are needed to configure the airplane for landing, the items are included in the Deferred Items section of the checklist. In the electronic checklists, deferred items are automatically added to the end of the applicable normal checklist. Flight patterns for some engine out situations are located in the Maneuvers chapter and show the sequence of configuration changes.

## Start a Checklist

Non-normal checklist use starts when the airplane flight path and configuration are correctly established. Only a few situations need an immediate response (such as CABIN ALTITUDE). Usually, time is available to assess the situation before corrective action is started. All actions must then be coordinated under the captain's supervision and done in a deliberate, systematic manner. Flight path control must never be compromised.

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## Do Memory Items

When a non-normal situation occurs, at the direction of the pilot flying, both crewmembers do all memory items in their areas of responsibility without delay.

## Call for Checklist and Do Initial Actions

The pilot flying calls for the checklist when:

- the flight path is under control
- the airplane is not in a critical phase of flight (such as takeoff or landing)
- all memory items are complete.

The pilot monitoring reads aloud:

- the checklist title
- the airplane effectivity (if applicable) as needed to verify the correct checklist
- as much of the objective statement (if applicable) as needed to understand the expected result of doing the checklist.

The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood.

For checklists with memory items, the pilot monitoring first verifies that each memory item has been done. The checklist is normally read aloud during this verification. The pilot flying does not need to respond except for items that are not in agreement with the checklist. With the electronic checklist, items that are complete (green) do not need to be read or verified. The item numbers do not need to be read.

## Do Reference Items

Non-memory items are called reference items. The pilot monitoring reads aloud the reference items, including:

- the precaution (if any)
- the response or action
- any amplifying information.

The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood. The item numbers do not need to be read. It is recommended that the flight crew read aloud all the choices in a "Choose one" step before taking action, to reduce the chance of error.

The pilot flying may also direct reference checklists to be done by memory if no hazard is created by such action, or if the situation does not allow reference to the checklist.

## "Confirm" Step

The word "Confirm" is added to checklist items when both flight crewmembers must verbally agree before action is taken. During an inflight non-normal situation, verbal confirmation is required for:

- an autothrottle arm switch
- an engine thrust lever
- a fuel control switch
- an engine or APU fire switch, or a cargo fire arm switch
- a generator drive disconnect switch.

This does not apply to the Dual Eng Fail/Stall checklist.

Confirmation is not needed for completion of non-normal checklist items when on the ground.

There is no requirement for specific words to say during a confirm step or for physical actions such as touching or pointing to a control.

## Areas of Responsibility: Ground vs. In Flight

With the airplane stationary on the ground:

- the captain and the first officer take action based on preflight and postflight areas of responsibility.

With the airplane in flight or in motion on the ground:

- the pilot flying and the pilot monitoring take action based on each crewmember's area of responsibility.

After moving the control, the flight crewmember taking the action also states the checklist response.

## Inoperative Items

Checklists include an Inoperative Items table only when the condition of the items is needed for planning the rest of the flight and the condition is not shown on EICAS. The inoperative items, including the consequences (if any), are read aloud by the pilot monitoring. The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood.

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## Consequential Alert Messages

Consequential EICAS alert messages can show as a result of a primary failure condition (such as AUTO SPEEDBRAKE as a result of HYD PRESS SYS C) or as a result of doing a non-normal checklist (such as PACK L or PACK R as a result of doing the Smoke, Fire or Fumes checklist). Consequential messages are shown for flight crew awareness, with the rectangle icons automatically removed. The flight crew does not do the checklists for consequential EICAS alert messages. In the printed primary checklist, the statement "Do not accomplish the following checklists:" is included to inform the flight crew of consequential checklists. In the electronic primary checklist, the statement "Inhibited checklists:" is included to inform the flight crew of consequential checklists. When doing the electronic primary checklist, the statement and the list of checklists do not need to be read. All consequential EICAS alert messages may not show while doing the primary checklist, depending on operational circumstances.

## Deferred Items

After completion of the non-normal checklist, normal procedures are used to configure the airplane for each phase of flight.

When there are no deferred items, the DESCENT, APPROACH, and LANDING normal checklists are used to verify that the configuration is correct for each phase of flight.

When there are deferred items, the non-normal checklist will include the item "**Checklist Complete Except Deferred Items.**" The pilot flying is to be made aware when there are deferred items. In the printed non-normal checklists, these items are included in the Deferred Items section of the checklist and can be delayed until the usual point during descent, approach or landing. In the electronic checklists, these items are automatically added to the end of the applicable normal checklist and can be delayed until the usual point during descent, approach, or landing.

The deferred items are read aloud by the pilot monitoring. The pilot flying or the pilot monitoring takes action based on each crewmember's area of responsibility. After moving the control, the flight crewmember taking the action also states the response.

The Deferred Items section of the printed non-NORM checklist includes the Descent, Approach and Landing normal checklists if one or more of the following occur:

- an item is deferred
- a normal checklist response is changed as a result of the non-normal situation. (The changed response is printed in **bold** type)

Use these checklists instead of the usual DESCENT, APPROACH, and LANDING normal checklists. In the electronic checklists, when there are deferred items, the items are automatically added to the end of the usual DESCENT, APPROACH, or LANDING normal checklist. The pilot flying or the pilot monitoring responds to the deferred normal checklist items based on each crewmember's area of responsibility. However, during the deferred Landing normal checklist, the pilot flying responds to all deferred normal checklist items.

## Checklist Complete

In the printed non-normal checklists, each checklist has a checklist complete symbol at the end.

The checklist complete symbol can also be in the body of the checklist. This only occurs when a checklist divides into two or more paths. Each path can have a checklist complete symbol at the end. The flight crew does not need to continue reading the checklist after a checklist complete symbol. In the electronic checklists, each checklist has a "Checklist Complete" item at the end. There is only one checklist complete item.

After completion of each non-normal checklist, the pilot monitoring states " \_\_\_\_\_ CHECKLIST COMPLETE."

## Special Situations

While every attempt is made to supply needed non-normal checklists, it is not possible to develop checklists for all conceivable situations. In some smoke, fire, or fumes situations, the flight crew may need to move between the Smoke, Fire or Fumes checklist and the Smoke or Fumes Removal checklist. In some multiple failure situations, the flight crew may need to perform several checklists or combine the elements of more than one checklist. Consider doing memory items first. In all situations, the captain assesses the situation and uses good judgment to determine the safest course of action.

## Troubleshooting

It should be noted that, in determining the safest course of action, troubleshooting (taking steps beyond published non-normal checklist steps) may cause further loss of system function or system failure. Troubleshooting should only be considered when completion of the published non-normal checklist results in an unacceptable situation.

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## Land At Nearest Suitable Airport

There are some situations where the flight crew must land at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- the non-normal checklist includes the item "Plan to land at the nearest suitable airport."
- fire or smoke continues
- only one AC power source remains (main engine generator, APU generator, or backup power system [both generators])
- any other situation determined by the flight crew to have a significant adverse effect on safety if the flight is continued.

## Immediate Landing

It must be stressed that for smoke that continues or a fire that cannot be positively confirmed to be completely extinguished, the earliest possible descent, landing, and evacuation must be done.

If a smoke, fire or fumes situation becomes uncontrollable, the flight crew should consider an immediate landing. Immediate landing implies immediate diversion to a runway. However, in a severe situation, the flight crew should consider an overweight landing, a tailwind landing, an off-airport landing, or a ditching.

## Engine Shutdown

Checklists directing an engine shutdown must be evaluated by the captain to determine whether an actual shutdown or operation at reduced thrust is the safest course of action. Consideration must be given to the probable effects of running the engine at reduced thrust.

## Loss of Indications

There are no non-normal checklists for the loss of engine indications, or automatic display of the secondary engine indications. Automatic display of secondary engine parameters due to engine oil quantity or vibration is for flight crew awareness and does not require pilot action. Continue normal system or engine operation unless an EICAS alert message shows or a limit is exceeded.

## Assumptions

Non-normal checklists also assume:

- During engine start and before takeoff, the associated non-normal checklist is done if an EICAS alert message is shown or a non-normal situation is identified. After completion of the checklist, the Dispatch Deviations Guide (DDG) or operator equivalent is consulted to determine if Minimum Equipment List (MEL) dispatch relief is available.

- System controls are in the normal configuration for the phase of flight before the start of the non-normal checklist.
- Aural alerts are silenced and the system is reset by the flight crew as soon as the cause of the alert is recognized.
- The EICAS message list is canceled after all checklists are complete or on hold so that future messages are more noticeable.
- The EMERGENCY position of the oxygen regulator is used when needed to supply positive pressure in the masks and goggles to remove contaminants. The 100% position of the oxygen regulator is used when positive pressure is not needed, but contamination of the flight deck air exists. The Normal position of the oxygen regulator is used if prolonged use is needed and the situation allows. Normal boom microphone operation is restored when oxygen is no longer in use.
- Indicator lights are tested to verify suspected faults.
- Non-normal checklists must not be used to:
  - Allow operations into situations where a non-normal condition is predicted.
  - Disable systems in anticipation of a non-normal event.
- In flight, reset of a tripped circuit breaker is not recommended. However, a tripped circuit breaker may be reset once, after a short cooling period (approximately 2 minutes), if in the judgment of the captain, continued safe flight and landing could be compromised by the inoperative system. On the ground, flight crew reset of a tripped circuit breaker should only be done after maintenance has determined that it is safe to reset the circuit breaker.
- Flight crew cycling (pulling and resetting) of a circuit breaker to clear a non-normal condition is not recommended, unless directed by maintenance.
- When a non-normal checklist directs the flight crew to attempt only one reset of a switch per flight, a second reset of the switch should not be done until maintenance has cleared the malfunction. After the one reset attempt, the flight crew should select ITEM OVRD for any additional checklist steps directing the flight crew to attempt a reset of the same switch.

## Use of Captain's Discretion

The flight crew must be aware that checklists cannot be created for all conceivable situations and are not intended to replace good judgment. In some situations, at the captain's discretion, deviation from a checklist may be needed.

## Non-Normal Situation Guidelines Overview

This is a general overview of how non-normal situations should be conducted.

Consider maximum use of autoflight system to reduce workload, if available and appropriate. If flight directors are selected on, ensure the proper flight director modes are selected.

<b>Pilot Flying</b>	<b>Pilot Monitoring</b>
Recognizes and announces the non-normal situation. Other pilot acknowledges.	
<b>MAINTAIN AIRPLANE CONTROL</b> Ensure that the flight path is under control.	Monitor the flight path.
	<b>ANALYZE THE SITUATION</b> Review all EICAS alert messages to identify the non-normal situation. Prioritize alerts and recommend course of action.
Acknowledges and confirms the Pilot Monitoring's identification or recommendation.	
<b>TAKE THE PROPER ACTION</b> Do the NNC memory items based on each crewmember's area of responsibility.	
Call for the appropriate NNC.	
	Completes the NNC.
Review all EICAS alert messages, and do other NNCs as needed.	
<b>EVALUATE THE NEED TO LAND</b> Review options for diversion or continued flight.	

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## Non-Normal Checklist Legend

### Redirection Symbol



The redirection symbol is used in two ways:

- In the Table of Contents of a system section, to direct the flight crew to a different system section.
- In a non-normal checklist, with the word "Go to", to direct the flight crew to a different checklist or to a different step in the current checklist.

### Separator Symbol



The separator symbol is used in two ways:

- In the Table of Contents of a system section, to separate the Quick Action Index checklists from the checklists that are not in the Quick Action Index.
- In a non-normal checklist, to separate the memory items from the reference items.

### Task Divider Symbol



The task divider symbol is used to indicate the end of one task and the beginning of another task.

### Decision Symbol



The decision symbol is used to identify possible choices.

### Precaution Symbol



The precaution symbol is used to identify information the flight crew must consider before taking the action.

### Checklist Complete Symbol



The checklist complete symbol indicates that the checklist is complete.



**Fire Eng on Ground L, R Checklist is  
on the reverse side of this page.**

**Fire Eng on Ground L, R**

Condition: One or more of these occur on the ground:

- Fire is observed in the affected engine
- Fire is detected in the affected engine

- 1 Thrust levers (both) . . . . . Idle C
- 2 PARKING BRAKE . . . . . Set C
- 3 Advise the cabin. C or F/O
- 4 FUEL CONTROL switch  
(affected side) . . . . . CUTOFF C
- 5 Engine fire switch  
(affected side) . . . . . Pull F/O
- 6 Engine fire switch  
(affected side) . . . . . Rotate to the stop  
and hold for 1 second F/O
- 7 Choose one:

◆ Evacuation is **needed**:

▶▶ **Go to the Evacuation checklist on  
page Back Cover.4**



◆ Evacuation is **not** needed:

▶▶ **Go to step 8**

- 8 Advise the cabin. C
- 9 Advise ATC. F/O





**Evacuation Checklist is on the  
reverse side of this page.**



**Evacuation**

Condition: An evacuation is needed.

- 1 PARKING BRAKE . . . . . Set C
- 2 OUTFLOW VALVE switches  
(both) . . . . . MAN F/O
- 3 OUTFLOW VALVE MANUAL  
switches (both) . . . . . Hold in OPEN  
until the outflow  
valve indications show fully  
open to depressurize the airplane F/O
- 4 FUEL CONTROL switches  
(both) . . . . . CUTOFF C
- 5 Advise the cabin to evacuate. C
- 6 Advise ATC. F/O
- 7 Engine fire switches (both) . . . . . Pull F/O
- 8 APU fire switch . . . . . Override and pull F/O
- 9 **If** an engine or APU fire is **observed or indicated**:  
Related fire  
switch . . . . . Rotate to the stop  
and hold for 1 second F/O

